

The New Jersey Private Well
Testing Program: An Evaluation
of Domestic Well Water Quality in
New Jersey

By

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Private Wells in New Jersey

- Estimated that there are 400,000 private wells.
- Approximately, 13% of the population of New Jersey have a private well as their drinking water source.
- No Federal regulations of water quality of private wells, and previously, New Jersey State regulations focused on well construction.

New Jersey Private Well Testing Act - Summary of Rules

- Program began September 2002
- Testing is required when a property is sold, or if a property is leased.
- Chemical results are valid for 1 year, fecal coliform/E. coli results for 6 month.
- Data is confidential.
- Primarily a Right-to-Know Statute

Sampling Requirements

- Samples are **raw water** collected before any treatment.
- Lead samples are collected after flushing for 2 minutes.
- Certified laboratories collect and analyze samples.

Parameters Analyzed Statewide

Total Coliform - Fecal Coliform/E. coli

- Nitrate
- Volatile Organic Compounds (26)
- Lead
- Secondary Standards
pH, Manganese, Iron

Parameters Analyzed Regionally

- Arsenic – Northern NJ
- Mercury – Southern NJ
- Gross Alpha – Southern and Central NJ

Data Required





- Location – Address, Block, Lot, Municipality, County, XY Coordinates
- Analytical Results
- Data is reported electronically from the laboratory to DEP, and stored in a database
- Data is available to county health officials

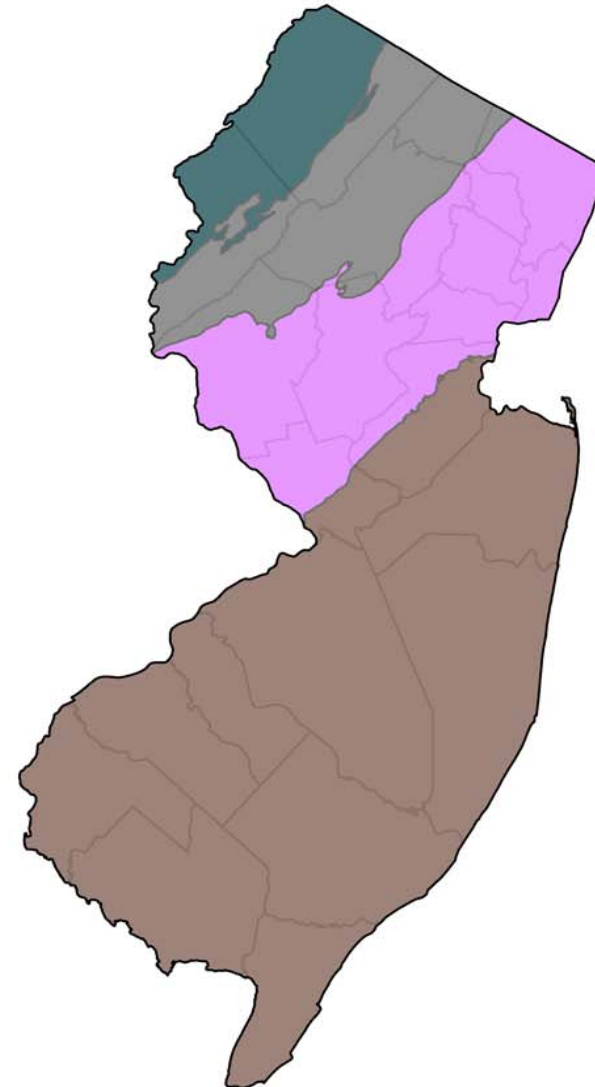
Private Well Data

- September 2002 – April 2009
- 70,954 Samples
- 63,036 Individual Wells


Physiographic Provinces of New Jersey

Provinces

-  Valley and Ridge
meta-sediments and limestones
fracture and cavernous flow
-  Highlands
granites and schists
limited fracture flow
-  Piedmont (Newark Basin)
marine shales and sandstone
fracture and bedding plane flow
-  Coastal Plain
unconsolidated sands, gravels and clay
porous flow



0 10 20 40 Miles





Contaminants with Primary MCLs

Total Coliform – Fecal Coliform/E. coli

Relationship of Coliform Groups

Total Coliform Bacteria

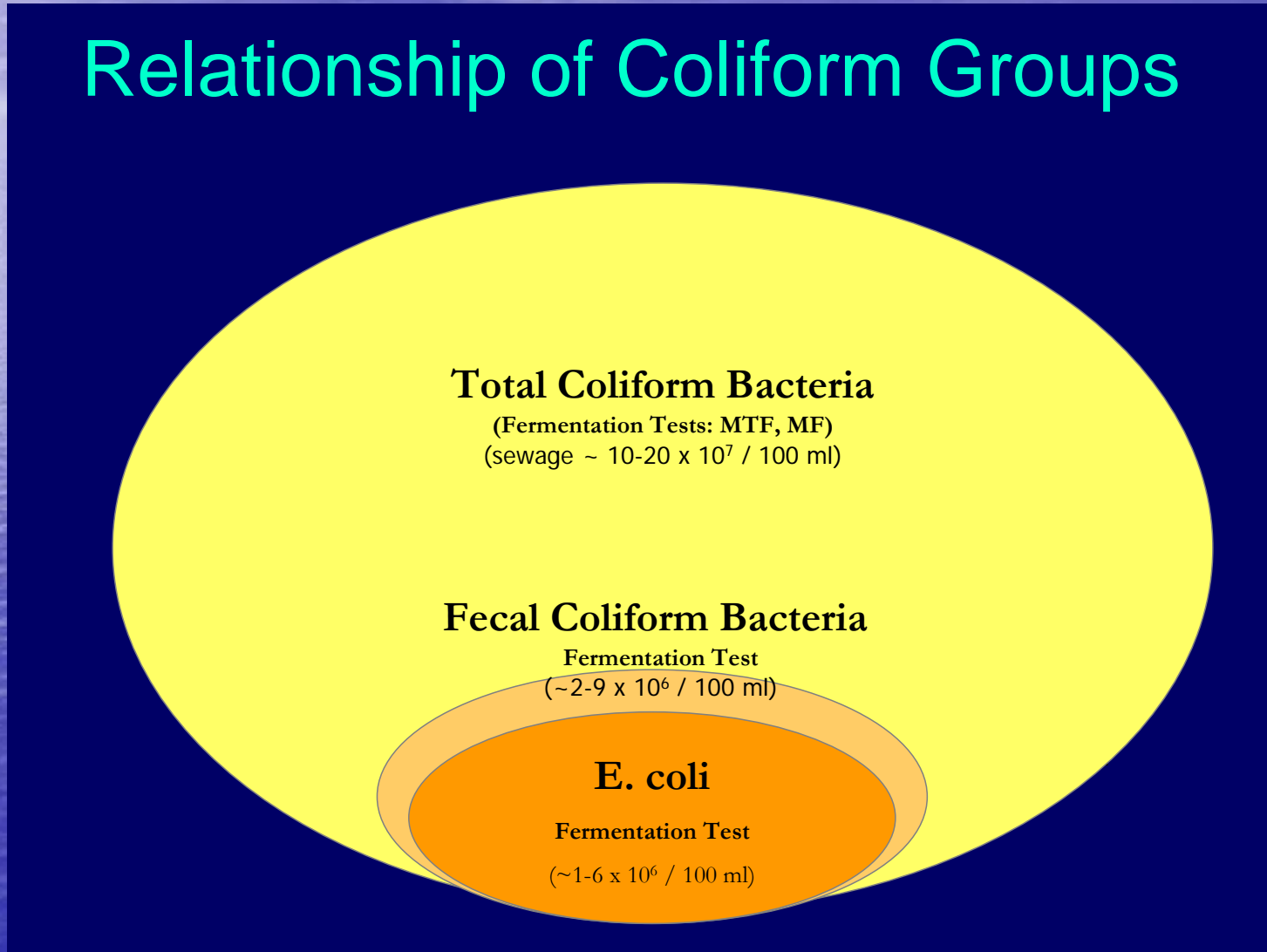
(Fermentation Tests: MTF, MF)
(sewage ~ $10\text{-}20 \times 10^7$ / 100 ml)

Fecal Coliform Bacteria

Fermentation Test
(~ $2\text{-}9 \times 10^6$ / 100 ml)

E. coli

Fermentation Test
(~ $1\text{-}6 \times 10^6$ / 100 ml)



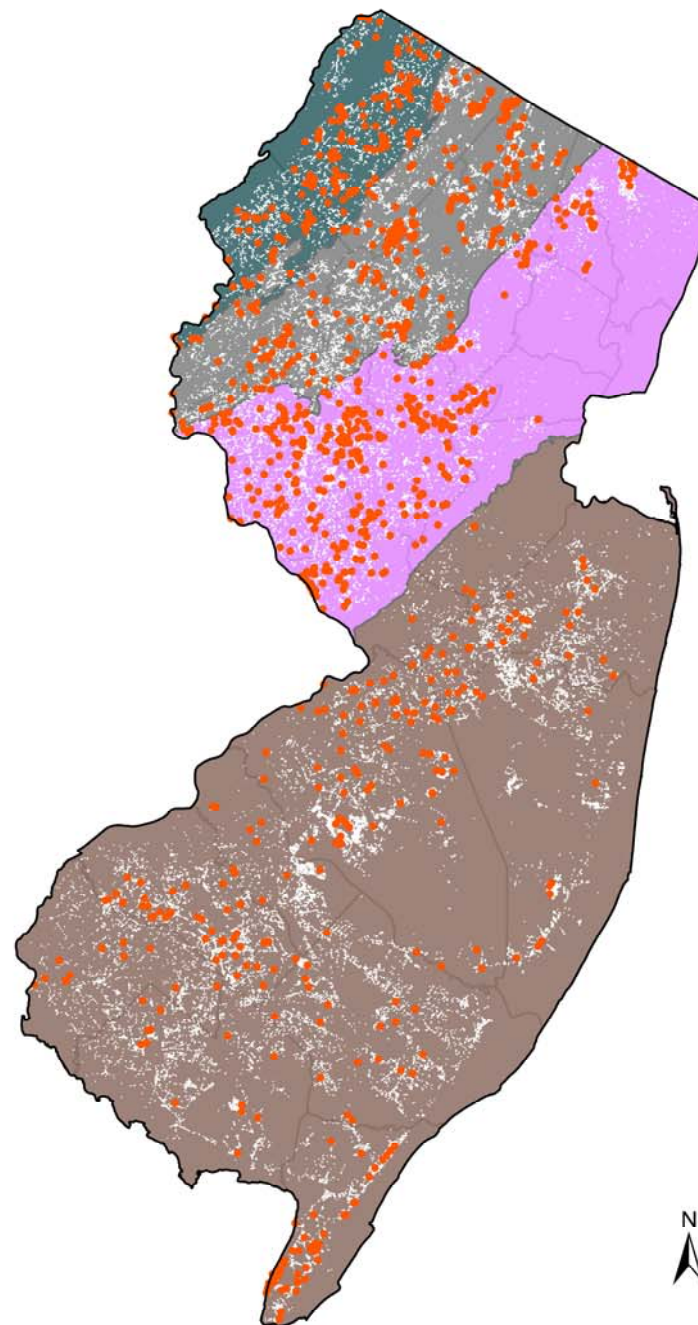
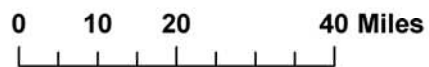
Private Well Testing Results 63,036 Wells Fecal Coliform/E. coli

Results

- Positive
- Negative

Provinces

- Valley and Ridge
- Highlands
- Piedmont
- Coastal Plain

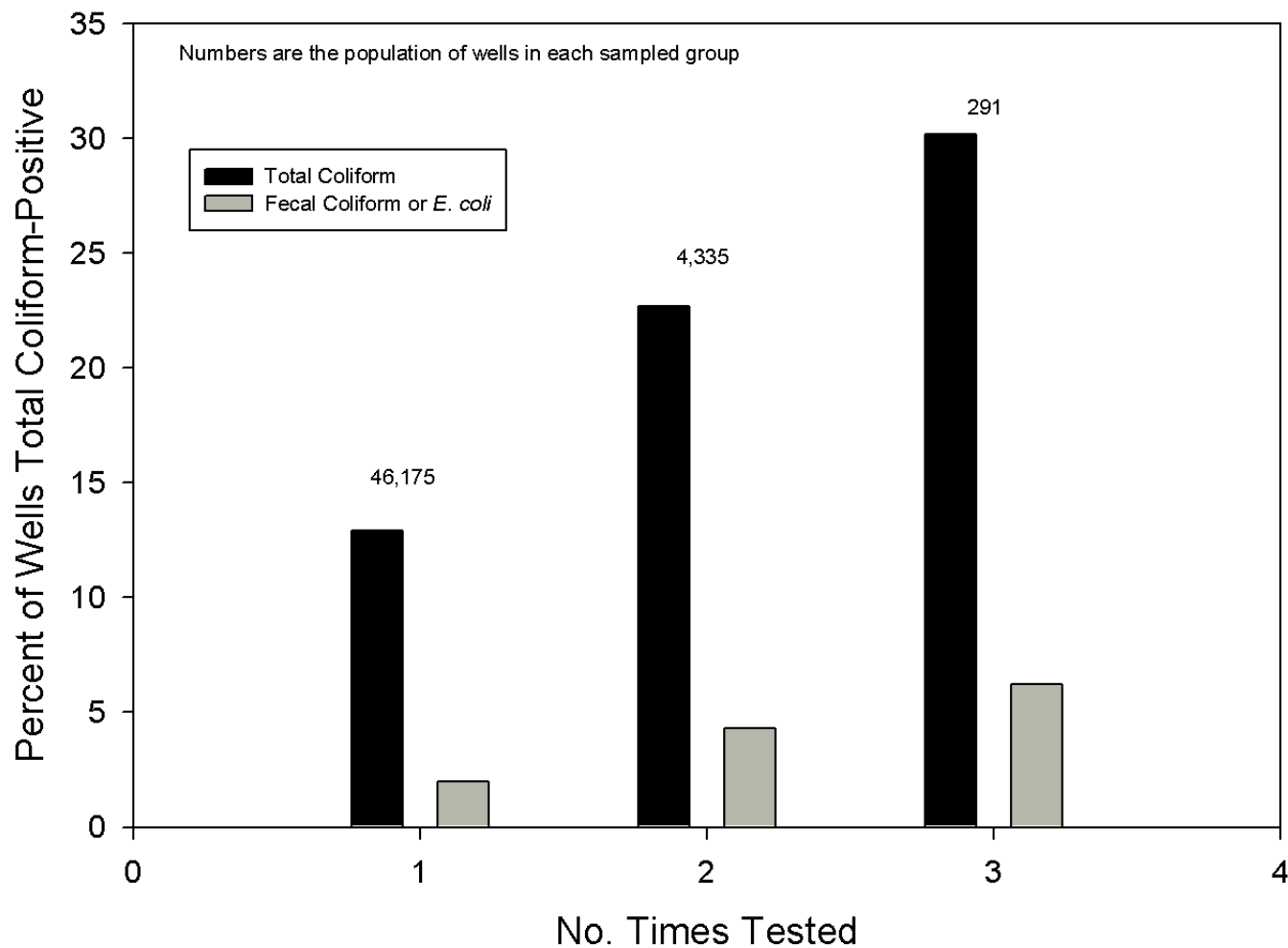


Fecal Coliform Exceedances

Overall 1.9% Exceedances

Province	% Exceedances
Valley and Ridge	3.5%
Highlands	2.3%
Piedmont	3.3%
Coastal Plain	0.9%

Figure 1. Percentage of Coliform-Positive Wells Following the Indicated Number of Times the Wells Were Tested



Private Well Testing Results 63,036 Wells Nitrates

Nitrate Results

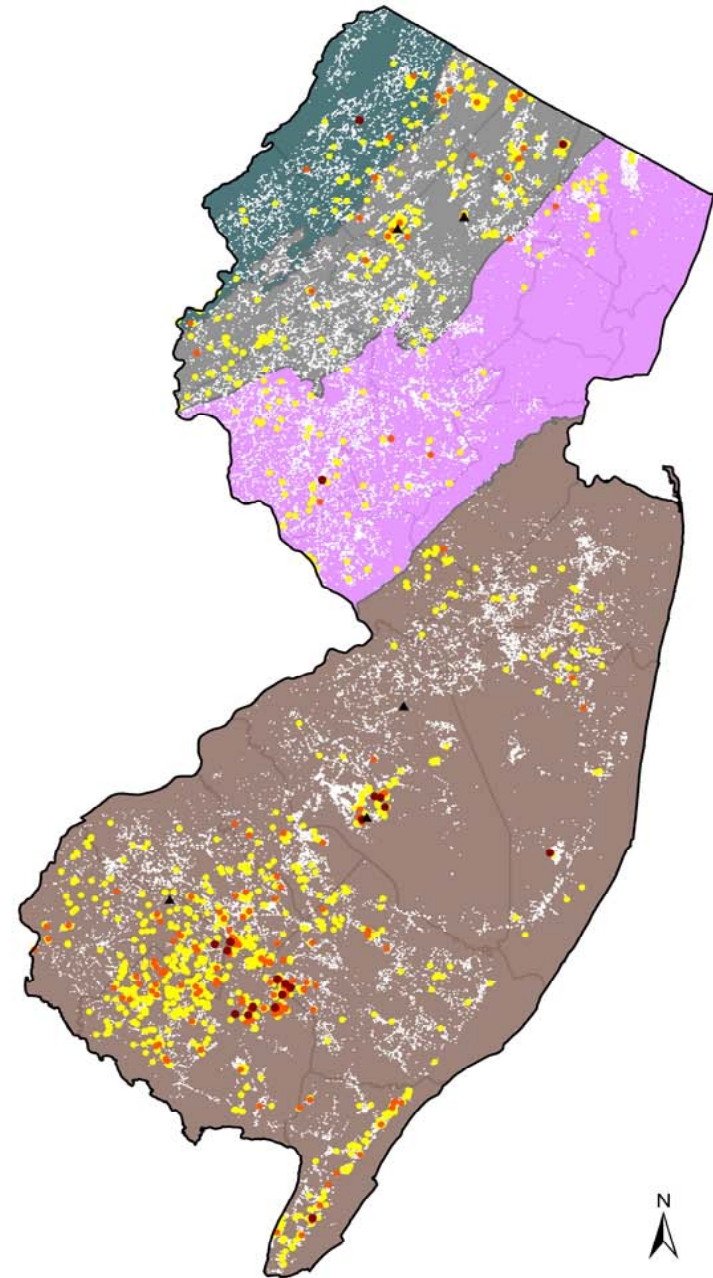
MCL = 10 mg/l

- > 10 mg/l
- > 10-20 mg/l
- > 20-40 mg/l
- > 40-80 mg/l
- ▲ > 80 mg/l

Provinces

- Valley and Ridge
- Highlands
- Piedmont
- Coastal Plain

0 10 20 40 Miles



Nitrate Exceedances

- 1,814 Wells exceeded the nitrate standard of 10 mg/l (2.9%)
- Range ND – 480 mg/l
- Coastal Plain (3.7%), Highlands (3.4%), Valley and Ridge (1.3%), Piedmont (0.8%)
- Eventually, trends in nitrate concentrations can be evaluated.

Private Well Testing Results 17,573 Wells Arsenic

Arsenic Result

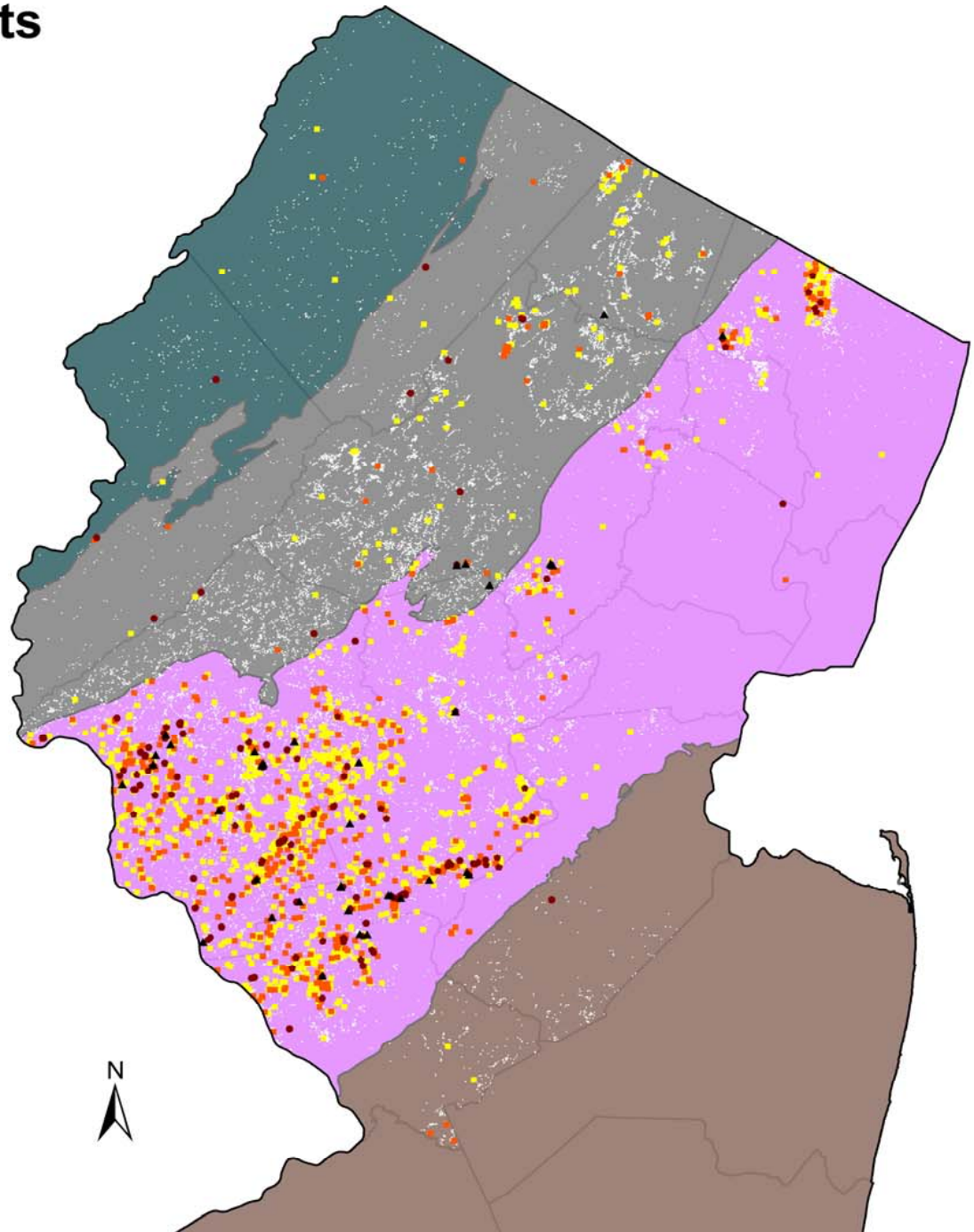
NJ MCL = 5 ug/l

- < 5 ug/l
- > 5 - 10 ug/l
- > 10 - 20 ug/l
- > 20 - 40 ug/l
- ▲ > 40 ug/l

Provinces

- Valley and Ridge
- Highlands
- Piedmont
- Coastal Plain

0 5 10 20 Miles



Arsenic Exceedances

- 1,962 out of 17,573 wells (11.2%) exceeded the NJ MCL of 5 ug/l.
- 634 out of 17,573 wells (3.6%) exceeded the Federal MCL of 10 ug/l
- Range – ND to 254 ug/l

Arsenic Exceedances

Province	Exceedance of NJ Standard (5 ug/l)	Exceedance of Federal Standard (10 ug/l)
Valley and Ridge	1.4%	0.5%
Highlands	1.2%	0.5%
Piedmont	16.8%	5.6%
Coastal Plain	1.0%	0.7%

Private Well Testing Results 31,635 Wells Mercury

Mercury Results

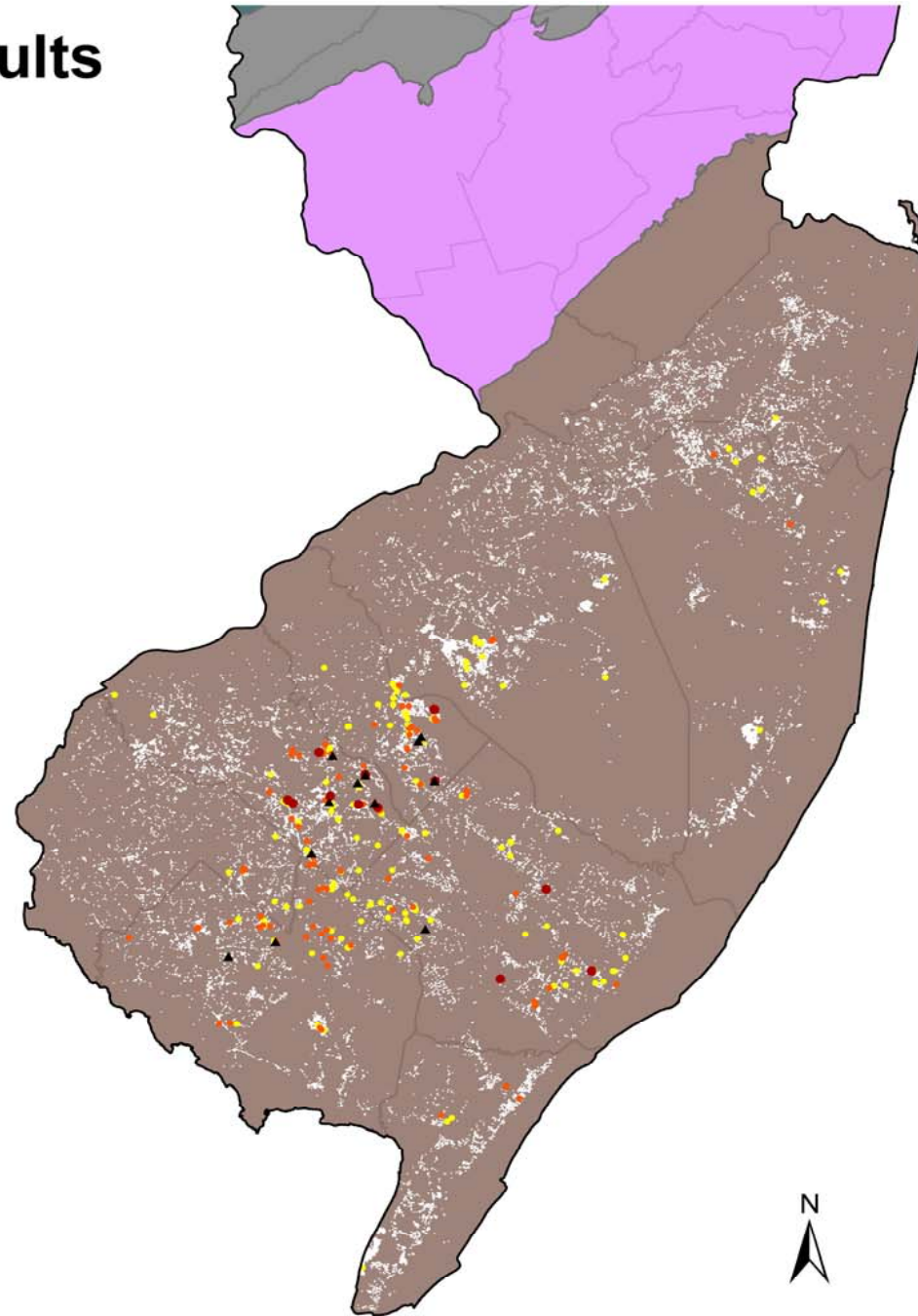
MCL = 2 ug/l

- > 2 ug/l
- > 2-4 ug/l
- > 4-8 ug/l
- > 8-16 ug/l
- ▲ > 16 ug/l

Provinces

- Valley and Ridge
- Highlands
- Piedmont
- Coastal Plain

0 10 20 40 Miles



Mercury Exceedances

- 290 out of 31,635 wells (0.9%) exceeded the mercury standard of 2 ug/l
- Range - ND to 83.3 ug/l

Gross Alpha New Jersey Method

- Radium 224, Radium 226, Radium 228
- New Jersey 48 hour Gross Alpha Test
 - First sample (24 hours), if gross alpha is greater than 5 pCi/l
 - Second sample (48 hours), if gross alpha >15pCi/l

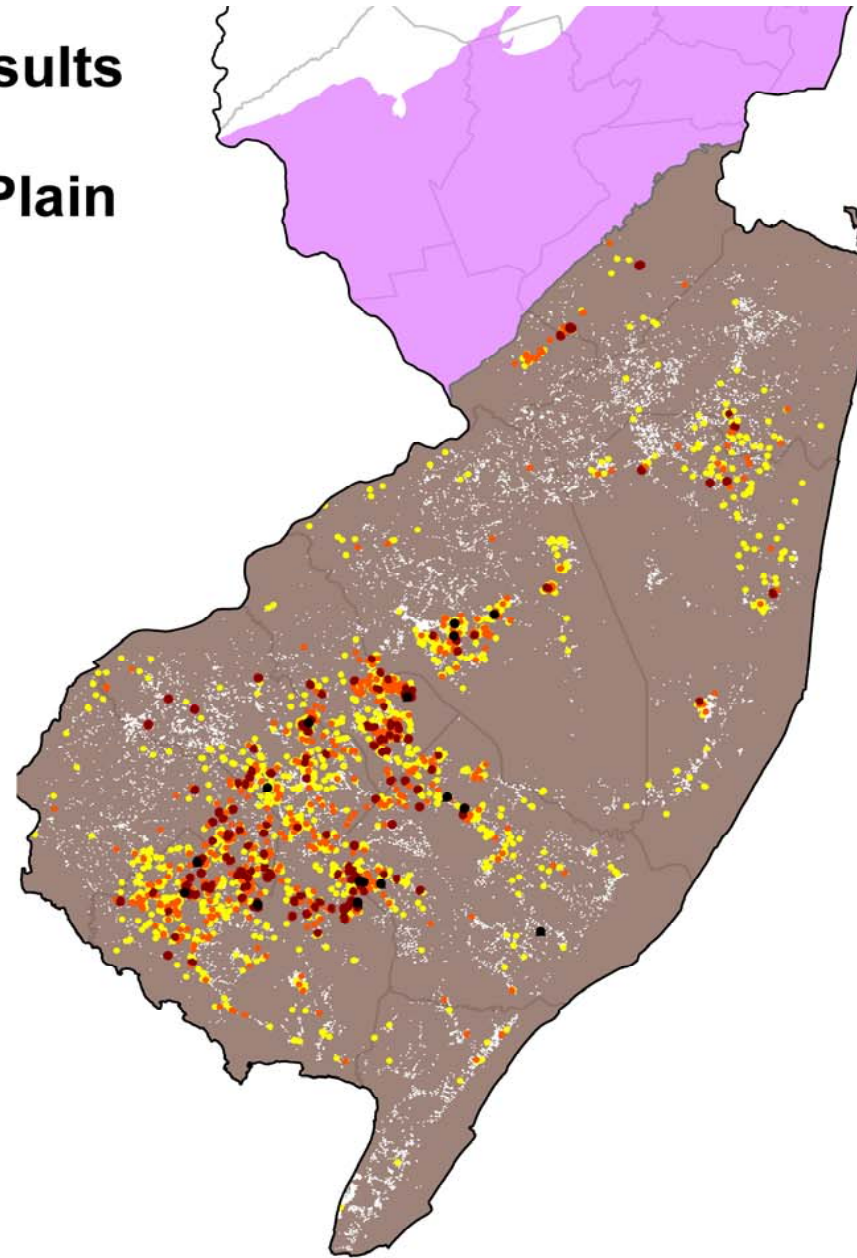
Private Well Testing Results 28,917 Wells Gross Alpha - Coastal Plain

Gross Alpha - Coastal Plain
MCL = 15 pCi/l [Radium only]

- < 15 pCi/l
- > 15 - 30 pCi/l
- > 30 - 60 pCi/l
- > 60 - 120 pCi/l
- ▲ > 120 pCi/l

Provinces

- Valley and Ridge
- Highlands
- Piedmont
- Coastal Plain



0 10 20 40 Miles



Gross Alpha in the presence of Uranium

- Gross Alpha MCL = 15 pCi/l – [Uranium]
- Uranium MCL is 30 ug/l or 20.1 pCi/l
- Where Radium and Uranium are both present
 - 20.1 – 35.1 pCi/l – potential exceedance
 - > 35.1 pCi/l – definitely exceed MCL for gross alpha

Treatment Options

- Radium – Cation Exchange Resin (Water Softener or Reverse Osmosis (RO))
- Uranium – Anionic Exchange Resin or Reverse Osmosis (RO)

Private Well Testing Results 6,248 Wells Gross Alpha in Piedmont and Highlands

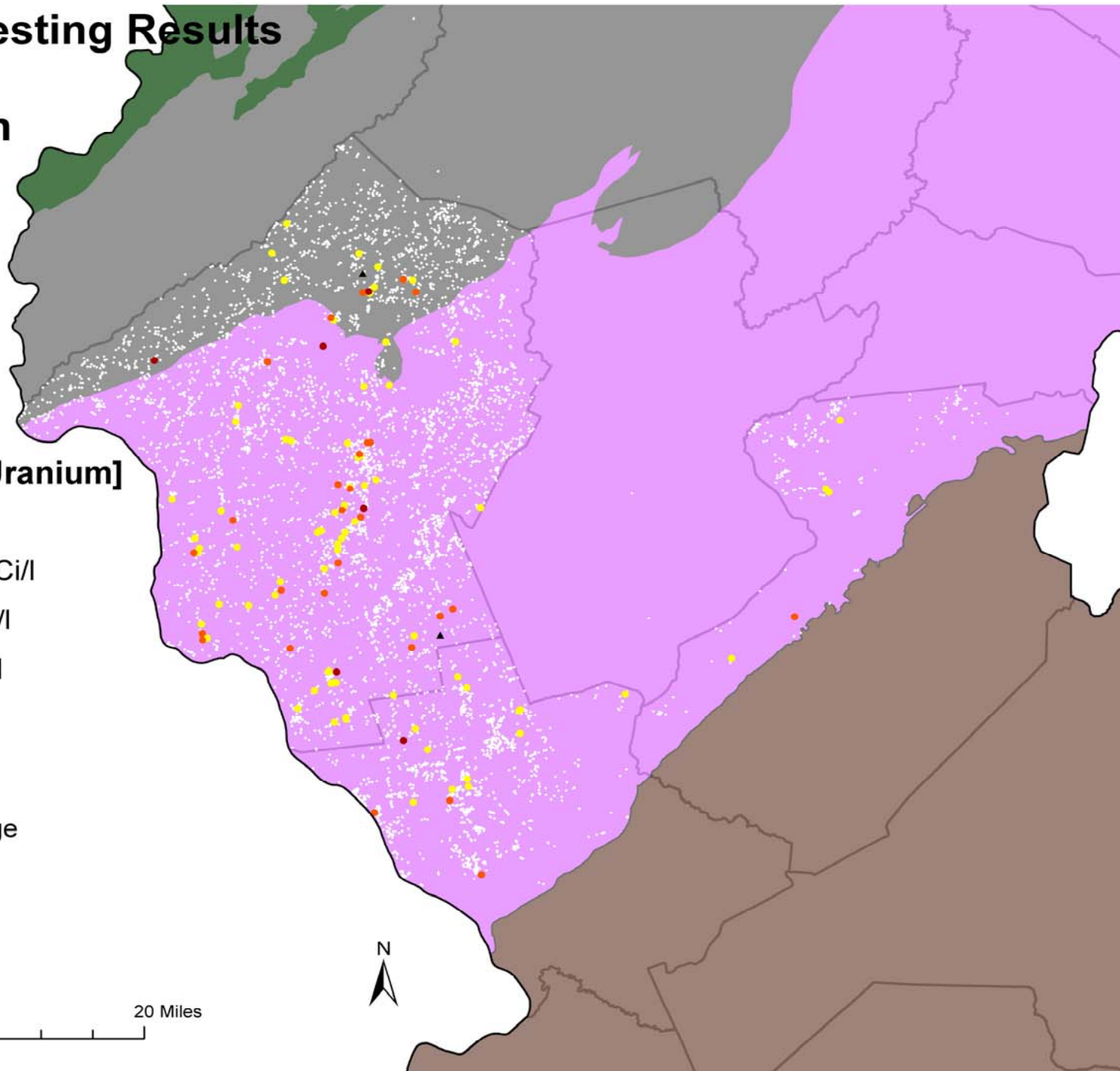
Gross Alpha
MCL = 15 pCi/l - [Uranium]

- < 20.1 pCi/l
- > 20.1 - 35.1 pCi/l
- > 35.1 - 70 pCi/l
- > 70 - 140 pCi/l
- ▲ > 140 pCi/l

Provinces

- Valley and Ridge
- Highlands
- Piedmont
- Coastal Plain

0 5 10 20 Miles



Gross Alpha Exceedances

Province	Exceedance
Coastal Plain	10.6%
Piedmont*	2.8%
Highland*	9.7%

Range – ND to 481 pCi/l

26 Volatile Organic Chemicals were analyzed in 63,063 Wells

- 1.4% of the wells exceeded the MCL for one or more VOCs
- 5 wells had 3 VOCs over their MCLs
- 63 wells had 2 VOCs over their MCLs

VOC table

Number Exceeding MCL

VOC	NJ MCL (ug/l)	Exceed MCL
Trichloroethylene	1	316 (0.50%)
Tetrachloroethylene	1	228 (0.36%)
Carbon Tetrachloride	2	83 (0.13%)
Benzene	1	79 (0.13%)
Methylene Chloride	3	58 (0.09%)
MTBE	70	42 (0.07%)

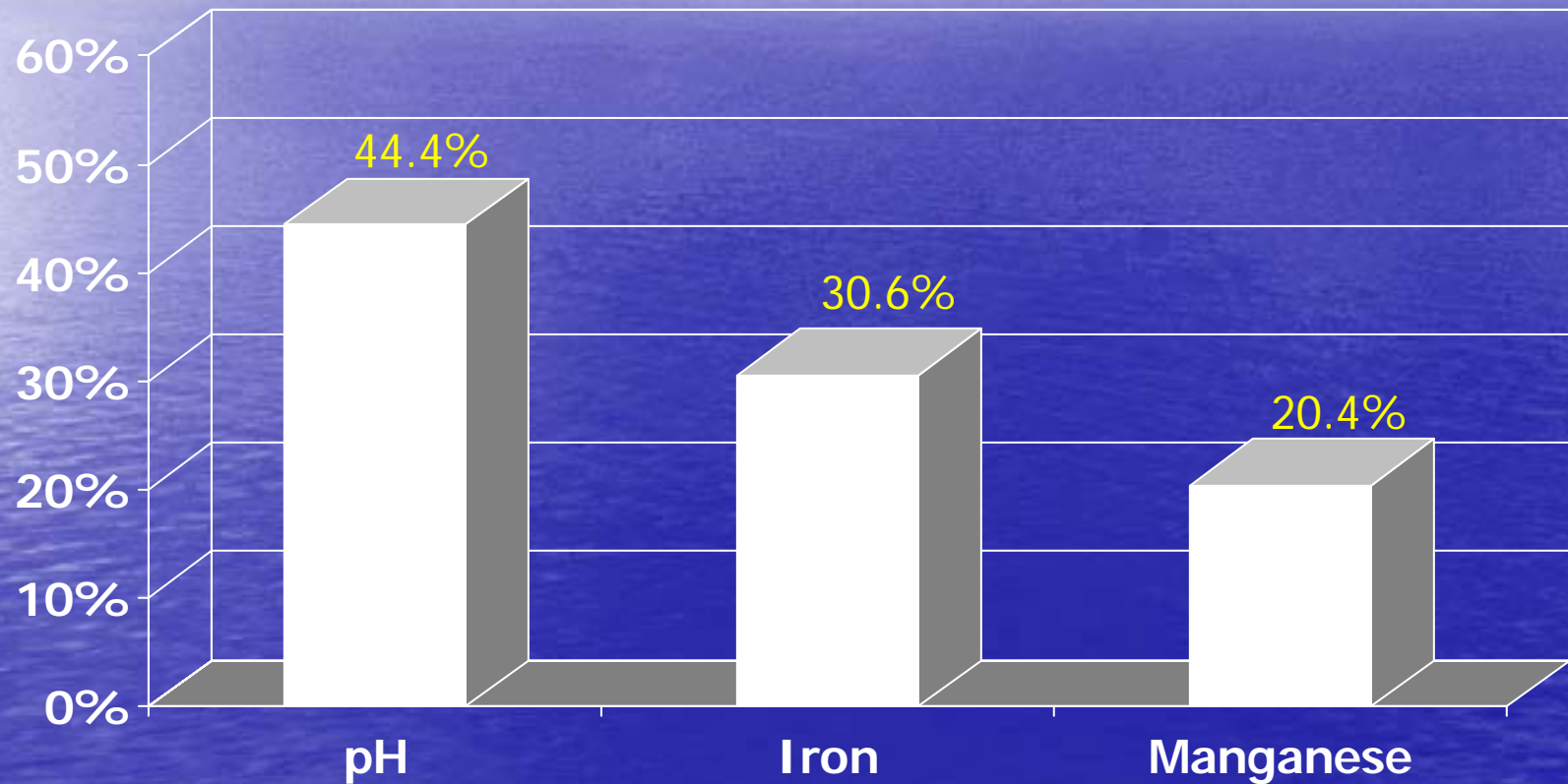
VOC Detected

VOC	Detected > 0.5 ug/l
MTBE	4,767 (7.56%)
Toluene	3,186 (5.05%)
Trichloroethylene	533 (0.85%)
Tetrachloroethylene	460 (0.73%)
1,1-Dichloroethane	444 (0.70%)
Methylene Chloride	396 (0.63%)

Lead

- Lead tested in all NJ counties.
- 10,390 of 63,036 wells (16.5%) had concentration of lead above the NJ ground quality water standard. (5 ug/l).
- DEP has determined that lead is seldom found in ground water. The likely source of lead is from the home's plumbing system or the well pump.

Secondary Standards Percent Exceedance



Private Well Testing Results 63,036 Wells pH

pH Values

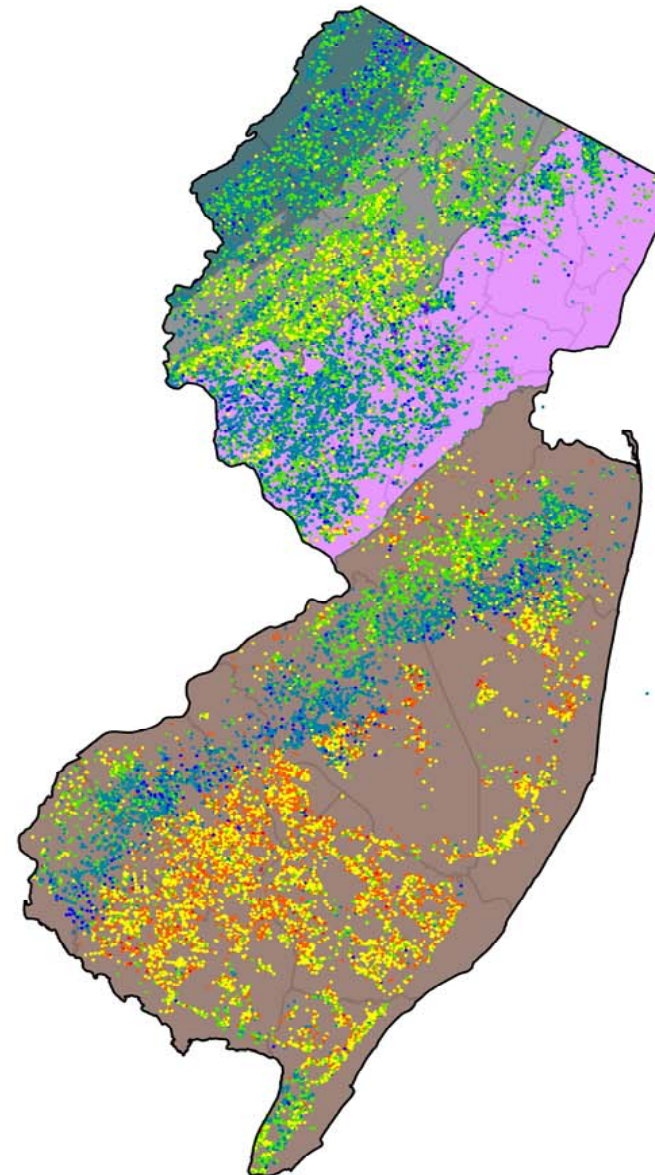
Secondary Standard
pH - 6.5 to 8.5

- > 4
- 4 - 5
- 5 - 6
- 6 - 7
- 7 - 8
- 8 - 9
- > 9

Provinces

- Valley and Ridge
- Highlands
- Piedmont
- Coastal Plain

0 10 20 40 Miles



Private Well Testing Results

63,036 Wells

Iron

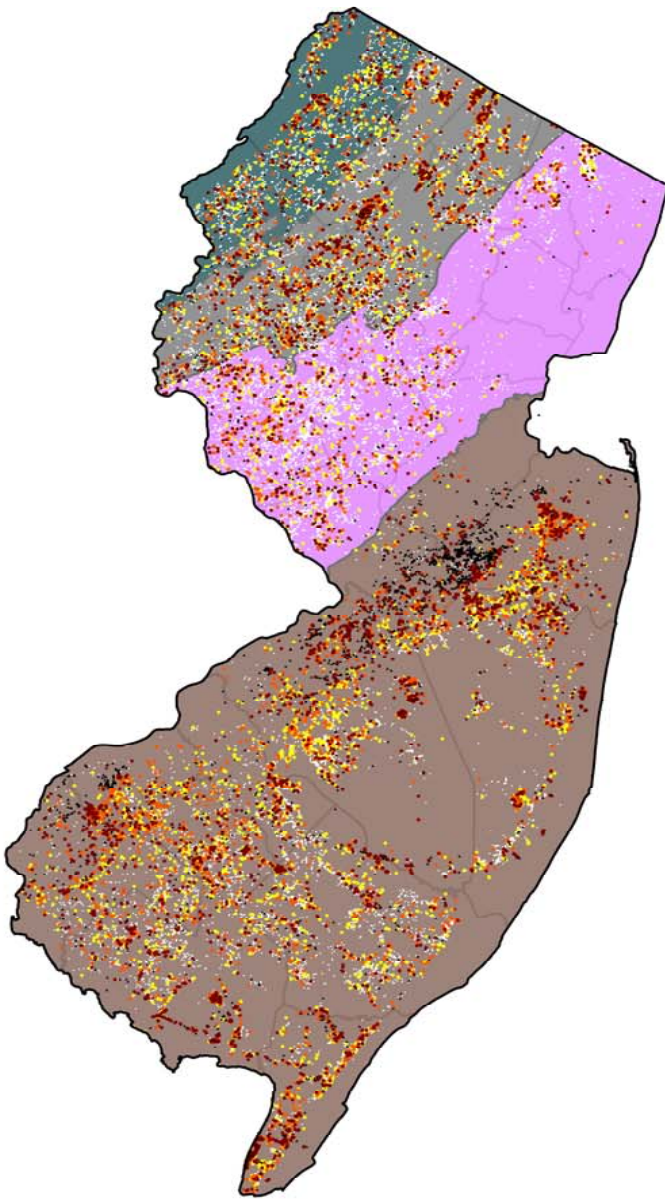
Iron Results

Secondary Standard = 0.3 mg/l

- < 0.3 mg/l
- > 0.3 - 0.6 mg/l
- > 0.6 - 1.2 mg/l
- > 1.2 - 2.4 mg/l
- ▲ > 2.4 mg/l

Provinces

- Valley and Ridge
- Highlands
- Piedmont
- Coastal Plain



Iron Exceedances of Secondary Standard

Province	% Exceedance of Secondary Standard
Valley Ridge	22.6%
Highland	26.4%
Piedmont	12.3%
Coastal Plain	40.7%

Private Well Testing Results 63,036 Wells Manganese

Manganese Results

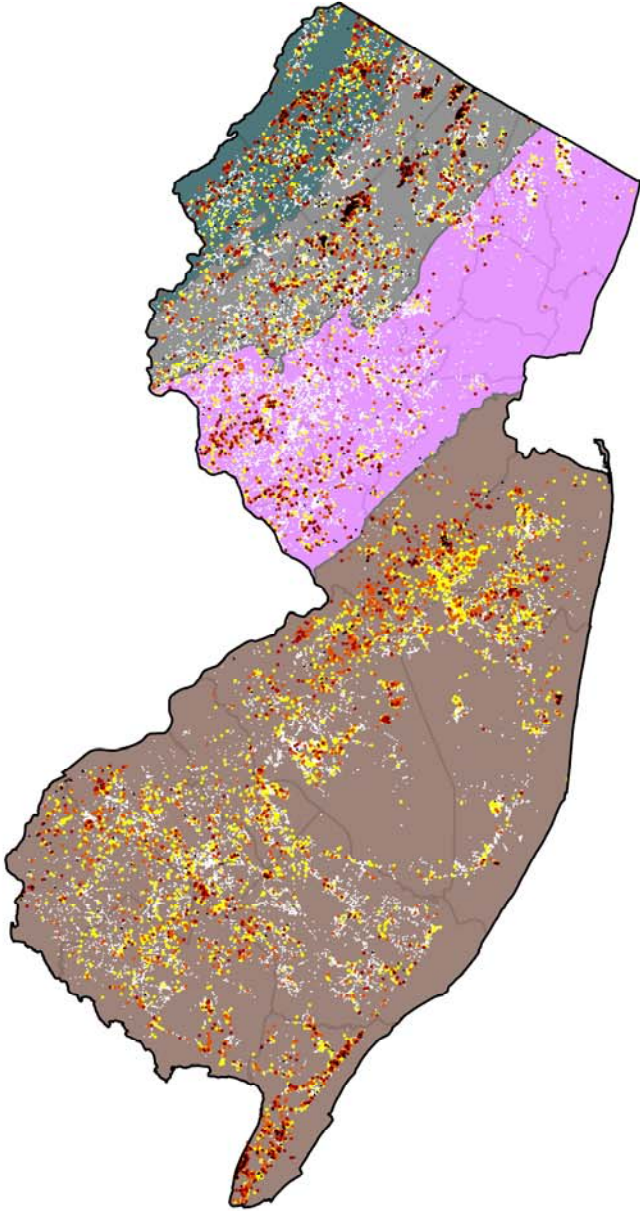
Secondary Standard = 0.05 mg/l

- < 0.05 mg/l
- > 0.05 - 0.10 mg/l
- > 0.10 - 0.20 mg/l
- > 0.20 - 0.40 mg/l
- ▲ > 0.40 mg/l

Provinces

- Valley and Ridge
- Highlands
- Piedmont
- Coastal Plain

0 10 20 40 Miles



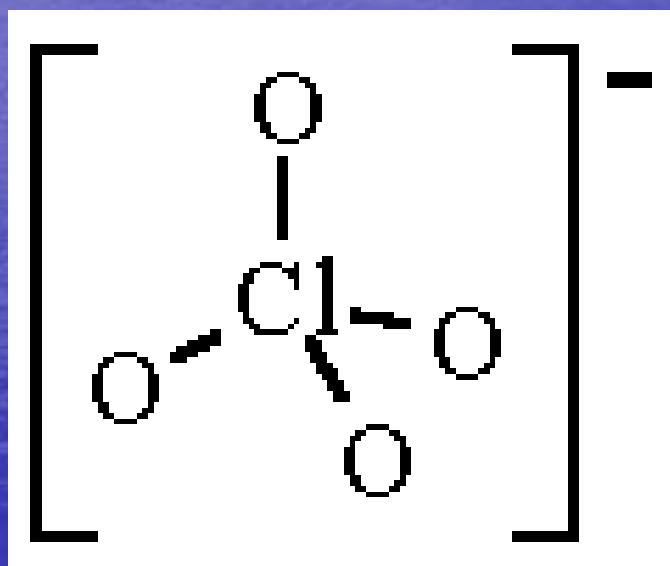
Manganese Exceedance of Secondary Standard

Province	% Exceedance of Manganese Sec. Std.
Valley and Ridge	27.2%
Highlands	19.8%
Piedmont	9.6%
Coastal Plain	23.7%

New additions

- Perchlorate
- Radon

Perchlorate



Perchlorate

- Chemical (oxidizer) used in the mostly manufacturing of rocket fuel, explosives and fireworks, also found naturally in certain types of fertilizers.
- Inhibits thyroid function
- The New Jersey DWQI recommended an **MCL of 5 ppb** for perchlorate.

Perchlorate

- Proposed MCL, should to be adopted by the end of 2009. Testing will start 90 days after the rule is adopted.
- Methods 314.0 (IC), 314.1(IC) and 331.0 (LC). Analysis must be done within 48 hours of sample collection.
- Treatment - Anion Exchange, Granular Activated Carbon, and Membrane filtration technologies.

Radon MCL

- The New Jersey Drinking Water Quality Institute has is recommending an MCL for radon of 800 pCi/l
- The question of treatment must be addressed before adding radon to the Private Well Testing requirements.

Limitations of PWTA Data

- **No Information about well depths**
- **Single Sample**
- **Errors in Municipality, Lot and Block**
- **GPS points (or location) are sometimes incorrect.**

Summary of PWTA Data Results

- Largest known database of private well water quality in the United States. This makes it an invaluable resource for groundwater studies.
- The contaminants most frequently reported over the MCL are:
 - Gross Alpha and Arsenic
 - Nitrate and Fecal Coliform/E. coli
 - VOCs and Mercury

Conclusions

- The program has provided information about water quality to buyers, sellers, and leasees.
- The State and Counties have learned about local contamination issues.

For Additional Information

- Contact: judy.louis@dep.state.nj.us
john.shevlin@dep.state.nj.us
- PWTA website:
<http://www.state.nj.us/dep/pwta>