Water Information Sheet #5

DOING MORE WITH LESS

Each economic sector in Alberta uses water for a wide variety of purposes. Many of the sectors have also changed the way in which they use water, having found and implemented various efficiencies over time. What follows is a brief snapshot of water usage in each of the sectors and some of the biggest changes in water usage trends.

This backgrounder is part of "From H_20: Turning Alberta's Water Headache to Opportunity," a forthcoming research paper by Casey Vander Ploeg identifying Alberta's water challenges and opening discussion on possible solutions.

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Agriculture

Over 96% of all water allocated for agriculture is used for crop irrigation, with the remainder reserved for livestock and feedlot operations. The biggest change in water usage by agriculture is the dramatic increase in irrigation efficiency seen over the past 50 years. On-farm water application efficiency—a ratio of the amount of water applied and retained within the active root zone relative to the total amount of water delivered to the on-farm irrigation system—has increased substantially. For example, a 2004 study on the Magrath, Raymond, St. Mary, and Taber irrigation districts reported that on-farm water application efficiency increased from 36% in 1965 to 74% in 2000 (Alberta Agriculture, Food, and Rural Development 2004).

Efficiency gains in irrigation have resulted from two factors. First, Alberta's 13 irrigation districts have invested heavily in infrastructure improvements to reduce water evaporation and seepage, replacing open ditches with pipelines and re-lining the open canals that remain. The Taber Irrigation District, for example, has completed 90% of its delivery system rehabilitation, and similar efficiency improvements continue in the other districts (Alberta Agriculture and Food 2000). In the Magrath, Raymond, St. Mary, and Taber irrigation districts, water evaporation and seepage has been reduced from 15% of gross water diversions to 5% (Alberta Agriculture, Food, and Rural Development 2004).

Second, improvements within the irrigation district have combined with increased efficiency on the farm, primarily through better irrigation management techniques, more efficient practices, and better on-farm irrigation equipment. In 1965, there were 700,000 irrigated acres in Alberta, of which 600,000 acres were watered through surface or flood irrigation. By 2003, the irrigated acreage in

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Alberta had expanded to 1.6 million acres, with 65% being watered through more efficient centre pivot systems, 23% through wheel-move systems, and only 13% through surface or flood irrigation (Alberta Agriculture, Food, and Rural Development 2004).

Improvements in the irrigation districts and the shift to higher efficiency, low-pressure centre pivot irrigation has allowed for water savings, higher water productivity, and an increase in the amount of acres that can be irrigated. A review conducted in 2000 identified additional improvements in water management efficiencies that would allow even more expansion to occur within the confines of current water allocations.

With all that said, the majority of crop production in Alberta is still dependent on "green" water—"rainfed" or "dryland" farming. Even here, changes in agricultural practices hold additional promise. Around the world, better dryland practices could result in a 15% rise in global food production. Better management of rain-fed agricultural practices, as well as irrigation, could achieve much.

Industry

Almost 90% of all water allocations for industry are for purposes of thermal electrical power generation while 8% is allocated to various forestry, pulp, and paper operations. The remaining 2% is shared by fertilizer and chemical plants, mining, manufacturing, and other industrial purposes, all of which use relatively little water. As Alberta grows, the water needs of industry are sure to grow alongside, especially to service additional electrical generation. The extent to which water efficiencies can be found here are unclear, although there are some hopeful signs. The potential of wind power is one such alternative.

As of 2009, Alberta had 500 megawatts (MW) of wind power connected to the provincial electrical grid, providing 4% of total electrical capacity. This is enough to power 500,000 homes. While approximately 11,000 MW of wind power projects have applied to connect to the transmission system, managing wind power is neither easy or straightforward (Alberta Energy 2009). The amount of power being supplied to the electrical system has to be balanced with demand across the province at all times. Because wind can change quickly—both starting and stopping—wind power carries the risk of causing an imbalance in the electricity system. When wind suddenly stops, conventional generation must

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be immediately put online to offset the imbalance. When wind suddenly starts, power must be immediately expended.

Changes in forestry practices have also been encouraging. Forests—like wetlands—are important water purifiers and filters. Better forestry practices include reducing the size of clear-cuts, more selective logging, and better rates of reclamation. Today, almost 90% of forestry sites are regenerated within ten years of the initial harvest (National Water Research Institute 2004).

Petroleum

Almost 80% of all water allocated for the petroleum sector is reserved for the oil sands, with 65% allocated for oil sands mining and 12% for thermal or in-situ recovery through cyclic steam stimulation (CSS) or steam assisted gravity drainage (SAGD). Another 13% is allocated for gas and petrochemical plants, and 10% for oilfield injection purposes. Here too, there have been some dramatic changes in how water is being used.

As conventional oil and gas reserves decline, Alberta has seen an increase in oilfield injection to enhance recovery. This has not, however, correlated with an increase in water used for this purpose. For example, in 1975 about 80 million m3 of water was injected for enhanced recovery. In 2007, less than 60 million m3 was used. This is a clear gain in water efficiency. Perhaps more important, the type of water being used for injection has also changed. In 1975, about 80% of the water used for oilfield injection came from fresh surface water sources. In 2007, about 40% of all oilfield injection came from fresh surface water sources. The use of saline or brackish groundwater for oilfield injection has grown from 2% in 1975 to over 40% in 2007 (Alberta Energy Resources Conservation Board 2006).

The search for water efficiencies is also ongoing in the oil sands. Petro-Canada's Mackay River in-situ project is instructive in this regard. Mackay River is a fully-functioning zero liquid discharge SAGD operation where brackish groundwater comes up with the bitumen. This water is treated and then heated to produce steam. Petro-Canada claims that more than 90% of this water is continuously recycled, and the operation withdraws very little water from underground aquifers. While the oil sands industry standard is typically 2-5 barrels of water for each barrel of oil produced, Petro-Canada's Mackay River operation uses 1/6th of a barrel of new water for each barrel of oil (CAPP 2008). If oil sands expansion is to continue to any large degree, such efficiency gains will become even more important.

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Municipalities

The actual usage of water in an average Alberta municipality has proven difficult to estimate. Most commentators, however, believe that about 55% of municipal water use is for residential purpose, 35% is for industrial and commercial purpose, and 10% is for institutional purpose. Municipalities in Alberta have been very active in trying to secure increased water efficiencies. Developments within the City of Calgary provide but one example.

Calgary's population has increased steadily for the last 25 years, but the amount of per capita water used has declined over the same time. In 1979, about 800 litres of water per person per day was being used in Calgary. By 2005, water usage had fallen to 500 litres per day per person (City of Calgary 2007). Calgary's total water use has increased at a slower rate than the population has increased—a clear water efficiency gain.

In 2005, the City also passed changes to its Water Utility Bylaw, which now requires all new homes and commercial construction—including renovations that require a plumbing permit—to install low water use fixtures. For example, toilets must use no more than 6.0 litres per flush and urinals no more than 3.8 litres per flush. Public restroom faucets must have a flow not larger than 1.8 litres per minute. New homes and renovations must use showerheads restricted to no more than 9.5 litres per minute. Faucets are restricted to no more than 8.3 litres per minute (City of Calgary 2006).

Environment and Management

Water management and environmental purposes hold about 6% of all provincial water allocations, of which 70% are allocated for flood control, stabilizing lakes and reservoirs, and other water management purposes, and 30% are allocated for ecosystem and habitat preservation, and restoring wetlands. The majority of these licenses have been issued to Alberta Environment itself and Ducks Unlimited.

Commercial

Water allocations for commercial purposes constitute less than 1% of all water allocations. Within this sector, about 55% of the water is used to irrigate parks and golf courses, and provide other recreational opportunities. Another 20% is used for food processing and beverage bottling. Efficiency gains across this

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sector are difficult to measure—much of the water is self-supplied and the total water used is very small. The sector has not been a focus for efficiency gains.

In many places and in many ways, Albertans are doing more with less water. There is a history here upon which the province can and must build. In an era marked by growing water demand and diminishing supply, Albertans cannot rest on their laurels. Rather, the challenge is to push the water efficiency and productivity envelope even further. ■

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