

Real and Perceived Water Quality Solutions

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In an effort to increase available water supplies on the Canadian Prairies, the Prairie Farm Rehabilitation Administration (PFRA) implemented a dugout construction program more than sixty years ago. Farmers that previously had insecure water supplies became "self-sufficient" by harvesting their own water through collection in dugouts. This has proven to be a highly effective means of increasing water supplies, with more than 100,000 dugouts presently in use across the Prairies.

It is estimated that each dugout traps around one million L (1,000 m³) of water each spring, making around 100 million m³ of "new" water available for Prairie farmers. The dream of plentiful on-farm water has become a reality for thousands of farmers. But while the quality of dugout water with regard to inorganic chemicals is excellent, dissolved and particulate organic materials (including microorganisms) present problems.

Thirty to forty years ago, it was well established in the scientific literature that nutrients, especially phosphorus, that entered water bodies, such as rivers, lakes and reservoirs, will cause rapid growth of algae and aquatic weeds. In small water bodies, such as dugouts, additional processes, such as movement of nutrients from bottom sediments into the water can compound these problems. This prompted international recommendations that water intended for consumption should not be stored in small, shallow reservoirs.

It was, however, not until this decade that PFRA actually started to worry about water quality. Realizing that no dugout water should be consumed without proper treatment, PFRA has established a Water Quality Section to examine water quality issues

in all three Prairie provinces. This research includes coagulation (removal of water impurities through the addition of chemicals), biological and membrane filtration processes, and water source protection. The results of this research are available to rural residents and are shared with provincial agencies. PFRA, while being slow to act to support real solutions to drinking water problems, should be commended for acting when realizing the extent of the problem facing rural people.

Sask Water's extension program was highlighted in the March issue of the Rural Councillor. Sask Water claims it has found commercially available solutions for 95% of the water quality problems people have approached them with (letter from the Honorable Maynard Sonntag to the Safe Drinking Water Foundation). The people with the remaining 5% of problems have been advised to continue hauling their water.

In theory, there are water treatment processes and equipment that will deal with most water quality problems in Saskatchewan and elsewhere. Most of these treatment devices will work as specified for a period of time. This can range from days to weeks to months. It is not until the equipment works successfully for years that the treatment becomes reliable and economic. The proof for sustainable production of quality water can only come after it has been tested on surface and ground water in Saskatchewan. Without such research, claims of success will remain unsupported. PFRA's current support of research is aimed at determining long-term sustainability of several different types of water treatment systems.

The following examples highlight some of the difficulties encountered in trying to find effective solutions to water quality issues in rural areas:

As part of PFRA's research program, a reputable company recently installed a reverse osmosis membrane unit into a house to treat its entire water supply. The company was convinced that its membrane could treat the water supply after it had evaluated an extensive set of chemical tests. The membrane plugged in just 5 days. A second brand new membrane was then put in. It plugged in only 3 days. A third and different type of membrane has now been installed and it has so far lasted for 3 weeks.

One of the world's largest membrane manufacturers (Filmtec) delivered a membrane course in Regina. A new type of membrane had been developed that the company claimed would only need cleaning every 6 months. I asked if this was the case for Saskatchewan and the person from Filmtec looked around and said, "Oh yes, I am in Saskatchewan. We have one industrial application treating surface water in Saskatchewan; those membranes need to be cleaned once a week. But, there again, Saskatchewan is a worst case scenario."

PFRA was keen to test a specific water treatment filter that is marketed around the world and partially supported the installation on a Saskatchewan farm using dugout water. A combination of poor instructions from the manufacturer and poor performance of the equipment on the dugout water resulted in smelly water high in microbes and other particles. At times the farmer needed to tend to the filter every day, but he still ended up hauling water. Through research, this system may yet become usable for dugout applications. Theoretically, the process used (slow gravity filtration) is quite suitable for dealing with many different problems. Indeed, theoretically

it is more suitable than typically used pressure filtration systems.

There are scientific uncertainties surrounding the treatment of rural surface and ground water. As a result consulting reports trying to solve water quality problems for small rural communities will often include a statement that the treatment is not guaranteed. One treatment technique, granular activated carbon, will certainly work for a month or two on typical dugouts with high levels of dissolved organic material. However, this is hardly sustainable, as the cost for replacing the carbon is high and for small systems it cannot be reused (for large treatment plants like Buffalo Pound the carbon can be reused). The removal of dissolved organic material is a key to producing safe water in small communities (less chlorine is required). Chlorine reacts with the organic material to form disinfection by-products, such as trihalomethanes, which can cause cancer.

Trihalomethanes in treated drinking water were highlighted by Saskatchewan Environment and Resource Management (SERM) in a

poster at the Fifth National Conference on Drinking Water (Winnipeg, 1992). Rural Saskatchewan drinking water rated the worst in Canada in terms of trihalomethanes produced! The Province has known for many years that there are serious water quality issues in rural Saskatchewan. It is difficult for a small province like Saskatchewan to deal effectively with the types of problems encountered. By providing information that has not been thoroughly tested, we are using quick-fix solutions when an in-depth analysis of the special requirements for Saskatchewan is clearly required. This then needs to be followed by appropriately designed water treatment processes.

The reluctance of provincial agencies, such as Sask Water, SERM, and Saskatchewan Health to spend money on researching sustainable solutions for producing safe drinking water stems from a tradition that has been prevalent for the past 10 years. This tradition has seen drinking water tossed around as a responsibility with many hats was SaskWater's, sometimes Health's and sometimes SERM's),

leading to everybody looking over their shoulder and passing the buck. When federal action was taken in the drinking water area, provincial red flags were raised, weakening federal efforts in Saskatchewan. Still, progress has been made in finding drinking water quality solutions for rural areas, and maybe in the next decade the Province will also take an active and positive part in these efforts, which could provide economic benefits as well.

The cost to Saskatchewan for consuming inadequately treated water has been estimated to exceed \$10 million per year, which is more than \$100 million over the past 10 years. However, over this same 10-year-period, the combined efforts of SERM, Health and Sask Water in supporting drinking water research have only amounted to a few hundred thousand dollars.

For more information on safe drinking water, check out <http://safewater.org>. (Safe Drinking Water Foundation, 11 Innovation Blvd., Saskatoon, SK S7N 3H5, email water@sk.sympatico.ca). ■

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