

Empowering Virginia's Well and Spring Users: The Virginia Household Water Quality Program

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Introduction to Water Resources – November 18, 2014

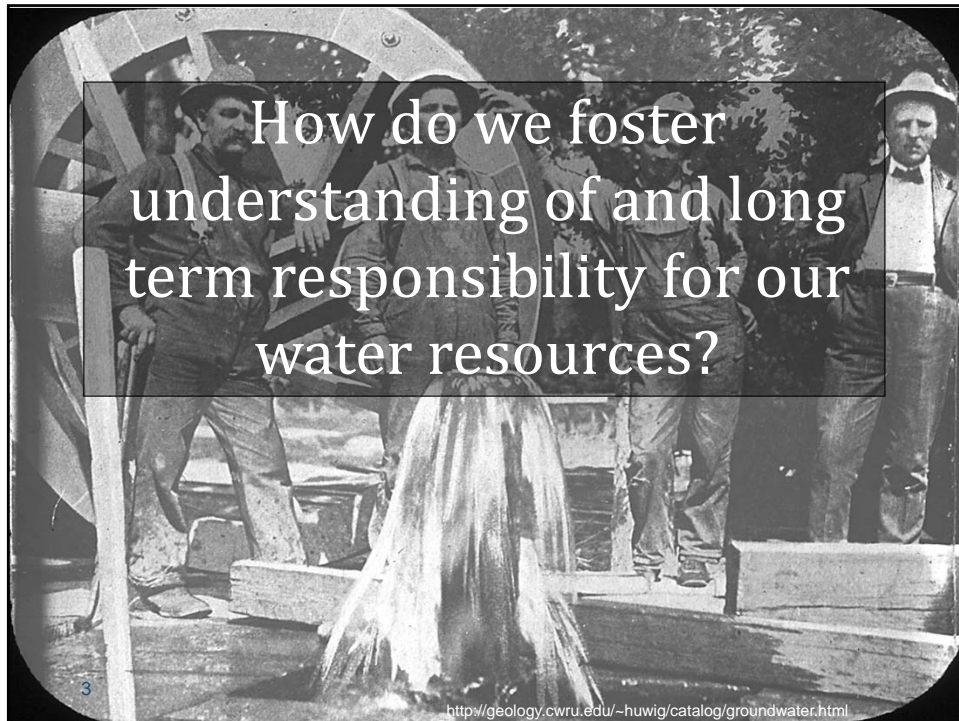


What is Extension?



- ▶ Land-grant universities have three critical missions:
 - ▶ Research
 - ▶ Education
 - ▶ Extension – extending science-based, unbiased information to solve public needs through non-formal educational programs
- ▶ Administered through county & district offices:
bring land-grant expertise to local people
- ▶ Program areas include
 - ▶ Agriculture & Natural Resources
 - ▶ 4-H Youth programs
 - ▶ Family & Consumer Sciences
 - ▶ Community Viability





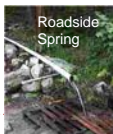
What's in YOUR Water?

- ▶ Where does your drinking water come from?
- ▶ Public or private?
- ▶ Surface or groundwater? More than one source?
- ▶ Do you know who manages your water supply?
- ▶ Is there a source water protection plan?
- ▶ Is your water tested regularly? Treated?
- ▶ Do you drink primarily bottled water?



Private Water Supplies in Virginia

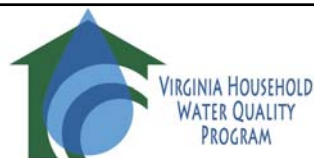
- About 1.7 million people, or 22% of Virginians rely on wells, springs or cisterns (USGS, 2010)
- Decrease in waterborne disease outbreaks overall since the 1980's, relative **INCREASE** in outbreaks associated with private water supplies (Craun, et al., 2010)
- Homeowners relying on private water supplies:
 - Are responsible for all aspects of water system management
 - Often lack knowledge & resources to effectively manage
 - Usually don't worry about maintenance until problems arise



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Craun, G. F., et al. 2010. *Clinical Microbiology Reviews* 23(3): 507–528.

What is the VAHWQP?



- Established in 1989
- County-based Drinking Water Clinics
 - Coordinated with trained local extension educators or volunteers
 - Kickoff Meeting – distribute sample kits
 - Homeowners collect samples; samples analyzed at VT labs
 - Interpretation Meeting: test results, interpretation & basic information about maintenance & addressing problems
 - 16,900 samples analyzed in 90 counties



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Drinking water clinics



- Testing for :

- Total coliform
- E. coli
- Nitrate
- Fluoride
- Sodium
- Manganese
- Copper
- pH
- Total Dissolved Solids
- Sulfate
- Hardness
- Arsenic
- Lead
- Quantification of bacteria

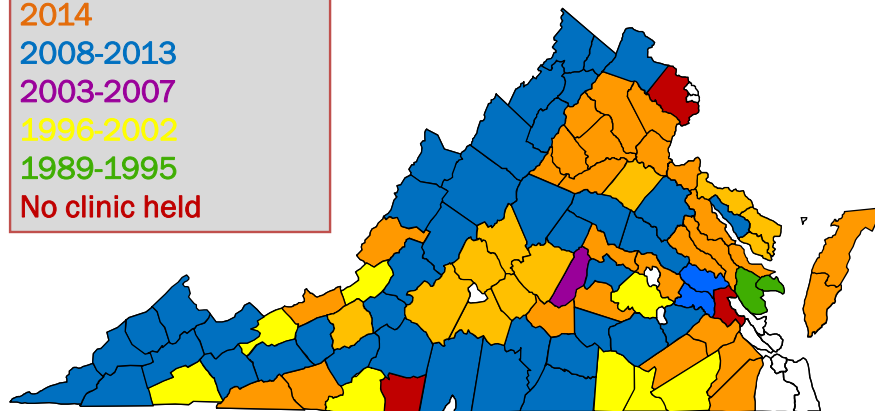
\$49 per
sample kit



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VAHWQP Drinking Water Clinics

YEAR of LAST CLINIC
2014
2008-2013
2003-2007
1996-2002
1989-1995
No clinic held



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Virginia Master Well Owner Network (VAMWON)

- Mechanism for training Extension Agents (to conduct drinking water clinics), volunteers & agency collaborators (VDH & DEQ) to conduct outreach & education
- One-day training workshops held across VA; vary regionally
- Guest speakers: drilling companies & state agencies
- Topics include:
 - Groundwater hydrology
 - Proper well location, construction & maintenance
 - Land use impacts/wellhead protection
 - Water testing & interpretation
 - Solving water problems/treatment options
 - Water conservation



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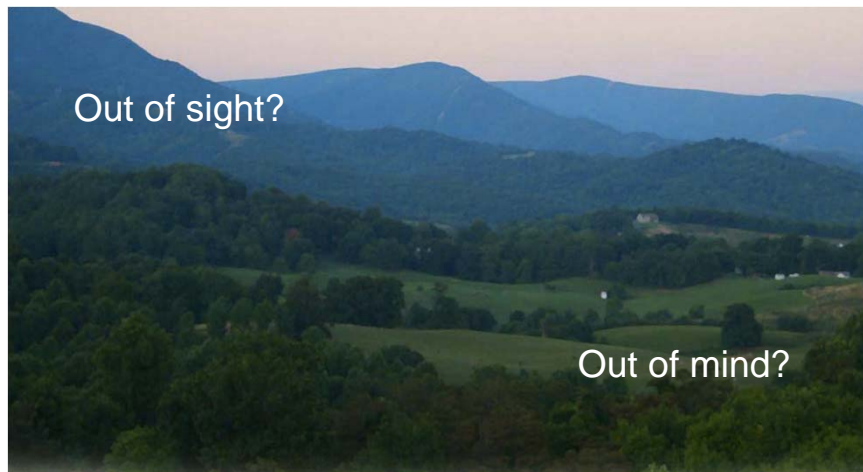
Key Partnerships

- ▶ Virginia Water Well Association
 - ▶ WellCheck
 - ▶ Develop & market program to provide affordable, standardized well inspections to homeowners
 - ▶ Guest speakers, resources, technical assistance
- ▶ Federal & State Agencies – USGS, VA Dept of Health, VA Dept of Environmental Quality
- ▶ VCE Master Gardeners, Master Naturalists
- ▶ Research Faculty & Graduate students
 - ▶ Bacteria source tracking
 - ▶ Metals profiling



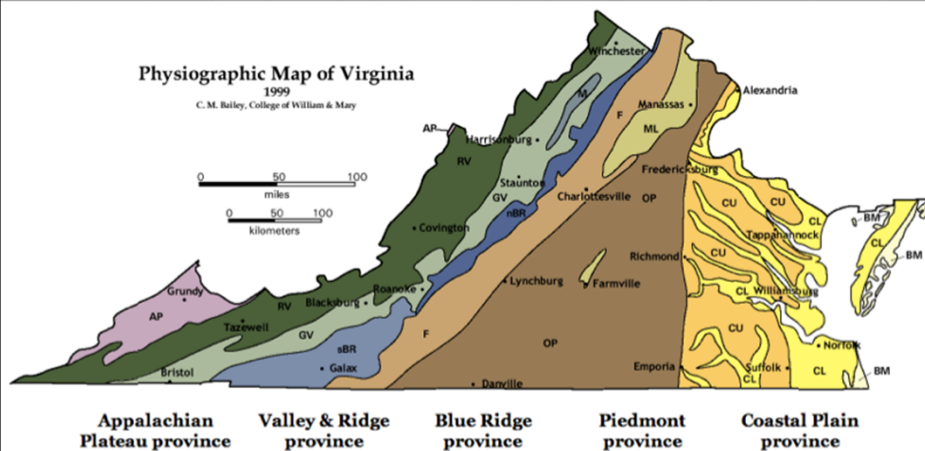
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Place-based GROUNDWATER Education?



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Physiographic Provinces of Virginia

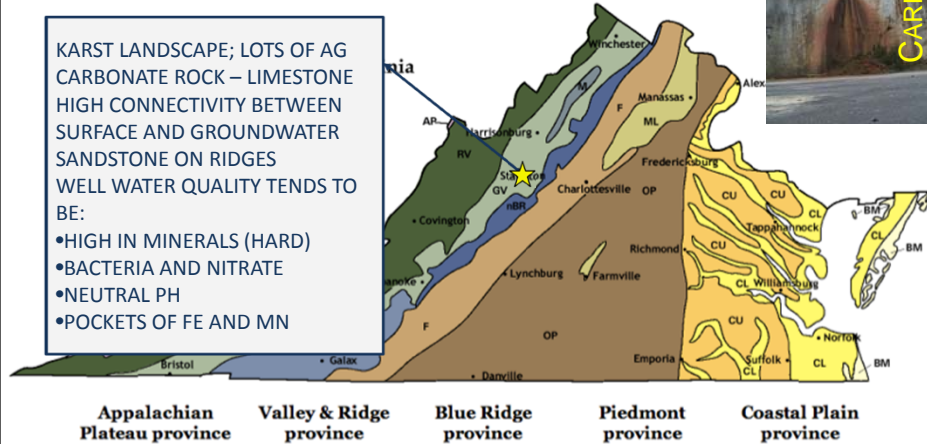
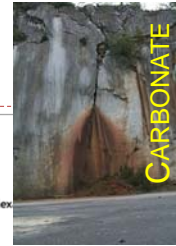


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Augusta County

KARST LANDSCAPE; LOTS OF AG CARBONATE ROCK – LIMESTONE
HIGH CONNECTIVITY BETWEEN SURFACE AND GROUNDWATER
SANDSTONE ON RIDGES
WELL WATER QUALITY TENDS TO BE:

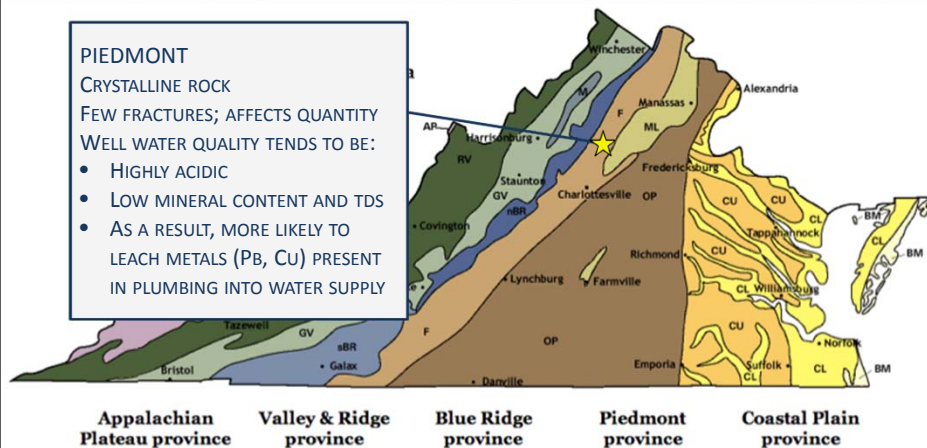
- HIGH IN MINERALS (HARD)
- BACTERIA AND NITRATE
- NEUTRAL PH
- POCKETS OF FE AND MN



Culpeper County

PIEDMONT
CRYSTALLINE ROCK
FEW FRACTURES; AFFECTS QUANTITY
WELL WATER QUALITY TENDS TO BE:

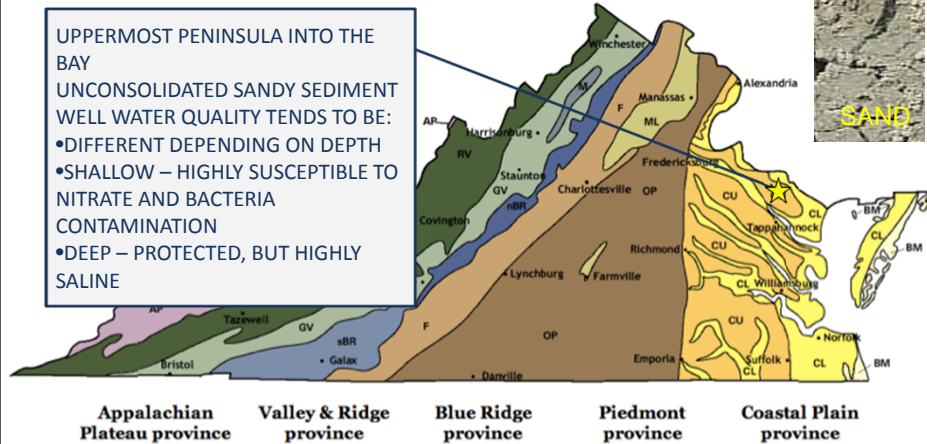
- HIGHLY ACIDIC
- LOW MINERAL CONTENT AND TDS
- AS A RESULT, MORE LIKELY TO LEACH METALS (Pb, Cu) PRESENT IN PLUMBING INTO WATER SUPPLY



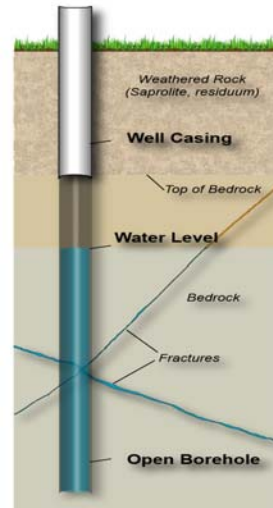
Northumberland County

UPPERMOST PENINSULA INTO THE BAY
UNCONSOLIDATED SANDY SEDIMENT
WELL WATER QUALITY TENDS TO BE:

- DIFFERENT DEPENDING ON DEPTH
- SHALLOW – HIGHLY SUSCEPTIBLE TO NITRATE AND BACTERIA CONTAMINATION
- DEEP – PROTECTED, BUT HIGHLY SALINE



Basic Well Concepts: How does water move to my well?



Basic Well Concepts: Proper well location & construction

- ▶ At least 50-100' & upslope from contamination sources
- ▶ Not in an area that receives runoff
- ▶ Ground surface slopes away from well
- ▶ Well casing at least 12" above ground
- ▶ Grout seal around casing (have checked by a well driller)
- ▶ Sanitary well cap (left, drilled well) or sealed concrete cover (right, bored well)



Photo credits: SAIF Water Wells ; Penn State University

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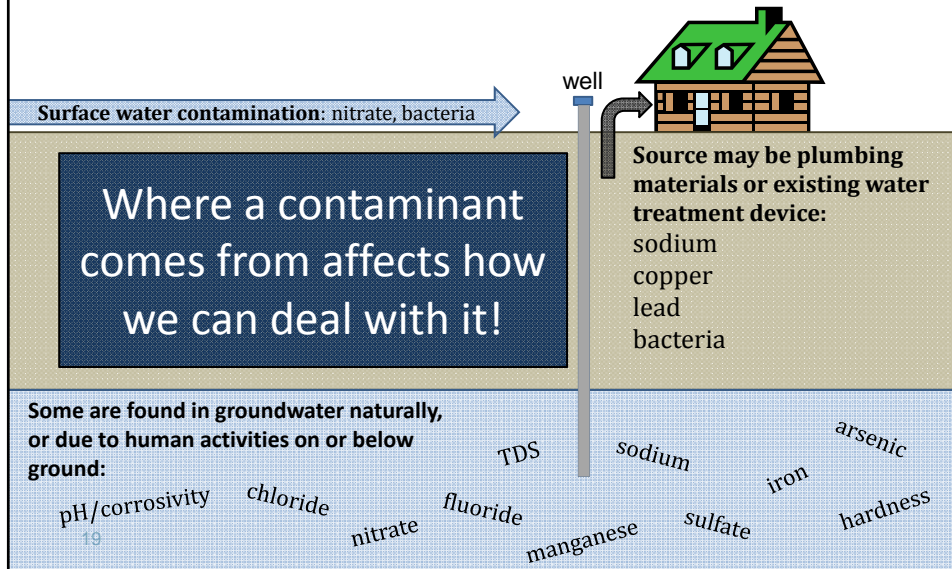
Basic Well Concepts: Well Maintenance Tips

- ▶ Do not use fertilizers, pesticides, oil, or paint around well
- ▶ Keep careful records
 - ▶ original contract, water test results & any maintenance or repair information
- ▶ Every year:
 - ▶ Conduct thorough visual inspection of well
 - ▶ Check cap for cracks, wear & tear, tightness
 - ▶ Test for coliform bacteria!
- ▶ Every 1-3 years have well inspected by a licensed well driller (with Water Well & Pump classification)
- ▶ Groundwater is a SHARED resource! Take personal responsibility!



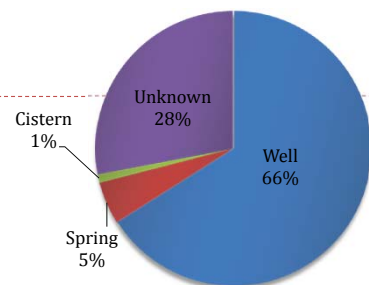
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Sources of potential contaminants or issues of concern



Data highlights

▶ Type of private water system



▶ Wells average 25 years old (pre-1992 VA regulations)

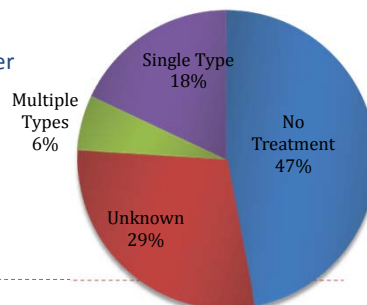
▶ > 80% of participants have never tested water or tested only once

▶ Treatment devices

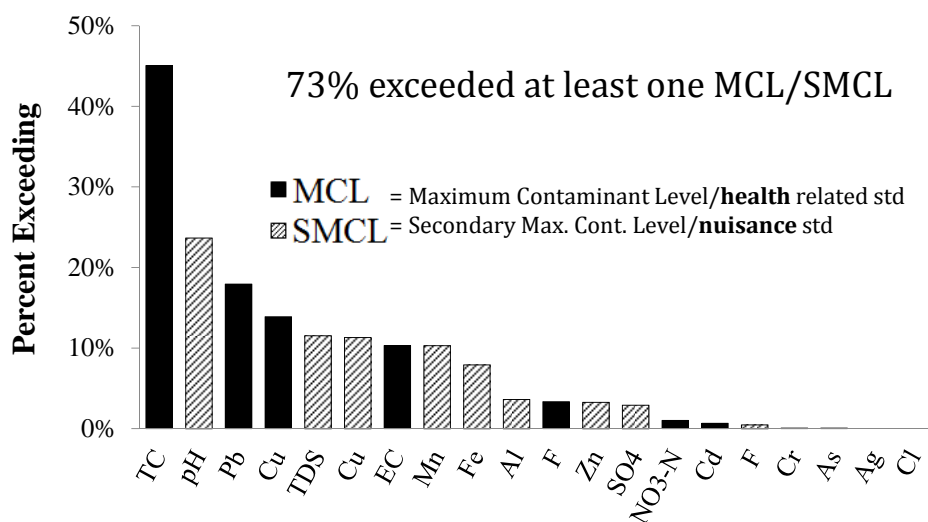
▶ Most common: water softener & sediment filter

▶ Drinking water clinic participants:

- ▶ 91% white (VA: 71%)
- ▶ 59% over 61 years old; 75% over 51 years old
- ▶ 68% college-educated or beyond
- ▶ Relatively high income

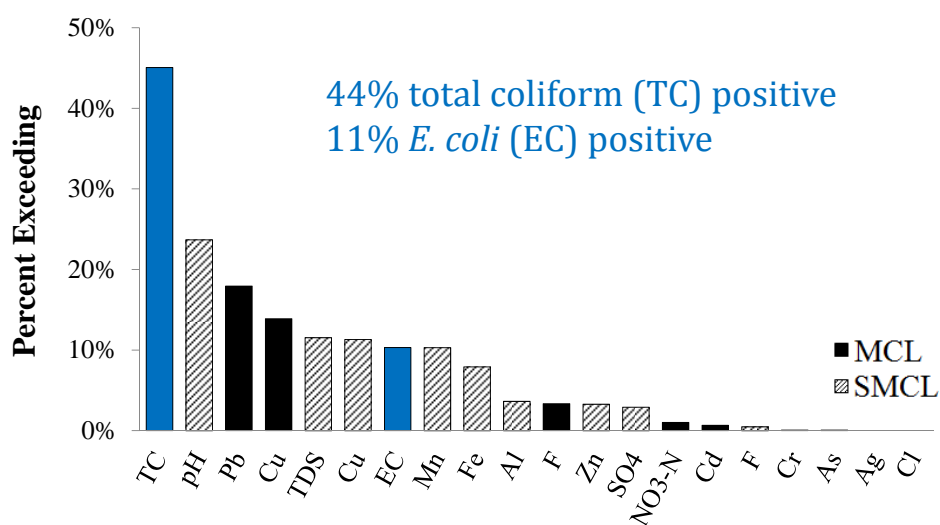


Comparison to Safe Drinking Water Act Stds



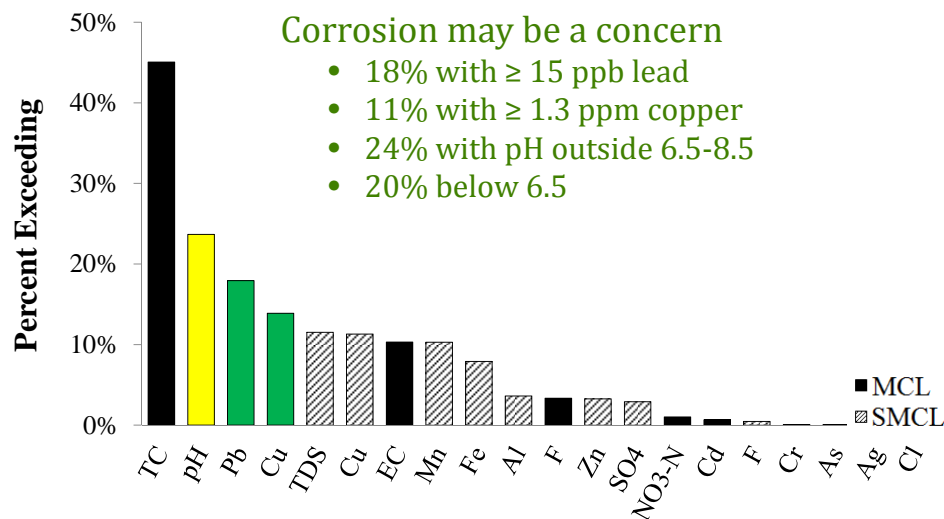
Slides prepared by Kelsey Pieper, PhD candidate, VT-BSE; Data from 2012-13; n = 1683

Bacterial contamination



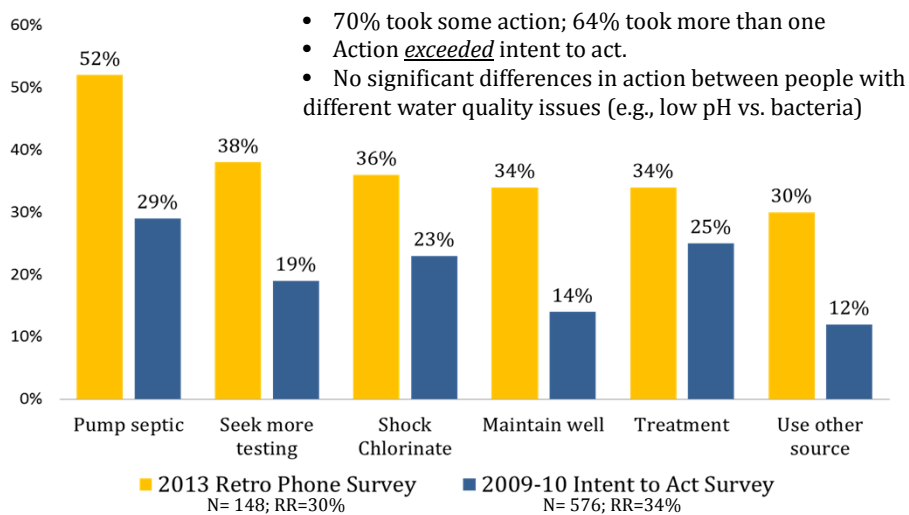
Slides prepared by Kelsey Pieper, PhD candidate, VT-BSE; Data from 2012-13; n = 1683

Contamination from corrosion



Slides prepared by Kelsey Pieper, PhD candidate, VT-BSE; Data from 2012-13; n = 1683

Intent to Act vs. Action







VIRGINIA HOUSEHOLD
WATER QUALITY
PROGRAM

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