COMMUNICATING WATER WELL STEWARDSHIP TO ELICIT EFFECTIVE BEHAVIORS: THE NGWA EXPERIENCE

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CHIEF EXECUTIVE OFFICER OF NGWA

SEPTEMBER 2014
13,250,000
41,900,000
887,000
A HUGE CHALLENGE

• It is a huge challenge reaching a widely dispersed private well owner population of 13.25 million households scattered through America, mostly in rural areas.

• There is no apparent easy or inexpensive way to reach current or potential well owners.
WATER WELL OWNERSHIP GEOGRAPHIC DENSITY
Counties correlating with Native American nations within South Dakota
 Counties correlating with Native American nations within South Dakota

<table>
<thead>
<tr>
<th>County</th>
<th>Total Households/1990</th>
<th>% of households on wells/1990</th>
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<tbody>
<tr>
<td>Charles Mix</td>
<td>3808</td>
<td>8.9%</td>
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<tr>
<td>Corson</td>
<td>1558</td>
<td>38.4%</td>
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<tr>
<td>Dewey</td>
<td>2123</td>
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<td>Jackson</td>
<td>1145</td>
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<td>Roberts</td>
<td>4728</td>
<td>44.5%</td>
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<tr>
<td>Shannon</td>
<td>2702</td>
<td>38.7%</td>
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<tr>
<td>Todd</td>
<td>2575</td>
<td>32.5%</td>
</tr>
<tr>
<td>Ziebach</td>
<td>799</td>
<td>23.7%</td>
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</table>
WHAT CONDITION ARE WE SEEKING TO CHANGE?

• CONSUMERS USING WATER DEEMED TO BE ABOVE MCLS OR THE EQUIVALENT
• CONSUMERS USING WELLS THAT ARE POORLY SITED, POORLY MAINTAINED, POORLY EQUIPPED, NOT CLEANED APPROPRIATELY
• NOT TESTING ANNUALLY OR WHEN CONDITIONS WARRANT
WHAT’S THE CONCERN?

• PEOPLE WILL BECOME SICK AND/OR DIE.
  • IMMUNE COMPROMISED INDIVIDUALS
  • INFANTS (“BLUE-BABY” SYNDROME)
  • CHRONIC ILLNESS WILL DEVELOP AND NOT BE ATTRIBUTED TO CONSUMING UNSAFE WATER
Where is the public health risk evidence?
• PHYSICAL PROPERTIES AND THE CONCENTRATIONS OF MAJOR IONS, TRACE ELEMENTS, NUTRIENTS, RADON, AND ORGANIC COMPOUNDS (PESTICIDES AND VOLATILE ORGANIC COMPOUNDS) WERE MEASURED IN AS MANY AS 2,167 WELLS.

• NO INDIVIDUAL CONTAMINANT WAS PRESENT IN CONCENTRATIONS GREATER THAN AVAILABLE HEALTH BENCHMARKS IN MORE THAN 8 PERCENT OF THE SAMPLED WELLS.

• ABOUT 23 PERCENT OF WELLS HAD AT LEAST ONE CONTAMINANT PRESENT AT CONCENTRATIONS GREATER THAN AN MCL OR HBSL, BASED ON ANALYSIS OF SAMPLES FROM 1,389 WELLS IN WHICH MOST CONTAMINANTS WERE MEASURED.
• Radon, nitrate, several trace elements, fluoride, gross alpha- and beta-particle radioactivity, and fecal indicator bacteria were found most frequently \textit{(in one or more percent of wells)} at concentrations greater than benchmarks and, thus, are of potential concern for human health.

• Radon concentrations were greater than the lower of two proposed MCLs (300 picocuries per liter) in about 65 percent of the wells and greater than the higher proposed MCL (4,000 pCi/L) in about 4 percent of wells.
• Nitrate, arsenic, manganese, strontium, and gross alpha-particle radioactivity (uncorrected) each were present at levels greater than MCLs or HBSLs in samples from about 5 to 7 percent of the wells; boron, fluoride, uranium, and gross beta-particle radioactivity were present at levels greater than MCLs or HBSLs in about 1 to 2 percent of the wells.

• Total coliform and Escherichia coli bacteria were detected in about 34 and 8 percent, respectively, of sampled wells.

• Thus, with the exception of nitrate and fecal indicator bacteria, the contaminants that were present in the sampled wells most frequently at concentrations greater than human-health benchmarks were naturally occurring.
There are constituents in groundwater

- Nearly half of the USGS reported health benchmark exceedances are for constituents not currently regulated by the Safe Drinking Water Act
- Samples taken from system prior to any already installed water treatment device
• IN CONTRAST TO THE EMERGING ISSUE OF LEGIONELLA, THE PROBLEM OF UNTREATED GROUND WATER DEFICIENCIES IN PUBLIC AND INDIVIDUAL WATER SYSTEMS PERSISTS.

• FULL IMPLEMENTATION OF THE GROUND WATER RULE, A FEDERAL REGULATION THAT AIMS TO PROVIDE INCREASED PROTECTION AGAINST MICROBIAL PATHOGENS IN PUBLIC WATER SYSTEMS THAT USE GROUND WATER SOURCES, MIGHT REDUCE THE NUMBER OF GROUND WATER OUTBREAKS IN PUBLIC SYSTEMS (2).

• HOWEVER, THIS REGULATION DOES NOT ADDRESS PRIVATE WELLS, WHICH THE ENVIRONMENTAL PROTECTION AGENCY LACKS THE AUTHORITY TO REGULATE, EMPHASIZING THE CONTINUED NEED FOR EDUCATION AND OUTREACH TO PRIVATE WELL OWNERS TO PREVENT OUTBREAKS (7,8).

Source: Surveillance for Waterborne Disease Outbreaks Associated with Drinking Water and Other Nonrecreational Water — United States, 2009–2010 Weekly, September 6, 2013 / 62(35);714-720
### TABLE 1. Characteristics of waterborne disease outbreaks associated with drinking water (N = 33) and other nonrecreational water* (N = 12), by state/jurisdiction — Waterborne Disease and Outbreak Surveillance System, United States, 2009–2010

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<th>Exposure category and state/jurisdiction</th>
<th>Month</th>
<th>Year</th>
<th>Etiology</th>
<th>Predominant illness</th>
<th>No. of cases</th>
<th>No. of hospitalizations</th>
<th>No. of deaths</th>
<th>Water</th>
<th>Setting</th>
<th>Water system**</th>
<th>Source</th>
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<tr>
<td>Drinking water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Maine</td>
<td>Jul</td>
<td>2009</td>
<td>Hepatitis A</td>
<td>Hep</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>Individual/Private</td>
<td>Well</td>
<td>Private residence</td>
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<tr>
<td>Missouri</td>
<td>Nov</td>
<td>2010</td>
<td>Escherichia coli O157:H7</td>
<td>AGI</td>
<td>11</td>
<td>3</td>
<td>1</td>
<td>Individual/Private</td>
<td>Well</td>
<td>Private residence</td>
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<td>Pennsylvania</td>
<td>Jul</td>
<td>2010</td>
<td>Campylobacter jejuni, Crypto sporidium sp.</td>
<td>AGI</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>Individual/Private</td>
<td>Well</td>
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<td>Vermont</td>
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<td>Cryptosporidium sp.</td>
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<td>0</td>
<td>0</td>
<td>Individual/Private</td>
<td>Well</td>
<td>Vacation rental house</td>
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SOURCE: SURVEILLANCE FOR WATERBORNE DISEASE OUTBREAKS ASSOCIATED WITH DRINKING WATER AND OTHER NON-RECREATIONAL WATER — UNITED STATES, 2009–2010 WEEKLY, SEPTEMBER 6, 2013 / 62(35);714-720
WATERBORNE DISEASE OUTBREAKS: HOUSEHOLD WELLS

• 1 DEATH AMONG 83,826,600 HOMEOWNERS SERVED BY INDIVIDUAL HOUSEHOLD WELLS IN TWO YEARS OF 2009 AND 2010

• 0.00119% OF THE HOMEOWNER POPULATION SERVED BY INDIVIDUAL HOUSEHOLD WELLS

• DOES NOT ACCOUNT FOR UNREPORTED ILLNESSES

• DOES NOT ACCOUNT FOR CHRONIC ILLNESS NOT IDENTIFIED AS LINKED TO GROUNDWATER
ARSENIC: HEALTH IMPACTS

• A STUDY CONDUCTED IN A CONTIGUOUS SIX-COUNTY AREA OF SOUTHEASTERN MICHIGAN INVESTIGATED THE RELATIONSHIP BETWEEN MODERATE ARSENIC LEVELS AND 23 SELECTED DISEASE OUTCOMES.

• DISEASE OUTCOMES INCLUDED SEVERAL TYPES OF CANCER, DISEASES OF THE CIRCULATORY AND RESPIRATORY SYSTEM, DIABETES MELLITUS, AND KIDNEY AND LIVER DISEASES. ELEVATED MORTALITY RATES WERE OBSERVED FOR ALL DISEASES OF THE CIRCULATORY SYSTEM.

• THE RESEARCHERS ACKNOWLEDGED A NEED TO REPLIicate THEIR FINDINGS.


  • HTTP://EN.WIKIPEDIA.ORG/WIKI/ARSENIC_CONTAMINATION_OF_GROUNDWATER
<table>
<thead>
<tr>
<th>Lives¹</th>
<th>Benefit</th>
<th>Costs</th>
<th>Net costs²</th>
<th>Cost-effectiveness³</th>
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<td>28</td>
<td>$170 million</td>
<td>$210 million</td>
<td>$40 million</td>
<td>$75 million per statistical life</td>
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<tr>
<td>28</td>
<td>$50 million</td>
<td>$210 million</td>
<td>$160 million</td>
<td>$26 million per statistical life</td>
</tr>
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<td>110</td>
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<td>$10 million</td>
<td>$6.4 million per statistical life</td>
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<tr>
<td>5.5</td>
<td>$10 million</td>
<td>$210 million</td>
<td>$200 million</td>
<td>$130 million per statistical life</td>
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</table>

¹ Statistical lives saved shown here are not discounted for latency. ² Net costs are costs minus benefits. Numbers may not add up, owing to rounding. ³ See article text for details. ⁴ We obtain our upper-bound estimate by taking EPA’s model, including “non-quantifiable” benefits and accounting for latency. ⁵ Our best estimate includes “non-quantifiable” benefits, accounts for latency, and incorporates a sublinear dose-response function. See article text for details.

Arsenic and Drinking Water from Private Wells

What is arsenic?
Arsenic is an element that occurs naturally in rocks and soil and is used for a variety of purposes within industry and agriculture. It is also a byproduct of copper smelting, mining, and coal burning. Arsenic can combine with other elements to make chemicals used to preserve wood and to kill insects on cotton and other agricultural crops.

For more information about arsenic illnesses and treatment, please visit CDC-ATSBR’s arsenic page.

Where and how does arsenic get into drinking water?
Arsenic can enter the water supply from natural deposits in the earth or from industrial and agricultural pollution. It is widely believed that naturally occurring arsenic dissolves out of certain rock formations when ground water levels drop significantly. Some industries in the United States release thousands of pounds of arsenic into the environment every year. Once released, arsenic remains in the environment for a long time. Arsenic is removed from the air by rain, snow, and gradual settling. Once on the ground or in surface water, arsenic can slowly enter ground water.

High arsenic levels in private wells may come from certain arsenic-containing fertilizers used in the past or industrial waste. It may also indicate improper well construction or overuse of chemical fertilizers or herbicides in the past.
ATTITUDES CONTRIBUTE TO CONSUMER BEHAVIORS
• WHICH OF THE FOLLOWING DRINKING WATER OPTIONS DO YOU THINK IS HEALTHIEST?

• BOTTLED WATER: 33.1%
• WATER FROM A WATER UTILITY: 8.0%
• WATER FROM YOUR OWN WELL: 54.7%
• DON’T KNOW: 3.7%

ASKED OF 171 RESPONDENTS WHO HAVE WELL WATER AS THEIR PRIMARY SOURCE OF WATER, TELENATION SURVEY BY MARKETFACTS, OCTOBER 5 -7, 2001. RESEARCH FUNDED BY NATIONAL GROUND WATER ASSOCIATION, WESTERVILLE, OHIO.
**IS YOUR WATER AS SAFE AS IT SHOULD BE?**

YES: 79.5%
NO: 16.7%
DON'T KNOW: 3.7%
• HOW OFTEN, IF EVER, DO YOU HIRE A PROFESSIONAL TO PROVIDE ANNUAL CHECKUPS OF MAJOR HOME SYSTEMS?

  • ONCE A YEAR: 30.7%
  • MORE THAN NEVER, BUT LESS FREQUENTLY THAN ONCE A YEAR: 10.2%
  • NEVER: 25.1%
  • SERVICE SYSTEM YOURSELF WHEN NECESSARY: 34.0%

ASKED OF 171 RESPONDENTS WHO HAVE WELL WATER AS THEIR PRIMARY SOURCE OF WATER, TELENATION SURVEY BY MARKETFACETS, OCTOBER 5 -7, 2001. RESEARCH FUNDED BY NATIONAL GROUND WATER ASSOCIATION, WESTERVILLE, OHIO.
1,733 MICHIGAN, MINNESOTA, WISCONSIN WELL OWNERS

• **DO YOU DRINK UNTREATED WELL WATER?**
  
  • **33% - MOSTLY – ALWAYS**
  
  • **53% - SELDOM TO NEVER**
  
  • **14% - MOSTLY ALWAYS PURCHASE BOTTLED WATER FOR DRINKING**

1,733 MICHIGAN, MINNESOTA, WISCONSIN WELL OWNERS

• OPINION OF WELL WATER SAFETY
  • 20% - VERY SAFE
  • 47% - SAFE
  • 13% - SOMEWHAT SAFE

1,733 MICHIGAN, MINNESOTA, WISCONSIN WELL OWNERS

• **HOW WORRIED ABOUT HEALTH RISKS?**
  
  • **52%** - NOT WORRIED  
  • **35%** - SLIGHTLY WORRIED

1,733 MICHIGAN, MINNESOTA, WISCONSIN WELL OWNERS

• THOUGHTS ABOUT WATER TESTING AMONG THOSE WHO HADN’T TESTED

• 41% - NEVER THOUGHT ABOUT IT
• 12% - THOUGHT, BUT NOT GOING TO TEST
• 6% - PLAN TO TEST IN NEXT YEAR
• 41% - PLAN TO TEST SOMETIME

1,733 MICHIGAN, MINNESOTA, WISCONSIN WELL OWNERS

• MAIN REASONS FOR NOT TESTING AMONG THOSE WHO HADN’T TESTED

  • 53% - WE’VE BEEN DRINKING FOR YEARS
  • 41% - DIDN’T KNOW WHAT TO TEST FOR
  • 35% - DON’T KNOW HOW
  • 25% - IT’S PROBABLY FINE
  • 17% - DIDN’T KNOW I SHOULD
  • 17% - IT COSTS TOO MUCH
  • 12% - WAIT FOR OTHERS
  • 12% - DEALING WITH PROBLEM WOULD BE $
  • 8% - I DON’T WANT TO KNOW
  • 7% - WE DON’T DRINK IT

1,733 MICHIGAN, MINNESOTA, WISCONSIN WELL OWNERS

• WHAT WOULD PROMPT A WATER TEST?
  • 86% - NEIGHBOR’S WELL CONTAMINATED
  • 86% - CHANGE IN TASTE, ODOR, LOOKS
  • 66% - WELL TESTING PROGRAM AVAILABLE
  • 63% - UNEXPLAINED HEALTH PROBLEMS
  • 61% - CONTAMINATION IN THE AREA
  • 59% - STATE OR LOCAL REQUIREMENTS
  • 33% - GETTING A REMINDER OR DISCOUNT
  • 28% - NEW BABY LIVING OR VISITING

1,733 MICHIGAN, MINNESOTA, WISCONSIN WELL OWNERS

• WHY DID YOU TEST?
  • 40% - TO KNOW IF MY WATER IS SAFE
  • 29% - TESTING PROGRAM OFFERED
  • 16% - NEW WELL
  • 14% - REAL ESTATE TRANSACTION
  • 12% - INFANTS OR PREGNANT WOMAN IN HOME
  • 8% - TEST REGULARLY

1,733 MICHIGAN, MINNESOTA, WISCONSIN WELL OWNERS

• TREATED WELL WATER
  • 64% SAID THEY MAINTAINED TREATMENT SYSTEM AS RECOMMENDED
  • 32% MAINTAIN THEIR SYSTEM LESS OFTEN THAN RECOMMENDED

1,733 MICHIGAN, MINNESOTA, WISCONSIN WELL OWNERS

• WHERE WOULD YOU FIRST LOOK FOR INFO ON SAFETY AND QUALITY?
  • MICHIGAN – 36% - LOCAL HEALTH
    • 25% - ONLINE
  • MINNESOTA – 23% - LOCAL HEALTH
    • 20% - STATE HEALTH
  • WISCONSIN – 23% - ONLINE
    • 22% - LOCAL HEALTH

~1,954 SOUTHERN ONTARIO PRIVATE WELL OWNERS

• 51% said that at least once, they, or another party, had visually examined their household wells

• Average time between inspections was 2.6 years

• Most frequently cited action taken was to manage or to remove potential contaminants from around their wells – 3% of 1,288 actions; 26% did nothing

~1,954 SOUTHERN ONTARIO PRIVATE WELL OWNERS

• 94% HAD WELL’S WATER QUALITY TESTED AT LEAST ONCE DURING OWNERSHIP
  • OF THESE, 35% WERE DOING MORE THAN ONCE A YEAR
  • 65% TESTED ONCE EVERY TWO YEARS OR LESS

~1,954 SOUTHERN ONTARIO PRIVATE WELL OWNERS

• AMONG THOSE WITH TESTING HISTORY

• 26% SAID TESTING WAS FOR “PEACE OF MIND”
• 23% SAID PART OF A ROUTINE
• 24% TO COMPLY WITH A LEGAL REQUIREMENT
• 11% SUSPECTED A PROBLEM
• 10% HAD WELL SERVICED

~1,954 SOUTHERN ONTARIO PRIVATE WELL OWNERS

• 16% EXPERIENCED AT LEAST INCIDENT OF WATER CONTAMINATION

• FOR THOSE WHO HAD TESTED, 50% WERE FOR BACTERIA
  • 43% USED AT LEAST ONE TREATMENT DEVICE TARGETING BACTERIAL CONTAMINATION

2011 U.S. HOUSEHOLDS* WITH WELLS WITH WATER THAT HAS NOT BEEN DISINFECTED

65% nationwide with wells where water is not disinfected

2011 U.S. HOUSEHOLDS BELOW THE POVERTY LEVEL WITH WELLS WHERE WATER HAS NOT BEEN DISINFECTED

WHY DO WE NEED NEW BEHAVIORS?

• TO PREVENT ILLNESS RELATED TO WATERBORNE CONTAMINATION AND CONTRIBUTE TO THE PROTECTION OF WATER QUALITY IN AQUIFERS.
THE WORLD IS NOT RISK FREE

• CENTRALLY TREATED AND DISTRIBUTED WATER IS NO ABSOLUTE GUARANTEE OF SAFE WATER DELIVERED AT THE TAP.
  • MILWAUKEE, WISCONSIN
  • CHARLESTON, WEST VIRGINIA
  • TOLEDO, OHIO
“DRINKING-WATER CONTAMINANTS IN GROUNDWATER ARE WIDESPREAD. AT THE SAME TIME, RESOURCES FOR PROTECTING OR TREATING GROUNDWATER SOURCES OF DRINKING WATER ARE LIMITED.

“IT IS THEREFORE BENEFICIAL TO UNDERSTAND WHICH WELLS ARE MOST LIKELY TO PRODUCE WATER WITH HIGH CONCENTRATIONS OF DRINKING-WATER CONTAMINANTS AND WHICH VULNERABILITY FACTOR(S) ARE MOST IMPORTANT FOR THOSE WELLS SO THAT MANAGEMENT STRATEGIES CAN BE TAILORED.”
• "TO SUMMARIZE, A WELL AFFECTS ITS OWN VULNERABILITY BY DRAWING IN WATER FROM A UNIQUE COMBINATION OF FLOW PATHWAYS THAT ARE ASSOCIATED WITH DIFFERENT COMBINATIONS OF WATER AND CONTAMINANT SOURCES, AQUIFER GEOCHEMICAL CONDITIONS, AND TRAVEL TIMES, GIVING RISE TO THE FLUX AVERAGED CONTAMINANT CONCENTRATIONS THAT OCCUR IN THE PRODUCED WATER. THUS, THE VULNERABILITY AND WATER QUALITY OF EVERY WELL IS UNIQUE TO ITSELF. THIS IS TRUE EVEN FOR WELLS WITHIN THE SAME AQUIFER AND WELLFIELD (EBERTS ET AL. 2013)."
SMOKE ALARMS AND GROUNDWATER QUALITY ALARMS

• SMOKE ALARMS DETECT ONLY SMOKE.

• WHAT WOULD A GROUNDWATER QUALITY “ALARM” NEED TO DETECT?
  • ONLY TESTING WILL PROVIDE AN ALARM?
  • WHAT TO TEST FOR?
• 3-YEAR STUDY TO EVALUATE TWO METHODS OF PROMOTING RESIDENTIAL SMOKE ALARM INSTALLATION AND MAINTENANCE IN HIGH RISK HOUSEHOLDS ACROSS THE U.S.

• TWO STRATEGIES:
  • DIRECT INSTALLATION OF ALARMS
  • DISTRIBUTION OF VOUCHER FOR FEE ALARM

• DIRECT INSTALLATION OF ALARMS BY PROGRAM STAFF RESULTED IN WORKING SMOKE ALARMS IN 90% OF HOUSEHOLDS RECEIVING THE DIRECT INSTALLATION INTERVENTION.

• STUDIES REVIEWED SUGGEST **CANVASSING AND SMOKE ALARM INSTALLATION ARE THE MOST EFFECTIVE MEANS OF DISTRIBUTING ALARMS AND INCREASING THE FUNCTIONAL STATUS OF DISTRIBUTED ALARMS.**

• THE **FUNCTIONALITY OF SMOKE ALARMS**, AN ISSUE NOTED IN EARLIER REVIEWS, **REMAINS A PROBLEM.**

• PROGRAMS INVOLVING **PARTNERSHIPS WITH FIRE DEPARTMENTS** HAVE INDICATED SUCCESS IN PREVENTING FIRES AND DEATHS, IMPROVING SMOKE ALARM OWNERSHIP AND FUNCTIONAL STATUS, AND IMPROVING CHILDREN’S FIRE SAFETY KNOWLEDGE.

GROUNDWATER QUALITY VARIES...A LOT

• OFTEN ON A WELL-BY-WELL BASIS
• CONCENTRATIONS CAN SUBSTANTIALLY VARY OVER SHORT DISTANCES AND WITH DEPTH WITHIN AN AQUIFER
• GROUNDWATER IS 3-DIMENSIONAL
• A ONE-SIZE FITS ALL APPROACH TO WATER TESTING OF PRIVATE WELLS MAY NOT WORK
CONSUMERS’ ROLES
WHAT IS WATER WELL STEWARDSHIP?

- ACTIONS TAKEN BY INDIVIDUALS TO PROTECT THEIR PERSONAL HEALTH AND THE QUALITY AND QUANTITY OF THEIR GROUNDWATER SUPPLIES.
WHAT WOULD BE EFFECTIVE CONSUMER BEHAVIORS?

- INSPECT WELLHEAD COMPONENTS AND SURROUNDINGS
  - \textit{BUT NOT INSIDE THE WELL!}
  - REMOVE CONTAMINATION RISKS

- SAMPLE APPROPRIATELY

TEST ANNUALLY FOR LOCAL CONCERNS

- BUT DEFINITELY FOR
  - BACTERIA
  - NITRATE

- CALL A LICENSED AND/OR COMPETENT PROFESSIONAL
STARTS WITH…

PROPER WELL LOCATION AND CONSTRUCTION

• WELL OWNER SHOULD EMPLOY QUALIFIED PROFESSIONALS
• MINIMIZES CONTAMINATION POTENTIAL
• MAINTAIN PROTECTION AREAS AROUND WELLS
REGULAR MAINTENANCE IS VITAL...

- **REGULAR VISUAL INSPECTION OF**
  - WELL CASING
  - VARIOUS SANITARY SEALS
    - PITLESS EQUIPMENT, WELL CAPS
    - OTHER VITAL WELL SYSTEM COMPONENTS
  - SERVICE OF ANY WATER TREATMENT EQUIPMENT ACCORDING TO THE MANUFACTURER’S RECOMMENDATIONS
REGULAR TESTING IS...

• THE RESPONSIBILITY OF THE PRIVATE WATER WELL SYSTEM OWNER.

• MANY PUBLIC AND PRIVATE ORGANIZATIONS RECOMMEND THE SAME APPROACH

• GOVERNMENT AND PRIVATE SECTOR GUIDANCE IS AVAILABLE FOR WHEN AND WHERE TO GET WATER TESTED AND FOR HELP IN UNDERSTANDING THE RESULTS
THE STEPS TO FOLLOW IN TESTING...

• TEST ANNUALLY FOR...
  • BACTERIA
  • NITRATE
  • ANYTHING OF LOCAL CONCERN

• OR, MORE FREQUENTLY IF CERTAIN CIRCUMSTANCES INDICATE THE NEED, SUCH AS CHANGES IN ODOR, TASTE, OR COLOR

• FIND OUT WHAT IS OF LOCAL CONCERN.

• WHILE USGS STUDY RARELY FOUND PROBLEMATIC LEVELS OF PESTICIDES AND VOLATILE ORGANICS, WELL OWNERS SHOULD CONSIDER POTENTIAL LOCAL CONTAMINATION SOURCES.
THE STEPS TO FOLLOW IN TESTING...

• QUALIFIED WATER WELL SYSTEM PROFESSIONAL SHOULD DETERMINE IF THE WELL IS CLEAN

• CRITICAL TO OBTAINING A REPRESENTATIVE SAMPLE OF THE GROUNDWATER

• IF THE WELL NEEDS CLEANING, IT SHOULD BE CLEANSED BY A QUALIFIED PROFESSIONAL PRIOR TO TAKING WATER SAMPLE
QUALIFIED WATER TESTING SOURCES...

- STATE CERTIFIED DRINKING WATER LABORATORIES
  - STATES CERTIFY LABS FOR TESTING UNDER SDWA
    - MAY ALSO OFFER SERVICES TO PRIVATE WELL OWNERS
  - SDWA STANDARDS USED FOR PUBLIC WATER SYSTEMS CAN PROVIDE PRIVATE WELL OWNERS WITH A BENCHMARK AGAINST WHICH TO COMPARE CONSTITUENTS
    - TYPICALLY ARE USED BY LABS WHEN TESTING PRIVATE WELL WATER
IF CONSTITUENTS ARE PROBLEMATIC…

• DOES **NOT** MEAN THAT THE WELL OWNER CAN’T USE THE GROUNDWATER

• OPTIONS
  • WELL REHABILITATION
  • APPROPRIATELY MATCHED WATER TREATMENT TECHNOLOGY
  • NEW WELL
WATER TREATMENT CONSIDERATIONS…

• SPECIFICATIONS OF THE TECHNOLOGY MATCH TO THE SUBSTANCES AND CONCENTRATIONS OF CONCERN

• PERFORMANCE TESTED BY NSF INTERNATIONAL, WATER QUALITY ASSOCIATION, OR OTHERS
PROTECT GROUNDWATER…

• LOCATE AND APPROPRIATELY DESTROY ANY ABANDONED WELLS

• WELL OWNERS WITH SEPTIC OR OTHER ON-SITE WASTEWATER SYSTEMS SHOULD HAVE THE SYSTEM REGULARLY CHECKED BY A QUALIFIED WASTEWATER SYSTEM PROFESSIONAL

• PROPER USE, STORAGE, AND DISPOSAL OF HAZARDOUS HOUSEHOLD SUBSTANCES
NGWA’S ROLES

• NOT ONLY DOES NGWA PROMOTE ITS WELL OWNER EDUCATIONAL TOOLS ON ITS WELLOOWNER.ORG WEBSITE, IT PROMOTES THEM THROUGH HUNDREDS OF GOVERNMENT AGENCIES AND NONPROFIT ORGANIZATIONS AT THE STATE AND LOCAL LEVELS.
  • WELLOOWNER.ORG HAS RISEN TO THE TOP OF THE GOOGLE SEARCH ENGINE IN A SEARCH OF “WATER WELLS,” SECOND ONLY TO WIKIPEDIA
  • NATIONAL GROUNDWATER AWARENESS WEEK, IN ITS 16TH YEAR, GARNERED EXPOSURE ON NEARLY 600 WEBSITES.
  • PROTECT YOUR GROUNDWATER DAY, IN ITS FIFTH YEAR, GOT EXPOSURE ON MORE THAN 200 WEBSITES.
NGWA’S ROLES

• A MAJOR THRUST OF OUR PUBLIC AWARENESS EFFORTS IS TO POINT THE WELL OWNER OR PROSPECTIVE WELL OWNER TO THOSE MOST QUALIFIED TO HELP THEM WITH WATER WELL SYSTEM OR GROUNDWATER ISSUES—THAT IS, QUALIFIED GROUNDWATER PROFESSIONALS.

• WHAT NGWA SEEKS TO DO THROUGH ITS PUBLIC AWARENESS PROGRAM IS PROVIDE INFORMATIONAL TOOLS THAT CAN BE SHARED WITH WELL OWNERS BY THE WATER WELL PROFESSIONAL. THESE TOOLS THAT HELP WELL OWNERS LEARN AT THE MOST BASIC LEVEL CAN ENHANCE THE CUSTOMER EXPERIENCE AS THE PROFESSIONAL SHARES THEM.
A REVIEW OF PROGRAMS AND ACCOMPLISHMENTS RESULTING FROM EPA-OW-OGWDW-13-01
EPA GRANT WORK

• UNDER A U.S. ENVIRONMENTAL PROTECTION AGENCY GRANT, NGWA CREATED AND/OR OPERATED:
  • FIFTEEN FREE ONLINE LESSONS AND EIGHT WEBINARS FOR WELL OWNERS ABOUT VARIOUS ASPECTS OF WATER WELL AND GROUNDWATER STEWARDSHIP
  • A MONTHLY EMAIL PRIVATE WELL OWNER TIP SHEET WITH IMPORTANT INFORMATION AND CONTACTS
  • A PRIVATE WELL OWNER HOTLINE TO HELP WELL OWNERS FIND THE INFORMATION THEY NEED—WHETHER IT BE A WATER WELL CONTRACTOR, STATE OR LOCAL WELL-RELATED INFORMATION, OR BASICS ABOUT A RANGE OF ISSUES FROM WELL CONSTRUCTION AND MAINTENANCE TO WATER TESTING, TREATMENT, GROUNDWATER PROTECTION AND MORE.
CONTRACT GOALS

• INCREASED ACCURATE AND TIMELY INFORMATION AND TRAINING TO STATE, TERRITORIAL AND LOCAL AGENCIES AND GROUNDWATER PROFESSIONALS THROUGH WEBINARS AND THE SOLICITATION OF NEW PRIVATE WELL RESEARCH

• AN INCREASE IN THE NUMBER OF PRIVATE WELL OWNERS WHO RECEIVE ACCURATE & TIMELY TRAINING & TECHNICAL ASSISTANCE THROUGH:
  • WEBINARS
  • ONLINE TRAINING MODULES
  • WWW.WELLOOWNER.ORG
  • WELL OWNER’S TIP SHEETS
  • TELEPHONE-BASED CONSUMER ASSISTANCE

• AN INCREASE IN THE KNOWLEDGE OF PRIVATE WELL OWNERS ABOUT WELL CONSTRUCTION, MAINTENANCE, WATER TESTING, TREATMENT, GROUNDWATER PROTECTION, WELL FLOODING, AND HYDRAULIC FRACTURING

• AN INCREASE IN THE KNOWLEDGE OF ORGANIZATIONS AND AGENCIES THAT INTERACT WITH PRIVATE WELL OWNERS.
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• AN INCREASE IN THE KNOWLEDGE OF ORGANIZATIONS AND AGENCIES THAT INTERACT WITH PRIVATE WELL OWNERS.
Webinars:

1) Testing Your Well Water
2) Treating Your Well Water
3) Groundwater Protection
4) Water Well Maintenance
5) Water Well Flooding
6) Testing Your Well Water in Proximity to Hydraulic Fracturing
7) Water Well Construction
8) Strategies for Providing Household Well Owner Education
Online training modules:

1) What to test water for
2) How to get & interpret a test
3) Treating your water
4) Arsenic
5) Bacteria
6) Nitrate
7) Radon
8) Well maintenance
9) Groundwater protection
10) Well flooding
11) Well construction
12) Testing near hydraulic fracturing
13) Abandoned wells
14) Using water wisely
15) Finding a professional
<table>
<thead>
<tr>
<th>Outputs</th>
<th>Outcomes</th>
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<tr>
<td>15 online well owner lessons and 8 webinars</td>
<td>Well owners &amp; state/local officials are learning based on quiz score improvement</td>
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<td>• 4,800+ people get the Tip sheet</td>
<td>Other surveys are out on the Tip Sheet, Hotline, and Groundwater Awareness Week</td>
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<td>• 7 people a day call the Hotline (9/day in July)</td>
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<td>• 4,984+ newspaper (print &amp; web) placements in all the states</td>
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<td>• Radio spots aired 255 times in 29 states</td>
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<td>• TV spots aired 158 times in 29 states</td>
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<td>Establishment of a state-specific web resources page at recommendation of Grant Advisory Committee</td>
<td>Well owners will have greater access to existing state-specific private well resources</td>
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<tr>
<td>WellOwner.org</td>
<td>Since start of grant:</td>
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<tr>
<td></td>
<td>• 121,000 sessions</td>
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<td>• 140,000 sessions</td>
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<td>• 327,000 page views</td>
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<td></td>
<td>• Ranks #3 on Google search of “water wells” (behind Wikipedia and USGS sites)</td>
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<tr>
<td></td>
<td>• “Well owner lessons” page among top 10 most viewed</td>
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<tr>
<td>Program elements, generally</td>
<td>Getting broad geographic reach has been accomplished; reaching large numbers of well owners &amp; stakeholders is a process</td>
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<td></td>
<td>• Every step well owners are asked to take reduces the # of people who move forward (i.e., pre-lesson quizzes as a prerequisite to accessing an online lesson)</td>
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GOAL: AN INCREASE IN THE NUMBER OF PRIVATE WELL OWNERS WHO RECEIVE ACCURATE AND TIMELY INFORMATION ON PRIVATE WELLS THROUGH A YEAR-ROUND WELL OWNER OUTREACH CAMPAIGN

• OUTCOMES:
  • MORE THAN 600 WEBSITES IN SOME WAY PROMOTED THE 2014 GROUNDWATER AWARENESS WEEK
    • 20+ NATIONAL PROMOTIONAL PARTNERS FOR NATIONAL GROUNDWATER AWARENESS WEEK
    • 100+ STATE- AND LOCAL-LEVEL PROMOTIONAL PARTNERS FOR NATIONAL GROUNDWATER AWARENESS WEEK
GOAL: INCREASED ACCURATE AND TIMELY INFORMATION AND TRAINING TO STATE, TERRITORIAL AND LOCAL AGENCIES AND GROUNDWATER PROFESSIONALS THROUGH WEBINARS AND THE SOLICITATION OF NEW PRIVATE WELL RESEARCH

• OUTCOME:

• MORE THAN 350 FEDERAL, STATE & LOCAL GOVERNMENT OFFICIALS HAVE REGISTERED FOR TRAINING LESSONS & WEBINARS
• More than 1 million visitors since 2005
• Frequent first or second rank on Google
New Private Well Research
Presented at NGWA Ground Water Expo and Annual Meeting / December 5, 2013

1. Social Media and the Internet as a Way to Communicate with Private Well Owners
2. Rhode Island Private Well Owners Take Action to Protect Their Drinking Water and Their Families
3. An Assessment of Private Wells Used for Drinking Water in Mississippi
4. WQA Final Barrier Initiative to Empower Private Well Owners
5. Private Well Water Quality in Georgia: Chemical and Microbiological Aspects
6. Baseline Water Quality in Groundwater Wells Across the Marcellus Region of Pennsylvania
7. Complying with the Revised Total Coliform Rule—The Importance of Well Maintenance
8. Arsenic Exposure Assessment in a New Mexico Community on Well Water
9. PrivateWellClass.org — An Online Technical Assistance Program for Private Well Owners
10. What's in Your Water? The Virginia Household Water Quality Program and Master Well Owner Network
11. National Assessments of Groundwater Quality in Principal Aquifers
12. Design and Initial Results for a Statewide Groundwater Pathogens Study
14. The Continued Importance of Well Development
601 Dempsey Road
Westerville, Ohio  43081 U.S.A.
800 551.7379
Fax:  614 898.7786
E-mail: kmccray@ngwa.org
Internet:
www.ngwa.org
www.wellowner.org
AN ESTIMATED THREE TO FOUR MILLION PEOPLE, ABOUT ONE IN EVERY EIGHT CANADIANS, ARE SERVED BY PRIVATE SUPPLIES (NOT NECESSARILY WELL SYSTEMS), OR ABOUT 13% OF NATIONAL POPULATION.


- 546,000 ONTARIO HOUSEHOLDS SERVED BY PRIVATELY OWNED INDIVIDUAL WELLS
  - SOURCE: ONTARIO MINISTRY OF ENVIRONMENT, ENVIRONMENTAL MONITORING AND REPORTING BRANCH, MAY 1, 2007

- 200,000 QUEBEC HOUSEHOLDS SERVED BY PRIVATELY OWNED INDIVIDUAL WELLS

- APPROXIMATELY 45% OF THE SASKATCHEWAN POPULATION RELIES ON DRINKING WATER FORM GROUNDWATER SOURCES, 70% OF WHOM USE PRIVATE WELLS.
WATER WELL SYSTEM PROFESSIONAL’S ROLES
ANSI/NGWA-01-14
Water Well Construction Standard

An American National Standard
NGWA Standard Development Oversight Committee
May 2014

Water well construction standard encompasses municipal, residential, agricultural, monitoring, and industrial water production wells.
PROPER WATER WELL CONSTRUCTION INCLUDES, BUT IS NOT LIMITED TO:

- APPROPRIATE WELL SITING
- AQUIFER SELECTION
- SEALING OF THE CONSTRUCTED SYSTEM AND DISINFECTION OF THE CONSTRUCTION

A PROPERLY CONSTRUCTED WATER WELL INTO A POTABLE AQUIFER SHOULD PROVIDE POTABLE WATER AT THE TIME OF CONSTRUCTION.

IF HARMFUL BACTERIA ARE IN THE GROUNDWATER FLOWING INTO THE WELL DISINFECTION SOLELY AT THE TIME OF CONSTRUCTION ARE NOT LIKELY TO MAKE THE WATER PERPETUALLY FREE OF BACTERIAL CONTAMINANTS.

DISINFECTION PROTOCOL AGREED TO BETWEEN NGWA, WATER QUALITY ASSOCIATION, WATER SYSTEMS COUNCIL.
PROPER WATER WELL CONSTRUCTION PRACTICES, SUCH AS AIR LIFTING, SCRUBBING THE CASING, CHLORINATION, AND PROPER PUMP INSTALLATION METHODS, SUCH AS NOT LAYING ANY PUMPING SYSTEM COMPONENTS ON LAND SURFACES PRIOR TO INSTALLATION INTO THE WELL, CAN HELP REDUCE THE RISK OF INADVERTENT BACTERIAL CONTAMINATION.
PROPER WATER WELL GROUTING

WATER WELL DESIGN PRACTICES FEATURING GROUTING HELP TO LIMIT DIRECT SURFACE WATER INFLUENCE AS WELL AS VADOSE ZONE INFLUENCE – TWO COMMON AREAS OF IMPACT TO LOCAL GROUNDWATER QUALITY.

THE VADOSE ZONE IS THE SUBSURFACE AREA ABOVE THE WATER TABLE IN WHICH THE INTERSTICES OF THE POROUS EARTH MATERIALS ARE ONLY PARTIALLY FILLED WITH WATER.
NATURAL CONDITIONS CAN IMPACT WELL SYSTEM DESIGN AND CONSTRUCTION

• IN AREAS OF RAPID RECHARGE, GEOLOGY CAN SHORT CIRCUIT THESE WATER WELL CONSTRUCTION BARRIER-SERVING COMPONENTS, HOWEVER.

• THIS IS TRUE IN WATERSHEDS WITH SIGNIFICANT AMOUNTS OF SANDY SOILS, AS WELL AS MANY RIVER ALLUVIUM SETTINGS. REGULATIONS AND TESTING SHOULD CONSIDER THESE TYPES OF INFLUENCES.
NATURAL CONDITIONS CAN IMPACT WELL SYSTEM DESIGN AND CONSTRUCTION

• IN AREAS WHERE DROUGHT MAY BE UNDERWAY THE RETRACTION OF CLAY BASED SOILS AND WEAKER LITHOLOGY FROM GROUT AND SEALS CAN BECOME A FACTOR.

• THESE CRACKS CAN BECOME DIRECT CONDUITS TO THE WELL’S GROUNDWATER INTAKE, ALLOWING EVENTUAL PRECIPITATION OR SURFACE WATER RUN-OFF TO BE CHANNELED DIRECTLY INTO THE WELL’S INTAKE.

• IT TYPICALLY TAKES CLAYS THAT HAVE BEEN DESTABILIZED FROM THE DROUGHT LONGER TO RE-HYDRATE AND EXPAND TO FILL THOSE GAPS.
FUNDAMENTAL TESTING

• COLIFORM BACTERIA AND NITRATE TESTING CAN BE INDICATORS A WELL HAS A BREACH OR SOME OTHER PHYSICAL PROBLEM WITH THE WELL’S CASING.

• WHILE BOTH ARE SENSITIVE TESTS, THEY ARE INEXPENSIVE, AND ARE WIDELY USED TO DETECT PROBLEMS WITH WATER SUPPLY WELLS.
ON-SITE WASTEWATER SYSTEM SITING

- The rules among the states for on-site wastewater management system design vary.

- A site specific soil survey should help to determine what type of system is required based on the potential for impact to groundwater resources.

- The purpose is to achieve increased bacterial degradation within the septic tank and to release lower amounts of potentially harmful bacteria/matter into the shallow subsurface.
SOMETIMES THE CONCENTRATIONS OF SELECT CONSTITUENTS WILL PROVE TO BE UNACCEPTABLY HIGH EVEN AFTER CAREFUL SITE SELECTION AND WELL CONSTRUCTION, OR AFTER CLEANING AN EXISTING WELL.

THE WWSP CAN RECOMMEND COST-EFFECTIVE WATER TREATMENT OPTIONS TO MITIGATE SUCH PROBLEMS.

FOR INSTANCE, IT MAY BE LESS EXPENSIVE FOR THE CONSUMER TO INSTALL AN APPROPRIATE WATER TREATMENT TECHNOLOGY TO REMOVE OR LOWER CONCENTRATIONS OF A CONTAMINANT THAN TO REPLACE OR DEEPEN AN EXISTING WELL OR TO USE A MORE EXPENSIVE DRILLING TECHNOLOGY TO EMLPLACE A NEW WELL.

ON THE OTHER HAND, IF A WATER INTAKE AREA IN AN EXISTING WELL HAS TO BE REPLACED OR AN AQUIFER LINED OFF, ECONOMICS WILL PROBABLY DICTATE THAT A NEW WATER WELL BE CONSTRUCTED.

SUCH DECISIONS ARE SITE-SPECIFIC AND, THUS, BASED ON CAREFUL ANALYSIS BY THE WWSP.
THIRD-PARTY ACTIONS
• At time of property transfer

  • Veterans Administration property loan process requires federal risk reduction actions are in place
  • Federal Housing Administration property loan process identifies certain triggers when water testing is required

  • Private sector lenders may also require water testing
Some programs that may provide financial assistance in a rehabilitated well, a new well, and/or water treatment is called for…

- Rural Housing Administration 504 Program
  - Low interest loans to very low income households
  - Grants in some cases to residents 62 or older
- Rural Utilities Service Household Water Well Financing Program
  - Low-to moderate-income household eligibility
- EPA Grant awards to nonprofits to communicate private well stewardship: RCAP, NGWA, Water Systems Council
STATE RISK REDUCTION ACTIONS ARE IN PLACE

• 48 STATES LICENSE WATER WELL CONSTRUCTION AND SERVICE PROFESSIONALS THROUGH COMPETENCY TESTING
  • MANY WITH MANDATORY CONTINUING EDUCATION

• 18 STATES REQUIRE TESTING OF PRIVATE WATER WELL SYSTEMS FOR HOUSEHOLD DRINKING WATER

• SOME STATES HAVE SPECIFIC LAWS ADDRESSING PRIVATE WATER WELL SYSTEM TESTING AT PROPERTY TRANSFER

• NUMEROUS STATE DISCLOSURE LAWS RELATED TO MATERIAL DEFECTS

• INFORMATIONAL WEB SITES FOR ALL 50 STATES
• **NEW YORK ASSEMBLY BILL 1039** (INTRODUCED JANUARY 2013)

  - Creates the Well Water and Water Supply Education Act.
    - Requires the Department of Health to establish and maintain a public education program on the potential hazards of private water supplies.
    - Requires home inspectors, licensed real estate agents and brokers to provide private water supply education materials to prospective buyers of property where such property is serviced by a private water supply.

  - The measure was amended June 10, 2014 and referred back to the Assembly Committee on Codes.
WHAT OTHERS HAVE DONE AND DO.

• PRIVATE WELL OWNER NETWORKS
  • PENNSYLVANIA, MARYLAND, DELAWARE, TEXAS, OREGON

• FARM*A*SYST

• HOME*A*SYST

• WELLCARE®

• CHILDREN’S GROUNDWATER FESTIVALS

• HOME AND GARDEN SHOW TYPE EVENTS
NEW NGWA GRANT AWARD

FROM THE CENTERS FOR DISEASE CONTROL AND PREVENTION

"ACTIVITIES TO PROTECT POPULATIONS AND COMMUNITIES SERVED BY UNREGULATED DRINKING WATER SYSTEMS FROM NON-INFECTIOUS CONTAMINANTS: EVALUATIONS OF INTERVENTIONS TO PREVENT EXPOSURE TO CONTAMINATES IN DRINKING WATER"

EXPERTS FROM THE SCHOOL OF PUBLIC HEALTH AT THE OHIO STATE UNIVERSITY ARE NGWA’S COLLABORATORS

PROJECT RUNS FROM SEPTEMBER 2, 2014 TO SEPTEMBER 1, 2015
WATER WELL SYSTEMS INSPECTION
WHAT NGWA HAS DONE (AND DOES)

• NGWA PROFESSIONAL FOCUSED PROGRAMMING – KNOWLEDGE AND TOOLS
  • BEST SUGGESTED PRACTICES
  • ANSI/NGWA-01-14 WATER WELL CONSTRUCTION STANDARD
  • VOLUNTARY CONTRACTOR CERTIFICATION
  • GOVERNMENT WELL INSPECTOR TRAINING
  • WATER WELL REGULATORS COUNCIL
  • PROFESSIONAL CERTIFICATION
  • JOURNALS AND TECHNICAL LITERATURE
  • CONFERENCES, SHORT COURSES, WEBINARS
  • RESEARCH, E.G. CLEANING AND DISINFECTING FLOODED WELLS
  • STATE AFFILIATED ASSOCIATIONS
WHAT NGWA HAS DONE (AND DOES)

- NGWA Set the stage in 1970 with a voluntary certification program for water well system professionals
- 16 states using NGWA certification exams for licensure or registration
- 47 states with statewide well construction standards
- Special construction standards in certain areas
- ANSI/NGWA well construction standard
- NGWA advises its member professionals to inform if certain naturally occurring constituents may be locally present
  - Stress to the consumer the importance of water testing prior to use of the water
  - Standard form business contract from NGWA urges the same
WHAT ELSE NGWA HAS DONE (AND DOES)

- WELLOWNER.ORG
- CLIP AND COPY/ONE PAGE FACT SHEETS
- PUBLIC AWARENESS TOOLKIT
- PSA’S
- RFD-TV
- WEBINARS
- ONLINE LESSONS
- NEWS RELEASES