Beavers as Partners in Restoration of the Nicola Watershed

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Presentation to the Nicola Roundtable

November 20, 2024

Beaver Habitat Loss

- Beavers have ***shaped our floodplains*** following glacial recession (Polvi and Wohl 2012)
- North American beaver populations have ***declined by 80-98%*** since European colonization.
- ***Beaver dam capacity*** (potential habitat) on the landscape has been nearly ***cut in half***.
- Beaver-related ***storage of water and sediment*** has ***declined*** in some regions by 40% (Scamardo et al. 2022).

Basics of Beaver Biology

- Beavers are “ecosystem engineers”, modifying their environment through dam construction to make it habitable.
- Beavers do not eat fish…
  - They are herbivores – feeding primarily on wetland vegetation in the summer and the inner-bark of young deciduous shrubs and trees during the winter.

Basics of Beaver Biology

- Adult beavers form pair bonds and “colonies” are usually associated with family groups.
  - One new litter is born into the family group each year.
  - Young will remain with their family into their second year.
- Beaver colonies (families) typically maintain numerous dams as part of a habitat complex.
- Beavers build lodges and bank burrows to protect themselves from predators and cold weather in the winter.

Why do beavers matter?

- Flood
- Drought
- Fire
- Fish

Floods

- Beavers are nature's ***Flood Managers***
  - Beaver dams can ***reduce peak flood flows*** by up to 60% (Puttock et al. 2021)
- A single beaver pond in SE Alaska was estimated to reduce peak flows in a stream by 5% (Beedle 1991)
- For streams with multiple complexes of dams, the ***effects increase cumulatively*** (Pollock et al. 2015)

Drought

- ***Flood and drought are linked***.
- Decreases in high flows from beaver dams (Puttock et al. 2021) = increase low flows (Nyssen et al. 2011).
- Beaver dams increase ***watershed sponginess***.

Fire

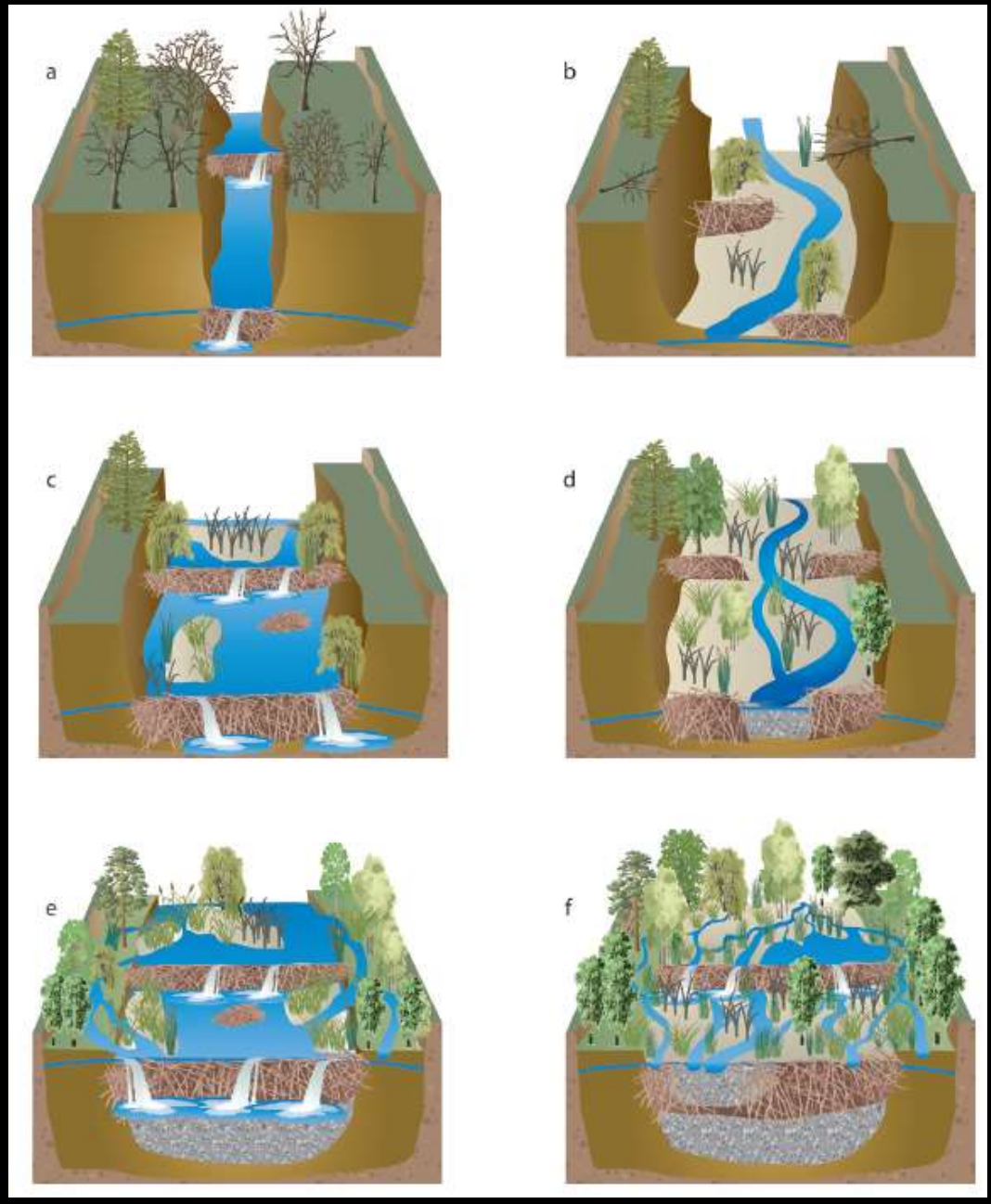
- Beaver dam-impounded wetlands create ***natural fire breaks***
- Beaver wetlands ***protect riparian areas*** from the effects of drought
- Beaver-dammed riparian corridors have been found to be relatively ***unaffected by large-scale fires*** when compared to those without beaver dams (Fairfax and Whittle 2020).

Fish

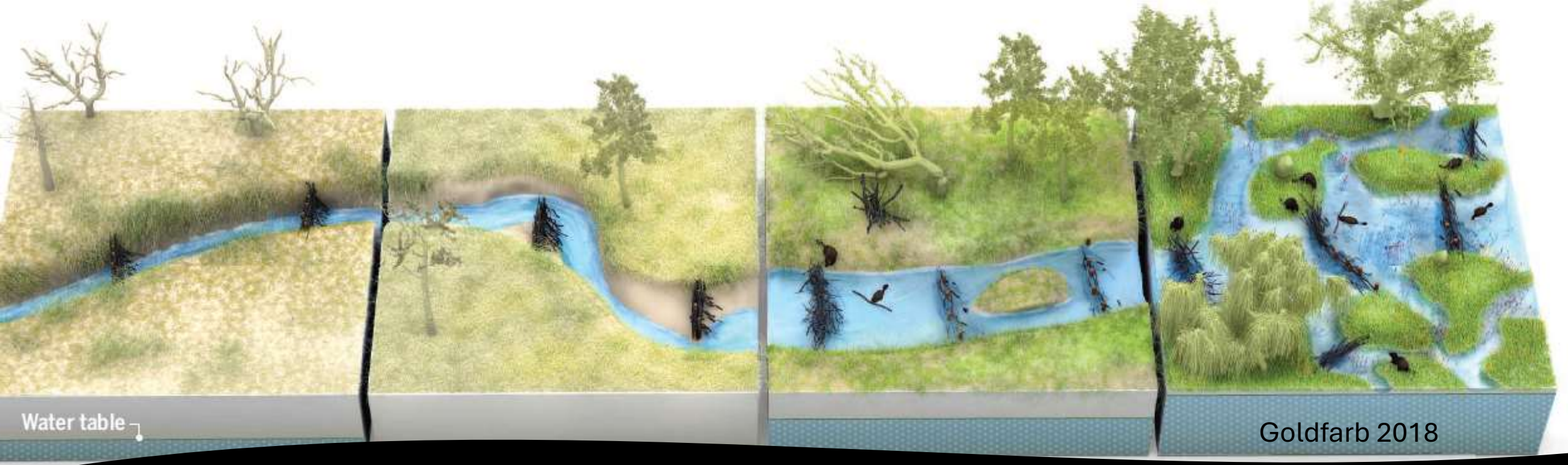
- ***Improve fish habitat*** by creating nursery ponds
- ***Reduce stream temperature*** by promoting interaction with groundwater
- ***Capture sediment*** creating horizontal heterogeneity in stream channels
- ***Mutually beneficial*** relationship
  - Salmon bring marine-derived nutrients to fuel vegetation growth for beaver
  - Beaver create habitat that drives salmon productivity (Bouwes et al. 2016)

Beavers as Partners in Restoration

- Beaver dams influence stream channel / floodplain form and function.
- Degraded streams can be repaired and to pre-disturbance condition.
- Many stream channels are too degraded to support colonization by beaver.



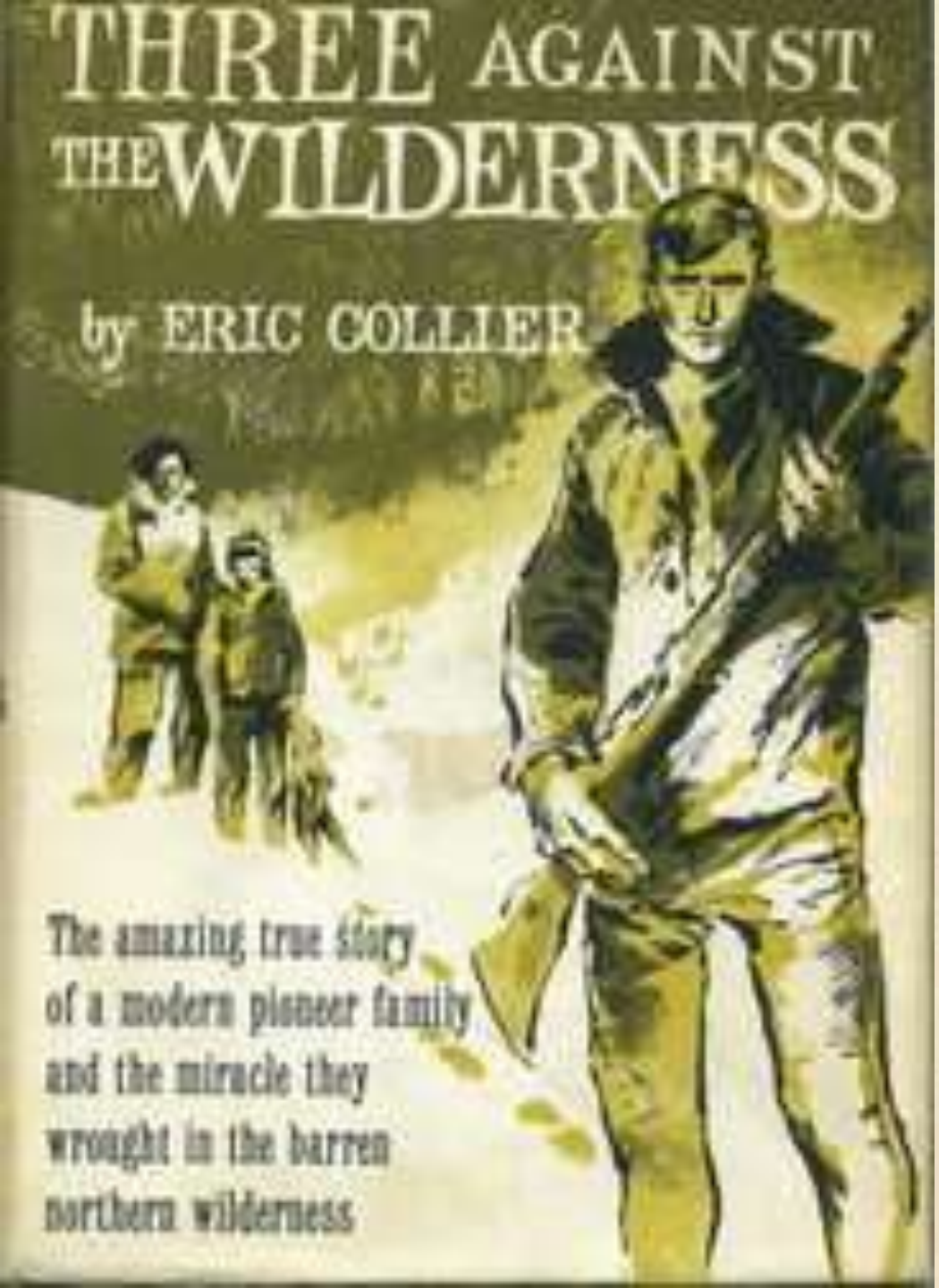
Pollock et al. 2014



Beaver Dam Analogue (BDA)

What is a BDA?

- Human-made facsimile of a beaver dam
- Leaky, low-head dam made of natural materials
- Slows the flow of water
- Allows sediment to accumulate
- Promotes habitat conditions suitable for beaver



New technique?

- Numerous early examples of partnering with beaver to restore degraded streams.
- Indigenous oral literature share practical and philosophical stories about beaver.

Rancher greens arid site with beaver dam analogs

By BRAD CARLSON Capital Press Aug 28, 2019

Chris Black near a beaver dam analog on his southwest Idaho property.

Steve Stuebner

LATEST NEWS

Judge stops logging project in Eastern Washington

Senator from rural district to run Washington lands commissione

BC’s First BDA Project

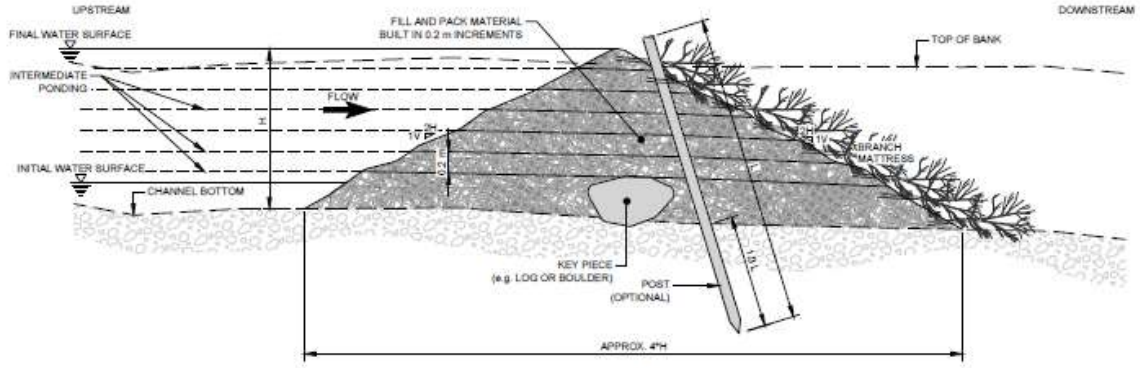
- Funding provided through the Fraser Basin Council in partnership with Nooaitch Band.

Major steps:

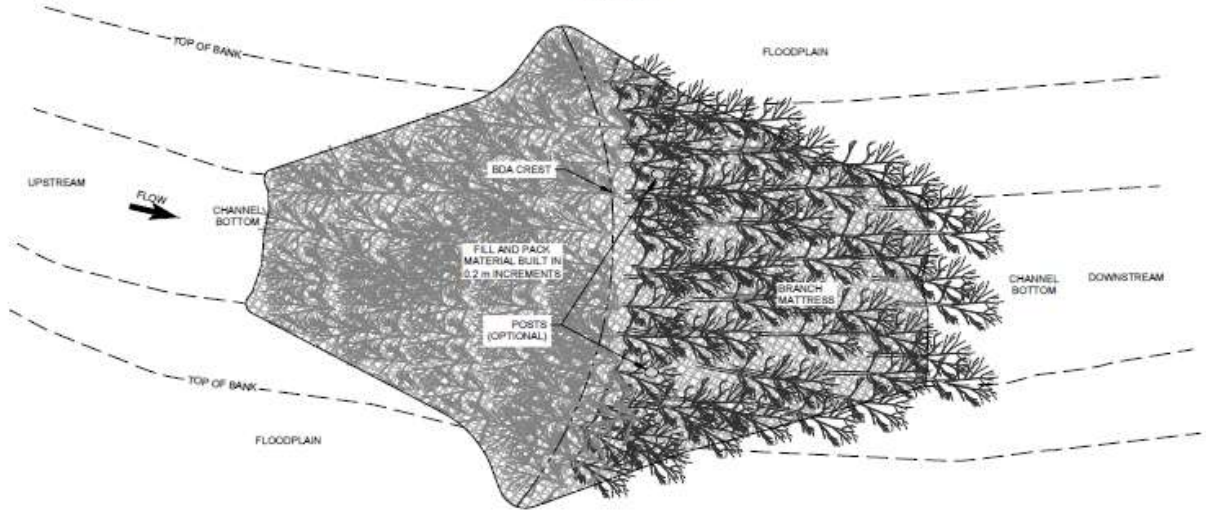
1. Review of available science
2. Site assessment
3. Design
4. Permitting
5. Construction
6. Monitoring

Howarth Creek Site

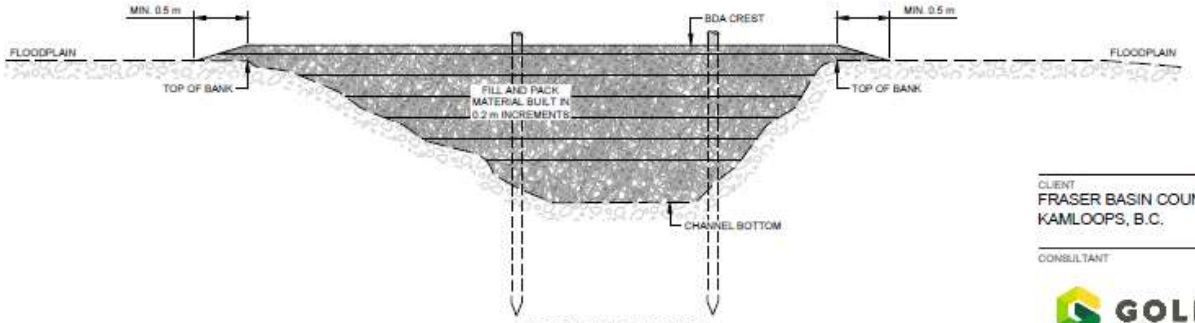
- Tributary to Voght Creek and Coldwater River
- Evidence of beaver historically but no current colony
- Stream exhibiting signs of degradation typical of post-beaver extirpation, as well as other disturbance types
  - Bank erosion
  - Downcutting
  - Loss of wetland vegetation



TYPICAL SECTION
SCALE 1:50 m



PLAN
SCALE 1:50 m



UPSTREAM ELEVATION
SCALE 1:50 m

CONSTRUCTION STEPS

1. EMBED ANY AVAILABLE "KEY PIECES" (LOGS OR BOULDERS) INTO THE BOTTOM OF THE CHANNEL, UP TO 1/3 OF THEIR HEIGHT.
2. BUILD UP THE FIRST LAYER TO THE TOP OF THE KEY PIECES, NO MORE THAN 0.2 m ABOVE THE INITIAL WATER SURFACE.
3. BUILD THE DAM IN APPROXIMATELY 0.2 m LIFTS. LAY DOWN LARGER FILL MATERIAL (WOODY DEBRIS), THEN BACK WITH SMALLER MATERIAL (MUD, LEAVES, TURF, ETC) TO PREVENT LEAKAGE. UPSTREAM PONDING SHOULD BE OBSERVED PRIOR TO PROGRESSING TO THE NEXT LAYER.
4. UNTREATED WOODEN POSTS MAY OPTIONALLY BE POUNDED THROUGH THE STRUCTURE AFTER CONSTRUCTION TO ADD STRUCTURAL INTEGRITY. POSTS SHOULD BE EMBEDDED INTO THE STREAM BED APPROXIMATELY 1/3 THEIR TOTAL LENGTH.
5. EMBED BRANCHES ON THE SURFACE OF THE DOWNSTREAM SIDE OF THE BDA PARALLEL TO STREAM FLOW, CREATING A "MATTRESS" TO MINIMIZE SCOUR.

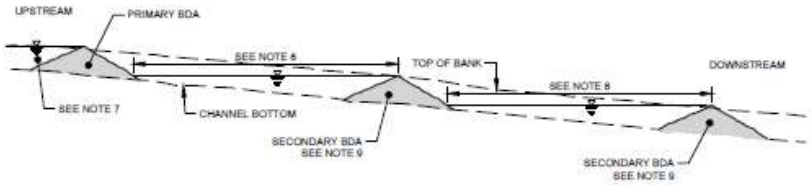
NOTES

1. TYPICAL SECTION SHOWN HERE INDICATES MAXIMUM CONSTRUCTED CONFIGURATION. BDA CREST MAY BE CONSTRUCTED BELOW TOP OF BANK DEPENDENT ON SITE CONDITIONS AND DESIRED INTENT OF BDA.
2. PLACING A BDA ON AN EXISTING BAR OR RIFFLE WILL HELP LIMIT THE MATERIAL REQUIRED.
3. BDAs SHOULD NOT EXCEED 1.5M IN HEIGHT. PRIMARY DAMS TYPICALLY EXTEND 0.15 M ABOVE THE FLOODPLAIN ELEVATION, SECONDARY DAMS END AT THE TOP OF BANK. TOP OF BANK ELEVATION TO BE DETERMINED IN THE FIELD BY A QUALIFIED ENVIRONMENTAL PROFESSIONAL BASED ON OBSERVED HYDROLOGY AND GEOMORPHOLOGY OF CANDIDATE SITE.
4. TAPER OFF TO END MIN. 0.5 m ONTO THE FLOODPLAIN.
5. WHEN VIEWED IN PLAN, BDA SHOULD BE STRAIGHT ACROSS THE CHANNEL OR CONVEX DOWNSTREAM, AS ILLUSTRATED. RADIUS OF CURVATURE SHOULD BE EQUAL TO OR GREATER THAN THE CHANNEL WIDTH.
6. WHILE POSTS ARE AVAILABLE COMMERCIALLY, USE OF LOCAL MATERIAL IS PREFERRED. POSTS SHOULD BE 0.05 TO 0.1 m DIAMETER AND SHARPENED TO A POINT. ROUGH POINTS MADE USING A CHAINSAW ARE ACCEPTABLE.
7. IF POSSIBLE, THE POND PRODUCED BY A PRIMARY DAM SHOULD INCLUDE CONVENIENT BANKS FOR BEAVER LODGE CONSTRUCTION.
8. THE PONDS PRODUCED BY SECONDARY DAMS SHOULD EXTEND AT LEAST TO THE BASE OF THE NEXT DAM UPSTREAM.
9. BDA SHOULD BE CONSTRUCTED IN SETS OF AT LEAST 3, UNLESS SITE CONDITIONS PERMIT.

REFERENCE

1. ADAPTED FROM THE LOW-TECH PROCESS-BASED RESTORATION OF RIVERSCAPES DESIGN MANUAL (WHEATON ET AL 2019).

DISCLAIMER



BDA SPACING GUIDANCE
NOT TO SCALE

0 1 2
1:50 METRES

CLIENT
FRASER BASIN COUNCIL
KAMLOOPS, B.C.

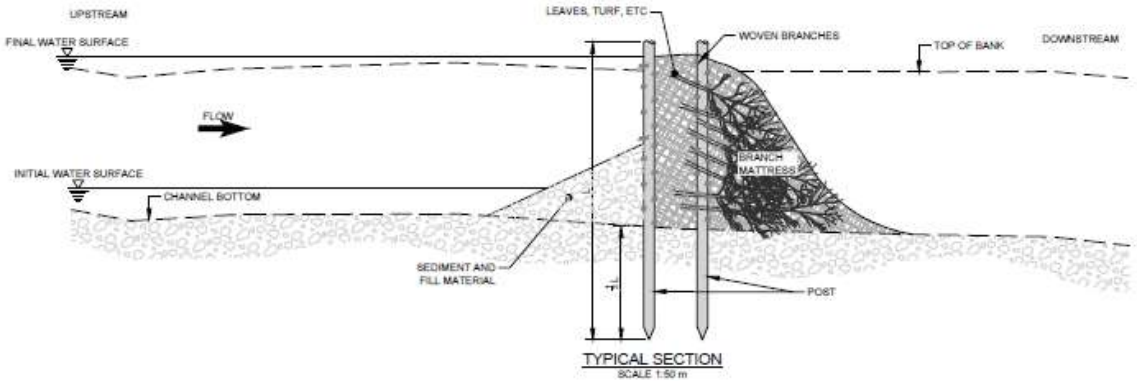
CONSULTANT
GOLDER

YYYY-MM-DD	2021-03-31
DESIGNED	RC
PREPARED	AF
REVIEWED	JMO
APPROVED	DK

PROJECT
BEAVER DAM ANALOGUES AND SEDIMENT WEDGE STABILIZATION

TITLE
CONCEPTUAL WOOD-MOUND BEAVER DAM ANALOGUE

PROJECT NO.	Phase/Task	REV.	FIGURE
21453359	1000/1200	0	02



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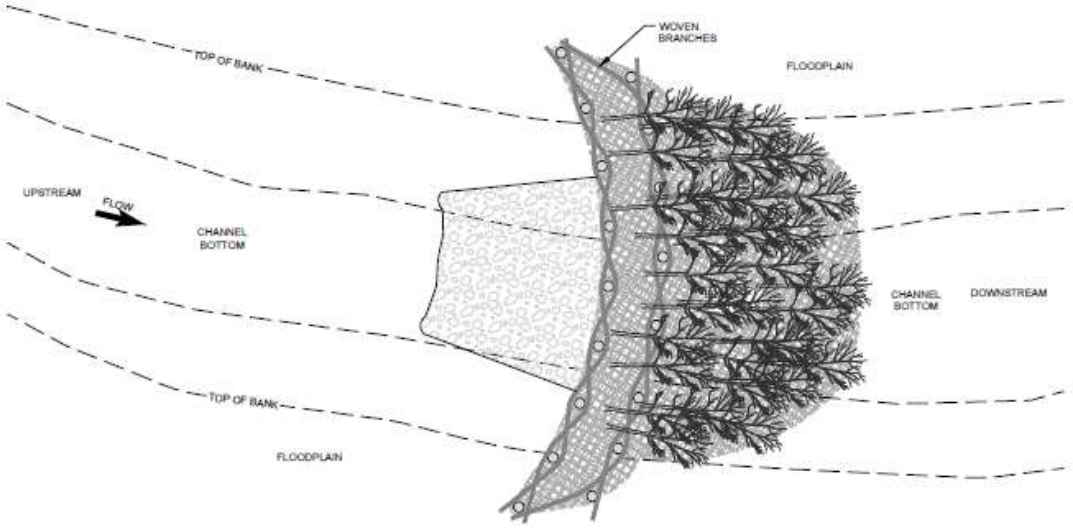

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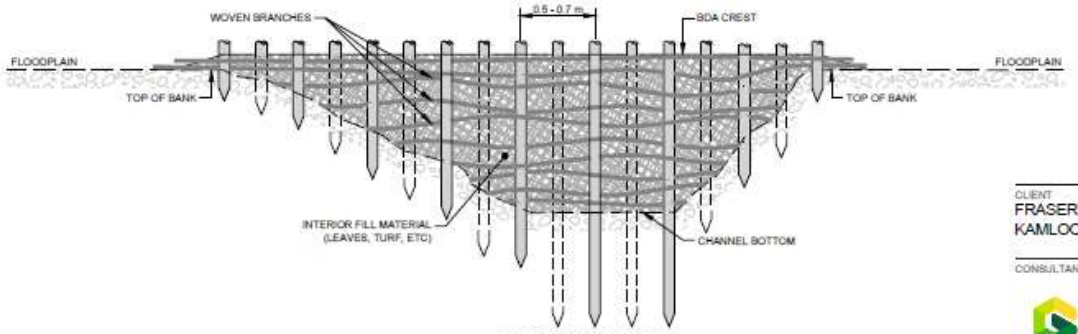

UPSTREAM ELEVATION
SCALE 1:50 m

CONSTRUCTION STEPS

1. EMBED UNTREATED, WOODEN POSTS 1/3 OF THEIR LENGTH INTO STREAM BED.
2. WEAVE BRANCHES TIGHTLY BETWEEN POSTS, MINIMIZING GAP SIZE.
3. ON DOWNSTREAM SIDE OF THE BDA, WEAVE-IN BRANCHES PARALLEL TO THE STREAM FLOW, CREATING A "MATTRESS".
4. FILL GAPS IN THE BDA WITH SMALLER MATERIAL (MUD, LEAVES, TURF, ETC).
5. BACKFILL WITH SEDIMENT AND OTHER SMALL MATERIAL.

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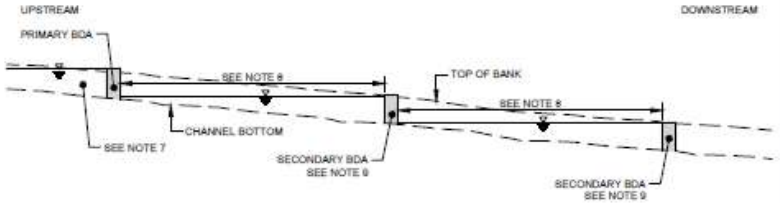

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CONCEPTUAL POST LINE AND WICKER BEAVER DAM ANALOGUE

PROJECT NO.	Phase/Task	REV.	FIGURE
21453359	1000/1200	0	03

CAT

2023

Beaver Relocation

- ***Beavers needed*** to take over ***maintenance of BDA***-mediated habitats.
- 2022 - Applied for General Wildlife Act permit to live-trap and transport “nuisance” beavers from private lands within the Nicola Watershed to BDA sites in Howarth Creek.
- 2023 and 2024 – Live-trapping in spring through fall.
    - Project team: **Tom Willms**, RPBio (NVIT); **Jordan Bryce**, MSc (NVIT); **Silas Potter**, BNRSc (NVIT alumni)
        - **Eva Hartmann**, RVT (Interior Wildlife Rehabilitation Society)

Key Elements of Trapping Program

- Live-trapping was for “nuisance” beavers only
- Traps checked twice daily
- Traps in contact with water but not submerged
- Trapping/release to target pairs of beaver and family groups

Temporary Captivity of Beavers

- **Interior Wildlife Rehabilitation Society** in Summerland, BC
- Provided veterinary care for injured beavers
- Held beavers captive in beaver-specific habitats
  - Allowed time for family groups to be reunited;
  - Or for pair bonds to form between beavers from different trapping locations.

Photos courtesy of: Eva Hartmann, 2023

Post-release Monitoring

- Literature suggests **successful translocation is not likely to be more the 50%** (Pollock et al. 2015)
- Follow-up monitoring of release site is ongoing
- **No active tracking** of individual beaver
- **Beaver have been observed** in ponds, post-release
- Evidence of some BDA maintenance by beaver
- **Evidence of beaver cuttings**
- **Bark-stripped cuttings easily visible** in wetland and on the upstream side of BDAs

Questions?

Thank you to our project partners!

INTERIOR WILDLIFE
REHABILITATION SOCIETY

Fraser Basin Council

NVIT

BCWF
BC WILDLIFE FEDERATION
WETLANDS EDUCATION PROGRAM

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