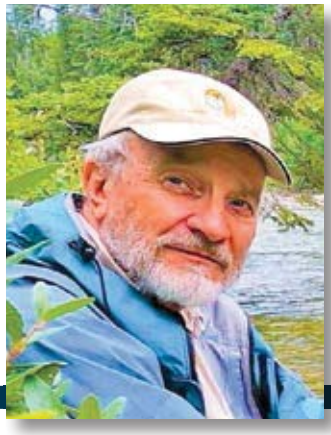
Are Prairie Rivers at Risk?

Irrigation and the Future of Southern Alberta's Rivers



By Lorne Fitch, *P. Biol.*

The pathway to degraded rivers

The heat dome and severe low flows of 2021 had me reflecting on the recent scheme by southern Alberta's irrigation sector to massively expand irrigated acreage. In response, I thought of the old hymn, "Shall we gather at the river". Some of you with church experiences might remember the refrain: "Yes, we'll gather at the river/The beautiful, the beautiful river…"

The details of this irrigation expansion, spun as a "modernization" project, are vague. Ten of the 13 Irrigation Districts with funding support from the Province of Alberta and the Canada Infrastructure Bank propose to "modernize" 86 components of irrigation infrastructure and construct (or expand) four off-stream reservoirs. Through increases in irrigation efficiency and water storage, the goal is to save sufficient water to increase the acreage under irrigation by 230,000 acres (+15 percent). This will be the single largest irrigation expansion in Alberta's history.

Irrigation Districts now hold licenses to withdraw roughly half of the average natural annual flow from the Bow and Oldman rivers and their major tributaries. This doesn't leave much room for providing water for uses outside of Irrigation Districts since half of the average natural flow in the South Saskatchewan River basin must be passed on to Saskatchewan according to a 1969 intergovernmental agreement. On average Irrigation Districts withdraw two thirds of their allocation each year. But in dry years essentially all the licenced amount is removed. Summer is the most critical period since demand for other uses of our rivers peaks then.

Evidence from government reports shows that southern Alberta rivers below major irrigation dams and diversions are stressed. Some are significantly degraded and the prognosis is for a continual decline in river health. That is the inescapable reality.

The proposed irrigation expansion, in the context of this reality, begs investigation. What are the implications of these irrigation ambitions?

Historical context—Why increase irrigation acreage?

We need historical context to see how the past influences the future. Irrigation Districts (or their precursors) have been diverting water from southern Alberta's rivers for well over a century. They have erected an extensive network of dams, diversions, reservoirs and irrigation canals. By now they divert, store and deliver water on demand to more than half a million hectares in a semi-arid landscape. Taxpayers largely paid for this marvel of engineering.

The history of water allocations to irrigation illustrates a rigid adherence to tradition and captured regulators. Water diversions started under the Northwest Irrigation Act of 1894. As David Percy noted in 1977, this federal law "was designed with irrigation in mind." When it came to allocating water, this Act established a system of seniority for water users that still exists in Alberta's Water Act. Known as "first in time, first in right" (FITFIR) it means that those with the oldest allocation licences are first in line for receiving water. Under FITFIR, water licences to Irrigation Districts are among those with the highest seniority and the largest volume.

The irrigation focus was encouraged by the fact that key officials in the new department of Alberta Environment came from Agriculture. They saw their water stewardship role through an irrigation-favourable lens. Alberta Agriculture was an accessory, rubber stamping the irrigation sector's expansion demands for decades. Whenever Irrigation Districts exceeded their allocation, instead of being held to account, they were allocated more water. When other interests, especially those concerned about fish, questioned the wisdom of increasing diversions, these concerns were ignored and additional allocations were passed out.

Despite evidence from the 1970s that southern Alberta rivers were already in peril, additional licenses were issued in the early 1990s to accommodate the Irrigation Districts' expansion limits established by the South Saskatchewan Basin Water Allocation Regulation of 1991. Amendments to the Irrigation Districts Act in 2002 allowed each Irrigation District to establish its own new expansion limit, beyond the 1991 allocation regulation, provided the total water demand does not exceed their licenced amount.

It wasn't until 2006 that the Alberta Government finally closed the Bow, Oldman and South Saskatchewan sub-basins to further allocation. Many believe that this action was "too little, too late."

Instream Flow Needs How much water does a river need?

Summer flows (May–August) in the Bow and Oldman rivers below impoundments and large-scale water diversions are now 40 to 60 percent below historical values. This is also when there is peak demand for irrigation withdrawals. Demands for ample flow in rivers are also greatest at this time as fish, cottonwoods, canoeists, swimmers and gardeners need the water too.

Irrigation demands in summer create extremely low river flows, below ecological limits, risking aquatic life, fish and riparian habitats. Photo © L.Fitch

Dr. Stewart Rood, Emeritus Professor at University of Lethbridge observed that, "Water budgeting that we based the allocation on was in the beginning of the 1900s which was naturally a very wet interval." All evidence suggests the future will not reflect the past, even though the past was used to allocate the water of tomorrow.

One way of managing the issues associated with intensifying irrigation withdrawals combined with declining river flows is to establish limits, real ecological limits, not arbitrary ones that can be stepped over when they impede expansion plans. An instream flow need (IFN) is a rigorous, science-based recommendation for the amount of water that should flow at any particular time to meet the objectives of river health.

Allan Locke, retired Provincial IFN Specialist, points out IFN recommendations are based on the natural variability in flow, since native biodiversity and ecological functions of rivers in southern Alberta have evolved under seasonal flow patterns. As an example, spring floods are essential to reset the ecological clock, providing new sediment bars for the seeds of cottonwood trees to establish themselves. Substrates of gravel are cleansed of sediment and new pools are created which are mandatory for aquatic life. Robust summer flows are required to buffer against higher water temperatures and maintain dissolved oxygen levels.

Unfortunately for southern Alberta rivers, when considering actual river flows under current allocations and commitments, there isn't enough water left to meet ecologically -derived IFN values. Healthy rivers should have been the goal in the first place, but while many waited for the answer from proper IFN research, water managers in the government of Alberta were busy giving away the water that would have assured a measure of ecological integrity.

Our rivers, especially those in southern Alberta show the strain of over a century of careless development. Fisheries biologists had been pointing this out for decades but water managers seemed oblivious until a massive fish kill occurred on the Highwood River in 1977, caused by high water temperatures and exacerbated by excessive diversions. This incident (and others) should be putting irrigation diversions and inadequate instream flows into the broader public consciousness.

Still, there was very little action to limit irrigation diversions over the next 30 years. As an example of the foot-dragging, a retired fisheries biologist recalls bureaucrats not wanting the term "over-allocation" to be used in reports and presentations. Work on IFN evaluations was not greeted with much enthusiasm by provincial water managers since it would not only provide a sense of limits, it would expose the fact that limits had already been exceeded.

The government of Alberta finally acknowledged in a 2006 report that the lower reaches of the Bow, Oldman and South Saskatchewan rivers were at least moderately impacted, some heavily impacted and a few degraded by water diversions *(Approved Water Management Plan for the South Saskatchewan River Basin [Alberta])*. All rivers impacted by irrigation withdrawals have aquatic environments believed to be in "a state of long-term declining health."

This 2006 plan recommended a water conservation objective (WCO) to protect river health of approximately 45 percent of natural flow. This was not based on IFN science but was all that might reasonably be achieved given high levels of water allocation. Recent analysis using historical flow records shows this inadequate target is seldom met 100 percent of the time in any given year for reaches below major irrigation dams and diversions and less than 70 percent of the time in drier than average years.

More disturbing is that 45 years of river flow records from the South Saskatchewan

River at Medicine Hat show the WCO is met only 40 percent to 70 percent of the time in the summer months (May to September). Because of liberal allocations of water to irrigation, actual flows are well below natural flows and the WCOs are rarely achieved.

When you've exceeded ecological limits with reckless water allocations and can't meet an IFN amount, all that's left are some administrative band-aids like water conservation objectives and instream objectives (IO) to give the impression our rivers are being managed to avoid ecosystem failure. These WCOs and IOs will not restore health to degraded rivers. In stark terms southern Alberta rivers are on life support, without enough water to guarantee a healthy, functioning ecosystem.

As a headwaters province Alberta also has responsibilities and legal agreements to allow enough water to pass our eastern border to Saskatchewan. This can provide an administrative ceiling on allocations within Alberta but as these become red-lined and exceeded for the Bow and Oldman watersheds, there is an increased reliance on the Red Deer River to make up the difference. This exacerbates river health issues on the Bow and Oldman systems.

Governments, both federal and provincial have failed in their stewardship responsibilities to manage the quantity and quality of waters under their jurisdictions for both current and future generations. Fundamental to that responsibility is ensuring sufficient water is retained in rivers, for all seasons, to sustain fish populations, riparian areas and overall riverine health and function.

Climate change – Are we paying attention?

Climate change scenarios suggest declines in natural annual flow will continue due to decreased snow accumulation, increased air temperatures and greater evaporation and evapotranspiration. This will lead to a decline in the glaciers that feed the headwaters of the Bow River. According to Dr. John Pomeroy, Canada Research Chair in Water Resources and Climate Change at the University of Saskatchewan, about 80 percent of flow in the Saskatchewan River basin comes from the Eastern Slopes, mostly from snowpack, making southern Alberta's rivers "very vulnerable to climate change."

Pomeroy reflects it is "important to look at the whole thing before expanding irrigation in one part or managing it differently in another part, and we're going to have to do that always with an eye to the mountains." Lessons from south of the border backstop this and need to be heeded. Over-allocation of water, coupled with drought in the Colorado River basin has led US governments to severely curtail water use by irrigators.

Recent modelling, using historical drought scenarios for water volume in the Oldman River at Lethbridge, suggests water needs would exceed supply. Water deficits for more than two years could not be mitigated by water stored in reservoirs, and provision of environmental instream flows would be further challenged. This demonstrates that building more reservoirs is, at best, a questionable adaptive strategy. Every bit of plumbing promises us we are ever closer to re-engineering our world into something it is not, and never will be—a place of abundant water. We kid ourselves if we think we can outwit nature instead of adapting to its realities.

Climate change, with greater frequency and duration of droughts cannot be mitigated with irrigation reservoir storage. Photo ©L. Fitch

In whose interest is irrigation expansion?

Irrigation Districts, with support from government, boldly assert that modernization of irrigation infrastructure does not require impact assessment and that decisions about expansion of irrigated acres are solely their purview. Construction of new and expanded storage reservoirs may or may not require impact assessment based on decisions of provincial and federal regulators. This massive irrigation expansion could proceed without a determination of whether or not it is in the public interest.

Initiatives with a proposed investment of public money that involve public resources (water) and have the potential to significantly impact the public interest in broader matters of ecosystem health should require greater scrutiny. What could be more in the public interest in semi-arid southern Alberta than maintaining adequate instream flows and the health of our rivers?

An independent review of this massive irrigation expansion has the potential to clarify the staggering lack of information on public interest matters such as: the history of irrigation development, especially allocations that ignored river health; a compliant, if not captured regulator that let allocations spin out of control; disturbing details on serious declines in river health, including water quality and biodiversity; how much the Alberta taxpayer has contributed to irrigation infrastructure and efficiency goals, with such little payback in river flows; a government that refuses to act proactively to remedy the situation; and corporate bodies (Irrigation Districts) that seem to be answerable to no one but themselves.

In this 'hydro-illogical' cycle, every proposed technological fix, including dams, reservoirs, spillways and efficiency gains through converting canals to pipelines, drop-tube pivots and water scheduling, is touted as solving the problem of water scarcity, until they are actually built. Then the cry begins again for more public investment to solve the problem of not addressing limits. Each time, ad infinitum and ad nauseum, politicians are swayed by the promise of more jobs, higher agricultural production and greater commodity exports from these fixes. We would be well advised to step out of this cycle.

Although increased irrigation efficiency, through use of pivots, reduces water requirements, increased irrigation acreage continues to threaten the health of southern Alberta rivers. Photo ©L. Fitch

Irrigation expansion simply maintains the cycle. The project is proposed to meet the immediate desire of the irrigation sector for growth, not the needs of future generations living with reduced river flows and the economic albatross of maintaining the accumulated infrastructure.

Irrigation interests might think they are adapting to climate change with the modernization and off-stream storage aspects of this expansion scheme. The reality is that without ensuring some of the water "saved" is left in rivers, it is just more of the same thinking that has left us with depleted rivers and risk of shortage to meet current allocations.

An environmental impact assessment (EIA) might allow those not benefitting directly from this scheme to see how other attributes important to a broader public might be affected.

A review could focus on the many questions related to this expansion initiative. No details are forthcoming on what the anticipated diversion rates might be, how much more of the licensed allocations of water will be diverted, when the water will be diverted, what changes will occur on return flows, how much more water will be lost from increased surface evaporation from reservoirs and, most troubling, potential impacts on southern Alberta rivers and on river flows downstream to the Saskatchewan River Delta in Manitoba. Also unclear are what lands are proposed for irrigation expansion and whether any of those lands will involve cultivation of native grassland, similarly imperilled as are rivers.

Lastly, the question of ecosystem limits needs to be addressed, perhaps with a simple question about irrigation expansion – how much is enough, and have we already exceeded reasonable limits? Could some of the water saved through efficiency improvements be used to augment instream flows? This is not an unreasonable suggestion given the high level of taxpayer investment.

Where next for irrigation in Alberta?

If this scheme is a race to exercise irrigation "rights", to use up all the allocation, who eventually wins the race? It won't be southern Alberta's rivers and those who cherish them.

Under the current conditions of irrigation allocations, our rivers are suffering and are significantly degraded and the prognosis is for a continual decline in river health. That is the situation where irrigation interests are already using, on average, two thirds of their licensed allocations. Taking more will simply exacerbate an already chronic state of poor river health.

Some might find perfection in row upon row of potatoes. Fair enough. But to push the vision of endless irrigated fields towards the ultimate death of our rivers will not find universal support from Albertans who are

already alarmed about potential water impacts from coal mining. Taxpayers, underwriting much of the cost will ask—who benefits and who pays?

Irrigation efficiency has improved tremendously, putting more water on crops and less lost to evaporation. Low head nozzles on irrigation pivots and buried, pressurized water pipelines have solved much of the wastage of water and is a laudable goal. One might think that this means less water has to be diverted from our rivers, improving aquatic habitat.

But irrigators have developed a Lord of the Rings, Gollum-like response of keening, "My precious, my precious" whenever there are discussions of saved water remaining in the river. After all, water is the "ring" that controls them all. This is despite the Alberta taxpayer footing 75 cents of every dollar of efficiency expenditure. Irrigation interests want to expand irrigation acreage with the water that is saved, a mercenary approach towards a limited resource, as opposed to thinking about long term stewardship.

It should not be too much to ask for irrigators to live with a little less water, so our rivers could have a little more. However, many of those who can foresee the upcoming crisis seem unwilling to accept any of the responsibility for creating it. There are few options for replenishing flow without the active involvement of the irrigation sector.

As Cheryl Bradley, an independent biologist who has followed this for years observes: "There is a palpable reluctance to release water under their [irrigation] licences, perhaps because it would mean relinquishing control over a valuable commodity in short supply." In reality, giving up some of "their" water to let rivers live will not diminish irrigation agriculture.

The irrigation lobby reminds one of Oliver Twist, in the Charles Dickens novel of the same name. There, the small boy comes forward, bowl in hand and begs Mr. Bumble for gruel with the famous request, "Please sir, I want some more." Except, the irrigation version of Oliver Twist already has a bowl full and still wants more. It is as if in a family one sibling ends up with most of the water. He prospers while those that like to fish and canoe and sit in a cool cottonwood grove see those attributes turn to dust. Unwilling to share, or even acknowledge the concerns of others he wants to use it all, for his own purposes.

Without change in policy and direction, irrigation demands coupled with drought will create dying and dead rivers. Photo ©L. Fitch

Irrigators may view water rights as absolute and irrevocable but as William Kittredge points out in *Owning it All*, "…we don't own anything absolutely or forever. As our society grows more and more complex and interwoven, our entitlement becomes less and less absolute, more and more likely to be legally diminished. Our rights to property will never take precedence over the needs of society. Ownership of property has always been a privilege granted by society, and revokable."

We need a new conversation about irrigation, one that takes place outside of partisan politics and the irrigation silo. Dying rivers are a problem that was created by successive provincial governments, aided and abetted by the irrigation sector. Both need to take some responsibility for their past actions and recognize that the current status of southern Alberta's rivers is not in the greater public interest, even without the proposed expansion. A great first step would be to reduce some of the licensed amounts of water diversion, a decision that is well within the power of the Alberta government.

If we are to successfully adapt to changing conditions – and adapt we must – what does this future look like for irrigation agriculture in our province? Continuing with the status quo will only serve to doom our rivers, with agriculture soon to follow, or at least agriculture as it's currently practiced.

Henry David Thoreau, the 19th century naturalist noted that, "Life in us is like water in a river." Holding onto those words for a moment, what would it mean to our lives if we continue to take so much water out of southern Alberta rivers?

Sadly, these rivers are shadows of what they once were, we know they are degrading, we know what they are degrading from and we can look forward to greater issues. Natural justice and a sense of equity need to be injected into plans for irrigation expansion, while there is still a chance to salvage a better future for our rivers.

Otherwise the response to "Shall we gather at the river?" might be "Will there be a living river left where we can gather?"

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