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

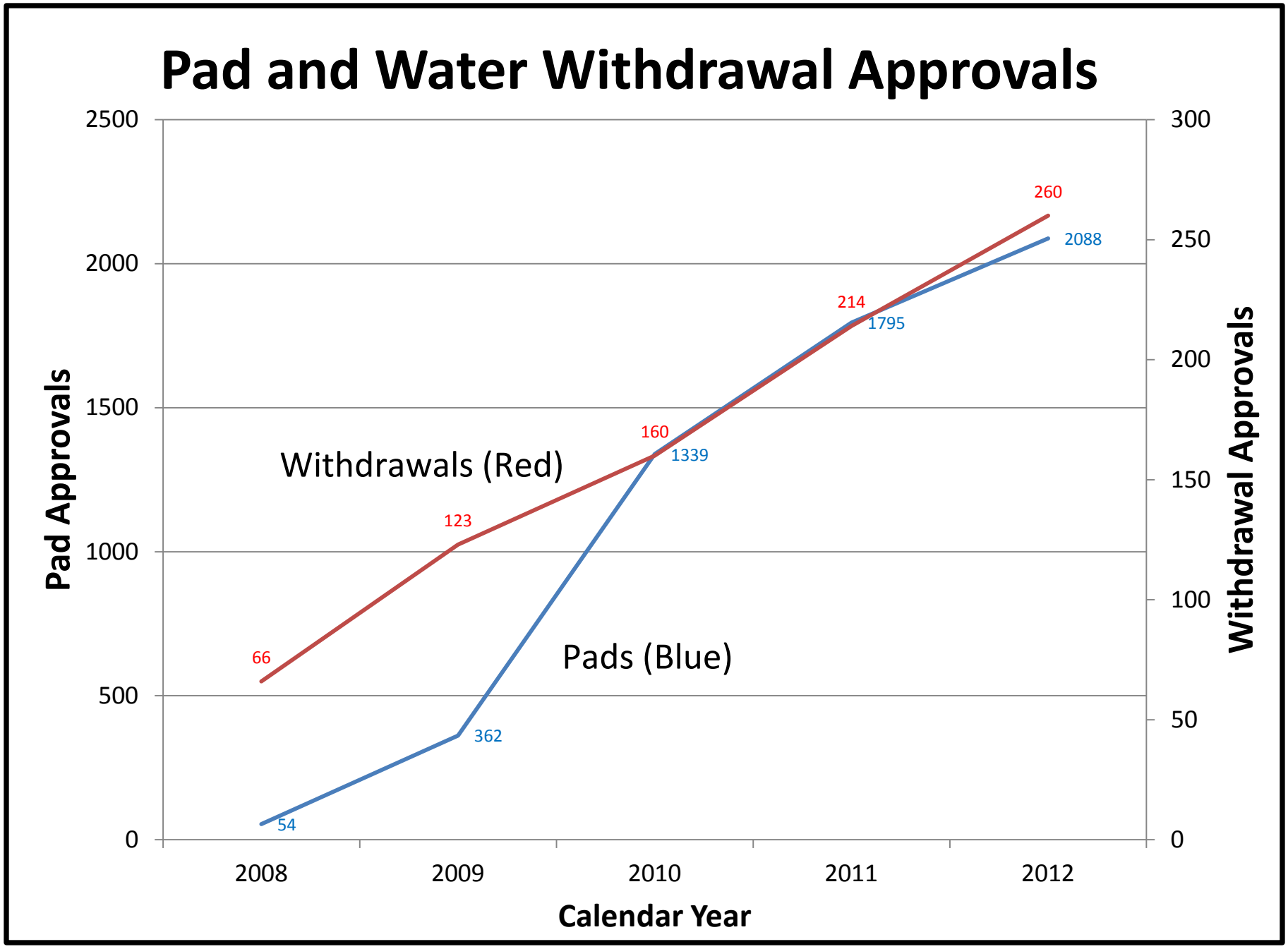
- On-line application process,
- Regulate CU through Approval-by-Rule (ABR); Ave. 30-Day Turn-Around of CU approvals,
- Multiple withdrawals/sources for multiple pad sites,
- Source water sharing between companies,
- Reuse of flowback, pad-to-pad transfers of flowback, and interbasin transfers of flowback,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

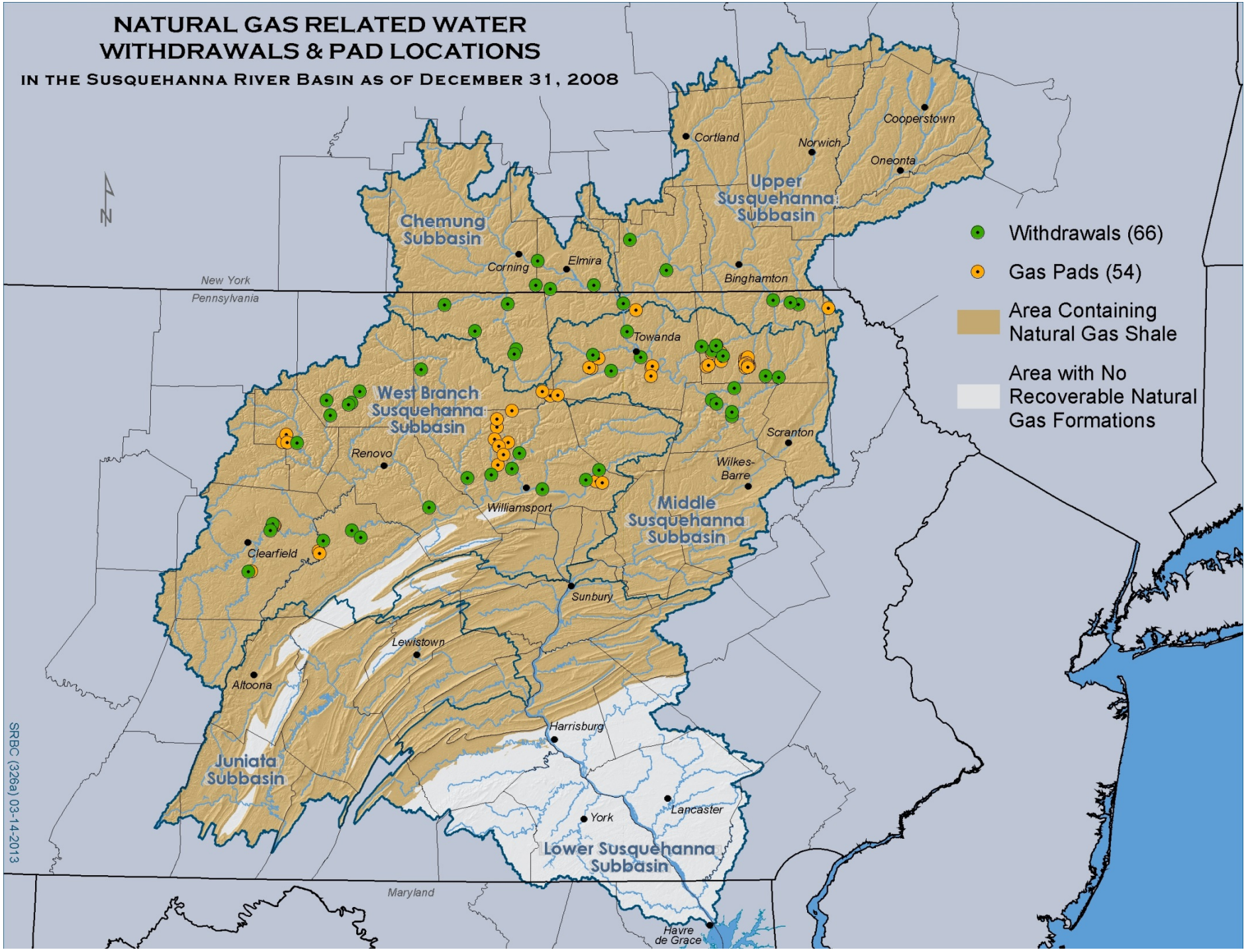
Major SRBC Challenges Posed by Unconventional Natural Gas Development

- 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
2500
2000
1500
1000
500
0
Pad Approvals
300
250
200
150
100
50
0
Withdrawal Approvals
Withdrawals (Red)
Pads (Blue)
66
123
160
214
260
54
362
1339
1795
2088
2008
2009
2010
2011
2012
Calendar Year

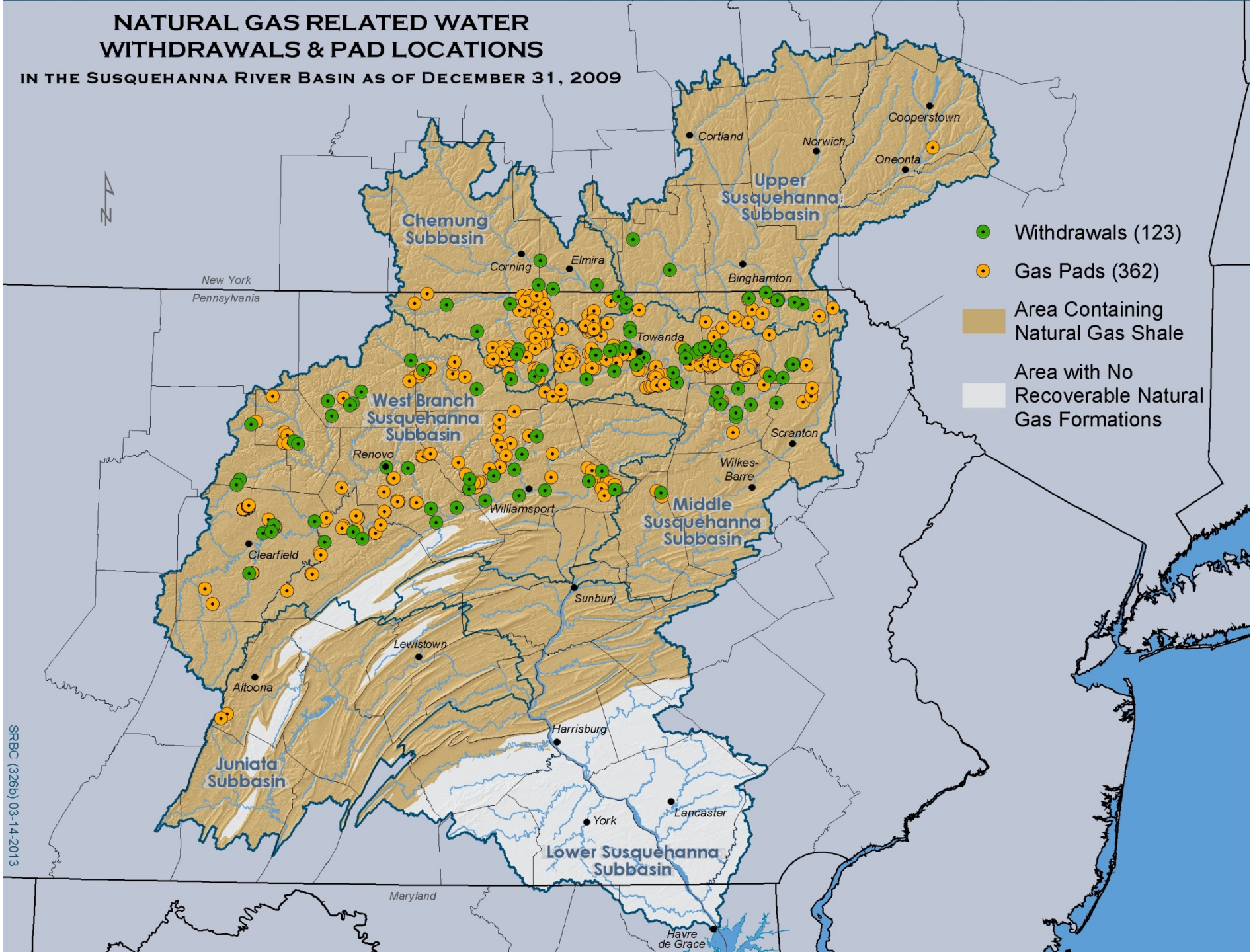
NATURAL GAS RELATED WATER WITHDRAWALS & PAD LOCATIONS

IN THE SUSQUEHANNA RIVER BASIN AS OF DECEMBER 31, 2008



NATURAL GAS RELATED WATER WITHDRAWALS & PAD LOCATIONS

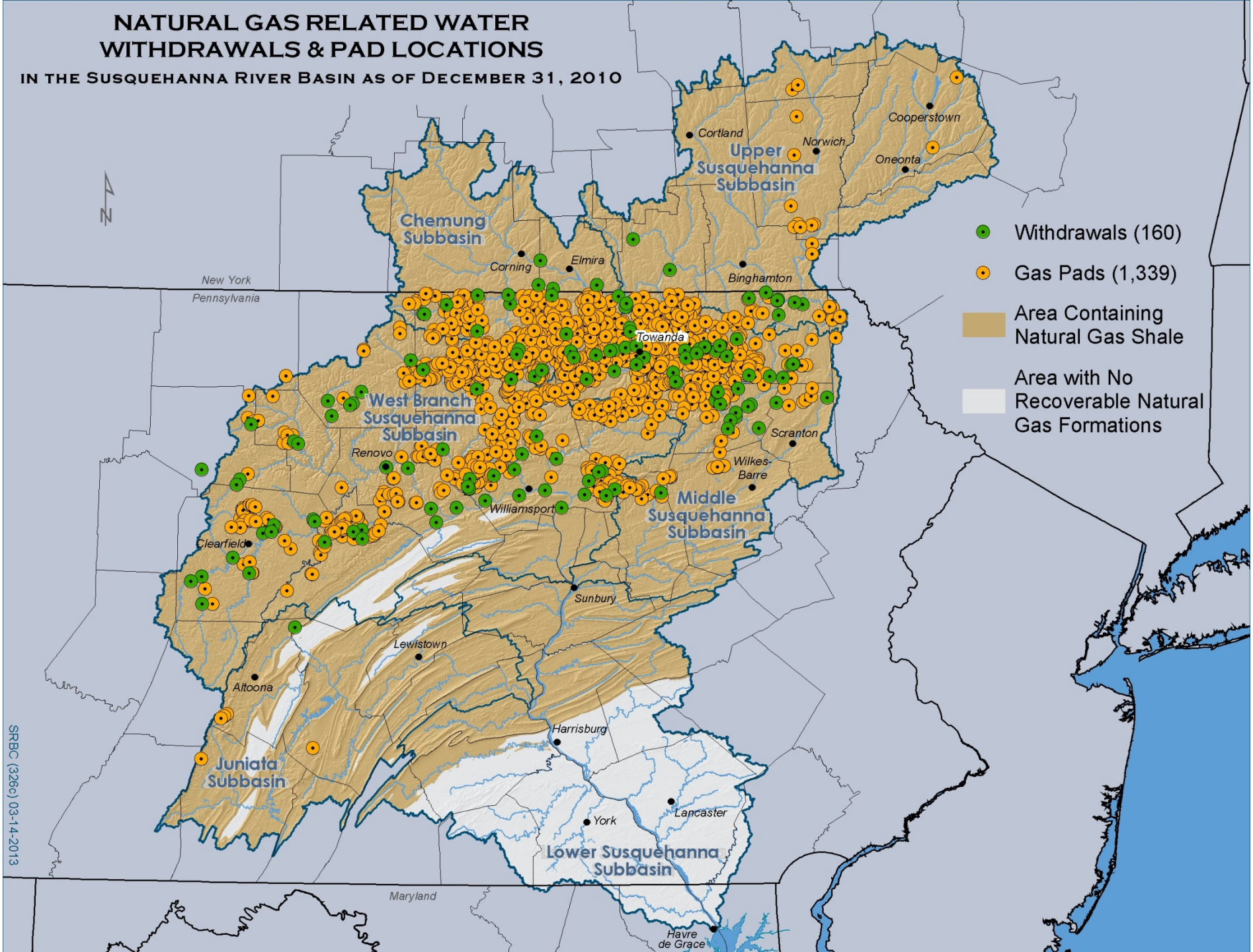
IN THE SUSQUEHANNA RIVER BASIN AS OF DECEMBER 31, 2009



SRBC (326b) 03-14-2013

NATURAL GAS RELATED WATER WITHDRAWALS & PAD LOCATIONS

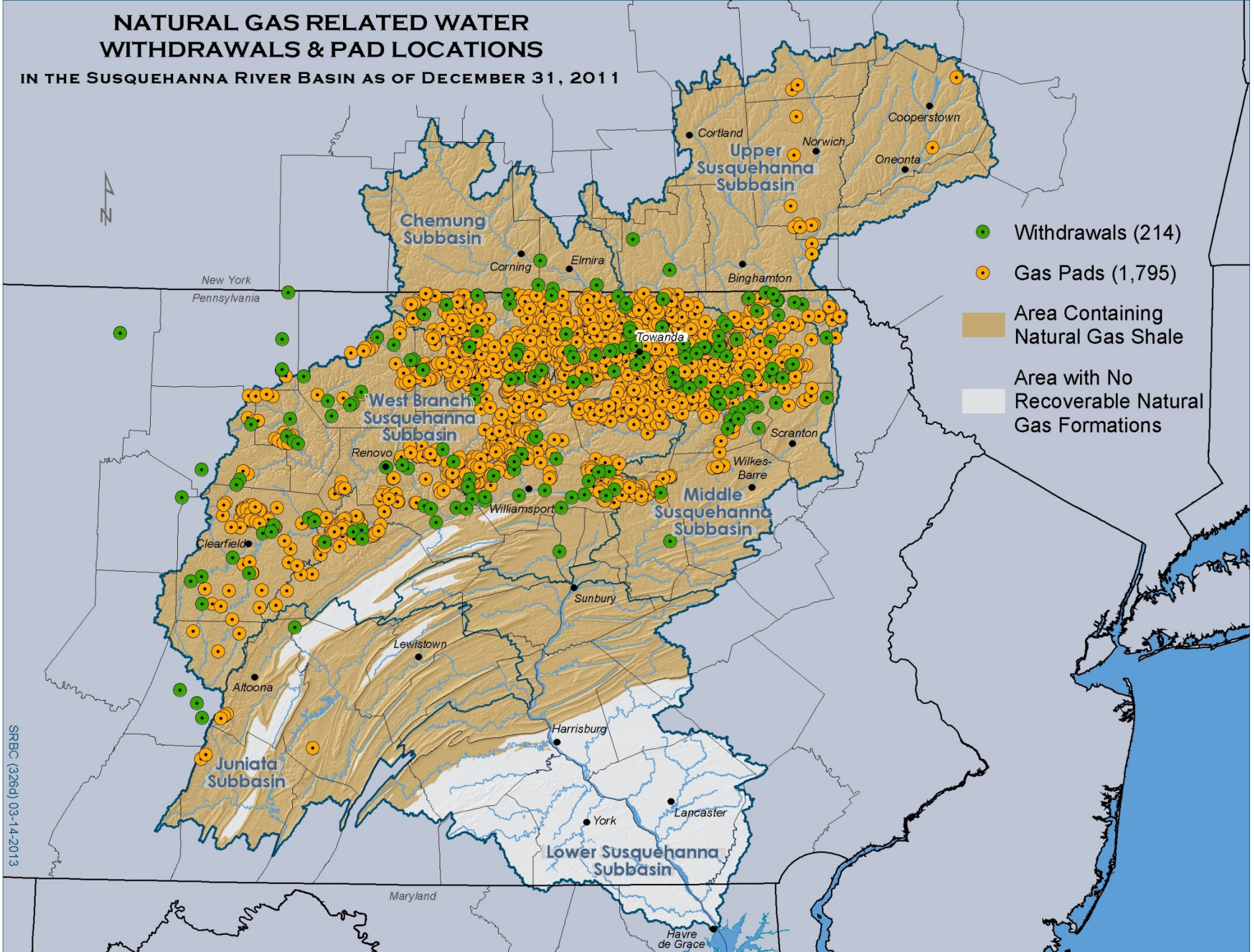
IN THE SUSQUEHANNA RIVER BASIN AS OF DECEMBER 31, 2010



SRBC (326c) 03-14-2013

NATURAL GAS RELATED WATER WITHDRAWALS & PAD LOCATIONS

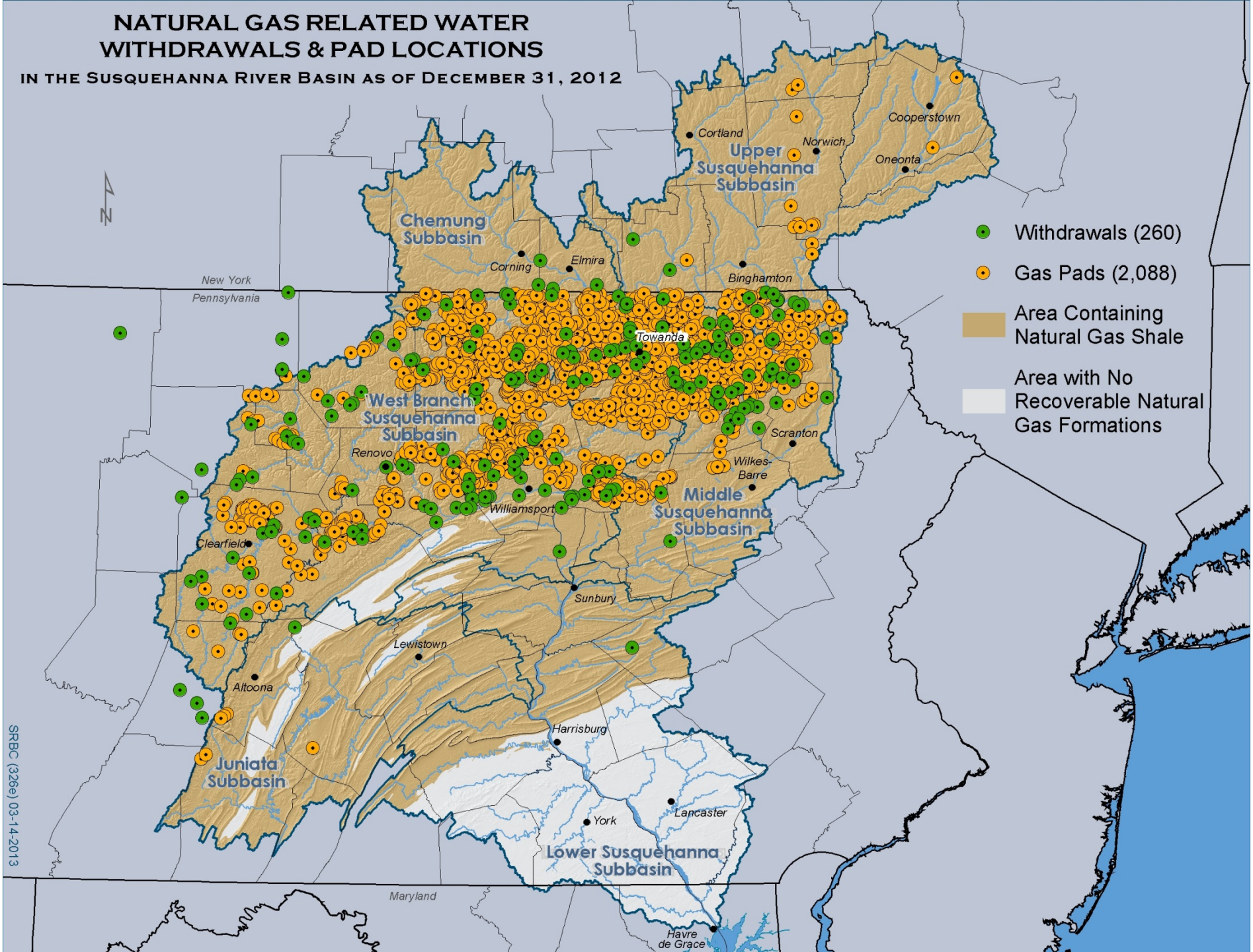
IN THE SUSQUEHANNA RIVER BASIN AS OF DECEMBER 31, 2011



SRBC (326d) 03-14-2013

NATURAL GAS RELATED WATER WITHDRAWALS & PAD LOCATIONS

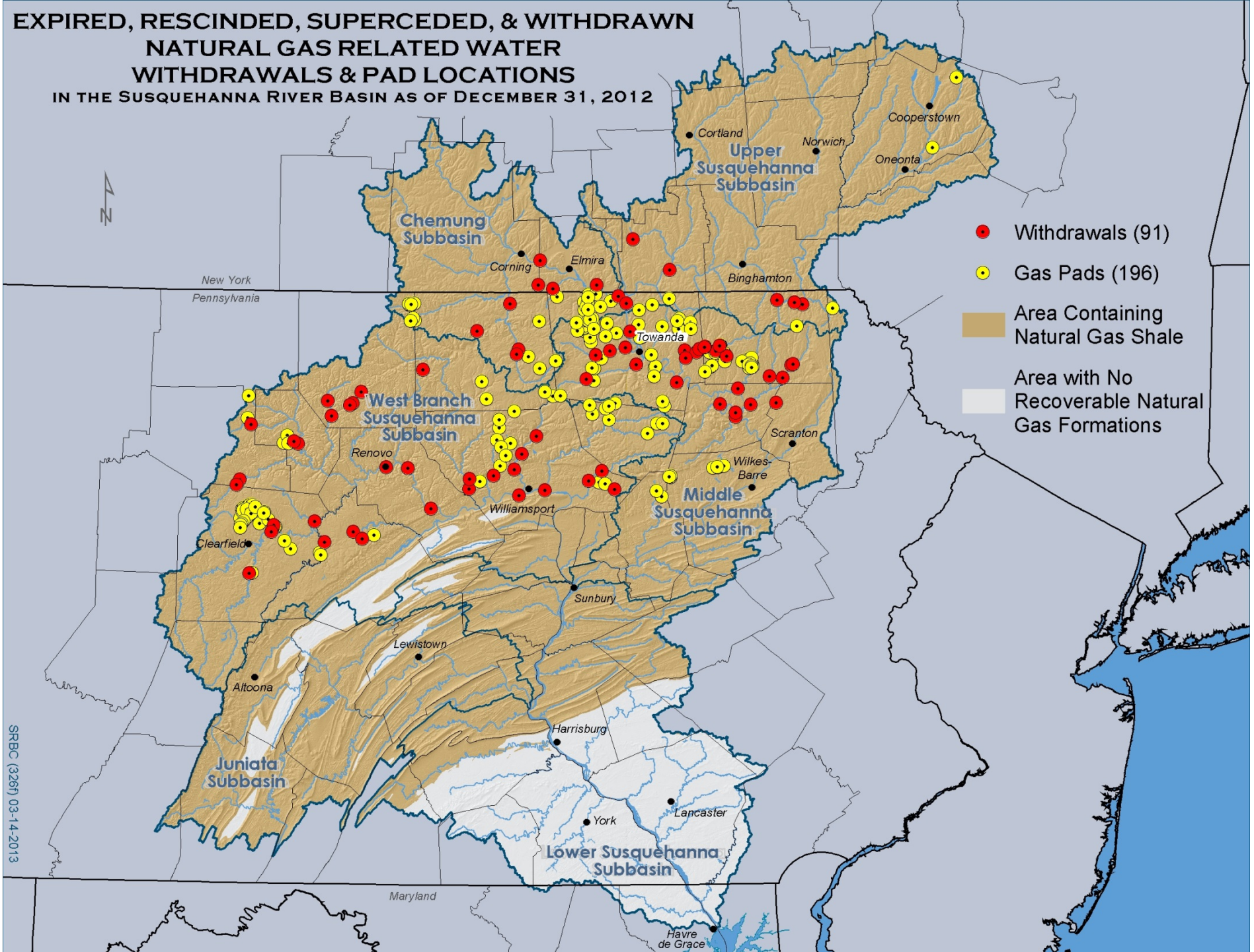
IN THE SUSQUEHANNA RIVER BASIN AS OF DECEMBER 31, 2012



SRBC (326e) 03-14-2013

EXPIRED, RESCINDED, SUPERCEDED, & WITHDRAWN NATURAL GAS RELATED WATER WITHDRAWALS & PAD LOCATIONS

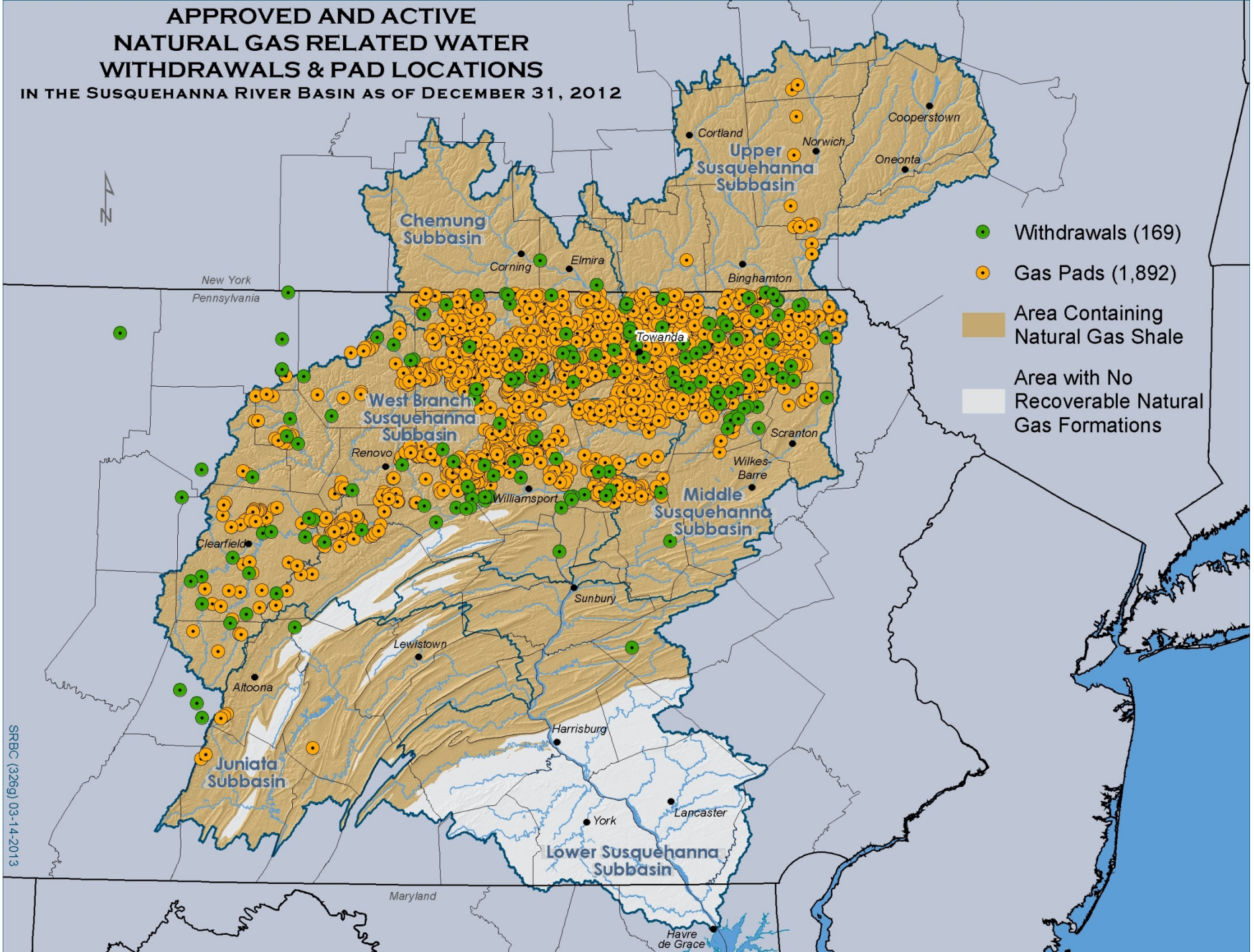
IN THE SUSQUEHANNA RIVER BASIN AS OF DECEMBER 31, 2012



SRBC (326f) 03-14-2013

APPROVED AND ACTIVE NATURAL GAS RELATED WATER WITHDRAWALS & PAD LOCATIONS

IN THE SUSQUEHANNA RIVER BASIN AS OF DECEMBER 31, 2012



Marcellus – Basin Water Use Profile

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

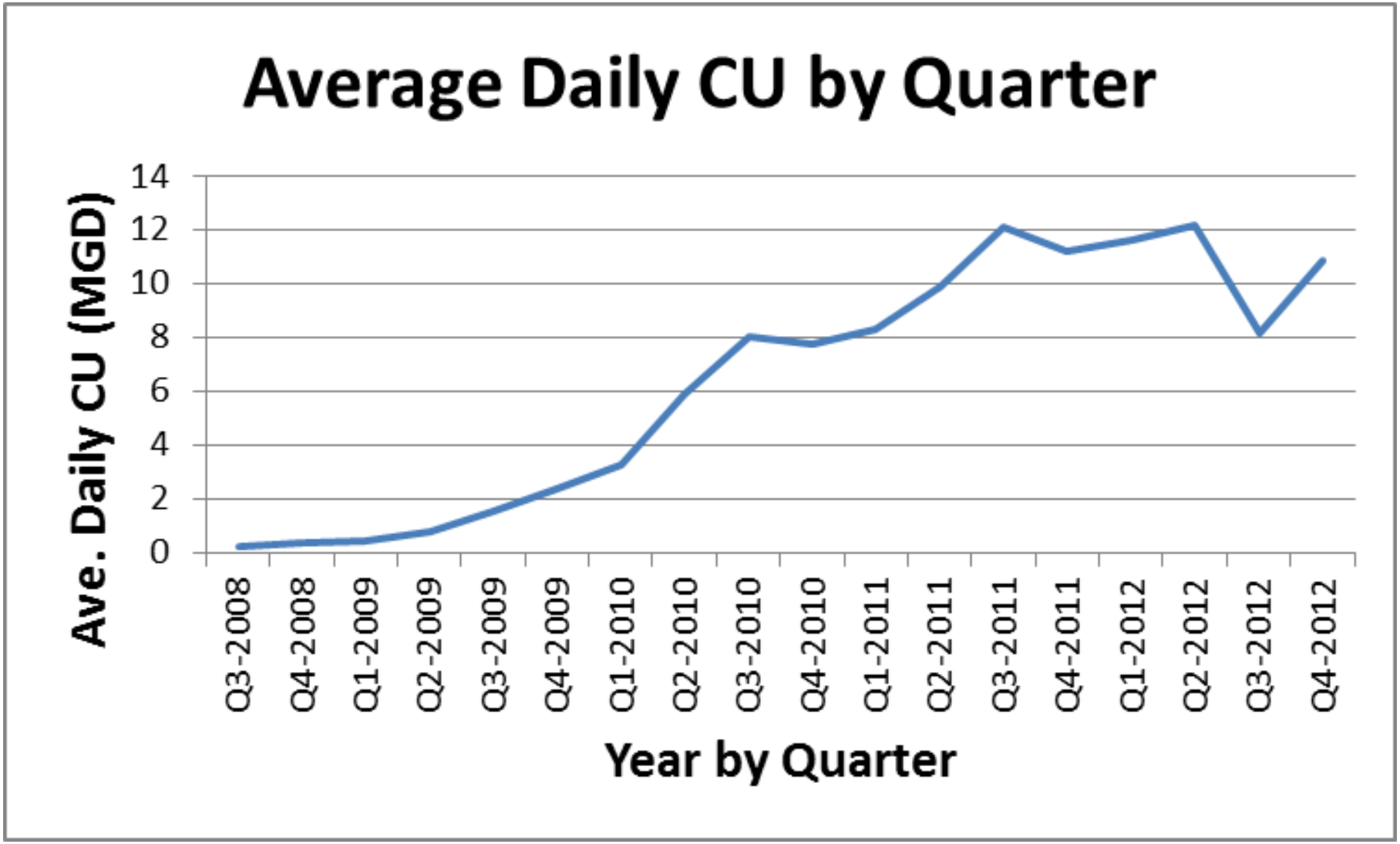
- 1,977 Unconv. gas wells hydraulically fractured,
- 10.3 billion gallons of water consumptively used,
- 8.0 billion gallons of water withdrawn from docketed sources,
- 2.3 billion gallons of water withdrawn from non-docketed approved sources (primarily PWS).

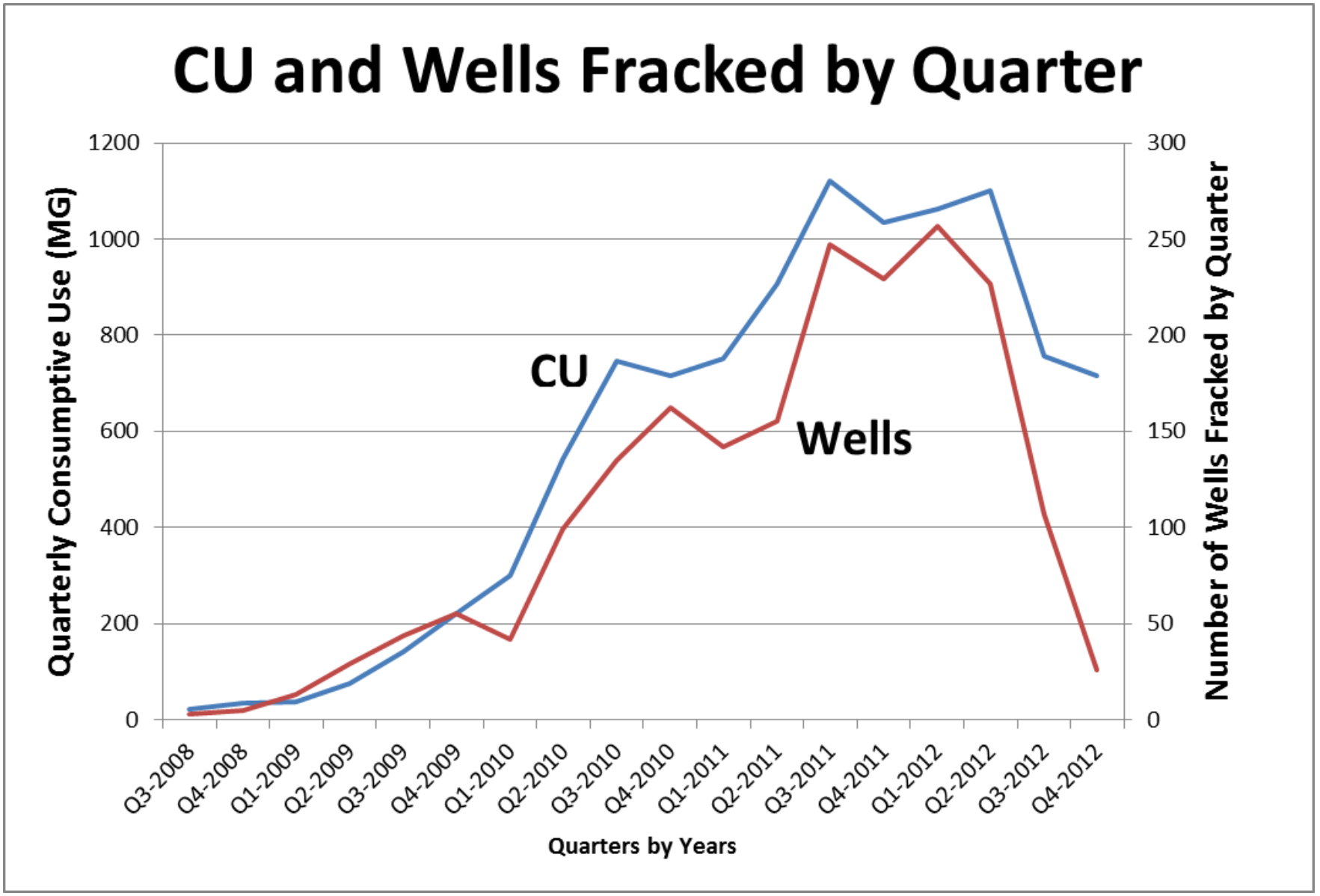
Marcellus – Basin Water Use Profile
(July 1, 2008 thru Dec. 31, 2012)
(Cont.)

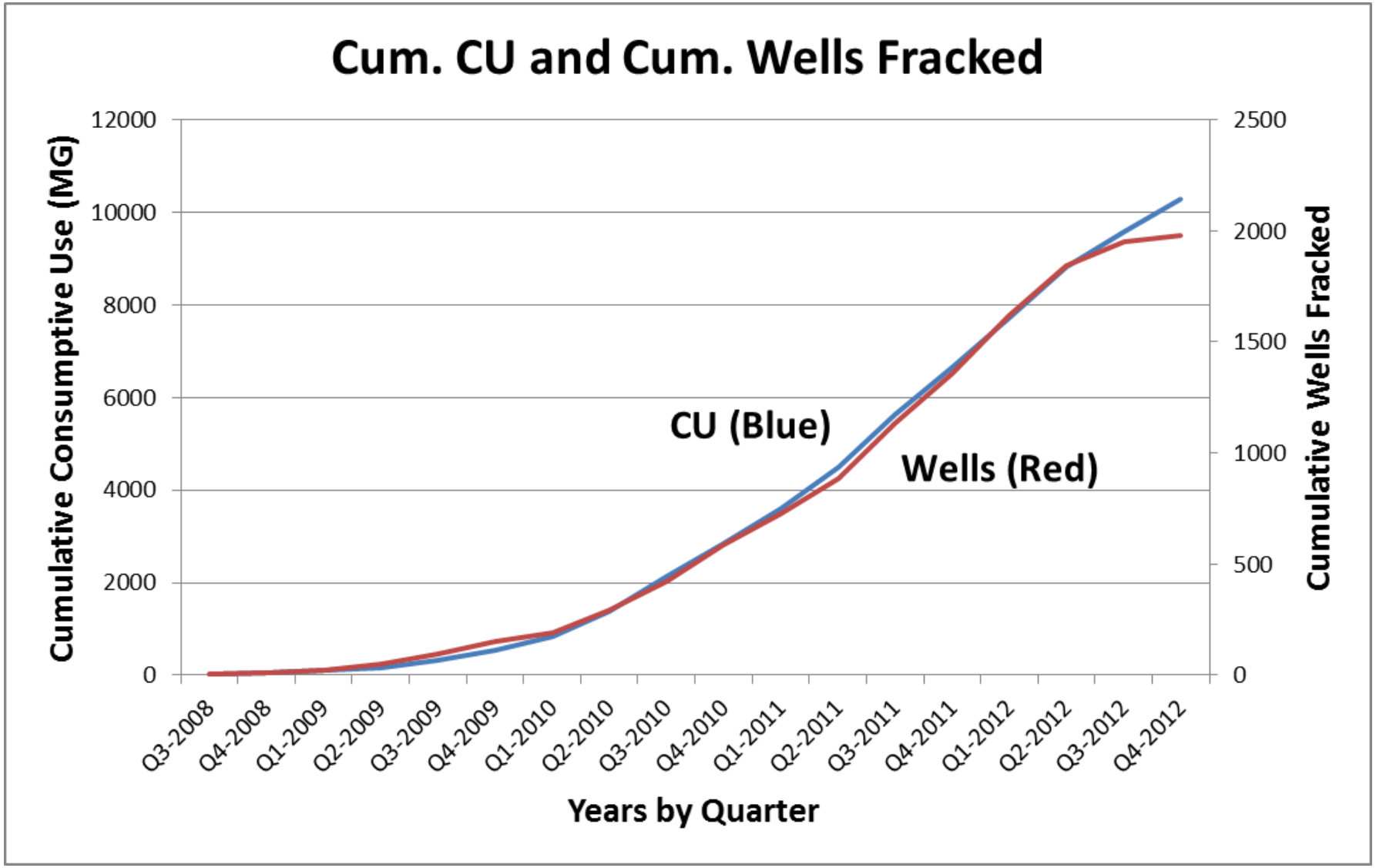
- 4.4 million gallons (ave.) used per well for hydraulic fracturing (86% freshwater, 14% flowback reused).

- 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
Ave. Daily CU (MGD)
14
12
10
8
6
4
2
0
Q3-2008
Q4-2008
Q1-2009
Q2-2009
Q3-2009
Q4-2009
Q1-2010
Q2-2010
Q3-2010
Q4-2010
Q1-2011
Q2-2011
Q3-2011
Q4-2011
Q1-2012
Q2-2012
Q3-2012
Q4-2012
Year by Quarter


CU and Wells Fracked by Quarter
Quarterly Consumptive Use (MG)
Number of Wells Fracked by Quarter
1200
1000
800
600
400
200
0
300
250
200
150
100
50
0
CU
Wells
Q3-2008
Q4-2008
Q1-2009
Q2-2009
Q3-2009
Q4-2009
Q1-2010
Q2-2010
Q3-2010
Q4-2010
Q1-2011
Q2-2011
Q3-2011
Q4-2011
Q1-2012
Q2-2012
Q3-2012
Q4-2012
Quarters by Years


Cum. CU and Cum. Wells Fracked
Cumulative Consumptive Use (MG)
12000
10000
8000
6000
4000
2000
0
2500
2000
1500
1000
500
0
Cumulative Wells Fracked
CU (Blue)
Wells (Red)
Q3-2008
Q4-2008
Q1-2009
Q2-2009
Q3-2009
Q4-2009
Q1-2010
Q2-2010
Q3-2010
Q4-2010
Q1-2011
Q2-2011
Q3-2011
Q4-2011
Q1-2012
Q2-2012
Q3-2012
Q4-2012
Years by Quarter

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?