

Water Acquisition for Unconventional Natural Gas Development Within the Susquehanna River Basin

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What Does SRBC Regulate?

- Surface Water Withdrawals; Threshold (100,000 gpd)
- Groundwater Withdrawals; Threshold (100,000 gpd)
- Consumptive Use; Threshold (20,000 gpd)
- Diversions; Thresholds (any amt. In; 20,000 gpd out)
- For Unconventional Natural Gas Industry, all regulatory thresholds are set at “Gallon One.”

Major Changes in SRBC Regulations Relevant to Unconventional Natural Gas Development

- On-line application process,
- Regulate CU through Approval-by-Rule (ABR); Ave. 30-Day Turn-Around of CU approvals,
- Multiple withdrawals/sources for multiple pad sites,
- Source water sharing between companies,
- Reuse of flowback, pad-to-pad transfers of flowback, and interbasin transfers of flowback,
- Pipeline docket approvals, facilitates ABR source water approvals,

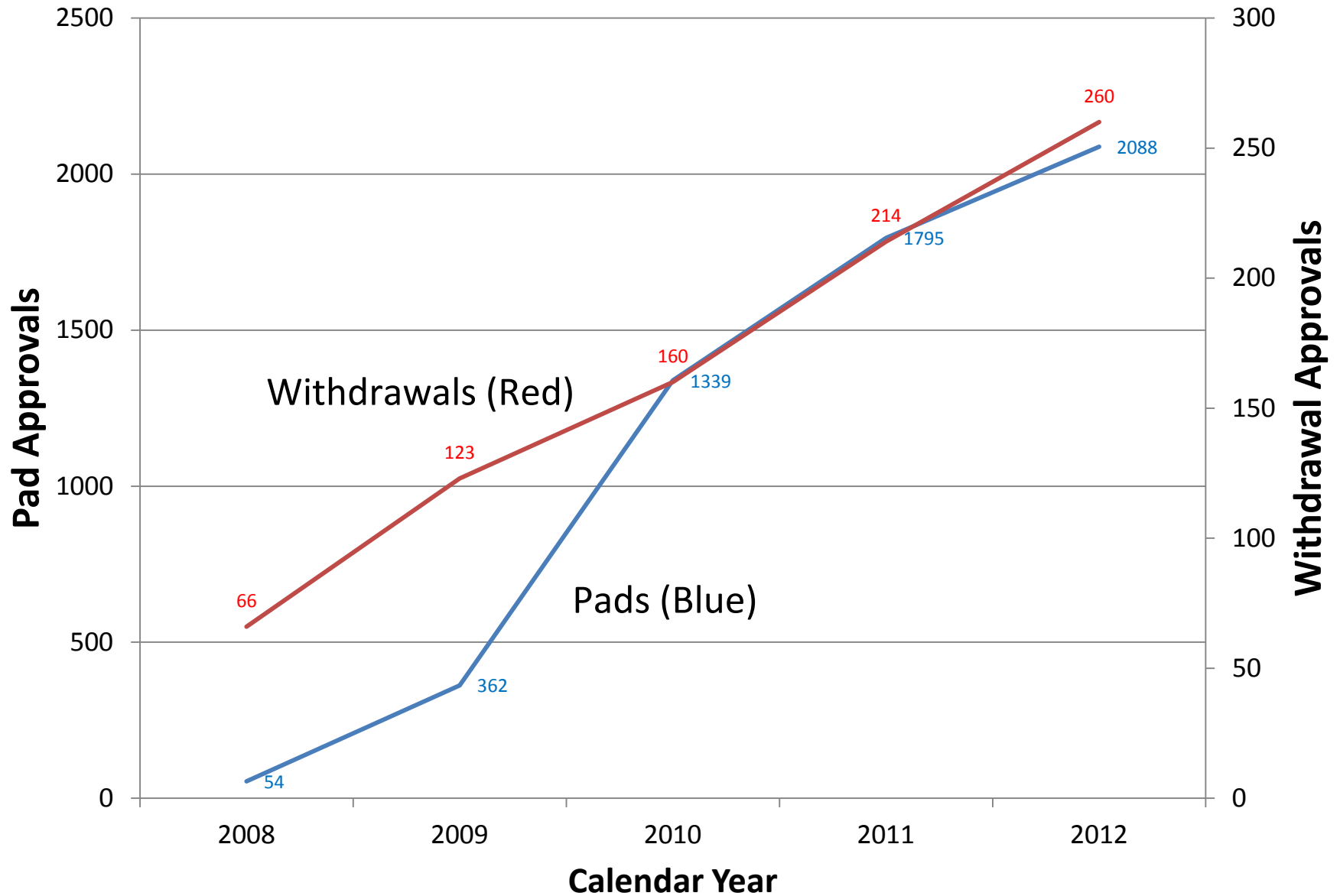
Major Changes in SRBC Regulations Relevant to Unconventional Natural Gas Development (Cont.)

- PWS and wastewater source approvals,
- Facilitate/encourage use of lesser quality waters,
- Allow on-pad use of top-hole water, direct precip., stormwater with ABR approval,
- Hydrocarbon water storage facility registration (Third Party Owners),
- Named additional geologic formations eligible for ABR approval process.

Major SRBC Challenges Posed by Unconventional Natural Gas Development

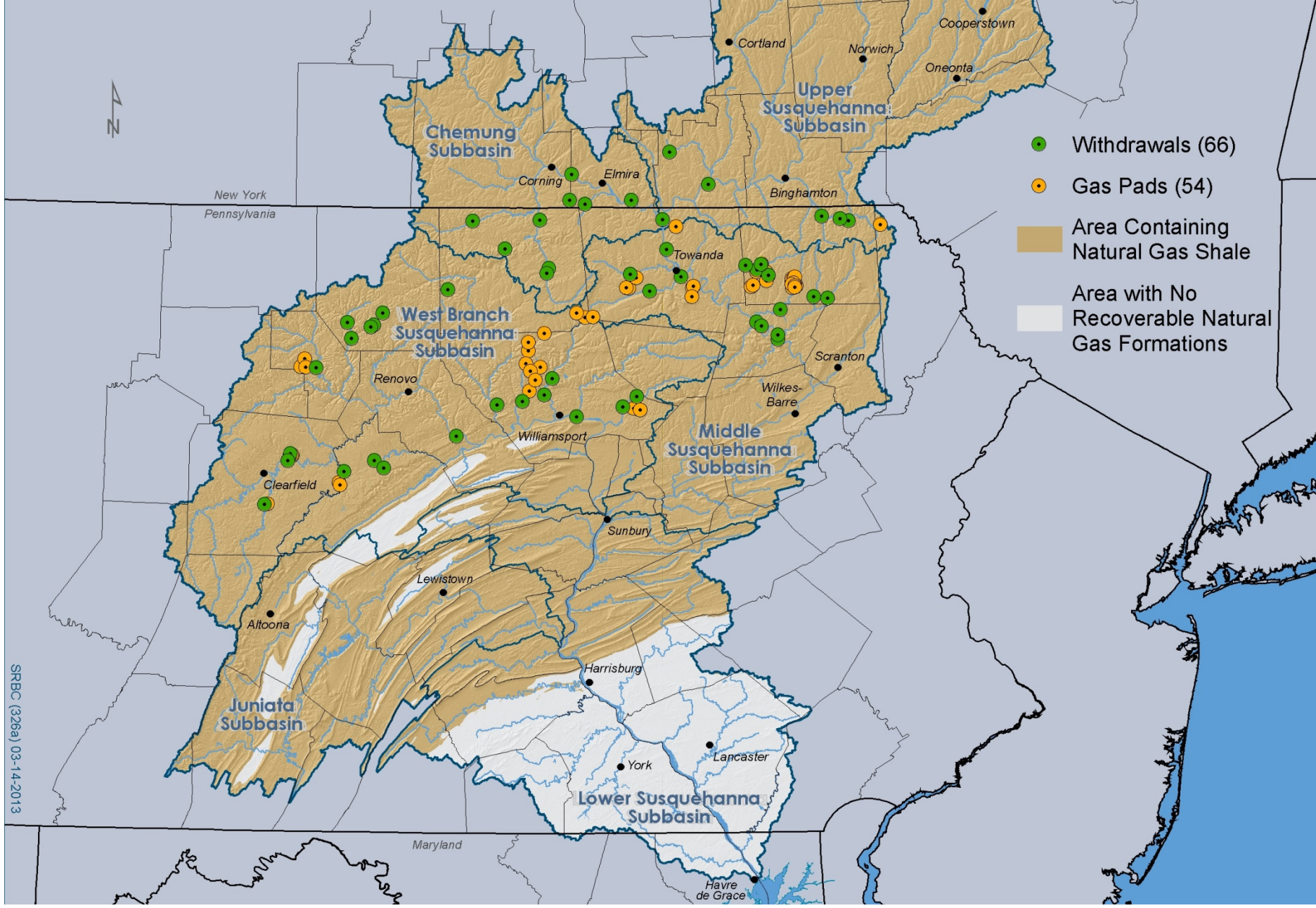
- Operates in headwaters - historically least developed portions of basin,
- Nomadic and short-term nature of projects,
- Volume of applications received and processed,
- Withdrawals distant from consumptive use locations,
- Rapid pace of industry is at odds with bureaucracy,
- Public scrutiny/opposition.

Pad and Water Withdrawal Approvals



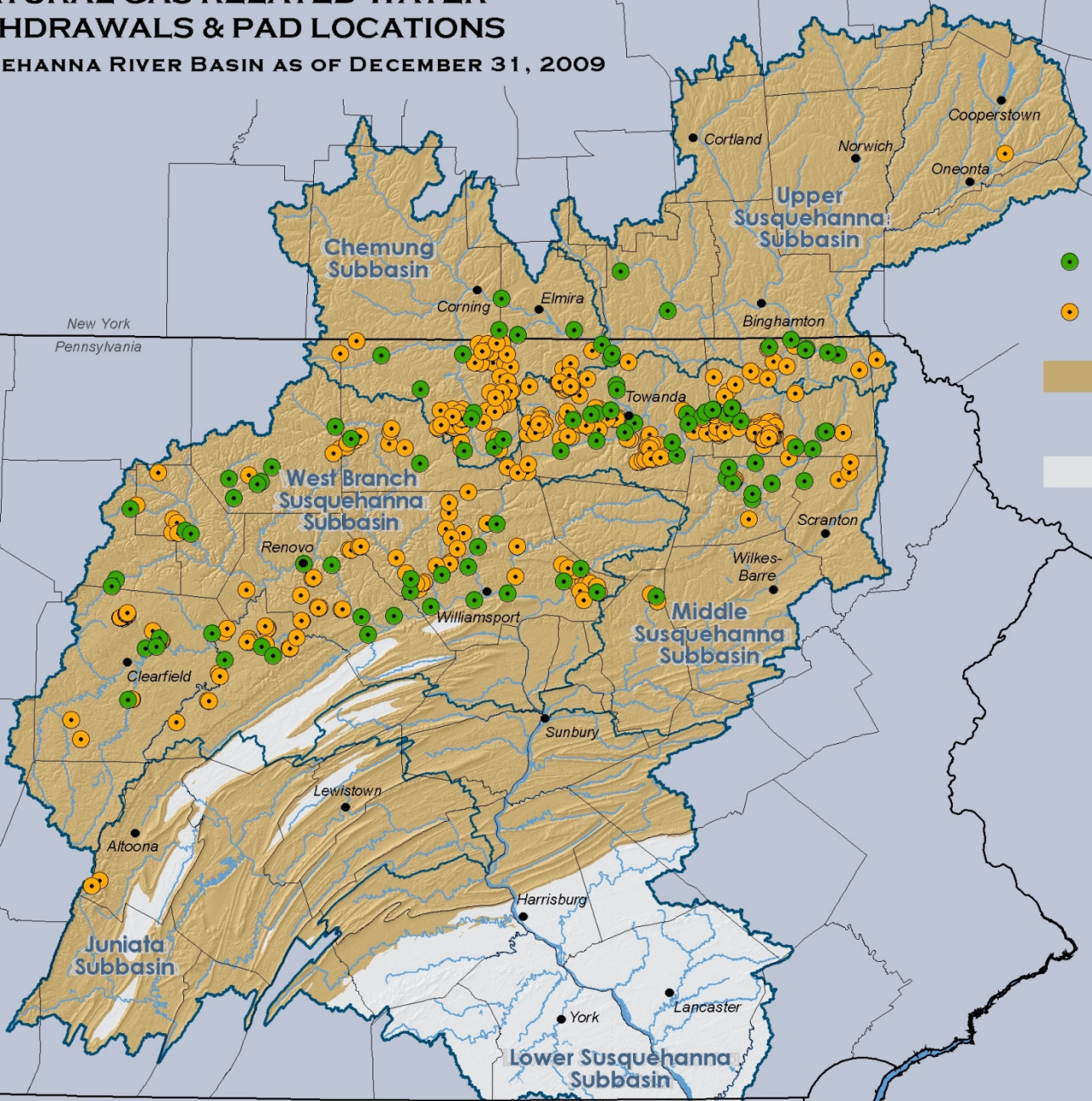
NATURAL GAS RELATED WATER WITHDRAWALS & PAD LOCATIONS

IN THE SUSQUEHANNA RIVER BASIN AS OF DECEMBER 31, 2008



NATURAL GAS RELATED WATER WITHDRAWALS & PAD LOCATIONS

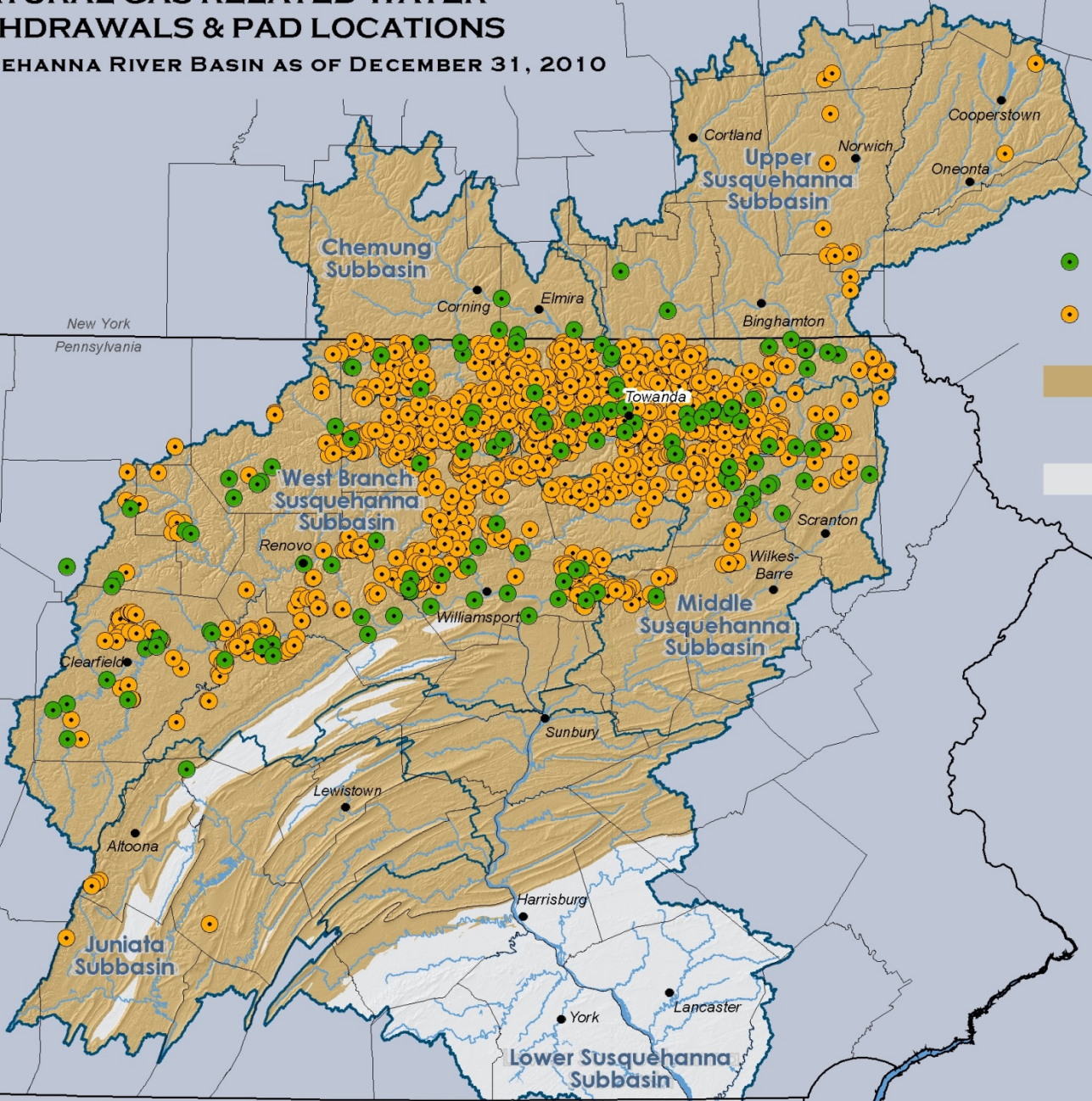
IN THE SUSQUEHANNA RIVER BASIN AS OF DECEMBER 31, 2009



- Withdrawals (123)
- Gas Pads (362)
- Area Containing Natural Gas Shale
- Area with No Recoverable Natural Gas Formations

NATURAL GAS RELATED WATER WITHDRAWALS & PAD LOCATIONS

IN THE SUSQUEHANNA RIVER BASIN AS OF DECEMBER 31, 2010



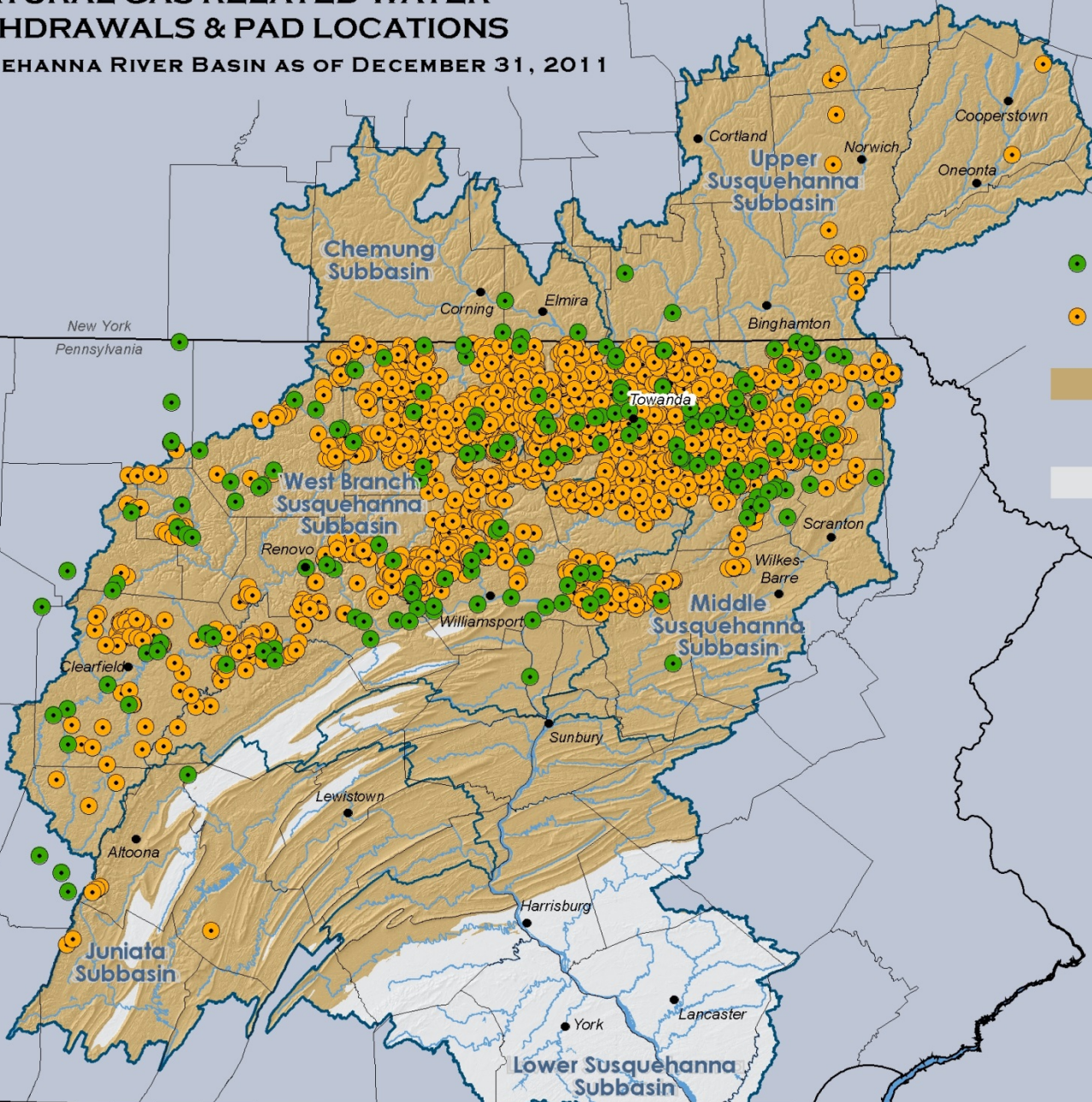
- Withdrawals (160)
- Gas Pads (1,339)
- Area Containing Natural Gas Shale
- Area with No Recoverable Natural Gas Formations

NATURAL GAS RELATED WATER WITHDRAWALS & PAD LOCATIONS

IN THE SUSQUEHANNA RIVER BASIN AS OF DECEMBER 31, 2011

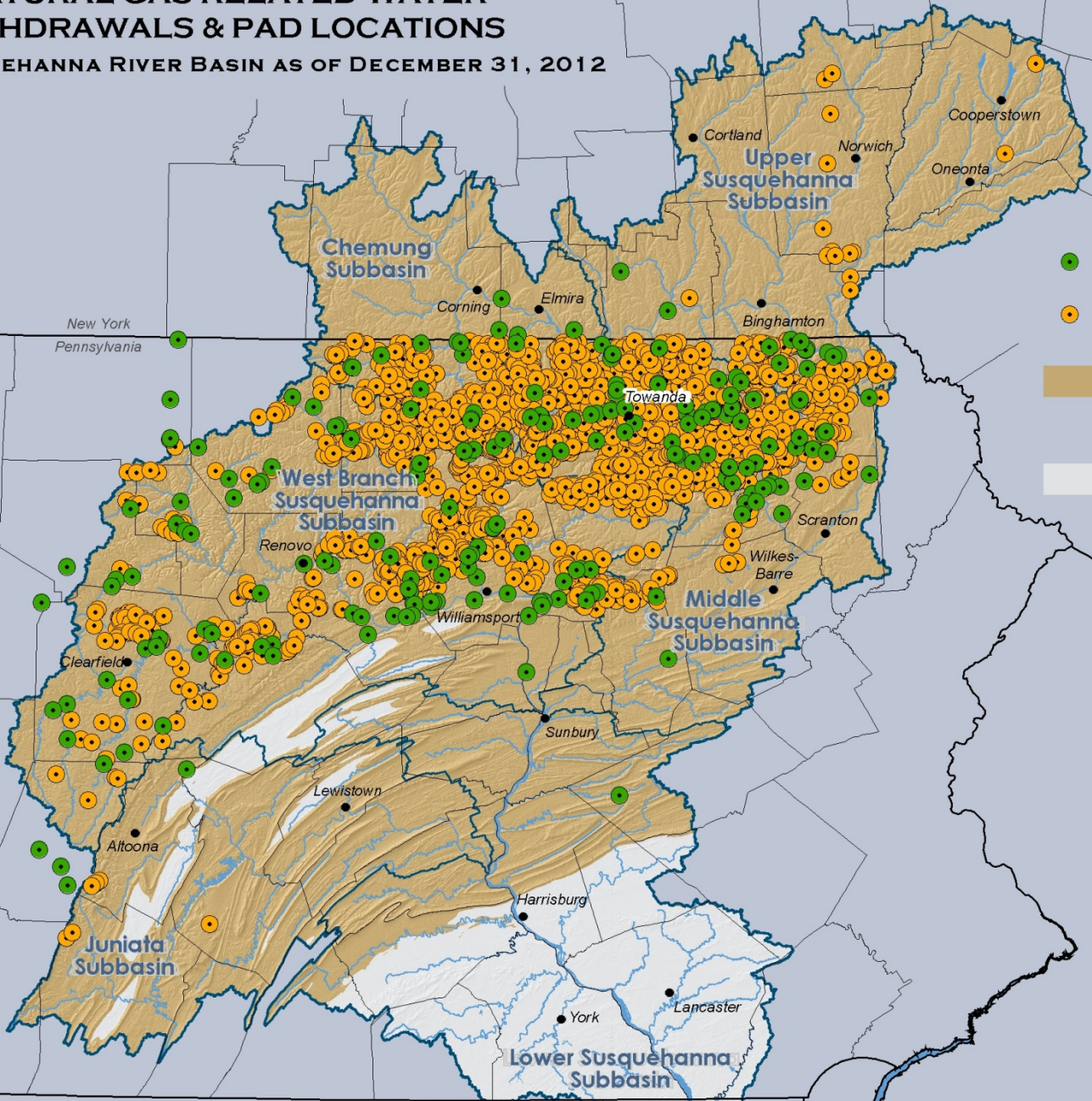


- Withdrawals (214)
- Gas Pads (1,795)
- Area Containing Natural Gas Shale
- Area with No Recoverable Natural Gas Formations



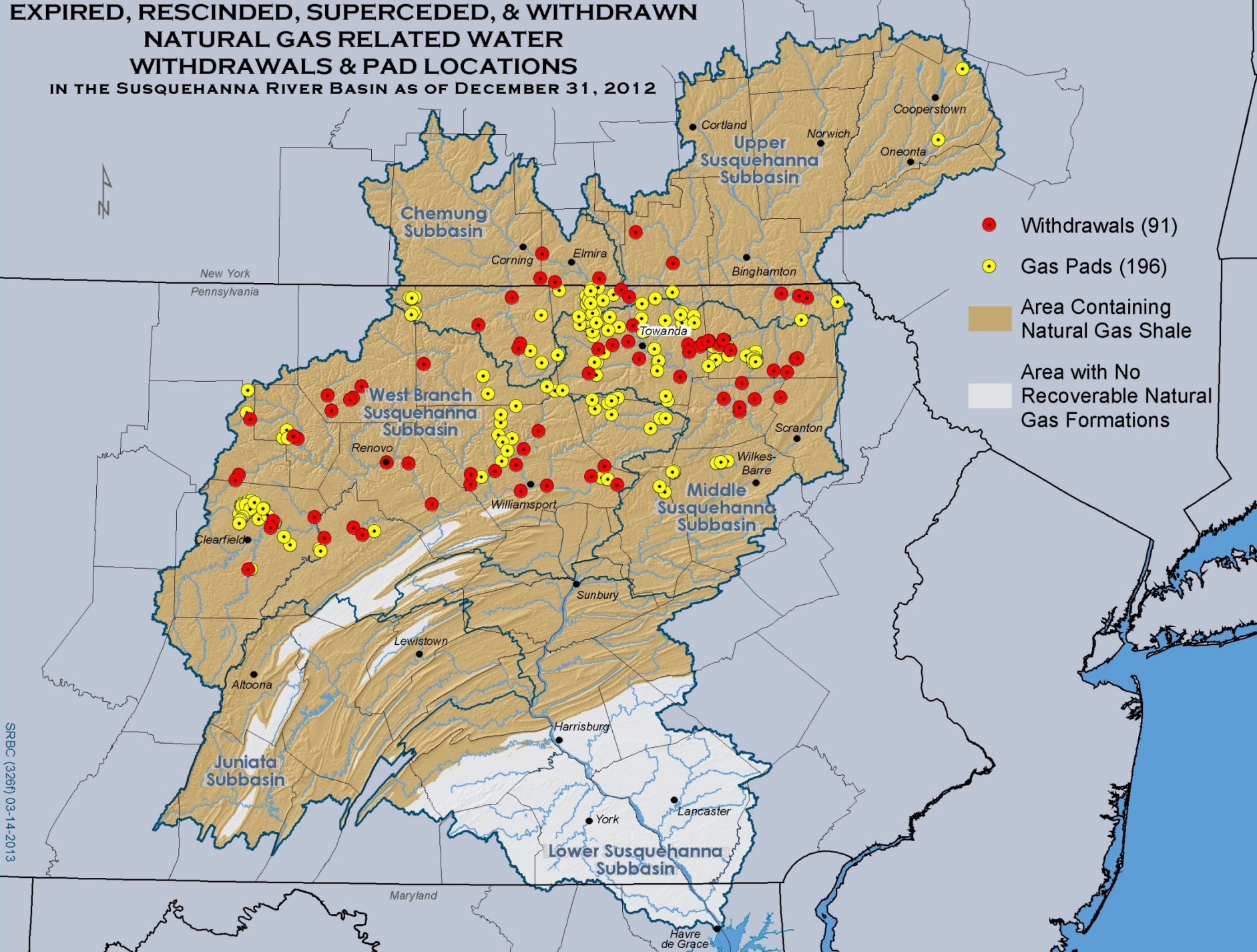
NATURAL GAS RELATED WATER WITHDRAWALS & PAD LOCATIONS

IN THE SUSQUEHANNA RIVER BASIN AS OF DECEMBER 31, 2012



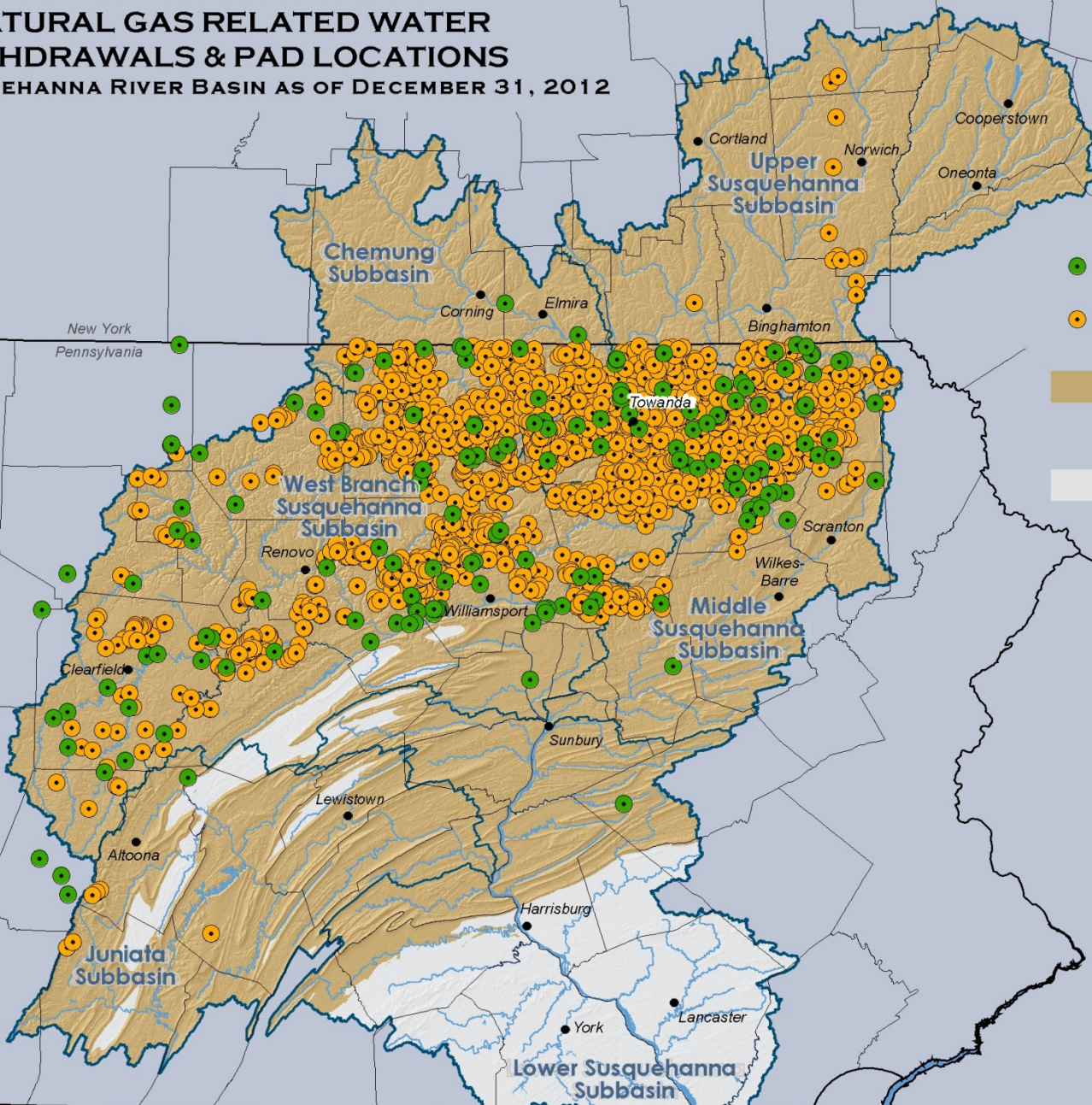
- Withdrawals (260)
- Gas Pads (2,088)
- Area Containing Natural Gas Shale
- Area with No Recoverable Natural Gas Formations

EXPIRED, RESCINDED, SUPERCEDED, & WITHDRAWN NATURAL GAS RELATED WATER WITHDRAWALS & PAD LOCATIONS IN THE SUSQUEHANNA RIVER BASIN AS OF DECEMBER 31, 2012



- Withdrawals (91)
- Gas Pads (196)
- Area Containing Natural Gas Shale
- Area with No Recoverable Natural Gas Formations

APPROVED AND ACTIVE NATURAL GAS RELATED WATER WITHDRAWALS & PAD LOCATIONS IN THE SUSQUEHANNA RIVER BASIN AS OF DECEMBER 31, 2012



- Withdrawals (169)
- Gas Pads (1,892)
- Area Containing Natural Gas Shale
- Area with No Recoverable Natural Gas Formations

Marcellus – Basin Water Use Profile

(July 1, 2008 thru Dec. 31, 2012)

- 1,977 Unconv. gas wells hydraulically fractured,
- 10.3 billion gallons of water consumptively used,
- 8.0 billion gallons of water withdrawn from docketed sources,
- 2.3 billion gallons of water withdrawn from non-docketed approved sources (primarily PWS).

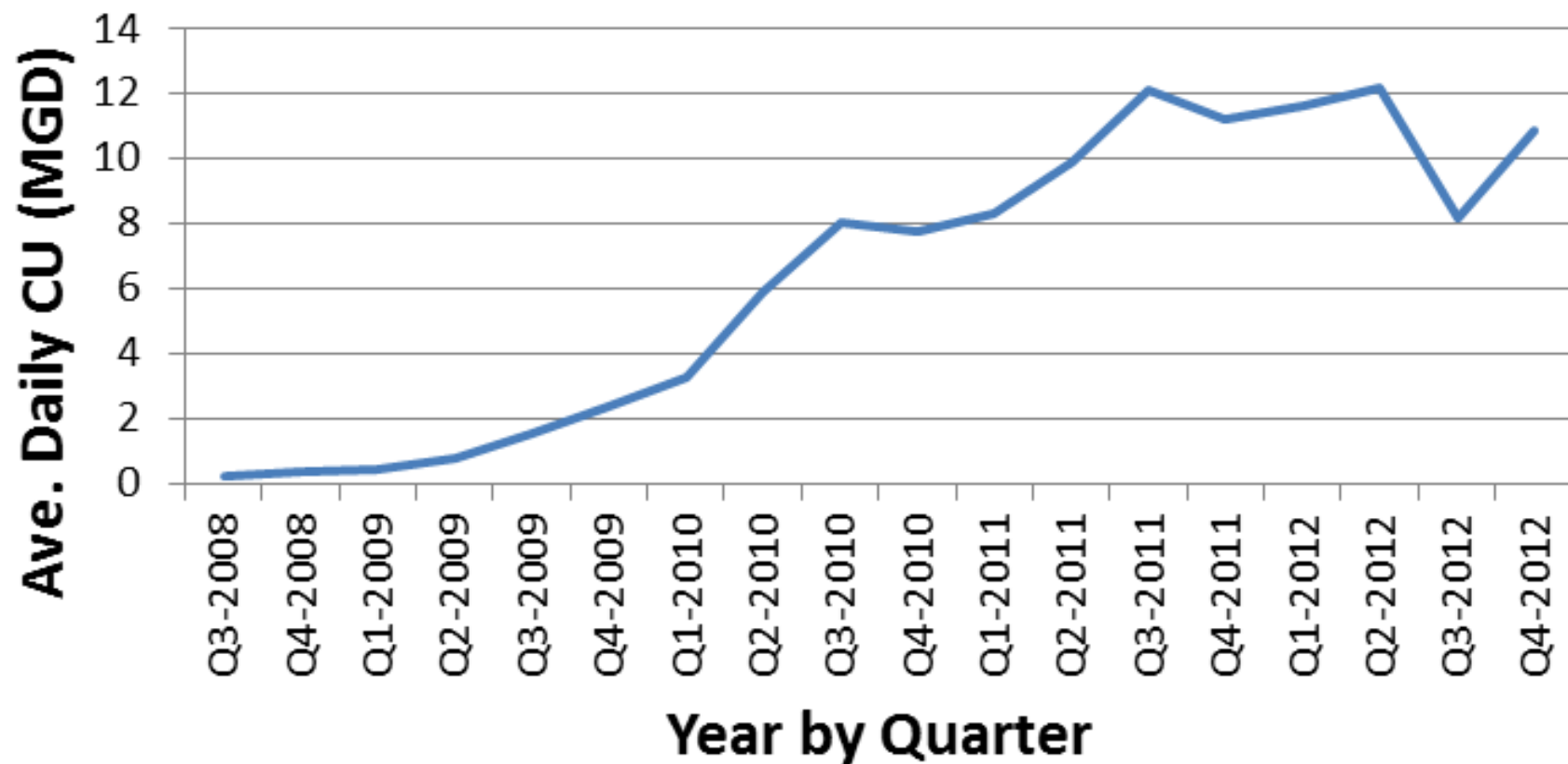
Marcellus – Basin Water Use Profile

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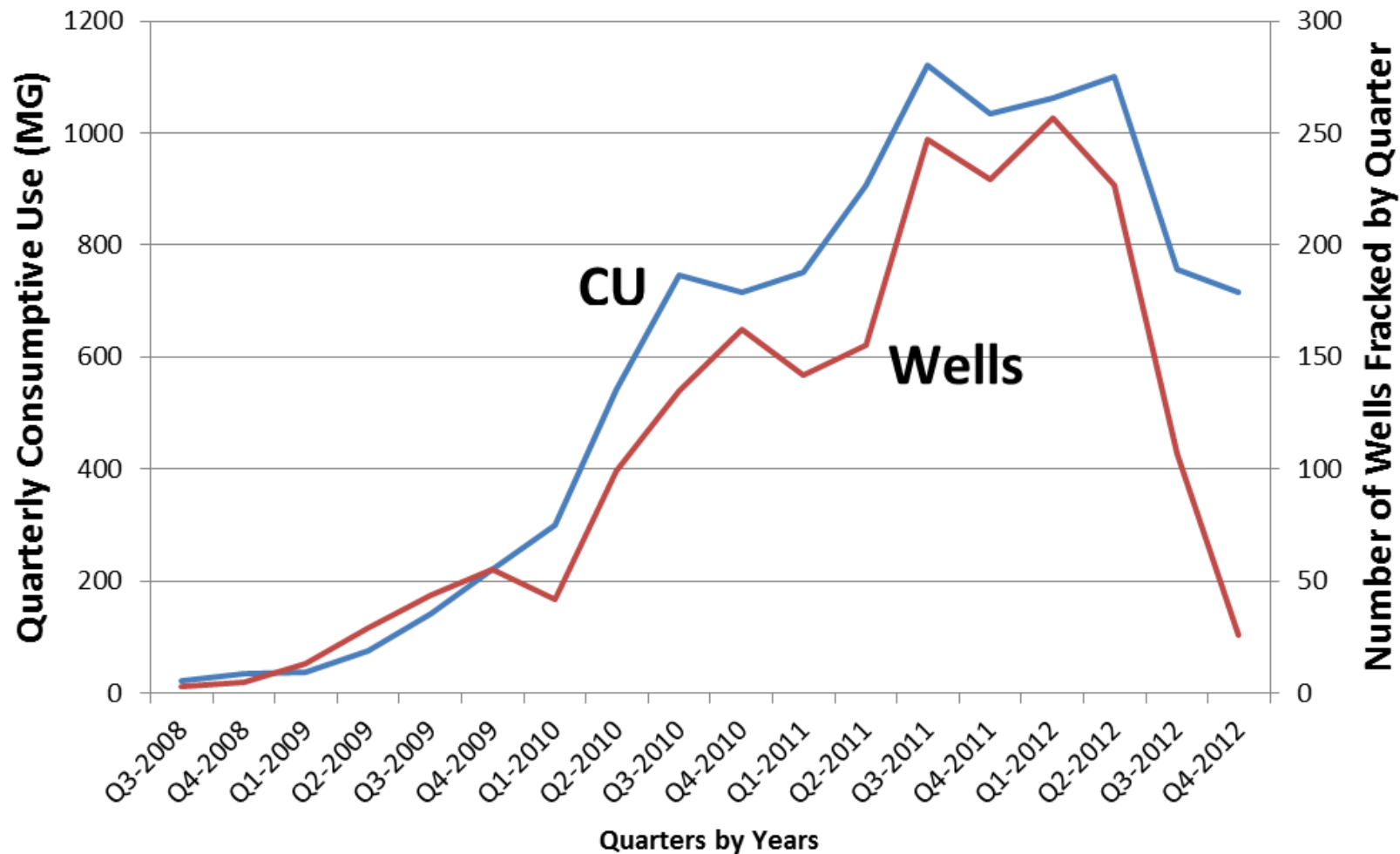
(Cont.)

- 4.4 million gallons (ave.) used per well for hydraulic fracturing (86% freshwater, 14% flowback reused).
- 8% - 10% of injected water is recovered as flowback w/i first 30 days after release of pressure.
- 87% of water brought on-site is used, balance of 13% temporarily stored on site, or transferred to another site.

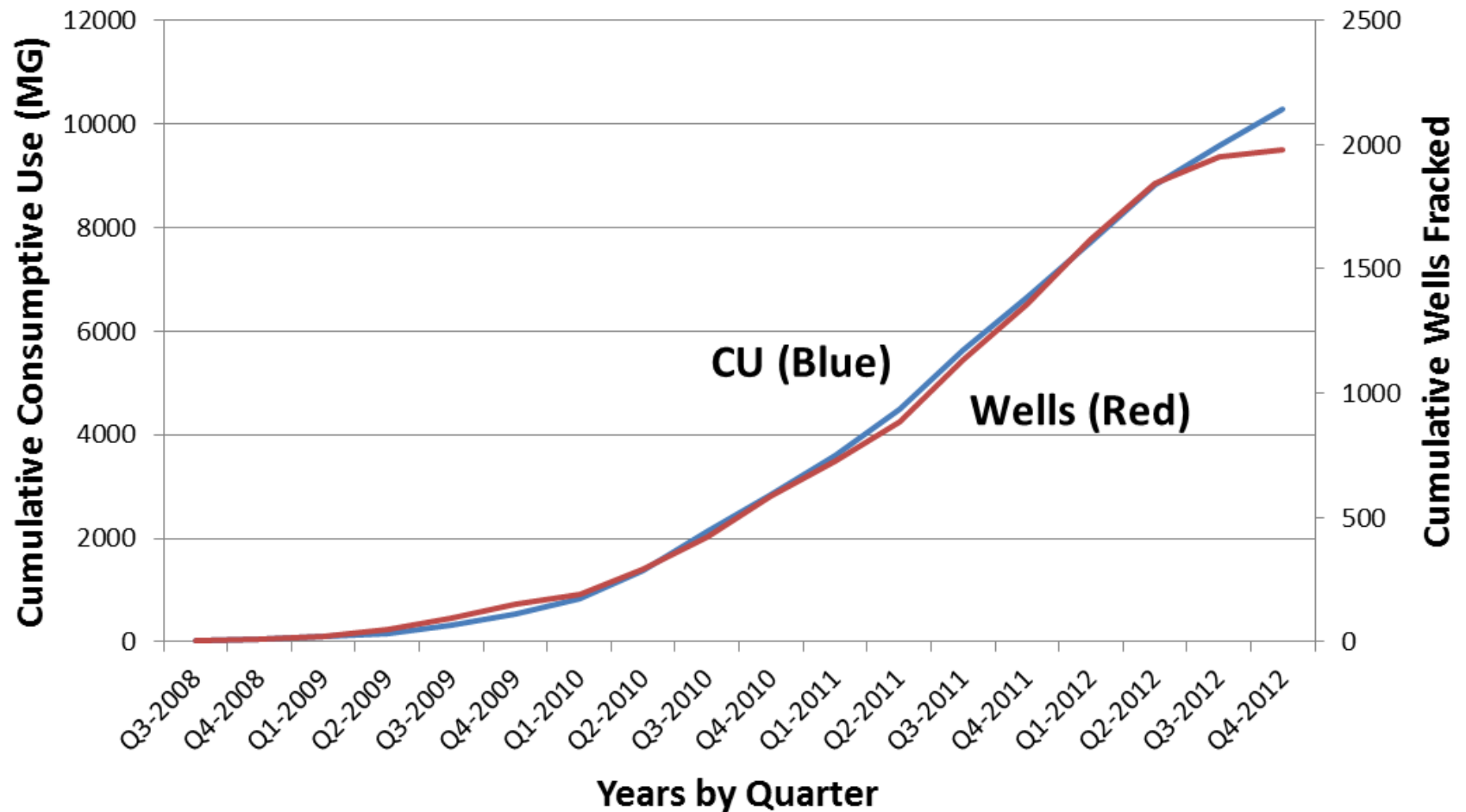
Average Daily CU by Quarter



CU and Wells Fracked by Quarter



Cum. CU and Cum. Wells Fracked



Summary of SRBC “Reviews”

- Science-based decision making,
- Cumulative impacts are critical,
- “Locations” of withdrawals more important than “amounts” of withdrawals,
- Use “interruptible sources” (passby’s) to minimize impacts on aquatic ecosystems during low flow periods.

Questions?

