

# Production and Water Use in Pennsylvania's Organic Shales

Katherine Schmid, P.G.  
and Aron Schmid

Northeast GSA meeting  
March 25, 2014

[www.dcnr.state.pa.us](http://www.dcnr.state.pa.us)

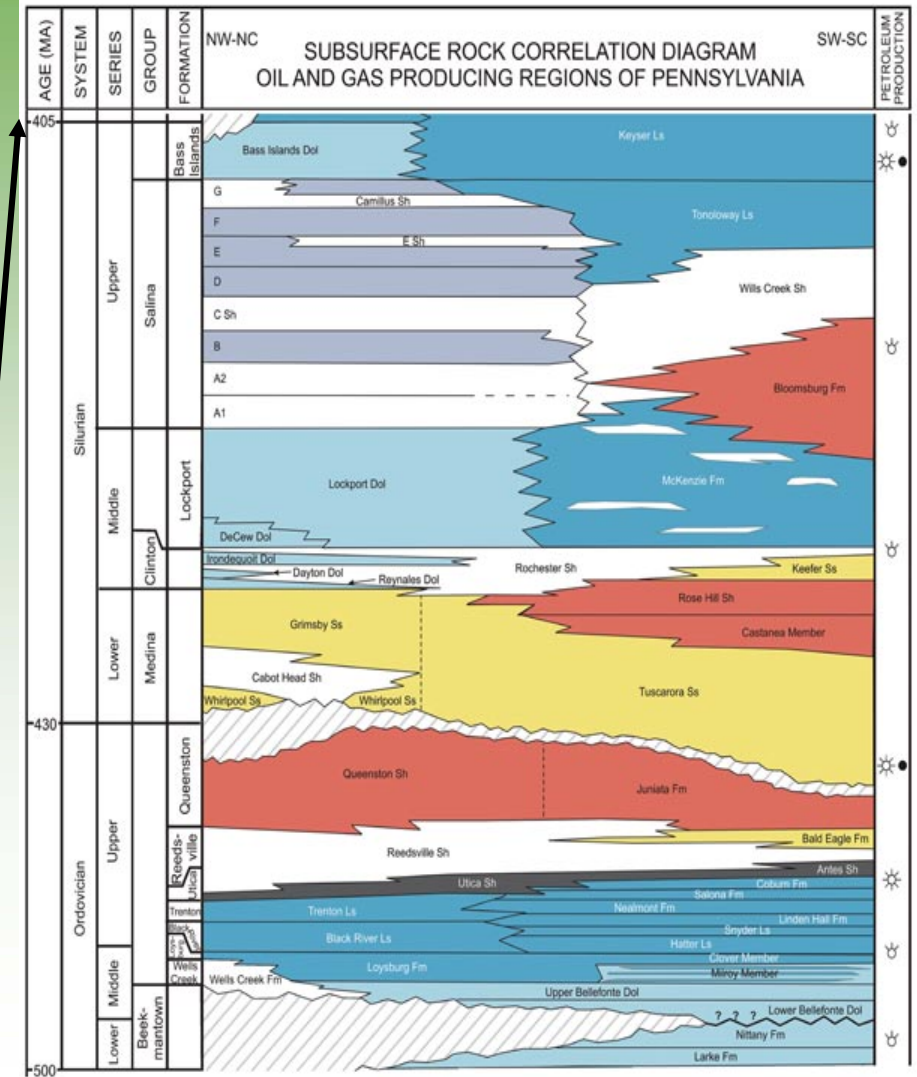
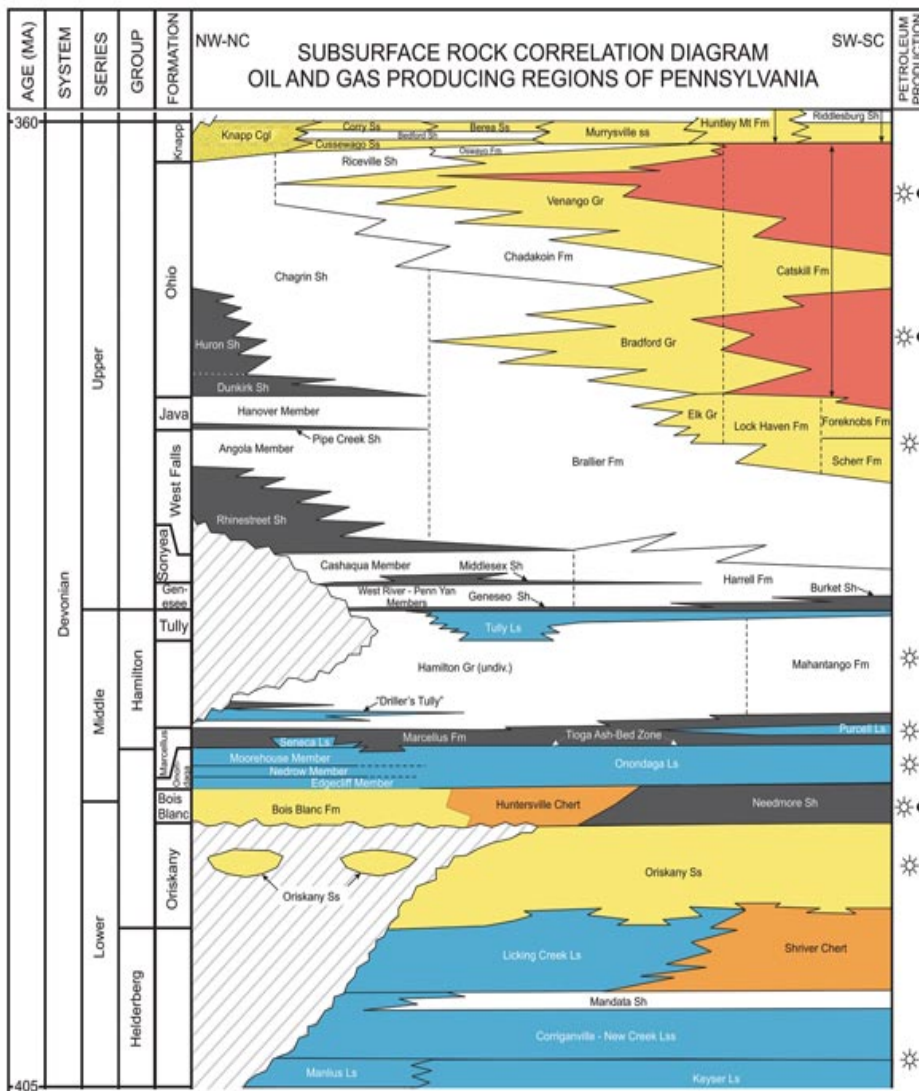




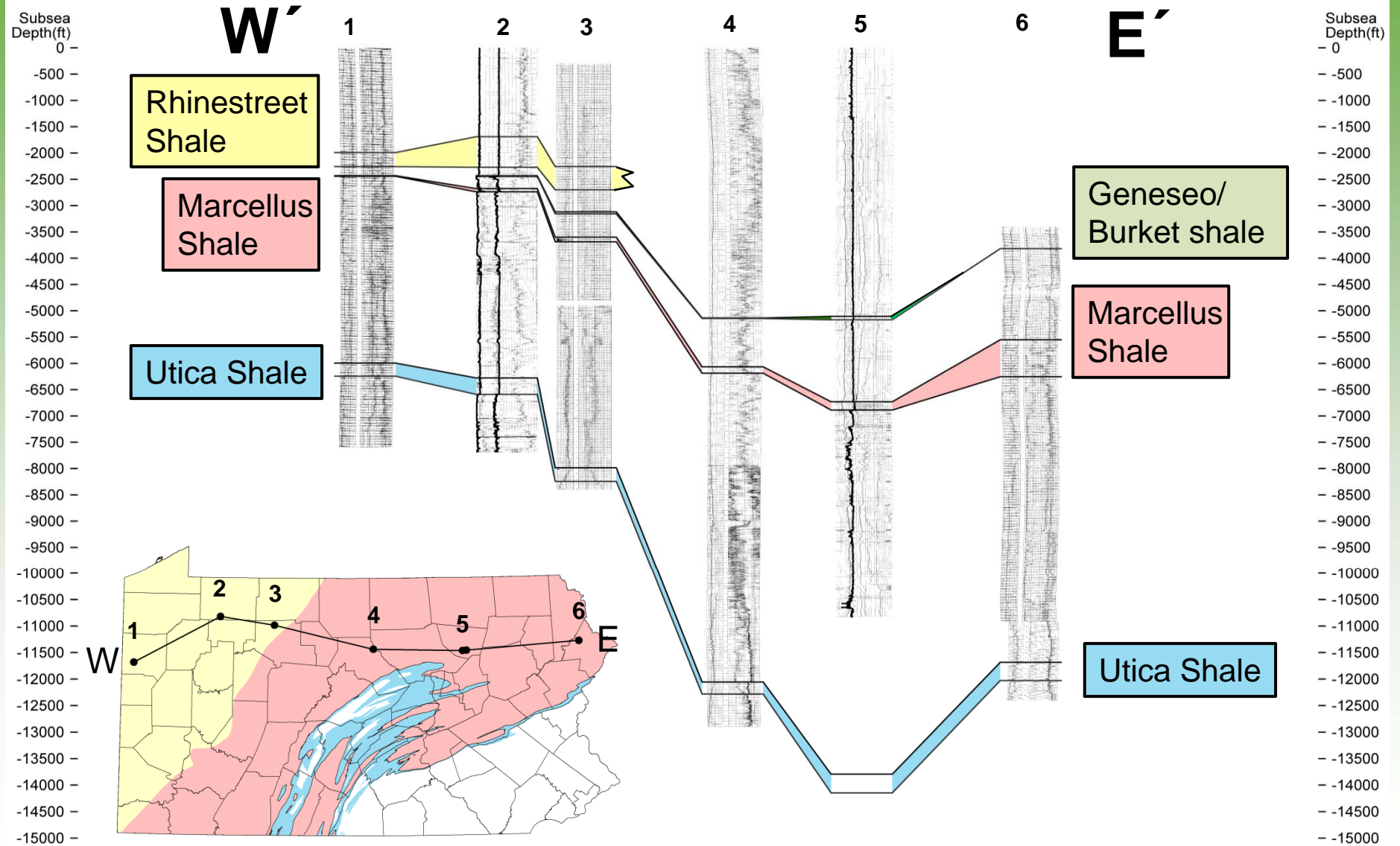
# Introduction

- Since 2004, four organic shales have been targeted across Pennsylvania by drillers.
- Great quantities of water are being used to complete these wells and produce natural gas.
- After a well has been fraced, some of this water returns to the surface with formation water and needs to be disposed of safely.

# Organic-Rich Shales

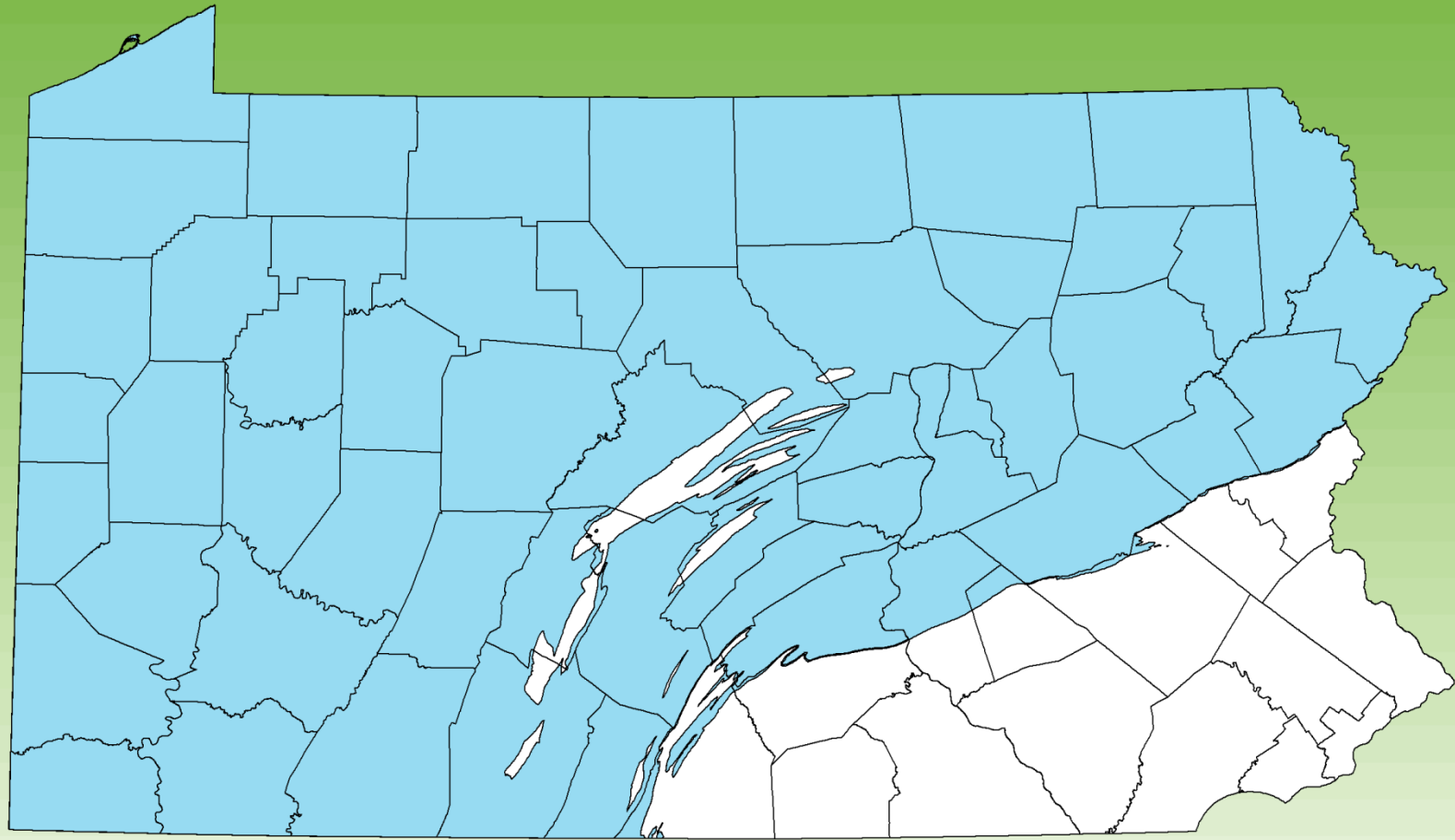



# Regional Cross-Section



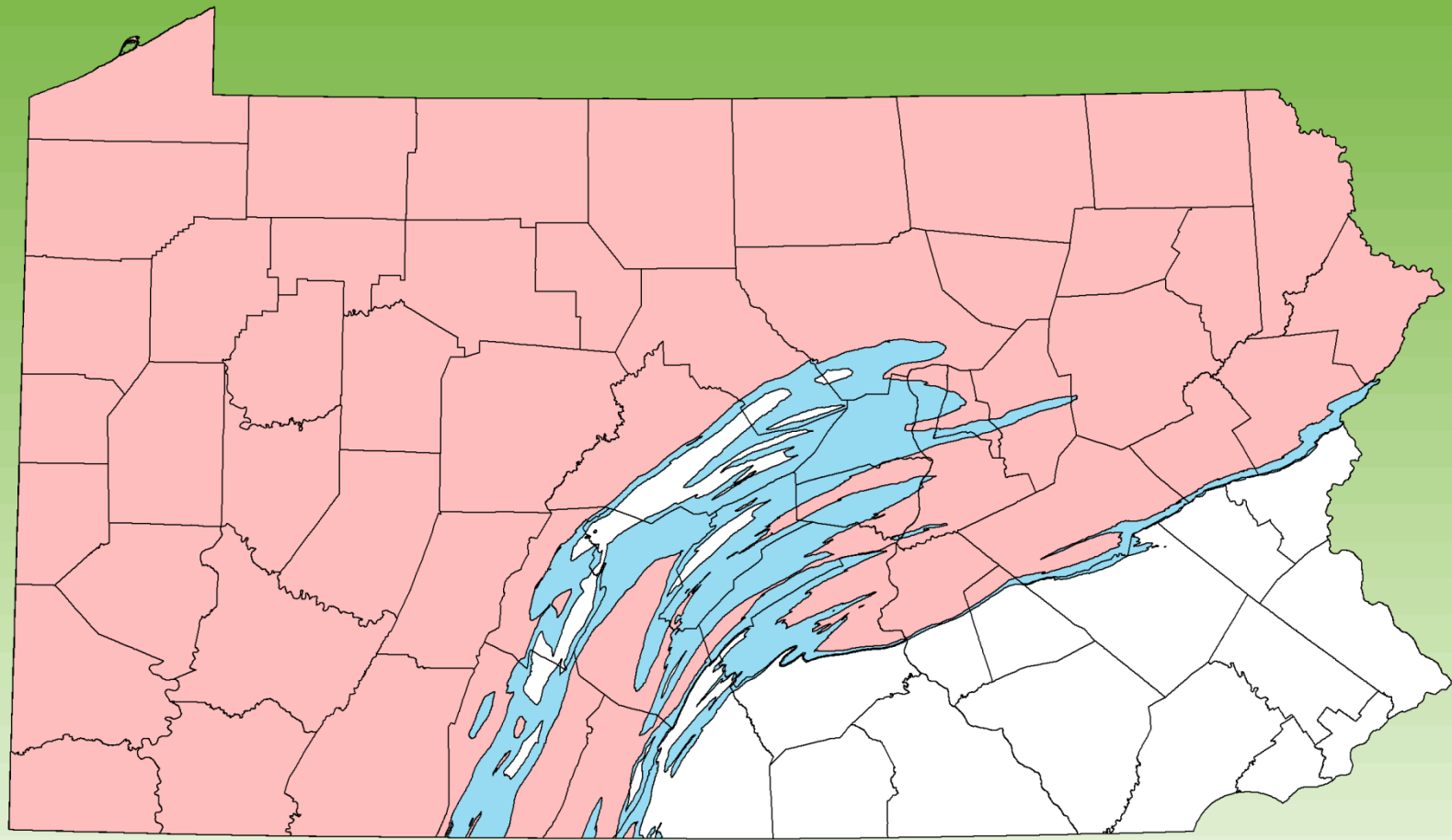


# Organic Shale Extents

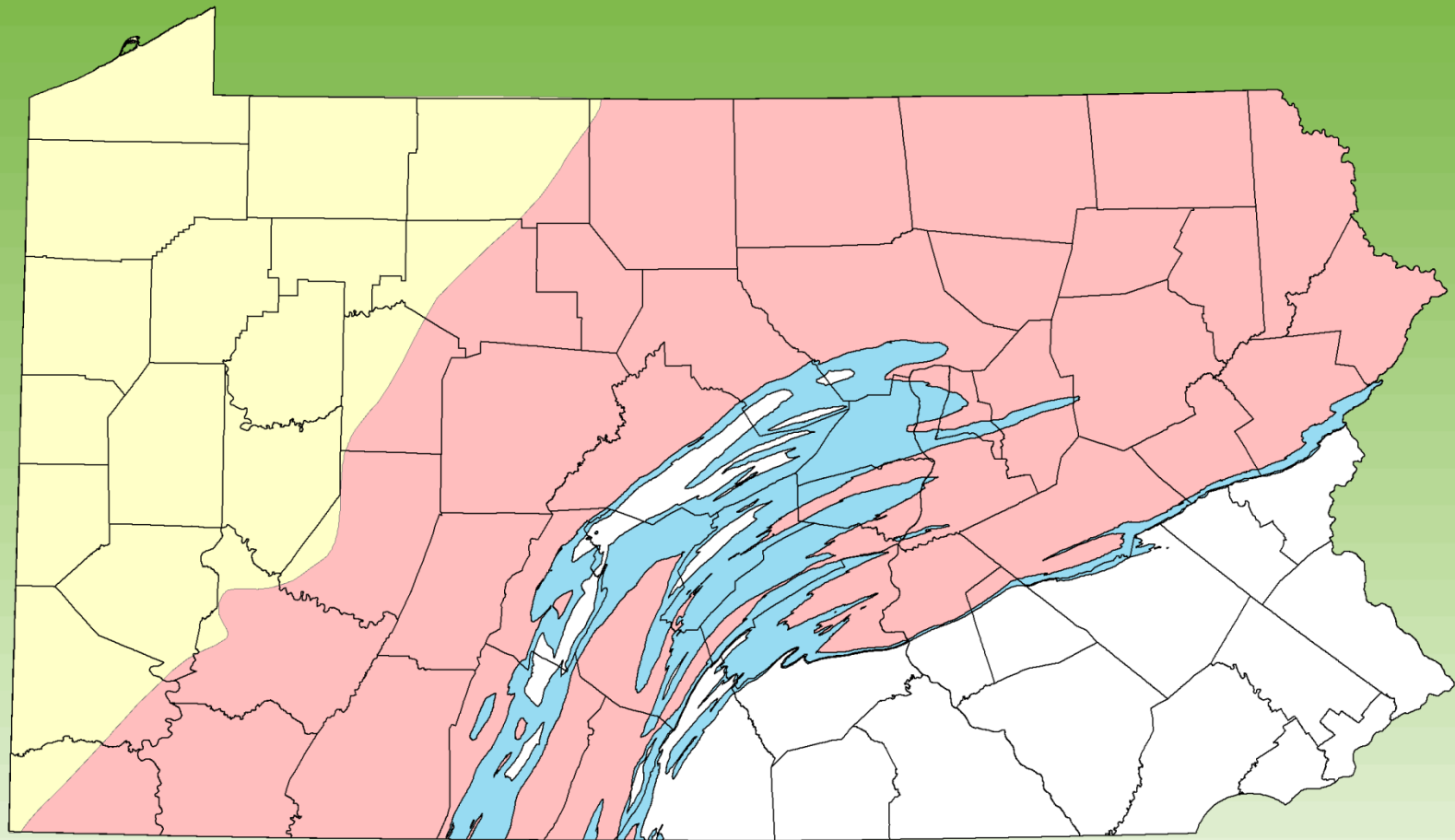





 **Utica Shale**

# Organic Shale Extents

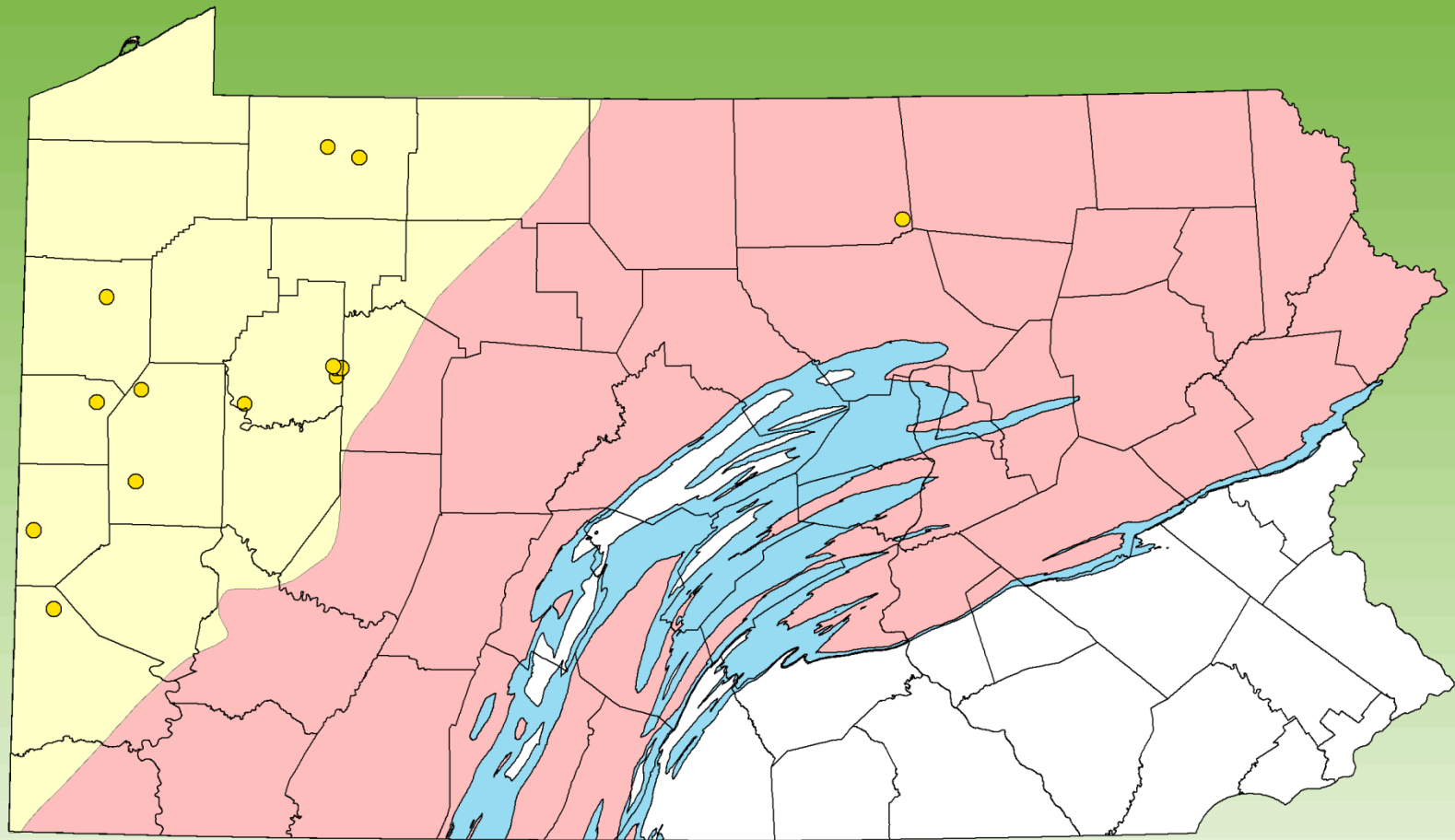


# Organic Shale Extents



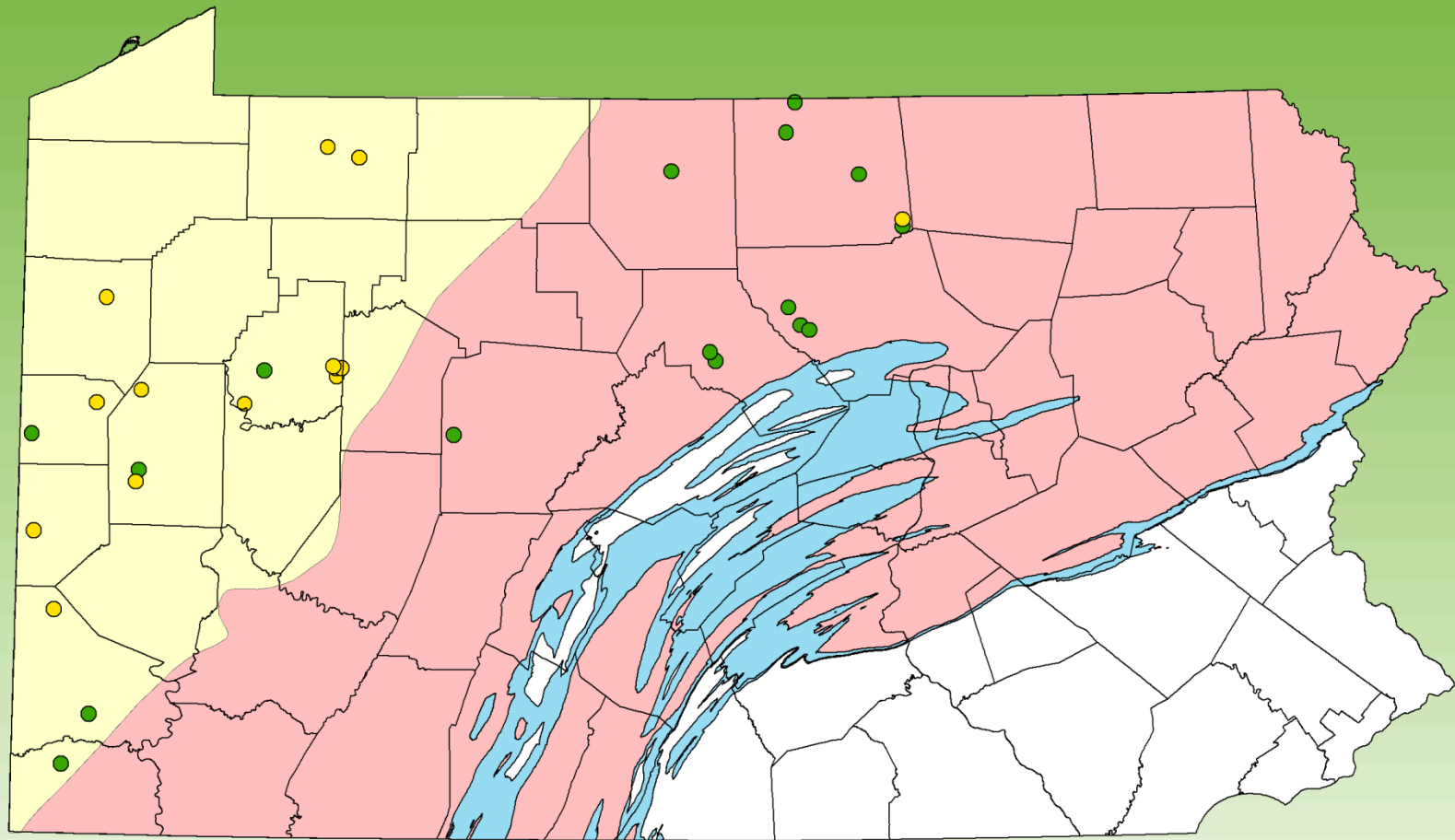
-  **Utica Shale**
-  **Marcellus Shale**
-  **Rhinestreet Shale**

# Organic Shale Extents with Wells

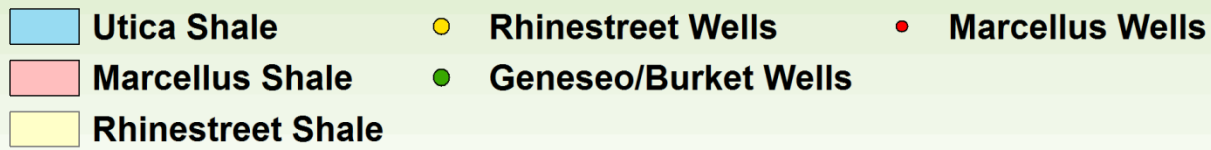
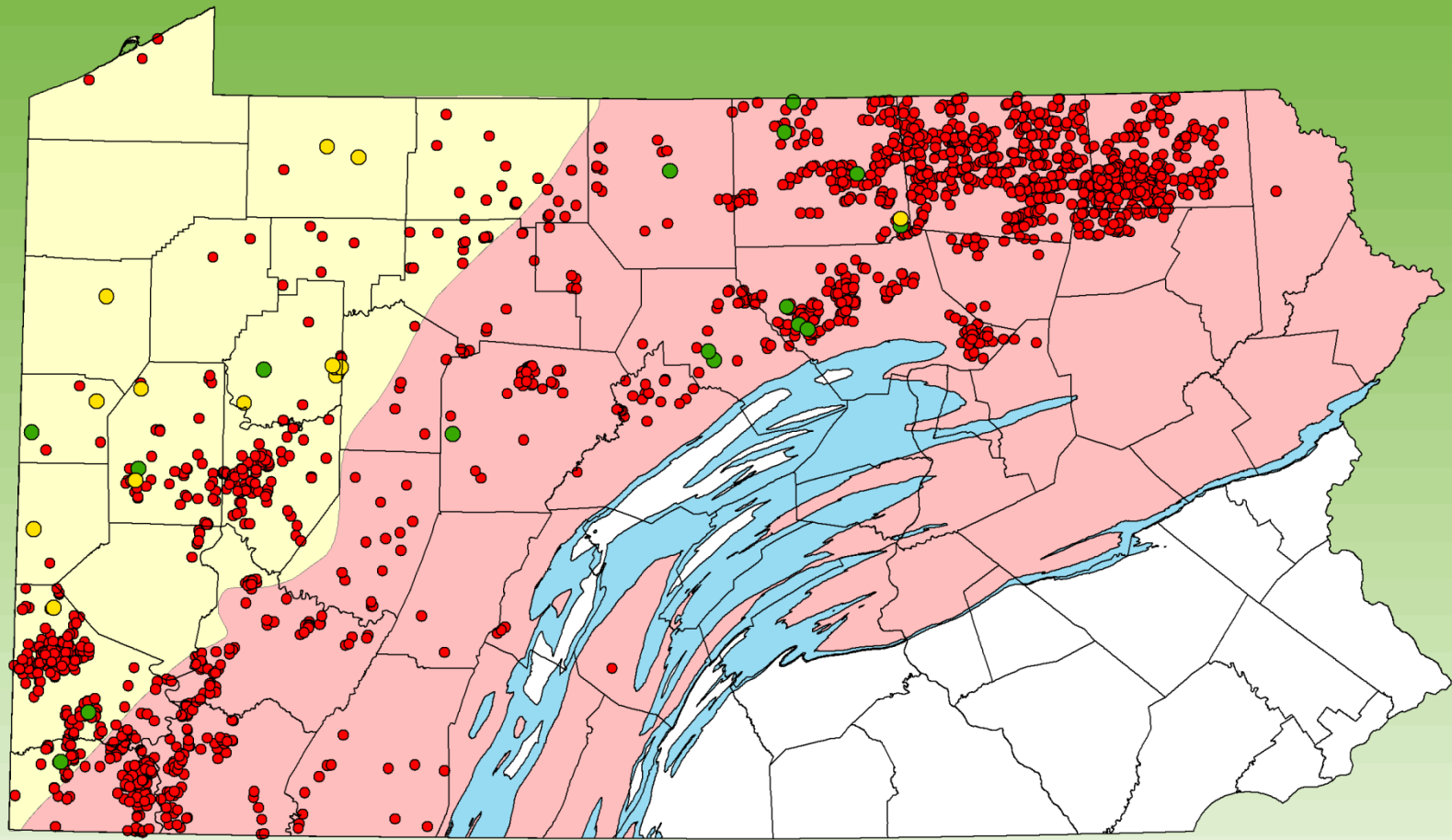




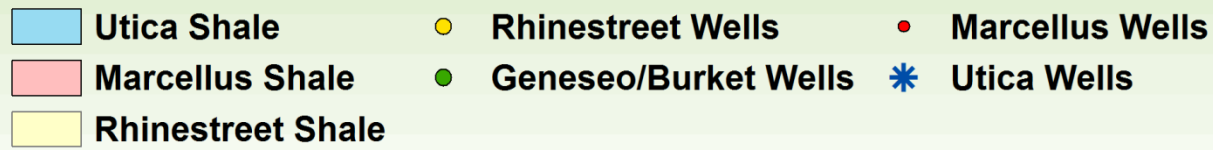
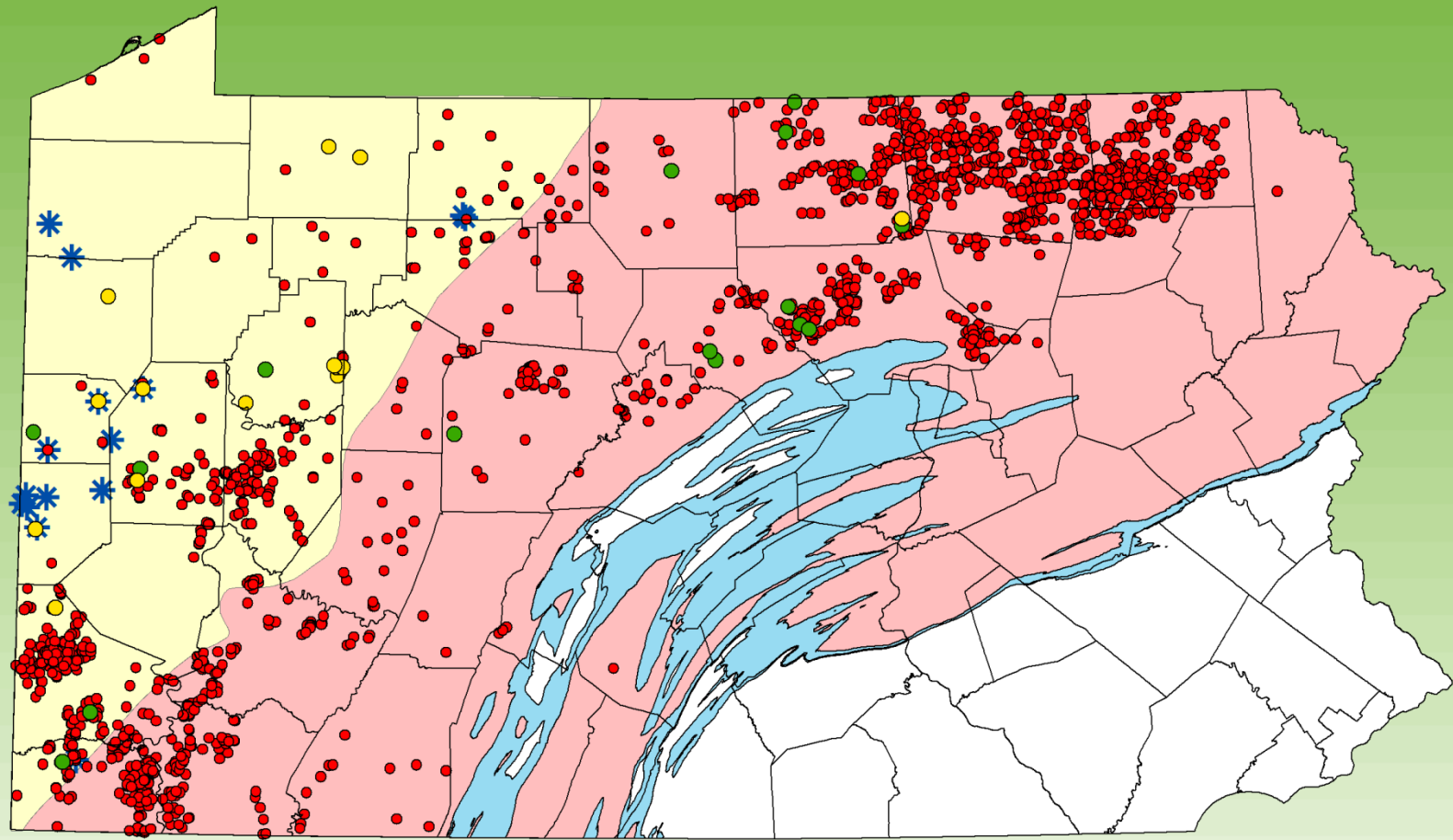
# Organic Shale Extents with Wells



# Organic Shale Extents with Wells



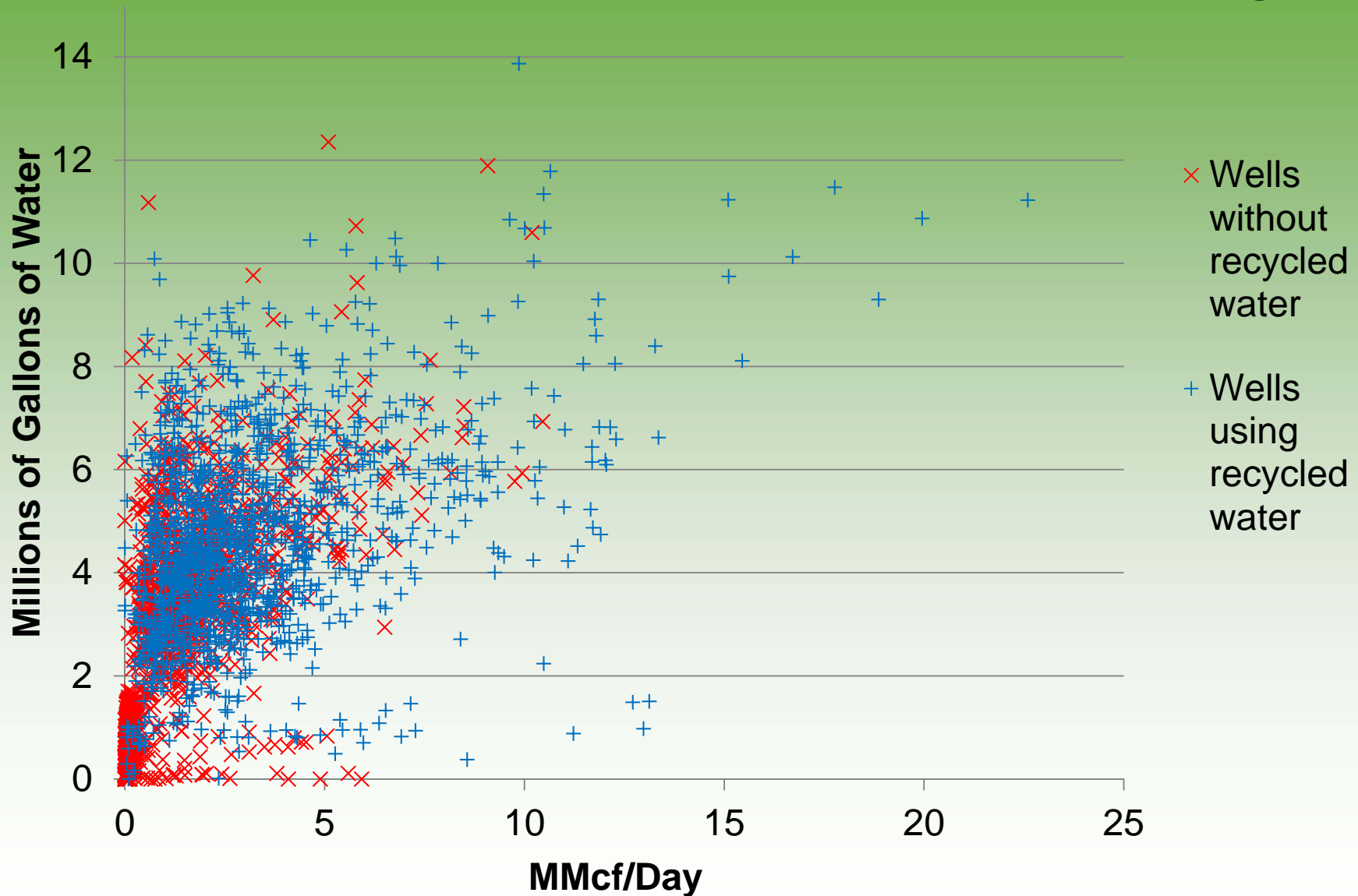
# Organic Shale Extents with Wells



# Data Sources

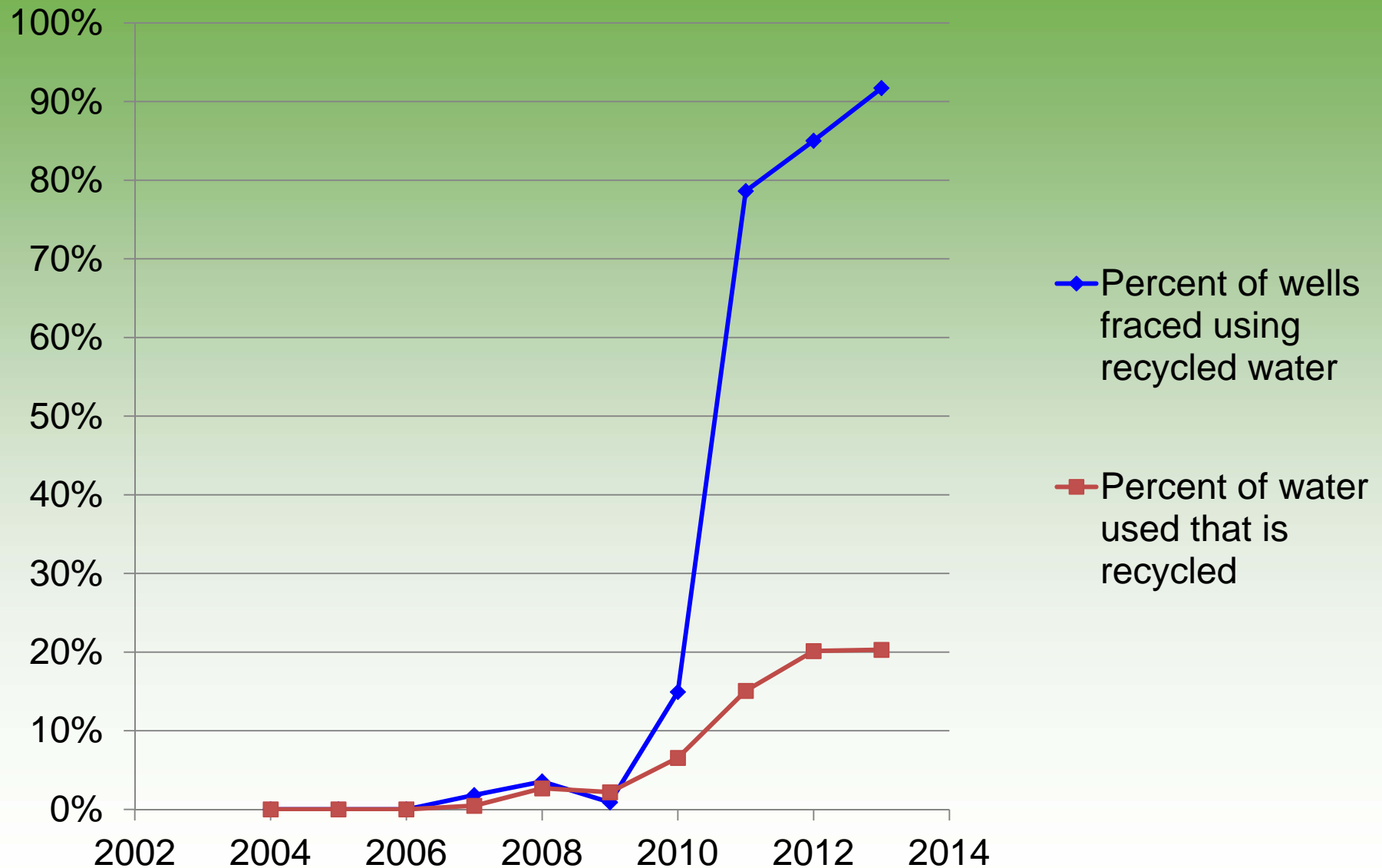
- Shale extent maps are from the PA Geologic Survey's website and well locations are from our PA\*IRIS/WIS system.
- Well production data and wastewater data are from the DEP's Office of Oil and Gas Management website as reported by operators.
- Water use and other well data are from completion reports in the PA\*IRIS system managed by the PA Geologic Survey.

# Gas Production vs Water Usage

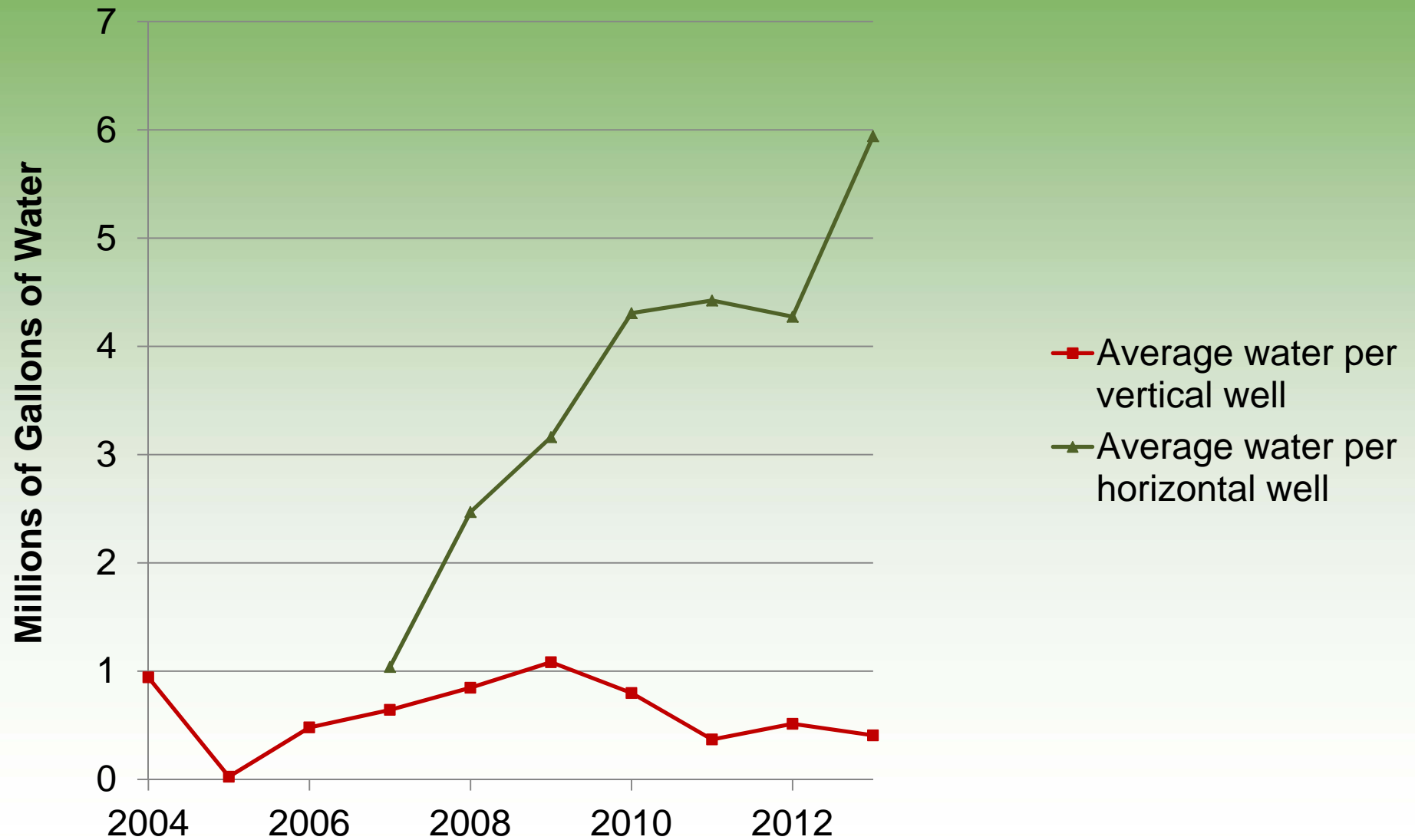




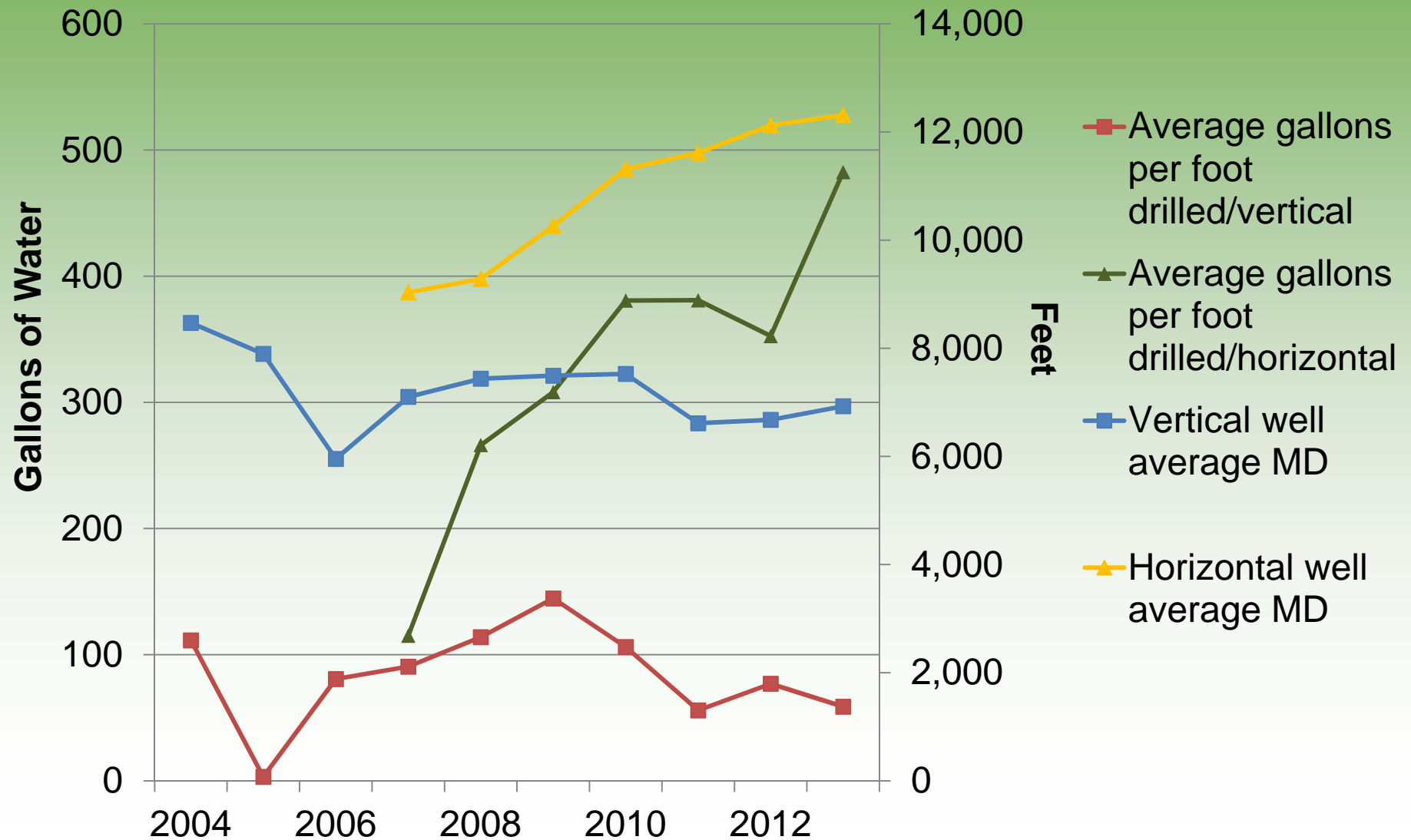
# Recycled Water Usage in Frac Jobs



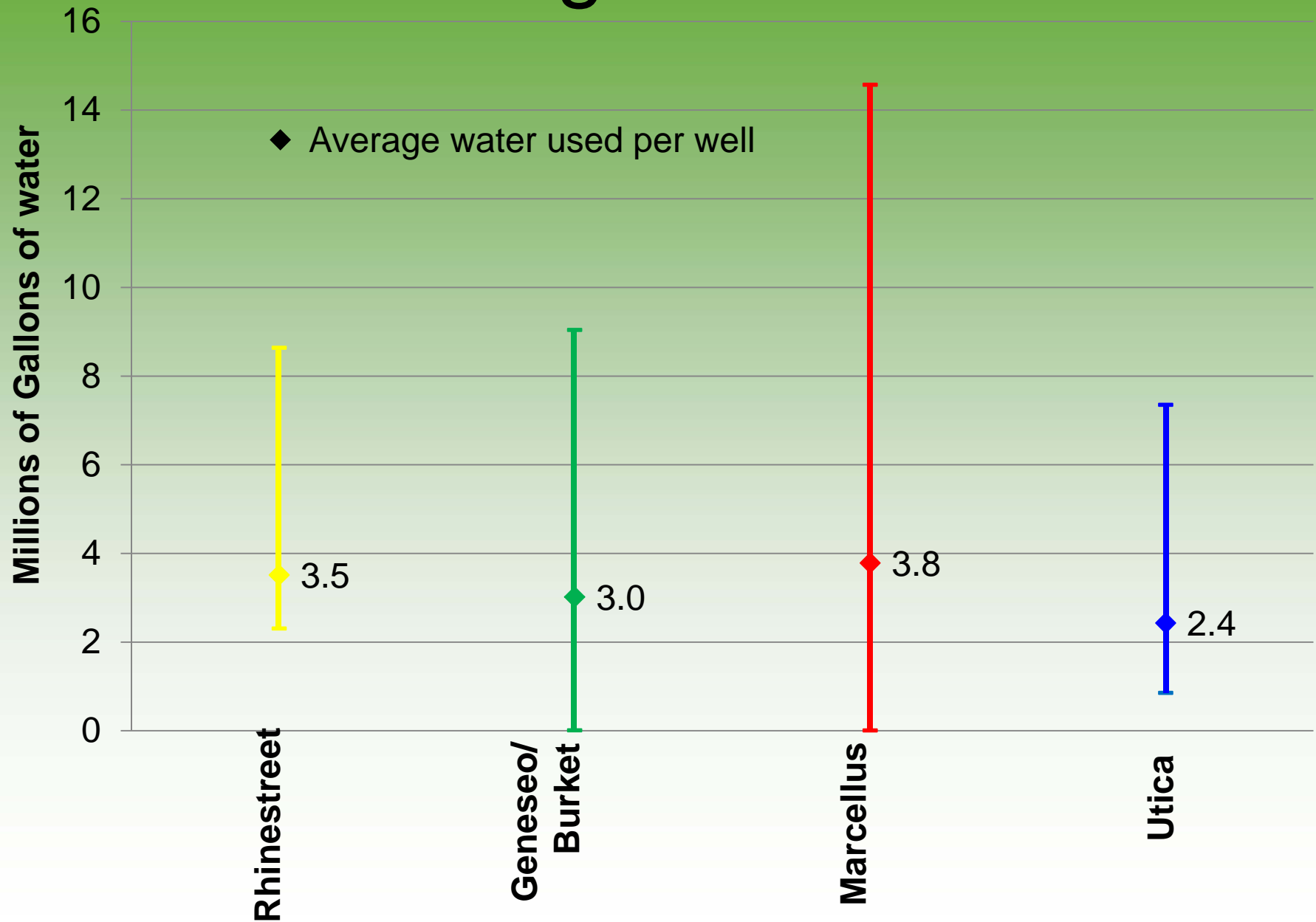
# Water Usage in Wells



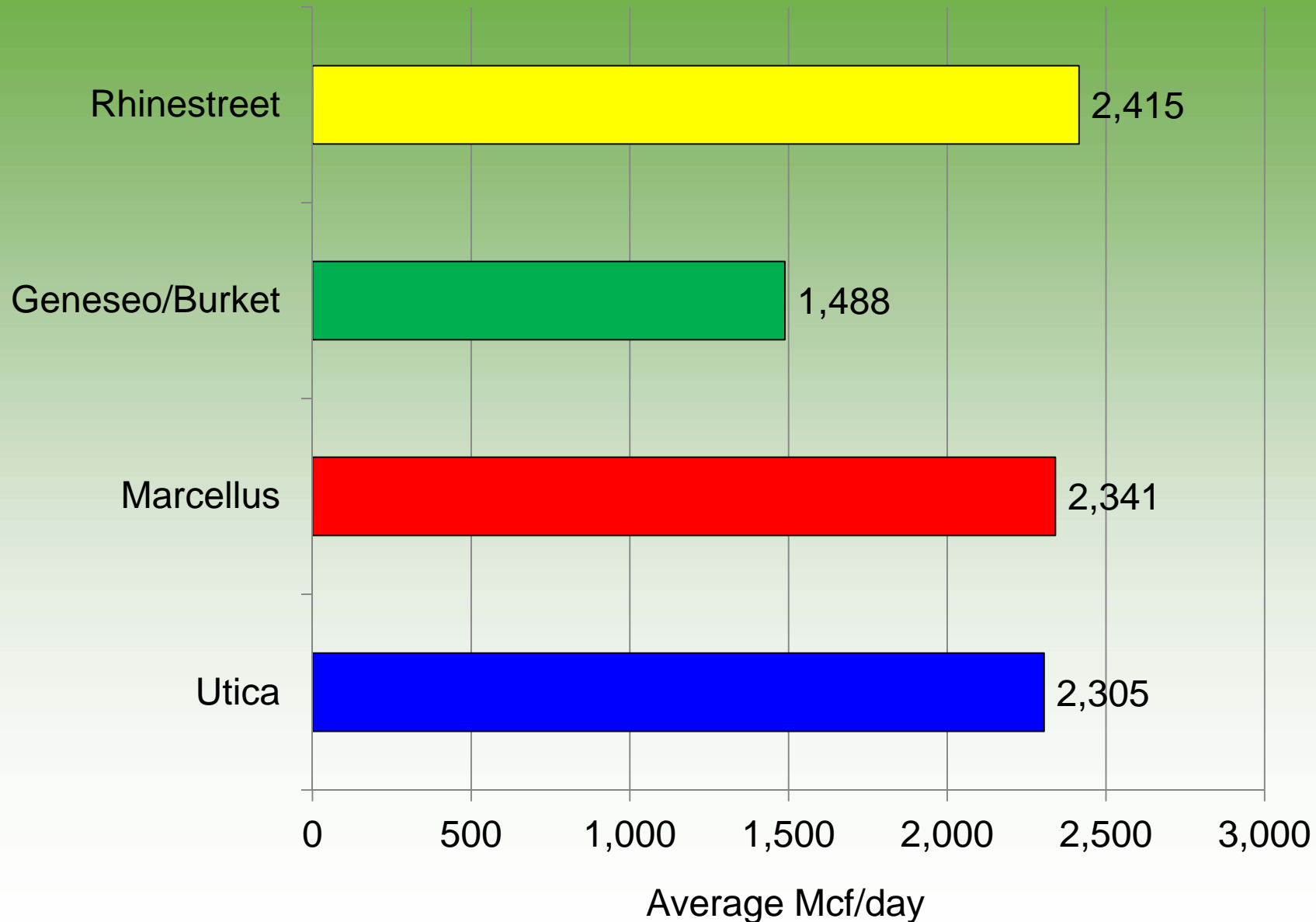
# Water Usage and Measured Depth



# Water Usage in the Shales



# Shale Gas Production





# Production Summary

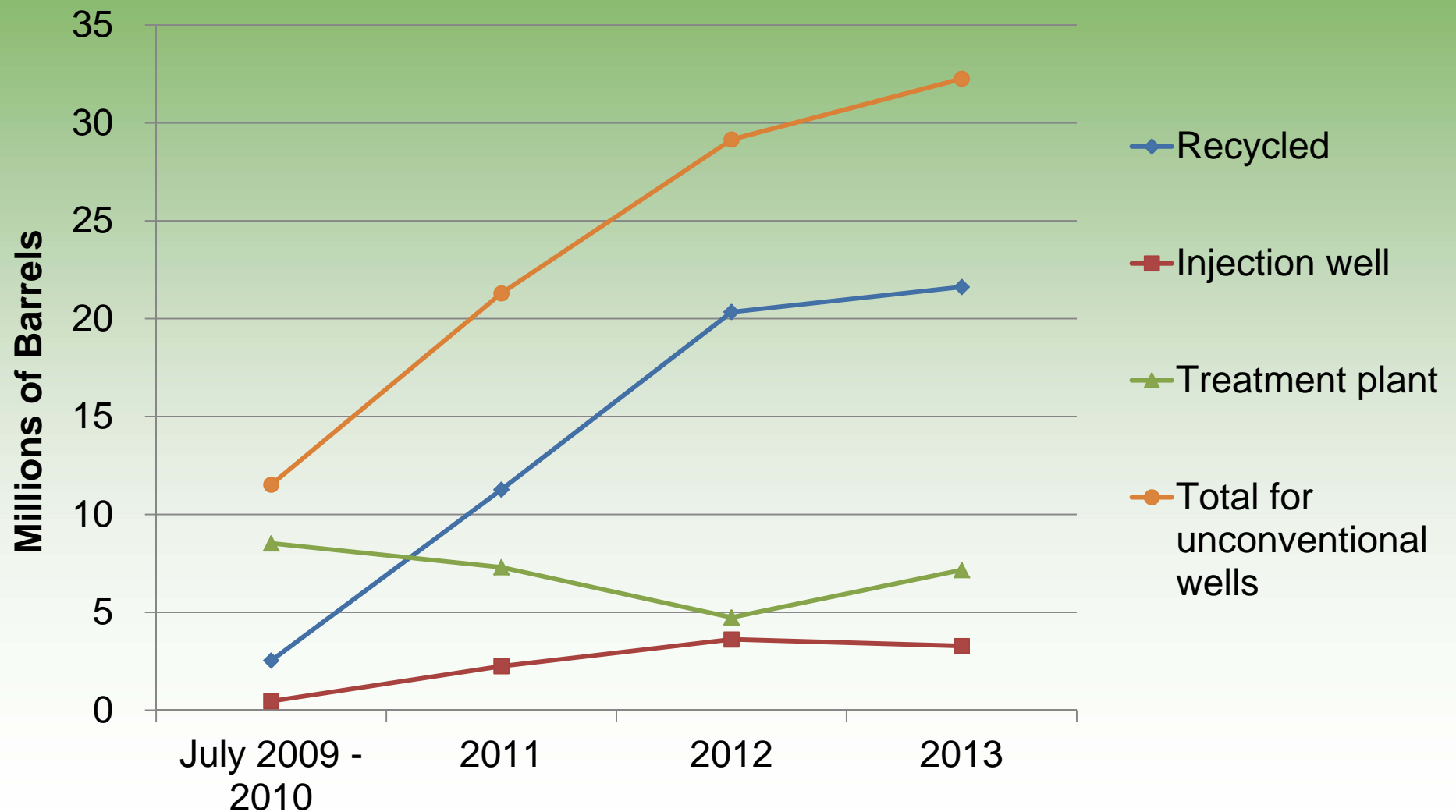
Formation	Number wells drilled	Gas produced (Bcf)	Oil produced (bbls)	Condensate produced (bbls)
Rhinestreet	14	3.45	0	43,347
Geneseo/ Burket	17	8.33	0	0
Marcellus	3,122	4,551	1.20 X 10 <sup>6</sup>	2.96 X 10 <sup>6</sup>
Utica	16	6.06	0	8

[www.dcnr.state.pa.us](http://www.dcnr.state.pa.us)

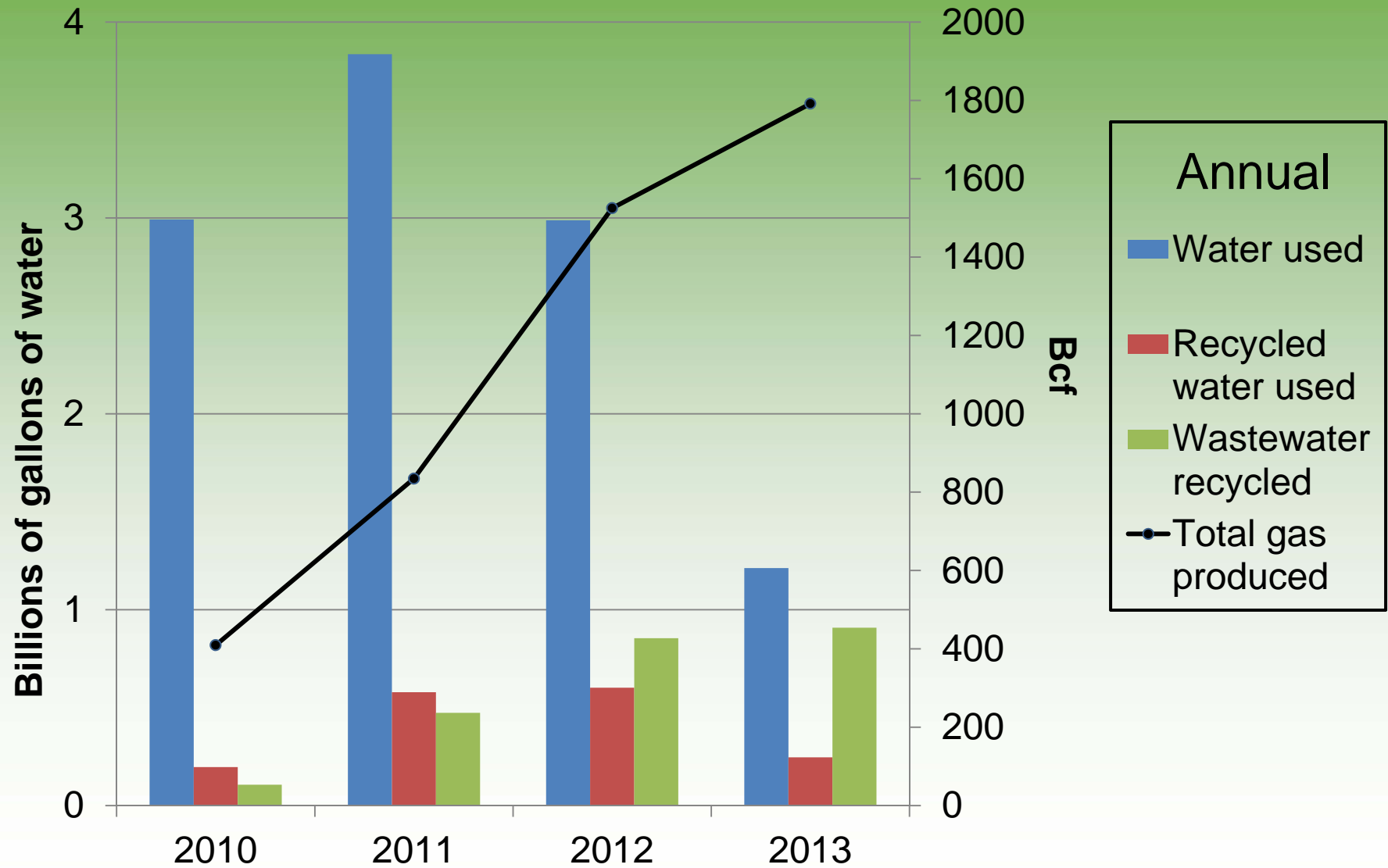
# Wastewater Disposal

- After a well has been completed, some of the frac and formation waters come back to the surface.
- Most wastewaters are disposed in various treatment plants, injection disposal wells, or are recycled.
- The use of these techniques has changed over time.

# Wastewater Disposal Methods



# Summary



# Conclusions



- Drillers are targeting four organic shales across Pennsylvania
- In general, more gas is produced when more water is used in the frac job.
- Water use and gas production from the different shales are comparable.
- More returned waters are being recycled and more frac jobs are using recycled water.



**Thank  
you!**



**Questions?**

[www.dcnr.state.pa.us](http://www.dcnr.state.pa.us)



STIMULATION BASE FLUID				
List Water Management Plan Source(s)		Water Management Plan ID	Volume (Gallons)	
1. Aqua		246326-4	3,228,456	
2. Parys Impoundment		246326-4		
3. Allen Impoundment		246326-4		
4. Neiley Impoundment		246326-4		
5. Cook N SUS 2H		246326-4		
6. Deer Park/MTN Energy		246326-4		
	DEP Biologist Review/Date	Total Gallons of Water Used 3,871,434	Water 3,228,456	Recycled 642,978
Other Base Fluid(s) Used			Quantity and /UOM	
1.			/	
2.			/	
Total Quantity all Fluid(s)			/	
STIMULATION/PRODUCTION INFORMATION (WELL)				



# Regional Cross-section

