


Welcome to our presentation titled “The North Raven River, a world-class treasure in Clearwater County”.

This presentation is by the Alberta Fish & Game Association, Alberta’s oldest conservation association.

The AFGA, along with several other organizations, partner with the Alberta Conservation Association in owning and managing the eleven sites in the immediate area.


Following the Border Paving pre-application open house this past November, a group began work pulling together a document that would detail our perspective on the ecologically unique and environmentally sensitive North Raven River watershed. This presentation summarizes that report.

I am Victor Benz, the AFGA’s Environment Chair. My co-presenter is Dr. Jon Fennell, Water Resource Specialist.



History of the North Raven River

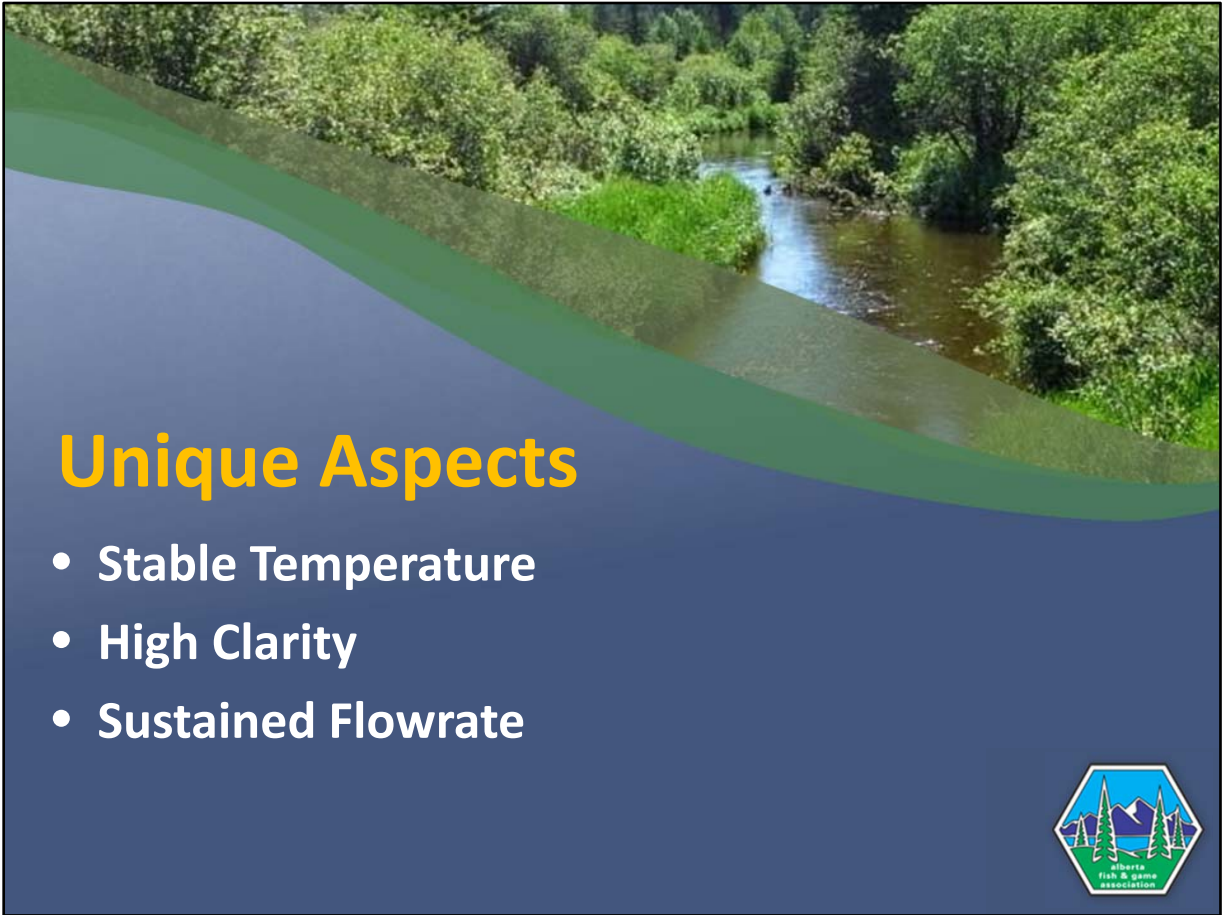
- Pre World War II
- 1945 – 1965
- Since 1965



The North Raven River was first stocked with brown and brook trout in the 1930s.

By 1965, prevailing agricultural, ranching and forestry practices had reduced it to little more than a glorified cattle trough. River banks were destroyed and it became a wide, wet, and muddy flat in many places.

Rehabilitation and restoration began in 1973 with a Buck for Wildlife project. Since then, over \$10 million and tens of thousands of volunteer hours have been expended to deliver one of the greatest Alberta conservation stories.



The springs feeding the North Raven River deliver consistent water temperature, high water clarity, and sustained flowrate all year around. This cannot be said of most other Alberta trout streams.

All three of these factors provide exceptional trout spawning and feeding habitat.

With the headwater spring temperature averaging 6°C and varying only by a few degrees, most of the upper North Raven River is clear of ice all year.



Tourism Impact

- Up to 3,000 angler-days per year
- At \$138 per angler-day, \$400,000/year impact
- About \$350,000/year additional benefit to businesses dependent on the river



The North Raven River sees about 3,000 angler-days per year.

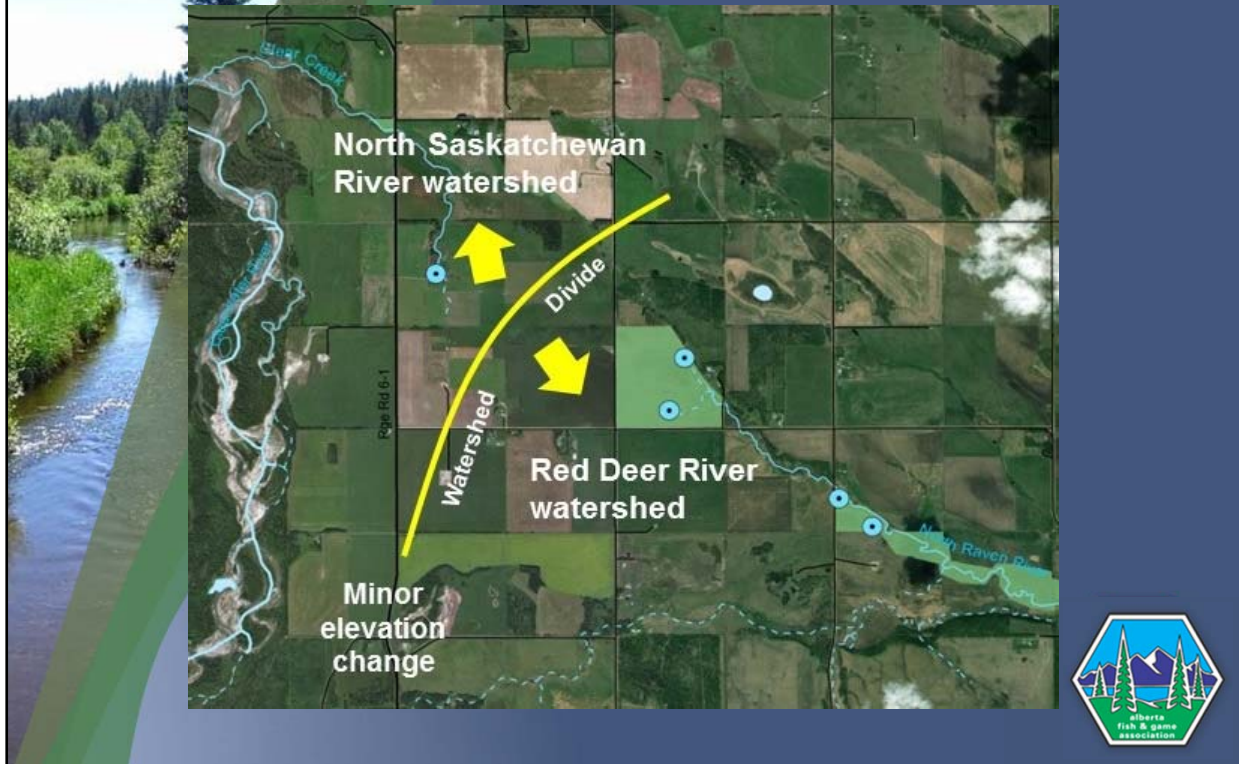
An Alberta 2010 report attributes angling economic impact at \$138 per angler-day.

This suggests that the North Raven River contributes \$400,000 to Alberta, in perpetuity.

Area businesses that depend on the North Raven River were contacted. They have told us that about \$350,000 of their total annual revenue is derived directly from the North Raven River.

Combining the two, we arrive at a figure of approximately \$750,000 annually, in perpetuity, for the economic impact of the North Raven River as it exists today.

Local Setting I



The North Raven River & Clear Creek lie on an important divide between the drainage basins of the North Saskatchewan River and the Red Deer River, as shown by the yellow line in this picture.

Waters N & W of the divide flow into the Clearwater River and on to the North Saskatchewan River drainage basin. These include Clear Creek.

Waters S & E of the divide flow into the Red Deer River drainage basin.

The springs feeding the North Raven River & Clear Creek are Meinzer Class III.

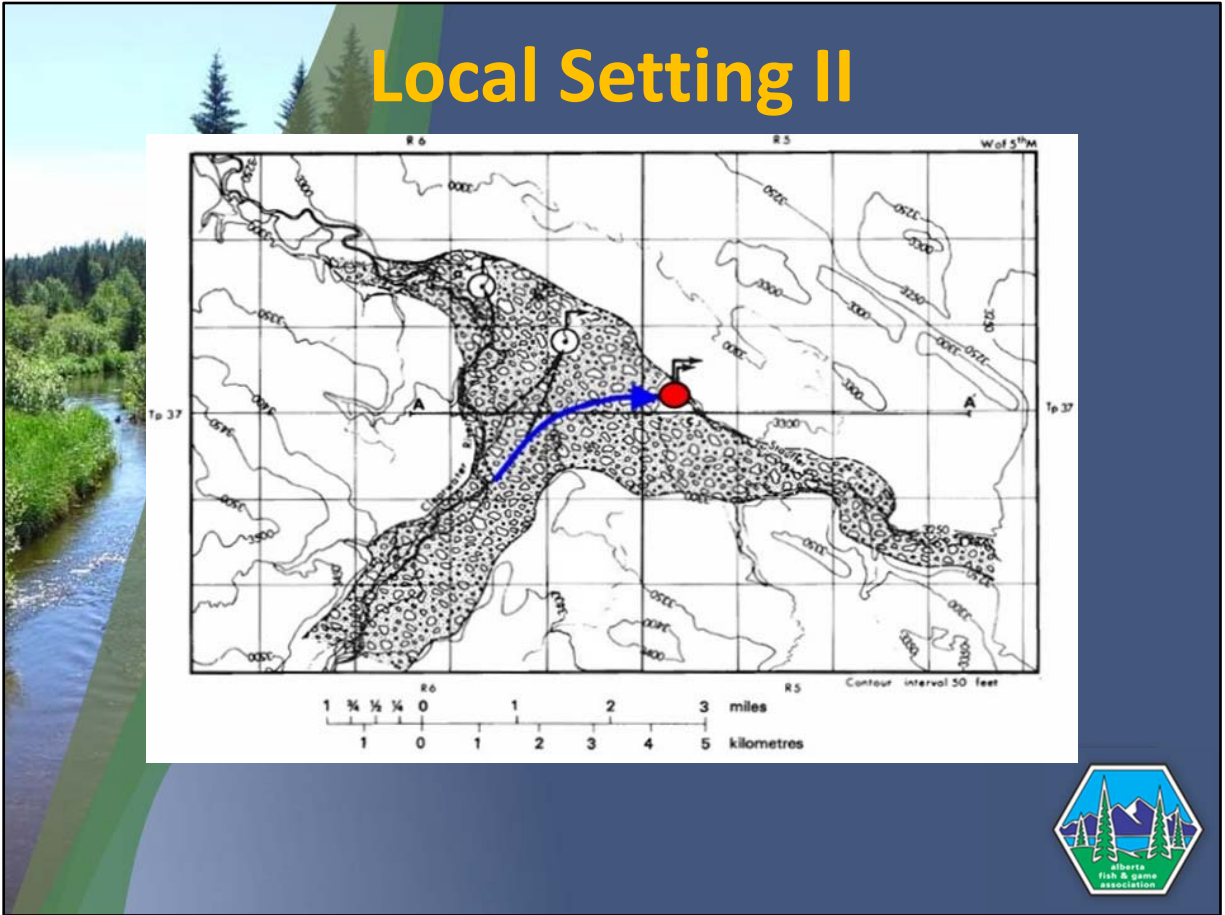
Only a few Alberta springs are larger, most notably Maligne Canyon Springs.

Both Miette Hot Springs and Banff Hot Springs are a couple of orders of magnitude smaller than the springs sustaining the North Raven River.

The five known springs in the area are indicated by the light blue dots. One feeds Clear Creek; the other four feed the North Raven River.

ACA Conservation sites are highlighted in light green.

Local Setting II



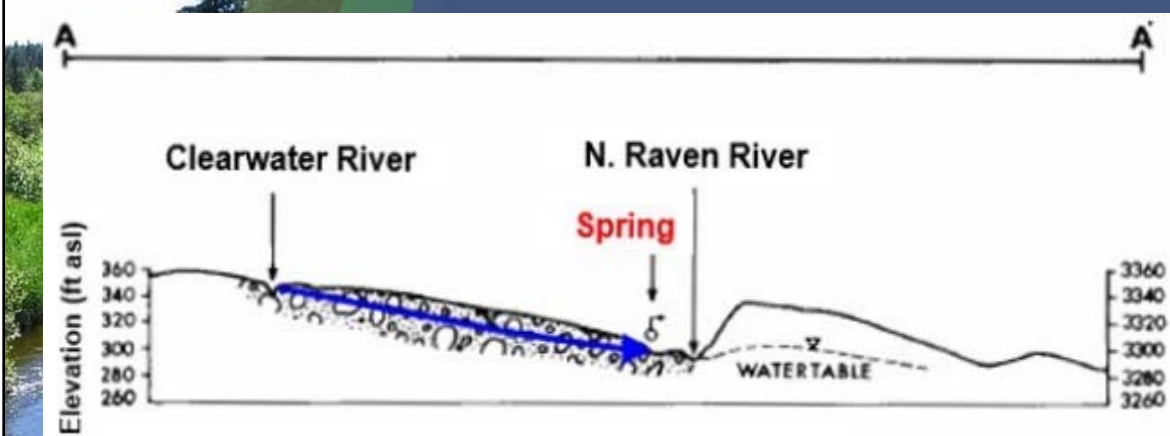
This slide delineates the extensive sand and gravel aquifer as noted by the stippled area. It is fed by the Clearwater River on the left of the picture.

The blue line shows the groundwater flow path that supplies the North Raven River headwater springs, indicated by the red circle.

Please note the transit line, A-A'.



Local Setting III



This slide shows the elevation change from the Clearwater River to the North Raven River along that transit line, A-A'.

The approximately 12-meter elevation change from the bed of the Clearwater River to the headwater springs of the North Raven River provides the hydraulic head needed to facilitate the groundwater flow, given the permeability and connectedness of the sand and gravel aquifer.

While it can be generalized that groundwater flow follows the lay of the land, moving downhill, immediate local flows are very much affected by the relative permeabilities of the aquifer and by impermeable inclusions in the aquifer, such as clay lenses.

Also, please note how shallow the water table is in the stretch between the Clearwater River and the North Raven River headwater springs.



Water quality measured at various points along the North Raven River above Secondary Highway 761 permit some initial conclusions. Although all measured values generally meet the current Canadian drinking water guidelines, some sample locations exceed those guidelines, as well as the guidelines associated with the protection of freshwater aquatic life.


The relative consistency of the Total Dissolved Solids (TDS) values at all points indicate that the TDS originates from the groundwater issuing from springs and welling up from the base of the river, and that negligible additional mineralization is picked up after the springs.

However, the steadily increasing nitrate values as one moves downstream are likely due to agricultural runoff.

Chromium is also a concern. Although all recorded values are below Canadian drinking water guidelines, most samples exceeded the fresh water aquatic life guidelines.

Sensitivity to Disturbance

- Thermal Plume
- Turbidity Plume

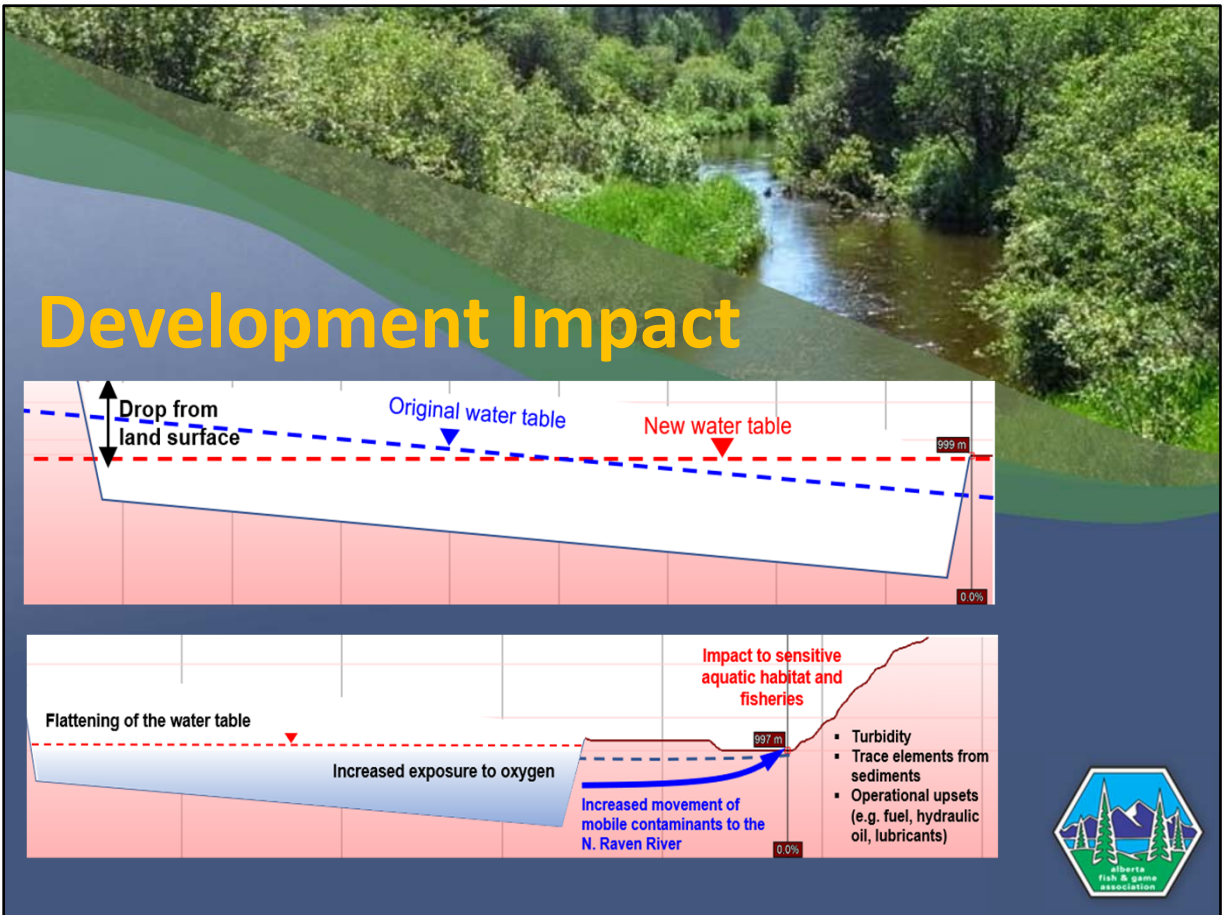


Because of the wide variation in sizes of springs and aquifers, it has become common practice to express the impact of an aquifer disturbance in the context of time of travel. The aquifer feeding the North Raven River has a calculated groundwater flow velocity of 5.3 m/day. This gives a one-year travel distance of 1,920 m.

An earlier slide identified the key, unique aspects of the North Raven River as stable water temperature, high clarity, and sustained flow.

A Blackport & Golder study concluded that thermal plumes from gravel pits generally dissipated in something less than a one-year travel time downgradient of gravel pit ponds.

Reviews by Thurston County, WA, determined that turbidity plumes associated with groundwater disturbance can spread up to 6,000 feet downgradient within an aquifer. This is equivalent to 1,829 m.



One of the greatest impacts a development can have is the creation of a large pond or pit. A number of additional concerns arise.

- The pond will flatten the water table in the immediate area. That is, the water table upgradient will drop, and it will rise downgradient.
 - The drop in the upgradient water table may affect agricultural production in that area.
 - Depending on the immediate area topography, the downgradient water table level may be above ground level.
- The pond temperature will generally reflect the ambient air temperature, more greatly impacting any temperature plume downgradient (particularly during extended hot and sunny periods).
- Finally, the pond will oxygenate the groundwater, which will change how certain trace elements in the sediments (notably chromium) dissolve into the groundwater as it moves towards the North Raven River.
- During severe Clearwater River flood scenarios like the most recent one in 2007, any large pond is likely to accumulate surface runoff and any contaminants in that runoff.
- Such flood scenarios could also lead to significant cascading into the pond's west end, resulting in erosion of the pond bank. Breaching of the downgradient berm brings additional erosion concerns.



Protection Proposal

- 1.8 km buffer surrounding the headwater springs of the North Raven River & Clear Creek
- Grandfather existing agricultural & commercial operations
- Severely restrict new development

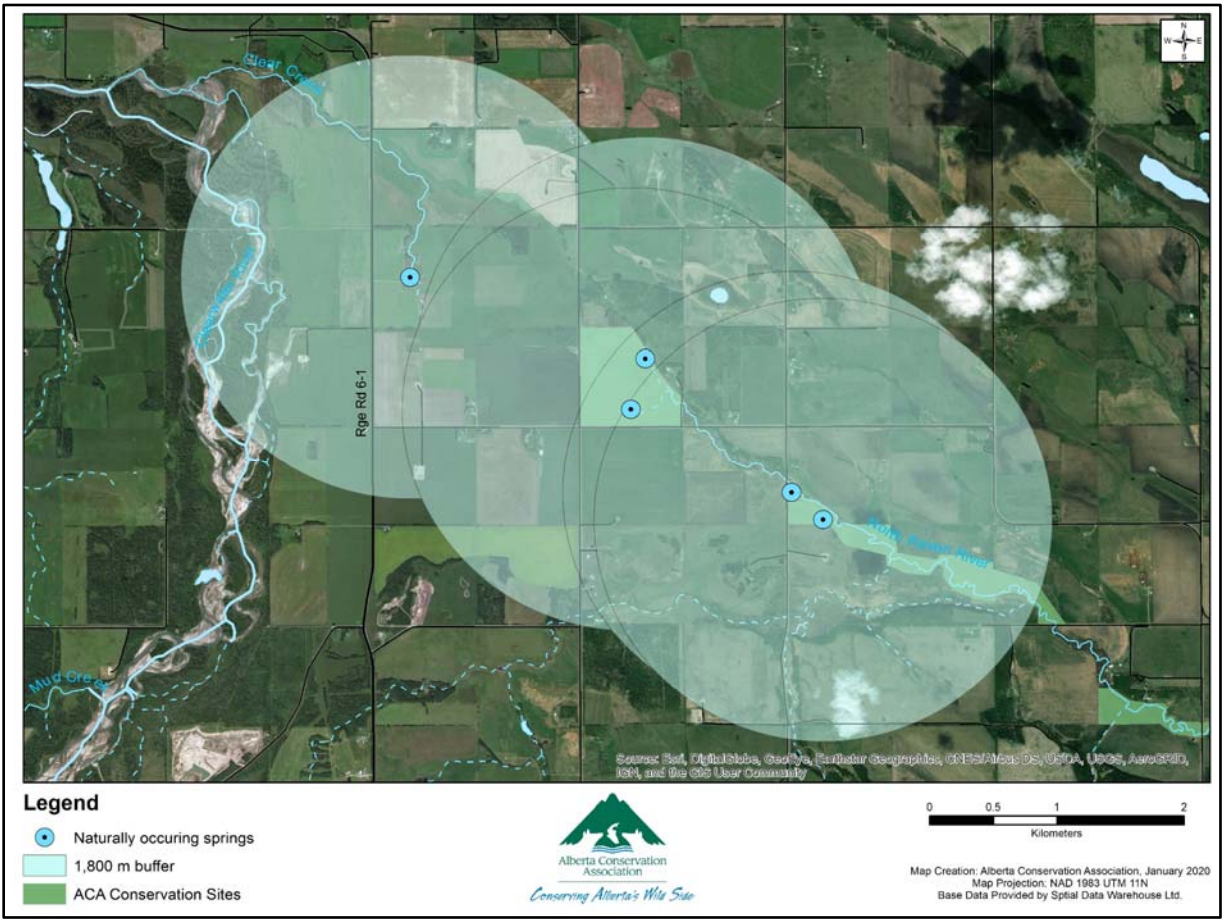


The intent is to protect this ecologically unique and very environmentally sensitive region of Clearwater County. AFGA proposes the following:

- Create a 1.8 km buffer zone surrounding the headwater springs of the North Raven River & Clear Creek
- Existing agricultural & commercial operations at currently approved intensity would be grandfathered.
- New development would be severely restricted.
- A study to identify, inventory and assess all springs and major groundwater discharge areas feeding Clear Creek and North Raven River above Secondary Highway 761 should be initiated. These additional springs, once identified, would then be included in the buffer zone.

Several opportunities exist for more formal protection under Clearwater County's Land Use Bylaw.

- Modify the existing Agriculture Land Use District 'A' to include this 1.8 km buffer zone.
- Create a new, additional Agriculture Land Use District based on this 1.8 km buffer zone.
- Define this 1.8 km buffer zone as either an Environmental Reserve or Environmental Reserve Easement.



A view of what such a 1.8 km buffer zone would entail.



What You Can Do

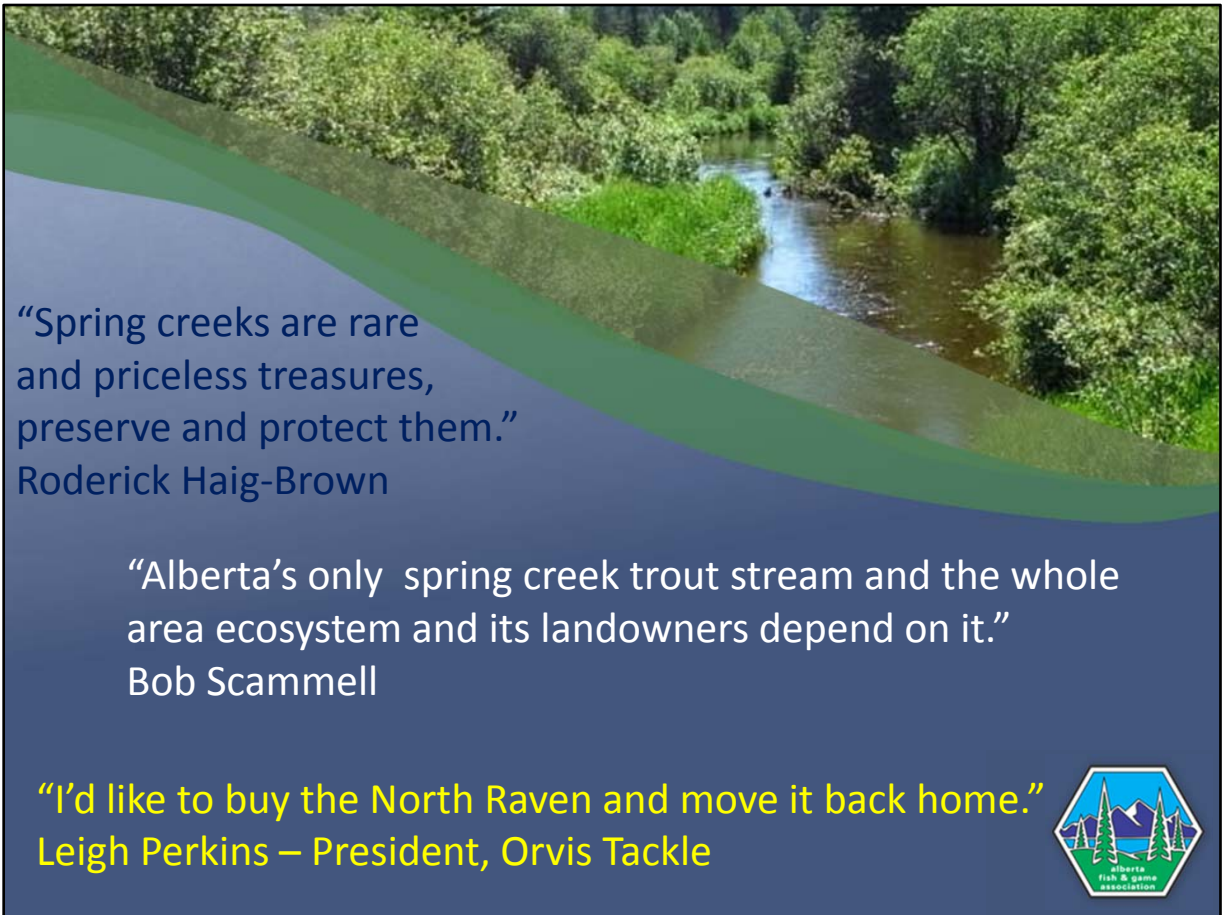
If what happens to the North Raven River matters to you, please:

- Share this information with all your contacts
- email your concerns to:
 - Clearwater County
admin@clearwatercounty.ca
 - Honourable Jason Nixon, Minister of Environment and Parks
aep.minister@gov.ab.ca



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“Spring creeks are rare and priceless treasures, preserve and protect them.”
Roderick Haig-Brown

“Alberta’s only spring creek trout stream and the whole area ecosystem and its landowners depend on it.”
Bob Scammell

“I’d like to buy the North Raven and move it back home.”
Leigh Perkins – President, Orvis Tackle



Any Questions?