Demand for Water - Water Retention and Storage in the Eastern Prairies

Figure 1: *Retention pond experiment in Manitoba to control water release rates on the landscape.*
(credit: D. Lobb)

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What's going on?

In many parts of the eastern Prairies, agriculture has been dominated by draining land to flush away snow melt-water in spring, so that the land is dry enough to seed as early as possible for a good crop using the available soil moisture. By summer, a landscape covered by water is just a memory, as the ground surface starts to crack, and production depends on a few steady rainfall events for a good yield.

Post harvest, producers may reinstall shallow surface drainage channels to be ready to drain the land in spring to ditches at the field margins, which drain to creeks, streams or man-made drains. Alongside roads, broad ditches take large volumes of water from fields through large culverts to protect property and infrastructure downstream.

The system is dependent on how wet the soil is in autumn; how much snow falls; how quickly it melts; how much the melting snow evaporates; whether the downstream drainage channels can cope with the volume of melt-water; how dry the summer is; how many heavy rainfall events occur. Water is vital for agriculture, but drainage is also a costly inconvenience.

What's coming up?

Predictions of no overall change to precipitation, but more frequent and heavier rainfall as well as increased aridity across agricultural areas, means that water management will become an even more complex balance of managing flood water but having enough for the dry periods.

With growing pressures on groundwater resources for high-value agricultural production as well as increasing population demand, the need for surface water management has never been greater.

How does it matter?

Management of floodwaters from fields downstream is important for protecting property and infrastructure, but it is also important to the health of Canada's fifth largest lake - Lake Winnipeg. Run-off, particularly from the Red River watershed is high in nutrients from the land, which cause algal blooms and trophic changes in the lake. Nutrient pulses have been linked to flood events in major tributaries[1]. Clearly, the importance of both water quantity and quality will increase in the future for our Prairie agricultural systems.

What's being done?

Integrated Watershed Management Planning has become the chosen way to address water issues in watersheds in the Prairies. The process is driven by local communities coming together to set out their concerns and to agree to priorities for action. Provincial staff from Conservation Districts and grants from federal and provincial funds support a limited number of schemes selected from a wide range of beneficial management practices each year. These schemes are usually delivered at the farm scale or sub-catchment scale rather than the basin/watershed scale, which gives individual producers and communities better resilience and management of risk. A common theme amongst the schemes is the reduction of flood risk, and the improvement of water quality. Concepts such as 'keeping water on the land' have become a common theme for a wide range of interested groups including researchers, NGOs, government and community groups.

"Concepts such as 'keeping water on the land' have become a common theme"

An example of a successful scheme to keep water on the land is found in Pembina Valley at Lizard Lake, Manitoba (Figure 2). The Conservation District brought together a group of producers and NGO partners and secured a long-term agreement to manage a wetland differently. Rather than drain the existing wetland in an attempt to improve the land enough for crop production, they agreed to extend the flooded area to create a wet pasture. A berm around 630 ha surrounding 200 ha of existing wetland is flooded each spring. A rich diversity of grasses, sedges and cattails has resulted creating valuable habitat. Drainage is managed to allow the wetland to soak up nutrients like a sponge, and the vegetation is cut for forage. Even the cattails have value as part of Manitoba's growing bioeconomy being spearheaded by the International Institute for Sustainable Development.

Systems such as that at Lizard Lake are being adopted where there is marginal land, and where there is a good likelihood of some sort of conservation easement being granted for waterfowl and other wildlife. But with research underway to develop flood tolerant crops, their application could be extended to cropping systems.

Figure 2: *Landscape modifications at Lizard Lake, Manitoba, to enhance water.*
(credit: B. Amiro)

Another option is to use the water stored more directly for agriculture. Retention ponds dug into a low spot, with the spoil creating a berm to contain water above grade are starting to be adopted (Figure 1). Most producers are keen to avoid the need for federal permits, so they limit the size to something large enough to drain a section of land (260 ha), which does not provide enough water to irrigate the land drained. But in the right place, say close to a greenhouse, or to high value crops such as potatoes, or forage seeds that need a well-prepared seed bed, it has potential. Such systems also work well with tile-drainage systems, where weeping tile underground drains the snow-melt and rainfall to a pond for recirculation. The full benefits of these systems for water and nutrient management have yet to be established, but research is underway.

One of the major challenges already seen is the multitude of players involved in water management, which makes leadership unclear: from the federal agriculture advisors, to the provincial agriculture extension staff; from the provincial flood engineers to the rural municipalities; from the provincial permitting teams, to the watershed planners, conservation district staff and NGOs. However, the concept of having more local control by producers is a key part of future strategies. It is also evident that a single solution cannot be developed for the wide range of landscapes across the Prairies. However, as we develop test cases, we will improve our knowledge of successful initiatives that are relevant to different regions. Such initiatives need to be developed over the coming decades to address a different climate in 2050.