Frequently Asked Questions:

1. What bugs are in my water?

Raw water contains many micro-organisms, some of which are healthy and some of which are not so healthy. For information about micro-organisms, including the kinds of illnesses that they can be responsible for, see the Disease Causing Micro-Organisms fact sheet. For more information about rural drinking water and waterborne pathogens, see Rural Drinking Water and Waterborne Illness.

Bacteria, protozoan parasites, and viruses are the common disease causing micro-organisms that are found in water. Pathogenic bacteria (meaning bacteria that will make you sick) that are waterborne include *Escherichia coli*, *Salmonella*, *Campylobacter*, *Helicobacter pylori*, *Vibrio cholerae*, *Shigella* and *Legionella*. For general information on bacteria, see the Bacteria fact sheet. For information on pathogenic bacterial illnesses, see the Escherichia E. coli, Campylobacter, Helicobacter pylori, Vibrio cholerae, Shigella and Legionella fact sheets.

Protozoan parasites that are waterborne include *Cryptosporidium* and *Giardia*. For general information on protozoan parasites, see the Protozoan Parasites fact sheet. For information on diseases that are caused by waterborne protozoan parasites, see Cryptosporidium and Giardia.

Viruses that are waterborne include the Coxsakie B and Hepatitis A viruses. For general information on viruses, see the Viruses fact sheet. For information on specific illnesses caused by waterborne viruses, see the Coxsackie B and Hepatitis A fact sheets.

Algae can also be found in water. Excessive nutrients allow algae to grow rapidly, which depletes the oxygen in the water, killing plants and aquatic life. For more information about algae, see the Algae fact sheet.

It is also common to find a variety of other contaminants in water. Excessive amounts of many naturally occurring minerals can be harmful. As well, chemicals from pesticides, urban runoff, industrial discharges, and inadequately treated wastewater can contaminate water sources. An emerging concern, with regards to water contamination, is the effect that chemicals in pharmaceuticals and personal care products (PPCPs) have on aquatic life. For more information about this emerging issue, see the Emerging Contaminants fact sheet. For more information about the contaminants that can originate from industrial operations, agricultural practices or domestic waste, see the Water Pollution fact sheet.

2. I get my drinking water from a private source (well or dugout). What kinds of contaminants are commonly found in Prairie water?

Much of the water in Saskatchewan, particularly in rural areas, is from dugouts, which fill from agricultural runoff. These water sources are generally shallow and filled with nutrients, which are ideal for algae growth. For information about Prairie drinking water, see the Canadian Prairie Drinking Water and Treating Rural Water fact sheets. For a straight forward summary about water contamination, as well as the illnesses that are caused by these contaminants, see the fact sheet called Drinking Water Quality and Health.

Campylobacter is a type of bacteria that is commonly found in Prairie water. Each year, there are over 200 cases of campylobacteriosis that are reported in Saskatchewan. The protozoan parasite, *Giardia* causes over 100 cases of giardiasis (Beaver Fever) each year in Saskatchewan, and the Hepatitis A virus was responsible for a substantial number of illnesses, until health officials began immunizing people against it. In North Battleford, Saskatchewan, there was a cryptosporidium outbreak in 2001, in which over 7,000 people become ill. For information on these waterborne diseases, see the fact sheets regarding Campylobacter, Giardia, Hepatitis A and Cryptosporidium.

In several studies cited by Agriculture Canada, it was found that 30 to 35 percent of wells in Alberta, Saskatchewan and Ontario exceed the safe levels for bacteria, 99 percent of private wells in Saskatchewan (92 percent in Alberta) exceed Canadian guidelines for both health and non-health related parameters. This typically includes hardness (due to excessive calcium and magnesium), iron, manganese, sulfate, sodium, dissolved organic carbon and colour. As well, Prairie water can contain high levels of arsenic, total dissolved solids, pesticides (from runoff), cyanobacteria and have a high turbidity. These contaminants, in addition to being unhealthy, make Prairie water difficult to treat, because a large quantity of chlorine (or other disinfectant) is required. When dissolved organic carbon reacts with chlorine, Trihalomethanes (THMs) are produced, which are potentially harmful disinfection by-products. For more information about disinfection with chlorine, see the Chlorination fact sheet.

3. I want to get my drinking water from my dugout or well. What do I need to test the water for? How often should I test the water?

A basic water potability test package will test for coliform bacteria, nitrates (particularly in groundwater), pH levels, sodium, chloride, fluoride, sulphate, iron, manganese, total dissolved solids and hardness. If additional contamination is suspected, water can also be tested for arsenic, selenium, uranium or pesticides. For more information about water quality, see the Water Quality fact sheet.

Domestic water supplies should be tested at least once per year, and shallow wells and surface water should be tested more frequently. At the minimum, you should test surface water once in the summer, and once in the winter, because the seasonal variation allows the bacteria and other contaminants to circulate within the water source. You should test your water both at the source and at the tap. Testing the water source ensures that the water quality is consistent, and testing at the tap ensures that your treatment system is performing adequately.

Your provincial water or environmental agency or local health department can provide additional water testing advice and a list of laboratories that will test water samples. Your federal or provincial department of agriculture can also provide information about Prairie water.

4. Who is responsible for providing safe drinking water? Where can I find more information about water quality guidelines?

While the United States and Europe have legislative water standards in place, Canada has only guidelines, which are negotiated between federal and provincial agencies. These negotiations have resulted in less stringent guidelines than the American and European standards.

In Canada, each provincial and territorial government is responsible for drinking water provisions within their province or territory. The only exception to this is in the case of native reservations, national parks and military bases, which fall under federal jurisdiction. Because Canada has delegated water responsibility to the provincial agencies, provinces with low populations, such as Saskatchewan, have difficulties dealing with complicated water issues. For example, Canada's recommendation for total dissolved solids (TDS) is a maximum of 500 milligrams per litre of water. Saskatchewan water, however, tends to have high levels of TDS, so the Saskatchewan recommendation is a maximum of 1,500 milligrams per litre of water. For more information about TDS levels in water, see the TDS and pH fact sheet.

Saskatchewan Environment implements the guidelines for communities and Saskatchewan Health implements them for rural water supplies. Each user is responsible for private water sources, such as dugouts. For more information about Canadian water guidelines, see the fact sheet about Water Quality Fact Sheets.

5. How is water treated to make it safe for drinking?

The conventional way to treat water is by a process of coagulation, sedimentation, filtration and disinfection. Coagulation and sedimentation can remove the large particles from the water, by allowing them to settle out of the water. Depending on the size of filter that is used, filtration can remove bacteria, viruses and dissolved substances. Generally, filtration is not sufficient to remove all viruses and bacteria, so the water is also disinfected with chlorine. There are newer methods of disinfection, including UV Irradiation, that are becoming increasingly popular. For detailed information about different water treatment methods, including the contaminants that are removed, see the following fact sheets:

- Conventional Water Treatment: Coagulation and Filtration
- Chlorination
- Filters for Families
- Integrated Biological and Reverse Osmosis Water Treatment Process (audio)
- Ultrafiltration, Nanofiltration and Reverse Osmosis

Each method can remove certain contaminants, but fails to remove others. For example, chlorination is quite effective in inactivating most waterborne pathogens, but cannot kill the *Cryptosporidium* parasite. For this reason, a multiple barrier approach is most often used, meaning that a combination of several different methods of treatment is used.

Many people believe that frequent water testing is sufficient to ensure that the water is safe for human consumption. There are several problems with this rationale, including the fact that, by the time a contaminant is discovered in the treated water, a Boil Water Advisory must be issued, as the water is already in the distribution system, on the way to homes and businesses in the community. While testing the treated water is still important, it is much more beneficial to use effective methods of treatment that can successfully remove all contaminants than to continually test the treated water and hope that there is nothing harmful in it. This concept is expanded on in the Cost-Benefit Analysis: Treat the Illness or Treat the Water? fact sheet, where the costs of treating waterborne illnesses are compared with the costs of constructing and maintaining proper drinking water treatment facilities.

6. What can I buy to treat my water at home?

Most people do not need to treat their drinking water to make it safe, especially in cities, where drinking water standards are more stringently followed. In rural areas, where drinking water treatment facilities may not be up to proper standards, or for extra precaution, additional treatment may be required or desired. There are a number of methods of water treatment that can effectively remove a variety of contaminants.

To decide which system is the most cost-efficient for your water, you will need to test the raw water, to determine what must be removed from it. The method of treatment that you choose will depend on what is in the water, what must be removed, and the cost of treatment.

The best protection any homeowner can have against waterborne health issues is to install a reverse osmosis (RO) water filter under the kitchen sink; units are available from plumbing stores everywhere from around $400. The RO uses pre-filters, which need to be changed at regular intervals. A reverse osmosis system will remove harmful viruses and bacteria. However, in rural areas of Canada, the high concentration of Total Dissolved Solids (TDS) in a water supply can easily clog the RO filters; therefore frequent changing of the filters is required. For more information about RO water filters, see Ultrafiltration, Nanofiltration and Reverse Osmosis, or read the Integrated Biological and Reverse Osmosis Water Treatment Process webpage. For more information about TDS, see the TDS and pH fact sheet.

Placing conventional treatment systems downstream of large outfalls of parasites etc., such as the Wakaw water treatment plant located downstream of Saskatoon's sewage outfall, is bound to generate problems as all conventional systems are based on inactivation of microbes rather than removal of those microbes. We find more and more microbes that are not inactivated and can cause problems. When in doubt, using an RO system is a good insurance. Many rural supplies are also tainted with problematic microbes. We did a survey and while we found *E. coli* and coliforms in all raw water supplies, they were removed by both rural and urban water treatment plants. The rural plants, however, still contained *Campylobacter*, which is another problematic microbe that the rural treatment systems are simply not able to inactivate. Also, for farmers, septic tanks may leak and installing an RO system is a good protection against contamination (in fact, approximately 50% of farm wells are contaminated).

Research is currently in progress to develop a biological water treatment system for individuals and small communities which could be used as a pre-filter, prior to RO treatment. A similar process is currently being successfully implemented in many First Nations, such as at Saddle Lake Cree Nation. For more information about the Biological and RO process, listen to the following audio clip.

7. I was talking to my aunt a while ago about the water we use at the lake. Both of us agree that it should be tested but we don't know where to go. We get our water from a well on the property. The water has no colour to it but can have an unappealing odour and taste. We use a regular filter for drinking water, but I think there should be something better.

There are many water filters available off the shelf, such as Brita™; these do nothing to remove harmful viruses and bacteria and, unless they are changed frequently, they may actually encourage the growth of bacteria! A reverse osmosis filter system on the other

hand can be easily installed in any kitchen or bathroom. A RO system is cost-efficient and does not require a plumber to install. For more information about RO systems, see question 6. When using a RO filter in summer cottages etc., they must be removed over winter months to avoid freezing.

8. Is hard water safe? Should I get a water softener?

Hard water is water with a high mineral content, especially calcium and magnesium (for more information about these dissolved solids, see the TDS and pH fact sheet). In general, hard water is not dangerous, but can cause scaling (which occurs when minerals form a deposit and can clog pipes and water heaters). Hard water does not lather well, which can cause laundry and bathing issues. For this reason, some people prefer to get a water softener. The most common method of softening water is using an ion exchange softener, which exchanges the calcium and magnesium in the water with sodium or potassium.

In Canada, the Prairie provinces tend to have high amounts of calcium and magnesium in the water, which results in hard water. Canada has no numerical guideline for hardness, but generally, levels between 80 and 100 milligrams per litre (of calcium carbonate) are considered acceptable, levels greater than 200 milligrams per litre are considered poor, and levels above 500 milligrams per litre are considered unacceptable. However, if you see the Water Quality Fact Sheets fact sheet, you will see that the Saskatchewan guideline for hardness is 800 milligrams per litre.

9. What kinds of standards are there for water treatment devices, like filters and chemicals?

It is advisable to use only water treatment devices that have been certified. The American National Standards Institute (ANSI) is an organization that allows certification agencies to become accredited to perform testing and certification to NSF/ ANSI (National Science Foundation) standards for drinking water treatment units, system components and chemicals.

The National Science Foundation (NSF) is one of the international organizations that certify devices for treating drinking water. The NSF/ ANSI Standard 60 covers drinking water additives, including chemicals for pH adjustment, softening, precipitation, coagulation, disinfection and oxidation. The standard focuses on two principal questions:

1. Is the chemical safe at the maximum dose?
2. Are impurities below the maximum acceptable levels?

This standard does not cover reaction by-products.

The NSF/ ANSI Standard 61 covers drinking water system components, which are any materials that come into contact with drinking water, between the water source and the faucet. This includes joining and sealing materials, pipes, process media (such as sand and carbon), filters and chlorinators.

The NSF/ ANSI Standards 42, 44, 53, 55, 58, 62, 177 and 222 cover drinking water treatment units. These standards address aesthetic effects, health effects, reverse osmosis treatment systems, cation exchange water softeners, ultraviolet microbiological treatment systems and distillation systems.

It is advisable to adhere to the standards that are set by the NSF/ ANSI, and not use any water treatment devices that have not been certified. A 2006 Health Canada survey found that Nunavut and the Yukon were the only two provinces or territories in Canada that were not intending to use Standard 60, and Nunavut, the Yukon, British Columbia and Prince Edward Island were the only provinces or territories that were not intending to use Standard 61. While most provinces are intending to use these Standards as guidelines, the legislation and regulations in place vary from province to province.

Other organizations that certify water treatment devices are the Water Quality Association (WQA), Underwriters Laboratories (UL), Canadian Standards Association, International Association of Plumbing Mechanical Officials (IAPMO) and Truesdail Laboratories, Inc.

10. What kinds of problems do animal waste and agricultural runoff cause for rural water supplies? What can I do to ensure that my water is not contaminated from agricultural sources? How does water quality affect agricultural practices?

There are a number of harmful effects that agriculture can have on water supplies. Sediment and pesticides can contaminate water through field runoff. Nutrients and pathogenic micro-organisms that are present in fertilizers and manure can enter the water and form ideal conditions for algal growth.

There are some agricultural practices that will minimize water contamination. If you use pesticides and fertilizers, using minimal amounts and applying during calm weather conditions will minimize runoff and spreading of the chemicals. Shelterbelts in fields minimize soil erosion, and grass buffer zones near water sources minimize runoff from the field into the water. For more information about water pollution from agricultural sources, as well as from industrial and domestic sources, see the Water Pollution fact sheet.

The Water Quality Fact Sheets provide an excellent overview of water quality as it pertains to livestock, irrigation, chemical spraying and other agricultural practices.

11. What happens during a Boil Water Advisory?

A Boil Water Advisory (BWA) is issued upon evidence of unacceptable levels of disease-causing bacteria, viruses or parasites in the water system between the source and the tap, unacceptable levels of turbidity (cloudiness) in the water, or as a precautionary measure when there is a concern for contamination. During a BWA, you should boil all water for drinking, preparing food, beverages, ice cubes, washing fruits and vegetables and brushing teeth. It is not necessary to boil water for showering, laundry, bathing or washing dishes. To boil water, allow it to come to a rolling boil for one minute, in order to inactivate all bacteria in the water.

At any given time, there are over 700 Boil Water Advisories in place in Canada. Many of these are in rural and First Nations communities. As of June 2007, there are 835 Boil Water Advisories in Canada, as well as 10 Do Not Consume water advisories. Over 78 percent of these are for communities in British Columbia, Newfoundland and Labrador, Ontario and Saskatchewan. As of June 1, 2007, 91 of the Boil Water Advisories were for First Nations communities across Canada. For more information about Boil Water Advisories, see the Boil Water Advisory fact sheet.

12. Who regulates bottled water and what are the standards?

Bottled water is a federal responsibility, shared by Health Canada and the Canadian Food Inspection Agency. Individual provinces and territories may have laws and guidelines as well, as the federal laws set only the minimum standards. The Food and Drug Act sets out the guidelines for bottled water. These regulations include requirements for microbiological quality, composition and clear labeling.

According to the Canadian Food Inspection Agency, "spring water" and "mineral water" must originate from a groundwater source, and be safe for drinking at the source. Spring water naturally contains less than 500 parts per million of total dissolved solids (TDS), while mineral water contains more than 500 parts per million of TDS. The only treatments that are allowed on spring water and mineral water are carbonation, ozonation and fluoridation.

"Distilled water" is water that has gone through the distillation process; "demineralized water" is water that has been treated to reduce the mineral content to less than 10 parts per million, and "carbonated water" is water that has been made effervescent by the addition of carbon dioxide. These guidelines mean that "distilled," "demineralized" and "carbonated" water can be tap water that has been treated. For more information about bottled water, see the Bottled Water fact sheet. For more information about water treatment and water quality, see Water Quality Fact Sheets and Water and Human Health.

13. Lesser Evil? I'm afraid to drink water from the tap because of the contaminants that are not taken out, and put into it… I'm afraid to drink bottled or pitcher-purified water because of the plastic it sits in… I'm afraid to find out what harmful substances might be used in faucet-mounted purifiers… Is there any (reasonably convenient) way to get truly safe and pure water? If not can you please tell me what is thought to be the least harmful in the long-run?

We recommend reverse osmosis (RO) systems, however it does depend on the source water. If receiving urban water supply RO will solve the problems and remove contaminants etc but they also remove minerals which is why we advocate adding Calcium/Magnesium supplements. If on rural supply then often TDS levels are so high the RO filters will plug way too often, so another filter system is needed as a pretreatment before the RO can do its job. Alternatively, if the source water has high Arsenic levels the RO alone cannot remove Arsenic sufficiently.

Resources:

Prairie Farm Rehabilitation Administration, Agriculture and Agri-Food Canada. Canadian Agriculture and Water. http://www.parc.ca/mcri/pdfs/papers/iacc078.pdf

Agriculture and Agri-Food Canada. March 2002. Water Quality Testing. http://www4.agr.gc.ca/resources/prod/doc/pfra/pdf/water_quality_testing_e.pdf

Canadian Food Inspection Agency. June 2009. Bottled Water. http://www.inspection.gc.ca/english/fssa/labeti/inform/wateaue.shtml

Health Canada. October 2011. Frequently Asked Questions about Bottled Water. http://hc-sc.gc.ca/fn-an/securit/facts-faits/faqs_bottle_water-eau_embouteillee-eng.php

National Science Foundation (NSF) International. 2004. Residential Water Treatment. http://www.nsf.org/services/by-industry/water-wastewater/residential-water-treatment

Peterson, H. 1999. Water Quality Fact Sheets. www.safewater.org

Public Health Agency of Canada. March 2010. ARCHIVED - National Notifiable Diseases. http://www.phac-aspc.gc.ca/aids-sida/about/dis-eng.php

Safe Drinking Water Foundation. 2007. http://www.safewater.org

United States Environmental Protection Agency. WaterSense Frequently Asked Questions. http://www.epa.gov/watersense/faq.html

Water.ca: The Chronicles. June 2007. Boil Water Advisories. http://www.water.ca