Availability of Existing Data to Assess Impacts of Shale Gas Development in the Susquehanna River Basin

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National Water Quality Monitoring Council
Web Meeting
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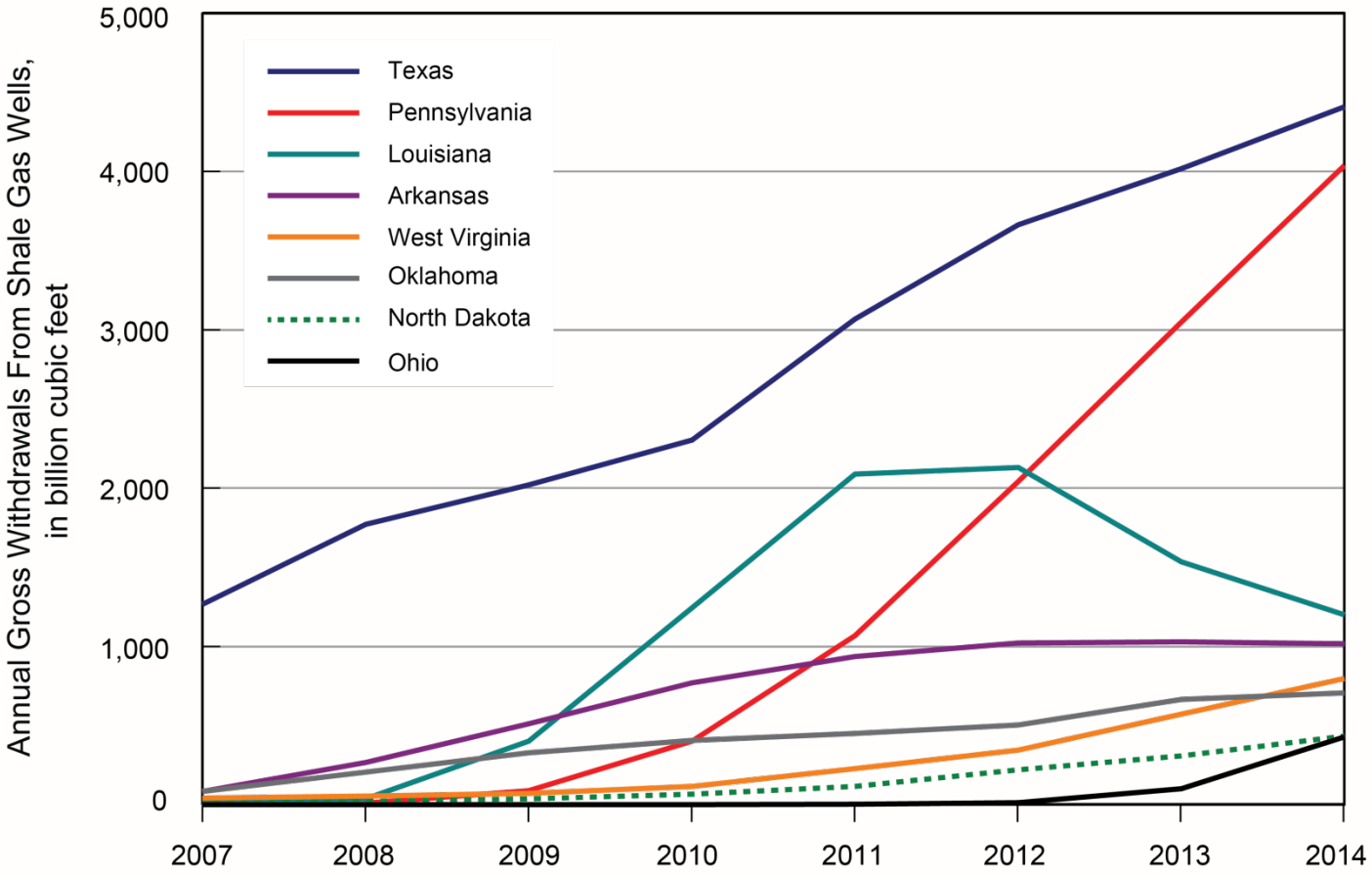
Shale gas production is rapidly increasing in Pennsylvania



(data from U.S. Energy Information Administration, 2015)

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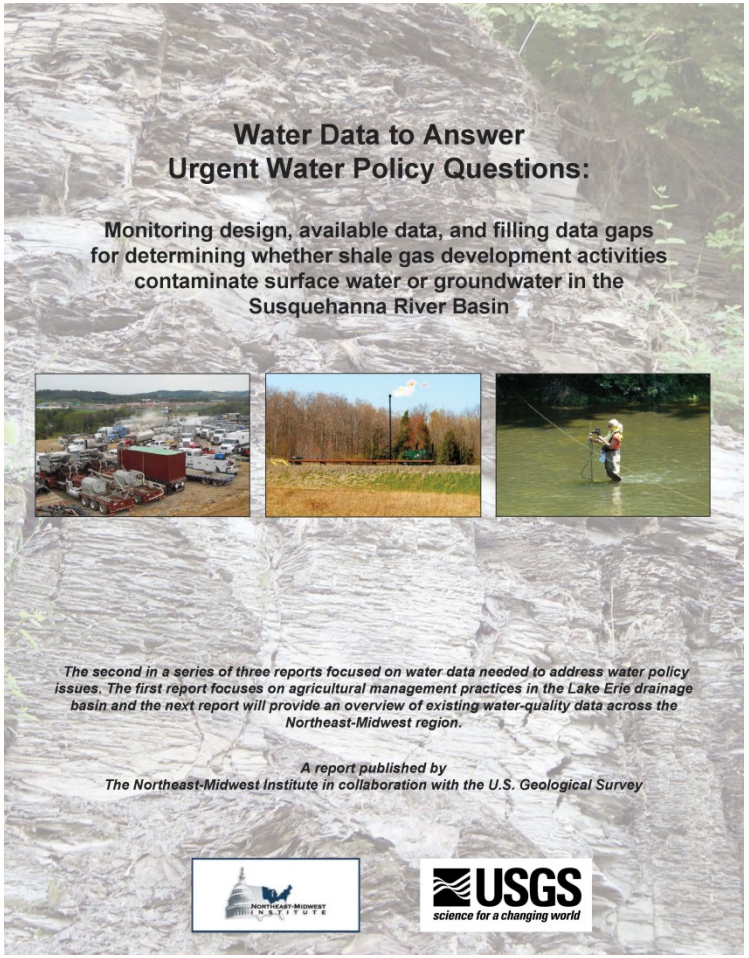
Shale Gas Development in the Susquehanna River Basin

Water Data to Answer Urgent Water Policy Questions



Do shale gas development activities contaminate surface water or groundwater?

Find the report at:

www.nemw.org

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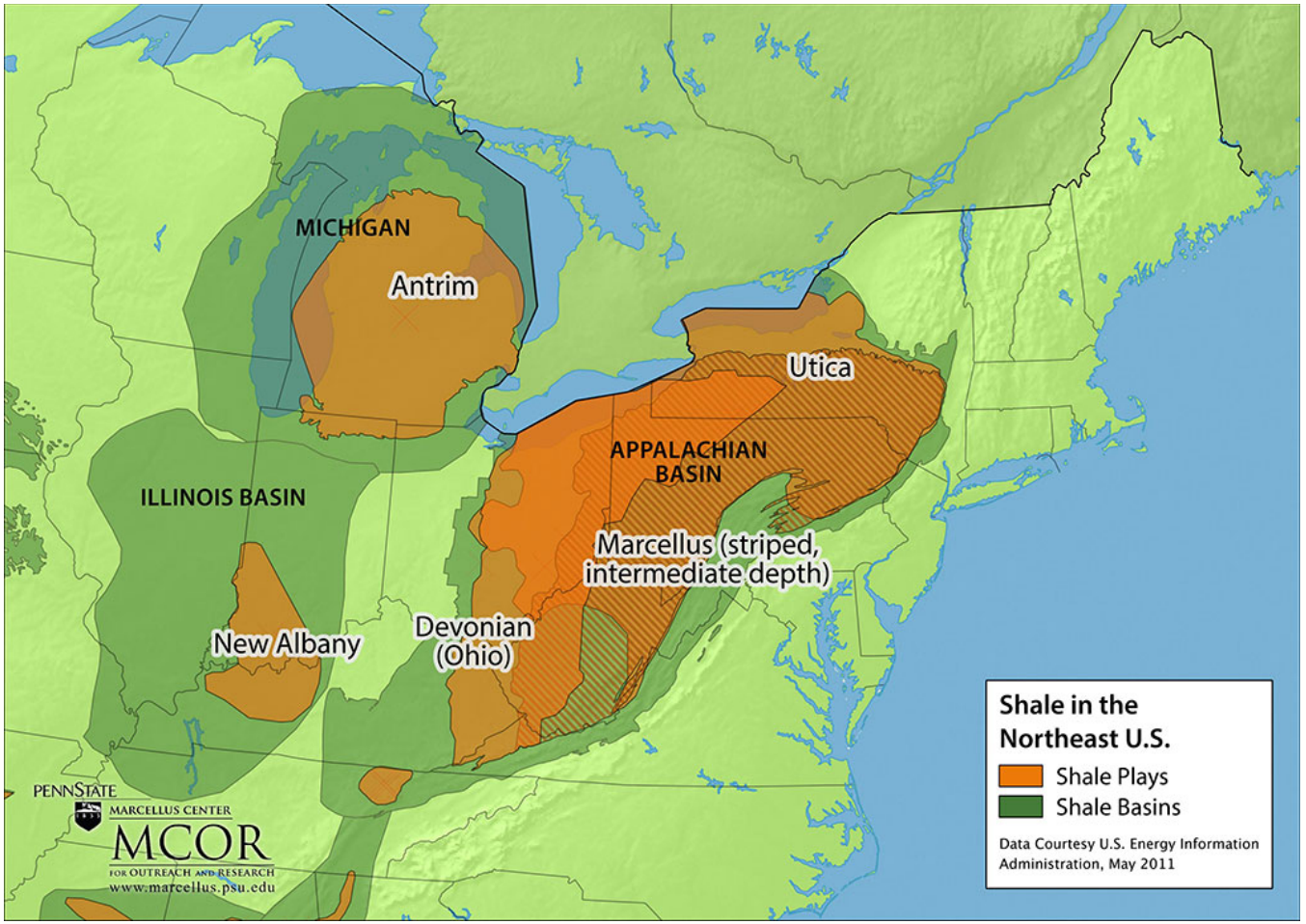
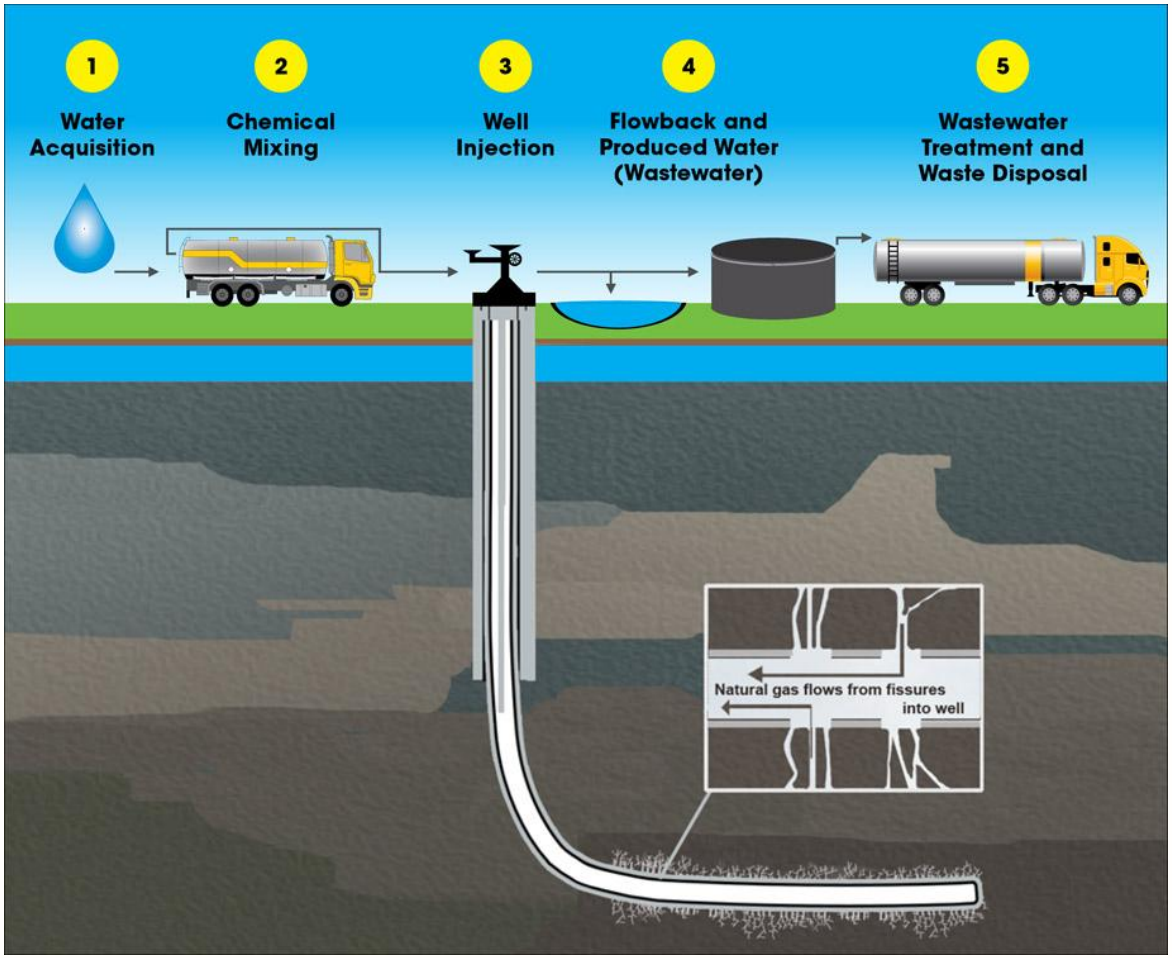
Shale Plays in the Northeast-Midwest Region



The Shale Gas Development Water Cycle



https://www.epa.gov/hfstudy/hydraulic-fracturing-water-cycle

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Study design to answer "Do shale gas development activities contaminate surface water or groundwater?"

Water-Quality Data:

Water-quality (and streamflow) data to detect change over time

Appropriate Monitoring Sites:

Monitoring sites in areas with high volume hydraulic fracturing (HVHF) wells

Ancillary Data:

Shale gas activity, geology, land-use, and climate data to correlate water-quality change with changes on the land

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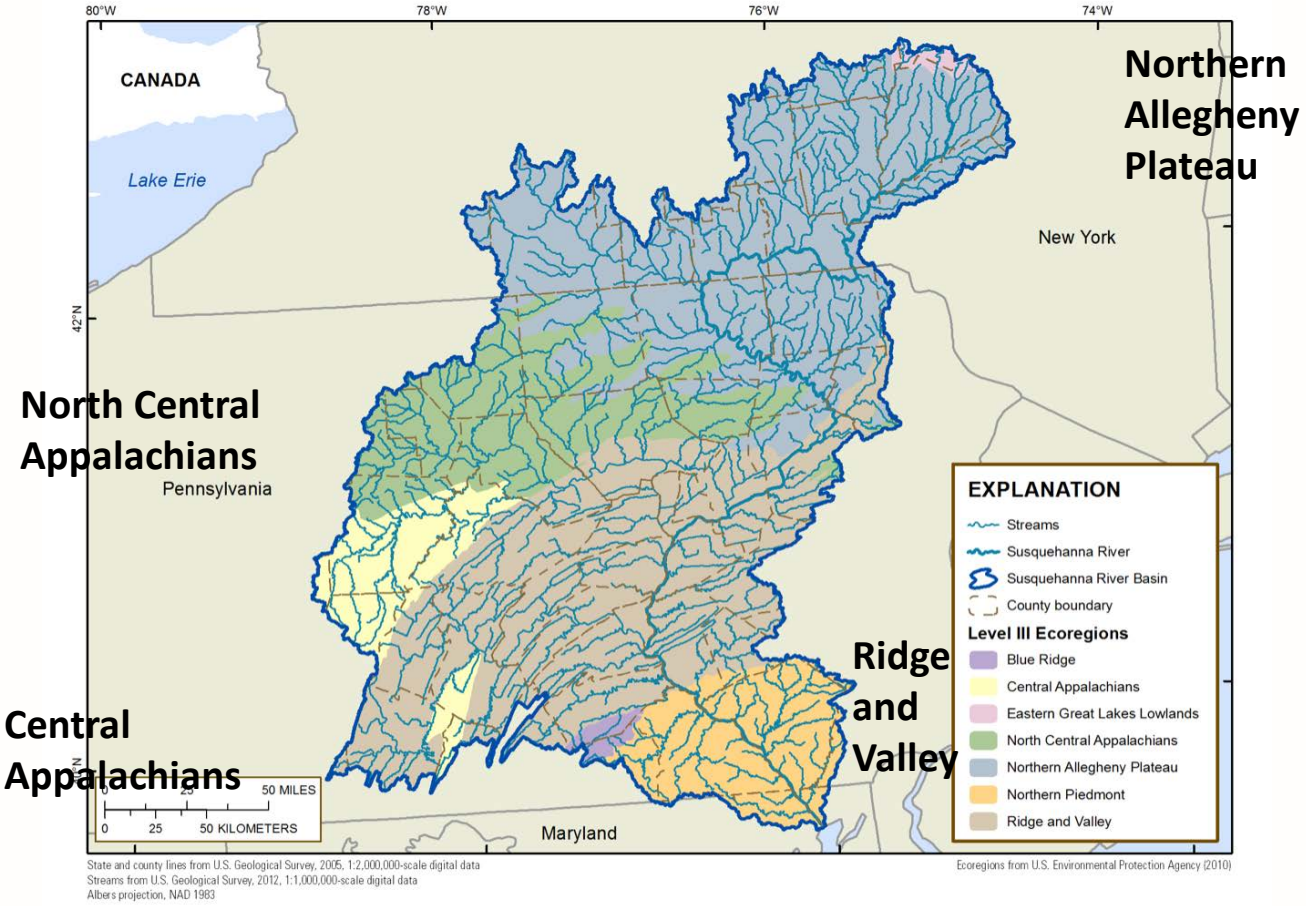
Monitoring sites are needed in each ecoregion with shale gas development



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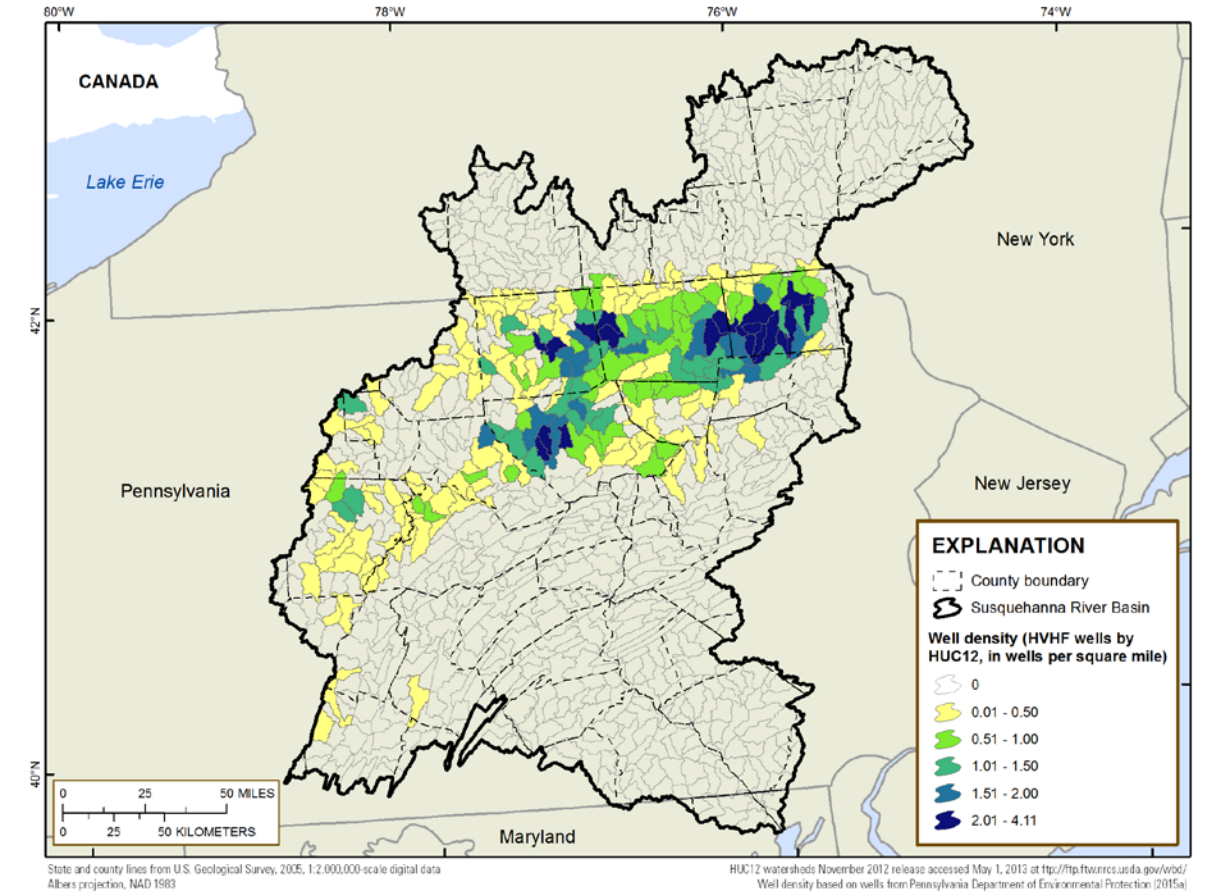
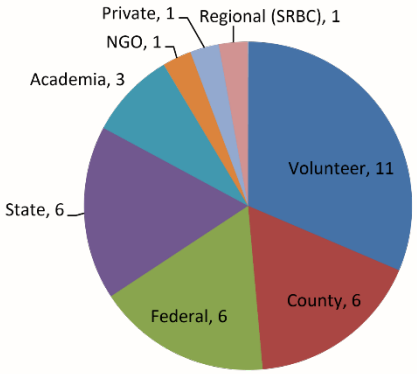
Monitoring sites are needed in areas with a high density of HVHF wells

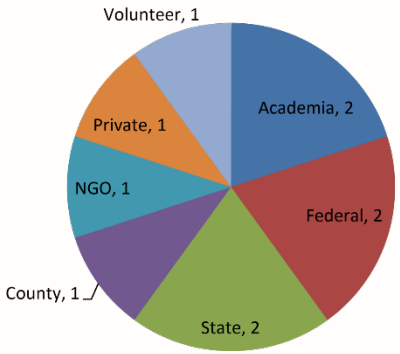


Surface water data are collected by 35 organizations in the Susquehanna River Basin

(A) Surface water organizations (n=35)



(B) Groundwater organizations (n=10)



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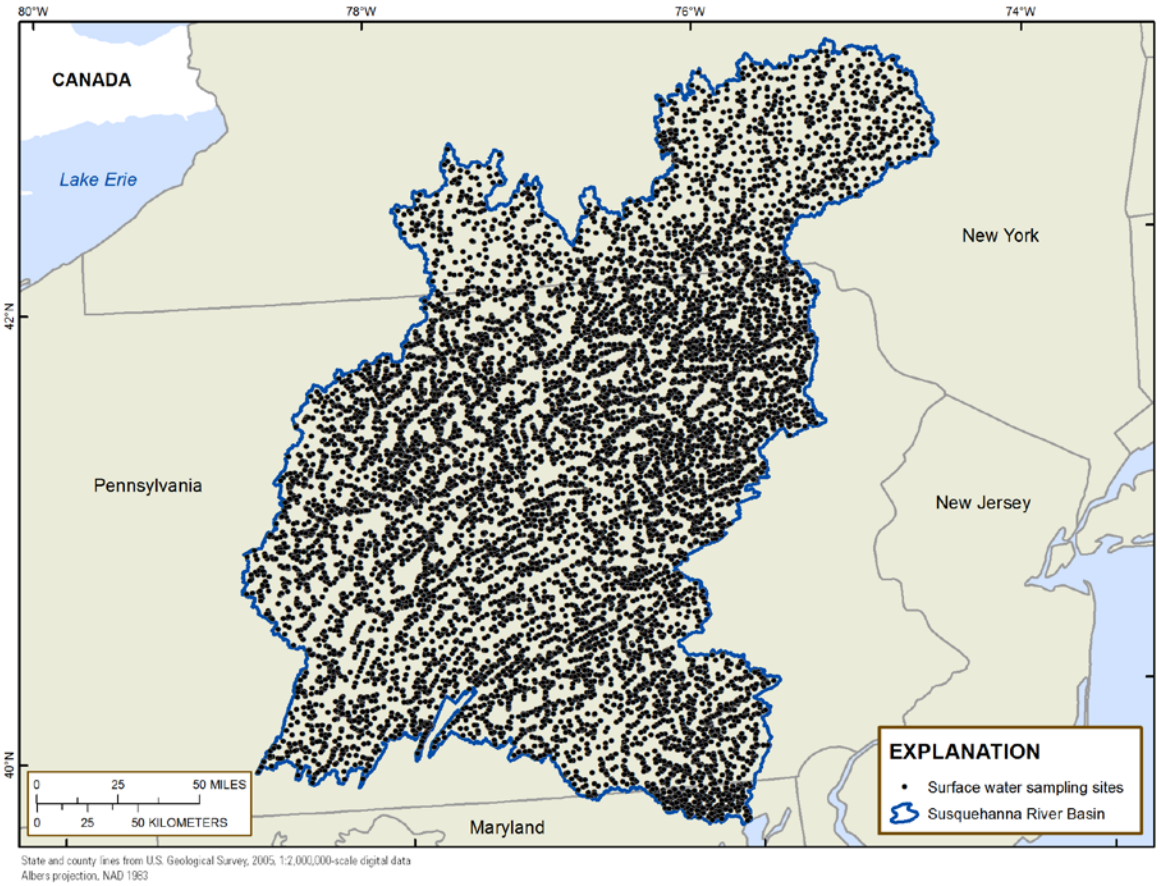
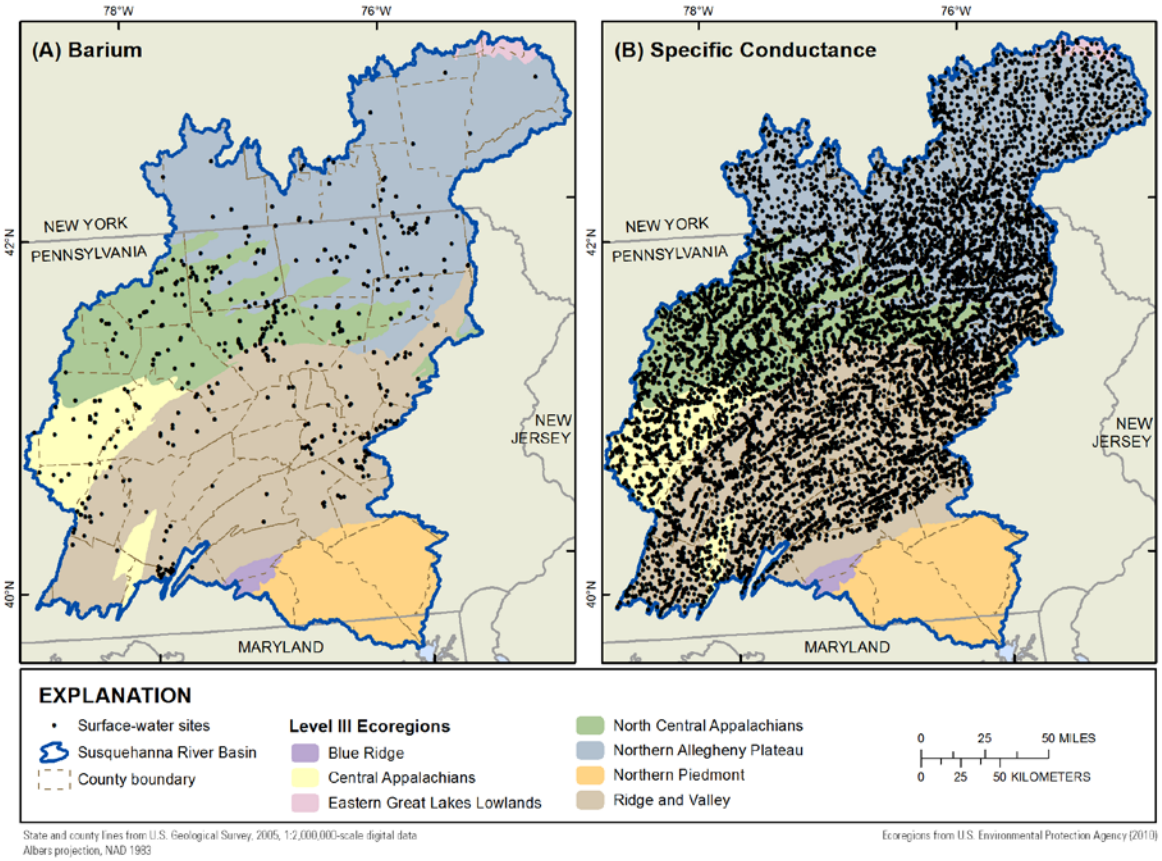
Surface water monitoring sites for comprehensive suite of parameters (n=14,730)



Monitoring sites with barium and specific conductance data in the Marcellus and Utica Shale area

n= 549 sites

n=11,890 sites



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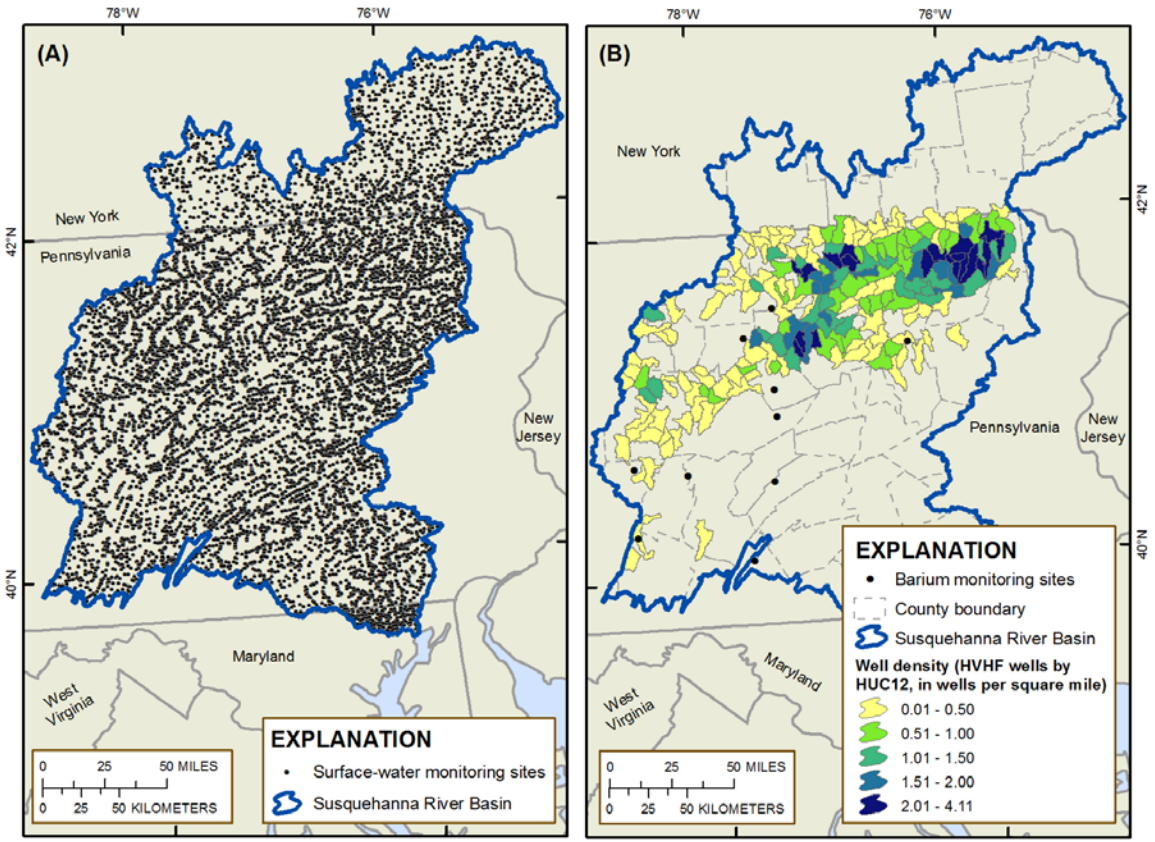
Surface water monitoring sites for comprehensive suite of parameters (n=14,730)

Sites with minimum data for detecting changes in barium concentration (n=10)



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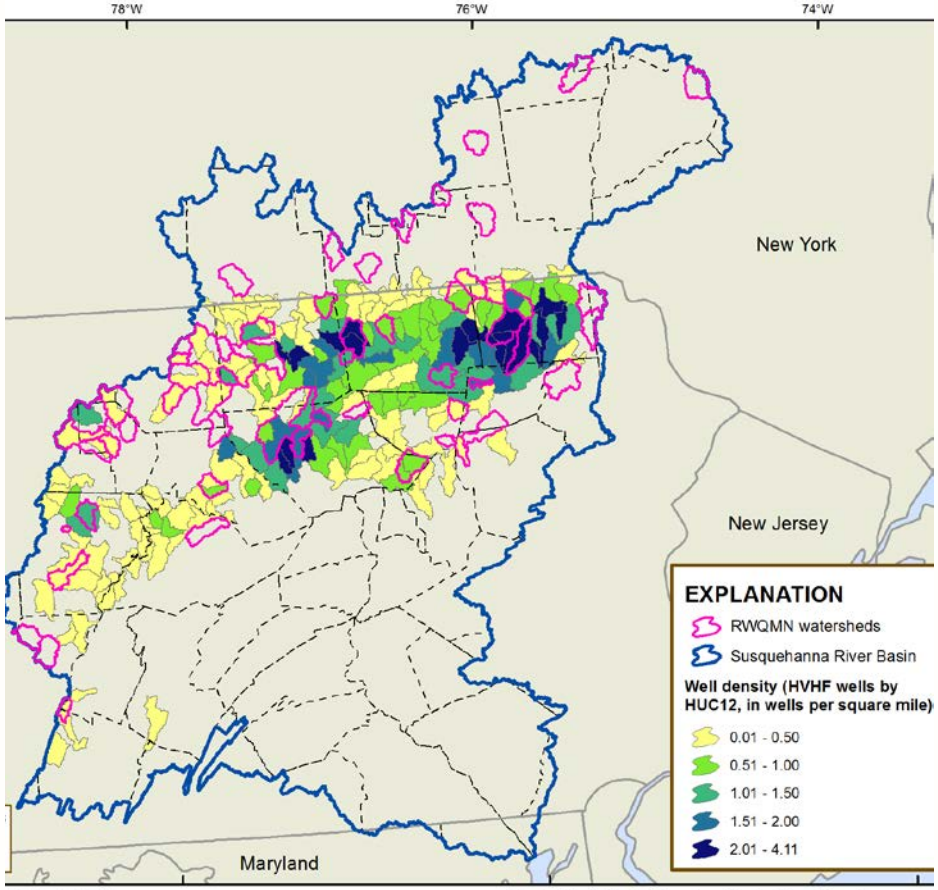
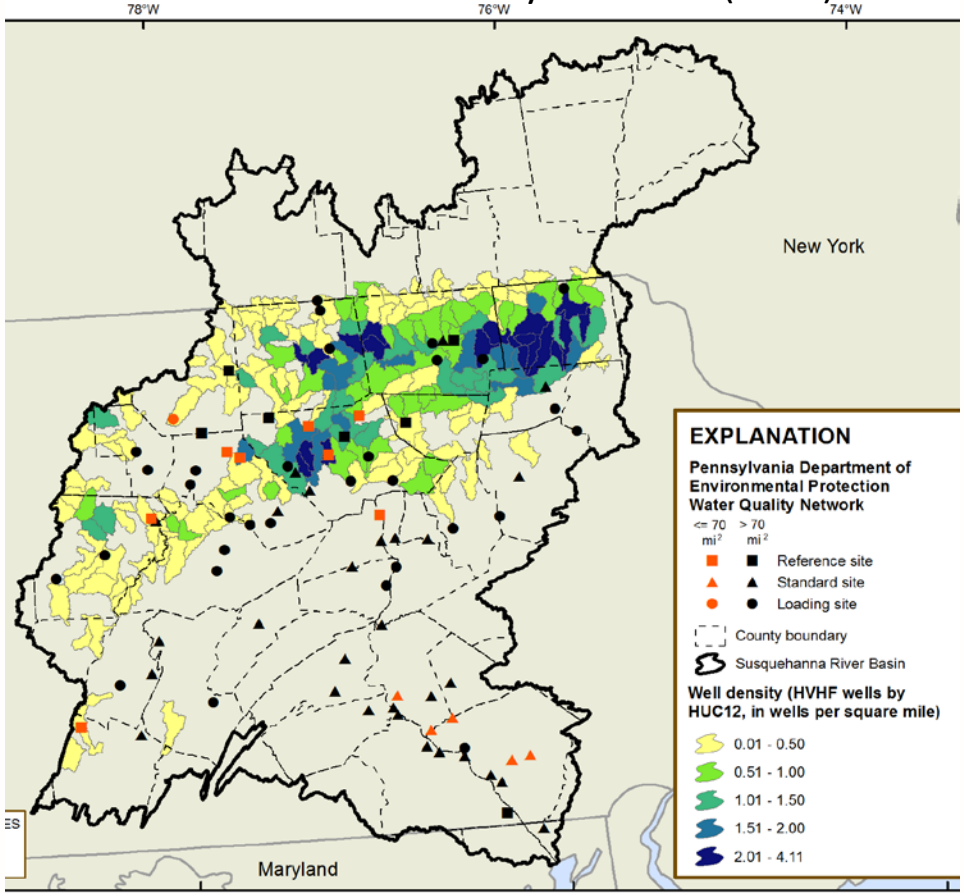
Recently initiated monitoring programs are sampling in the right locations

Susquehanna River Basin Commission Remote Water Quality Monitoring Network (2015) n=58



Pennsylvania Department of Environmental Protection Fixed Water Quality Network (2015) n=74



Recommendations for filling surface water data gaps

- Increase monitoring at a minimum of 8 targeted surface water monitoring sites; additional monitoring sites are highly recommended.
- Analyze samples for the full suite of priority surface-water parameters and streamflow at each monitoring site.
- Maintain long-term monitoring at selected sites

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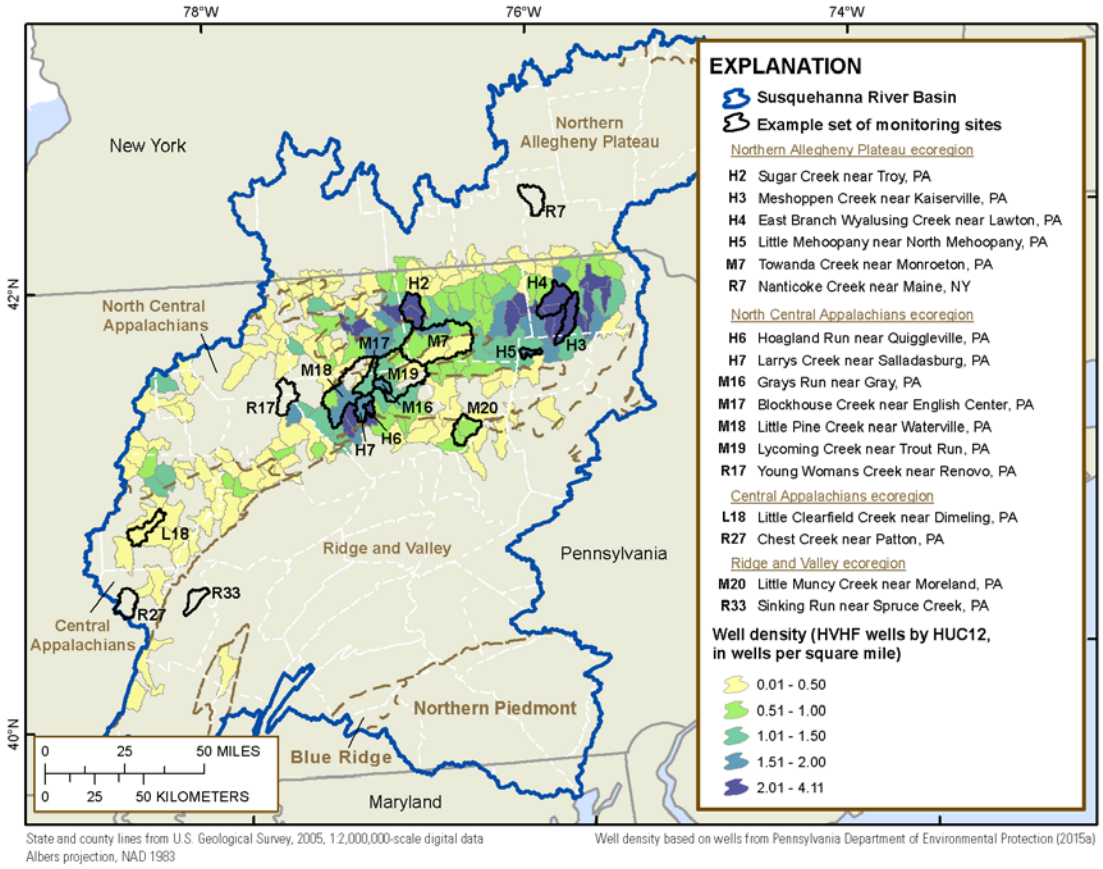
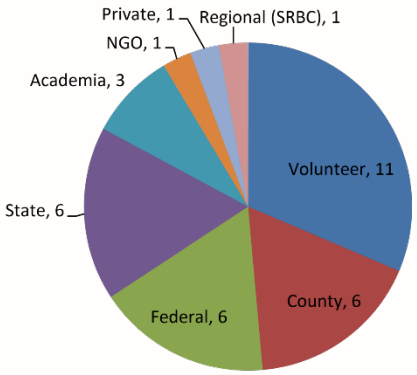
Example set of surface water sites for increased targeted sampling

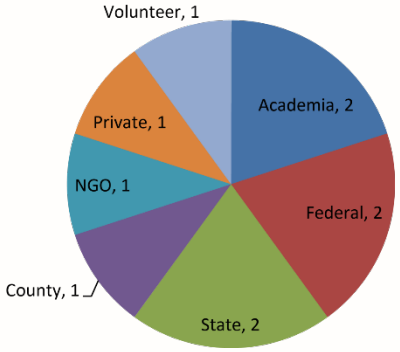


Groundwater data are collected by 10 organizations in the Susquehanna River Basin

(A) Surface water organizations (n=35)



(B) Groundwater organizations (n=10)



Groundwater Network Analysis Monitoring Design

- 5 monitoring networks needed
- 25-30 sampling sites per network, each site within 1 mile of HVHF well
- Two samples at each site, separated by approximately 10 years and taken before and after shale gas development

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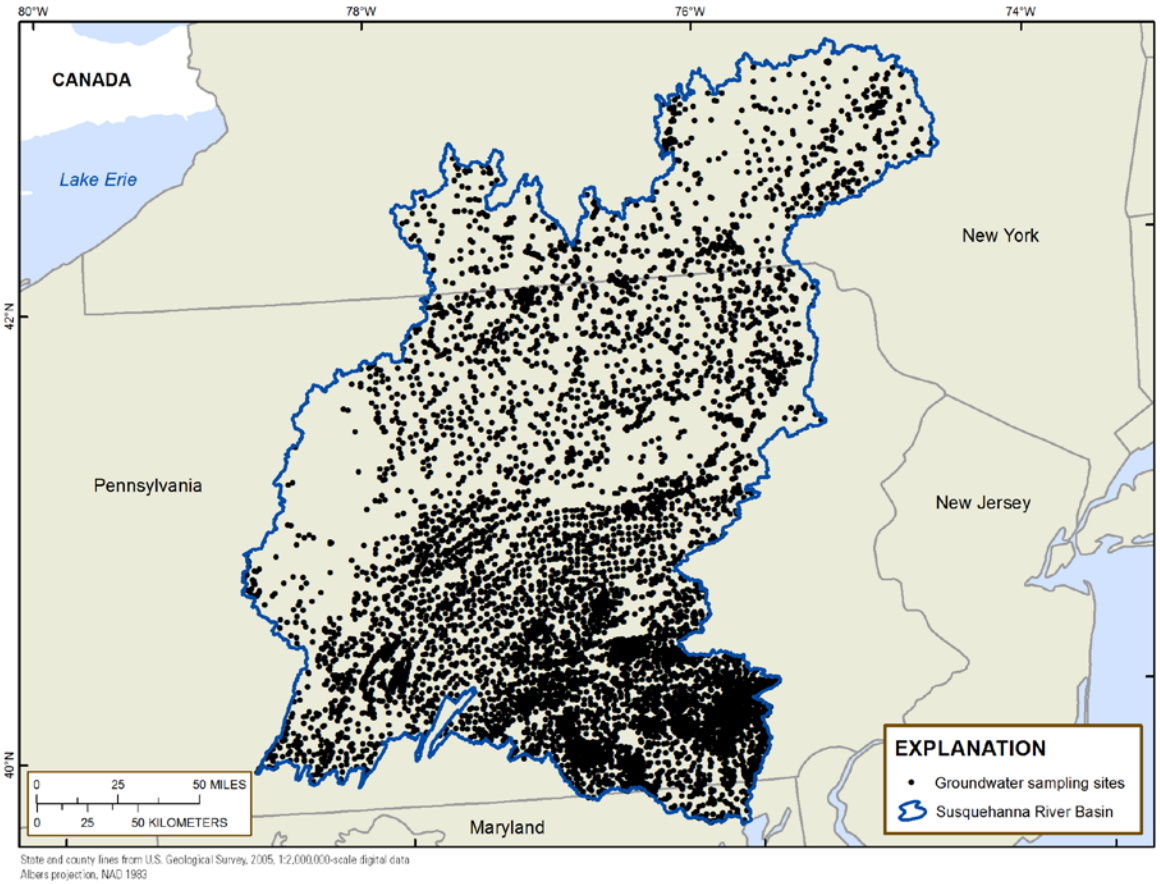
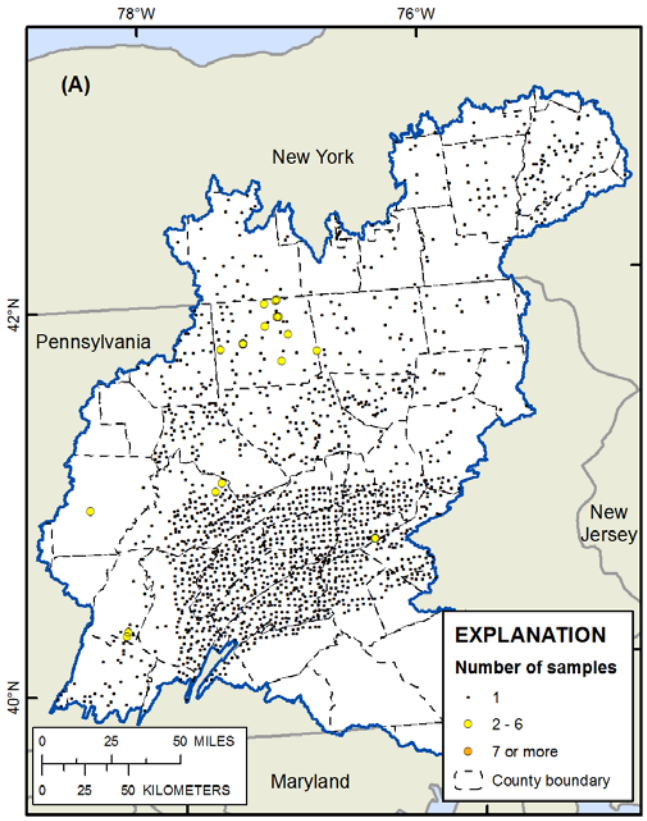
Groundwater monitoring sites for comprehensive suite of parameters (n=9,761)



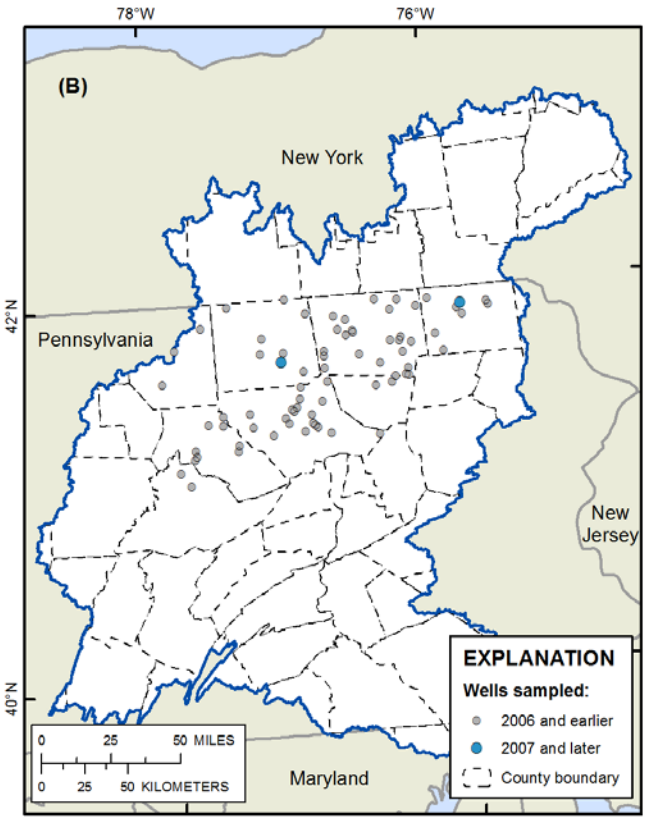
Existing groundwater monitoring sites for bromide

All sites (n= 1,686)



State and county lines from U.S. Geological Survey, 2005, 1:2,000,000-scale digital data
Albers projection, NAD 1983

Sites within 1 mile of an HVHF well (n=74)



State and county lines from U.S. Geological Survey, 2005, 1:2,000,000-scale digital data
Albers projection, NAD 1983

Wells from Pennsylvania Department of Environmental Protection (2015a)

Recommendations for filling groundwater data gaps

- Design and implement a systematic, long-term groundwater monitoring program with industry input

- Establish a coordinating entity with representation from water monitoring organizations, shale gas industry, domestic well owners, and public citizens

Policy Needs

- Incentives for shale gas industry to share water quality data and participate in water monitoring planning
- Coordinating entity to develop surface water and groundwater sampling plans
- Funding:
  - Increased surface water monitoring
  - Streamgages
  - Groundwater monitoring network