March 31, 2014

Honourable Premier Christy Clark
Honourable Bill Bennett, Minister of Mine and Energy
British Columbia Hydro President Charles Reid (retiring)
British Columbia Hydro Board of Directors
Norm MacDonald, MLA Columbia River - Revelstoke

Dear Honourable Premier Clark and Minister Bennett, BC Hydro President and Board members, my MLA Norm MacDonald;

I write to bring to your attention my concerns that you are collectively involved in the continuance of the cultural, social and environmental errors of the original Columbia River Treaty (CRT). The original treaty was imposed on the people and the environment of the basin. It was spoken of in terms of "benefits to the province" and our international partners to the south. The same language appears in today's discussions but what has changed is the public's desires and our objectives for a modernized treaty. I will speak to one of those objectives, an improvement in ecosystem function on those lands and in those waters most affected by the original treaty. This includes: fish, both salmon and freshwater; riparian forests and wetland ecosystems, and agricultural lands.

I will refer you to two documents:

1. Hansard, Legislative Record: Monday July 22, 2013, afternoon session, Volume 4, Number 2. (Minister of Mines and opposition members discuss the CRT, Columbia Basin Trust (CBT), and who represents, who is the voice of the basin's residents. Be very clear, it is not the CBT.)
   http://www.leg.bc.ca/hansard/40th1st/20130722pm-Hansard-v4n2.htm
2. BC Government's "Decision on Columbia River Treaty"
   (Reveal the BC government's assertions regarding basin residents' desire for ecosystem function and an improved treaty, as well as the role of "Water Use Planning" and other environmental "mechanisms" in accommodating those public desires. See Items 7, 8 and 9)
   http://blog.gov.bc.ca/columbiarivertreaty/files/2012/03/BC_Decision_on_Columbia_River_Treaty.pdf

During your 2012-2014 treaty consultations with basin residents, including the Citizens' Sounding Board and others, you heard from a wide range of participants that this time, in this new treaty we the residents most affected want to see improvements in the ecosystems that were impacted by the original treaty. That means in today's river and its marginally functional lakes/reservoirs. There is a manner in which this can be achieved and it is called "ecological operations" of dams and reservoirs.

The government, and through its agency BC Hydro, dabbles around the edges of this concept with its Water Use Plans and its "Soft" Constraints. While it dabbles, new impacts and additional environmental losses are incurred as a direct result of two government priorities. First, its revenue priority through BC Hydro's Powerex and Powerex's affects on operations. Second, the construction/modernization of plants and facilities on the Columbia River (and Peace River) which are creating new, as well as unforeseen impacts on environmental and ecological resources in the province, its rivers and its reservoirs.

The government in its parliamentary discussions and in its CRT Recommendations refers specifically to the "CBT", "Water Use Planning" and other "mechanisms" that will accommodate the public desire of basin residents for ecosystem improvements in the river and its reservoirs. With these public processes in place, residents are told there is no need to include a British Columbia discussion of ecosystem functions in the renegotiations of the Columbia River Treaty. I challenge this proposition as there is clear evidence that these very processes and entities are manipulated and designed in a manner that precludes their utility for achieving the public's objectives for ecosystem improvements.

I am a basin resident for thirty two years, who has participated in seven years of Water Use Planning (WUP), and facility Environmental Assessment (E.A.) processes such as Revelstoke Unit Five. Mica Five and Six, and currently, Revelstoke Unit Six E.A. and the Five Year review of Water Use Planning.

I feel compelled to inform you that in all of the current Columbia River WUP and Facility E.A. processes the government and its agency, BC Hydro, has purposely and with intent acted to "limit the scope" of these processes. The consequences of these "scoping limitations" are transparently directed to also limit the government's and its agency's responsibilities and liabilities with respect to new and historic environmental impacts.

By limiting scoping in the Revelstoke Unit Six E.A. the government will attempt to sidestep and avoid the long overdue requirement for a comprehensive "Cumulative Environmental Impacts" review which will finally consider all the ecological harms that have been done to the Columbia River as a result of the Revelstoke Dam's construction - a non-treaty dam - and its operations. This is a necessary counterpoint to the chorus of "benefits to the province" we in the basin have heard for over a generation. The obvious risk for the government and its agency coming from a comprehensive Cumulative Environmental Impact review is that neither party would be able to suggest, that they have done so much, when in fact they have done practically nothing in those areas most affected by the treaty, our homeplaces.

The Five Year review of the Columbia River Water Use Plan has purposely and with intent refused to accommodate a logical and full review. The government and its agency have carefully limited the scope of this review. Specifically, a review of components of the WUP that are the most prominent and important elements derived from WUP. The government and its agency have formally refused to discuss the "Physical Works and Monitoring" projects that were created as a direct response to public concerns during the original WUP. This is a corruption of public process and a transparent effort to avoid the inevitable embarrassments: administrative, scientific, planning and policy that would flow out of a full, transparent and honest review of the Columbia River WUP.

Facility E.A.s, WUP Reviews and the CRT renegotiations are all elements of a continuum. And they all lead to the same end. Once again, and fifty years later, it appears to be the intention of the government and its agencies to ignore and dismiss the legitimate desires of those basin residents who have been most affected. What we ask is that you listen this time to our voices and our concerns; listen to what has and is again happening to us, listen to what we hope for in our homeplaces and in the New Columbia River Treaty. Do this in the name of "benefits to the province" so that history does not repeat itself.

Sincerely

Francis Lewellyn Maltby, I.p.r.
Revelstoke, British Columbia
250-837-5845
flm@telus.net

Public participant and member: Columbia River WUP, Revelstoke. Unit 5&6 E.A., Mica Unit 5&6 E.A., Columbia River WUP Physical Works Committee, Government of B.C.'s CRT Citizens' Sounding Board)

cc. Columbia Basin Trust, President and Board.
CBT's Local Governments Committee

Introduction: I subscribe to Einstein's belief that if you cannot explain an idea to a child it is probably not that good an idea. I have worked as a National Parks Cultural and Natural History Interpreter for six years and I have developed environmental education materials and programs for adults, children and high school students. I believe "experts" have a responsibility, beyond "Trust Me", to inform and bring along "normal" people in their understanding of ecosystems. This is a modest effort.

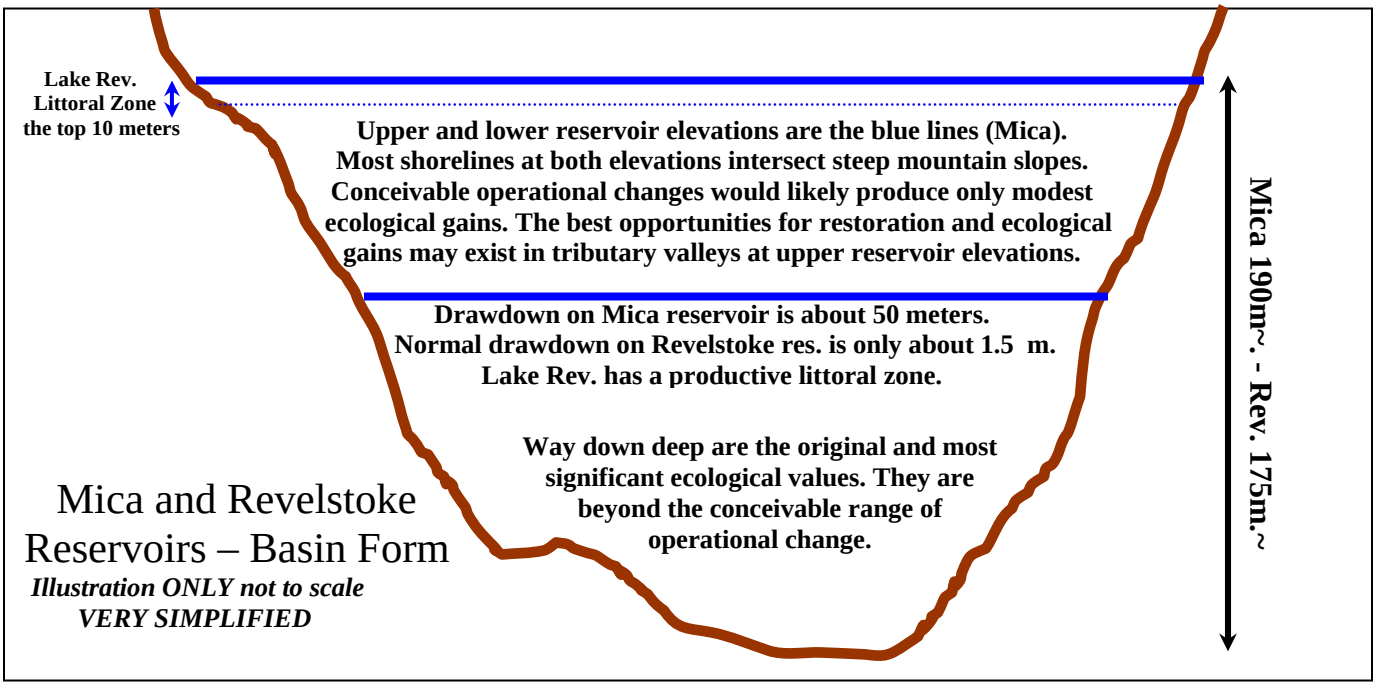
Francis L. Maltby – March 2014 Errors and omissions are mine. Your comments are welcome.

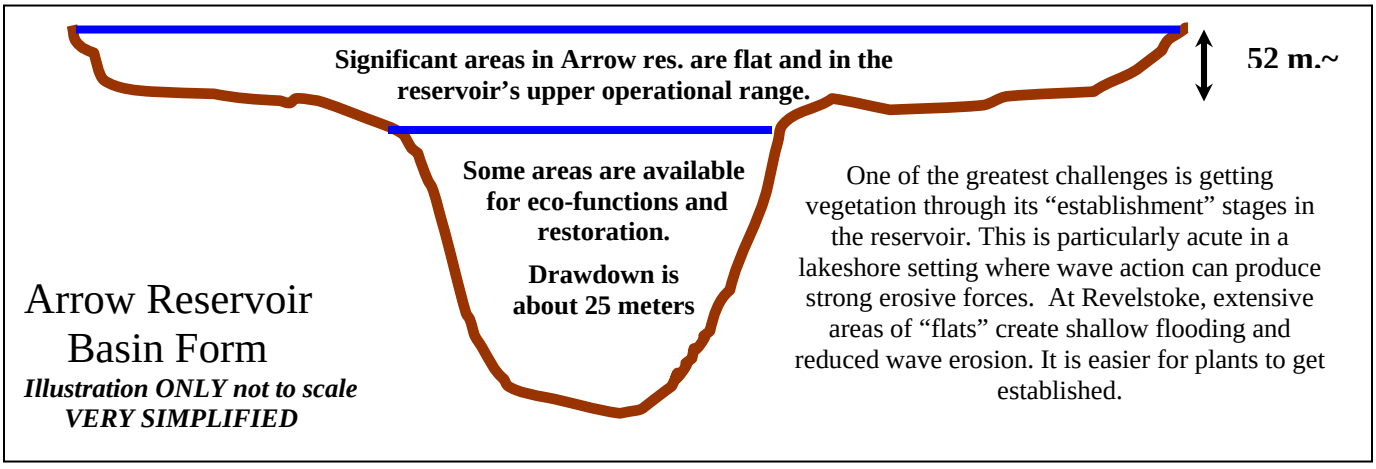
Variations in Basin Form - What and where are the Opportunities?

A very SIMPLIFIED Version

There are three major reservoirs on the Canadian portion of the Columbia River. From south to north they are: Arrow, Revelstoke and Mica. Each of them has its own unique basin form. The physical form or topography of a basin will determine where values that did exist are now found (how deep); what values may currently exist given the current operational regimes; what values it may be possible to expand or restore given a modified operational regimes.

Mica and Revelstoke reservoirs share a few important characteristics. They both were created in relatively narrow mountainous reaches of the river (sic). Their basin form puts many of the values of the original river system deep under water. Additionally, much of their shoreline perimeter is relatively steep sloped mountain side. There appear to be areas within some of the upper reaches of the major tributaries which may provide areas capable of recovery and or opportunities for restoration given human interventions.





Wetland dependant and flood adapted species are affected by four principle factors:

1. Flood depth
2. Flood duration
3. Flood frequency
4. The seasonal period of flooding (*seasonality).*

These four factors affect almost all flood adapted or wetland dependant species; plants, animals and even micro-biota. These adaptations have occurred over millions of years, they are consistent, relatively well researched and understood, and they are predictable.

1. Flood Depth – determines whether a species principle habitat is available, whether only part of or the entire organism is underwater, whether sunlight is available, it can affect water temperature, it can affect gas exchange processes within leaves and or roots, water pressure increases with increased depth can affect survival. Organisms arrange themselves within flood plains and wetlands along tolerance bands, or elevation limits for flood depth.

2. Flood Duration – while flood depth is one determinant of a species tolerance and ability to survive inundation another very important factor is the duration or length of time an organism is underwater. Any given species may be able to survive a period of complete inundation. However, the longer the organism is completely underwater the more likely it is to succumb to flood induced mortality.
(For all wetland dependant and flood adapted species it is principally a combination of factors 1 and 2 which will determine there ability to survive in a natural or a reservoir flood regime. Therefore, understanding and being guided by what occurs in natural regimes - how species arrange themselves along flood tolerance gradients - is the logical place to start understanding how species survive within a reservoir.)

3. Flood Frequency - can be measured over an annual cycle as with a river system subject to seasonal freshets from snow melt and or seasonal rainy periods. In the case of oceans and estuaries it can be measured in daily tidal cycles. Regular flood cycles are, over extended periods of time, what has promoted flood adaptations in many species. The KEY here is to recognize that it is the *"regularity"* of environmental conditions which has resulted in flood adaptations and flood tolerances. If Reservoir operations not aligned with ecological objectives, do not provide regularity of ecological conditions it is difficult to establish, maintain or restore desired ecological functions associated with riparian or wetland ecosystems.
(It is important to note that "frequency" has a special meaning when considering the environmental impacts to river and wetland ecosystems as a result of power generation demands. Daily fluctuations in power demand produce large and very unnatural fluctuations in river discharge and river water elevation. This means the river's water level can go up and down, one or more times in a single day, by the same amount it would over an entire year. The affect of this on wetlands and river bank erosion can be very damaging.

4. Seasonal Period of Flooding (*Seasonality)* – flood adaptation has provided species with strategies for survival and reproduction which are often very tightly connected to seasonal (and in some cases, daily – tidal) periods of flooding. Species may reproduce before, after, or even during flood periods, which occur on a regular annual cycle. Some species of riparian plants require post flood conditions for reproduction. Suitable areas for vegetation growth may be flooded when seeds are being distributed.
(When the seasonal flooding period is disrupted or in the case of a reservoir, out of sync with natural regimes very important ecological conditions or requirement for reproduction may not be met. An interesting observation at Revelstoke is that in local wetlands species as diverse as Canada Geese, Great Blue Herons and Western Toads and painted turtles all seem to be able to complete or be far enough along in their reproductive activities in the spring / early summer that they are able to survive even when the reservoir fills later in summer and their normal habitat is completely inundated) Even slight changes in seasonal hydrological conditions can for some species mean the difference between survival and extirpation in reservoir lands.

"Six Meters" – wetland, riparian, and semi-aquatic Life in Arrow Reservoir

There is a significant amount of complexity which could be considered in efforts to understand what is occurring at present in the Arrow Reservoir. Understanding the basics requires far less effort. Start with some basic assumptions, ask the right questions, add good observations, some temporal thinking, and then project a future set of desirable physical conditions.

Basic Assumptions:

- All organisms respond to conditions within a reservoir exactly as they would in a natural flood regime.
- The closer to a natural flood regime reservoir operations are the more likely improvements in ecosystem function will occur.
- Using historic data to understand present conditions is the best guide to predict desirable operational changes. Long-term observations are a valuable asset.
- Much of what needs to be know is already known; good data exists, there is an ongoing experiment and some monitoring and experimentation has already begun.
- Ecosystem improvements in the reservoir will be the result of a combination of natural processes and human intervention.

Observations in Arrow Reservoir:

- 50 years of relatively stable (sic) operations have produced a relatively consistent pattern of vegetation loss, development and survival.
- Within the pattern of vegetation development, variations in reservoir operations have resulted in some shifting of vegetation, in response to slight modifications in reservoir year to year flood regimes. Generally speaking, when flood depth or duration has increased vegetation shifts up, when the reverse occurs vegetation moves down in the reservoir.
- These nuanced patterns of vegetation development, change and loss are predictable and consistent responses based on adaptation.

Temporal Thinking:

- Using historic reservoir elevation data it is possible to correlate changes in vegetation to depth and duration data.
- Identifying periods of operational change which "appear" to have influence vegetation change, benefit or loss, informs the development of a more desirable operating regime, which better support ecological functions.
- What has occurred historically can and will likely occur in future. Matching historic conditions to desired future outcomes provides valuable evidence, logical arguments and a good starting point for experimentation.

Desirable Conditions:

- Using the two criteria of water depth and flood duration and the topographical basin form of the Arrow Reservoir it is possible to model an operating regime which will allow for expansion of riparian ecosystem attributes and allow for more normalized function of wetlands within the reservoir.
- In response to alteration of flood depth and flood duration - shallower depth and or shorter flood period – conditions will be created that allow for vegetation to develop and riparian areas to expand.
- Ensuring seasonal periods of flooding align with reproductive requirements (i.e. not flooded in spring / early summer) and seasonal habitat needs will support species requirements.
- One of the most important factors is a degree of consistency (***regularity***) year to year in flood regime. That means consistency of depth and duration as well as seasonality. Short-term variations rapid recovery, likely OK. Long-term variation and irregularity (as currently occurs), NOT OK.

"Six Meters" in Arrow Reservoir

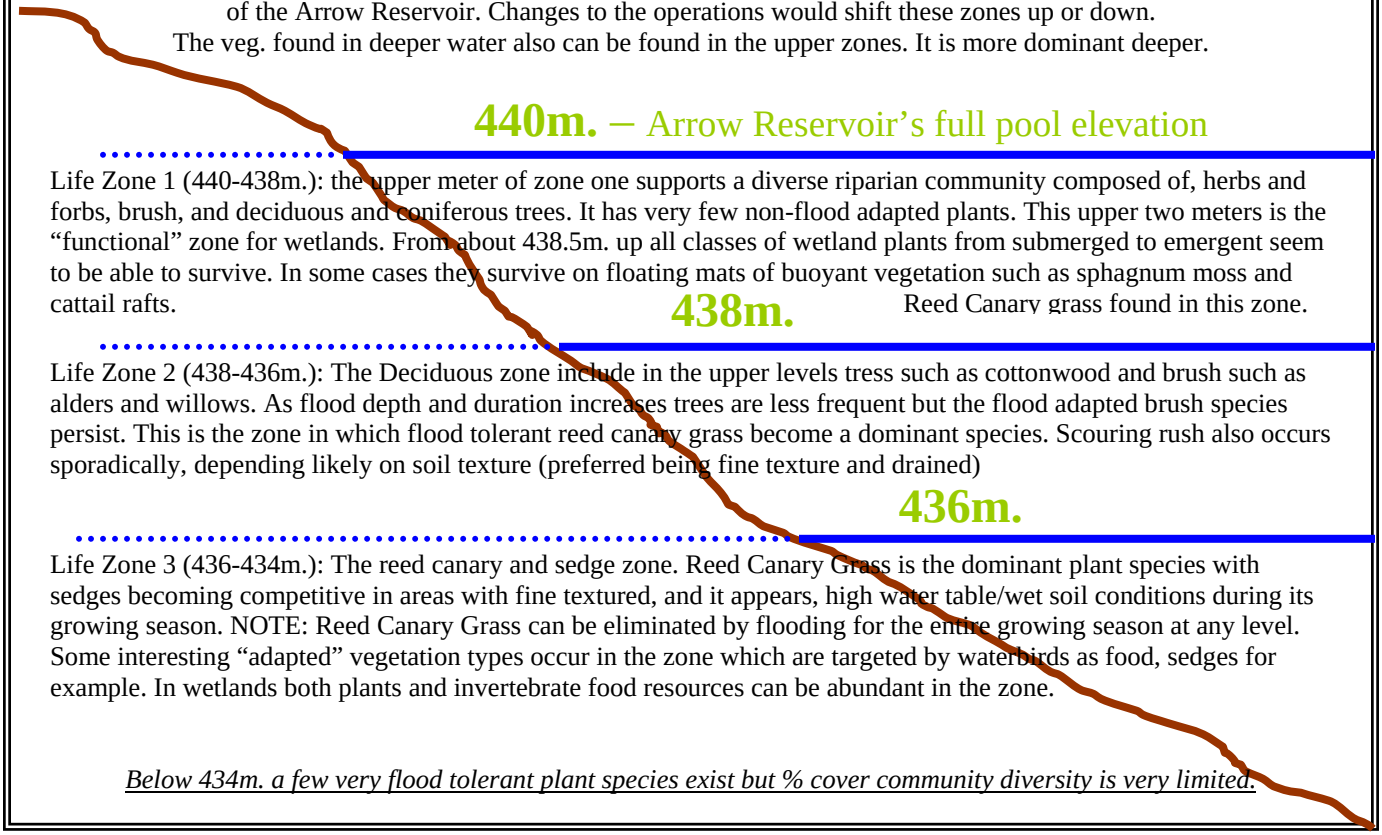
Construction of the Hugh Keenleyside Dam and the operations of the Arrow Reservoir and other Treaty and Non-Treaty dams have resulted in the almost complete destruction of riparian and wetland ecosystems on the main stem Columbia River within Canada. Within the area of the Arrow Reservoir wetland and riparian losses likely exceeded 95%.

The historic operating regime for Arrow Reservoir has allowed for the development of *novel "life zones" in the upper 6+ meters of the reservoir area.* These zones are remarkably productive and support 5 or more threatened species of birds, reptiles and amphibians. The seasonal operating regime has allowed for the regular completion of important life cycle requirements such as reproduction and rearing of young. Additionally, the areas provides very important migratory habitat for an amazing variety of neo-tropical song birds and waterbirds. A somewhat counter intuitive development that is a direct result of reservoir operations is a flood maintained grassland exists at and south of Revelstoke. It is quite possible that bird diversity here is a result of this rather novel ecological anomaly. This ecological feature is the result of both human interventions and natural processes.

The KEY MESSAGE here is that with modifications in operations of the reservoir these *"life zones"* can be expanded and the area of semi-aquatic, riparian and wetland ecosystem productivity in the Arrow Reservoir can be increased. Additionally, it is my sense that flow modifications that could benefit salmon can align with changes to reservoir operations. Ecologically, this is a win, win proposition for riparian and wetland ecosystems and for salmon.

A very Simplified Version of Six Meters of Life – the Arrow Reservoir lands at Revelstoke, B.C.

These zones and the living things within them are the direct result of the operational characteristics of the Arrow Reservoir. Changes to the operations would shift these zones up or down. The veg. found in deeper water also can be found in the upper zones. It is more dominant deeper.



Life Zone 1 (440-438m.): the upper meter of zone one supports a diverse riparian community composed of, herbs and forbs, brush, and deciduous and coniferous trees. It has very few non-flood adapted plants. This upper two meters is the "functional" zone for wetlands. From about 438.5m. up all classes of wetland plants from submerged to emergent seem to be able to survive. In some cases they survive on floating mats of buoyant vegetation such as sphagnum moss and cattail rafts. Reed Canary grass found in this zone.

Life Zone 2 (438-436m.): The Deciduous zone include in the upper levels tress such as cottonwood and brush such as alders and willows. As flood depth and duration increases trees are less frequent but the flood adapted brush species persist. This is the zone in which flood tolerant reed canary grass become a dominant species. Scouring rush also occurs sporadically, depending likely on soil texture (preferred being fine texture and drained)

Life Zone 3 (436-434m.): The reed canary and sedge zone. Reed Canary Grass is the dominant plant species with sedges becoming competitive in areas with fine textured, and it appears, high water table/wet soil conditions during its growing season. NOTE: Reed Canary Grass can be eliminated by flooding for the entire growing season at any level. Some interesting "adapted" vegetation types occur in the zone which are targeted by waterbirds as food, sedges for example. In wetlands both plants and invertebrate food resources can be abundant in the zone.

Below 434m. a few very flood tolerant plant species exist but % cover community diversity is very limited.

Francis L. Maltby, Revelstoke, B.C, Canada

Phone 250-837-5845 - Email flm@telus.net