

H₂O How's the Water?

Perspectives on Water and Rural Communities in Saskatchewan

Surface Water

Lakes, rivers, streams, ponds, creeks, sloughs, dugouts and reservoirs are all forms of surface water. Precipitation not absorbed by the soil collects in low spots or runs into a flowing stream. Surface water is strongly affected by weather. In a dry year, small creeks and sloughs dry up completely; wide beaches or mudflats form on lakes and rivers as their levels drop; and white rings of salt form when water evaporates from saline sloughs. In years with heavy snow, runoff can refill old sloughs and raise lake and river levels significantly. Severe storms and quick thaws can cause floods. Underground springs and seepage from the water table also feed surface waters. These sources buffer the effects of drought somewhat, since groundwater moves slowly and is not subject to evaporation.

Surface waters are the basis of aquatic, wetland and riparian (stream bank) ecosystems. Healthy surface water bodies support biodiversity. Aquatic plants, insects, microscopic

organisms, fish and some amphibians live in the water. The edges of streams, sloughs and lakes are the most productive habitats on the prairies, and support intricate communities of wildlife, birds and plants.

Surface waters supply municipal water supplies for most Saskatchewan communities. Dugouts provide water for many farms. The surface water's quality influences the methods used and the costs of treating drinking water.

Surface waters can be damaged by spills when effluent is dumped or when runoff waters are contaminated. In Saskatchewan the most common types of run-off pollutants are nutrients (nitrogen and phosphorus from chemical fertilizers and manure), dissolved organic material and pesticides. Surface waters can be polluted if contaminated groundwater flows into the surface water body as well.

Too much nitrate in drinking water can be fatal to babies, as it blocks the ability of blood to carry oxygen. Sources of nitrate in surface water include decaying plant or animal

The Walkerton and North Battleford crises have jolted us into paying much closer attention to water. Water quality has an immediate impact on our lives, but is the result of thousands of interactions between human beings, our technological and social systems and the natural world. The quantity of water that is in natural ecosystems and available for industrial and domestic use also depends upon complex and sometimes unpredictable relationships.

Saskatchewan Eco-Network's Water Working Group/Water Watch Committee has gathered information about water and the environment in rural Saskatchewan and has compiled contact information for citizens who want to follow up on their own concerns. In the course of our research we held community meetings in different parts of the province to find out about the insights, information and experience of rural citizens. We also called upon expertise from the universities, government agencies and non-government organizations. 💧

material, agricultural fertilizers, manure, and domestic sewage. Too much phosphorus in surface water causes algae to thrive, forming a thick green scum on the water. When the algae die they decay and use up oxygen in the water. Lack of oxygen kills the fish, and generally reduces the biodiversity of the ecosystem. Animal manure and domestic sewage are primary sources of phosphorus contamination. If coliform organisms (*e coli* bacteria) and intestinal parasites, such as giardia and cryptosporidium, are in the water, it means it has been contaminated by sewage or manure.

In studies of Saskatchewan dugouts fed by agricultural runoff, all cases showed pesticide residue contamination. The levels of pesticides found were below Canadian drinking water standards, but well above European limits. Some of the pesticides that were found had not been sprayed in the area for years. Some residues were persistent in the surrounding soils and others came from contaminated rain. High autumn pesticide levels were caused by the annual mixing

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“Chemicals used on the Cypress Hills golf course will contaminate our springs.”

“Local people are not being listened to.”

“SERM should not be testing and monitoring their own projects.”

“Salt water from gas production is being dumped in the Sand Hills.”

“Why does Junction Reservoir have such high levels of mercury?”

– Concerns heard from Maple Creek residents

“6,000 loads of drilling mud were dumped in this slough. Energy and Mines says it's okay, but no testing was done.”

“I could lose organic certification if my land is contaminated by polluted water. The oil industry is being developed on the back of agriculture.”

“What happens to the leachate in the contaminated soil pit? Does it affect the plastic liner?”

“My neighbor drained his slough and now my land floods every year. SaskWater couldn't help when I called.”

– Concerns heard from Weyburn residents

phenomenon that happens when the top layer of water cools, allowing it to mix with cold deep waters. The wind then stirs up the whole dugout, releasing pesticide residues from the bottom mud.

The health consequences of surface water contamination range from well-known effects of cryptosporidium parasites and “blue baby” syndrome, to the largely unstudied effect of long term exposure to a mixture of pesticide residues over many years. Recently, however, non-Hodgkins lymphoma has been linked to 2,4 D exposure. 💧

Groundwater

Aquifers, underground springs, and wells are all sources of groundwater. Groundwater is the Earth's hidden circulation system. Precipitation that is not absorbed into the soil, used by plants, or does not run off into streams, lakes and rivers, makes its way downwards by way of cracks and pores in the subsoil and bedrock. Surface water moves into shallow sand and gravel layers fairly quickly, but deeper formations hold water that has been seeping in for thousands of years.

In rural Saskatchewan, we depend on groundwater for a lot of our water. Groundwater is used for private domestic purposes, family farms, industries, and municipalities. Municipal and industrial wells require permits from SaskWater to ensure that water consumption does not exceed the rate of recharge.

Shallow wells give some of the best quality water; however, their flow rates fluctuate with climatic conditions and they are most vulnerable to contamination by surface pollution. Deeper wells, though often high in minerals, are very consistent, providing security where drought is a frequent problem. But if we take too much groundwater too fast, we get into an unsustainable situation – we become dependent on a source of water that we are actually using up. Groundwater depletion has severe consequences for surrounding wildlife and neighbors – as the water table drops, wetland habitat disappears, river and lake levels decline and wells go dry.

When groundwater pollution occurs, it is very serious because groundwater moves slowly and is not exposed to the air, sunlight and microbes that break down pollutants. Aquifers accumulate pollutants and cannot be flushed out the way man-made pipelines can be. For all practical purposes, groundwater pollution is irreversible.

Improperly capped wells provide a direct route for run-off and floodwaters to pollute groundwater. Incredibly, some people throw hazardous garbage down old wells. Toxic liquids leach from poorly located and improperly designed dumps. Pesticides and nutrients can leach through soils, particularly when applied in areas with sandy soils, gravelly sub-soils, or fracture-prone clay layers.

Hazardous waste can enter groundwater when spills occur and disposal practices are not properly carried out. In some places there are toxic minerals, such as arsenic, in rock formations that are dissolved as water flows through. Improperly de-commissioned natural gas wells can contaminate groundwater with methane. Old, leaky, underground gas tanks seep carcinogens. And in some cases, contact between polluted surface waters and underground aquifers can cause pollutants to enter groundwater.

Contaminated groundwater can cause health problems in people and livestock. It also increases costs for testing and treating water. The question of human rights for future generations also enters the picture since groundwater pollution is essentially permanent. Likewise, if we use up groundwater faster than it recharges, we unilaterally limit the amount of water available to others in the future. 💧

Climate Change

Climate change will have a significant impact on water. Longer, hotter, dryer summers are expected. Increased evaporation will concentrate pollutants, salts and sediments in surface waters, leading to higher water treatment costs and perhaps more health problems. Ironically, floods will also occur more often and patterns of precipitation will change. The greenhouse effect means more of the sun's energy is stored in the atmosphere. This extra energy drives bigger and more frequent storms.

Winters may have less snow. If there is less runoff and more evaporation, groundwater sources will recharge more slowly, lowering the water table. The size, water quality, vegetation and biodiversity of wetlands will also be affected.

More dramatically, the glaciers that feed our major river systems are receding and may soon disappear completely. Prairie rivers would then be fed only by melting snow and rainfall. The volume of flow in the

Saskatchewan River system will be less predictable, and could be significantly reduced.

Demand for water will increase. People will want to use more water for domestic, agricultural and industrial purposes, and there may be increased pressure to export water to the USA. Conflict over increasingly scarce water supplies is likely to occur.

Forests buffer the effects of climate change. Precipitation moves through forest soils slowly, making more water available to the ecosystem. But seedlings will have a harder time surviving in hotter, dryer conditions. Protecting forests is one way to reduce the impacts of climate change.

Clearly, reducing greenhouse gas emissions needs to be a priority. We also need to develop strategies to cope with the effects of climate change on water. Above all, we can't assume that the past is a model for the future because the uncertainty caused by climate change has to be taken into account. ♪

Water Export

Saskatchewan forbids bulk water export. But provisions in the North American Free Trade Agreement (NAFTA) undermine provincial control. The World Trade Organization (WTO) defines water as a "good", and prohibits export controls on any good, even for environmental purposes. As soon as one province exports bulk water it becomes a good, then NAFTA obliges all provinces to allow exports. NAFTA permits investors to sue governments that make rules that would prevent them from making a profit by exporting goods. The "proportionality" clause means that if we begin to export water, we would have to continue to do so, regardless of how it might affect us.

The most likely way for water to be exported from Saskatchewan would be via diversion projects involving the Saskatchewan, Qu'Appelle, Souris and

Milk Rivers. The United States is interested in getting water from Canada because it is rapidly depleting its most important water resources. The Ogallala Aquifer lies under the American Great Plains. It waters roughly one-fifth of all irrigated land in the USA and is being pumped out 14 times faster than it is being replenished. California exceeds its permitted water usage and has failed to comply with orders to reduce consumption. It is the second largest food producer in the USA, with lucrative fruit and vegetable crops that depend upon irrigation. Heavy investment in irrigation agriculture means that the USA is looking for new sources of water, not shifting to less water-intensive crops.

Proponents of water export appeal to Canadians by pointing out that we have abundant fresh water, and people in many poor countries are suffering with water shortages.

However, water export is business, not charity, and only those who can pay will have access to water exported from Canada. The people who would benefit if water were to be exported would not be the poor. ♪



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Water Impacts of Major Rural Industries

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“What effect do pesticides from lawns and fields have on children? Are the chemicals going into the water?”

“People burn pastures when they can get away with it, not when it is good for regeneration. How does deliberate burning affect the watershed?”

“How does draining sloughs affect groundwater? Even if it is only a small amount of water, the economic benefits and convenience just go to farmers who drain.”

“We need government investment for protecting the watershed.”

– Concerns heard from Spiritwood residents

High Input Agriculture

High input agriculture depends upon herbicides, insecticides, fungicides, and chemical or liquid manure fertilizers. In irrigation areas, inputs are higher because high yields offset equipment and chemical costs. Low input and organic agriculture minimizes or eliminates purchased farm chemicals, and relies instead on biodiversity, crop rotations, tillage and skilled management to control pests and maintain fertility.

Though high input farming aims to be economical in applying chemicals, contamination of surface waters occurs when spring run-off, heavy rainfall or irrigation waters pick up residual chemicals and nutrients from the top layer of the soil. Zero-tillage reduces surface runoff, but also promotes leaching via the miniature tunnels formed when dead crop roots are not disturbed by cultivation.

Near Lake Diefenbaker, high levels of herbicide have been found in the irrigation water, at times exceeding the guidelines for irrigation, livestock watering and aquatic wildlife. Crop damage caused by irrigation with dugout water contaminated with the herbicide 2,4, D is not uncommon.

Pesticides that are highly volatile or applied in a fine spray quickly evaporate. These chemicals eventually return to the surface in the rain. Studies have shown that during certain times of the year the rain contains high levels of 2,4,D.

Intensive Livestock Operations

Large intensive livestock operations raise concerns about both quality and quantity of water resources. Clean water is required for the animals to drink and it is also used to wash down the barns and liquify the manure. A 5,000 sow operation uses at least an estimated 125,000 gallons per day, or about 45 million gallons per year or more.

Liquid hog manure contains nitrogen, phosphorus, cleaning solvents, fecal coliforms and feed additives such as copper, hormones and antibiotics. Manure is stored in open pit lagoons, usually designed to hold 13 months' waste. Manure is pumped through flexible pipelines and injected into fields within a two-mile radius. In spite of guidelines that recommend manure pits be built with packed clay liners and in places with little risk of leaching into groundwater, some are in areas with high water tables or porous gravel formations. Whether the pits have the capacity to hold runoff from unusually heavy rainstorms is another concern.

Manure spills, surface runoff and leaching can also pollute water. A recent study showed that injected hog manure releases more nitrogen into surface run-off than does the equivalent amount of chemical fertilizer. Time constraints for manure injection make fall manure application a common practice, which in turn makes nutrient run-off more likely because plants do not take up nitrogen during winter. The concentration of manure within a two-mile radius of barns is likely to cause salt and heavy metal build-up in soils. Equipment failure during pumping caused a major spill into a field and adjacent ditches and a slough near Sturgis.

The impacts of large cattle feedlots may become a concern in coming years. In Alberta's "Feedlot Alley", water quality problems have been linked to intensive cattle operations.

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Oil and Gas Industry

Oil and gas industry wastes and products must be handled carefully to prevent water pollution. Crude oil contains toxic and carcinogenic compounds. Drilling mud contains heavy metals, radioactivity and salts. Natural gas contains very salty water that has to be separated out before the gas goes into the pipeline. In order to increase gas production, water with radioactive tracer elements is injected into wells under high pressure. Biocides added to injection water and oil and gas in pipelines kill metal-eating bacteria. Chemical lubricants, additives, pesticides, solvents and degreasing compounds are used in various processes, and can pollute the water.

Well site and pipeline spills can leach toxic compounds into ground and surface water. There are concerns that the pressurized brine from deep well injection could also be forced upwards into potable groundwater sources. Another serious concern is "orphan" sites where failed companies have left behind improperly capped wells, illegal dump sites, and contaminated soils. Special funds set aside to clean up these sites have failed to address all the problems.

There are regulations for production and waste handling, however inspection and enforcement have not kept pace with oil and gas development for several years. Little government staff time is devoted to inspection so regulators depend upon the public to report problems. As a result, many environmental violations go unreported and uncorrected. 💧

Residential Water

Saskatchewan's cities are growing. While the province's population has been about one million for decades, almost half of our people now live in Saskatoon and Regina. The other main cities and towns make up about 25 percent. Cities use a lot of water for residential and industrial purposes.

Each city and town's water consumption corresponds with its output of sewage. Sewage contains not only human excrement and water, but also different kinds of chemicals, drugs, heavy metals and debris, some of which are toxic. Effective sewage treatment can remove most of these substances so that clean water is returned to the natural environment. With poor, faulty, or no treatment, polluted water enters the ecosystem and damages the ecological balance, harming wildlife populations and human health. Storm sewers discharge urban runoff water mixed with oil, salt, and other residues from the streets directly into the environment in most cases.

Saskatchewan's sewage treatment regulations require municipalities to meet minimum standards regarding total dissolved solids and biological oxygen demand (BOD) in their discharge effluent. In some cases they must get a permit and meet higher standards based on the sensitivity of the area downstream. The larger cities have enhanced secondary sewage treatment, which removes most of the BOD, coliforms and suspended solids, but does not remove some of the other toxic substances. Regina disinfects sewage effluent with Ultra Violet (UV) light, but Saskatoon still uses chlorine, which is toxic to aquatic life. Saskatoon also has a problem with cracked sewer pipes that are leaking into the storm sewer system and into the river.

Smaller communities tend to use simpler wastewater treatment systems. The two-cell aerated lagoon is common. Conflicts occur when effluent discharge is seen to

"What impact will ILOs have on shallow wells?"

"The concentration of hogs leads to pollution especially after a heavy rain. What is in the manure – chemicals, antibiotics, drugs, hormones?"

"I'm frustrated and disillusioned by government. I'm being hemmed in by hog barns on all sides."

"When departments of Natural Resources and Environment amalgamated, we lost a lot of environmental staff. SERM needs trained people, like environmental chemists."

"Frog populations are declining."

"Guidelines don't reflect scientific findings about safety. The Province has to set standards."

"From what I hear about GATS, it will make way for privatization of water, even farm wells."

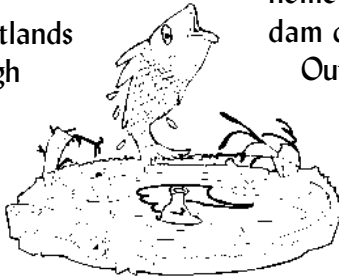
– Concerns heard from Preeceville residents

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have an adverse impact on the downstream residents' water supply. Farms and resort communities face water quality problems if residents do not keep their septic systems in good repair.

Some communities use constructed wetlands for sewage treatment. Their sewage goes through a series of ponds that are planted with cattails and other species that use up the nutrients and absorb contaminants. Davidson uses its treated effluent to irrigate hay fields. In Bear River, Nova Scotia, the town's sewage treatment system has become a tourist attraction. It looks like a greenhouse and uses a combination of bacteria, plants, aquatic species, composting and UV



disinfection to treat its waste.

Conserving water saves treatment costs for both drinking water and sewage. You can easily save water at home by installing a low-flow showerhead, a toilet dam or low-volume toilet and fixing leaky taps.

Outdoors, plant a xeriscape (drought tolerant) yard instead of a traditional lawn, set up a rain barrel, and water in the cooler times of day.

You can protect water quality by using environmentally friendly cleaning products, and if you have hazardous products, outdated drugs, or used oil, dispose of them safely – don't dump them down the drain or the storm sewer. ♻️

Regulations, Monitoring and Enforcement

The responsibilities for water in Saskatchewan are divided up among many jurisdictions — federal, provincial, municipal and First Nations. Under the Canada Water Act, the provinces have ownership of water resources and the federal government looks after waters that are international, inter-provincial and on federal lands. Yet there are gaps where nobody is responsible; and there is often political conflict between departments and agencies that get in the way of protecting the water.

In recent years, the trend has been towards voluntary compliance and self-regulation of industries. Furthermore, Saskatchewan's laws and regulations often use weak language (for example, the Minister "may" instead of "shall") and provide guidelines instead of enforceable standards. Most significantly, serious

conflicts of interest exist where government departments are in charge of both environmental regulation and promotion of economic development.

In Cypress Hills Provincial Park, SERM is the developer and the regulator of tourist infrastructure. This has resulted in treated sewage effluent being used to irrigate a golf course in an important regional groundwater recharge area. Saskatchewan Agriculture and Food has a promotional wing, Sask Pork, dedicated to expanding intensive livestock operations, while at the same time the department issues permits for new developments. Sask Energy and Mines regulates and promotes the oil and gas industry and has supported the interests of large companies when they have come into conflict with farmers.

Environmental monitoring, inspection and enforcement have been

severely understaffed for many years. Pertinent information about water in the environment has not been systematically collected. Workers are spread very thin, and do not even have gas money to go out and do regular on-site inspections. As a result, investigations usually happen only after persistent complaints from members of the public. Unscrupulous companies are therefore able to break environmental rules with little risk of consequences.

There is a lot of room for improving regulations, inspection, monitoring and enforcement to protect Saskatchewan's water quality and water supplies. Lack of political will, underfunding, and conflict of interests that allow short-term economic goals to override long-term ecological health values have resulted in weak measures and second-rate practices. ♻️

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Who's in Charge of What

SaskWater	<ul style="list-style-type: none">• Manages, controls, develops and administers use of water• Regulates wells used for industrial and municipal purposes
Saskatchewan Environment and Resource Management	<ul style="list-style-type: none">• Deals with water pollution and spills via Environmental Management and Protection Act• Can override SaskWater in order to protect the environment or public health• In charge of the Environmental Assessment Act• In charge of the Saskatchewan Fisheries Act
Saskatchewan Health and the Health Districts	<ul style="list-style-type: none">• Monitor and provide advice on water quality and treatment to owners and operators of private water supplies• Issue permits for private sewage systems• Provincial Lab tests water samples
Saskatchewan Agriculture and Food	<ul style="list-style-type: none">• Issues permits under the Agricultural Operations Act• Administers the Pest Control Products Act
Saskatchewan Energy and Mines	<ul style="list-style-type: none">• Regulates the oil and gas industry• Manages Oil and Gas Environmental Fund• Regulates mineral exploration and development
Environment Canada	<ul style="list-style-type: none">• Responsible for water on federal lands (e.g. national parks)
Department of Fisheries and Oceans	<ul style="list-style-type: none">• Responsible for navigation, navigable waters and fisheries
First Nations/ Saskatchewan Federation of Indian Nations	<ul style="list-style-type: none">• Look after drinking water quality and wastewater systems on First Nations• Operate a training and certification program for water system operators• Active in protecting water sources• Consider health and water to be a human right
Municipalities	<ul style="list-style-type: none">• Ensure water treatment and sewage treatment meets provincial guidelines• Can enact land use zoning bylaws to protect watersheds

Water Privatization

Water itself in its natural state cannot be privately owned in Canada, but water treatment infrastructure and distribution systems – water treatment plants, pipelines, hydroelectric dams, and municipal water utilities – can be.

With publicly-owned water systems, elected representatives are responsible and water is delivered at cost,

or in some cases, subsidized through other tax revenues. But when water systems are privatized, decisions about service, maintenance, and pricing are made solely in the interests of shareholder returns. The price of private water always includes a profit margin over and above the cost of providing the service.

Consortiums of large multinational corporations, such as Vivendi and Ondeo, are involved in water privatization in

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order to control water and water service projects in Europe and South America. These companies are acquiring treatment and distribution rights for water and the rights to dams, waterways, and watersheds in North America as well.

The most likely doorway to privatization of water in Saskatchewan would be through Public-Private Partnerships (PPPs), or agreements whereby a private company builds a water treatment plant and/or a pipeline, and leases it to a municipality. The municipality is saved the trouble of

financing a major project, but loses control over its water supply. In British Columbia, PPPs have been soundly rejected by municipalities in British Columbia in spite of the corporations' attractive self-promotion efforts. In places where PPPs have been established, water prices have risen, poor people have had their water cut off, and water has been wasted due to poor maintenance of pipes and valves. The environmental costs of excessive water use under PPPs have largely gone unmeasured. 💧

Protecting Our Water

It is not commonly understood that the waters of the Great Plains region are presently fully utilized. It is not all used consumptively, but virtually every drop of water that is not used consumptively flows through a hydroelectric turbine, supports aquatic life and water-based transportation and recreation. Each increment of water taken from the river systems for consumptive use changes the opportunities to those existing uses.

R. S. Pentland and P. Tones. Stretching Water Supplies: Alternate Technologies and Strategies (1992).

Water is necessary for life. Anything that affects its quality or supply needs to be taken very seriously, and decisions should be based on the precautionary principle. This simply means that when it is likely that something will cause irreparable harm, we avoid doing it — we don't wait until the harm has been proven. Precaution is not the same as paralysis. It is action based on setting goals for positive outcomes, seeking out and evaluating alternatives, shifting the burden of proof to one where a proponent has to prove their activity will not cause harm, having proponents take full responsibility for preventing harm, and creating more democratic and thorough decision-making processes.

Water is a sustainable resource only if we take good care of it. We need to know the nature of threats to our water in order to prevent it being degraded. Water can be polluted at any point in the water cycle. Saskatchewan's water supply is limited and climate change is adding more uncertainty — even for the near future. If we draw down groundwater faster than it recharges in order to make up for a shortfall in precipitation, we will use up the resource. If we fail to use our water sustainably we will be faced with serious conflicts, as clean water becomes increasingly scarce. In addition, if we fail to protect our water today we will impose the costs, in the forms of compromised health, reduced biodiversity, restricted options for agriculture, and increasing social conflict — to name a few — on future generations.

If you are concerned about water, there are many ways you can contribute to protecting it. As an individual in your community and family, you can become informed and talk with others about what you find out. If you want to work with others, you can join an established environmental group or organize your own. If you are concerned about a water problem, you can find out if there is a legal or regulatory solution that can be applied. You can make water a topic in your local coffee row, club, team, class, union local, association or workplace. You can also make your views known to your elected representatives at the local, provincial and national levels.

