



Responses to public and Federal/Provincial/ BC Hydro feedback on Arrow Lakes Reservoir Mid Elevation Scenarios - Scoping Evaluation

Presented to

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Alan Thomson Mountain Station Consultants, Nelson BC

Greg Utzig Kootenai Nature Investigations, Nelson, BC

Summary of Report Circulation and Exposure

Arrow Lakes Reservoir Mid-Elevation Scenarios: Scoping Evaluation

January 2016



Prepared for:
Kathy Eichenberger
Ministry of Energy and Mines, Province of British Columbia
and
Heather Matthews
BC Hydro and Power Authority

Co-authored by:

Alan Thomson, Mountain Station Consultants Inc., Nelson, BC.
Greg Utzig, Kutenai Nature Investigations Ltd., Nelson, BC.
Bill Green, Canadian Columbia River Inter-tribal Fisheries Commission, Cranbrook, BC.
Nicole Kapell, Ktunaxa Nation Council, Cranbrook, BC.

Report released (online) May 2016 and open for public comments for 5 months. Agencies had longer time for review.

Written comments received from:

- Provincial agencies (FLNRO, MEM)
- Federal (Environment and Climate Change Canada)
- BC Hydro
- ENGO (1)
- CBRAC
- public (8 individuals).

Public Exposure

- 5 public presentations in BC, WA and OR.
- 5 presentations to CBRAC, local, provincial and federal gov'ts.
- 2 report revisions based on feedback.



#1



#3

**Feedback
Interest**



#2



#4



#5

Responses to Comments document

Responses to Comments received by the Province on the
Arrow Lakes Reservoir Mid Elevation Scenarios – Scoping Evaluation Report – April 2017.

The following table contains responses to all written comments and feedback received from a variety of organizations, senior government agencies and the public. Where appropriate, similar comments have been combined. The response to each comment is either found below or in the report section noted. In some cases, the response appears below and in the report.

Comment or question	Response	See Report Section
Section 4.2: Vegetation		
What increase in area in the drawdown zone would result from the Scenarios?		3.1, Table 1
Discuss time and limitations to terrestrial ecosystem recovery under the Scenarios.	<p>Under Scenario 2, above 1,430 ft. (435.9 m), the rate of ecosystem succession will vary across the reservoir. Periodic establishment of trees, shrubs and other herbaceous species under existing conditions in low water years, demonstrates that revegetation can begin quickly (likely in 1 to 5 years, depending on species and weather conditions), especially in the fringe adjacent to seed sources (potentially up to 100m+). The rate and trajectories of succession will vary depending on substrate, moisture availability, as well as proximity to seed sources. Moist areas with finer textured soils at the upper elevations will likely revegetate more quickly. In general substrate conditions within the Revelstoke Reach, and areas on fans in the Arrow Lakes portion of the reservoir are more favourable to rapid succession although competition with dense communities of reed canary grass and other sedges may slow initial transition in some areas. Coarse textured soils and exposed bedrock sites will be the slowest to revegetate. Under favourable conditions succession to shrub communities will likely take at least 5 years, while development of full forest structure will likely take at least 30 years. Development on less favourable substrates would potentially benefit from soil enhancement and planting. Un-managed off-road vehicle disturbance may slow revegetation in some areas.</p> <p>The growing season weather of the initial non-flood years will also affect the speed of revegetation by determining seed production and seedling survival. The periodicity of the 1 in 7 flood years will also impact the speed of revegetation, the longer the initial non-flood interval, the faster revegetation will proceed.</p> <p>Effective implementation of Scenario 2 will require an adaptive management strategy complete with on-going monitoring and the potential for responses to identified issues. Where appropriate, the responses may include: planting of trees and shrubs, control of invasive species, re-establishment and stabilization of stream channels on fans, fertilization, management of off-road motorized access to minimize disturbance of establishing vegetation, wildfire management and others.</p>	4.2.2.3

Fisheries and Aquatic Resources

How will return of anadromous salmon be affected by the Scenarios?

Provision of upstream fish passage past Arrow Lakes Generating Station part of EA certificate.

Based on ongoing research by FN & Tribes, **restoration of sockeye and chinook salmon populations into the Arrow Lakes is a significant possibility in the near future.**

Sockeye – tributary spawners; positive for Scenario 2; rearing; 1-2 years in reservoir; uncertain how current pelagic productivity will affect sockeye. Chinook – spawning in larger tributaries and mainstem Columbia R. ; ALR pelagic productivity will affect chinook if juveniles rear in the ALR.

How will Nutrient Retention change under the Scenarios?

Highly uncertain: Related more to discharge, less so reservoir elevation.

Generally higher nutrient discharge in spring, lower during summer.

Fisheries and Aquatic Resources

How will Scenarios affect White Sturgeon in Revelstoke Reach?

Working hypothesis that sustained high flows are beneficial for white sturgeon spawning and incubation life stages. Effect due to high velocity, associated turbidity or substrate conditions?

Scenarios 1 and 2 result in higher flows over known spawning grounds as reservoir will not backwater spawning grounds.

What is the Fisheries Baseline used in the report?

Scenarios are **compared to values affected by current operations**, not pre-regulation.

Vegetation

Time and limitations to terrestrial ecosystem recovery under Scenarios?

Scenario 1 – very little change from current operations.

Scenario 2 – Variable

Shrubs – 5 years

Trees/forest – 30+ years

Depends on substrate, soil moisture and texture, aspect, proximity to seed sources, inundation regime during establishment.

Finer texture (silts) with moisture = faster vegetation recovery (Rev. Reach)

Coarser texture (gravel, cobble) = slower vegetation recovery (large sections of Arrow Lakes foreshore).

Implementation of vegetation re-establishment?

Varies based on numerous variables; Adaptive management – natural revegetation, planting, controlling invasive species, streambank restoration, managing recreational vehicle use (ATVs), etc.

Vegetation	
What is the increase in area under Scenario 2?	<p>Area between 1,430 ft. and 1,444 ft. where mature vegetation should establish.</p> <p>Approximately 2,400 ha or 24 km²</p>
Under Scenarios, what will happen to Reed canary grass in the Rev. Reach?	<p>Scenario 2 should establish conditions that allow native vegetation to compete with canary grass above 1,430 ft.</p> <p>Reed canary grass will continue to populate areas below 1,430 ft.</p>

Wildlife and Wildlife Habitats

Revelstoke wetlands; will they be sustained under Scenarios?

Largest wetlands (Airport Marsh, Beaton Beaver Ponds, Montana Slough, Cartier Bay) were present and functional before reservoir was flooded, and will continue functioning under Scenario 2.

Wetlands water sustained by ground and surface water from areas outside the reservoir.

How will Scenarios affect mosquito populations?

Mosquito populations likely to be reduced in non-flood years. During flood years, populations likely similar to current levels.

Abundance related to spring summer precipitation and air temp, reservoir levels and efficacy of mosquito abatement programs (larvicidal application).

Hot dry summers + low water levels= fewer mosquitos.

Wet cool spring/summer + higher water levels = more mosquitos

Reed canary grass monocultures are popular breeding areas.

Archaeology

How will known pictographs be affected by the Scenarios?

No effect for sites that are completely inundated, or completely exposed under current conditions.
Unknown effects for sites that are within the drawdown zone; has not been studied in the Arrow.

Below the full pool elevation, can vegetation protect archaeological sites from soil erosion?

Yes, there are **examples of successful protection of higher elevation arch. sites** in the Kinbasket reservoir by vegetation.

Can artifacts be removed from the site?

Artifact removal from vulnerable sites is part of the current Reservoir Archaeology Program.

Flood Control

How much Assured Flood Control capacity needs to be reallocated to other reservoirs to maintain current Assured Flood Control values?

Scenario 1: additional 0.78 Million acre-ft. or 6.9 ft. of water.

Scenario 2: additional 0.66 Million acre-ft. or 5.9 ft. of water.

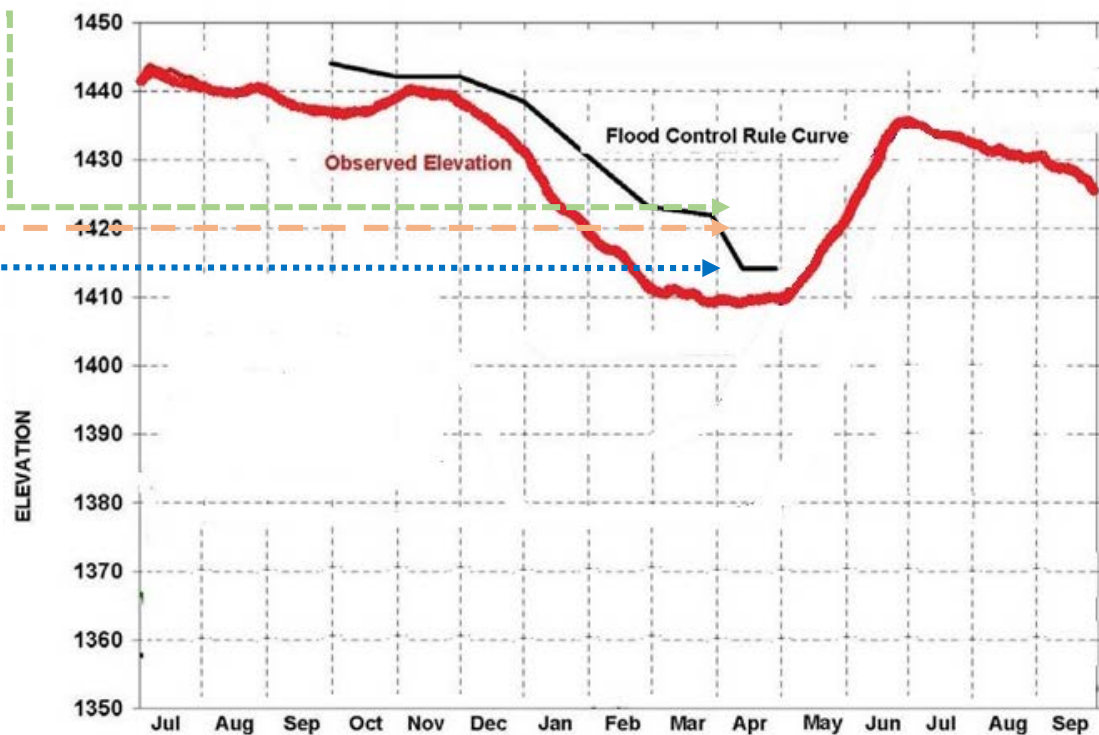
ARROW

July 1, 2008 to September 30, 2009

S1: 1,421 ft.

S2: 1,420 ft.

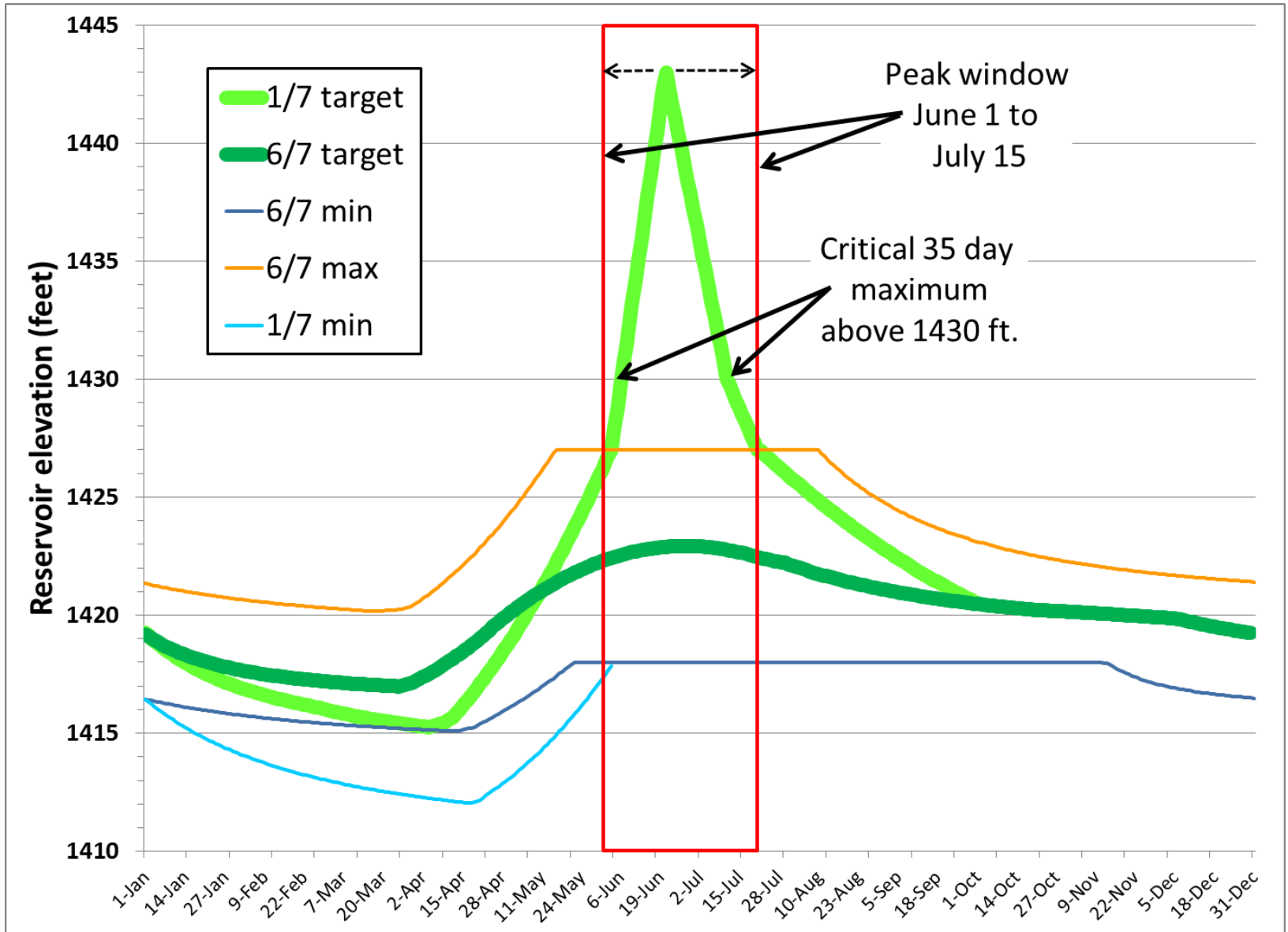
Current: 1,414.1 ft.



Columbia River at Arrow Project, British Columbia

General	
Discuss effects of climate change on Scenarios.	Climate change excluded from the report as out of scope. Future modelling of the CR system will include climatic extremes (drought, floods) values and frequency that are projected to increase with climate change.
What about impact of Scenarios on low water years?	Analysis of low water years will be included in future iterations of stable Arrow models.
Impact of Scenarios on upstream/downstream resources?	Project Terms of Reference restricted analysis to the Arrow Lakes Reservoir footprint. Future analysis will include upstream/downstream effects.
If either Scenario is enacted, land development restrictions will be required to keep foreshore free of developments	Existing “safelines” or flowage easements as designated by BC Hydro would remain in place. Under either Scenario, private developments would not be allowed below the safeline, as is the case currently. Management of off-road motorised use would also be required.
Why not develop a Scenario that follows the pre-dam natural hydrograph?	Basis of Scenario 3...

Scenario 3 Proposal



Scenario 3 Proposal – Comparison

