



# **THE CANADIAN SOCIETY OF ENVIRONMENTAL BIOLOGISTS Bulletin**

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- **Restoration in the Squamish Estuary to Improve Chinook Salmon Populations**
- **Change: The Dubious Virtue of Official Baselines and Datasets**
- **Book Review: Louis “David” Riel: Statesman/Lunatic/Visionary Politician/Nation Builder**





# CSEB Bulletin SCBE

VOLUME 76, ISSUE 3, Fall, 2019

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Front Cover: Blue Markwart of RC BioSolutions Ltd. conducting fish habitat surveys in the coastal mountains of northwestern British Columbia.

Back Cover: Top: Watching humpback whales (*Megaptera novaeangliae*) in early September, 2017, in the outer Bay of Fundy (see Peter Wells comments on page 3).

Bottom Left: Lynnette Allemand of RC BioSolutions Ltd. collecting minnow traps in central British Columbia, Vanderhoof area. Bottom Right: Blue Markwart of RC BioSolutions Ltd. taking measurements of a rainbow trout collected in central British Columbia, Vanderhoof area.

Photo Credits: Back Top: Peter Wells, CSEB Atlantic Region Member. Front Cover and Other Back Cover Credits: Blue Markwart, RC BioSolutions Ltd.

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## CSEB BULLETIN 2019

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The Canadian Society of Environmental Biologists Bulletin is a quarterly publication. The Bulletin keeps members informed of the Society's activities and updates members on the current affairs and advances in the field of environmental biology. This publication draws together the widely diverse group of Canadian environmental biologists through a national exchange of ideas. Members are invited to contribute papers, photos or announcements that are of a national biological and environmental interest. Letters to the editor are welcome. This is a volunteer non-profit organization and we rely on your participation to make the Bulletin a productive forum for ideas and discussion.

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## LE BULLETIN de la SCBE 2019

Vol. 76, Numéro 3, Automne 2019

Le Bulletin de la SCBE est une publication trimestriel de la Société Canadienne des Biologistes de l'Environnement. Le Bulletin informe les membres des activités de la Société sur événements courant ainsi que les progrès qui font en sciences de l'environnement. Par un échange d'idées au niveau national, cette publication intéresse un groupe très diversifié d'environnementalistes Canadien. Les membres sont invités à contribuer des articles, photos (noir et blanc) ou des messages qui sont d'intérêt nationale en sciences biologiques et environnementales. Les lettres à l'éditeur sont bienvenues.

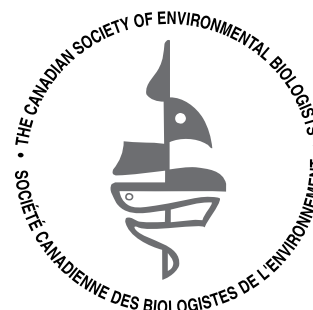
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The views expressed herein are the writer's of the articles and are not necessarily endorsed by CSEB, which welcomes a broad range of viewpoints. To submit a piece for consideration, email [newslettereditor@cseb-scbe.org](mailto:newslettereditor@cseb-scbe.org).

## The Canadian Society of Environmental Biologists



## CSEB OBJECTIVES

The Canadian Society of Environmental Biologists (CSEB) is a national non-profit organization. Its primary objectives are:

- to further the conservation of Canadian natural resources.
- to ensure the prudent management of these resources to minimize environmental effects.
- to maintain high professional standards in education, research and management related to natural resources and the environment.

## OBJECTIFS de la SOCIÉTÉ

La Société Canadienne des Biologistes de l'Environnement (SCBE) est une organisation nationale sans but lucratif. Ses objectifs premiers sont:

- de conserver les ressources naturelles canadiennes.
- d'assurer l'aménagement rationnel de ces ressources tout en minimisant les effets sur l'environnement.
- de maintenir des normes professionnels élevés en enseignement, recherche, et aménagement en relation avec la notion de durabilité des ressources naturelles et de l'environnement, et cela pour le bénéfice de la communauté.

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# NATIONAL News

## PRESIDENT'S Report

*By Curt Schroeder, CSEB President*

As I return to work after summer holidays, my employer (Saskatchewan Polytechnic) reminded all staff and faculty of our commitment to the Truth and Reconciliation Commission's Calls to Action. In our institution, we have several programs and events designed to raise knowledge and awareness of Indigenous ways of knowing, teaching, and learning, and integrating them into our practices, procedures, and services. I suspect many CSEB members' employers have similar policies and procedures.

As a national body, does that mean that CSEB, as an organization, reflects the calls to action of the Commission? Do we have a responsibility to engage ourselves and others in addressing the legacy of residential schools and advance the process of Canadian reconciliation? Do our communications through the Bulletin, website, and other media advance awareness of Indigenous ways of learning and reconciliation in general? Do we adjust the composition of our Board of Directors to be reflective of the perspectives of Aboriginal peoples? Do we advocate for equitable access for Aboriginal peoples in our communities to employment in our fields of expertise? Do we partner with certain Aboriginal organizations where common ground can be found? Through internal dialogue among our members, I hope we can begin to address these open-ended questions. I think we're up to the challenge.

### Back Cover Photo Comment by Peter Wells, CSEB Atlantic Region Member

On every boat, there is an observer taking notes on the whale identification, behaviour, condition, etc. This material goes to the New England Aquarium in Boston where records are kept on every observed animal in the NW Atlantic. There is a continued concern about the impact of whale watching itself on the whales, due to the noise of the boats, the possibility of collisions, and the interference with its swimming/feeding patterns while on the surface if the boat(s) get too close (though most skippers in my experience stay the legal distance away and do not cross the paths of feeding animals). Also note the small scars that may have come from touching ropes of fishing gear; the entanglement problem is huge in our coastal waters, both in Fundy and especially now with right whales in the GSL. The plight of "our" whales should be the concern of every Canadian environmental biologist, no matter where in Canada they live or what their particular specialty is – we share the planet with so many amazing animals and they and their habitats deserve our long-term protection.

## SCIENCE TIDBITS

*Submitted by John Retallack, CSEB Alberta Member*

### Birds and Fish Edition

#### Great Blue Herons Eat LOTS of Salmon Smolts!

The challenge Zachary Sherker had for his M.Sc. thesis at UBC (with Andrew Trites in the Marine Mammal Research Unit) was to determine whether Great Blue Herons were significant predators of salmon smolts.

His thinking was fairly linear... hatcheries put passive integrated transponders (aka PIT tags which can be activated with a mobile detector) into salmon smolts before they are released.

Observations have suggested some birds, including mergansers and herons, were preying on various types of salmon smolts. But the extent of predation on salmon smolts was not known accurately.

The linear thinking was as follows: herons tend to concentrate in specific rookeries – they eat whole fish in streams, rivers, and ocean shores where smolts tend to concentrate – some salmon smolts are fitted with PIT tags – digestion is inevitable and the results will mostly end up on the ground – perhaps the easiest place to look for PIT tags is on the ground below rookeries! While herons do not defecate only at rookeries, they do tend to spend a lot of time at their home rookeries.

Results seem to suggest:

- More than 400 tags were detected in droppings at the Cowichan River heron rookery (the rookery has about 100 nests)
- A total of 900 tags were detected in the course of the study
- Predation by herons doubled when the Cowichan River had low flows and herons could access more parts of the river
- Using the Cowichan as an example, it appears predation by herons affects a minimum of 1.5 - 3% of salmon smolts.

#### And the Most Abundant Bird on the Planet is— Domestic Chicken

About 23 billion domestic chickens inhabit the planet at any one time and 65 billion or so feature prominently each year to service the diets of every meat-based society on earth.

As context, the population of passenger pigeons, the most common bird in human history, is estimated to have been only as high as five billion birds.

The domestic chicken is descended from the Red Jungle Fowl. Native to SE Asia, it is a very striking bird and the feathers of

the male (especially Jungle Cock Nails) figure prominently in the fly-fishing community!

While modern day free-range chickens may look more-or-less like their Jungle Fowl ancestor, most chickens are intensively raised and are bred to accentuate features desired by market forces...the lifespan of a broiler chicken may be as short as five to seven weeks!

### **A Species of Duck Brought Back From the Brink of Extinction Due to Fish Farming – With Help From...Scottish Fish Farmers**

Madagascar pochards were thought to be extinct in the wild for the past 15 years. But, with the help of floating cages from Scottish salmon farms, they have now been brought back from the brink at a remote location in Madagascar.

It is thought that the introduction of non-native carp and tilapia was largely responsible for their demise since the feeding habits of the carp stirs up the bottom and tilapia tended to eat most of the near surface vegetation, making it difficult for the ducks, especially the ducklings, to be able to find food.

Workers from the Peregrine Fund spotted some of the thought-to-be-extinct ducks while conducting other bird projects. The pochards were apparently breeding successfully in a remote high mountain habitat, but the young did not seem to adapt well to the deep and cold conditions in their refuge. In 2009, The Durrell Wildlife Conservation Trust, The Wildfowl and Wetlands Trust, The Peregrine Trust, and the Government of Madagascar joined forces to capture some newly hatched chicks and relocate them to a breeding center.

To help the new recruits adapt to their living conditions in the final step in reintroduction, Scottish salmon farming cages were modified into pre-release enclosures to allow the birds to become accustomed to foraging in the lakes.

### **Fish Discover They Can't Trust Humpback Whales**

Some Humpback whales near the north tip of Vancouver Island have developed a unique method to capture fish.

The feeding method has become known as "trap feeding", and marine birds are key for this method to work. During trap feeding, a whale suspends itself with its mouth open, just below the surface

of the ocean where seabirds are feeding, and remains still for several seconds. Fish disturbed by the feeding birds seek refuge in the "cave" created by the whale. Then, using its large pectoral flukes to further confine the fish, it snaps its jaws closed and, with little effort and risk, collects a good meal.

The trap-feeding method is apparently a learned behaviour. Only two whales were seen using the technique in 2011, but the number of whales using the technique had risen to 16 whales by 2015.

### **Blue Fin Tuna Rebounding in the North Sea**

At present, catching bluefin tuna is banned in British waters to protect low stocks. Recently, however, large numbers of bluefin have been observed off the south coast of England and in the Irish Sea between Ireland and England.

Dr. R. Kirby (Plymouth University and University of Lille) has determined that the bluefin are being found farther north due to the cycling of the Atlantic Multidecadal Oscillation (AMO) that tends to increase sea temperatures around the UK over a 60 - 120 year cycle.

While the presence of Bluefin around the UK is encouraging, Dr. Kirby notes the increased population of blue fin around the UK does not likely reflect a recovery of the UK stocks but rather simply reflects an environmental adjustment.

### **Anyone For Tuna Tossing?**

Yes you heard it correctly!

The tuna tossing world championship is held annually as part of Tunarama in Port Lincoln, Australia. 2019 will mark the 40th Anniversary of the first event.

Much like the hammer throw in Olympic field events, a rope is strung through the gill/collar area of a tuna, and using a similar spinning movement, the tuna is hurled as far as possible.

In earlier days, dead tuna were used in the competition. Fortunately, the use of dead tuna was discontinued several years ago and now standardized rubber "competition" tuna are used.

If you want to confirm that I am not making this up, just type in "tuna tossing Port Lincoln" and you will find "thons" of examples (pun fully intended).

## **Restoration in the Squamish Estuary to Improve Chinook Salmon Populations**

*By: Edith Tobe, Executive Director, Squamish River Watershed Society, CSEB Member, and Lora Tryon, Lake Trail Environmental Consulting*

The physical and biological uniqueness of the Squamish estuary tells a story of the past, including geological events, human settlements, and even climate change that continue to shape it physically, biologically, and even culturally. This is countered by a history of human culture, settlement and industry that have created a collective appreciation for its uniqueness and at the same time threatens to shift the natural progression of ecological communities that depend on it. Evidence of this shift is emerging with the decline of Chinook Salmon populations. Chinook Salmon have evolved to depend on the Squamish estuary as the last stop for feeding, growth and acclimation to changing salinities as

preparation for their adult life in the marine environment. Access to the estuary during this critical time is impeded by a massive man-made physical structure, which is the legacy an industrial dream from over 40 years ago. Restoration solutions to improve access of Chinook Salmon to the estuary are being explored and implemented alongside monitoring to evaluate effectiveness.

The Squamish Estuary is located approximately 54 km north of Vancouver, British Columbia, at the north end of Howe Sound within the Salish Sea (Figure 1). The Squamish River drains an area of over 3,600 square kilometers and is a major source of sediment to Howe Sound. This sediment originates from moraine





Figure 1: Location Map

veneers located on steep mountain slopes and vesicular volcanic sources such as Mount Cayley and Mount Garibaldi (Hicken 2011) in the upper watershed. The retreat of a valley glacier in the Squamish River over 10,000 years before present, carved a U-shaped valley now known as the Squamish Valley that extends from the confluence with the Elaho River south to meet Howe Sound. Since the last glaciation period, the delta in the Squamish Estuary has been prograding and has infilled approximately 20 km into the fjord (Brucker et. al. 2007). The result of these geological processes is a highly biodiverse estuary that provides rich habitat for marine and terrestrial species.

The first people to settle the valley and establish villages alongside the estuary were part of the Coast Salish Nation. For practical purposes, in 1923 sixteen families amalgamated, creating the modern era of what is now the Squamish Nation. Of the former numerous villages inhabited by Squamish Nation historically in the estuary, only the site of Stawamus remains inhabited.

Like many estuaries around the planet, the Squamish Estuary has been logged, infilled, and developed. After 150 years of development, less than 50% of the original estuarine habitat remains intact. What remains of the Squamish estuary has been modified by roads, rail, dikes, and river berms that have restricted flows from the Squamish River into the estuary. The logging and alterations that have occurred in the estuary over the past hundred years are the result of the European influence.

One of the major impacts to the estuary was the construction in 1970 of a 5 km road/berm that was intended “train” or cut off the river flows from the estuary for the construction of a coal port by BC Rail. This structure has become known as the Training Berm. While the coal port development ultimately never received approval and was abandoned in favour of a site in Prince Rupert, the 5 km berm was left intact. From the mid-1990s until 2013 nine culvert crossings of various sizes were installed across the lower 3km of the Training Berm to reconnect the river to the central estuary. The intention of the culvert restoration was two-fold: 1) to improve water exchange between the freshwater

of the Squamish River and the saline brackish waters of upper Howe Sound, and 2) to improve fish access between the river to the estuary, in particular for out-migrating juvenile salmonids.

From 2013 until 2016, the Squamish River Watershed Society (SRWS) undertook a study funded by the Pacific Salmon Foundation to determine the effectiveness of the culverts for fish passage. The study results clearly indicated the patterns of use of salmonids. Juvenile Chinook Salmon were likely not entering into the estuary [through the culverts] prior to their migration out to Howe Sound which likely affected the survival of the juveniles transitioning to saltwater environments (InStream 2018). As a result of this study the SRWS, in partnership with Fisheries and Oceans Canada (FOC) and Squamish Nation, developed a project proposal to replace the existing culverts, at key locations, with larger sized structures to increase the tidal flows between the river and estuary and re-establish connectivity for juvenile salmonids.

Many of the Chinook Salmon populations on the south coast are either at risk, threatened, or in decline. The population of Chinook Salmon within Howe Sound and the Squamish watershed are grouped with the Southern Mainland Georgia Strait Conservation Unit. The low southern BC Chinook Salmon populations are of foremost concern by government, First Nations, and the recreational and commercial fishing sectors after several years of low spawner escapements of this population unit (Brown et al., 2019). There are also implications under the Species at Risk Act; studies indicate that the SARA Schedule 1 listed Southern Resident Killer Whale population forage selectively on Chinook Salmon, and their survival has been correlated with the abundance of adult Chinook Salmon (Ford, Wright, Ellis, & Candy, 2010). These concerns have prompted initiatives aimed to address uncertainty around long terms trends in Chinook Salmon abundance and productivity to improve management, and a COSEWIC review of the status assessment of southern BC Chinook Salmon (Brown et al., 2019). Due to the decline in annual adult Chinook Salmon returns to the Squamish River, the Squamish River Watershed Society focused its attention on improving access to the estuary for out-migrating juvenile Chinook Salmon as an important stage in their survival before they enter the ocean. Studies on wild Chinook Salmon populations within the Squamish watershed have noted populations within the past few decades have shifted from stream-type to ocean-type fish (Schubert 1993). Wild Chinook Salmon have two distinct life history types: stream-type and ocean-type that are recognized as distinct races. The young of the stream-type remain in fresh water longer than the ocean-type and consequently are larger when they enter saltwater. The adults of stream-type tend to return to fresh water earlier than the ocean-type and they remain in fresh water longer than the ocean-type before spawning (Healy 1991).

To improve fish passage across the Training Berm, the Squamish River Watershed Society was able to secure funding (with support from Coastal Restoration Fund, Pacific Salmon Foundation, and Fish and Wildlife Compensation Program) to replace culverts at key locations. The location of Culvert #3, located approximately mid-way down the structure, was selected based on flood and sediment transport modelling (Figure 2). The intention was to replace the twin 1.2 m corrugated steel pipe (CSP) culverts that were installed at what is now Culvert #3 in 1994 to a larger box culvert in order to target the sensitive early life stage when



*Figure 2 Location of Culvert #3*

Chinook Salmon are navigating from river to estuary where forage opportunities and refugia will promote growth and survival. The upgrade to the culvert was intended to improve mixing of cold freshwater of the river with the saline water of the ocean during the late spring and summer periods, thus attenuating temperature extremes during estuarine rearing and migration of Chinook. As well, the box culvert has a lower design invert elevation than the former CSP culverts and allows the conveyance of much larger volumes of water to better enable passage of juvenile salmonids into the inner estuary.

The decision around the location of the culvert upgrade had to take into consideration several factors, including ensuring no added flood risk to the District of Squamish, no significant increase in sediment transport that could affect the operations of the Squamish Terminals (an industrial port authority located downstream of the proposed culvert location), and no long-term impact to access for the wind-sport groups, who gain access into Howe Sound annually from the southern tip of the Training Berm during May through September.

In order to determine the impacts and potential effects of making modifications to the Training Berm an engineering firm, Kerr Wood Leidal (KWL), was hired. Two main areas were explored: 1) a qualitative sediment transport assessment to evaluate the potential difference in sediment transport between the river and the estuary; and 2) a 2-D hydraulic model to evaluate the impact of opening the Training Berm on local flood protection elevations within the estuary. Based on the results of KWL's work, a 3 m x 3 m concrete box culvert with a total length of 26.5 m was selected for the remedial works. The road width at this location, at Culvert #3, is around 7.7 m with an embankment slope of 1.5H:1V. Stratigraphic soil samples of the Training Berm were undertaken using a truck mounted sonic drill rig that could provide subsurface exploration on substrates including sand, gravel, and fluvial deposits, that were expected to be found within the berm. Two sonic boreholes were drilled to approximately 18 m in depth from the existing ground surface.

Due to the location of the works being within a tidally active area, dewatering of the site was not an option. Furthermore, the



culvert needed to be installed over stable subgrade that could be compacted and had to be above the low-low tide level as well as the base flow elevation for the Squamish River during the construction period of April/May. As a result, the invert elevation was determined based on the ground water of the Squamish River below a 1.0 m tide that would allow approximately 45.75 cm of subgrade sand and gravel overtopped by 1.9 cm ( $\frac{3}{4}$ " ) minus clear crushed gravel bedding material. The bedding and all gravel and soil placement were compacted at every stage under the supervision of the site engineer. The fill removed from the Training Berm was tested and determined to be clean and was used as backfill once the culvert installation was completed. All works were conducted per an operational health and safety plan with oversight from engineering consultants and Fisheries and Oceans Canada staff.

The photos below provide a visual summary of the works from start to finish. Tree removal was undertaken in March 2019, a few weeks in advance of the planned construction plan, in order to ensure no birds would be nesting in the trees. A bird nesting survey was completed to ensure no birds were nesting at the time. Preparation for the site then included the excavation and removal of the twin 1.2 m CSP culverts. The culverts and headwalls were trucked to the site (two pieces per truck) and were off-loaded with the use of a 165-ton crane provided by Gwil Crane Service (Figure 3 and Photos 5 and 6).

The actual placement of all the culvert pieces took place over the course of one day and the following day the headwalls were lowered into position. The site was backfilled to original grade and the side slopes were stabilized with armour rock that was overlain with gravel and original berm material. The entire culvert and intake design were constructed to allow a 1% gradient between the river and the estuary through the culvert. Concrete baffles were installed in the culvert segments to reduce large flow velocities but designed in a manner to allow fish passage (Photo 7). Revegetation of the site will be completed in the fall with the placement of over 375 native riparian trees and shrubs to replace the 56 mature trees that were removed in preparation of the site.

From 2017 until 2018 baseline monitoring was conducted in the estuary in advance of the culvert upgrade and has been expanded upon following the culvert restoration works undertaken in spring 2019 to measure sediment movement, water quality parameters, and fish presence and distribution (Instream 2019). The greater diversity and area of estuarine vegetation, which covers the spectrum of freshwater to brackish water species, provides a valuable food source for juvenile salmonids. In order to assess the success of the culvert upgrades, two monitoring protocols were developed specific for the Squamish estuary: 1) **Restoration Monitoring for the Squamish Estuary Restoration Project** to monitor metrics relating to water quality, physical habitat, hydrology, sediment dynamics, vegetation communities, and

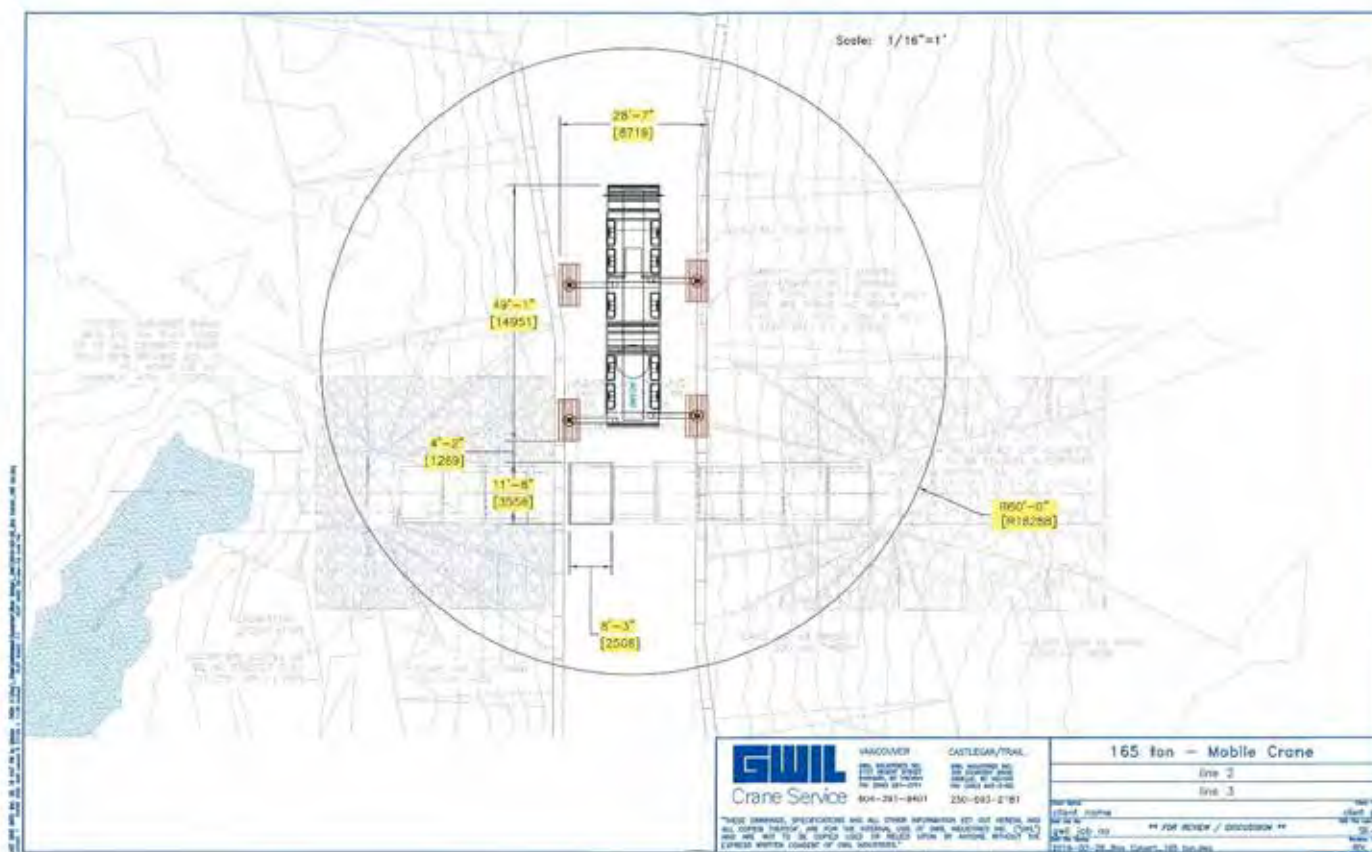


Figure 3 Dimensions and positioning of crane and pads at Culvert #3.





*Photos 1 & 2: Prior to construction (March) and post-construction (May 2019).*



*Photos 3 & 4: Excavation of site and placement of gravel bedding & culvert installation.*



*Photo 5: Transport of culvert & headwall pieces to site from Langley Concrete.*



*Photo 6: Crane used to off-load culvert & headwall pieces from transport and to place culverts & headwalls into position.*





*Photo 7: Facing east from river side of culvert. Note acoustic arrays and gap in concrete baffles to right to allow fish passage.*



*Photo 8: Culvert opened for conveyance of flows (note acoustic monitoring equipment – black box – to count tagged fish passing through the culvert).*



*Photos 9 & 10: Before (March 2019) and after (July 2019) photos of Culvert #3 location.*

invertebrate communities (Lake Trail 2019); and 2) **Squamish River Central Estuary Restoration Effectiveness Monitoring of Juvenile Chinook Salmon** to evaluate the success of improving estuarine access for Chinook salmon through a three-step approach that includes mark recapture and PIT tagging, acoustic telemetry, and seine netting and minnow trapping to determine presence and distribution of juvenile salmon before and after the culvert upgrade (InStream 2019). The Chinook Salmon monitoring program is an expansion of the original studies on culvert usage by salmonids that commenced in 2015, which indicated virtually no juvenile salmonids were accessing the central estuary.

The monitoring goal for the Squamish Estuary Restoration Project was to collect and analyze data from the Squamish River and estuary in order to evaluate the success of restoring habitat for juvenile salmonids, primarily Chinook. The objectives were: 1) to estimate the changes in passage of juvenile Chinook between the river and the estuary before and after restoration activities, and, 2) to document changes in fish habitat and water quality in the estuary as a result of restoration activities. To ensure

metrics covered the spectrum of benefits to salmonids from restoration, the studies were selected to encompass the capacity, opportunity and realized function of juvenile Chinook Salmon habitat as defined by Simenstad and Cordell (2000). Capacity refers to habitat conditions that promote survival in salmon, for example through improved foraging and growth, protection from predators, and water quality conditions. Opportunity refers to the ability for salmonids to access and benefit from that habitat. Realized function refers to the resulting benefit of that capacity and opportunity on juvenile Chinook, for example survival, residence time, foraging success and growth. Additional metrics were chosen for water quality monitoring partially guided by the NOAA publication “Protocols for Monitoring Habitat Restoration Projects in the Lower Columbia River Estuary” (Roegner et al. 2009). The metrics recommended in the NOAA protocol were developed for projects that involved restoring connectivity and functionality of riverine and estuarine wetland habitats.

In preparation of the culvert upgrade construction, initial baseline monitoring commenced in 2018 to include eight stations which were installed in the estuary to monitor the aquatic environment



as it relates to juvenile salmonid health. Monitoring has continued through 2019, and we now have six temperature and water level loggers, four conductivity loggers, 16 sediment stations, and seven stations for tidal cross section monitoring. As well, three sites with baseline vegetation communities and soil profile data were established to document changes in vegetative communities and to capture changes to soil composition, erosion, deposition, and organics. The project also includes a control site in the upper central estuary to which changes in the downstream restored areas can be compared. Additional metrics of soil carbon and invertebrate assemblages are also being collected and will relate restoration to salmonid forage opportunities.

The monitoring programs are designed to test the hypothesis that restoration of the Squamish estuary will improve forage opportunities, refuge habitat, and water quality for smolting salmonids as they prepare for their ocean phase of life. Restoration will help deliver more riverine sediments into the estuary, allowing for the expansion of estuarine wetlands which are essential refuge habitat during high tides, a carbon sink, and a source of invertebrate prey items for salmonids. Sediment stations, vegetation and soil plots, and invertebrate and photo-point monitoring will help us to evaluate the influence of sediment on wetlands and salmonid prey items. Restoration activities will deliver greater hydraulic activity to tidal channels, improve mixing of fresh and saline waters and scour pools that are important refuges for salmonids during low tides. Channel cross-sections will help to monitor the progress of tidal channel morphology following restoration and water level, temperature and conductivity loggers will monitor hydraulic and water quality changes. The suite of metrics chosen to monitor restoration in the Squamish estuary provide us with a chance to evaluate the direct and indirect benefits of improving estuarine access to salmon.

Restoration activities in the Squamish estuary are expected to address a critical intervention to reverse alarming trends in Chinook Salmon populations and contribute towards the wider resilience of Southern BC Chinook Salmon. Estuaries are well known to provide an important component in Chinook Salmon life history (Healey 1982; Simenstad, Fresh, and Salo 1982). Restoring connections between the Squamish River and the estuary provides an important step to alleviate the stress of human development on a resource that holds high intrinsic value, as well as indirect values for humans and the ecosystem. Monitoring activities will inform both the status and the outcome of restoration efforts as they relate to Chinook Salmon life history requirements. In addition to the monitoring activities mentioned in this article, fish passage monitoring will evaluate the effectiveness of both interim and prospective long-term restoration activities in the Squamish River estuary. We expect to provide a greater understanding of the results of fish passage monitoring following the spring 2020 outmigration season of Chinook Salmon, in particular by the acoustical arrays that will monitor pit tagged Chinook utilization of the new culvert.

This project is ongoing and additional studies will be undertaken in the coming months and year. For more information on this project please refer to <https://www.squamishwatershed.com/central-estuary-restoration.html>.

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**Check out the CSEB Video at**  
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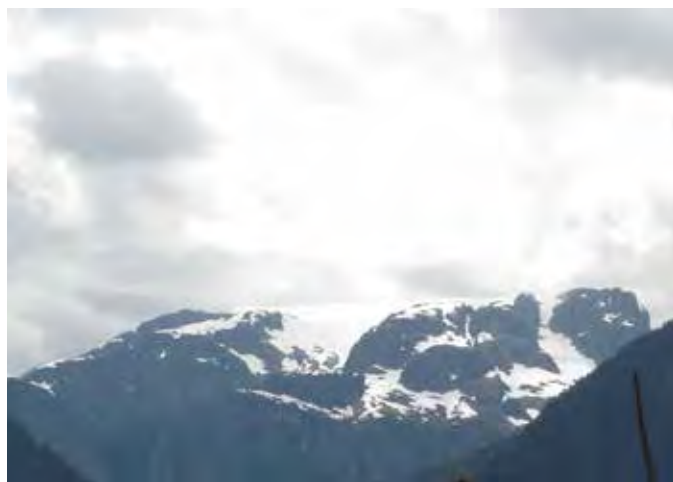
## REGIONAL News

## BRITISH COLUMBIA News

Submitted by Loys Maingon, CSEB BC Director

### Change: The Dubious Virtue of Official Baselines and Datasets

*“One of the few good things about getting old is that one gains a fine-grained appreciation of the various forms of change.” -Daniel Pauly*



*Figure 1: Ongoing change in BC: Comox Glacier July 30 2007 and September 5 2019 (Even accounting for the 30 days difference in these historical pictures, would not account for the magnitude of change over 12 years).*

On August 18, 2019, to much international fanfare, Icelanders and scientists erected a plaque commemorating the death of Okjökull Glacier, which ceased officially to be a glacier in 2014 after melting down to only 0.953 square kilometres (0.386 square miles), or 6.6% of its original 15.0 square kilometres (5.8 square miles). It is interesting to note that Iceland claimed this international “first.” Canada and BC, which are usually so anxious to claim to be “first” or “world class,” could likely have done as much. We too have melting glaciers. Admitting as much, however, might be at odds with public illusions of being “world-leaders” in the perilous fight against climate change. As **Figure 1** above illustrates, BC’s coastal glaciers, such as the Comox Glacier, on which the K’omoks Nation’s cultural identity is largely based, is well underway to disappear entirely by 2030.<sup>1</sup>

Oddly, the disappearance of glaciers is not happening “at glacial pace.” That epithet no longer applies. Ongoing environmental change is happening at an unprecedented rate, while cultural habits of mind that drive climate change continue to stagnate, often refusing to adapt to the realization of the demands at hand. We continue to try to address problems with out-dated tools, and when we find that our toolkits are outdated, we often simply pretend that the problems do not exist and may magically go away.

The province has released its preliminary report on climate change prepared by the Climate Action Secretariat.<sup>2</sup> The findings

indicate that BC is just beginning to experience what many feel will be the “catastrophic” consequences of inaction.<sup>3</sup> Even the notion of simple “adaptation preparation” is rapidly coming to be considered an inadequate response,<sup>4</sup> particularly as species adaptation-response capacity appears to be greatly limited.<sup>5</sup>

BC is an earthquake zone. Its flora and fauna, and its distribution are an adaptive response to millennia of extreme disturbance regimes. However, even those previous extreme disturbances seem to have been no match for what we are beginning to witness. An adequate response to this rapidly evolving crisis, therefore, requires that our terms of reference be both broad-based and long-term.

Datasets and baselines make up a scientist’s frames of reference by which to measure the evolving state of the environment. The question is “What state of the environment is either acceptable or “normal,” that is, which one forms the most information-rich referential base? Most people believe that the current state, that is, the one state best known to them, is the only state and therefore “the norm,” thereby confirming the old adage: “What you don’t know won’t hurt you.” Unfortunately, the adage has often proven to be false; great harm does result from ignorance of facts.<sup>6</sup>

It is disturbing to consider that this blind spot is also found to handicap the scientific community.



One of the most common errors made in the interpretation of datasets that form our referential baselines is that we assume that because the dataset has at the very least in principle been gathered objectively, it is itself an objective account against which to measure environmental impacts. We see the numbers on the page, but not the biases and assumptions behind them. Daniel Pauly's recently published set of essays, *Vanishing Fish: Shifting Baselines and the Future of Global Fisheries*, provides a useful antidote to this misconception. His review of FAO data not only reveals the weaknesses of national under-reporting and omissions of recreational and small fisheries, it also brings into perspective the generational blind spots of researchers in what he calls "the shifting baseline syndrome":

*"Essentially this syndrome has arisen because members of each generation of fisheries scientists accept as a baseline the population size and species composition that occurred at the beginning of their careers and use this to evaluate changes. When the next generation starts its career, the populations have further declined, but it is their size at that time that serves as the baseline. The result obviously is a gradual shift in the baseline, a gradual accommodation of creeping disappearance of resource species, and inappropriate reference points for evaluating economic losses resulting from overfishing or for identifying targets for rehabilitation measures."*<sup>7</sup>

The arbitrariness of such datasets really comes out in the terms of reference that constrain Environmental Impact Assessments to piecemeal considerations. A review of EIAs, such as the Roberts Bank Terminal 2 hearings, would show that the consultants hired by the proponents are only required to justify impacts within a narrow geographical area around the proposed projects. This, at best, limits these impacts to their footprint on the current state of the local ecosystems. In other words, the consideration is only limited in time to the baseline known to that generation of consultants. Similarly, there is little consideration given to the broader regional or provincial implications. Thus, terms of reference are limited in space to the region known to the consultants. There are little or no considerations given to the ramifications outside of the site disturbance, as though species affected were ecologically important only to the site under consideration.

Thus, whether it be in fisheries or forestry, the operative baseline is a generational baseline, limited to the immediate experience of consultants, the businessmen who employ them, and politicians who rely on their information. For decades this myopia has guaranteed the continuous degradation of the environment. The actual terms of reference should be based on the state of regional ecosystems and the dynamics of species populations that make up these ecosystems in both space and time reaching back to the historical contact period. In BC, that would be the state of the environment circa ~1865.

The evidence for this proposition, which will seem outlandish to many people who simply view ecosystems as "industry resources" and "stocks," becomes obvious when we consider the current demise of Chinook Salmon (*Oncorhynchus tshawytscha*). As the ongoing near-extinction of Southern Resident Orcas shows, Chinook Salmon are a critical building block for apex species that structure entire food chains from Puget Sound to points north of Vancouver Island. The destruction of prime Chinook nursing areas within the critical habitat of Southern Residents, is a problem that

far exceeds limitations imposed by the terms of reference of The Roberts Banks Terminal 2 hearings.

Numbers that are now surfacing indicate that the Chinook Salmon collapse is just part of an over-arching problem of mismanagement that has also led to shockingly low numbers of both Sockeye Salmon (*Oncorhynchus nerka*) and Pink Salmon (*Oncorhynchus gorbuscha*). While the DFO modelling suggested that 4.8 million Sockeye Salmon were supposed to enter the Fraser River in 2019, only 13% showed up (628,000), with only about 85,000 making it past a landslide at Big Bar in the lower Fraser canyon.<sup>8</sup> Even the "4.8 million" number needs to be weighed. That is a low number compared to expectations of the year 1900, which represents about 25% of turn-of-the-century numbers. The operative baseline should be about 20 million.

Well before the Big Bar disaster and the lower returns observed, conservationists were already expressing serious concerns that were dismissed by the DFO. In 2018, the DFO over-estimated numbers and allowed increased fishing effort. The results were record low returns in 2018 in traditionally productive rivers such as the Adams River: "DFO data show 535,564 salmon made it home to spawn, the lowest on record for this cycle."<sup>9</sup> (That 2018 "low number" at the Adams River is incidentally 6.2 times the number of Sockeye Salmon that will have returned to the entire Fraser River and tributaries in 2019). And it is not just Chinook Salmon and Sockeye Salmon populations that are in trouble, even traditionally abundant populations of Pink Salmon are facing extremely low returns.<sup>10</sup>

The problems posed are both spatial and temporal. What is used as a baseline should not be just limited to what we know now, at this point in time, which may be the lowest denominator. It should be based on the optimum state, the state of maximal productivity,<sup>11</sup> which would take us back to numbers and conditions at contact.

The "productivity baseline" has to reflect those conditions that created the abundance of BC's ecosystems before the high industrialization of 1914. These numbers are not just part of an oral literature, they can be reconstructed—and when they are, they are stunning witnesses of the extent of the destruction that we have wrought. As recent research that pushes database references back to 1919, rather than the current 1960s, shows, there is a need to completely re-think the assumptions that currently guide management.<sup>12</sup> Without extended time series, we seem to assume that species, or species populations, can somehow be "redundant" and that systems are far more resilient, and less connected than they are in fact.

As noted by Pauly, the "professional habit" of treating the ecosystems as a set of resource stocks rather than as species populations that perform essential services, has resulted in the current ongoing global environmental collapse. The actual costs of treating the environment as a larder to be judiciously raided for the benefit of a consumer economy, comes in the recent re-assessment of the databases on which we have been managing Sockeye Salmon. Skeena numbers show that fisheries management has collapsed 13 major sockeye populations to between "56% to 99% of original numbers over the period from 1914 to 2014," resulting in an overall 75% decline of Sockeye Salmon in what is still considered today to be one of the most productive salmon rivers in BC, the Skeena River.

The key problem identified in this study, as in others before it, is the one that the DFO consistently denies, but which a growing number of conservationist NGOs have consistently, and correctly noted: overfishing by both commercial and recreational interests. This problem is not limited to BC. It is a global problem, detailed by Pauly's work, which needs to be addressed by setting aside marine reserve areas.

Official denial may re-assure voters and allow for status quo to continue unabated, until it hits the hard wall of reality. It therefore comes as no surprise that BC's commercial fleet has now gone into full shock at the realization that commercial First Nations and industry both find that BC now faces the worst fish return in 50 years.<sup>13</sup> Mismanagement of the larder by short-term and skewed datasets that create the illusion of infinite supply for an unsustainable economic model ultimately leads to a collapse and social dislocation: "*Advocates say the federal and provincial governments need to step in to help fishermen through the worst commercial fishing season in 50 years, as **runs have plummeted for all species and in all regions***" (italics and bold are mine).

Should anyone suggest that BC's plight is just an ecological or regional anomaly, the parallel collapse in Quebec, at the other end of the country, of cod in the Gulf of St. Lawrence, suggests otherwise. It is a systemic mis-management problem. A decade of appeals to a succession of governments by COSEWIC to list Gulf of St. Lawrence cod as endangered species, has only been met by political dithering to allow commercial overfishing interests to continue to exploit a vanishing "stock" to the point at which both populations of cod are now on the verge of irreversible extinction.<sup>14</sup> All of which, of course, is fully consistent with the late Ramson Myer's 30 year-old warning: "*Humans have always been very good at killing big animals. Ten thousand years ago, with just some pointed sticks, humans managed to wipe out the woolly mammoth, saber-toothed tigers, mastodons, and giant vampire bats. The same could happen in the oceans.*"<sup>15</sup>

In the light of ongoing fisheries crises, there is an obvious need to rein in commercial and recreational fishing efforts and set aside extensive marine reserves to give all fish species and commercial stock the opportunity to replenish. In August of this year, the results of the United Nations "Intergovernmental Conference on Marine Biodiversity of Areas beyond National Jurisdiction"<sup>16</sup> did not seem to make headlines in the English-Canadian press. They did, however, find resonance in the French-Canadian press where the performance of Canada was found to be on a par with such other environmentally "progressive countries" such as...Russia.

The aim of the conference was to create a mechanism that would establish "sanctuary zones" that would protect ocean species by setting aside 30% of the oceans by 2030. However, the Canadian government—like the Russian and the Norwegian governments—objected to the concept of scientists regulating the commercial interests of international fisheries cartels who currently plunder the seas with very little regulation. The conference failed to support a regulatory mechanism and showed a complete lack of political will to change what is proving to be, even at home, a disastrous status quo:

*«Le manque de volonté politique par rapport à un résultat progressif de ces négociations est alarmant : certains pays*

*continuent de favoriser l'exploitation plutôt que la protection. Le statu quo ne sauvera pas nos océans, pas plus que l'humanité»<sup>17</sup>*

Whatever baselines are guiding the decisions of officialdom, they seem strangely out of step with the reality that we experience, and which a series of UN reports telling us that "Our planet is in crisis" have confirmed.<sup>18</sup> BC can provide two examples of the ineffective response by the prevalent political leadership.

For decades, there has been a growing concern with the deteriorating state of the Salish Sea's water quality. Most of the data for the water quality come from environmental health testing at public beaches. Until recently, on Vancouver Island these data were collected by the Vancouver Island Health Authority for the Ministry of Environment. Of late, the data have become increasingly embarrassing, as I have reported in previous articles. VIHA has found the ultimate solution to this embarrassing baseline:... "cease to gather the data." VIHA no longer gathers samples to test for water contamination at public beaches. (And here we might want to consider whether it is true that "What you don't know won't hurt you.")

VIHA has decided no longer to test public waters.<sup>19</sup> It has "theoretically" downloaded the responsibility to municipal governments who may, or may not, carry out the tests at their discretion. I specify "theoretically", because it seems that municipal governments have not been informed. Neither VIHA nor the ministries responsible for either public health and safety, or environmental health have seen fit to inform municipal governments of their expedient decision.<sup>20</sup>

There is also a legal problem inherent in this decision. Some municipal governments are currently being sued for development permits and practices that have previously contributed to pollution alerts. It, therefore, is not in the interest of municipalities to carry out these tests. That is a clear conflict of interest.

None of this Orwellian thinking should really come as a surprise to British Columbians. At the end of July, the Auditor General found that BC was not sufficiently protecting drinking water.<sup>21</sup> However, it is not clear if the current NDP government has a legal responsibility to protect clean water, since BC Supreme Court Justice Mark McEwan, proving Charles Dickens's perspicacious view of the law correct, recently ruled that Canadian citizens do not have a legal right to clean water.<sup>22</sup>

Clean water generally comes from clean functioning watersheds. The fact that our NDP government does not seem to make this connection and actively prioritizes forestry workers' right to log old-growth forests around the province confirms the logic of Justice McEwan's ruling. Thus, in spite of ongoing public protests against old-growth logging and interventions from the scientific community suggesting that old-growth not only be protected but expanded, such as a report recently calling for the urgent need for restoration of old-growth to 30% of the original distribution,<sup>23</sup> government response is not commensurate with the magnitude of the climate and biodiversity crises that are emerging. Notwithstanding a well-publicized collapse of the timber-supply, the response of the minister of the aptly named: "Forests, Lands, Natural Resource Operations and Rural Development" has been to continue to accelerate raids on the larder unsustainability. Continued logging is carried out



with the re-assurance of out-dated short-term data sets. To the bewilderment of the BC community of botanists and ecologists, the response of the Honourable Doug Donaldson to scientific concerns, was to “canonize 54 large trees” around the province, as compensation for sending the rest of the old-growth forest choir to timber heaven.<sup>24</sup>

The practice of setting aside small patches is reminiscent of the recreational view of W.A.C. Bennett and of Dave Barrett in the 1960s or early 1970s. It is as though time has never progressed. The Honourable Doug Donaldson's act is a clear demonstration that our current politicians do not even begin to have an inkling of the magnitude of the crisis they have contributed to the making thereof.

BC has been in a drought since January 2019. Although the fire season has been moderated by light rains in July, many important salmon-bearing rivers (when there are salmon) such as the Koksilah<sup>25</sup> and the Cowichan<sup>26</sup> have effectively gone dry. There is much concern about a return of the 2014-2015 Blob in the North-east Pacific, which is likely to have a further adverse effect on what is left of our fisheries.<sup>27</sup> Coastal deforestation at the rate it is proceeding is only compounding problems and fire risks.<sup>28</sup> People and the politicians they elect do not seem to understand the linkages between the increased average temperatures, warmer ocean temperatures, rivers too warm for salmon,<sup>29</sup> droughts, and the growing instability of geological formations,<sup>30</sup> which may have contributed to the recent landslide at Big Bar and the resultant Fraser salmon disaster. It is all becoming too complex for people who continue to believe and act as though the world is now as it was in the age of Emperor Marcus Aurelius, and who seemingly are oblivious to momentous change about us.

Our environmental problems are all part of a much more highly-connected set of phenomena. If we are to manage the changes that our environmental problems impose on us. We cannot do so through simplistic filters. It is somewhat re-assuring that the scientific community is taking note of this very problem. The notable recent issue of *Science* dedicated to the legacy of von Humboldt homes this point.<sup>31</sup> It was clear to Humboldt that “Humanity and nature are deeply intertwined.” It reiterates Humboldt's discovery 200 years ago that climate is a basic organizing principle of life and that all things are deeply connected. We need to take a much broader perspective that recognizes these connections. We need to prioritize an outlook that includes a sense of place, and care for place.

Over the past few months, the good stories in BC come from First Nations. They are in a sense “local stories” rooted in the bond that local people have with place. Not too surprisingly, the positive stories are coming from First Nations' bond with place. As one study showed, lands managed by First Nations have 40% more rare and endangered species, and generally have a higher biodiversity index. And the reason isn't too complex, as the title of the article states: “You protect what you love”: Why biodiversity thrives on Indigenous-managed lands.<sup>32</sup> So it is that after much opposition from the ranching and hunting community, the federal government, with the support of BC has established the South Okanagan National Park. The success for this comes largely thanks to the drive of the Okanagan Nation intent on protecting traditional territories that are key to its cultural identity. The new

Okanagan National Park will be managed very much along the lines of Gwai Haanas National park, as a tribal park in cooperation with Parks Canada.<sup>33</sup>

The other major success lies in the negotiations for the creation of the Kaska Indigenous Protected and Conserved Area, which some describe as the “Serengeti of the North.” This would create a conservation area greater than Vancouver Island, within which there would be “no development.”<sup>34</sup> In the preparations for this territorial project, the Kaska Dene are thinking long-term and relying on an oral dataset that goes back at least 4,500 years. And they are not using the dataset to raid it as a larder, but as a way of understanding a living entity to be protected. Whether they will be able to protect what they love still depends, of course, on getting the support of BC's government, which makes its decisions on ~45-year datasets.

Somehow, it seems that the Kaska Dene are much better prepared to meet the crises that future generations will be facing. The heart sinks at the thought that the people with the better dataset have to depend on the permission of those who only know the short-sighted dataset.

The key phrase that one finds increasingly throughout the writings of biologists as different as Daniel Pauly and Monica Gagliano<sup>35</sup> is “There is an urgent need for man to reconnect with nature.” It is time we used datasets that make that long connections before we make the now common disastrous decisions favourable to business and development that are too often taken to be “normal” and “common sense.”<sup>36</sup>

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## ALBERTA News

Submitted by Brian Free, CSEB Alberta Regional Director

### A New Provincial Government

Elected in April, the new United Conservative Party government, led by Premier Jason Kenney, is gradually establishing its approach to environmental management. With its focus on job creation, reducing red tape and announcing at every opportunity that “Alberta is open for Business”, we are watching to see how this focus on the economy will affect environmental management. Some notable steps taken so far by the new government include the following:

- Repealed the *Climate Leadership Act* and killed the carbon tax. Nevertheless, the new government has indicated that it remains committed to tackling climate change, although it will be taking a much different approach from the previous government.
- Voiced opposition to the federal government’s Bills 68 and 69. Bill 68 is the *Oil Tanker Moratorium Act* that will restrict oil tanker traffic along the northern British Columbia coast. This is intended to protect that sensitive coastal ecosystem and the killer whales inhabiting those waters. Bill 69 overhauls the environmental impact assessment system and may have significant implications for large-scale resource development, including oil pipelines.
- Established a “War Room” to fight attacks on Alberta’s oil and gas sector by environmental organizations, especially those funded from outside of Canada. The government has launched a public inquiry into the foreign sources of funds behind “the anti-Alberta energy campaign.”

### Woodland Caribou

As Woodland caribou have been on the decline for many years, they are considered a threatened species in Alberta. A major factor in their decline has been increasing disturbance of the landscape, primarily from industrial activities. It has reduced the caribou’s favoured habitat—old-growth boreal forest. This opens the door for deer, elk, and moose to expand into these disturbed landscapes, bringing their predators, such as wolves, with them. While hunting for their “normal” prey, wolves will gladly take any caribou they come across.

The new government has taken a step back from the proposed caribou range plans developed by the previous NDP government to allow more local input. Three sub-regional task forces are being established to advise government on land-use planning at the local scale, including caribou recovery actions. Sub-regional plans will be built upon a foundation of science and socio-economic assessments, the latter showing how sub-regional plans work within local and regional economies. Previous work to prepare a draft woodland caribou range plan is not being abandoned. Alberta’s 2017 Draft Provincial Woodland Caribou Range Plan will be available to the caribou sub-regional task forces as a resource when considering caribou outcomes within each sub-region.



Each Caribou Sub-regional Task Force will include representatives from local municipalities, Indigenous communities, the energy sector, the forestry sector, trappers, recreational users, environmental non-government organizations, and other local stakeholders. Membership in the sub-regional task forces will be announced in September. Hopefully, some Alberta biologists will be included!

## SASKATCHEWAN News

*Submitted by Robert Stedwill, CSEB Saskatchewan Member*

The Government of Saskatchewan has finally enacted regulations (The Household Hazardous Waste Product Stewardship Regulations), which when added to current recycling programs across the province, will address most recycling needs.

The regulations require first sellers – businesses that manufacture, sell or distribute household hazardous waste products in the province – to operate a product stewardship program for the collection and safe disposal of these products.

The development of regulations for an industry-led household hazardous waste program has apparently been a significant focus for the Ministry of Environment over the past year. Once the program is established, citizens across the province will have access to responsible disposal options for these materials, although various cities and municipalities have previously, on their own accord, accepted these wastes on a semiannual (or other cycle) basis. Judging by the lineups on “hazardous waste days”, the public is generally very supportive of these initiatives.

The next step for first sellers is to produce a product stewardship program for review by the Ministry of Environment within 180 days. That should be sometime in early 2020.

Through this model, producers of these products manage the full life cycle of the products in an environmentally responsible manner and create systems for accountable waste management.

### Albany Potash Project

CanPacific Potash Inc.'s proposal to develop a new 3.25 million tonne-per-year solution mine in southern Saskatchewan has received conditional approval from the Ministry of Environment, based on the findings of an environmental assessment. The Ministry received a considerable number of comments (453!) during the public review of the EIA, mostly concerning the impacts of the project on native grasses and wetland habitat.

Conditions of the approval include the following:

- For native grassland and wetland habitat that cannot be avoided by the project, CanPacific must develop a compensation plan for approval by the Ministry of Environment.
- The plan will identify affected native grassland and wetlands, identify the methods to restore/enhance existing areas or create new native prairie/wetlands, and provide a time-line for completing the work and monitoring the areas.

- CanPacific must submit a signed Development Plan Agreement to the RM of Francis prior to construction proceeding. The company must also obtain further ministerial approval for future development of the 20-year well-field areas.“

## MANITOBA News

*Submitted by Robert Stedwill, CSEB Member*

It appears that Lake Winnipeg is not only suffering from zebra mussels, but high levels of blue green algae and *E. coli* as well this past summer.

In mid-July, record-high bacterial contamination was discovered at two of the lake's most popular beaches, West Grand Beach and Gimli Beach. At Gimli Beach, the count soared to an alarming 1,364 *E. coli* bacteria per 100 millilitres of water. The allowable limit under national water recreation guidelines for safe swimming is 200. At West Grand Beach, readings hit 1,387 per 100 millilitres.

This is the second year in a row that swimmers at the lake have been warned about high *E. coli* contamination levels. It's been suggested that birds, particularly gulls, may be major contributors to the high counts—although water flows into the lake from across a large area of Western Canada and the north central USA. All those areas are, of course, primarily agricultural—complete with runoff from hog and cattle producing areas, along with phosphorus nutrient loads.

In regard to excessive levels of algae, the lake seems to be doing better than last year. Scientists have found little evidence this year of the thick, green slime that covered much of the lake last year. Cool weather in the early summer and high water levels are thought to be responsible for the improvement. But the problem may still get worse this year. Algae blooms are still possible in September if the weather remains warm. And heavy rainfall in the early part of the summer likely washed more phosphorus into the lake. It could mean that there'll be big problems with algae next summer.

With respect to zebra mussels (*Dreissena polymorpha*), there have been no further updates following the one find in 2018 of a single veliger from Shoal Lake, which is the water supply for the City of Winnipeg.

### CSEB Research Webinars

Check the CSEB Website at  
[www.cseb-scbe.org](http://www.cseb-scbe.org)  
 for upcoming webinars and registration  
 information.

## ATLANTIC News

Submitted by Peter Wells, CSEB Atlantic Member

1. **The upcoming GOM2050 Symposium in Portland, ME, Nov. 2019.** Good progress is being made by the organizers for this important conference, to be held in Portland Nov. 4-8, 2019. Over 150 abstracts have been submitted. The emphasis is on the various changes in the Gulf of Maine/Bay of Fundy ecosystems and surrounding larger NW Atlantic, due largely or in part to climate change. Other topics of concern will be discussed too. The conference will likely influence the direction of coastal research in this region for many years.
2. **Marine debris becoming a major regional issue – the Advocate Harbor beach cleanup.** One of the beaches in the upper Bay of Fundy, West Advocate Beach, has been in the news (Chronicle Herald, Aug. 26th, A3, Aaron Beswick) due to it being inundated with marine debris, 90% of it, according to the article, coming from the fishing industry—“broken pieces of lobster traps, rope, oil jugs, and bits of trawl”. Three dumpsters have been filled so far, and only part of the beach has been cleaned. Some of the lobster trap debris comes from Maine, showing how this material enters the oceanic surface currents of the Gulf and is distributed far and wide. Such materials pose enormous hazards to marine fish, turtles, birds, and mammals.
3. **Status of the NA Right Whale.** This has been another catastrophic year for right whale mortalities, at least seven so far, most in the Gulf of St. Lawrence. Most have been due to ship strikes and the resulting blunt trauma and other injuries, despite speed restrictions in place for all vessels. Some injuries continue due to entanglement in fishing lines and much effort is being spent to disentangle them, very dangerous work carried out largely by volunteer whale conservation specialists. The whales seem to have moved their summer feeding areas to the Gulf of St. Lawrence, due to a shift of their zooplankton food. The population is critically endangered and prospects are not encouraging for their future survival as a species.
4. **Nova Scotia asks for public input on a new proposed environmental bill (The Chronicle Herald, 27/8/19).** The Nova Scotia government is consulting with the public on a proposed *Sustainable Prosperity Act*—“we’re working on new legislation to help us advance our goals of a healthy environment and long-term prosperity for Nova Scotians. We’re inviting Nova Scotians to share their feedback”. Areas of focus in the new legislation are cleaner energy, climate change mitigation and adaptation, circular economy, leadership in sustainable prosperity, biodiversity and natural asset stewardship, and inclusive economy. The government wants all Nova Scotians to share their thoughts on the proposed areas of focus, by Sept. 27th.



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5. **The Arrow oil spill—50 years later.** In February 1970, the tanker Arrow ran aground in Chedabucto Bay, Nova Scotia, releasing many tons of Bunker C oil into the coastal environment. A massive clean-up and recovery effort took place and much of the oil was recovered from part of the sunken ship. However, oil from this spill persists in the sediments of the rocky shoreline in the northern part of the Bay. Importantly, this spill stimulated various research programs in Canada on oil spill fate, effects, and treatment research, some of which continue to this day. A full account of this event, that was almost 50 years ago, and hence is “an environmental anniversary” worth noting, is found in *The Voyage of Discovery* (Nettleship et al. 2014)<sup>1</sup>, published by the BIO Oceans Association, Dartmouth, NS.
6. **BoFEP celebrates 25 years of work next year.** The Bay of Fundy Ecosystem Partnership (BoFEP) has been operating as a volunteer NGO since the winter of 1995, so next year will be celebrating 25 years of work, communicating about and stimulating new research on the environmental issues facing the Bay of Fundy and greater Gulf of Maine. It plans to hold its 13th BoFEP Bay of Fundy Science Workshop in 2020, with a program reflecting, in part, the directions and suggestions from the GOM2050 Symposium.

7. **New oceans governance book now freely available from Brill/Nijhoff.** The book of essays on *The Future of Ocean Governance and Capacity Building*, produced by the International Ocean Institute—Canada at Dalhousie University, and published last year by Brill/Nijhoff, is now available free as E-files from the publisher (<https://brill.com/view/title/36420?lang=en>). Hence, it is widely available to world-wide students and practitioners, who otherwise would not have been able to afford the expensive hard copy.



<sup>1</sup> Nettleship, D.N., D.C. Gordon, C.F.M. Lewis and M.P. Latremouille (Eds.). 2014. *Voyage of Discovery: Fifty Years of Marine Research at Canada's Bedford Institute of Oceanography*. BIO-Oceans Association, Dartmouth, NS, Canada.

## TERRITORIES News

Submitted by Sharleen Hamm, RPBio, CSEB Territories Director.

Seems I spend more time behind a desk than in the field these days, so I was very excited by the opportunity for July field work in the Kitikmeot Region of western Nunavut. Perhaps the best part of all was that I was able to ferry to and from site with the helicopter as it positioned from Cambridge Bay on Victoria Island to Kugluktuk, Nunavut's western-most community, and then south to Yellowknife in the Northwest Territories; from sea ice to forest fires in five days. One word....WOW!

After a few days of being a tourist in Cambridge Bay, visiting Ovayok Territorial Park (<https://nunavutparks.com/parks-special-places/ovayok-territorial-park/>) and climbing the giant esker that is Ovayok or Mt. Pelly and spending some time out on the land with friends, I have a new understanding of an appreciation for the Amundsen Gulf Lowlands ecoregion within the Northern Arctic

Ecozone and its fascinating glacial landforms and seemingly endless shale beaches. I was there in early July, during that narrow window of time when some sea ice is still present, precluding boat travel, and the snow has melted precluding overland travel by sled, so, some very, very muddy ATV-ing was the main mode of travel outside of town. Did I mention it was muddy...?! We experienced record rainfall (which seems so ironic to me, as I currently reside in the Vancouver area) during what is understood to have been an above average warm July.

Leaving Cambridge Bay, we followed the holes in cloud ceiling and the islands below across the Coronation Gulf and the mouth of Bathurst Inlet to the mainland, where we made our way along the coast west to Kugluktuk, through a portion of the rocky Takjuaq Lake Uplands ecoregion and the lowlands of the Coronation Hills ecoregion, home to the world's most dense natural population of muskox, or Umingmaq.

Once we finished our field work outside of Kugluktuk, the flight south to Yellowknife traversed the fragmented treeline in the Coppermine River Uplands ecoregion, where the boreal forest and the tundra meet, and the Tazin Lake Upland ecoregion around



*Pyrola grandiflora* and mosquito, Coppermine River, NU

Great Slave Lake and Yellowknife, where we bypassed no less than five forest fires.

Most of the ecological land classification information mentioned above is based on the Ecological Framework of Canada, available from Environment and

Climate Change Canada (<http://ecozones.ca/english/>). Efforts are currently underway by Polar Knowledge researcher Donald McLennan to expand Polar Knowledge Canada's Tundra Ecosystem Classification and Mapping Project from the Cambridge Bay area to include the Kugluktuk area. Defining local ecosystems by their plant communities, ecosystem maps generated can be used as baseline data against which changes over time may be tracked and compared. For more information, contact Donald at [donald.mclennan@polar.gc.ca](mailto:donald.mclennan@polar.gc.ca).

Speaking of Polar Knowledge Canada, CHARS is now open! The Canadian High Arctic Research Station (CHARS) in Cambridge Bay provides Arctic researchers with accommodation, technical services, and support, as well as public use areas (<https://www.canada.ca/en/polar-knowledge/CHARScampus.html>).

For those of you planning your fall conference travel and presentation schedule, note the following:

- Yellowknife Geoscience Forum, Nov 19-21, Yellowknife NT Not just for geoscientists! There is a substantial technical program including environmental monitoring and research. Abstracts can now be submitted until October 4, 2019. <https://www.nwtgeoscience.ca/yellowknife-geoscience-forum>
- Annual ArcticNet Scientific Meeting, Dec 2-5, Halifax, NS.. Abstracts can now be submitted until September 30, 2019. <http://www.arcticnetmeetings.ca/asm2019/>

See you there!

## Book Review

By Bob Gainer, CSEB Alberta Region Member<sup>1</sup>

### Louis “David” Riel: Statesman/Lunatic/Visionary Politician/Nation Builder

I have just read Darren O’Toole’s article in the July/August Canadian Geographic Magazine about Louis Riel; “Hero. Heretic. Nation Builder.”, which prompted my rereading of several Louis Riel books notably by Thomas Flanagan. O’Toole’s article features pictures of two Riel statues, the first standing and looking statesman like; the second naked, contorted, tortured, and confined; an allusion to what O’Toole (a Red River Metis and faculty member at U of Ottawa) thinks the Canadian state did to Riel’s mental health. I would suggest that it should also include the Metis mental health, the native mental health, western Canadians’ in general (including my own notably) mental health, maybe the whole country’s mental health, and maybe the mental health of our particular form of political government.

The Red River Metis Settlement was unique in Canada. It had originally developed around Fort Garry in the late 1700s as a base for the Northwest Fur Company’s canoe route between Montreal, QC, and Fort Chipewyan, Alberta, and beyond. In the early 1800s, Lord Selkirk relocated a number of Scottish farmers to form the Selkirk colony nearby, and in 1823, the Hudson Bay Company took over Fort Garry. In 1867, the Hudson Bay Company started the handover of Rupert’s Land to the new Canadian government.

The industry in the area was manpower for the canoes, York boats, bull trains to Saint Paul Minnesota, Red River carting to the Saskatchewan Rivers and back, buffalo hunts to supply pemmican for the manpower, and the hides, plus subsistence farming, cutting firewood, hunting, trapping, and fishing. Manpower was originally Cree, but also Montreal based Quebecois/Iroquois Coeur de bois, Scottish settlers, and immigrants from Ontario and America. Womenpower didn’t come from outside much, mostly the men made do with local Cree girls. Religion was best represented by Catholic priests. Non-Catholics were generally referred to as Orangemen, and were despised. Few people went to church except to get married or buried.

Riel was born here in 1844, 50% French, 3/8 Quebecois, 1/8 Dene (Chipewyan from Ile la Crosse) to an upwardly mobile aspiring family but actually of modest means. Riel’s father had made a name for himself as a protest leader leading a band of 300 armed Metis to surround and intimidate a court to allow them to sell furs to Americans and not just to the Hudson Bay Company. Riel’s mother was one of the first white women married west of Ontario. Riel was home-schooled until 13 when he was one of three Metis boys chosen by the local clergy to be sponsored at great expense to attend the College de Montreal, along with Quebec’s future political elites. The course was for eight years, based primarily on old languages and religions, taught by Sulpicians, considered to be 200 years out of date and extremely demanding. During his first year, he struggled but after that Riel was usually head of his class. His two other Metis compatriots dropped out.

<sup>1</sup> Note: the views expressed herein are those of the author, and do not necessarily reflect the views of the Canadian Society of Environmental Biologists.

This is at a time when only a tiny fraction of the Red River population could read or write, or in Quebec and Canada in general. For his later years at College, Riel was a member of Montreal’s High Society until towards the end of his eighth year he asked to marry one, only to find out he was a “bandit” and a penniless aspirer, not at all good enough material. He dropped out with only a few months to go for his degree (actually kicked out for not attending classes), apprenticed with a local law firm, which didn’t inspire him, tried other work including law firms in New York, and eventually ended up penniless, wifeless, back in Red River in 1868. He was involved in the family farm, even started his own farm but was most interested in the politics of the upcoming sale of Rupert’s Land (including Red River Settlement) to the Canadian government.

The Catholic Metis were concerned about the Canadian government’s intentions to flood the Red River area with Orangemen from Ontario. Riel formed the “National Committee of the Metis of Red River” with John Bruce as president and him as secretary. They quickly made peace with their fellow English speaking Metis and parishes as well. The first thing their committee did was to refuse the Governor, whom Prime Minister John A. MacDonald had appointed to rule their territory, permission to enter their territory. Next they seized control of Fort Garry and made it their headquarters. Suddenly that got them noticed in Ottawa.

What did Riel bring to this job. He was only 25 years old, had no experience at anything much other than writing a few letters to the editor, letters to his family and friends, a whole pile of love letters, and probably most of all, a whole whack of unrequited love poems and songs. His education was almost eight years of ancient Greek and Latin, and the history of every oddball religion and cult you can imagine. And by the way, he had incidentally spent some time working in a few Law Offices. More or less like giving the music group Nickleback (of Hanna fame) or some other rock star hippity hop rapper the stage and telling him to negotiate a deal for you (remember the Metis were virtually uneducated and living off the land, but relative to them, Riel could at least talk and write and act like he knew what he was doing).

He didn’t have a clue what he was doing, and he did a magnificent job. He found what it was he was born to do. His *Manitoba Act* of 1870 was a masterpiece and got passed intact in parliament. He was a natural orator, born to be on a stage and rabble rouse, which he did a lot of, every chance he could get. He became their superstar; he had stood up to Ottawa and won. This is the O’Toole statue number one of Riel the statesman in 1870.

Except for one wee little minor screwup when he sentenced a particularly obnoxious and treacherous Orangeman to death, which allowed Ottawa to charge him with murder. He was famous alright, actually more infamous, but all the headlines were about him. Every time he submitted articles to a newspaper, they were immediately published. Fame has a habit of going to a person’s head, especially when he had come from nowhere and now was on his way back there. He wanted the attention in the worst way, but not that of an Orangeman with a gun, and they were everywhere. Next thing, he ran as the MP for the Red River riding and won, but couldn’t show up to accept it. The rest of the Parliament voted him out and next election he ran again and won. Again he was voted out. He won it three times but knew better than to try and sit in Parliament, something about the sound of bullets whistling past your ears that made you think twice about it.



He was famous and had lots of supporters, but no money. From 1870-76, he was able to live off his friends and clergy in Red River, Quebec and New York, but he had nothing much to do. He had lots of hours of solitude to think and dream about what might have been in his fields of religion and politics, maybe too much time, as his friends put him in an insane asylum for two years. His profession: Gentleman without a Profession, his diagnosis: Delusions of Grandeur, as good a description of a natural born politician as there ever was. In the asylum, the first trick he pulled was to get naked and scream (a born politician). They had strait jackets back then, which is where he spent a lot of time tied up like a knot, the second statue that O'Toole described. This is when he started getting serious about putting together his own ideas on religion and government. His almost eight years of college training, a good part of it at the top of his class, which would make him the smartest human being in the whole world on those topics, or at least in that strait jacket. But the strait jacket did teach him to keep his big fat mouth shut and pretend to be humble and non defiant, hide all your notes on the topic, and a few years later he got out. Either that or he got kicked out again because whoever was his sponsor had stopped paying the asylum bill.

About this time MacDonald granted Riel amnesty for the execution of the Orangeman and bribed him a few thousand dollars with a promise of more to come if he stayed out of the country. He mooched off clergyman in New York state for awhile, long enough for another woman to fall in love with him and proceeded to try and find a job. He drifted out west, joined up with American Metis buffalo hunters for a few years, started trading furs, and fell in love with another woman. He really was like a rock-star and polygamy was one of his religion's core values.

Meanwhile, back in Red River, things were going from bad to worse. The government still had not gotten around to doing any of the changes they had promised the Red River settlement. Custer had had his last stand and all the native tribes were on notice to behave themselves, the buffalo were eliminated, railroads in the US and Canada plus steamboats on the rivers eliminated the canoes, York boats and the bull trains to Saint Paul; all the features that had made Red River unique and successful were gone. The manpower was now forced to farm but all the land promised to them in 1870 never got assigned. Many Metis and English settlers drifted to the Batoche area. The same thing happened in Batoche as happened in Red River 15 years previously. In 1884, the Metis and English settlers formed a Committee under William Henry Jackson with a long list of grievances more or less like 1869 before, that Ottawa kept ignoring.

Then they remembered Riel and how good he was at getting Ottawa's attention, understanding their bullshit, writing bullshit for the Metis in reply, and then representing them in a way that Ottawa didn't like, so they went south to Montana and got him. Meanwhile several local tribes nearby were starving and desperate for the food that Ottawa had promised them. It seems the tribes just didn't understand that Ottawa was at a time of budget restraint, meaning they were to get no food long before anyone's salary in the civil service would get cut. These tribes were plenty pissed off.

What the committee didn't realize was that Riel was a very different Riel from 1870. He now insisted that 'David' was part of his name and that being a competent politician was no longer his game. Instead, he was a stark raving mad lunatic interested in advancing the cause of his newly formulated religion and government with him as its god, or its prophet, or Saint Louis, or King David (or with his eventual hanging as the second crucifixion of Christ reincarnated), all for his own benefit. As well, he expected to be rewarded with

\$100,000 cash upfront (he didn't trust MacDonald to promise him more in the future), all because he was the smartest person on earth etc., etc., and was owed it. Only when Ottawa refused to cooperate did he take hostages and declare an independent state (and religion, his). Again Riel suddenly got their attention.

The second rebellion was even more of a screwup than the first, only this time the tribes that Ottawa had cheated out of food went on the warpath and killed a bunch of whites. Canadian soldiers were the greatest casualty and about half as many Metis, still too many of all groups. Luckily calmer leaders on the native and Metis side negotiated peace with Ottawa. It was too bad because the basis for both rebellions was that Ottawa wasn't consulting with the locals, wasn't giving them any rights, and when they did sign the *Manitoba Act* or Treaties, they ignored them. Ottawa just couldn't seem to deal in good faith. All they were accountable for was paying themselves lovely salaries, and they couldn't understand why the Metis and natives didn't appreciate this.

After the second rebellion, Ottawa had the biggest mass hanging in Canadian history of the natives they cheated out of food, and they hung Riel because he was responsible for it all. Maybe it was for the right reasons they were hung and the Prime Minister and the whole Department of Indian Affairs who created this show by not dealing in good faith, ever, didn't get hung, or even blamed for anything.

After exactly 150 years, Riel still attracts as much adulation as ever (statue number one, Statesman) and Ottawa still attracts just about as much scorn for land claims unsettled, treaties broken, western alienation, favouritism of eastern provinces, double dealing, breaking promises, and no faith. Not nation builders but nation destroyers.

The second statue of Riel, the lunatic, delusional, destructive rock star who thought his ideas were superior to all others was diagnosed by the government psychiatrist as an inveterate masturbator with delusions of grandeur, the only treatment hanging. This accords with my experience (very limited) with visionary politicians. All politicians aspire to be visionaries I guess, this is where checks and balances like the American system may be a godsend, unlike our parliamentary system where a majority government potentially creates tyrants.

After 150 years, Canada still has the same form of government that is most accountable to their public servants. The leaders will say and promise and sign and do anything for re-election, and the public is just suppose to know that delivery is optional. Too bad we have not had a visionary like Statue number one who rebuilt the nation to respect all regions and interests equally without it determining who the leader was. Instead we have an even more dysfunctional, dishonest, partisan, corrupt, nest feathering, kickback and divisive gamesmanship system for getting votes. This is destroying the country. Our history of stupidity just keeps repeating itself.

Colby Cosh just wrote an article August 23, 2019 in the National Post that sure got my attention. The sale of Rupert's Land was "for the sole trade and commerce of the area draining into the Hudson Bay", nothing about land or sovereignty. Cosh writes that the legal fiction by which we live is almost always on close scrutiny, weirder than you think. He compares John A. MacDonald's role to a Trumpian deal. MacDonald privately confessed "All these poor people know is that Canada bought this Country and that they are handed over like a flock of sheep." Riel both times challenged MacDonald on this but the ultimate legal principal was that Riel was vanquished both times, actually hung the second time. Sir John A., nation builder or just another sleazy politician.

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