

Private Homeowner Drinking Water Issues  
Luzerne County  
Harveys Lake Presentation (Part II) - 2010

Presenter

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## Project Sponsors

- **Pocono Northeast Resource Conservation & Development Council**  
<http://www.pnercd.org>
- **C-SAW Program - Consortium for Scientific Assistance to Watersheds Program**  
<http://pa.water.usgs.gov/csaw/>



## Center for Environmental Quality

Non-profit/ equal opportunity employer, is operated and managed, within the Department of Environmental Engineering and Earth Sciences

### Outreach Programs

- Environmental and Professional Education and Training
- Applied Research
- Community and Business Outreach Programs

Website: <http://www.water-research.net>

New Website – <http://www.wilkes.edu/water>

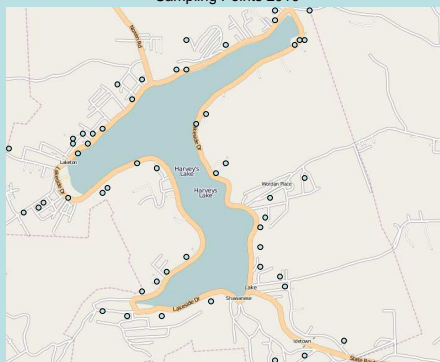
## New Community Resource



Download a Free Copy or Link to a copy at

<http://www.wilkes.edu/water>

Sampling Points 2010

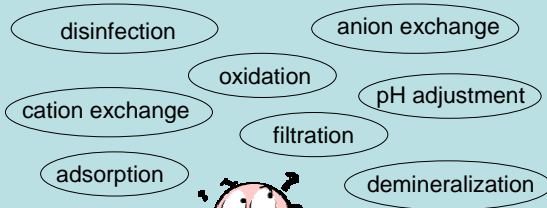


## Summary of Testing Results (2010)

	Tested	Standard or Guidance	# Exceeding	% Violates
Total Coliform	51	Absent	28	54% (38 %-2008)
E. Coli Positive	28	Absent	12	43% (e. coli positive)
pH	51	> 6.5	16 (< 6.5)	31 %
pH	51	< 8.5	1 (> 8.5)	< 1 %
Nitrate	51	< 10 mg/L	0	0
Nitrate	51	2 mg/L (regional mean)	4 (> 2 mg/L) 25 (> 1mg/L)	8% 49%
Sulfate	51	< 250 mg/L	0	0
Copper	51	< 1.0 mg/L	1	< 1 %
Iron	51	< 0.3 mg/L	1	< 1%
Chloride	51	< 250 mg/L	0	0 % (3- over 100 mg/L)
Sodium	51	< 20 mg/L *	24 (> 20 mg/L)	47 % (highest 259 mg/L)
Corrosion Issues	51	No standard	8 (1 Cu and 1 Pb exceed)	41%

\* EPA suggested limit for individuals on low sodium diet.

## Water Treatment



Match the pollutant with the correct process!

## Recommendations After the Water Has Been Tested

- Evaluate Existing Source
- Maintenance and Inspection of System
- Repair Existing Source
- Pollution Control Measures
- Treatment- POU, POE, or other

Explore all of them before taking action- FINAL ACTION!

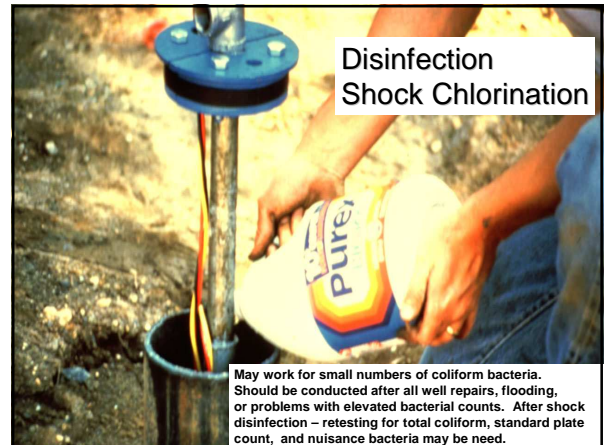
Bacterial Issues, Odors, and Turbid Water:  
Inspect Well; Possibly Change Well Cap,  
Regrade Area, Divert Runoff

Loose-fitting vs. Sanitary  
Sealed Well Caps

CAP SEAL



Disinfection  
Shock Chlorination



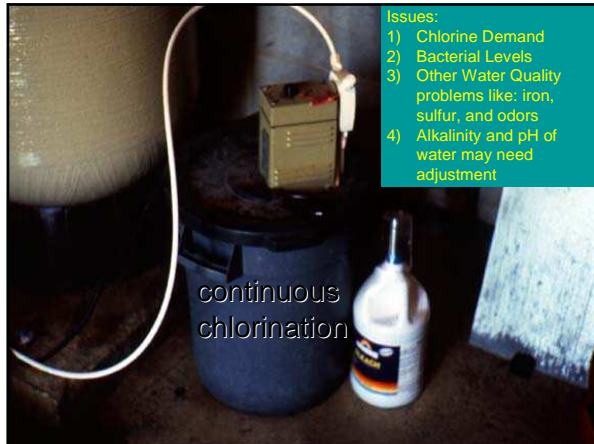
May work for small numbers of coliform bacteria. Should be conducted after all well repairs, flooding, or problems with elevated bacterial counts. After shock disinfection - retesting for total coliform, standard plate count, and nuisance bacteria may be need.

## Hydrogen Sulfide

- Hot water only?
  - Adjust water heater to a temperature of 140-160 °F for 6 to 24 hours and then flush
  - remove or replace rod in heater (Warranty Issues)
- Carbon Filtration- **no bacterial problem**
- Chlorination/ Contact Tank / Filtration
- Aeration- **no bacterial problem**
- Oxidizing filter- manganese greensand
- Shock disinfection may solve or temporarily solve this problem

## Whole House Treatment

Point of Entry (POE)


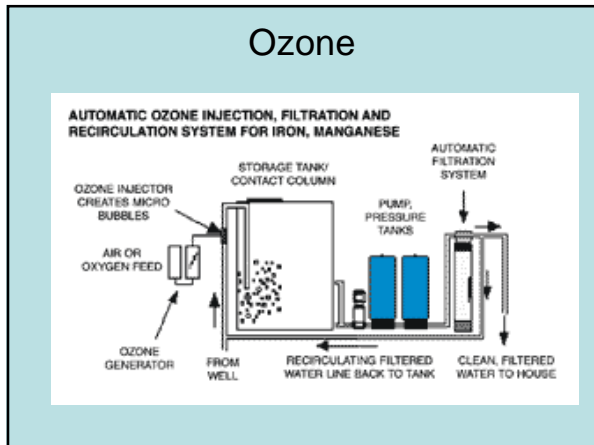


## U-V Sterilizer

The Selection of UV Unit system depends on the following:

- General Water Quality
- Turbidity
- Hardness
- Iron and Manganese
- Bacterial Levels
- Source Water Type and Overall Water Quality ?
- Class A or Class B Unit ?

<http://www.nsf.org>

## Acid (Corrosive Water) Control

Water

Media

Gravel

Use this unit if existing pH is 6.0 or greater.

Target pH is 6.9 to 7.0 - use limestone.

Target pH is higher - use magnesia (magnesium oxide)

## pH adjustment- Low pH

Chemical Pump

Storage Tank

May require a reaction tank to provide contact time.

Use sodium carbonate (soda ash) when pH is  $\geq 4.0$  to 6.8

When  $< 4.0$ , use caustic soda (sodium hydroxide)

## Water Softener (Reduce Hardness, Iron, Manganese)

Do Not Remove All the Water Hardness !  
 Exchange: Sodium or Potassium for Ca, Mg, Fe, Mn, etc

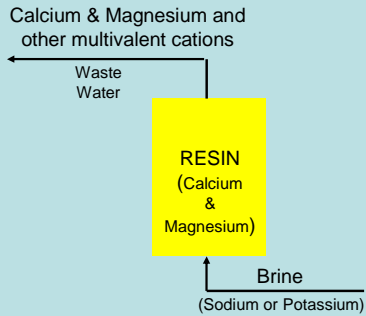
Raw Water

Calcium & Magnesium And other Multivalent cations

RESIN (Sodium Or Potassium)

Treated Water (Sodium or Potassium)

## Recharge with Brine



## Iron and Manganese Removal

- Form and concentration is important
  - Oxidized = visible, orange or black stain
  - Reduced = colorless
- Removal Methods
  - Water Softener
  - Chlorination / Filtration
  - Oxidizing Filter
  - Ozone



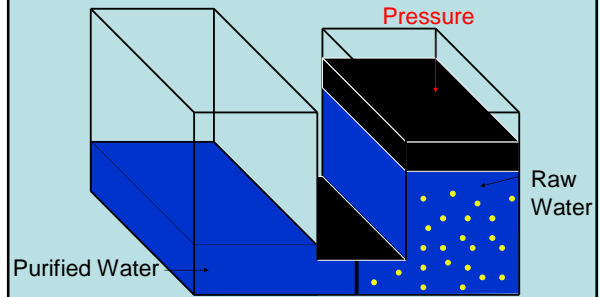
## Nitrate Exchange Resin

Reaction Tank with Computerized Controller (adjustable)



## Reverse Osmosis

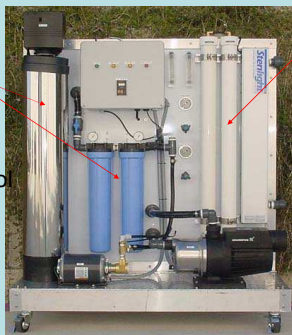
- force water through membrane
- removes many contaminants



## Reverse Osmosis System

Pretreatment

- 1) Softener
- 2) Filtration
- 3) Disinfection
- 4) Fe / Mn Control



R/O Units

## R/O Requires Storage

Size of Tank is a function of demand and water quality

Also, a percentage of the water is wasted. The recovery rate may be 20 to 30 % (70 to 80 % wasted)



## Before You Buy Treatment Equipment Get the Facts- Not the Sales Pitch

- Have your water tested by a reputable accredited, approved, and/or certified lab
  - Don't rely on in-home water test results.
  - Don't rely on free water tests.
- Consult unbiased water quality experts and get multiple quotes for a system.
- Explore all alternatives
  - Well rehabilitation, New source, Local Pollution Control, Maintenance

## Tips for Buying Treatment Equipment

- Seek reputable companies that have been around
- Ask for customer references
- Research company history
- Beware of hard sale techniques (scare tactics)
- Ask about maintenance requirements
- Get a detailed warranty
- Look for NSF and WQA certifications
- EPA certification means nothing
- Get everything in writing!
- If it sounds too good - it is!

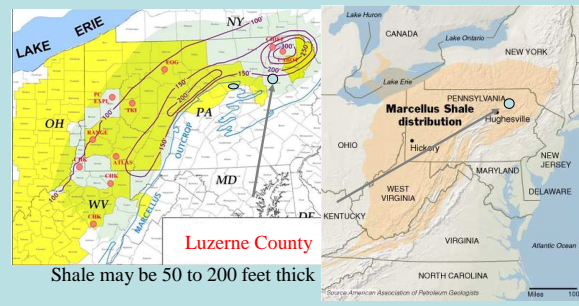
## Marcellus Shale



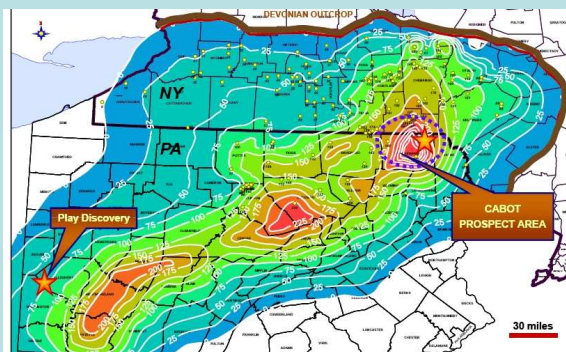
Black Gold ?



## Marcellus Shale- Natural Gas Play 50 to 200 trillion cubic feet

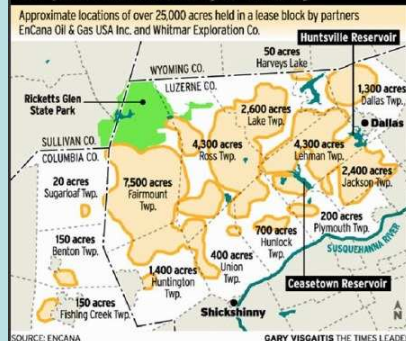


This is why the term – Fairway is being used to describe the play.



Source- Cabot – Marcellus Shale Thickness Map

## Luzerne County properties targeted for possible natural gas drilling





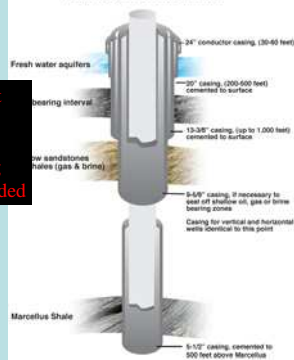
## Marcellus Shale Drilling Site



Pads can be 5+ acres – but one pad can support drilling multiple horizontal wells.

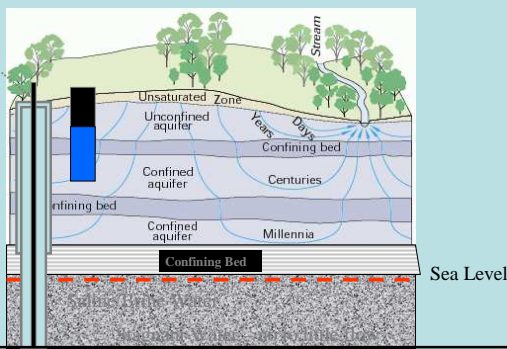


### Generalized casing design for a Marcellus Shale gas well to protect the environment

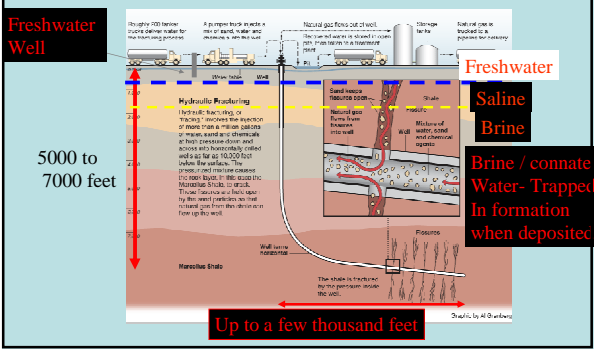


Series of Cement Casings Used in Drilling Process  
Adequate Casing Centralizers Needed

## Groundwater Moves - Slowly feet per year



## Getting to The Natural Gas



## Background Testing and Baseline (Work as a Community !)

- This requires chain-of-custody and the use of third party collectors.
- Sample collectors are either representatives of the certified laboratories and other professionals that are authorized by the laboratory to collect and deliver samples to the laboratory. You may want to use licensed professional that is approved by the laboratory.
- Field testing should be conducted at the time of sampling to determine the well is properly purged.
- Document static water levels, well production capacity, and spring flows.
- Pre Drilling Baseline – within 6 months of starting a production well.
- Post Drilling Testing – within 6 months of completion.
- Allow the Gas Companies to conduct the necessary baseline testing.

## Some Recommendations on Baseline Testing – Residents over 1000 feet from Well Site

- Recommendations are for Residential / Private Wells that are outside 1000 feet of the well.
- Recommendations are for Private Wells that are not along a horizontal leg for the gas well.
- Different testing may be needed for springs and surfacewater.
- Pricing listed is based on survey of local certified laboratories, including Kirby Health Center, Seewald, Quantum, Lancaster, and NEEL.



## Water Testing Recommendations

- Package # 1 – Based on Penn State University Recommendations- Targeting Inorganic Natural High in Area and High in Flowback Water.
- Parameters: total coliform, e. coli, chloride, sodium, barium, bromide, pH, iron, manganese, methane/ethane, and total dissolved solids.
- Laboratory Cost – *Approximately \$ 300.00 - \$375.00/sample.*
- Very inadequate – This is the minimum!
- *After this baseline evaluation – suggest adding nitrite and nitrate to this testing.*

## Water Testing Recommendation

Package # 2- Includes the Parameters in Package # 1, plus (Based on PADEP Recommendations and Flowback Water Chemistry:

- T. Hardness, Calcium, Magnesium, Selenium, Strontium, Alkalinity, Arsenic, Nitrate, Total Suspended Solids, Sulfate, **add Nitrite**
- Oil & Grease, Surfactants, 21-VOCs, MTBE
- Estimated Cost w/o Chain-of-Custody and Collection – **Approximately \$550.00 - \$ 775.00 /sample\***.

\*This is based on a survey of labs.



## Water Testing Recommendation

Package # 3- Based on Flowback Water Chemistry, Regional Groundwater Normally Corrosive, and Elevated Levels of Radon in Air

- Potassium, Sulfide, Ammonia, Acidity, Nickel, Gross Alpha / Beta, Lead, Uranium
- Estimated Cost w/o Chain-of-Custody and Collection **\$ 850.00 - \$ 1000.00 per sample\***

\*This is based on a survey of labs.



## Water Testing Recommendations

Package # 4 – Comprehensive Testing

1. Includes all drinking water parameters for a regulated source.
2. Parameters that target Natural Gas, Connate Water, Brine Water, Flowback water that are not part of the Drinking Water Standards
3. Additional Synthetic Organic Compounds
4. This is not for the typical homeowner.

**\$ 1850.00 and Up\***

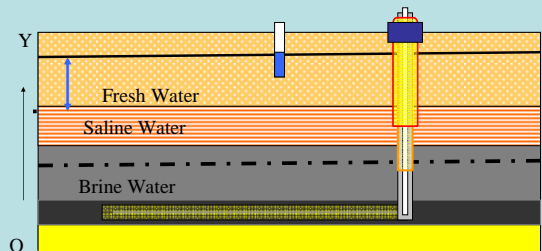
\*Based on a survey of certified labs.



## Announcement

- Harvey's Lake Environmental Advisory Council (EAC) is working on putting together information on baseline testing.
- Information will be posted on the Associations Website.
- <http://www.harveyslakepa.us/eac.htm>

## General Geology Horizontal Bedding



Use a Multiple Casing Approach  
Geology of Appalachian Plateau Provinces

## Learn More about Marcellus Shale

- PADEP Sites
  - <http://www.dep.state.pa.us/dep/deputate/minres/oilgas/oilgas.htm>
- Education Sites
  - <http://extension.psu.edu/naturalgas>
  - <http://cce.cornell.edu/EnergyClimateChange/Pages/default.aspx>
- Industry Sites
  - <http://www.energyindepth.org/2010/06/debunking-gasland/>
  - <http://marcelluscoalition.org/>

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