# Revisiting The River Basin Game

**Where was your River Basin Game based (Geographically)?**

It was designed to represent the Saskatchewan River as it flows across Alberta-Saskatchewan-Manitoba relationship and water share agreements in place, as well as cost of living for various stakeholders in each province. This was designed to help you experience the inequity that can result when downstream users experience unfair, unjust upstream pressures.

The **optimal** long-term sustainable solution yields the following results:

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| --- | --- | --- |
|  | **Profit (CAD/yr)** | **Water Units Stored per year** |
| Upstream | 340 | 27.6 |
| Midstream | 219 | 41.7 |
| Downstream | 332 | 54.9 |
|  | **891** | **124.2** |

However, by cooperating (Round 2 of the game) such that upstream farmers voluntarily (or by law) limit their maximum sustainable withdrawal, then more equitable sharing among the reaches is possible and the overall profitability of the system is higher:

|  |  |  |
| --- | --- | --- |
|  | **Profit (CAD/yr)** | **Water Units Stored per year** |
| Upstream | 215 | 33.6 |
| Midstream | 297 | 53.7 |
| Downstream | 179 | 75.1 |
|  | **692** | **162.4** |

Upstream farmers make *slightly* less profit, but to the benefit of the system as a whole and other geographically disadvantaged regions.

This is why we have **Boundary Water Treaty’s** for rivers flowing between Canada-USA, and the **Master Agreement on Apportionment** across the Prairie Provinces.

We also observed how **‘first-in-time-first-in-right’** (FITFIR) policies often end up skewing the dynamics of power, making those users more powerful when there is an imbalance of power and no water share agreements binding them.

Western Canada is governed by FITFIR policies for water licensing. We are the only jurisdiction in Canada to do so, and the only one with a moratorium (since 2015) on new water extraction licenses. What dynamics does this cause for water in Alberta?

* Corporations or oldest (largest profitiers, often the richest) continue to extract water. Often using more than they need.
* New competitors are disadvantaged
* Innovation is stiffled
* Sharing is limited/discouraged
* Water is overallocated even if not used
* In drought years, newest users get curt off, which depresses the economy and potentially removes downstream markets that senior licence holders depend on

## Sustainable Water Use

Water supply management is not typically thought of as problematic in or for Canada, but climate change is adding increasing pressure, particularly at certain times of the year.

One of the biggest challenges for Canadian water management today is that water is managed at the Provincial level, but of course, it flows across many jurisdictions. This presents a host of challenges including (but not limited to):

* Inequitable sharing
* Water quality management
* Destruction of downstream resources
* Data sharing
* Cost sharing
* Stakeholders who aren’t considered (Indigenous)

This is why the transboundary water agreements were established, to recognize and uphold rights of all water users and stakeholders in Canada.

Water share agreements (generally) work when there is a **balance of power** and interests that prevents any one stakeholder from exerting undo, unjust pressure on another.

|  |  |
| --- | --- |
|  | An **inequitable** **balance** of power leads to the abuse of power.  = ↑ risk that one party will not be fairly represented  = ↑ inequitable water share |

Let’s revisit the principles of balanced water management in the context of the game and the real life setting of the river basin.

### Tragedy of the Commons

* Σindividual optima ≠ global optimum

Why was it so difficult to control the water balance in each subbasin?

1. Within one river basin compartment, water can be regarded as a ‘common pool resource’, which means that farmers in that subbasin have equal access to the water.
2. Additional water use by one is at the expense of the whole group (common good).
3. Within one compartment, S(individual optima) ≠ group optimum.
4. At all times, there is the risk of “free riders” or those who take more than their fair share because they are so entitled to.
5. First in time, first in right does not promote the collective good.
6. Cooperation does not easily establish itself, although this is in the interest of all.

### Tragedy of Dynamics

Hydrology is highly non-linear, and least of all predictable!

Just as you thought you knew how to optimize your results and understand what was happening, climate change happened! The reality is that weather (water supply) is dynamic, and stakeholders must continuously respond to on-the-ground conditions with little to no warning.

1. The tendency is to go for short term benefits, but that comes at the expense of long-term success.
2. Due to the dependency of one year on the previous year, S(year – optima) ≠ optimum over the period of years.
3. It is difficult to recover from poverty and environmental degradation.
4. Recovery requires strongly reduced use, while poverty conditions do not allow for that.
5. Assessing what is optimum becomes more difficult when dependency between years exists but also (unpredictable) differences in each year (e.g., annual rainfall).

### Tragedy of Geography

Upstream → Midstream → Downstream

The upstream to downstream setting means that geography plays a critical role in power imbalance within this game (and the Nelson River basin)

1. Upstream users have the advantage of having the first opportunity to use the water
2. The upstream water footprint, unless controlled (i.e., Game 2) subtracts from the downstream water availability, but upstream users do not account for that in their decisions about water use
3. The S(compartment – optima) ≠ river basin optimum

But total sustainable net benefit in the river basin **as a whole** can be increased if the farmers from the three separate compartments would cooperate, which requires effective communication across the basin.

The net benefit within the basin would be higher without increasing the total volume of water abstraction, only by sharing differently.

However, the model shows that benefit sharing at some stage will be at the cost of the net benefit within the basin as a whole, and likely upstream users.

## Is there a ‘best’ solution for Water Management?

* Public accountability
* Balance economics internally and externally
* Don’t overuse or abuse the system; find the sustainable threshold
* Apply optimization theory; plan for multiple ‘optimums’
  + ‘best’ economic solution
  + marginal benefit/unit of water = marginal cost/unit
  + f(time); consider choice of statistical output
* Think long term for global sustainability
  + Short term = economically sustainable but environment will crash
  + Long term = can be economically sustainable AND environmentally sustainable

What are some possible solutions or work arounds to the above in a real-world setting?

1. Create a forum for sharing information. Agree on making abstractions publicly known.

2. Internalise externalities. This means: let the upstream farmers cover the additional costs incurred by the downstream farmers as a result of upstream water abstractions.

3. Impose water quota to the upstream farmers. Consider (possibly partial and/or temporary) compensation of the upstream farmers for their lost benefits by the downstream farmers.

4. Agree on the leave of half of the farmers (there seems to be little place for all of them) and pay them a few years so they can develop other work…

5. Benefits could still be more evenly shared by limiting the water quota for upstream farmers and by allowing the downstream farmers to abstract substantially more