

Rural H₂O

Water Guardians

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"All the water that will ever be, is right now." (National Geographic)



Water is essential for life and will be valued, kept safe, and shared

- The Nova Scotia government's vision for provincial water resources

***If you think you are too small to make a difference
...you've never been in a tent with a mosquito!*** (Lynda Rankin)

Rural H₂O

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Funded By:

Annapolis Valley Health Association

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Executive Summary

The Rural H₂O pilot project was implemented from 2012 to 2014 and was available to rural homeowners in Kings, Annapolis, Digby, and Yarmouth counties. Homeowners were required to have both an onsite septic system and a private water supply to qualify for participation in the project.

The Rural H₂O project was based on community-based social marketing (CBSM) strategies. Targeted behaviors selected for modification along with the associated barriers and benefits were identified based on existing literature and use of local surveys. The six behavior goals targeted in the Rural H₂O project were to commit rural homeowners to:

1. Test drinking water every 6 months for bacteria and every 2 years for chemical parameters to ensure a safe water supply;
2. Properly maintain septic systems by pumping septic tanks every 3 to 5 years;
3. Use water resources in a sustainable manner and install low flow aerators, low flush toilets, repair leaks, and use rain barrels or cisterns where appropriate;
4. Properly manage riparian zones by planting native vegetation to prevent erosion, create buffer zones, establish refuge for wildlife and shade for fish and other aquatic species;
5. Properly manage storm water through use of bio swales, infiltration trenches and rain barrels; and
6. Prevent ground water pollution through education on the interaction of the hydrological system, pollutants and groundwater.

The barriers identified to accomplish these six goals showed consistent similarities with cost, education, and inconvenience as the most frequent barriers.

A delivery plan was developed using prompts, incentives, and education to reduce barriers and achieve the behavioral goals of the project. All participants were required to sign a commitment to the goals and share information with friends and neighbors. Upon completing the signed commitment, participants were given the title of Rural H₂O Water Guardians.

The Rural H₂O project was extremely successful in outreach, education and altering behaviors of rural homeowners with regard to water management in rural Nova Scotia and experienced over 80% uptake. Specifically:

- 223 rural homeowners signed commitments as Rural H₂O Guardians
- 183 rural homeowners tested drinking water, of which
 - 56 wells had coliform present including 11 with *E. Coli*
 - 8 wells had unacceptable levels of arsenic
 - 6 wells had unacceptable levels of uranium
 - 6 wells had high levels of lead
- Of 90 homeowners with riparian zones, 56 planted native riparian species
- 65 homeowners had identified storm water issues including 15 flooded septic beds during moderate to heavy rain events
- 100 rain barrels were provided to participants

- 25 well repair grants each valued up to \$1500 were issued
- 9 storm water remediation grants each valued at \$500 were issued
- 138 Septic tank pump vouchers each valued at \$100 were issued

Of the 183 water test conducted, 70 wells failed one or more aspects of the current standard for safe drinking water. In general, dug wells experienced higher incidence of *E-coli* and lead contamination beyond acceptable limits while drilled wells experienced higher incidence of arsenic and uranium contamination beyond acceptable limits. While nitrates and nitrites were detected, no tests were beyond current drinking water standards.

Recommendations from the program include continued access to prompts, incentives and education regarding water management and the connection with ensuring safe drinking water for Nova Scotia residents with no municipal water and sewer services. In addition, it is highly recommended and encouraged that programs similar to the Rural H2O project be considered high priority for the Nova Scotia Government and the Government of Canada due to the prevalence of heavy metals through the province, acid rain impacts in southwestern Nova Scotia on heavy metal leaching into water supplies and health implications associated with consumption of contaminated drinking water. Proactive steps and programs like the Rural H2O project not only foster increased health for both citizens and the environment in rural Nova Scotia but also have the potential to reduce the long term health costs associated with exposure to poor drinking water.

Table of Contents

Executive Summary	I
Table of Contents	III
List of Figures	V
List of Tables.....	VI
List of Acronyms.....	VII
Acknowledgements.....	VIII
1.0 Introduction	1
2.0 Methodology.....	2
2.1 Selecting Behaviors	2
2.2 Identifying Barriers and Benefits.....	3
2.2.1 Water testing barriers and benefits:	3
2.2.2 Septic system maintenance barriers and benefits:.....	4
2.2.3 Sustainable use of water barriers and benefits:	4
2.2.4 Riparian zone management barriers and benefits	5
2.2.5 Storm water management barriers and benefits	6
2.2.6 Pollution prevention barriers and benefits:.....	7
2.2.7 Summary of barriers and benefits.....	8
2.3 Developing Strategies.....	9
2.3.1 Educational Material.....	9
2.3.2 Prompts and Incentives.....	11
2.4 Program Delivery.....	12
2.4.1 Regular Water Testing.....	13
2.4.2 Sustainable Water Use.....	15
2.4.3 Storm Water Management.....	15
2.4.4 Riparian Zone Management	16
2.4.5 Septic System Management	16
2.4.6 Pollution Prevention.....	17
3.0 Results and Discussion	17
3.1 Regular Water Testing	18
3.2 Sustainable Water Use	30
3.3 Storm Water Management.....	32
3.4 Riparian Zone Management.....	33

3.5	Septic System Management	35
3.6	Pollution Prevention	36
4.0	Conclusions and Recommendations.....	38
4.1	Conclusions.....	38
4.1.1	Regular Water Testing.....	38
4.1.2	Sustainable Use of Water.....	39
4.1.3	Storm Water Management	39
4.1.4	Riparian Zone Management	39
4.1.5	Septic System Management	40
4.1.6	Pollution Prevention.....	40
4.2	Recommendations	40
4.2.1	It is recommended that rural homeowners in Nova Scotia continue to have the opportunity to participate in a program with similar goals, incentives and education as the Rural H ₂ O Water Guardian Pilot Project; and,	40
4.2.2	It is highly recommended and encouraged that programs similar to the Rural H ₂ O project be considered high priority for the Nova Scotia Government and the Government of Canada due to the prevalence of heavy metals through the province, acid rain impacts in southwestern Nova Scotia on heavy metal leaching into water supplies and health implications associated with consumption of contaminated drinking water.	40
5.0	References.....	41
6.0	Appendices	44
	Appendix A: Homeowner survey	44
	Appendix B: Water Guardian Agreement.....	46
	Appendix C: Refrigerator magnet and reminder stickers.	47
	Appendix D: Homeowner Report.....	48
	Appendix E: Rain Barrel Sticker.....	50
	Appendix F: Rural H ₂ O Septic Tank Pump out Voucher	51
	Appendix G: Well Repair Voucher	52
	Appendix H: Storm Water Remediation Voucher.....	53
	Appendix I: Water Quality Test Voucher	54
	Appendix J: Testimonials	55

List of Figures

Figure 1: Wells tested by County.....	19
Figure 2: E-coli and coliforms by County	20
Figure 3: Chemicals detected by County	21
Figure 4: Well type versus contamination comparison	22
Figure 5: Coliforms detected (acceptable level is 0).....	23
Figure 6: E-coli detected (acceptable level is 0).....	24
Figure 7: Arsenic detected, acceptable level is $< 10 \mu\text{g/L}$	25
Figure 8: Uranium detected (acceptable level is $< 20 \mu\text{g/L}$).....	26
Figure 9: Lead detected (acceptable level is $< 10 \mu\text{g/L}$)	27
Figure 10: Fluoride detected (acceptable level is $10 \mu\text{g/L}$).....	28
Figure 11: Nitrite/nitrate detected (acceptable level is $< 10 \mu\text{g/L}$).....	29
Figure 12: Water saving devices by County.....	32
Figure 13: Storm water issues	33
Figure 14 Potential pollution sources.....	37

List of Tables

Table 1: Grants issued and redeemed	17
Table 2: Wells tested	18
Table 3: Bacteria detected.....	19
Table 4: Chemicals detected	20
Table 5: Presence of contaminants by well type	21
Table 6: Provincial projection for well contamination	30
Table 7: Rain barrel distribution	31
Table 8: Water saving devices	31
Table 9: Storm water issues	32
Table 10: Year one riparian zone planting and survival rate	34
Table 11: Year two riparian zone planting.....	34
Table 12: Riparian zone plants 2012-2013.....	35
Table 13: Septic tank pump out vouchers.....	35
Table 14: Potential pollution sources	37

List of Acronyms

CARP-----	Clean Annapolis River Project
CBSM-----	Community-based social marketing
EHAP-----	Environmental Home Assessment Program
NGO-----	Non-Governmental Organization
ORCWP--	Ottawa Rural Clean Water Group
P2-----	Pollution Prevention Programs
µg/L-----	Micro-grams per litre

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1.0 Introduction

The Clean Annapolis River Project (CARP) is a charitable not for profit organization established in 1990 with the mission to:

Enhance the ecological health of the Annapolis River watershed through science, leadership and community engagement.

In the last 20 years, CARP has assisted rural homeowners and farmers to understand the connection between human activities and water pollution. Despite these efforts, high stressors such as chemicals, fertilizers and wastewater pollution continue to be present throughout the watershed.

For the past 7 years, CARP has delivered the Environmental Home Assessment Program (EHAP) in western Nova Scotia for the Nova Scotia Department of Environment. The EHAP program educates rural homeowners on proper maintenance of septic systems, wells, and oil tanks. Results from the program documented that very few homeowners test well water for bacteria and even fewer test for chemical parameters. This was concerning because the constant recharging of aquifers from rain events can bring pollutants, bacteria and harmful chemicals such as arsenic and uranium into our water supplies. Through the delivery of the Riparian Habitat Stewardship program with farms in the Annapolis River watershed, it was also realized that many riparian zones were degraded and left water courses vulnerable to runoff pollution and storm water events.

The findings from these two programs highlighted the importance of addressing concerns for water management in regions of the watershed where no municipal water and sewer services were available and where riparian zones were more numerous.

Based on the results of past programs, assumptions were made to identify what type of barriers might exist for people to change their behaviours towards rural water practices. Barriers may include a lack of understanding that the drinking water could harm human health, proper sample collection for well water testing, difficulty interpreting of test results, ignorance on efficient water consumption, lack of awareness on ground water and surface water protection from pollutants, and lack of understanding the hydrological cycle. From these potential barriers, it was deemed imperative to create an educational and social behaviour change program to reduce water pollution in both ground water and surface water to ensure that the ecological and social health benefit continue beyond the life of the program by building capacity in the community and ensuring long term changes in behaviours.

As a result, a program targeting rural homeowners was created using principles of community-based social marketing (CBSM) with the goal to prevent water pollution both in ground and surface water and promote benefits to both the health of the watershed and the residents participating in the program.

The following report presents the two-year pilot program called the “Rural H₂O Water Guardian Project” that was implemented from 2012-2014 in the Kings, Annapolis, Digby and Yarmouth counties to rural homeowners with private wells and septic systems.

2.0 Methodology

The methodology used in the planning and delivery of the Rural H₂O Water Guardian pilot project was based on community-based social marketing (CBSM) strategies of Doug McKenzie-Mohr (2011). Three main strategies used in this process include:

1. Selecting behaviors to be modified and promoted,
2. Identifying barriers and benefits for adopting the promoted behavior, and
3. Developing strategies to aid in modifying the selected behavior.

In addition, a signed commitment from homeowners was also an essential part of a CBSM strategy while prompts and incentives were effective tools for successful project delivery to reinforce the commitments of participants to the goals of the program and achieve the targeted behaviors.

2.1 Selecting Behaviors

Whether the purpose of a campaign is to reduce waste, enhance energy or water efficiency, alter transportation choices, protect a watershed or reduce CO₂ emissions, most often a wide range of behaviors may be promoted. The first step of community-based social marketing is to determine which of these behaviors should be promoted (McKenzie-Mohr 2011).

Taking into consideration the concerns discussed above, six target behaviours were identified for the Rural H₂O project. Specifically, the project goals were to have homeowners:

- 1) Test drinking water every 6 months for bacteria and every 2 years for chemical parameters to determine that drinking water is safe and to establish a base line for future comparison. Rural homeowners need to be aware that they are responsible for ensuring their water is safe for use by regular testing.
- 2) Properly maintain septic systems by pumping septic tanks every 3 to 5 years to reduce groundwater pollution and repairs required to ensure proper septic function. Homeowners need to know why and how to maintain septic systems to prevent septic system failures that result in ground water contamination.
- 3) Use water resources in a sustainable manner by installing low flow aerators and low flush toilets, repair leaks, use rain barrels or cisterns where appropriate to reduce the use of well water and divert rain water for re-use.
- 4) Properly manage riparian zones by planting native riparian species to prevent erosion, create buffer zones to reduce flow of contaminants into waterways, establish refuge for animals and shade for fish to enhance wildlife activity in riparian zones. Homeowners need to be aware of the interaction of all the water sources on and near their property and how to best manage sources of water to create a safe, erosion resistant, pollution free environment.

- 5) Properly manage storm water through use of bio swales and infiltration trenches to divert storm water away from septic beds and use of rain barrels and cisterns to collect and reuse storm water. Homeowners need to be aware of the interaction of all the water sources on and near their property and how to best manage sources of water to create a safe, erosion resistant, pollution free environment.
- 6) Prevent pollution by promoting the other targeted behaviors and increased awareness on the interaction of the hydrological system, pollutants and groundwater. Homeowners need to be aware of any potential pollution sources on their property and also the potential impact of pollution from nearby sources. Homeowners need to be educated on how sources of pollution interact with ground and surface water and to realize the health issues involved with various types of pollution as well as how to minimize or eliminate associated risks on their property.

2.2 Identifying Barriers and Benefits

If any form of sustainable behavior is to be widely adopted, barriers that impede people from engaging in the activity must be first identified along with what measures would be required to motivate the desired actions. Community-based social marketers recognize that there may be multiple internal and external barriers to widespread participation in any form of sustainable behavior and that these barriers will vary for different individuals (McKenzie-Mohr 2011).

After the specific target behaviors were determined, the barriers and benefits for homeowners to accomplish the goals were identified as well as methods available to overcome barriers. This was done through literature review of online resources, CARP's physical library and CARP's electronic archives.

A local survey was also conducted to get a more accurate picture of what barriers were present for local rural homeowners to accomplish the goals of the program (Appendix A). The survey was designed to direct the respondent towards their normal behavior in water and wastewater practices around their property. The survey was personalized with a very brief introductory letter signed by the project leader as well as a hand written, signed sticky note on the cover page. The survey was well received with a response rate of over 70%.

2.2.1 *Water testing barriers and benefits:*

The following section highlights key findings from the literature review regarding the barriers that exist for homeowners testing drinking water. In general, barriers include cost, inconvenience, complacency, ignorance, and lack of awareness of health risks.

A postal survey of private well owners' perceptions of their water quality in the City of Hamilton, Ontario found that private well owners noted the following barriers to more frequent well testing: inconvenience and time issues, no health problems or noticeable water changes and forgetfulness or procrastination (Jones *et al.* 2006).

A study done by the Geology Department of the University of Guelph on “Influences on the water testing behaviors of private well owners” revealed that barriers include complacency, inconvenience, ignorance, cost, and privacy concerns (Imgrund *et al.* 2011).

An investigation of bacteriological and chemical water quality and the barriers to private well water sampling in a southwestern Ontario community found that removing the barriers of cost and inconvenience doubled the response rate for private homeowners testing the quality of their drinking water (Hexemer *et al.* 2008).

In September 2003, three focus group discussions were conducted: two with men and women aged 36–65 years and one with men and women 20–35 years of age. The purpose of this study was to explore the drinking water perceptions and self-described behaviors and needs of participants served by private water systems in the City of Hamilton, Ontario. Barriers to water testing included the inconvenience of the testing process, acceptable test results in the past, resident complacency and lack of knowledge (Jones *et al.* 2005).

Benefits to homeowners doing regular testing include peace of mind and reassurance that their water is safe for use (Imgrund *et al.* 2011). Moreover, regular water testing aids in preventing the consumption of harmful bacteria and chemicals that may be found in drinking water supplies. This should have a positive effect on rural homeowners’ health as well as reducing health care costs associated with long-term consumption of unhealthy drinking water.

2.2.2 Septic system maintenance barriers and benefits:

Due to involvement with the Environmental Home Assessment Program over the past 7 years, barriers to maintaining septic systems were not included in the literature review. Barriers were already determined to be cost and education.

Benefits to properly maintained septic systems include a reduction in septic system failures, a reduction in surface and ground water pollution caused by failures, and an increase in the life of a septic system.

2.2.3 Sustainable use of water barriers and benefits:

The following summarizes the findings from the literature regarding the barriers of sustainable water use. In general, cost, inconvenience and lack of awareness were the primary hurdles identified.

Clean Nova Scotia ran a pilot program in 1996 called “Be Water Wise...It Makes Cents” to test their assumption derived from research that cost and inconvenience could be barriers to participating in a water conservation program (Clean Nova Scotia 1996). The “Be Water Wise ... It Makes Cents” program included rebates for low-flow shower heads, faucet aerators and ultra-low-flow toilets to address the cost barrier. The convenience barrier was addressed by home visits discussing water conservation, delivering kits with the

rebates and by providing a list of approved plumbers who could install the toilets. Following the home visit, a public commitment to reduce water consumption for one year was also requested from this group.

The response to the retrofit kit approach was poor. Clean Nova Scotia felt that a stronger education campaign would result in more interest in water conservation and the installation of water-saving devices. They expressed that, in future, they would like to allocate more money toward education (Clean Nova Scotia 1996).

Consumer focus groups conducted by the Behavior Research Center in 2000 indicated that water conservation ranked in importance below other local concerns such as air quality and traffic congestion. The focus groups also revealed that the majority of consumers lacked knowledge about water conservation techniques and that they thought their individual actions would not make much difference (Behavior Research Center 2000).

Benefits to rural homeowners using their water in a sustainable manner are less strain on limited water resources and better management of available water resources. Savings associated with use of electricity to run a water pump and a reduction of maintenance and repairs to system due to less use are also of benefit to homeowners.

2.2.4 Riparian zone management barriers and benefits

The following summaries highlight the available literature regarding barriers to riparian zone management.

An article titled *"Explaining landholders' decisions about riparian zone management: the role of behavioral, normative, and control beliefs"* showed that landholders with strong intentions to manage their riparian zones differed significantly in terms of their beliefs compared to landholders who had weak intentions to manage their riparian zones. Strong intentions to manage riparian zones were associated with a favorable cost-benefit analysis, greater perceptions of normative support for the practice and lower perceptions of the extent to which barriers would impede management of riparian zones (Fielding *et al.* 2005).

Economic motivations appear to be the dominant driver of landowners to implement conservation practices. Specifically, a number of studies found financial factors including lack of labor and time, costs associated with implementing and maintaining practices to be the key constraints to adoption (Camboni & Napier 1993; Cary & Wilkinson 1997; Greiner *et al.* 2003; Rockloff & Lockie 2004; Lankester & Greiner 2007). They also point to risk on reliability of expected returns as a key barrier to adoption.

Landowners perceived most incentives as effective to some extent. Due to the complexity of natural resource management issues such as water quality improvement, it is unlikely that a single instrument will be effective. Rather, a suitable mix of incentives is required to address the diversity of decision-making situations encountered by landholders, the different barriers that landholders face to adoption, and the different innovations that contribute to water quality improvements (Young *et al.* 1996).

In 2000, a Riparian zone workshop titled “Using Buffers to Improve Ontario Waterways” discovered that when it comes to incentives for encouraging others to establish buffers, education and “preaching” about the importance of soil conservation and water quality protection were viewed as essential, recognizing that it will take time to reach the majority (Imhof 2000). The financial incentive was regarded as very important initially in encouraging landowners to establish buffers; 75% of participants in the program would not have done so without it. Existing demonstration sites were considered an important incentive. Several farmers felt that good, hard statistics on the benefits versus costs of establishing buffers would go a long way in selling them.

Benefits for properly maintaining a riparian zone include less pollution entering the water way, less erosion, and a better habitat for both aquatic and terrestrial wildlife.

2.2.5 Storm water management barriers and benefits

The following section highlights available literature on barriers that exist in storm water management.

An article in the 2010 spring edition of the Canadian Water Resources Journal titled “Identifying barriers to widespread implementation of rainwater harvesting for urban household use in Ontario” (Leidl *et al.* 2010) identified the principal barriers for storm water management as:

- Cost - High capital cost emerged as the most significant barrier, discussed by 81% of participants.
- Liability - Liability was the second most important barrier, discussed by 50% of participants, the majority of whom were municipal representatives. The ultimate concern is the potential for someone to get sick due to the consumption of contaminated rainwater.
- Poor differentiation between grey water, rainwater and [non-potable water](#). Separating grey water and rainwater was seen as a necessary prerequisite for expanding the end uses of rainwater as additional applications such as laundry are more feasible for rainwater than for grey water.
- Lack of environmental commitment among the public - 75% of respondents were not interested in water conservation practices.

Most participants in this study felt that public education is required to get more people involved; however, a few thought that regulations and permits were more of a detriment than education.

Nova Scotia’s water resource management strategy “Water for Life” published in December 2010 makes the following statement: Recent studies across Canada show that a lack of knowledge and access to information is a large barrier to managing water resources effectively (Nova Scotia Government 2010). Better information is

needed, not just for government decision making but for businesses making decisions as well.

Benefits associated with storm water management include a better understanding of the hydrological cycle, a reduction of contaminants entering water ways, a reduction in ground water pollution, reduced erosion as well as the recycling of storm water for use on lawns and gardens.

2.2.6 Pollution prevention barriers and benefits:

A review of existing literature identified barriers for pollution prevention to be a combination of lack of awareness, cost, and complexity.

In a 2007 study done by the Canadian Federation of Independent Business, the conclusion was made that looking at barriers to implementing energy conservation measures to rural residents will likely be similar to barriers SMEs (Small and Medium Enterprises) faced when implementing other environmental measures. It was found that no one single obstacle dominates, but rather a combination of factors that can be categorized into three key areas: not enough information, too expensive and too complicated (Armstrong *et al.* 2007).

The Ottawa Rural Clean Water Program (ORCWP) gives grants to rural residents to undertake projects that improve the quality of surface water and ground water. Grants are provided for land stewardship and agriculture best management practices and septic replacement and well upgrades, replacement and decommissioning. The program also has a public education component. The 2008 report on the "Ottawa Rural Clean Water Program" (Schepers 2008) stated that:

"Money is the greatest incentive and the greatest barrier to increasing participation in the Ottawa Rural Clean Water Program. Money is the main barrier to participating in the ORCWP, since the grant pays for up to half of the project's cost in most cases and the applicant needs to pay the balance. Money is also the primary incentive for participants to take on projects, followed by personal gains in such terms as added property value, reduced farm operating costs, compliance with provincial regulations, reduced risk of environmental or property damage, and health benefits."

Voluntary and so-called "quasi-regulatory" programs have come to play an increasingly prominent role in environmental policy, at both the federal and provincial levels. Pollution prevention (P2) programs are a set of voluntary programs that target hazardous waste, toxic waste, and toxic releases. Such programs aim to reduce pollution by "encouraging source reduction and other practices that reduce or eliminate the creation of pollutants through: increased efficiency in the use of raw materials, energy, water, or other resources; or the protection of natural resources by conservation." P2 programs include technical assistance, educational outreach, grants, and awards (Mitchell 2005).

A project sponsored by Canadian Institute for Environmental Law and Policy (Mitchell 2005) identified some common barriers to pollution prevention that organizations face:

- Economic: A business case may need to be made where P2 measures require capital investment.
- Administrative: Without full and visible management support a P2 program or measure may have limited success.
- Operational: Implementation of P2 measures often requires time, technical expertise, money and personnel, all of which are in short supply.
- Regulatory: The activities of some organizations are not subject to regulations and therefore do not receive priority amongst management.

Benefits of pollution prevention include cleaner ground water, cleaner streams, rivers, lakes and an overall cleaner environment. Cleaner water means less water related health issues, safer water for drinking, household use, and recreation. Long term benefits would be a healthier population with reduced costs to the health care system.

2.2.7 Summary of barriers and benefits

Barriers:

The barriers identified to modify rural homeowners' behaviors to accomplish the six goals of the project showed consistent similarities with each behavior. Cost, lack of education, and inconvenience were at the top of the list. Attitude, time and lack of regulations were also prevalent.

Benefits of the six goals of the Rural H₂O Water Guardian Project:

1. Regular water testing aids in preventing the consumption of harmful bacteria and chemicals that may be found in our water supplies. This should have a positive effect on rural homeowners' health as well as their contribution to the cost of health care. Benefits to homeowners doing regular testing include peace of mind and reassurance that their water is safe for use
2. Benefits to properly maintained septic systems include a reduction in septic system failures, a reduction in surface and ground water pollution caused by failures, and an increase in the life of a septic system.
3. Benefits to rural homeowners using their water in a sustainable manner are less strain on limited water resources and better management of available water resources. Savings associated with use of electricity to run a water pump and a reduction of maintenance and repairs to system due to less use are also of benefit to homeowners.

4. Benefits of properly maintained riparian zones include less pollution entering the water way, less erosion, and better habitat for both aquatic and terrestrial wildlife.
5. Benefits associated with storm water management include a better understanding of the hydrological cycle, a reduction of contaminants entering water ways, a reduction in ground water pollution, reduced erosion as well as the recycling of storm water for use on lawns and gardens.
6. Benefits of pollution prevention include cleaner ground water, cleaner streams, rivers, lakes and an overall cleaner environment. Cleaner water means less water related health issues and safer water for drinking, household use, and recreation. Long term benefits would be a healthier population with reduced costs to the health care system.

2.3 Developing Strategies

Social science research has identified a variety of “tools” that are effective in changing behaviour (McKenzie-Mohr 2011). These tools include approaches such as gaining a commitment from an individual to try a new activity, such as biking to work, or developing community norms that encourage people to behave more sustainably. The techniques are carried out at the community level and frequently involve direct personal contact. Personal contact is emphasized because social science research indicates that people are most likely to change behavior in response to direct appeals from others. In the delivery of the pilot program, education was directed towards individual circumstances and issues of homeowners due to associated differences in identified barriers. Clients with no riparian zones were less interested in learning about riparian zone best management practices while clients with storm water issues were more attentive to storm water remediation information.

A key goal of a CBSM strategy is the development of a social norm such that participants understand the key characteristics of the general accepted behaviour. In this case, it should be emphasized that participating homeowners were encouraged to become leaders in protecting water sources in the community and were honored as “Water Guardians” upon signed commitment which was required for participation in the program (Appendix B).

Additional strategies developed to ensure successful results are discussed in more detail below.

2.3.1 *Educational Material*

Lack of awareness and the importance of education was a primary goal of the Rural H₂O project and was the basis for successful execution of appropriate prompts and incentives. As such the following materials were distributed to homeowner throughout the program in concert with prompts and incentives depending on the circumstances and parameters involved in properties of individual homeowners.

All participating homeowners were given a variety of “Drop on Water” information pamphlets from Nova Scotia Department of Environment (2008) which were delivered through kitchen

table style meetings. Included in the “Drop on Water” book were the quotes from the beginning of this report. These were read to every participant to re-enforce the importance of looking after the water in the environment. Handouts in the book included the following:

- Protecting your Drinking Water
- Sources of Drinking Water
- Online Interactive Groundwater Map
- Waste Water Septic Systems
- General Chemistry and Metals
- Fluoride
- Arsenic
- Uranium
- Lead
- Nitrate
- Nitrite
- Coliform Bacteria
- PH and Alkalinity
- Corrosive water
- Rain Barrels
- Cisterns
- Well Decommissioning

Homeowners were also given booklets from Nova Scotia Department of Environment related to the project;

“A Guide for Private Well Owners”,
<http://www.novascotia.ca/nse/water/docs/wellwaterbookletEnglish.pdf>

“A Homeowner’s Guide to Septic Systems”, and
<http://www.novascotia.ca/nse/wastewater/docs/Homeowners.Guide.to.Septic.Systems.pdf>

“A Homeowner’s Guide to Heating Oil Tank Systems”
<http://www.novascotia.ca/nse/petroleum/docs/OilTankGuide.pdf> (where oil was used as a heating source). Participants with a riparian zone were given an information pamphlet on

planting riparian zones and a book on riparian zone management produced by Agriculture Canada. <http://www.islandnaturetrust.ca/wp-content/uploads/2010/04/Beneficial-Management-Practices-for-Riparian-Zones-in-Atlantic-Canada1.pdf>

Other educational components included hands on training on how to take a water sample, help planting riparian buffers and instructions on how to install their water barrel.

2.3.2 Prompts and Incentives

Prompts and incentives are available tools to aid in achieving the desired outcome of the target behaviors.

Prompts are effective in reminding people to engage in sustainable behaviours (McKenzie-Mohr 2011). A prompt is a visual or auditory aid which reminds people to carry out an activity that might otherwise be forgotten. The purpose of a prompt is not to change attitudes or increase motivation, but to simply act as a reminder to engage in an action that is already predisposed. To be effective, a prompt should be delivered as close in space and time as possible to the targeted behavior. Financial incentives can provide the motivation for individuals to more effectively perform an activity that they already engage in, such as recycling, or to begin an activity that would otherwise not be performed. Incentives can be an important component of a community-based social marketing strategy, particularly when motivation to engage in a behavior is low. The incentives offered in this project were flexible to better address individual homeowners' circumstances and needs in regards to the variety of behaviours that were targeted.

2.3.2.1 Prompts

Simple reminder mechanisms were an imperative component of the strategies for the delivery of this program.

Reminders to participants commitments to the Rural H₂O program included a project specific 2-year [2014/15 Water Guardian Calendar](#) with reusable stickers to place on the dates when to re-test their water or pump their septic system (Appendix C). The calendar was designed to include relevant topics related to the project goals and included reminders to pump septic systems and test drinking water on every page. A refrigerator magnet with reminders to test drinking water every 6 months for bacteria and every 2 years for chemicals was given to each participant as well. The magnet also included a reminder to pump septic tanks every 3 to 5 years.

A homeowner report detailing specific areas of improvement for the client was sent to the homeowner within 6 months of their assessment (Appendix D). This serves as a record of participation for the homeowner and a reminder of their commitment to ongoing participation in the Rural H₂O Water Guardian Project. Included with the report was a letter signed by the project leader thanking the homeowner for their participation with reminders of participant commitment and the importance of regular water testing. Some homeowners were given a free rain barrel with a noticeable sticker showing participation in the project (Appendix

E). The rain barrel sticker, refrigerator magnet, reminder stickers, and calendar act as reminders for the homeowner as well as conversation starters for friends and neighbors who see them.

2.3.2.2 Incentives

Incentives used during the delivery of the Rural H2O project included vouchers, rain barrels, rebates, native plants and access to support dollars.

Vouchers worth \$100 off the homeowner's next septic tank pump out were given to homeowners in need of a pump out (Appendix F). Some participants received a similar septic tank pump out voucher from the EHAP program as they participated in both programs.

Rain barrels were given to participating homeowners that had a place and practical use for one (*i.e.*, water shortage, garden, lawn, accessible gutters) which included an eye-catching sticker on the rain barrels to promote the project to friends and neighbours of the participants.

Participating homeowners during the first year of the program that had riparian zones were included in a spring planting event from April 18 to May 15, 2013. Homeowners were on site to help with the planting of armouring plants in order to ensure they were located in areas of most benefit to the ecology of the riparian area and to the satisfaction of the participant. Each homeowner received a variety of trees, shrubs, and flowers that provided means for erosion control and water filtration through planted areas. The survival rate of the plants was checked in the fall just before a similar planting was organized and carried out for 2013/2014 participants. The survival rate of the fall planting will be assessed in the spring of 2014.

All participants had access to a well repair rebate which covered for a third of the cost of well repairs to a maximum of \$1,500 (Appendix G). This rebate could be used to offset the cost of a new well installation, repairs to an existing well, decommissioning of an old well, or for the installation of a water filtration system. A household net income of \$50,000 or less was required to qualify for the repair grant.

Homeowners with storm water issues had access to \$500 in support funds to help in the installation of berms or French drains to redirect the flow of storm water (Appendix H). The funds could also be used for rain gutter installation to stop rainwater from entering a basement and redirect rain water away from homes.

2.4 Program Delivery

The Rural H2O Program was implemented between September, 2012 and December, 2013 to homeowners that had both septic systems and private wells on their property (*i.e.*, no municipal services for sewer or drinking water were available).

In the initial planning of the delivery of the program, collection of spatial data of participants' wells, septic systems, homes, outbuildings and property perimeters were conducted followed

by a kitchen table education session. However, due to the time involved with the kitchen table educational aspect of the program and the importance of this component for success of the program, the GPS portion of the program was discontinued due to time constraints.

The Rural H₂O project was first delivered to new EHAP clients. After an Environmental Home Assessment, the homeowner was given the option to sign on to the Rural H₂O Water Guardian program and gain access to the incentives available. When the yearly quota for EHAP's was reached, former EHAP clients were notified and given the option to sign on as a Water Guardian. This resulted in achieving sufficient participation to fulfill the client quota for the first year of the pilot project.

Word of mouth, information on CARP's website about the project and a press release in local papers in the fall of 2012 resulted in a waiting list of more than 70 homeowners interested in participation in year two. Word of mouth from these 70 participants, a booth promoting Rural H₂O at the Lawrencetown Exhibition, and a presentation to a community homeowners association along with e-mails to MLAs, Councilors and Wardens, Waste Water contractors, and Community Health boards resulted in enough rural homeowners for year two of the pilot (125) and a waiting list of over 30 homeowners who expressed interest in future participation. No formal advertising was required or used to promote the Rural H₂O Water Guardian project in year two of the project.

A Rural H₂O assessment consisted of an onsite property visit, an introduction to the goals of the project and the incentives available, and a signed commitment with the homeowner to test their water regularly and adhere to the principles of the project before proceeding with the actual assessment (refer to Appendix B). A brief look around the property identified available water resources and potential sources of pollution and was followed by a kitchen table education session with the homeowner. The assessment identified issues specific to the property and addressed homeowners concerns regarding associated aspects of the project. Suggestions for remediation were discussed with the homeowner and available resources were shared with homeowners to aid in the remedial work necessary to ensure benefits to both human and environmental health. An assessment took from 1.5 to 3 hours depending on project related property issues and questions the homeowner may have. The assessment included education and information on all six goals of the project.

2.4.1 Regular Water Testing

To promote regular testing of water every six months for bacteria and every two years for chemicals, the homeowner was shown the relationship between surface and ground water and how they interact with each other. Specifically, it was demonstrated how the quality of the water on rural properties can change over time and what factors can influence that change. The homeowners were also shown groundwater maps of the province highlighting the prevalence of arsenic and uranium in Nova Scotia.

A brief inspection of the well or water supply with the homeowner was used to identify possible repairs the well or water supply needed to aid in the delivery of good quality water to the home. Homeowners were shown how to properly collect a water sample and were left

with all required supplies to gather their own water samples and transfer the samples to a lab for testing. The supplies included ice packs, an insulated envelope for transport to the lab, and courier supplies as needed.

In year one of the project, clients in the Annapolis Royal area were able to drop both the bacteria sample and the chemical sample at the Annapolis Royal Community Health Center where the bacteria sample was sent to the Valley Regional Hospital in Kentville for testing and the chemical sample was forwarded on to Capital Health's Environmental Services Laboratory in Halifax for testing. Clients in Digby, Yarmouth and Kings Counties had to use a courier to transport the chemical samples to the lab in Halifax while the bacteria samples were delivered by the homeowner to the local hospital and were forwarded to Valley Regional in Kentville or to Yarmouth Regional hospital for testing.

In year two of the project, discussions about accessibility to water testing with lab managers in all the local hospitals and Capital Health in Halifax resulted in homeowners being able to drop both of their samples off at the local hospital in the community: Valley Regional (Kentville), Soldiers Memorial (Middleton), Digby General (Digby), or Yarmouth Regional (Yarmouth). The local hospital would forward the samples to either Valley Regional or Yarmouth Regional to test for bacteria and the chemical sample would be forwarded on to Capital Health's Environmental Services Laboratory in Halifax. The samples were shipped via the hospital's internal delivery system used for blood collection and delivery. There was no charge to the homeowner for this service. This change in service greatly reduced the inconvenience and cost barrier for chemical testing and should continue for rural homeowners in the future.

The cost of the first bacteria test and the courier was paid for by CARP with the use of a "Water Quality Test Voucher" left with the homeowner (Appendix I). The first chemical test was put directly on CARP's account with the lab. Initially this was paid for with the voucher as well but the combined cost of the courier and the 2 tests proved to be a financial barrier for many participants. Eliminating the courier helped to reduce the initial outlay of funds to the homeowner for their first test and in the future when no assistance is available will make chemical testing more convenient and more affordable.

Failures of water quality tests resulted in suggestions to install an ultraviolet light filtration system to remediate bacteria problems or some other type of purification system to treat harmful chemicals in the water. In some situations, a new well was suggested to be the best solution. In the case of lead contamination, it was suggested to replace the old water pipes with new plastic lines. The homeowner was made aware of any assistance available to help in any well repairs, construction or filtration system installation.

The drinking water test results provided a baseline condition of homeowners' water supply. Homeowners signed commitments to do additional water testing to see if water quality remained good over time and were left with reminders regarding future timing for bacteria (every 6 months) and chemical tests (every 2 years). Completion of the project required the results of four bacteria tests over two years and two chemical tests, however, homeowners were encouraged to continue with this testing regime indefinitely.

2.4.2 Sustainable Water Use

To promote the sustainable use of water resources, homeowners learned to spread major water uses over time to allow recharging of the water supply. Demonstrations were provided of the benefit of using a rain barrel to capture water from rooftops for use in watering lawns or gardens. In addition, rain barrels can prevent roof water from flooding a septic bed and serve to keep excess water away from the foundation of the homes as well as aid in preventing erosion from water runoff.

The first fifty interested participants in year one of the pilot were given a rain barrel to provide a practical solution to help in the sustainable use of water as well as storm water management. In year two, the first fifty participants that carried out water testing were given a free rain barrel. Homeowners were also encouraged to install additional rain barrels or cisterns where practical.

Supplying the first rain barrel allowed homeowners to conserve well water for household use, reduce storm water runoff from the roof, and prevent erosion around their downspout. Homeowners with limited water resources realized the benefits of having a rain barrel and understood how additional barrels or a cistern could be more beneficial and supply the extra water required for maintaining a garden or lawn.

Homeowners were praised for any water saving devices already in place and participants were made aware of all the water saving devices available for the home (showerheads, aerators, washers, etc.) alongside the associated benefits.

2.4.3 Storm Water Management

Homeowners were shown how devastating storm water damage can be to the landscape, surface water and groundwater. Specifically, fast flowing water can be significantly destructive and storm water can transport environmental pollutants and deliver them to surface waters including streams, lakes, rivers and, ultimately, the ocean. It was also communicated how pollutants present in the surrounding environmental can make their way into the ground water and local well water.

Homeowners were given information on rain gardens and how actions they take can play a role in dissipating the effects of storm water runoff. If a rain garden was suggested to aid in storm water management for their situation, the homeowner was supplied with plants recommended for use in rain gardens and given instructions and help in designing and planting a garden that was appropriate for their property.

Homeowners learned how to reduce flooding and storm water damage around the foundation of the home with the use of rain gutters and ensuring the ground slopes away from the foundation. Some homeowners were in a situation that required the installation of a swale, a French drain or a berm to eliminate or control storm water runoff. Flexibility in rebates and incentives allowed for the most practical use of funds available for each individual situation.

Homeowners were also encouraged to follow suggestions that provided the best control over storm water runoff along with access to any available assistance.

Education on storm water runoff also emphasized the importance of regular water testing to homeowners due to an increase understanding of the impacts of storm water on ground water contamination. Learning about storm water runoff also showed homeowners the importance of individuals' role in protecting groundwater and how actions and inactions of neighbors can impact well water on nearby rural properties.

2.4.4 Riparian Zone Management

Where a riparian zone was on or adjacent to the homeowner's property, efforts were made to encouraged homeowners to see that it was kept in a healthy state. Homeowners were shown the different characteristics between healthy and unhealthy riparian zones, the importance of healthy riparian zones, as well as actions to maintain or improve the health of riparian zones on the property.

Homeowner were given information on armouring plants used to prevent erosion and how they can be used if the riparian zone on the homeowner's property was in need of erosion control. They were also given a book produced by Agricultural Canada on riparian zone management and learned that healthy riparian zones reduce the risk of flooding, prevent erosion, provide habitat for a variety of wildlife and provide thermal refuge and cover for fish and other aquatic species.

Homeowners were given access to any available incentives to assist in developing and maintaining a healthy riparian zone on their property. All year one participants with riparian zones had access to armouring trees, shrubs, plants, and assistance in planting from April 15 to May 15, 2013. Year two participants had the same opportunity from October 22 to November 14, 2013.

2.4.5 Septic System Management

As indicated above, participating homeowners were required to have an onsite septic system as well as their own water supply.

Homeowners were shown how a septic system works and the importance of regularly pumping the septic tank. They learned what not to put in their septic system and why it is important to spread out major household water use over time so as not to saturate the septic bed. Homeowners were encouraged to use environmentally friendly products for cleaning and laundry in their home. Homeowners were shown how storm water runoff can affect septic beds and what to do to prevent septic systems from polluting the local groundwater. Homeowners were shown how harmful hair and lint and can be to a septic system and what they can do about it.

Homeowners were asked to commit to regular septic tank pumping (every 3 to 5 years) in the future.

2.4.6 Pollution Prevention

The overall objective of the Rural H₂O pilot project was pollution prevention. By showing rural homeowners how the hydrological system works and how ground water is stored and extracted, there was an increased awareness of the interactions between surface and groundwater. This provided a better understanding of how household water supply can become polluted and how important homeowners' actions are in pollution prevention.

Homeowners were asked to reduce the cosmetic use of pesticides and fertilizer on lawns to aid in pollution prevention. They were asked to dispose of hazardous and toxic substances in the proper manner and were shown how and where to do so. Homeowners learned how well water can be affected by external forces beyond their control (neighbours, industry, weather, etc.) and that regular testing of well water is the only way to ensure that it is safe for drinking.

Homeowners that were able to accomplish all the goals of the Rural H₂O project relative to their particular situation were very proactive on pollution prevention through their actions alone. Homeowners who participated in the project but were unable to accomplish all the goals still contributed to pollution prevention.

3.0 Results and Discussion

The Rural H₂O project experienced high demand with rural homeowners in Kings, Annapolis, Digby and Yarmouth counties. Two hundred and twenty three homeowners signed commitments to test their water every 6 months for bacteria and every 2 years for chemicals and strive to accomplish the goals of the project. A waiting list of over 30 rural homeowners was also collected for future participation should the project continue beyond the pilot program.

Over 80% of participants actually followed through and tested their water. Based on the results of the water testing and homeowners individual situations, 25 well repair grants each valued at up to \$1500 were given out as well as 9 storm water remediation grants each worth \$500 (Table 1).

Table 1: Grants issued and redeemed

2012-2014	Kings	Annapolis	Digby	Yarmouth	Total
# Of Clients	56	110	36	21	223
Well Repair Grants Issued	1	11	10	3	25
Grants Redeemed	1	3	9	1	14
Storm Water Repair Grants Issued	1	3	2	3	9
Grants Redeemed	1	3	1	1	6
Total Grants Issued	2	14	12	6	34
Total Grants Redeemed	2	6	10	2	20

Participating homeowners were happy to respond to a request for suggestions and testimonials. The following is a summary of over 40 suggestions and testimonials that were received by CARP (Appendix J);

- Many participants shared information with friends, family and neighbours
- Few would have checked their water otherwise
- Many have significantly altered their behavior
- Would like to see testing included for road salt runoff
- Most people did not know that water should be tested in the first place
- Suggestions to advertise in high-risk areas
- Enables informed decision-making
- Valuable program
- Well presented, very informative

3.1 Regular Water Testing

Once people were shown how their well or source of drinking water can be affected by their actions and how their water supply has the potential to get polluted by storm water run-off, they realized the importance of regular water testing. When they were made aware of the incentives and rebates available to aid them in insuring their water supply is safe to use, they were willing to commit to regular water testing.

Of the 223 rural homeowners who signed commitments, 183 (82%) have tested their water to date (Table 2, Figure 1). A slightly higher percentage of Water Guardians from Annapolis and Digby counties participated in water testing than Water Guardians in Kings and Yarmouth counties. A higher percentage of drilled wells were tested than dug wells and all the participants with sandpoints and cisterns tested their water quality.

Table 2: Wells tested

Well Type	Kings	Annapolis	Digby	Yarmouth	Total	% Total	# Tested	% Tested
Drilled Wells	51	80	18	4	153	69%	126	82%
Dug Wells	1	22	18	17	58	26%	46	79%
SandPoint	2	6	0	0	8	4%	8	100%
Spring	1	2	0	0	3	1%	2	67%
Cistern	1	0	0	0	1	0.4%	1	100%
Total Water Supplies	56	110	36	21	223		183	82%
Total Tested	42	95	31	15	183			
% Tested	75%	86%	86%	71%		82%		

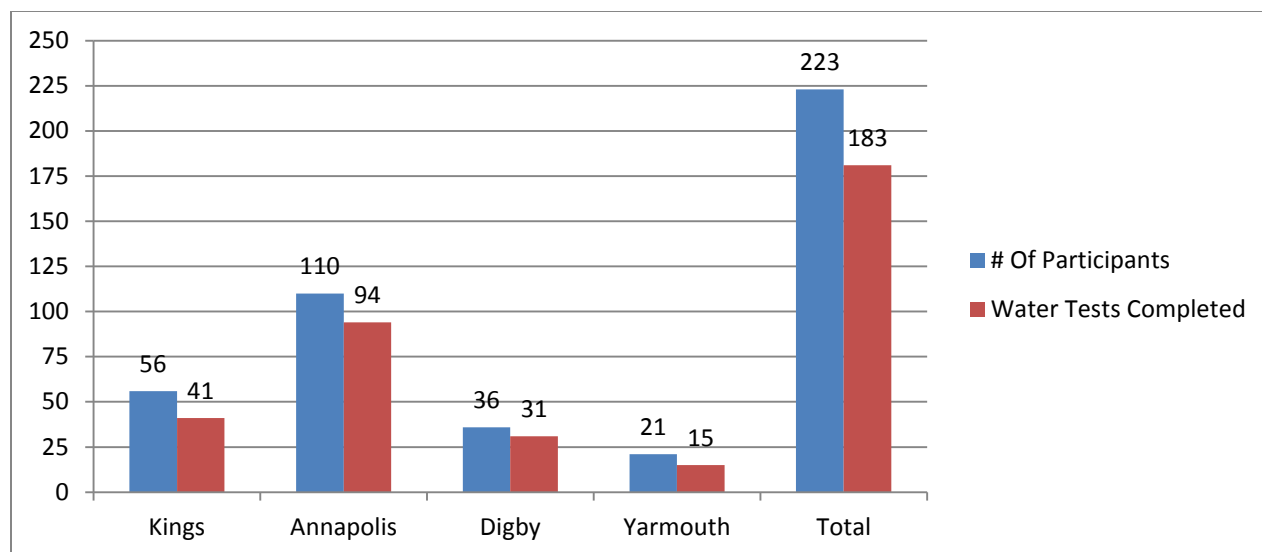


Figure 1: Wells tested by County

The acceptable level of coliforms or *E-coli* in drinking water is 0. *E-coli* were detected in 11 (6%) of the 183 wells tested while fecal coliforms were found in 56 (31%) of the 183 wells tested (Table 3, Figure 2). More testing in Annapolis County resulted in higher overall numbers and showed a slightly higher contamination rate of *E-coli* (8.5%) than the project average. Digby County showed elevated contamination levels of coliforms (45%) than the project average. In wells where *E-coli* were detected, coliforms were always found whereas counts were often present for total coliforms in the absence of *E-coli*.

Table 3: Bacteria detected

2012-2014	Kings	Annapolis	Digby	Yarmouth	Total	% Total
# Of Participants	56	110	36	21	223	
Water Tests Completed	42	95	31	15	183	82%
E-Coli - Unacceptable Levels	0	8	2	1	11	6%
Coliforms - Unacceptable Levels	7	26	14	9	56	31%

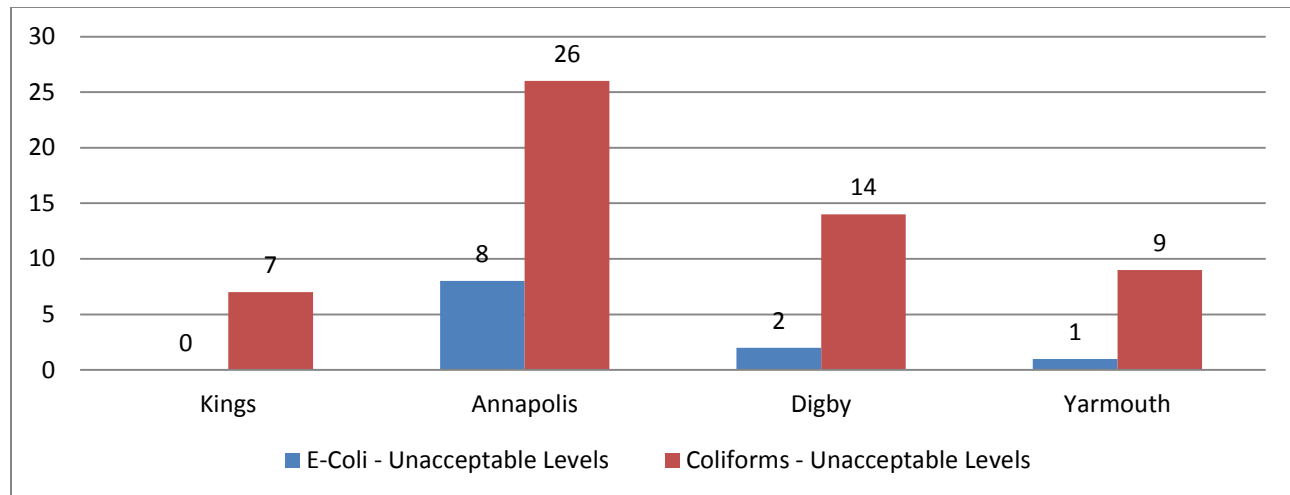


Figure 2: E-coli and coliforms by County

The acceptable level of arsenic, lead, fluoride, and nitrate/nitrite is 10 micro grams per liter ($\mu\text{g/L}$). Uranium is acceptable up to 20 $\mu\text{g/L}$. Arsenic was at unacceptable levels in 8 of the 58 wells it was detected in (Table 4, Figure 3). Uranium was at unacceptable levels in 6 of the 32 wells it was found in, and lead was at unacceptable levels in 6 of the 33 wells it was detected in. Fluoride and nitrate/nitrite although plentiful throughout the tested wells, were never found to be in excess of the acceptable levels. Although there was a larger sample size in Annapolis County, similar results were found in all counties.

Table 4: Chemicals detected

2012-2014	Kings	Annapolis	Digby	Yarmouth	Total	% Total
# Of Participants	56	110	36	21	223	
Water Tests Completed	42	95	31	15	183	82%
Arsenic	12	35	6	5	58	32%
Unacceptable Levels (arsenic)	0	5	1	2	8	4%
Uranium	7	25	0	0	32	17%
Unacceptable Levels (uranium)	2	4	0	0	6	3%
Lead	9	9	8	8	34	19%
Unacceptable Levels (lead)	0	2	2	2	6	3%
Fluoride	7	9	2	1	19	10%
Unacceptable Levels (fluoride)	0	0	0	0	0	0%
Nitrate/Nitrite	30	80	25	13	148	81%
Unacceptable(nitrate/nitrite)	0	0	0	0	0	0%

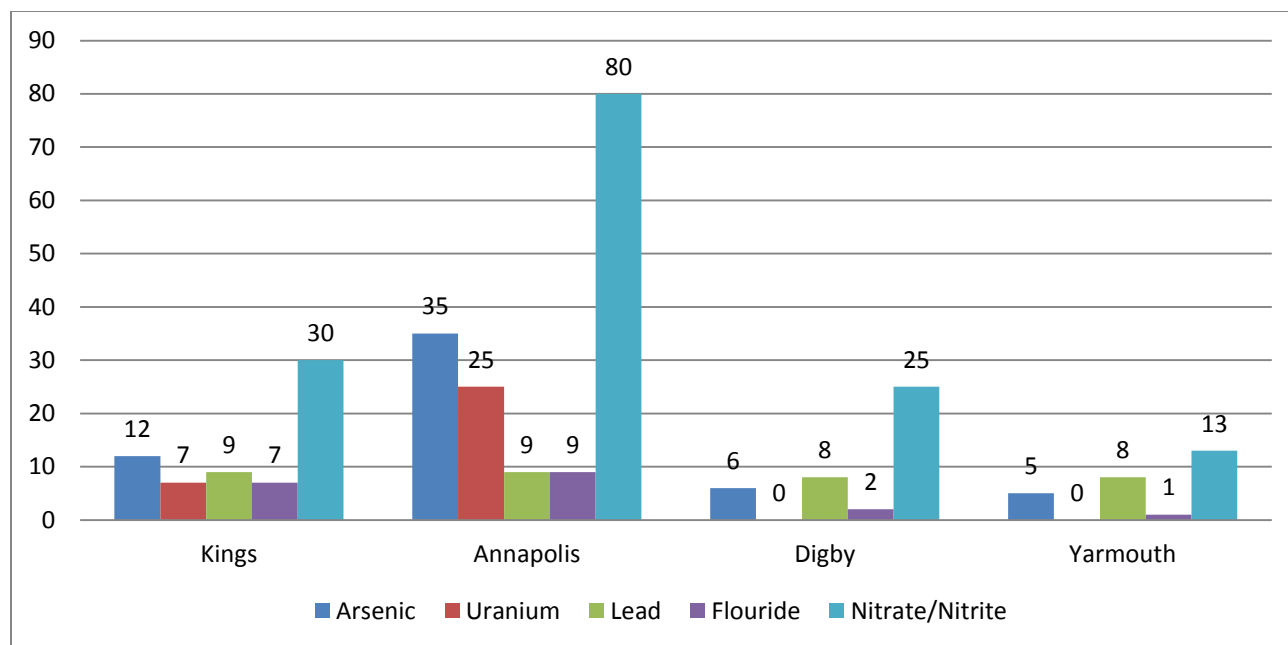


Figure 3: Chemicals detected by County

Of the drilled wells, 45% were found to have arsenic present compared to 13% of dug wells (Table 5, Figure 4). Almost 21% of drilled wells had uranium present compared with less than 9% in dug wells. Lead, however, was found to be present in only 11% of drilled wells and 37% of dug wells. Nitrate/nitrite were found in 87% of dug wells and almost 81% of drilled wells. Fluoride was detected in only 2% of dug wells compared to 15% of drilled wells. Bacteria (*E-coli* and coliforms) was found in over 67% of dug wells but was detected in less than 18% of drilled wells.

Table 5: Presence of contaminants by well type

Well Type	Number Tested	E-coli detected	Coliforms detected	Arsenic detected	High Levels Arsenic	Uranium detected	High Levels Uranium	Lead detected	High Levels Lead	Fluoride detected	Nitrate detected
Drilled well	124	1.58%	17.74%	40.32%	6.45%	20.96%	4.03%	11.29%	2.42%	15.32%	80.64%
Dug Well	46	17.39%	67.39%	13.04%	0	8.69%	2.17%	36.95%	6.52%	2.17%	86.95%
Other	11	9.09%	27.27%	18.18%	0	18.18%	0	27.27%	0	0	54.54%
Total	183	6.01%	30.60%	31.69%	4.37%	17.49%	3.28%	18.58%	3.27%	10.93%	79.78%

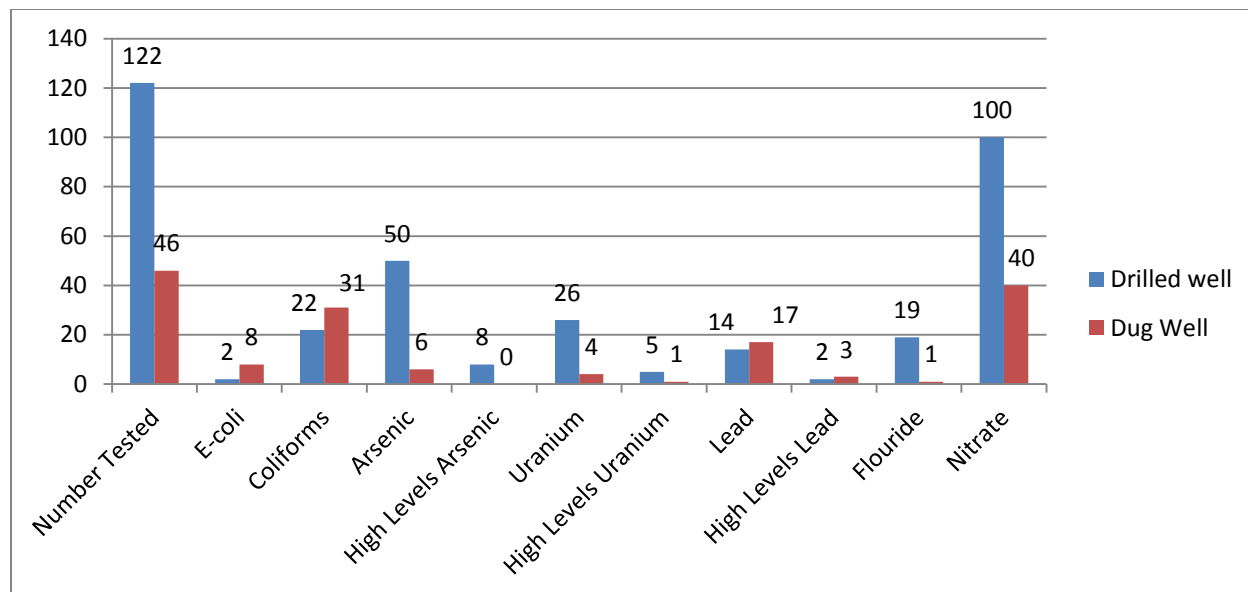


Figure 4: Well type versus contamination comparison

A series of maps showing contamination levels of coliforms, *E-coli*, and all the chemicals tested for provided a better visual of how extensive contamination levels were and where high concentration or unacceptable levels were located (Figure 5 to Figure 11). The acceptable level of coliforms and bacteria is 0. Arsenic, lead and fluoride are acceptable at levels < (less than) 10 µg/L (micro grams per litre) and uranium is acceptable at <20 µg/L.

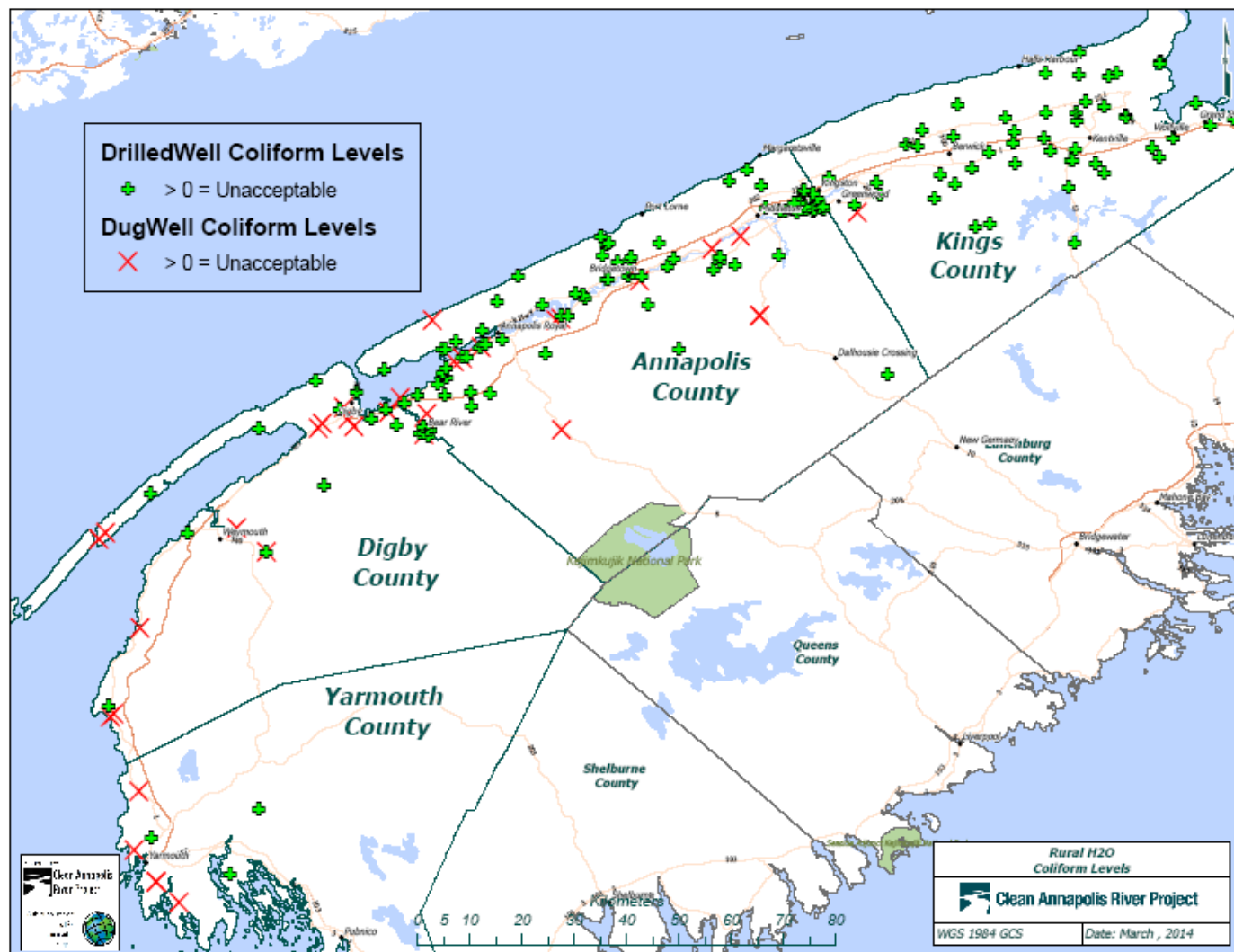


Figure 5: Coliforms detected (acceptable level is 0)

Coliforms can only be detected through testing; they have no taste, smell, or colour. Coliforms are not acceptable at any level and are an indication that there may be disease carrying micro-organisms present. Boiling water can destroy coliforms, making it safe for use until the source of contamination can be determined and remediated (Nova Scotia Department of Environment 2008).

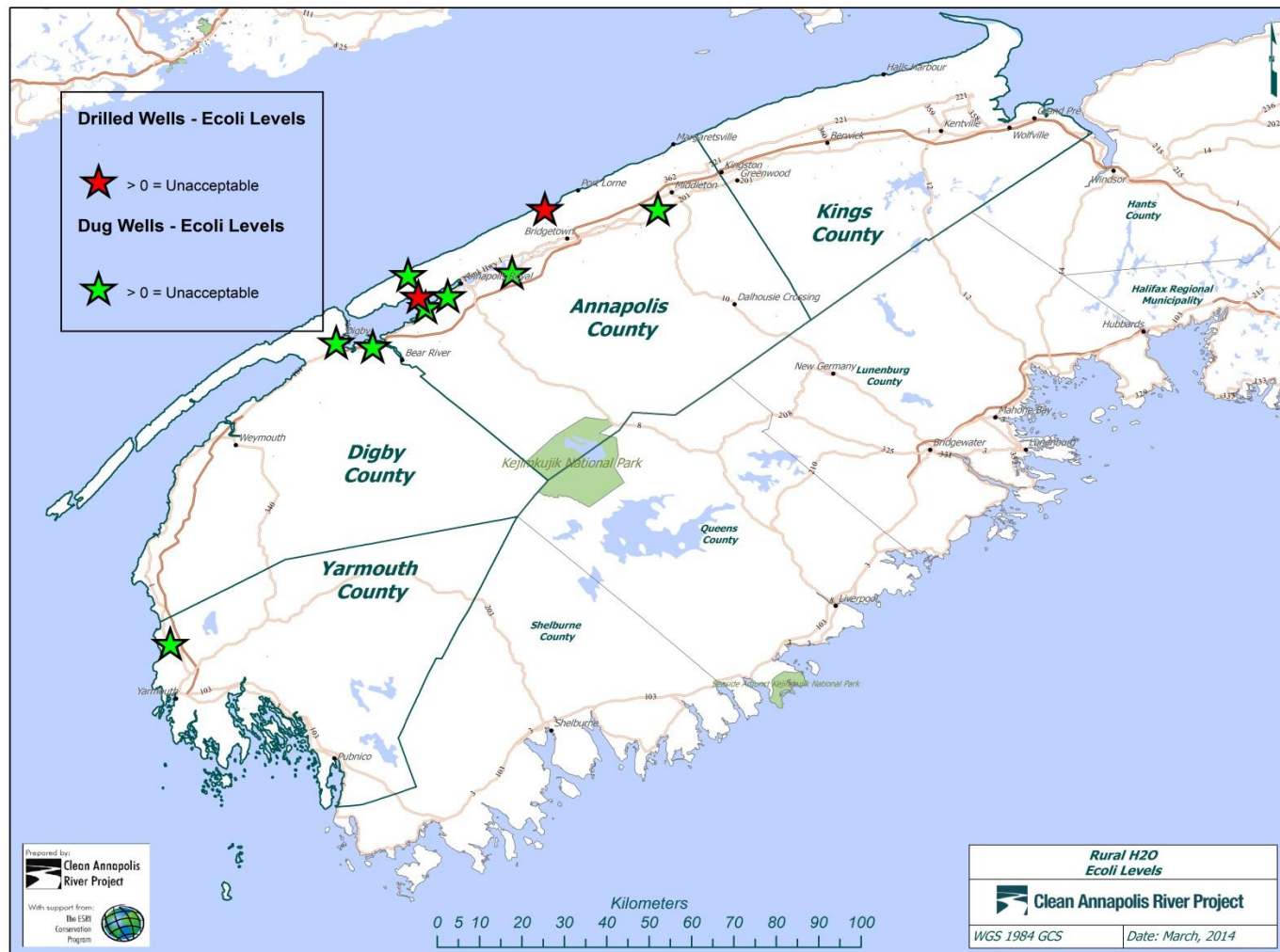
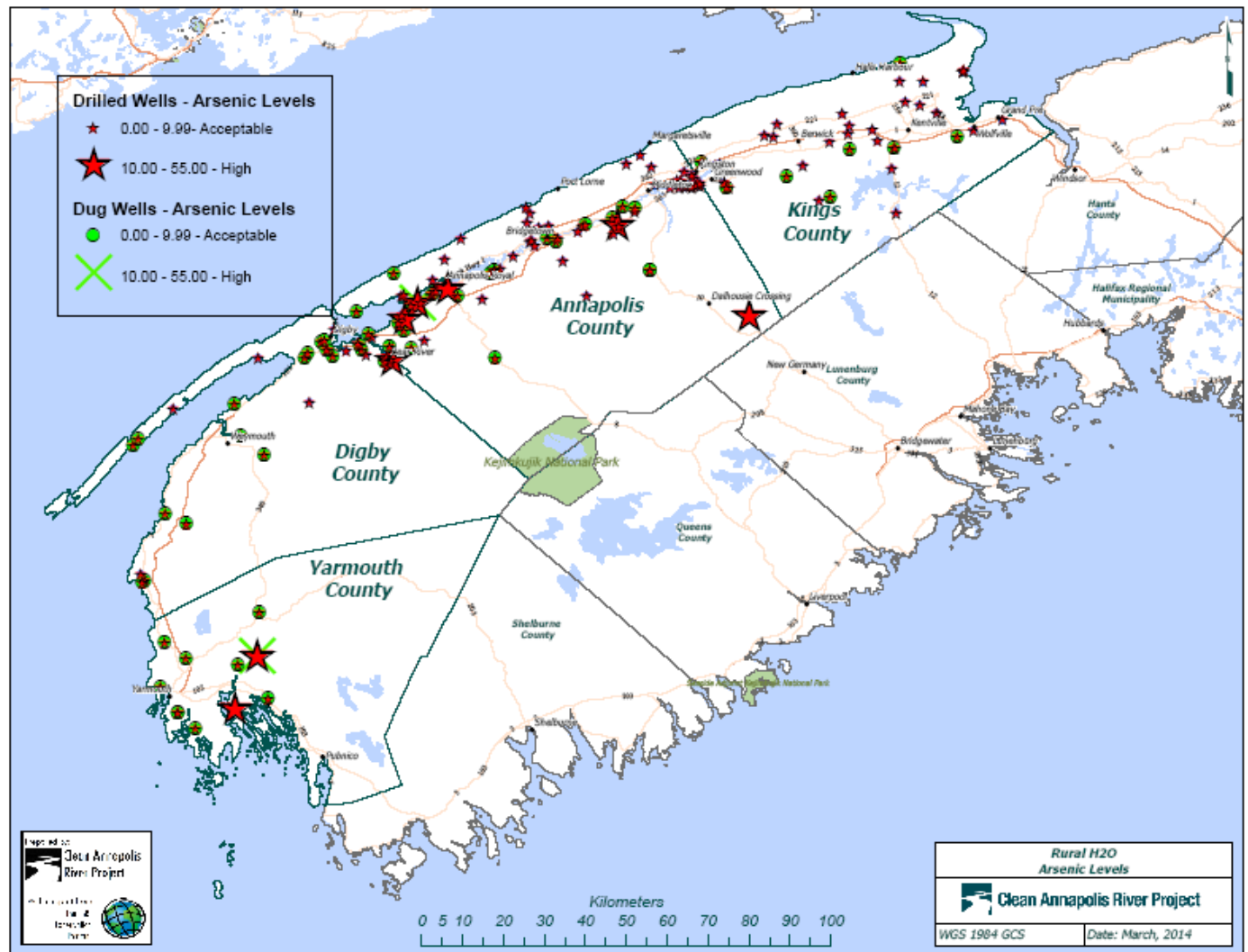


Figure 6: E-coli detected (acceptable level is 0)

E-coli detected in drinking water means that fecal contamination has occurred and disease carrying micro-organisms may be present. Bacteria (*E-coli*) usually get into wells through surface water runoff or may be present in shallow aquifers where bacteria can be found naturally. Health risks associated with *E-coli* include nausea, vomiting, and diarrhea. In extreme cases the lungs, skin, eyes, nervous system, kidneys and liver can become infected and the results can be fatal. Boiling water can destroy bacteria, making it safe for use until the source of contamination can be determined and remediated (Nova Scotia Department of Environment 2008).



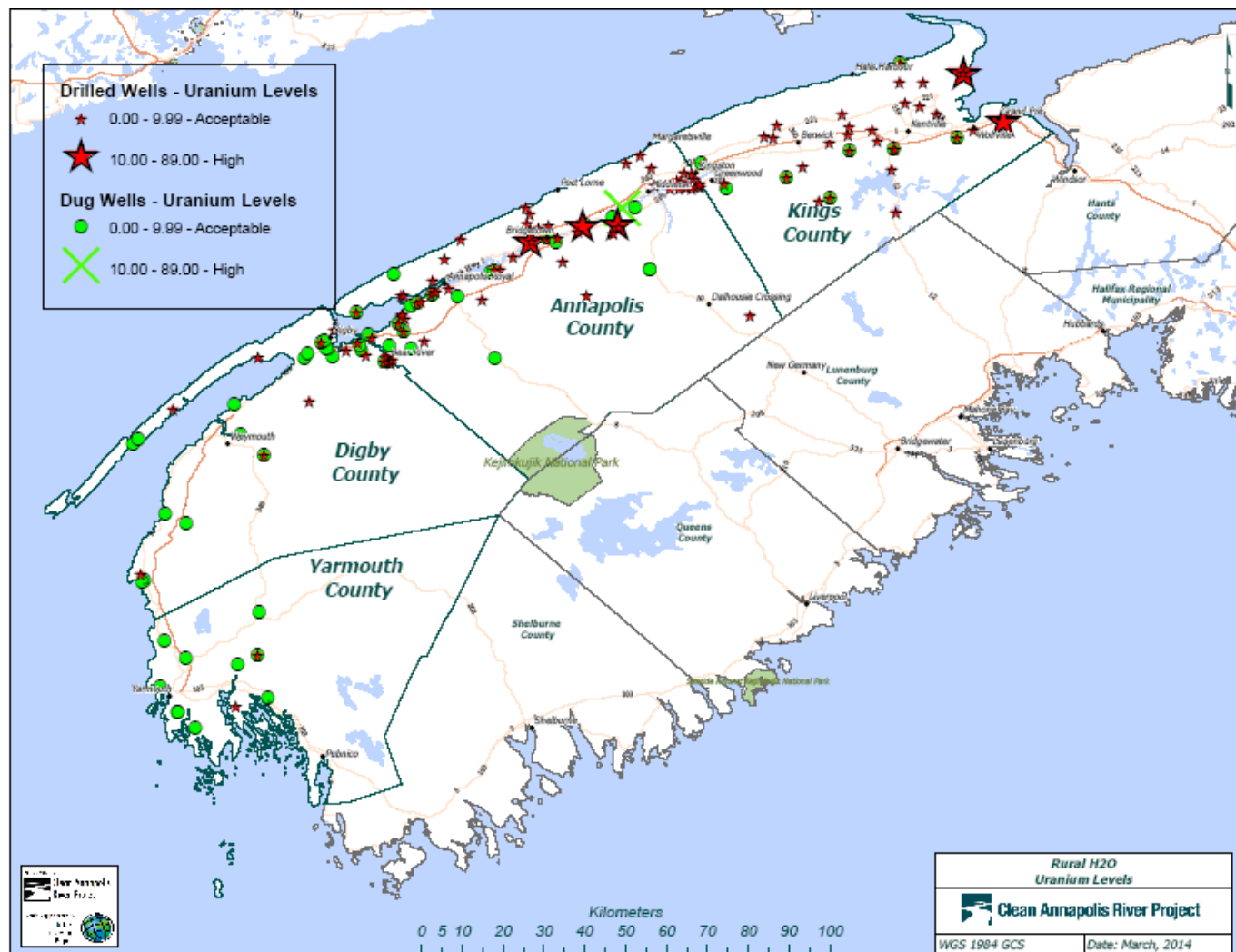


Figure 8: Uranium detected (acceptable level is $< 20 \mu\text{g/L}$)

Uranium is naturally occurring in bedrock and soil throughout Nova Scotia. Some areas are more likely to have elevated levels of uranium in ground water due to the geology of the area. Uranium is odorless, colourless, and tasteless. The only way to verify the presence of uranium is to test the water.

Uranium above the acceptable level in drinking water can increase the risk of kidney damage (Nova Scotia Department of Environment 2008).

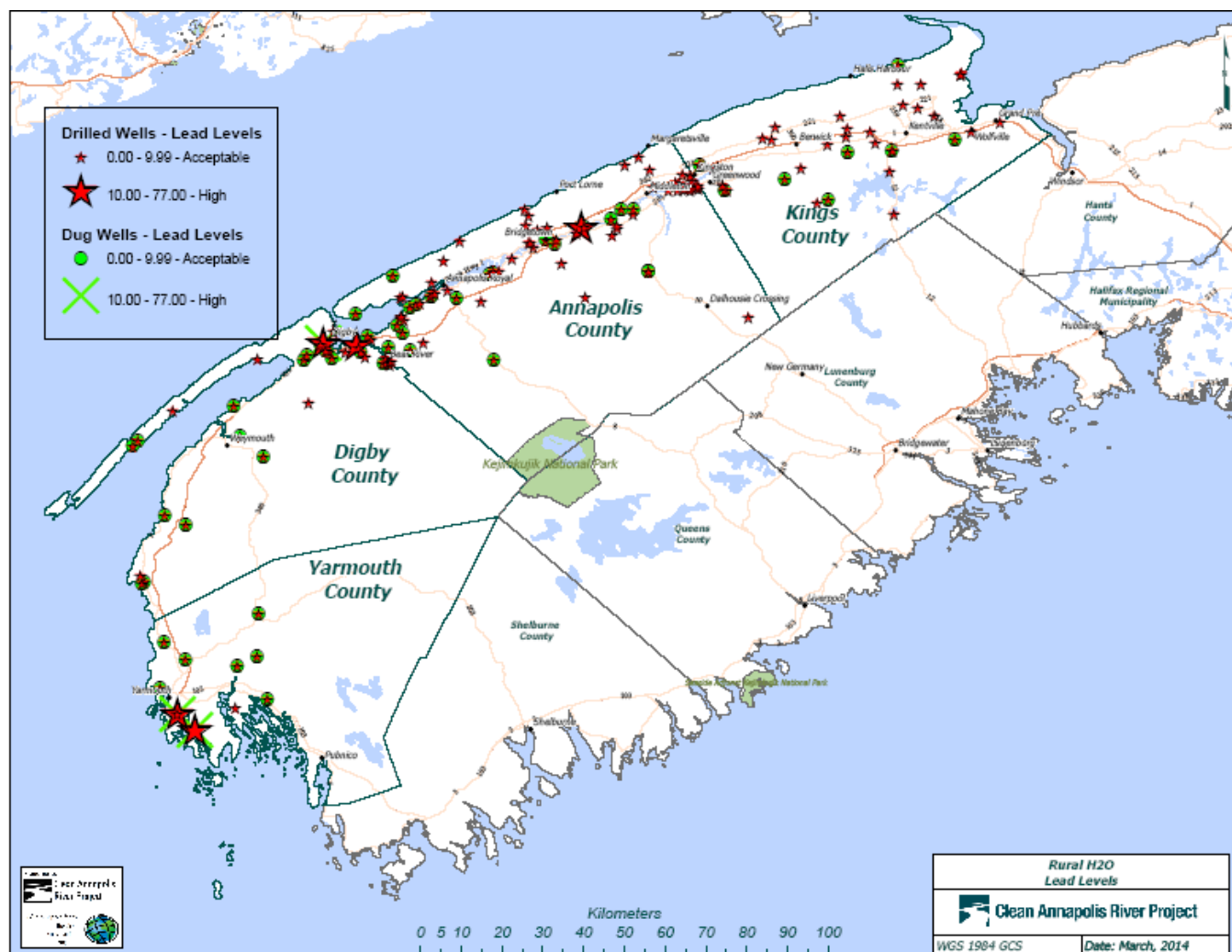


Figure 9: Lead detected (acceptable level is $<10 \mu\text{g/L}$)

Lead was detected in a large number of wells, most often at acceptable levels. The distribution of lead in the wells tested reflects the promotion of the Rural H₂O Water Guardian Project in that where a well was assessed the participant would encourage their neighbour to test as well. That is why there are drilled and dug wells that appear to be in the same location, they are so close that on a map of this scale their symbols overlap or show up on top of each other.

Lead above the acceptable level in drinking water can cause a variety of adverse health effects such as high blood pressure, kidney damage, anemia, digestive problems, nerve disorders, memory loss, muscle and joint pain, fatigue, irritability, and headaches. Excessive levels of lead in drinking water can be harmful to children, causing them to suffer from damage to the brain and nervous system, have delays in physical and mental development, cause behaviour and learning disabilities and possible hearing (Nova Scotia Department of Environment 2008).

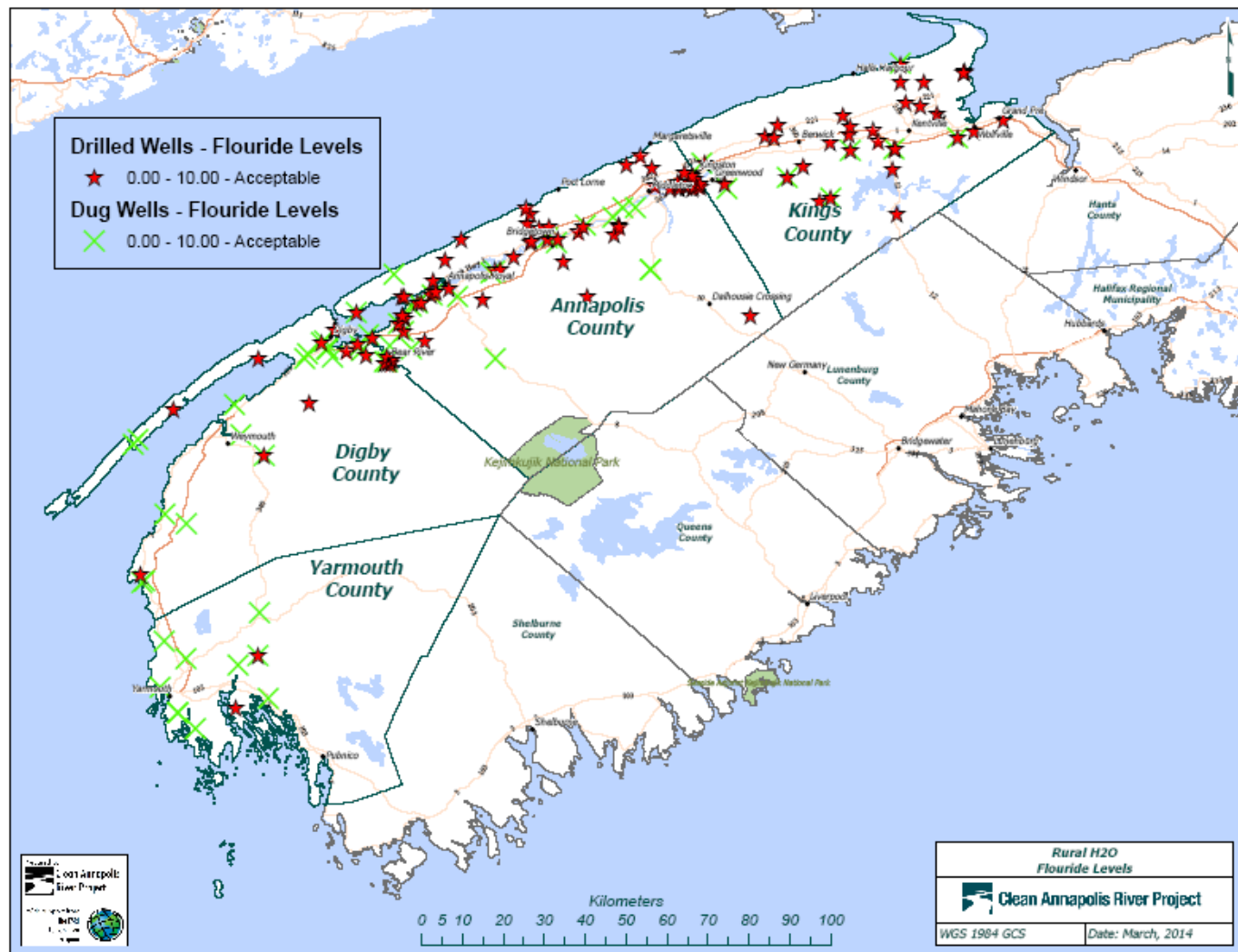


Figure 10: Fluoride detected (acceptable level is 10 µg/L)

Fluoride is naturally occurring in the groundwater of Nova Scotia. Exposure to concentrations of fluoride above the acceptable level can cause tooth discolouration, white spots and tooth enamel degradation (Nova Scotia Department of Environment 2008). Long term exposure to unacceptable levels can result in chronic joint pain, restriction of mobility and lead to an increased risk of bone fractures. Fluoride was never found above acceptable levels in water tests done through this project.

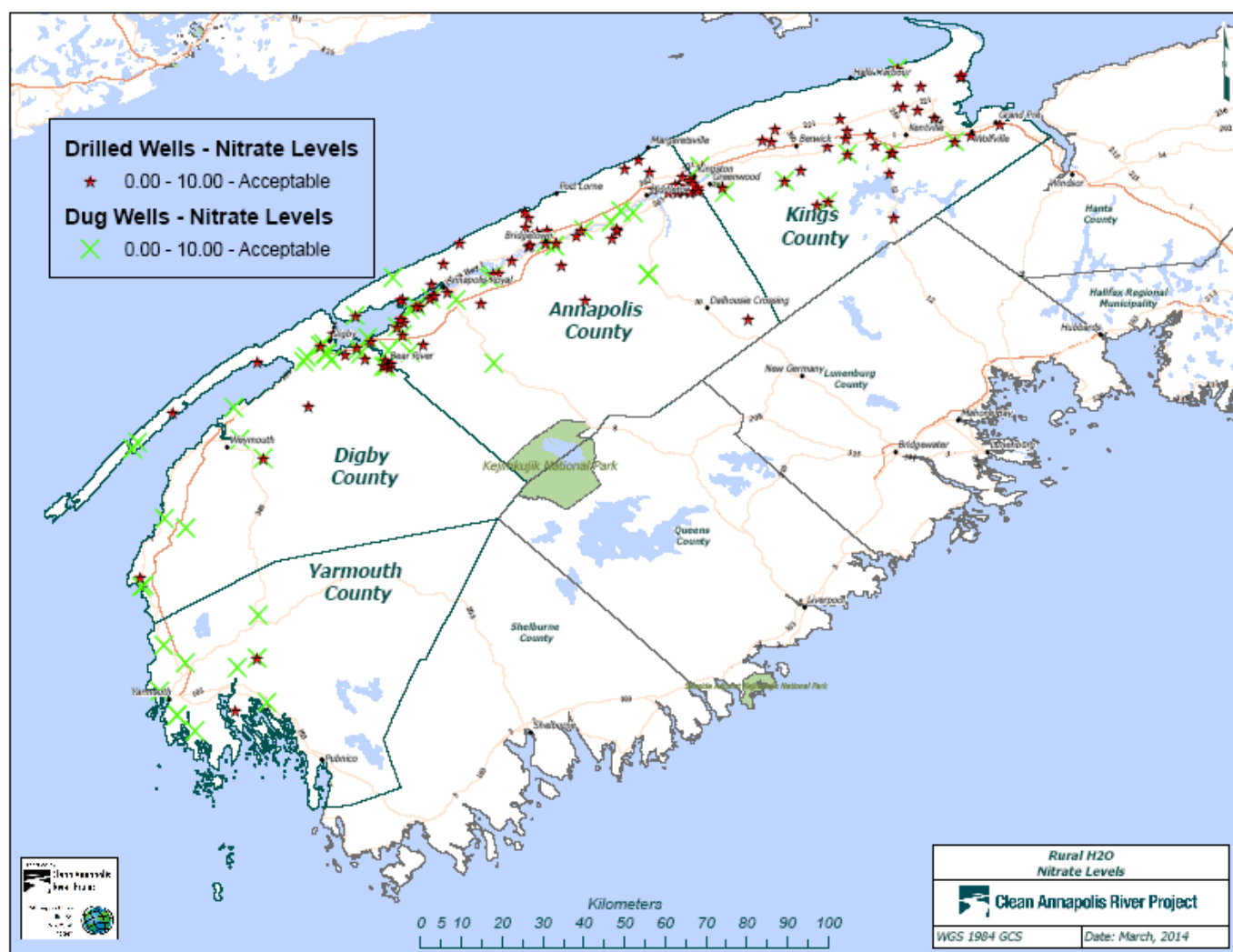


Figure 11: Nitrite/nitrate detected (acceptable level is $<10 \mu\text{g/L}$)

Nitrate/nitrite in groundwater comes from agricultural fertilizers, decomposing plant and animal material, livestock manure, and septic systems. Nitrate/nitrite above acceptable levels in drinking water can be harmful to infants under 6 months of age causing diminished oxygen carrying capability of the blood (Nova Scotia Department of Environment 2008). This may result in a condition called blue baby (bluish colored skin) and in extreme cases, death.

Nitrate/nitrite was never found above acceptable levels in water tests done through this project.

These maps show that the majority of wells are not tested, and with the widespread contamination of coliforms, e-coli, arsenic, lead and uranium, much more testing needs to be done.

There are approximately 390,280 households in Nova Scotia (Statistics Canada 2011a). Of those, approximately 36% (140,500) have their own private water supply in the form of a dug well, a drilled well or other (sand point, spring, cistern) (Statistic Canada 2011b).

If it is assumed that conditions province wide are similar and the proportion of contaminated wells found in this pilot project (refer to Tables 3 and 4) is applied to the estimated 140,500 rural homeowners that have their own water supply, over 4700 households could have unacceptable levels of uranium and lead, more than 6300 could have excessive amounts of arsenic, 44,000 plus homes could have fecal coliforms in their household water supply and approximately 8600 wells could be contaminated with *E-coli* (Table 6). That makes over 67,000 rural households in Nova Scotia whose residents can be protected from drinking contaminated water simply by testing their water. With an average of 2.3 residents per household, (Statistics Canada 2011a) that translates to 155,675 rural residents potentially affected by poor quality water.

Remediation of some sort would also be required to obtain and maintain good quality water at those locations. These projected numbers are estimates only, actual contamination levels can only be determined through water quality testing.

Table 6: Provincial projection for well contamination

Provincial Projection for Well Contamination	Drilled Wells	Dug Wells	Other	Total
% of Total Wells	69%	26%	5%	100%
% of wells tested with high Arsenic levels	7%	0	0	4%
Projected # of wells with high Arsenic levels Province wide	6313	0	0	6313
% of wells tested with high Uranium levels	4%	2%	0	3%
Projected # of wells with high Uranium levels Province wide	3942	792	0	4734
% of wells tested with high lead	2%	7%	0	3%
Projected # of wells with high Lead levels Province wide	2158	2381	0	4539
% of wells tested with e-coli present	2%	17%	9%	6%
Projected # of wells with E-coli present Province wide	1580	6353	690	8623
% of wells tested with Fecal Coliforms present	18%	67%	27%	31%
Projected # of wells with Fecal Coliforms present Province wide	17,378	24,618	2068	44,064
Total Potential Well Contamination Province Wide	30,783	34,144	2758	67,685

3.2 Sustainable Water Use

Promotion of water saving devices and discussions on using water resources responsibly resulted in an increased awareness of why and how to use water in a sustainable manner. 100 rain barrels given to homeowners will result in 20,000 liters (100 x 200L) of rain water recovered with every rain event for future use on lawns and gardens (Table 7).

Table 7: Rain barrel distribution

2012-2014	Kings	Annapolis	Digby	Yarmouth	Total
# Of Participants	56	110	36	21	223
Rain Barrels	21	55	14	10	100

Rain barrels given to participants will aid in storm water management and contribute to sustainable use of water. The education homeowners received on sustainable use of water and storm water management will have an effect on rural homeowners' future actions and a positive effect on pollution prevention.

Water saving devices already in use by homeowners were recorded (Table 8). A chart of water saving devices in use by County showed that use varies some across all four Counties but is fairly consistent (Table 8, Figure 12).

Table 8: Water saving devices

Water Saving Device	Kings	Annapolis	Digby	Yarmouth	Total	% Total
Low Flush Toilet	20	31	10	5	66	30%
Low Flow Shower	20	29	9	5	63	28%
Low Flow Aerators	31	43	19	11	104	47 %
High Efficiency Washer	3	3	1	1	8	4%
Rainbarrel	1	13	1	2	17	8%
None	8	14	6	3	31	14%
Total Participants	56	110	36	21	223	

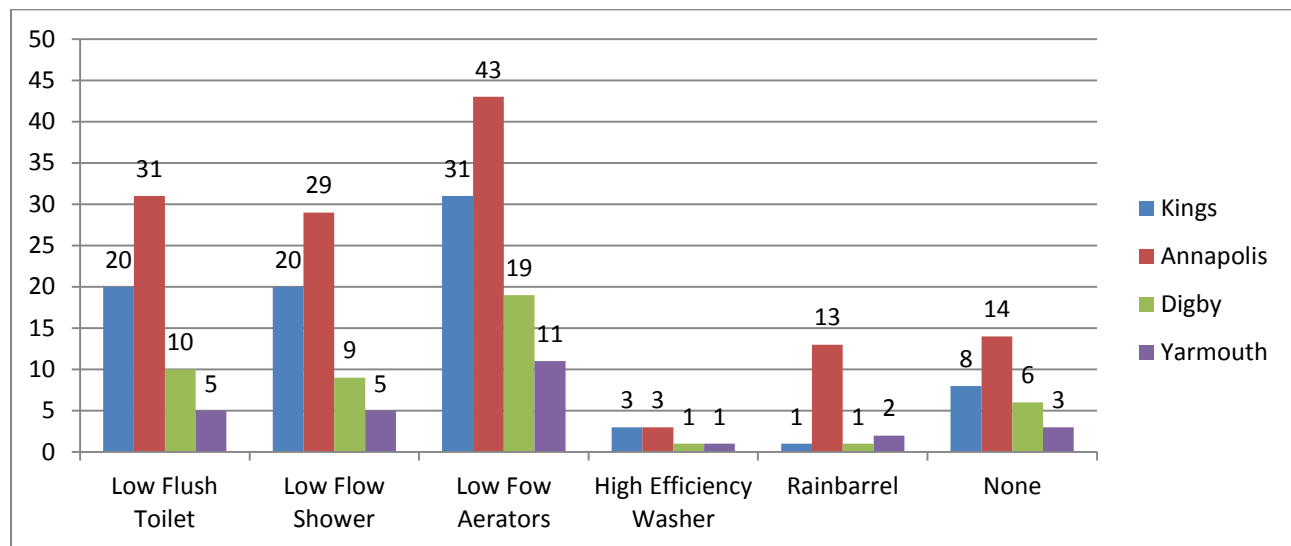


Figure 12: Water saving devices by County

3.3 Storm Water Management

Sixty-five of the 223 (29%) participants reported storm water issues or damage: 25 had flooded basements, 15 reported flooded septic beds in heavy rains, 3 reported flooded out buildings, 9 had driveway erosion and 13 had flooded yards (Table 9, Figure 13). The issues vary across the 4 counties with higher numbers in Annapolis County due to more assessments done.

Table 9: Storm water issues

Storm Water Issues	Kings	Annapolis	Digby	Yarmouth	Total
# Of Participants	56	110	36	21	223
Flooded Basement	3	14	4	4	25
Flooded Septic Bed	1	5	2	7	15
Flooded Out Buildings	0	3	0	0	3
Driveway Erosion	2	4	2	1	9
Flooded Yard	1	9	1	2	13
Total Issues	7	35	9	14	65

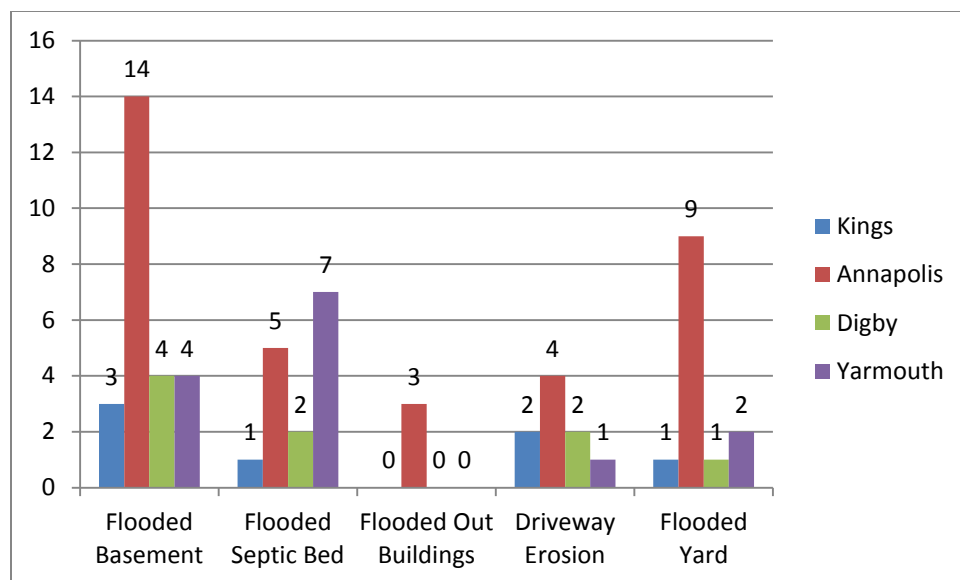


Figure 13: Storm water issues

Nine participants were given access to \$500 in Storm water remediation funds. Two homeowners used the funds available to help with the cost of installing drainage ditches to redirect storm water away from their septic beds. Five participants used the funding to install eaves trough to alleviate regular flooding of their basements. Two participants chose not to use the funds made available due to excessive cost of the remediation suggested and lack of additional funds.

3.4 Riparian Zone Management

In year one, thirty-three participants had riparian zones. Twenty-six of those chose to participate in the spring riparian zone planting. Three hundred and fifty trees, shrubs, and flowers were planted over 23,000 square meters of riparian zone by the project leader and an assistant with the guidance and assistance of the homeowners (Table 10). Planting was done from the water edge (flowers and ferns) to 10 meters from the shoreline (trees and shrubs). Trees planted were white ash, sugar maple, red maple, larch, and grey birch. Shrubs and flowers included wild raisin, sheep berry, sweet fern, winterberry, and blue-flag iris. Four-hundred willow stakes and 200 red dogwood stakes were also planted. All species planted were native to Nova Scotia. The survival rate for the spring planting was checked in October of 2013. It was observed that the plants put in areas where there was an abundance of existing vegetation were more likely to be choked out by the already established grasses and vegetation.

Table 10: Year one riparian zone planting and survival rate

2012/2013	Kings	Annapolis	Digby	Yarmouth	Total
# Of Participants	32	37	18	11	98
Riparian Zones	7	16	5	5	33
Sites Planted	4	15	3	4	26
Plants Planted	65	205	35	45	350
Survival Rate	89%	70%	72%	78%	77%
Willow Stakes	0	400	0	0	400
Dogwood Stakes	0	200	0	0	200
Survival Rate	0	66%	0	0	66%

In year two, fifty-seven participants had riparian zones. Twenty-eight took part in the fall planting. Three hundred and five trees, shrubs, and flowers were planted over 25,000 square meters of riparian zone (Table 11). Planting was done the same as year one from the waters' edge up to ten meters away with the help of an assistant and the homeowner. More care was taken to place the plants where they would be less affected by the existing vegetation. Three hundred and sixty willow stakes and 300 dogwood stakes were also planted in areas where river banks were in need of protection from erosion. The survival rate for year two will be checked in the spring of 2014.

Table 11: Year two riparian zone planting

2013/2014	Kings	Annapolis	Digby	Yarmouth	Total
# Of Participants	24	73	18	10	125
Riparian Zones	8	37	5	7	57
Sites Planted	5	18	5	0	28
Willow Stakes	0	360	0	0	360
Dogwood Stakes	0	300	0	0	300
Plants Planted	65	205	35	45	305

The distribution of the riparian zone plants used is shown by County (Table 12).

Table 12: Riparian zone plants 2012-2013

Trees, Shrubs and Flowers	Kings	Annapolis	Digby	Yarmouth	Total
Sugar Maple	22	50	5	3	80
Red Maple	24	53	12	6	95
White Ash	12	45	6	3	66
Grey birch	10	42	10	3	65
Yellow Birch	3	29	3	0	35
Pussy Willow	5	1	1	0	7
Red Chokeberry	6	8	2	0	16
Winterberry	18	32	6	10	66
Wild Raisin	8	18	2	2	30
Blue Flag Iris	29	56	10	11	106
Trembling Aspen	5	3	0	0	8
Blueberry	3	5	2	0	10
Blue bead Lily	3	4	3	0	10
Sheep Berry	8	14	1	2	25
Larch	1	9	0	0	10
Sweet fern	5	14	2	4	25
Total trees, shrubs and flowers	162	383	65	44	654
Willow Stakes	0	760	0	0	760
Dogwood Stakes	0	500	0	0	500
Total planted	162	1260	65	44	1914

3.5 Septic System Management

Septic tank pump out vouchers were given to 64 Rural H₂O participants, eleven from RH₂O funds and 53 from the EHAP program funds in year one of the project (Table 13). An additional 16 pump out vouchers were given out in year one prior to the start of the Rural H₂O Water Guardian project as an incentive with the EHAP program. In year two, thirty-two vouchers were given to participants from the Rural H₂O project funds and forty-two from the EHAP program funds for a total of seventy-four pump out vouchers. In the two years of the pilot, there was a total of 138 septic tank pump out vouchers given to Rural H₂O participants each valued at \$100 each.

Table 13: Septic tank pump out vouchers

2012-2014	Kings	Annapolis	Digby	Yarmouth	Total
# Of Clients	56	110	36	21	223
Septic Pump Out Vouchers (RH ₂ O)	11	19	9	4	43
Vouchers Redeemed (RH ₂ O)	6	14	2	2	24
Septic Pump Out Vouchers (EHAP)	28	38	18	11	95
Total Vouchers Distributed	39	57	27	15	138

Two homeowners took advantage of funds available for storm water management to install drainage ditches to direct storm water away from their septic beds that were flooding in heavy rains.

Homeowners were happy to be able to learn how their septic system worked and how to properly maintain it. A lot of participants were unaware of the type of system they had and did not even know where it was.

3.6 Pollution Prevention

The 138 septic tank pump out vouchers given to clients contributed to a reduction in ground and surface water pollution. The discussions with homeowners on the effects of their actions and the interaction of rain and potential pollution sources on and adjacent to their property resulted in an increased awareness of how pollution of surface and ground water occurs and the benefits of responsible management of toxic and harmful substances.

The riparian zone planting that was done will help create a buffer zone to aid in reducing the run off of pollutants from entering the streams, lakes, rivers, and ponds on Rural H₂O participants' property.

Two of the nine storm water remediation grants issued to homeowners were used to help with the installation of drainage ditches designed to reduce or stop storm water from causing the effluent of their septic beds from entering nearby water ways and polluting the ground water. Five storm water remediation grants were used to install eaves trough will help to reduce roof water runoff from contributing to surface water runoff as well as prevent flooding in homeowners' basements.

Participants were also made aware of potential pollution sources on and around their property. Drilled wells, dug wells, sand points and springs were all sources of water for homeowners. Each source can be affected to varying degrees by a variety of potential pollution sources.

Fertilizers, pesticides, and farming were identified through observations during assessments as the largest potential source of pollutants to enter water ways and the ground water through surface water runoff (Table 14, Figure 14). Decaying vegetation and septic systems were also identified as major contributors to well and surface water contamination, more so in dug wells, but also a contributor to drilled well contamination. Again these contaminants enter the ground and surface water via surface water runoff. Junkyards, garages, dumps, highway salt, and oil tanks can also be potential causes of pollution but are more site specific and need to be looked at on an individual basis.

Table 14: Potential pollution sources

Potential Pollution Sources	Kings	Annapolis	Digby	Yarmouth	Total
Fertilizer/Pesticides/Farming	19	24	3	3	49
Junkyard/Garage/Dump	3	4	1	1	9
Decaying Vegetation	0	6	3	1	10
Bugs/Well Breach	0	3	1	5	9
Septic System	2	9	1	3	15
Highway Salt	0	2	2	1	5
Oil Tank	2	1	0	0	3
Total	43	86	27	28	184

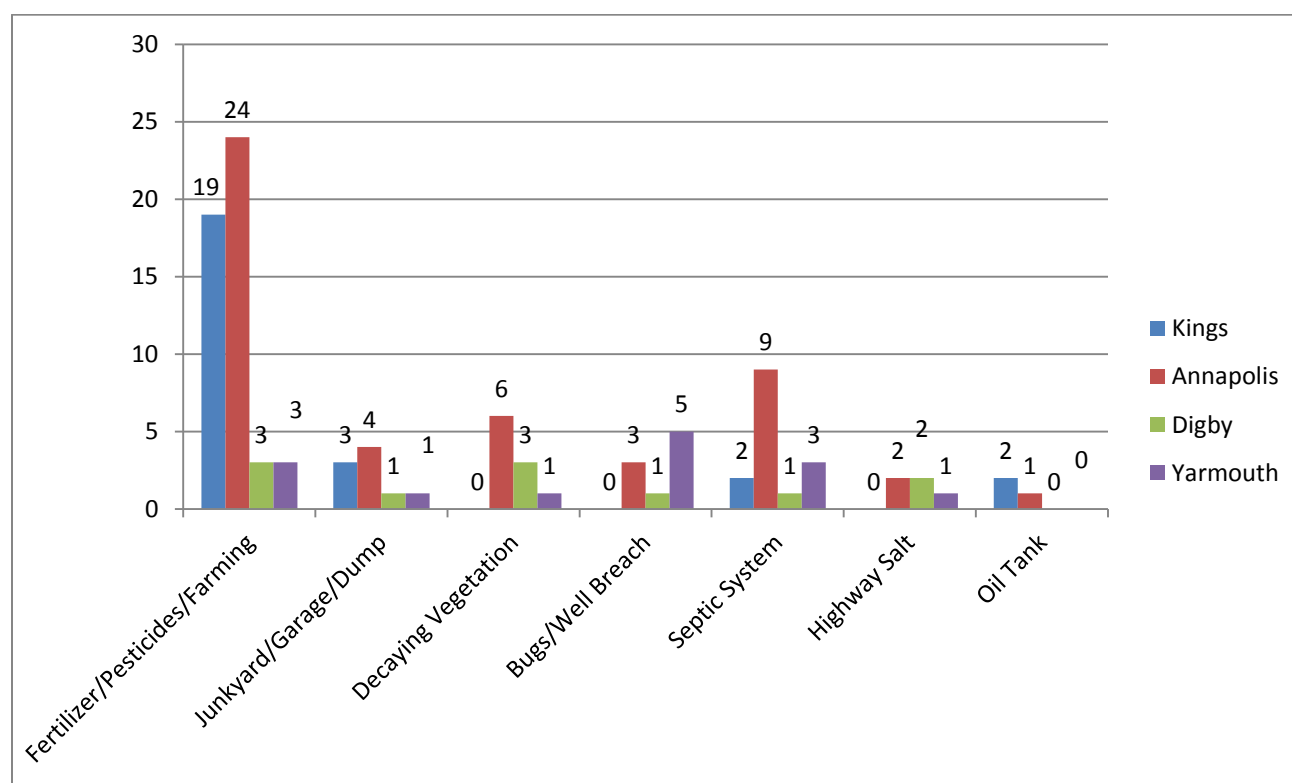


Figure 14 Potential pollution sources

4.0 Conclusions and Recommendations

CBSM strategies worked well in identifying the barriers and benefits of the goals in the Rural H₂O Water Guardian Project. The incentives and delivery used resulted in over 80% of the homeowners participating in the water testing, 138 septic tanks pumped, three new wells drilled, one well repaired, 8 ultraviolet lights installed for bacteria remediation, and 2 reverse osmosis filters installed to remediate chemicals present in the water. Three homeowners have replaced their copper lines containing lead solder with plastic lines due to high levels of lead detected in their water tests.

Word of mouth, a key aspect of CBSM strategies, worked well in creating interest for the project among friends and neighbours of participants. The prompts and reminders given to homeowners will continue to act as reminders of the commitments to the project goals of this program.

Research of the barriers and benefits of the target behaviours, the results of the water sampling, discussions with homeowners, and homeowner testimonials all suggest that more effort should be placed on the education of homeowners regarding their role in protecting their rural water supply and managing water resources as well as the importance of regular testing. To support such activities in the long term, more assistance is needed to fund and deliver ongoing programs that provide effective pathways to alter behaviour and contribute to the long term health of rural citizens and sustainable water management in rural environments.

4.1 Conclusions

4.1.1 *Regular Water Testing*

Homeowners were genuinely concerned about water quality and the interaction of water resources on their property. Participating homeowners understood why regular water quality testing was important and would like to see access to testing made easier. The primary barrier was inconvenience followed closely by cost.

Homeowners suggested that the connection between contaminated water and long term health issues coupled with the prevalence of arsenic and uranium in Nova Scotia's ground water necessitates integration of regular water testing costs into Provincial or Municipal taxes to ensure that all homeowners with private water supply monitor the level of harmful chemicals and bacteria in well water and understand what measures can be taken to ensure safe drinking water.

Regular water testing was important to participants but many homeowners question the necessity to test drilled wells for bacteria every six months as properly constructed drilled wells are less likely to be affected by surface water runoff. Testing for bacteria every six months in a dug well where the water is so much more likely to be affected by surface water runoff was viewed as more practical by homeowners. However, increased awareness of the risk associated with rain events and the potential for contamination in dug well generated greater

understanding of the need to ensure that local pollution sources do not have a negative impact on drinking water from dug wells. A newer, properly located and installed dug well should only need to be tested every 6 months as recommended by NS Environment. However, a large number of participants with dug wells claim that they drink bottled water because they do not trust the quality of their well water.

Removing the need use a courier to get samples to a lab made chemical sampling as easy as testing for bacteria. Travelling to a local hospital to drop off water samples was still a barrier to some residents but was much better than having to deal with the inconvenience and cost of a courier to get the chemical sample to Capital Health in Halifax.

Finally, the results of the project indicated that more water testing is required. Homeowners in areas where high levels of harmful chemicals were detected should be informed of the risks and benefits of regular water testing. In addition, homeowners with dug wells should be informed of the risks of bacterial contamination, the importance of regular testing and remedial actions that can ensure long term safety of drinking water in rural environments.

4.1.2 Sustainable Use of Water

The majority of homeowners valued water conservation and were already using some water saving devices. Some homeowners less concerned or aware about the prudent use of water, became more aware of how important it is to appreciate, protect and refrain from wasting the water resources on their property. The 100 free rain barrels given out through this project will continue to foster water conservation and reduce surface water runoff and erosion. Most homeowners were aware of the various water saving devices and appliances, see the value in them and are gradually replacing old with new and improved as things wear out. Education and affordability were key in shifting to sustainable use of water. Necessity was seen to force some participants with limited water resources to install all low flow devices and appliances.

4.1.3 Storm Water Management

The riparian zone planting done through this project will aid in increasing buffer zones and reducing erosion. Storm water management can be costly in regards to flooded basements, septic fields and washed out driveways. Future remediation is dependent on resources available and the degree of importance. If there are no funds available for remediation and the problem can be tolerated than no action is likely to be taken. Although two flooded septic beds were remediated with the help of storm water remediation funds available through this project, thirteen homeowners with the same issue were unable or unwilling to pay the difference in the cost of remediation and therefore still have septic beds that are flooding and contributing to surface and ground water pollution. More needs to be done in regards to education and assistance in remediation.

4.1.4 Riparian Zone Management

The healthy riparian zone goal was addressed with the educational materials supplied and with the free planting in the spring and fall made possible by project funders. An average success rate of 77% in the spring planting is expected to be exceeded in the fall planting due

to improvements in planting practices. More education, guidance and assistance are needed to improve riparian zone management among rural homeowners.

4.1.5 *Septic System Management*

The EHAP program showed that regular septic tank pumping becomes routine for homeowners once educated on the importance of proper maintenance of septic system. Similar results are expected with this project. Continuation of the EHAP program is imperative to provide continued outreach and education opportunities to rural homeowners on proper maintenance of septic systems, wells and oil tanks.

4.1.6 *Pollution Prevention*

Pollution prevention was practiced by the majority of participating homeowners prior to the initiation of this project. However, the Rural H₂O Water Guardian project gave homeowners more in depth knowledge of pollution sources and the potential interaction with ground water which resulted in an increased level of homeowner participation in pollution prevention. Due to the CBSM approach, this outreach also extends to participants' friends and neighbours.

4.2 Recommendations

Recommendations from the program include continued access to prompts, incentives and education regarding water management and the connection with ensuring safe drinking water for Nova Scotia residents with no municipal water and sewer services. Specifically,

- 4.2.1 It is recommended that rural homeowners in Nova Scotia continue to have the opportunity to participate in a program with similar goals, incentives and education as the Rural H₂O Water Guardian Pilot Project; and,
- 4.2.2 It is highly recommended and encouraged that programs similar to the Rural H₂O project be considered high priority for the Nova Scotia Government and the Government of Canada due to the prevalence of heavy metals through the province, acid rain impacts in southwestern Nova Scotia on heavy metal leaching into water supplies and health implications associated with consumption of contaminated drinking water.

Proactive steps and programs like the Rural H₂O project not only foster increased health for both citizens and the environment in rural Nova Scotia but also have the potential to reduce the long term health costs associated with exposure to poor drinking water.

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6.0 Appendices

Appendix A: Homeowner survey

SURVEY; WATER RESOURCES

COULD YOU PLEASE TAKE A LITTLE OF YOUR TIME TO COMPLETE THIS CONFIDENTIAL SURVEY ON WATER RESOURCES IN YOUR AREA.
Your participation is needed to improve our programs and is much appreciated. THANK YOU.

1. What is your main source of water for use in your home?

☐ Drilled well 73% ☐ Dug well 21% ☐ Sand point 3% ☐ Spring 1% ☐ Other 1% -Water cooler or bottled water

2. When was the last time you tested your water for bacteria (coliforms and e-coli)

☐ Less than 1 year 16% ☐ Less than 5 years 41% ☐ More than 5 years 32% ☐ Never 6% ☐ Don't know 4%

3. Has your water ever tested positive for either fecal coliforms or e-coli?

☐ Yes 18% ☐ No 69% ☐ Don't know 13%

4. What prevents you from testing your water for bacteria more frequently?

(Please check all that apply)

☐ I test it twice a year now 5% ☐ Time 6% ☐ Cost 29% ☐ Convenience 22% ☐ Not sure why I should 12%

☐ Remembering to 19% ☐ Other *(Please Specify)* 6% -Too far, don't know how, poor results

5. When was the last time you tested your water for chemicals?

☐ Less than 2 years 18% ☐ Less than 5 years 19% ☐ More than 5 years 30% ☐ Never 24% ☐ Don't know 9%

6. Has your water ever tested positive for Uranium or Arsenic?

☐ Yes 3% ☐ No 71% ☐ Don't know 26%

7. What prevents you from testing your water for chemicals more frequently?

(Please check all that apply)

☐ I test for chemicals every 2 years 3% ☐ Time 5% ☐ Not sure why I should 20% ☐ Cost 31% ☐ Convenience 21%

☐ Remembering to 12% ☐ Other *(Please Specify)* 8% -don't think necessary, water filtered, too far to go

8. What is your water source for watering your garden and/or lawn?

☐ Same as household water 75% ☐ Rain Barrel 15% ☐ Other; specify 9% -rain, do not water, sandpoint

9. What would prevent you from using a Rain Barrel for lawn or garden watering?

(Please check all that apply)

☐ I use one now 14% ☐ Time 9% ☐ Cost 30% ☐ Convenience 25% ☐ Aesthetics 8% ☐ No rain gutters 11%

☐ Other *(Please Specify)* 23% lots of water, do not water lawn, no garden, can't be bothered, too old to

10. a) Do you have a stream, lake, river or other water body on or adjacent to your property?

☐ Yes 43% ☐ No 55% ☐ Don't know 2%

10. b) If Yes, do you have an area of shrubs trees or plants at the edge of the shoreline?

☐ Yes 42% ☐ No 56% ☐ Don't Know 2%

11. What would prevent you from maintaining an area of trees shrubs or plants at the edge of the shoreline?

(Please check

all that apply)

☐ No water bodies present 60% ☐ Time 4% ☐ Cost 2% ☐ Remembering to 0% ☐ Convenience 2% ☐ Don't know how 2%

☐ Other *(Please Specify)* 29% nothing, I do now, not applicable

12. Which of the following do you consider the MAIN source of pollution for your watershed?

(Please check only one)

☐ Industry/farming 54% ☐ Stormwater runoff 24% ☐ Recreational activities 3%

☐ Other, please specify 19%- don't know, septic systems, nature(decaying plants and trees)

13. Does/has stormwater runoff cause/caused any damage to your property?

- ☐ Yes, if yes please explain **20%** -washed out driveway, water in basement, flooding from beaver dam
☐ No **71%** ☐ Don't know **9%**

14. What is preventing you from addressing problems with stormwater runoff?

(Please check all that apply)

- ☐ No problems **65%** ☐ Time **3%** ☐ Cost **11%** ☐ Remembering to **0%** ☐ Convenience **1%** ☐ Don't know how **7%**
☐ Other (Please Specify) **13%** - No help from DOT, not on my property, no assistance available, no resources

15. Do you think activities taking place on adjacent properties can impact your water supply?

- ☐ Yes **56%** ☐ No **29%** Don't know **15%**

16a) Do you have a septic system?

- ☐ No **0%** ☐ Yes **100%** - Please answer the following:

16b) How often do you have your septic system inspected and pumped? (Please choose only one)

- Annually **4%** ☐ Every 2-to 3 years **48%** ☐ Every 3-to 5 years **33%** 6 years or more **2%**
☐ When there is a problem **8%** ☐ Never **0%** ☐ Other (Please specify) **4%** new system, when they call me, just did

17. What prevents you from having it inspected and pumped more frequently? (Please check all that apply)

- ☐ Septic is inspected and pumped as frequently as recommended by pumper **57%** Cost **28%** Time **2%**
☐ Remembering to **3%** ☐ Convenience **5%** ☐ Other (Please Specify) **5%**- checked 15 years ago and it was good, don't think I need to, do not need to.

THANK YOU for the time you have taken to complete this survey. Your help is needed and much appreciated. This survey is confidential and the information you have provided will be used for statistical purposes only and will not be connected to your name.

Thanks from Clean Annapolis River Project (CARP)

Environmental Home Assessor,

Jamie McCamon.

71 out of 100 surveys sent out to former EHAP clients were completed and returned. After 3 weeks we had a response rate of over 60%. After 6 weeks we had 71% of the surveys completed and returned.

Appendix B: Water Guardian Agreement

Rural H₂O Project : Water Guardian Agreement

I _____ am aware that the only way to

ensure that my household water is safe for use is to test it regularly. I realize the importance of regular testing and want to be sure my family, friends, and I are using good quality water. As a participant in the Rural H₂O Water Guardian program, I will commit to;

- Test my water for bacteria/e-coli twice a year.
- Test my water for chemicals every two years.
- Share the results of my water tests with CARP for statistical purposes.
- Pump my septic tank on a regular basis (every 3 to 5 years).
- Do whatever I can to address storm water damage
- Maintain a healthy riparian zone if present
- Do whatever I can do to prevent ground water pollution
- Tell friends and neighbours about my involvement with the Rural H₂O Water Guardian Program

Homeowner's Signature; _____

Environmental Home Assessor; _____

Appendix C: Refrigerator magnet and reminder stickers.



Appendix D: Homeowner Report



Clean Annapolis River Project

Rural H₂O "Water Guardian" Homeowner Report

Property Owner:

Date: 06-Jun-13

Address:

Phone:

Property Description: Mostly wooded with field and landscaping
around house

Email:

Water testing

Water test results

Acceptable Levels		0/100ml	0/100ml	<=10ug/l	<=10ug/l	<=10ug/l	<=1.5mg/l	<=10mg/l
	Date	E coli	Coliform	Arsenic	Uranium	Lead	Fluoride	Nitrate/Nitrite
Your	12-Aug-12	6	77	0	0	0	0	0.14
Results	28-Aug-12	0	0					

Household water supply

☒ Dug Well

☐ Drilled Well

☐ Pond

☐ Stream

Other / comment:

Seing

Water Supply Age and Condition:

Water Suggestions:

Test water on a regular basis to ensure good quality water.

Sustainable Use of Water Resources

Water Savings Devices Present: aerators

Water Savings Suggestions:

Consider using a rain barrel to collect rainwater from roof for future use on lawn and garden. Consider installing a low flush toilet and low flow shower head.

Riparian Zone

Riparian zone present?

☒

Description of riparian zone:

Stream on property

Riparian Zone Suggestions:

Plant armouring plants where stream banks are eroding.

Jamie McCamon Environmental Technician

Clean Annapolis River Project 314 St. George Street, P.O. Box 395 Annapolis Royal NS B0S1A0
www.annapolisriver.ca E-mail: jamiemccamon@annapolisriver.ca

Clean Annapolis River Project

Rural H₂O "Water Guardian" Homeowner Report

Storm Water Management

Is storm water an issue? ☒

Storm water effects on property: Front lawn (septic bed) prone to flooding in heavy rain.

Storm Water Suggestions: Install french drain to direct water away from septic field.

Septic System

Type of system: Tank & Distribution Field **Age of system:** unknown

Pump frequency: 3-5 years **Last Time Pumped:**

Malfunctions observed:

Septic Suggestions: Pump septic system every 3-5 years.

Pollution Prevention

Pollution Sources: Forest floor debris around well/spring

Potential Pollution Sources: surface water run off

Pollution Suggestions: Test water regularly to ensure good quality water.

Action Plan

Suggestions Test water every 6 months for bacteria and every 2 years for chemicals.
Pump septic tank every 3-5 years.

Available rebates and incentives

Free rain barrel ☒

Free chemical and bacterial test ☒

Other ☐

Notes:

Failed first Bacteria test. Well has been shocked, retested and is good. Owner will retest in the spring.

Jamie McCamon Environmental Technician

Clean Annapolis River Project 314 St. George Street, P.O. Box 395 Annapolis Royal NS B0S1A0
www.annapolisriver.ca E-mail: jamiemccamon@annapolisriver.ca

Appendix E: Rain Barrel Sticker



Appendix F: Rural H₂O Septic Tank Pump out Voucher



Rural H₂O Water Guardians

Septic Tank Pumpout Voucher

Voucher value is \$100.00

Must be redeemed by; _____

Location of Assessment:

Date of Home Assessment:

Assessor:

LIMIT ONE VOUCHER PER HOUSEHOLD

Mail completed voucher to:

Clean Annapolis River Project
314 St. George Street.
P.O. Box 395, Annapolis Royal
Nova Scotia, Canada
B0S 1A0
1-888-547-4344

HOMEOWNER INFORMATION (Please Print)

Name: _____

Address _____

Telephone Number _____

PUMPING INFORMATION (Please Print)

Company Name: _____

Certified Septic Tank Cleaner _____ Cert. # _____

Address _____

Phone # _____

Date of Service _____ Total Cost of Service Provided _____

Homeowners Signature

The above noted service was completed on the date specified to the best of my knowledge.

Certified Septic Tank Cleaners Signature

I have completed the above noted service on the specified date, at the above address.

Appendix G: Well Repair Voucher



Well Repair Grant Voucher

Rural H₂O; Water Guardians

Voucher value is 1/3 the cost of repairs to a
Maximum of \$1500.00.

Location of Assessment:

Date of Home Assessment:

Assessor:

LIMIT ONE VOUCHER PER HOUSEHOLD

Voucher is redeemable for up to one year from assessment date.

This voucher is to cover 1/3 the cost of your well repairs. Mail completed voucher to:

Clean Annapolis River Project
151 Victoria Street,
P.O. Box 395, Annapolis Royal
Nova Scotia, Canada
B0S 1A0
1-888-547-4344

HOMEOWNER INFORMATION (Please Print)

Name: _____

Address _____

Telephone Number _____

WELL REPAIR INFORMATION (Please Print) *Income verified to be less than \$50,000/yr.* _____

Repair description:

Cost of repairs:

Grant Voucher value:

Well Driller/Plumber:

Address:

Phone:

Certification #:

Make Cheque payable to:

Appendix H: Storm Water Remediation Voucher



Storm Water Remediation

Rural H₂O; Water Guardians

Voucher value is maximum \$500.00

Location of Assessment:

Date of Home Assessment:

Assessor:

LIMIT ONE VOUCHER PER HOUSEHOLD

Voucher is good until Dec.21, 2013.

This voucher is to cover up to \$500.00 in Storm Water Remediation Mail completed voucher to:

Clean Annapolis River Project
314 St. George St.
P.O. Box 395, Annapolis Royal
Nova Scotia, Canada
B0S 1A0
1-888-547-4344

HOMEOWNER INFORMATION (Please Print)

Name: _____

Address _____

Telephone Number _____

REMEDIALTION INFORMATION (Please Print)

Income verified to be less than \$50,000/yr. -----

Repair description:

Cost of repairs:

Grant Voucher value:

Contractor:

Address:

Phone:

Make Cheque payable to:

Appendix I: Water Quality Test Voucher



Water Quality Test Voucher

Rural H₂O; Water Guardians

Voucher Value: Cost of Bacteria Testing (\$30)

Location of Assessment:

Date of Home Assessment:

Assessor:

LIMIT ONE VOUCHER PER HOUSEHOLD

This voucher is to cover the cost of your bacteria test. Mail completed voucher to:

Clean Annapolis River Project
314 St. George Street
P.O. Box 395, Annapolis Royal
Nova Scotia, Canada
B0S 1A0
1-888-547-4344

HOMEOWNER INFORMATION (Please Print)

Name: _____

Address _____

Telephone Number _____

WATER TESTING INFORMATION (Please Print)

Date of Chemical Test: _____

Date of Bacteria Test: _____

Drop both samples off at your local hospital. You will pay for the bacteria test (\$30) when you drop off the samples.

Please include a copy of the receipt from the lab. Be sure to include a copy of the test results as they are required to redeem the voucher. The recommended chemical test for this program is the "Chemical Quality" test. (\$65.15) You may choose to do a more comprehensive test but CARP only covers the cost of the recommended test.

The cost of the bacteria test (MPN, most probable number) (Approx. \$30.00) is covered by this voucher; it is your responsibility to get the bacteria test to a lab (hospital) in your area. **Please include a copy of the receipt from the lab as well as a copy of the test results to qualify for the rebate.** THIS VOUCHER IS ONLY GOOD FOR 60 DAYS FROM ASSESSMENT.

Appendix J: Testimonials

Testimonial Summary

- Many participants shared information with friends, family and neighbours
 - Few would have checked their water otherwise
 - Many have significantly altered their behavior
 - Would like to see testing included for road salt runoff
 - Most people didn't know that water should be tested in the first place
 - Suggestions to advertise in high-risk areas
 - Is it really necessary to test for bacteria every six months? Especially after a clean first test
 - Think about educating hospital lab staff so that all are on same page for the program
 - Enables informed decision-making
-

Good morning Jamie,
You asked for my opinion on the Rural Water Guardian Project.

May I say that I think it is an extremely beneficial project. It certainly makes one aware of the ramifications of how we use our water, and how to conserve. I have already recommended the project to friends and neighbours. The delivery of the project was excellent and I learnt a great deal about the minerals and contaminants that can be in our water supply. The information regarding vegetation is also very useful.

I will certainly be testing my water for bacteria every six months and sharing the results with you, and also the chemical test when it is due.

Thank you for allowing me to be part of this very useful and important project.
Wendy

Jamie;
Thanks for touching base with respect to water and sewer in areas supplied by the residence owners. We were not aware such a service was available. It's an education in having water test carried out and the care of septic systems at our residence.

Keep up the good work and hope we can meet all the requirements in future.
Yours truly;
Gertie and Bill

Dear Jamie;

Both the wife and myself found your visit very informative and without your info we would never have had our water checked. It was found okay on both bugs and minerals but the results made both of us feel a lot safer and as a result we will continue to have it checked. Thank you very much for your time and info books.

Sincerely,
Glenn and Donna

Jamie McCamon

Let me take this opportunity to thank you for the professional advice on the spectrum of issues affecting water quality in our rural setting. Without the Rural H₂O project I am sure that I would not have had my septic tank serviced before significant damaged had taken place due to poor maintenance. The water testing has given me peace of mind on my drinking water and provided a benchmark for further testing.

I hope the program continues. We were late into the program and I would like to recommend this program to my relatives, friends and neighbours.

Cheers,
Edwin

I must say Jamie that my experience with the project was made very pleasant, helpful and ultimately a financial help to me on my retirement income. You and your staff were more than informative and helpful. I recommended your office to several persons and I can only hope some if not all would have used your expertise to their benefit also. Thank you very much for the experience.

Wayne

Just eighteen months ago, Judy and I moved "home" to Nova Scotia. As we settled into our home overlooking the Annapolis Basin in Upper Clements, we noticed with interest occasional newspaper reports of various projects being undertaken by the Clean Annapolis River Project (CARP). One of these notices was posted in the *Bridgetown Reader* regarding the Rural H₂O Water Guardian Project.

A quick phone call started the process which led to a visit by Jamie McCamon and a very helpful discussion that, over a period of several months, served as a catalyst to getting our well tested, septic system checked and cleaned, a rain barrel to better utilize rainwater runoff,

and planting some trees along ditches that carried water off the South Mountain towards the Annapolis Basin.

The Rural H₂O Water Guardian Project has helped us to become more knowledgeable about the water resources on our property, and has helped us to take positive steps to protect this resource for the benefit of ourselves and of our community. We continue to use the reference materials provided to monitor the progress we're making. Thanks to Jamie and to Stu Campana for their on-site visits and their continued availability to provide guidance.

We would recommend that others avail themselves of the help available through the Rural H₂O Water Guardian Project

Roy and Judy

Hi Jamie

Yes time does fly by - two years just goes like a whiz.

Anyway in terms of this project, my comments are as follows:

1. the program does fill a need from an environmental protection perspective
2. from a practical standpoint the project has provided consultative advice and financial assistance to the end user participants
3. the project has been well presented and explained in terms of the objectives of the initiative
4. I would like to see the project continue and evolve as required

Thanks

Allan

The Water Guardian Project helped us to see the strengths and weaknesses in our drainage, water and septic systems. Advice on best practices and local regulations helped us make the correct and necessary changes. We have owned our house for five years. In the last eighteen months we have pumped our septic, shocked and sealed our well, and have begun a rain garden in the lowest part of our lot. Most importantly we have established a schedule for future maintenance of these systems, something we were "meaning to get around to" but didn't.

Our thanks to Jamie and Stu for their advice and assistance.

Jim and Colleen

Jamie and Stu,

The Rural H2O water project at my home was greatly appreciated I gained information from your time spent here and would recommend this program to all of my rural neighbours , in fact have done so in at least two occasions.

When you come from the city and really don't know much about wells and septic systems any knowledge gained by your visits is most appreciated and to help to keep the brook bank from eroding any further is simply icing on the cake. It is a program that at present is great and could be further improved upon.

Just one item of change would have saved me some time and energy. In shocking the well, which I had to do, the term unscented Javex should be changed to scented and I see no reason to further dilute the Javex in 2 to 5 gallons of water, case in point by diluted unscented Javex it reduces to a point that one cannot smell it in the taps, scented Javex would be most helpful in this case. In my case I had 90 ft. of well head water, would seem not necessary to dilute Javex further, just my opinion.

Once again thanks for the assistance in this matter.

Gordon

I think it is a great program, and I have referred other people to you. Someone was supposed to come back and check on the riparian plants (by making an appointment with me first). Is that going to happen?

Also, I would suggest additional parameters to check in the well water testing. One would be salt, since there may be salt water intrusion in this area, and also the salt trucks throw all that winter road stuff

way up into my yard, at least. I think there were some other contaminants that would be important to test, and I forget which were included and which were not (lead, uranium, arsenic, nitrate/trite, mercury, oil/gas, hardness/softness, pesticides/herbicides, for some examples).

Keep going with the program! We need your help.

Kathleen

Re: Rural H₂O Water Guardians

The plants, which placed along a brook, had a lot of competition from grass and weeds; however, a majority appear to have survived. The survival rate, come spring, will be the true test.

We'll hope for the best!

Thanks,

Brian

I am grateful for being a part of the rural H₂O water guardian project. It's a relief to have both water tests come back with perfect results plus the cost covered by CARP. I have recommended it to my neighbour.

I did learn a lot from Stu and from reading the books and pamphlets he left with me. It didn't occur to me to check the well cap. I didn't know the harm done to the septic tank when doing multiple loads of wash or using the washer at the same time as the dishwasher. I certainly didn't know I should have my water tested twice a year for bacteria. Stu inspected the location of my well, septic and disposal field approving of the proximity to each other and the slope of the land. I didn't know about the grants that are available. These are just a few of the things I learned through the program.

I will have my water tested twice a year as well as the two year chemical test and will forward them to you.

Sincerely,

Karan

Thank you for the chance to give my opinion on this program. When I first joined it I was very skeptical that it would do anything for me.

I have been proved wrong and think this was one of those programs that was a winner in all aspects.

From Jamie McCamon to the employees who did the testing or the instillation all were extremely professional and very friendly and helpful.

Myself, I have learned a lot from this program and wish to thank all who assisted me.

Matthew

Hi Stu and Jamie.

I think the Project was great , The support and information was put to us really well and nothing to do really with just had to take the water up to be checked, Plus the vouchers was a good Idea,

The plants great Idea to stop our bank from giving away and even was planted for us... And when you come over to the Hampton Hall for your presentation the residents got lots of information and you got lots of questions and I also got lots of good feedback. Thank you both for a job well done and hope the Project keeps rolling along so lots more people can get all the information . Take care.

Jo

Hello Jamie,

A few comments ...no problem.

I became aware of the problem when I learned that a friend who had received your information and guidance, had learned that her water was dangerous to her health and that she should immediately address the problem.

I contacted your office and received a prompt appointment. Your visit to my home was appreciated. I found your information to be relevant and important. You were very knowledgeable and professional. It was a priority for our family to find out the quality of our drinking water. Fortunately our results were positive.

I have referred the program to several individuals. I think all home owners who have their own wells should participate.

This is a valuable program.

Thanks,

Gord

I am pleased to say that this project is both important and valuable for the local environment and local homeowners. It was good to know that there were no problems with the water from our own artesian well. Contacts were courteous and helpful. Many thanks and we hope the project continues.

Richard

Hi Jamie

I just want to add my comment that water safety is a high priority for rural home owners and this project has been very beneficial. I strongly support continued funding and have encouraged my neighbours and friends to access the program. Thanks again.

Pat

Hi Jamie,

I felt that your project was very helpful with the testing of our water not only for harmful bacteria but also or high levels of unhealthy compounds. The water barrel is perfect.

Thanks again,

Cheryl

Dear Jamie,

I highly recommend the water guardian project. To know what is in our water is so important, it should be taken to the school children. I greatly appreciated you dropping by.

Sincerely,

John

Dear Jamie:

Our participation in your project was very recent, and we haven't yet completed all the steps in the process. However, we have seen the value of the project.

We had been meaning to have our water tested for years, but we were under the belief that we had to get our water to Halifax during business hours to have it tested. This seemed to be quite difficult for us, so we had been putting off the testing. Your project made it much easier. Stu came to our house, looked over the placement of the well and septic system, and gave us written information – this is much more than we would have expected, and was much appreciated.

We ran into a slight snag because we took our water samples to the Bridgewater hospital on a Friday morning, and they would not take samples on Fridays. In hindsight, we remembered that Stu might have mentioned that we should take them in between Monday and Thursday. We collected a new sample and took it to Middleton hospital – they would have even been willing to accept it on Friday if it was early in the morning.

The results came back in a reasonable amount of time. Unfortunately, we have a high level of arsenic in our water. Most of our drinking water had already been going through an RO machine, but we had been drinking water from other taps in our house – now we know not to do that. We also got advice on testing the water that comes out of the RO machine – seems like a good idea.

I only wish we had your services 25 or 30 years ago! We have had our RO machine in place for a few years, but our children grew up drinking water with a high level of arsenic. This is a concern.

A suggestion: we saw an advertisement for your service in the Spectator, but not everybody reads that newspaper. In areas where high arsenic levels (or uranium, etc) have been found, perhaps a flyer could be sent to households advising them of the ability and advisability of getting water tested. I realize this would add a cost in getting the information sent out, and would also result in a huge cost as more people would want to get their water tested. However, it would almost certainly be less than the cost of treating people who become sick. Many of our neighbours have taken water samples to the hospital for testing, but do not realize that the test was only for bacteria.

Thanks for your service. I hope you can continue to offer it, and even expand it.

Sue

Hello Jamie,

After many years of wondering if our water might have unsafe levels of dangerous chemicals, such as uranium or arsenic, it was a relief to finally discover it is indeed safe to drink. We were under the impression that it would have cost us over \$200 to have it tested for chemicals, and that always seemed to be prohibitive. When my sister told us you had this water guardian project, we were happy to participate. We, also, have recommended it to others. The material you left with us was interesting reading, as well.

I am wondering if people will really remember to retest regularly. It is difficult to find a spot for my chemical test bottle that I will be sure to come across in two years' time. If a second test (and possibly a third, which would be four years from the first one) still has the same levels, is it really necessary to require people to do this as an ongoing thing? I believe some will have trouble committing to that.

Another question I have is if it is critical to continue with the ecoli/coliform test twice per year if one has a drilled well and is in no immediate area of ground water run-off ? I have not sent in a fall test, which I believe was expected?

One major thing is missing from this project, and that is testing for the presence of any dangerous chemicals such as dry-cleaning solvents. Just this week, I was reading an editorial about Dr. Ross in our newspaper, the Annapolis County Spectator. He was a family doctor in New Minas, who in the 1980's fell mysteriously ill. His illness was traced to residual amounts of dry cleaning effluent in New Minas' drinking water.

I hope my thoughts have been of assistance.

Yours truly,

Karen

Thoughts on the Rural H₂O Water Guardian Project

When we purchased our house in Centrelea, just over four years ago, we were pleased to find that it had an artesian well that had been in use for more than seven years, and after the mandatory pre-purchase test for the presence of coliform bacteria came back as “negative” we assumed that all was well with our water and would continue to be so. That assumption was naive.

Living as we do close to the solid granite of the south mountains in the Annapolis Valley we became aware that there was potential for uranium, arsenic and other metal and elemental contamination of the aquifer from which we draw our water.

We live in a rural farming area and have become concerned at observing the increased use of chemicals, fertilisers, pesticides and herbicides that are commonly used in the cultivation and growth of corn and soybean. We have thought about what happens to these nitrite/nitrate “chemical cocktails” as they soak into the ground, into the Annapolis River, and what happens to the residual “chemistry” that remains in the ground from year to year and the possibility that this could also permeate into the aquifer from which we draw our water.

Earlier this year we participated in the Rural H₂O Water Guardian Project and soon realized that we needed a more detailed chemical analysis of our water supply. The process was simple and efficient and cost free, collect two water samples, bottles provided, keep them cool, refrigeration pack provided, and take them to our nearest health laboratory for testing.

The quality of information provided during that initial meeting on water quality, septic tank systems was both extensive and revealing into why continual monitoring of our water supply is recommended.

While we were pleased to see that the coliform level remains at zero, the more detailed chemical analysis revealed some surprising results.

The reported levels of arsenic, lead and fluoride were significantly below acceptable limits. Of concern to us was the level of uranium. While it is still below acceptable limits the presence of uranium in our water supply demands regular monitoring.

We were also pleased to see that report included nitrite and nitrate levels and that while these are presently at levels below acceptable limits, our intent is to monitor these on a regular basis as we do not see a change in farming practice or enlightened stewardship of agricultural land in the near future.

The Rural H₂O Water Guardian Project provides an invaluable resource to homeowners in raising their awareness of the need to test and regularly monitor the quality of the water that

they are drinking, and in the event that metal and/or elemental levels are above acceptable limits, informed advice on what forms of treatment are required.

We cannot assume, as we did, that coliform is the only water contaminate that we need to be aware of. We cannot assume that our water supply will continue to be free of any contaminant and we are now fully aware of the need for regular monitoring and are pleased at having a dedicated group of individuals who provide interpretation of the results and detail any corrective action that is needed.

While monitoring of residential water quality may presently be a prime goal of the Rural H₂O Water Guardian Project, the long term benefit of programmes such as this provide invaluable information on the quality of aquifers and river systems and the monitoring of non-natural, pesticide, herbicide, levels that have the potential of leaching into them.

Philip

We feel the project is of great benefit to the people living in Annapolis County who are well owners. It was good to be made aware of the need to regularly test our well water. We found the booklets provided helpful, and they will be a good reference source to refer back to.

We have a pond and were grateful to receive the planting of several trees and Iris which will enhance the area and our pond and will hopefully encourage more insects and wildlife to the area. We were pleased to participate.

Sheila and Martyn

Hi Jamie;

We appreciated the opportunity to have our water tested and were very lucky that there were no problems found. I do believe that this is a good project and with the amount of cancer found in the Annapolis Valley, this testing should continue.

Thank you,

John

In regards to the Rural H₂O Water Guardian Project, we feel it is extremely important that households become aware of the bacteria and chemical levels in their drinking water. With this project and the guidance given by the projects representatives, one can then make informed decisions and take proper action to improve the health and safety of their drinking water. Also care was taken to inform on septic issues as well as any waterways on the property and how to maintain these waterways for the betterment of the environment.

The representative who came to our home evaluation was very professional, very knowledgeable, and offered lots of advice. The incentives this project offers are also very valuable to the homeowner, and we feel they help to encourage people to take part in the

project. The reading material which was left with us was also much appreciated and contained helpful information.

In all, we feel this is an extremely worthwhile project which we strongly feel should continue.
Thank you,
Donna and Judy

Re CARP Water Guardian Project

Thank you for including me in this project.

I have found the program very useful to me in a number of ways:

- It was good to have someone look at my well and septic system locations and confirm they are suitable.
- The chemical water test was very helpful as my last one was many years ago.
- The bacterial tests have caused me to consider seriously some type of treatment.
- The vouchers for tests and septic pumping are helpful in covering some of the costs.
- The riparian planting is appreciated as I want to reduce any further erosion along the riverbank.
- Information on a number of water and sewage topics will be helpful.
- Information on other sources of funding for improvements is also appreciated.

Thanks again.

C

Hi Jamie,

The Rural H₂O Water Guardian Project encouraged me to have a chemical analysis of my well water - the first since the well was drilled in 1970. Now I will continue to have the chemical analysis done every two years as well as the test for bacteria every six months. I have already recommended the project to my next door neighbour who has a meeting with you next week. The Project was well delivered and everything happened as indicated with the reimbursement of the initial testing costs done in a very timely manner. This is a great project and hopefully it will receive funding to continue.

Regards

Ernie

Jamie,

I couldn't be more pleased with my experience with your group. I learned a wealth of things about my well and how to keep it clean and functioning forever; I also learned about my septic system and because of your visit I took action to have it pumped and just in time, if I had not been educated on how it operates and it's necessary maintenance requirements I would have had a very costly ordeal ahead and not very far ahead either.

I have had our water tested which had never been done before and it is a good feeling knowing everything is safe and healthy. I was very pleased to have learned of your project and hope it continues!

Thank you for the very useful information!
Lee

We are so appreciative of the Rural H₂O Water Guardian Project and believe that this program has benefited all who participated in it.

We believe that people like ourselves, who have their own private water supply are too lax in the testing of our drinking water. We assume that if it tastes OK that it is safe to drink. This is a great misconception and this program has brought it to our attention that regular testing is so important.

We did recommend this project to a neighbour and would not hesitate to do so again.

The only suggestion that we can see that would improve this project is when the water samples are taken to Annapolis hospital. I realize that at times they are short staffed but our experience there could use improving upon. When we took the sample to the hospital the girl that was at the lab at that time had no idea about what I was talking about regarding having a water sample sent out for testing. When I tried to explain to her that the water sample went along with the blood samples to the lab, she informed me that the blood sample truck had already left the hospital (which it had not). Luckily after a few minutes the regular lab attendant came along and all went well from that point on. I realize that this is a small matter and really not associated with the actual work that CARP does, but if all staff were educated regarding what to do with water samples this would go smoother for everyone.

We would like to thank you both for the help that we received, the information that was left with us and for the professional and friendly manner in which this was all carried out.

Regards,
Lloyd and Carol

Dear Jamie,

In reply to the email below, I would like to express our appreciation for your informative and timely dealings with our water supply. Through you, we were able to have our water tested for the normal bacteria but also for the heavy metals which were of a concern to Verne's doctors.

The information we received was thorough and delivered in a manner that was easy for us to understand and to act on. We also appreciated your visits to our home to help with the collection process and for getting back to us to discuss the results.

Thanks to you and our participation in the Rural H₂O Water Guardian Project, we know that our water is safe from contaminants and will continue to participate in this project in the future.

Keep up the good work and thank you.

Betsy

To whom it may concern,

I am glad to be a participant in the Rural H₂O Water Guardian Project. It was a great incentive to get us to focus on something so important as our water supply, something we had neglected for quite a long time.

The project is well-run with friendly, knowledgeable, dedicated and efficient people. Thank you to Jamie and Stu for coming out in the rain to do my plantings. It is a credit to you both.

Thanks,

Sincerely yours,

Eleanor

I was lucky enough to meet up with Jaime McCamon while he had a display table set up in Kingston in April/May 2013. I gave him my name and email address, expressing I had interest.

I was promptly contacted via email by Jaime and we made an appointment for him to come to my property on Trout Lake.

At all times Jaime was VERY professional, punctual, extremely knowledgeable and friendly. He explained everything in a manner I could understand and answered every question I had. He gave me printed reference materials full of useful information and seemed to be passionate about his work. Jaime obviously likes his work.

I was pleasantly surprised to be given a rain barrel and Jaime even came out in October and planted some bushes, trees and flowers on my lakeshore. WOW!

I am grateful to be a part of this process and hope that it continues. I recommended it to my neighbours, who took part, but still have other friends that have property in NS that could/would participate if given the chance. I feel CARP is an important project and am grateful that it is in place - water is life!

Linda

Jamie

Thank you for all of the hard work you have been doing.

We feel that the Rural H2O project is an extremely important project highlighting the need to safeguard our water supply through education, testing and baseline water quality tracking. In a world that is constantly threatening the safety of our drinking water, it is comforting to know that there are people like you and organizations like CARP that are actively bringing water quality to the attention of others.

Without water there is no life.

Thank you,

Steph and Daniel

Dear Jamie McCamon,

The Rural H2O water Project is very important; this testing will let us know your drinking water is safe for your family and friends to drink. Sending the test reports to you will help you know about the water in our area. Thank you.

Fred

Jamie,

Sorry for so long getting back to you.

We really appreciated the water project. We have not taken the time to get our water test for the ten years that we have owned our home after the initial test at purchase time. With the economic conditions the way they are, this program has helped me know my family is safe as a result of the water test. I appreciate your program educating us about keeping the water supply safe too.

I have recommended this program to my friends and my family to so they can verify that their water is safe too!

Thanks for visiting us and helping us know what is in our water too!

Aaron

Hi James,

I found your project extremely meaningful and timely. I am chairman of the Aylesford and Loon Lakes Property Owners Association. We have a membership in the order of 250 people and my email listing numbers 215. One of our mandates is to protect the water quality in our lakes system. To do this we must all understand the impact we make on the Lake system by what we do as individuals on our respective properties. We must also be provided the science proven means to successfully accomplish these goals. Your visit to my lake location was very

helpful in clearing up some grey areas that I had in relation to well water, septic systems, the importance of testing drinking water and general property management when living adjacent to a water body. After your visit I emailed this information to the Association membership, as I do with information that I receive from the County of Kings. Incidentally I have been a volunteer on the Kings County Lake monitoring program for over 15 years. I therefore take water quality very seriously. Your project was a very valuable tool for me and the feedback that I received from the Association at large indicates a very positive response to your suggestions and the work that your organization has undertaken with this project.

One of the things that we have done on our Lake in 2008 is to impose a voluntary "no wake" zone in a secluded cove on Aylesford Lake. To our knowledge this is the only posted no wake zone on a lake in Nova Scotia. We did the process through individual voting and had 82% in favour. By doing this we hope to prevent shore erosion and protect and foster the ecosystem in that area. This move has also awakened a general feeling of concern for our lake environment by residents and visitors alike. I have sent information flyers on the importance of protecting shore lines with natural vegetation and other housekeeping procedures such as drinking water testing, septic system maintenance and lawn fertilizing impacts on lake water quality. I also keep the Association informed on all the results of water quality testing and email suggestions on improvements that may be recommended by the scientific community at large or organizations such as yourself.

Keep up the excellent work.
Sincerely,
Andy

We wish to thank those responsible as we feel knowing your water is safe for your family is vital. Also the books left provide hours of reading and learning about the various types of trees and plants helpful for each area as well as great gardening information.

Stephen & Sandy

Hello Jamie

I have been pleased with the opportunity to be part of the monitoring and educational services provided through the Rural H₂O Water Guardian Project. As you know my water failed miserably in the tests and is perhaps a good example of the kinds of issues which one can have and be totally unaware of. My water contained unacceptable amounts of lead, traces of arsenic and failed the bacteria count as well! The testing gave us valuable insight in how to best look after our well, test our well and the actions required following the testing. I appreciate the value of this information and have suggested that neighbours have testing done of their water as well.

Thanks for your service.
Stephen

Dear Jamie,

I think the rural H2O guardian project is a great program.

It gives homeowners the opportunity to get their well water tested and to do upgrades to their wells and septic systems.

In my case I sealed my dug well, invested in a vented well lid and will install a UV water treatment system.

This all wouldn't have happened without the program.

I also could get two friends of mine to get in contact with you to get an assessment done and they are also doing some upgrades to their wells.

Regards

Bernd

To Jamie,

Thanks for including us in your project, got a lot of good information and had been planning to have water tested since we had the flood here but sometimes you need something like this to get you moving and have it done. Had been planning to have sewer done too, but had been putting it off it really needed it so now we have both projects done. Recommended it to several friends and relatives, hope they take advantage of it.

Thanks again,

Phyllis

Jamie and Stu,

I am more than pleased to be able to comment on the program. I have had a marvelous experience with your program. I first got in touch with you through your public presence at the Lawrencetown Ex and I am sure many others learned about your programs there. I first was interested in your septic grant, but Stu's visit was very informative and the information package made the information on water issues very accessible and I have referenced it on line and in hard copy several times already. That is unusual and proof of a good resource.

Because of his visit, we tested our water and discovered that it is high in uranium--something I have been planning to do for ages but just never got to. I now encourage others to test as well. I loved the riparian planting and really think that it will help educate people, not only on the importance, but the cache of having a wetland. (sorry no accent on the French word--that would be way too hard to figure out :) Coolness factor is a big help in selling wetlands.

Finally, the grants encourage me to make improvements but the personal contact really is a large factor in motivating me to do it now and not later--you know, someday.

Thank you so much for your help,

Kelley

In response to your request, I'm more than happy to offer a comment about your program. I feel it is a worthwhile endeavour and I feel that it has been beneficial to me and my family. The expertise of the staff was very insightful to me in that I have always lived in the city and so was ignorant in many ways of the water and sewage systems of rural life. I continue to benefit from the publications you have provided and also am grateful for discovering that my water had arsenic in it and that it could be rectified. Without your help I wouldn't have known that! I certainly would recommend your program to anyone.

Thanks so much,

Terry

Jamie,

A word of thanks to you, Stu and CARP for offering a fabulous, well organized rural water testing program. Our expectations were exceeded at the level of professionalism and the manner in which this program was delivered. Stu did a great job, and thanks to you for making it all happen - and so quickly! We dropped off our samples this morning, and will spend this snowy day going through the great resources we were given.

Refreshing to see such something done so well, and of such value to homeowners.

Thanks again,

Kim and Dave

Hi Stu and Jamie,

I must say that that my wife and I were very impressed with your delivery of this project to us. We have been in our home for 8 years and this is my second new home on this lake. Good quality water is very important to us. I've come to appreciate what good water means to a home owner because I had a lot of iron and other minerals in the well of my first home. It cost me a lot of money because I ended up having to dig a new well and eventually installing a water system that cost over \$2000.00. So I know how much good clean water is worth. This project helped us understand some simple things we can do to help protect our well and also ensuring that our septic system works the way it was designed to work. The free testing for bacteria and minerals in our well water gives us an assurance that we do have excellent water and the information that Stu provided is helping us ensure the water stays the way it is. We had our septic tank pumped and when that was done I was able to verify that the field bed pipes are open and working properly. Thank you for the money that helped us get that done.

We were hoping to get some landscaping done to divert the water away from the field bed, but the contractor had a look and the cost will be around \$2500.00. Too much money for us right now, even with the \$500.00 that we could have received from your program.

I just want to thank you for the manner in which you conducted yourself and presented the program to us. You helped us see many small things we can change to help our environment around us to keep our precious water and lake clean. I hope this project continues, as we

would like to get that landscaping done to divert the water away from the septic, sooner than later and if we can take part in this project next spring, that would be great.

Thanks again

Charles and Brenda

Dear Jamie,

I am writing to share my opinion and remarks on the Rural H2O program.

I heard about the Clean Annapolis River Project from several friends and called to enquire about the program. I was impressed from my very first phone call with the professional manner of the staff and the amount of information they had to offer. The program was explained well, the home visit was prompt and informative. After I took my water for testing, the results arrived quickly and I was contacted to ensure I had received the information and to ask if I had any questions. Again, all my questions were answered. I was amazed with the level of knowledge everyone who visited my property had.

The assistance with all levels and aspects of this project are of tremendous importance to a rural homes owner. I have learned a great deal about the care of my well and septic as well as the guardianship of my entire property with its natural wet areas and weather dependent brook. I am intending to take steps to correct the quality of my domestic water and really appreciate the assistance I have received and hope to continue receiving. The trees and bushes that were planted on my property this fall are just another unexpected bonus.

I certainly hope this project is continued. There are many more people who would benefit from the information available.

Thank you,
Joey

Hi,

I am writing to say I very pleased with the Water Guardian program. I want to say that Jamie was so wonderful with me, re-booking for another day and accommodating my schedule. He was very informative and patient. The materials he brought to help me understand the importance of water quality were very helpful and my husband found them helpful as well, and since I was having septic issues, he took the time to explain the system and break down the parts I didn't understand (with pictures!). I have already told several people the importance of water testing and the frequency in which we should test. I likely wouldn't have got the test if it weren't free and since I called initially about a septic question, this led to the water test. I am very pleased with the results and again have already told many people to contact CARP and inquire about the program, the staff are wonderful and get a 10 out of 10 from me.

Sincerely,
Sheri

Dear Mr. McCamon

We would like to express a big "Thank You" for allowing us to participate in the clean water program. Upon having our water tested we got the surprise of our lives that our water was in fact not fit to be drinking with arsenic and uranium levels being very elevated. It was a scary time for us but also an eye opener as to how one can think one thing but the facts show another. We immediately put in a filtration system and feel much safer with our water now. I have recommended the project to many other people and hope that a project like this can continue to run for the health benefits if nothing else.

Again thank you to those who sponsor this.

My only recommendation would be that when a water test comes back as bad as ours that maybe once the filtration system gets put into place, possibly another follow up water test could be available sooner than the two year wait. We assume that our water is good now, but have no way of knowing short of another test. We have learned that assuming is not the answer. LOL.....cause we assumed it was good before the test.

However, no complaints, rather a big thank you for helping us discover what we did not know.

Sincerely

David and Darlene
