

Environment and Climate Change Canada
Canadian Nature Fund Community-nominated priority places for Species at Risk



**Beavers and wetlands along the lower Duncan-Lardeau River floodplain:
Kootenay Connect DLSAR Beaver 2023-2026**

Summary of Factors Influencing Location and Extent of Beaver-Created Wetlands 2010 – 2025



Kootenay Connect is a program facilitated by the Kootenay Conservation Program



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Executive Summary

Efforts to work with beavers in their role as wetland engineers have been a priority in the Kootenay Connect 3-year DL SAR Beaver project, as wetlands along the Duncan-Lardeau River floodplain have deteriorated in recent years. Along large rivers like the Duncan-Lardeau, one of the uniquely vital roles of beavers is to create small, stable ponds and marshes on otherwise shifting, swift-flowing waterways. The resulting small wetlands contribute disproportionately to biodiversity and species at risk.

The primary objectives of the DLSAR Beaver 3-year project period include: 1) re-establishing beavers in a suitable location on the Duncan Lardeau floodplain (e.g., Argenta Slough); 2) undertaking at least one water supplementation project to benefit beaver-associated wetlands (e.g., Hamill Ditch); 3) investigating at least one additional water supplementation project (e.g., Site 2A/B); and 4) undertaking minor restoration work to aid beaver expansion or establishment where needed (e.g., Site 1A, Carter Bend).

The long-term vision guiding this project is to see beaver colonies occupying and developing wetlands in all or most locations on the floodplain that have wetland potential. Towards this end, an additional objective of DLSAR Beaver has been to consolidate findings from the present project and earlier work back to 2010 that pertain to the capacity for, and limitations of, wetland creation by beavers along the Duncan-Lardeau River floodplain.

Most hands-on project objectives were achieved from 2023-2026. We succeeded in re-establishing beavers along Argenta Slough, with live-capture, quarantine and release in 2023 which resulted in seven dams and a doubling of the wetland area above their largest dam. We undertook the Hamill Ditch project (as a supplement to Argenta Slough for when subsurface inputs are low), with initial restoration efforts in 2024 and improvements in 2025 to benefit 32 hectares of open water and marsh wetland habitat. We wrapped over 30 cottonwood trees with wire guards to protect them from beavers at Argenta Slough and Meadow Creek. We prepared Site 1A for improvements and are awaiting MWLRS approval. We also conducted another inventory of beaver colonies between Duncan Dam and Kootenay Lake.

Towards the long-term vision of beavers and wetlands in the Duncan-Lardeau, our review of past and recent findings concludes that: a) beavers are restricted in wetland-building to somewhat sheltered, fine-substrate channel complexes (shown on Figure 2); b) these complexes tend to be maximized by beavers if beavers are in the locale, especially if occupied by black cottonwood or abundant willow; and c) the suitability of these complexes is threatened by specific aspects of the dam operating regime on the lower Duncan River that add to the impacts of an increasingly drier climate.

This report recommends that these sites (shown in Figure 2) be considered priorities for monitoring, protecting and encouraging beavers wherever possible. These sites should also be utilized in modeling efforts designed to evaluate various flow scenarios as part of BC Hydro Water Use Plan processes and Columbia River Treaty negotiations. From what has been observed to date, avoidance of a fall discharge drops to less than 110 m³ (Gauge 08NH118) would make a significant difference to the capacity for year-round beaver occupation in these sites that are so vital for other riparian species and overall biological diversity on the Duncan Lardeau River floodplain.

It is also recommended that reconnaissance-level monitoring of beavers continue at least every 3 years to assess population and habitat status. Along the Argenta Slough, a collaborative stewardship agreement should be developed with the landowner whose property is intertwined with Crown (MWLRS) and Nature Trust of BC lands as identified on Figure 3. The purpose of the agreement will be to allow (protect) the newly established beavers in their efforts within a defined area, but also to consider the needs of the landowner in defined ways. Initial conversations have been held, and it is reasonable to expect it to occur in 2026.

1.0 Introduction

Beavers have gained broad recognition in recent years for their wetland-creation abilities, their ecosystem engineering skills defining them as a keystone species or one on which many others depend. Their ability to retain and moderate water levels with dams, re-connect floodplain waterways and provide vital refugia for obligate aquatic species in times of drought makes them key players in adapting to a drier, less stable climate. Along large rivers such as the Duncan-Lardeau, one of their uniquely vital roles is to create small, stable ponds and marshes on an otherwise fast-flowing, ever-shifting floodplain, and these wetlands contribute disproportionately to biodiversity in the valley, most notably to species at risk.

The ability of beavers to build dams, dredge ponds, dig canals and create wetlands depends on a number of factors, and understanding those factors that are unique to the Duncan-Lardeau system has been an essential part of trying to ‘work with beavers’ to restore wetlands over the past 3-5 years.

In the 3-year “Beavers and Wetlands” Kootenay Connect project (DLSAR Beaver) we implemented a number of hands-on beaver and wetland stewardship projects, most notably re-establishing a colony of beavers along the east edge of the lower Duncan-Lardeau floodplain (Argenta Slough). We conducted another inventory of beaver colonies between Duncan Dam and Kootenay Lake applying the same methods as in previous inventories as an update on overall status. The activities undertaken in DLSAR Beaver from spring 2023 through winter 2026 are listed below. Sub-reports with details are provided in Appendix A and metrics associated with outcomes of the DLSAR Beaver project are summarized in an Excel spreadsheet earlier submitted.

We also tried to consolidate findings from beaver and wetland investigations to date undertaken in the Duncan Lardeau (2010 through 2025) that relate directly to strategies and next steps for working with beavers and wetlands in the future. Most of the following document is a summary of this effort, with discussion of future options and recommended next steps. Further details on all pre-2023 components are provided in Appendix B or available on request.

The project focal area in 2023-2026 has been the floodplain between Duncan Dam and Kootenay Lake (Figure 1). The Lardeau River upstream from the Duncan to Gold hill was inventoried for beaver colonies along with the Duncan in 2010, and north to Gerrard, south to Kootenay Lake in 2020.

2.0 Kootenay Connect DLSAR Beaver Activities 2023-2026

DL SAR Beaver project activities from 2023-2026 have included:

- Live-trapping “problem” beavers, quarantining, releasing and re-establishing them successfully in Argenta Slough in August 2023 (see Report in Appendix A).
- Ongoing frequent monitoring of the released beavers as they constructed/reconstructed seven dams, in two years doubling the overall ponded and wetland area of the slough and tripling it above their largest dam despite occasional dam destruction by people. Evidence of kits born in May 2025 (see Report in Appendix A).
- Working on initial stages of collaborative agreement with landowner/users to allow beavers to develop wetlands within a defined area along Argenta Slough in 2025 (see Map in Appendix A).
- Reviving an old irrigation ditch Hamill Ditch in 2024 to provide a supplementary water supply to Argenta Slough from Hamill Creek, followed by improvements in 2025 (see Report in Appendix A).
- “Shovel-ready” awaiting MWLRS approval to remove man-made blockage of beaver canal at Site 1A
- Planting and tending of over 4000 willow and red-osier dogwood live stakes alongside Argenta Slough (2024, 2025) and protecting over 30 mature and sapling cottonwood trees from beaver cutting.
- Mini-scale beaver assistance, including a small experimental Reed canary-grass reduction to allow beavers to access willow.
- Inventory of beaver colonies between Duncan Dam and Kootenay Lake to compare to the previous inventories in 2010 and 2020 (see Report in Appendix A).

3.0 Summary of factors influencing location and extent of beaver-created wetlands along the Duncan-Lardeau River floodplain based on field findings 2010-2025

3.1 Channel morphology

Beaver wetland development is limited to sheltered positions along both the Lardeau and Duncan-Lardeau River reaches, including:

- meander lobes and associated side channels
- abandoned channels fed via subsurface from river
- floodplain edges fed by toe-lope springs or creeks as well as subsurface from the river
- low-lying sites near channels on the delta with Kootenay Lake

Our 2020 survey found that literally all such habitat complexes along both rivers had been worked by beavers into ponds and wetlands, currently or historically, with the exception of coarse-textured, gravel-cobble-

dominated complexes. Some of these complexes are ephemeral in suitability and others are semi-permanent, to be explained later.

Beavers do utilize the main river channels on both Duncan and Lardeau rivers when velocity allows them to cut food, disperse, and construct lodge-dens in banks that are used seasonally; however, they cannot construct dams and create wetlands along the main river.

3.2 Substrate Texture

Substrate texture has been found to be a key factor in successful beaver works of all kinds and especially in constructing pools and wetlands. Fine silts to clays are needed for them to successfully dig canals and dredge ponds, and fine material enables the construction of strong, water-tight dams and lodge-dens.

Beavers dig canals to carry water to ponds and to gain access to inland food. They frequently dredge small ponds 'from scratch' in low-lying sites close to larger water bodies and normally dredge around the entrance to lodge-dens.

A similar strategy is seen in beaver dredging of fine-textured substrates alongside and parallel to side channels and other water bodies such as lower Meadow Creek. On both sides of lower Meadow Creek channel there are linear pools dug by beavers as shown on Figure 4. These diversify the channel and will ultimately increase wetland area ultimately and increase beaver access to willow (Figure 4). In older, abandoned beaver sites these formations and dredged pools were typically found as well-established sedge communities.

All of these efforts require fine - textured substrates.

3.3 Hydrology

Hydrology is of course the ultimate determinant of beaver presence as an aquatic mammal. Water depth, timing flow velocity and overall supply are all critical. Beavers are capable of controlling these factors with their works in the sheltered habitat complexes described to a surprising extent, but the main Duncan-Lardeau River is the primary, base driver of water levels on all other water bodies on the floodplain, by subsurface or subsurface. Kootenay Lake shares influence with the river in the delta reach, south roughly of the 20-year flood level of Kootenay Lake.

The operating regime of the lower Duncan River poses certain challenges for beavers, and these are believed by this report to limit colony establishment and size, overall beaver population success and wetland development. Over the past 18 years, the regime has included an abrupt drop in river discharge in early October for 2 to 3 weeks. This causes a major drop in water levels throughout the floodplain¹. Beavers are typically well

¹ On Argenta slough and other waterbodies with springs or additional supplies, beavers can hold water levels in ponds for ~ 2 weeks or more, but this is often to the detriment of ponds and wetlands downstream

advanced in winter preparation by early October, with den holes and food caches intentionally below the water surface, and months of effort tied up in the food cache and often other structures, so a sudden water level drop is a very significant disruption. They will sometimes move to lower-elevation and/or larger channels, if nearby, and suitable, but that strategy leads to a second disruption when the river ramps up in late October and further in mid winter when the highest discharge of the year typically occurs on the lower Duncan River which typically erodes the dens and caches on those channels.

It can be expected that this kind of disruption impacts winter survival and spring reproduction for beavers and it discourages colonization of otherwise suitable sites. It is evident that this hydrological factor constrains beaver wetland development in many channel complexes that are otherwise suitable.

The typical annual hydrograph of Kootenay Lake differs from the Duncan River with regards to freshet peak timing and it is more conducive to Black Cottonwood regeneration. The extensive open sand between most of the young stands and waterways for much of the year makes this food challenging for beavers to access, except in high lake flood conditions, so this area is currently thriving as a developing stand of cottonwood .

In 2010 there were more established, over-wintering beaver colonies on the delta reach than there were in 2020 or 2025. The reasons for this are not yet clear, but it may relate to an operating regime change on either Kootenay Lake or Duncan River. Figure 2 shows the delta reach with 'caveats' for beaver suitability. Each purple blob marks a pool created by beavers in the past.

It is noted that the most successful long-term beaver colonies are near floodplain edges and have some supplementary (small) water source, typically toe-slope springs.

3.4 Food Supply

Food supply strongly affects colony size, location of colonies and thus closely influences the location of beaver works.

Highly preferred winter foods are sapling cottonwood and trembling aspen; willow is next in preference (all species), followed by red osier dogwood. Birch and aspen rank considerably lower, with coniferous species basically a last resort. An interesting study by Breck et al (2002) found beaver colonies that fed primarily on cottonwood were larger, with large body sizes, than colonies feeding primarily on willow.

Summer foods include leaves and shoots from the above species along with sedges rushes and other semi- aquatic and aquatic plants. Once established, beaver ponds and wetlands produce their own summer foods which can reduce feeding pressure on cottonwood and willow. This is an important consideration.

Cottonwood reproduction and distribution, and to a lesser extent willow, depends on dynamic channel action to create new seedbeds (and inspire root coppicing), and on episodic high flood levels to distribute the

seeds to new sites. In the initial ~ 30 years following construction of Duncan Dam when side channels narrowed, or were abandoned, there was a 'flush' of cottonwood and willow growth that is thought to have supported a high beaver population (although little solid info is available). If the lower Duncan River stabilizes and simplifies, as many rivers do below dams, suitable side channel complexes for cottonwoods as well as for beavers directly could be greatly reduced. Yet, as long as the Lardeau River and three large creeks of Meadow, Hamill and Cooper remain unregulated, there will be natural variability influencing at least 40% of the flow.

As noted earlier, the most expansive supply of sapling cottonwood on the system at this time is developing on the lower delta at the head of Kootenay Lake, but it is only available to beavers when the lake level is high, as beaver do not normally forage more than 20-30 meters from water.

Of interest, there are several beaver complexes along the Lardeau reach where long-term beaver colonies appear to be self-sufficient in terms of food, with extensive pond systems producing willow thickets in addition to herbaceous plants. Other colonies are abandoned due to water levels or other channel changes or, it appears, when they deplete the supply of shrubs and trees and are unable to create a self-sufficient situation.

3.5 Population size, colony size

The size of the overall beaver population and especially the size of colonies have a large influence on the size and durability of wetland-creating beaver works. We have seen that larger colonies can build larger, stronger dams and lodge-dens that can withstand higher velocity flow; they can dig larger canals to carry water to where they need it, and they can respond more quickly to sudden changes in water levels or flow rates.

Available historic evidence suggests Duncan-Lardeau beaver populations have risen and fallen a number of times over the past 50 years, as is roughly illustrated in Figure 2 and Table 1, Variable influences on the Duncan-Lardeau beaver populations include food supply, predation pressure, legal and illegal trapping and shooting and many aspects of hydrology including timing, velocity and total water supply. Combinations of these influences create ever-changing opportunities and constraints for beaver colonies to thrive, persist at a low level, vacate or perish. Examples of all 4 have been observed along both river reaches.

Between the 2010 and 2020 inventories, there was a notable population drop of over 50 % that is estimated to have occurred most dramatically between 2012 and 2015, but no formal attention was paid to beavers during those years, so few solid details are available. Below is a conceptual drawing that shows a few known historic values for beaver numbers, Black cottonwood abundance and predator abundance with rough estimates of trends between values. This diagram does not include any other factors.

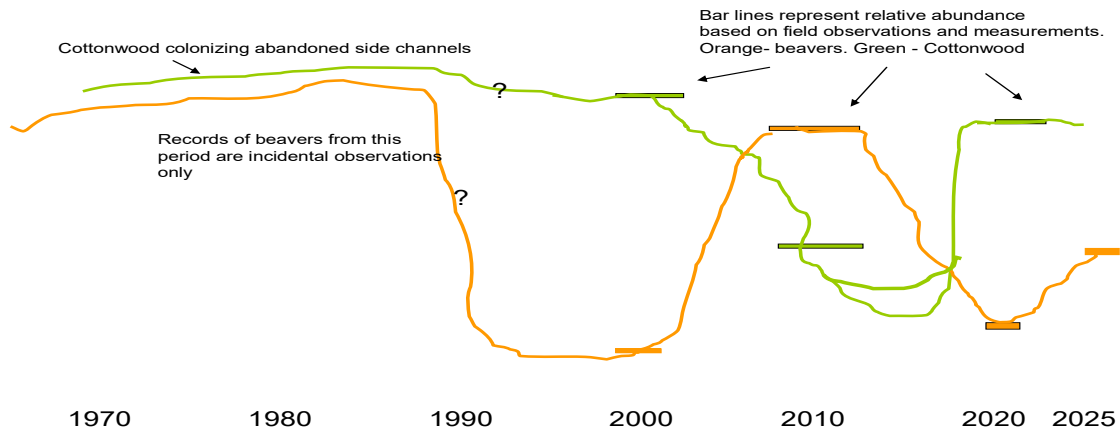


Table 1. Colony counts and population estimates along the lower Duncan-Lardeau River.

Survey Year	Colony count	Est. colony size average(Very rough Total Estimate	Comments
2002	No beaver cottonwood	inventory but general observations of almost no beaver cutting on sapling cottonwood, their top favourite food)	thorough with	Black cottonwood was mapped and aged from Duncan Dam to Kootenay Lake and very little sign of beaver activity observed in suitable habitats Sapling cottonwood is relatively abundant and available.
2010	12	6	50-60	High beaver numbers; available cottonwood and willow becoming depleted. Very little predator sign observed.
2020	6	2-3-	18+	Low beaver numbers. Cottonwood and willow along Lardeau and Duncan River are relatively abundant and available. Predator numbers are notably high overall and sign observed at most beaver sites.
2025	9	3-4	27 to 36	Beaver population may be rebounding. Predator numbers notably low, Elk numbers up, food supply of Black Cottonwood along main river well-utilized and less abundant than in 2020 but still adequate.
Colony counts were based on presence of winter food caches, active lodge-dens and recent scent mounds. Colony size estimates were based on overall cutting levels, size of lodge and food caches, extent/size of all 'works' and they are very broad estimates.				

Table 2. Habitat suitability factors for beaver wetland creation and colony establishment in Duncan-Lardeau River floodplains.

Factor	Suitable Conditions
Substrate Texture	Fine-textured, silt to clay substrates with high water-holding capacity is strongly associated with all successful beaver works in the project area. Required for canals, pond-dredging and successful, strong dams and lodge amour.
Channel Morphology	Extensive beaver ponds, canals, dams and other works in the project area are all associated with low-lying, alluvial deposits, broad meanders, side channels, abandoned side channels or other water bodies sheltered from the main river current; however, being <i>near</i> the main river channel can be advantageous when water levels drop. At the same time: Fine-textured banks that stand above highest water levels are needed for lodge-dens and or the most effective dams , although for lodges, if available, beavers will also use large log jams, bridge decks or other structure providing slight elevation
Water Supply and Timing	With adequate supply and the above two factors met, beavers can dam and hold water to meet depth criteria needed to a large extent. It would be good to derive a metric for “adequate supply” See Section 3.3 for discussion of timing concerns on the Duncan.
Food Supply	<u>Winter:</u> Cambium and bark of cottonwood, aspen, willow, red osier dogwood (most other woody spp less preferred) <u>Summer:</u> Sedges, rushes, aquatic plants, small shoots and leaves of above species Established wetlands can supply summer foods and reduce feeding pressure on cottonwood and willow Foods needs to be located within 30 m of navigable water or canal

4.0 CONCLUSIONS and RECOMMENDATIONS

Much has been learned regarding beavers and their role in the Duncan-Lardeau ecosystem over the past 15 years, and the past 3-5 years have accelerated that learning while also accomplishing several ‘hands-on’ tasks aimed at beaver and wetland restoration.

The primary hands-on accomplishment during the 3- year beaver subproject of Kootenay Connect DL SAR Beaver, 2023-2025, has been the re-establishment of a beaver colony along the Argenta Slough on the east side of the Duncan-Lardeau floodplain where the beavers have revived dams, built new dams and revitalized one of the most diverse and productive wetlands in the North Kootenay region. Additional actions have included completion of a supplementary water supply project for when subsurface inputs are low to Argenta Slough

(Hamill Ditch), with initial efforts in 2024 and improvements in 2025; and tree-wrapping of 20 mature cottonwood to protect from beavers (Argenta Slough, Meadow Creek). A small but likely-to-be effective project is shovel-ready at Site 1A and awaiting MWLRS approval. We also conducted another beaver colony inventory between Duncan Dam and Kootenay Lake, applying methods used in 2010 and 2020.

While important questions remain, particularly related to beaver mortality, sufficient information is available now regarding Duncan-Lardeau beavers, wetlands and floodplain processes to predict and consider various scenarios and options for encouraging beavers and wetlands over the coming decade in the face of a drier, warmer, less stable climate and other stressors. Climate aside, we know that beavers are only able to develop wetlands in meander lobe segments, side-channels and other sheltered channel complexes, as shown on Figure 2.

To the extent beavers can occupy these sites over the coming years they will serve as unique and vital habitats year-round for species at risk and as climate refugia for riparian species in periods of drought, but the suitability of these complexes or beavers is threatened by specific aspects of the lower Duncan River operating regime adding to the impacts of an increasingly drier climate.

This report recommends that these sites, shown in Figure 2, be priorities for monitoring, protecting and encouraging beavers wherever possible, and that they be utilized in modeling efforts designed to evaluate various flow scenarios as part of BCHydro Water Use Plan processes and Columbia River Treaty negotiations. From what has been observed to date, avoidance of a Fall discharge drops to less than 110 m³ at Gauge 08NH118) could make a very significant difference to the capacity for year-round beaver occupation in these sites that are also so vital or other riparian species and overall biological diversity on the Duncan Lardeau floodplain.

It is also recommended that reconnaissance-level monitoring of beavers continue, at least every 3 years, to get a sense of population and habitat status, and that along the Argenta Slough a collaborative stewardship agreement be developed with the landowner whose property is intertwined with Crown riparian (MWLRS) and Nature Trust of BC lands as identified on Figure 3. The purpose of the agreement will be to allow (protect) the newly established beavers in their efforts within a defined area, but to also consider the needs of the landowner in defined ways. Initial groundwork has been accomplished on this and it is reasonable to expect it to continue and conclude in 2026.

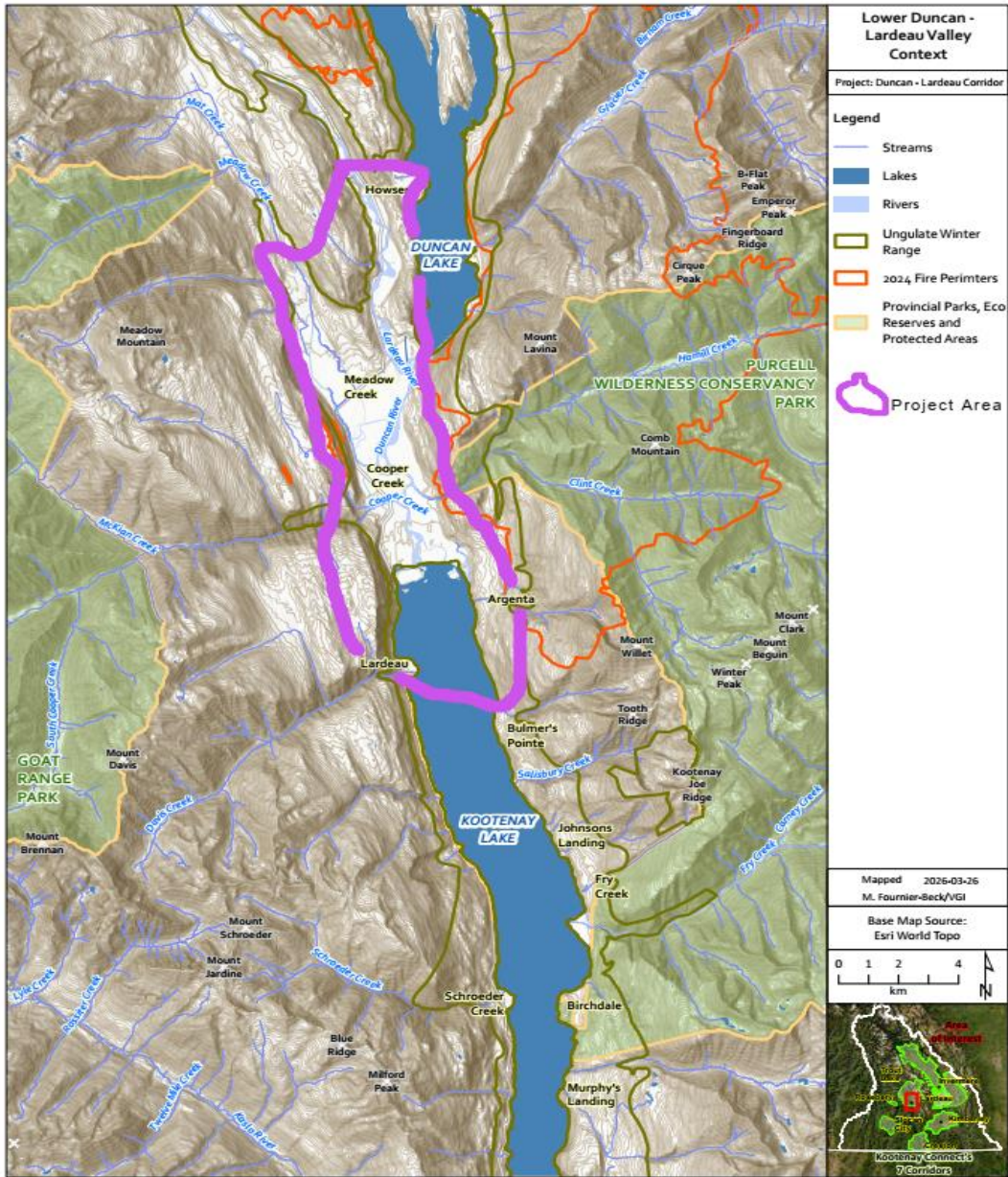


Figure 1. Project area of Duncan Lardeau projects part of Kootenay Connect in 2023-2026.

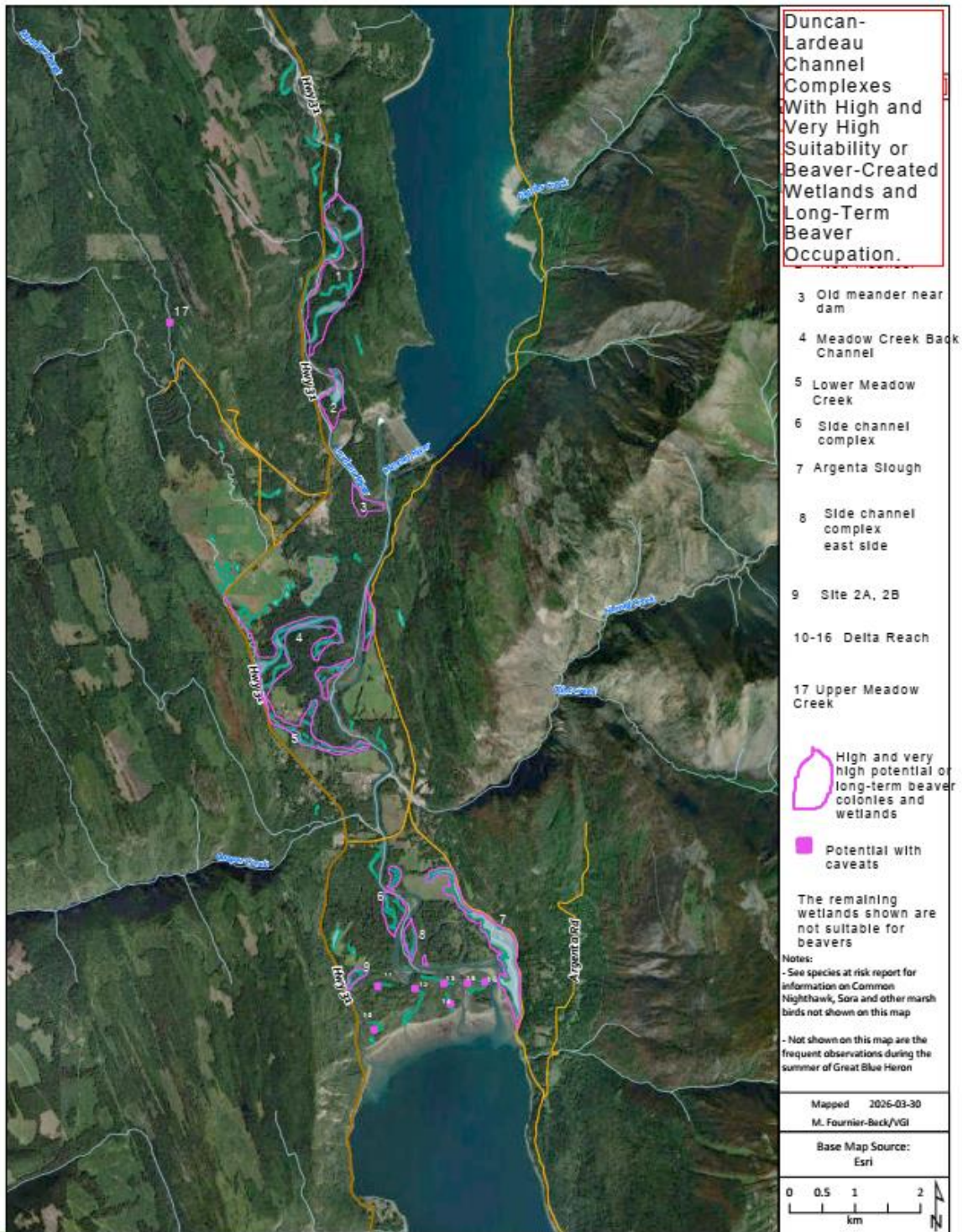


Figure 2. Duncan-Lardeau channel complexes with high suitability for beaver wetland creation.

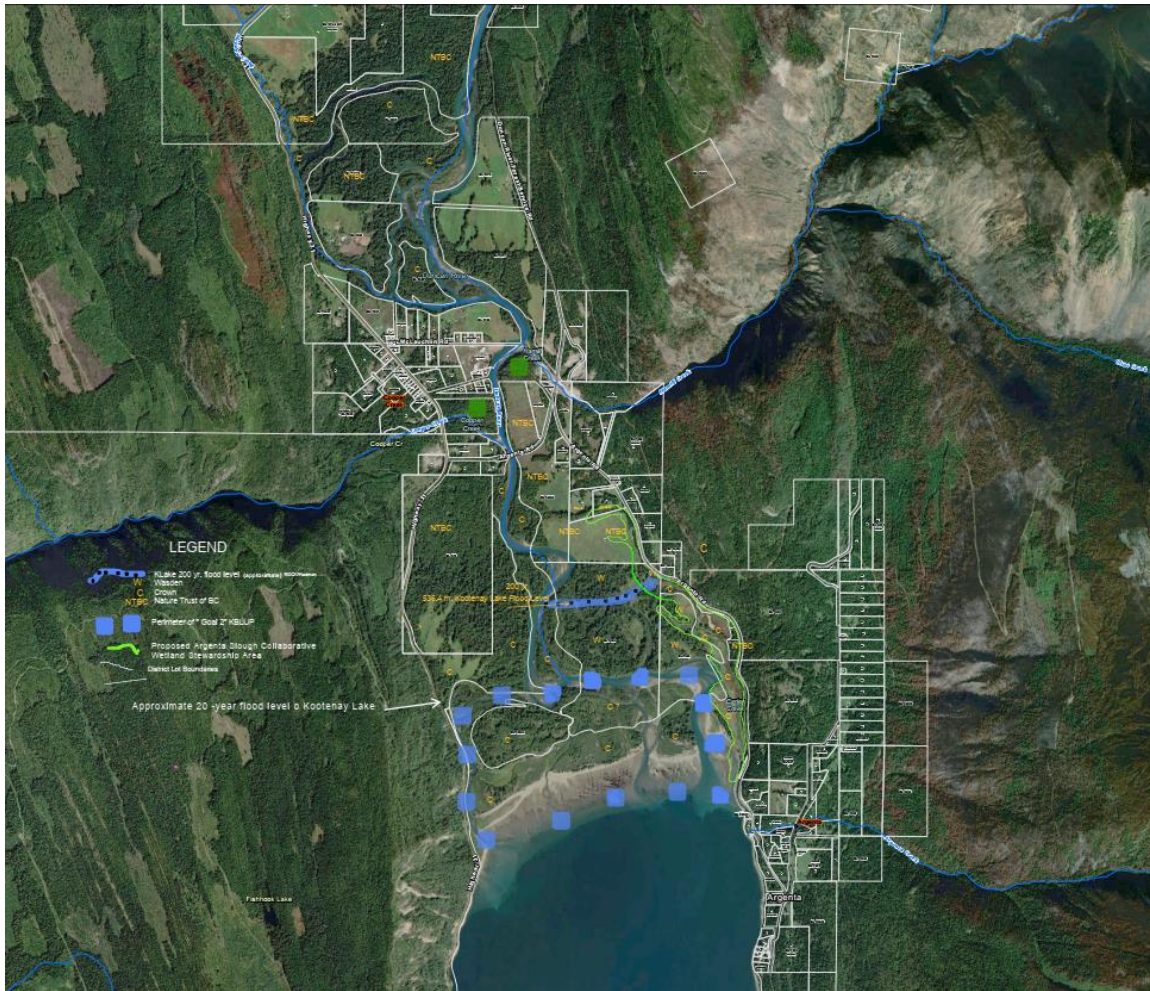


Figure 3. Argenta Slough proposed collaborative landowner wetland stewardship area.

APPENDIX A

Translocation of beavers from Pass Creek to the lower Duncan floodplain

Introduction

At the end of 2022, we learned of a colony of problem beavers that needed to be moved, (or exterminated), from Pass Creek near Castlegar. Since none of the previously identified Duncan-Lardeau beaver analogue projects¹ were 'shovel-ready' for a variety of reasons, and since augmenting the Duncan Lardeau population still seemed prudent and timely, we decided to shift immediate action priorities from constructing beaver works analogues to bringing in the beavers themselves to do the wetland construction. Plans were thus put in motion to trans-locate beavers to the Duncan-Lardeau from the Pass Creek area near Castlegar.

Planning and permits

Prior to the translocation we reviewed relevant literature (of which there is very little) and most usefully held conversations with others in North America experienced in translocating beavers or caring for beavers in captivity. The first contact was veterinarian Amelie Mathieu (Wildkin veterinary services) who was retained thereafter throughout the project. Amelie jointly developed with NKCS the permit application to Front Counter B.C for capture, handling and disease/parasite sampling (in Appendix A1) and was part of most of the discussions with other experts. People we exchanged information with several times included Angelika Langen from (Northern Lights Wildlife Rescue Centre); Melanie Whalen (Calgary zoo); Alexa Whipple (Methow Beaver Project) and most especially Nate Norman and BeckyYeager (U of Utah/Balance Environmental, Utah).

Additional activities during the months prior to beaver capture included locating and contracting a supportive, experienced BC licensed trapper; obtaining traps and bait; talking with landowners at the capture site²; looking over the capture site; confirming potential release sites,

¹ In 2021-2022, several beaver analogue projects were preliminarily designed by NKCS and examined by a PEng. These will be provided as Appendix B in the beaver recovery strategy report Population augmentation has been recommended as an additional recovery action due to the low beaver numbers inventoried in 2020 and no obvious increase in colony # since then along the lower Duncan.

² After plans were well advanced for the translocation, some unaffected landowners expressed opposition to moving the beavers. At that point I asked MOF (Luke Van der Vennen) to make the decision: to trap or leave the beavers. Their decision and reply are attached in Appendix A1.

lining up food supplies for the captivity period and identifying / constructing a secure holding shelter and pool for the beavers in the Duncan-Lardeau valley.

We were granted our first Wildlife Act and Animal Care permits in April but re-applied to trap in the July-August period, as by April we were concerned about overlapping with beaver birthing time or capturing pregnant or lactating females or young during the trapping period. Permit documents are provided in Appendix A1.

Constructing a holding area for the beavers

The beavers needed a structure to be held in for quarantine purposes and to facilitate grouping the colony together before release. In our case we were fortunate in having MOF offer the use of an old building at the Meadow Creek Spawning Channel for this purpose. The 12 X 14 A-frame building had a round, 10-ft. diameter a 4 ft deep fiberglass pool in the centre of it (see photos, Appendix A2) but the set-up needed a number of alterations to keep the beavers from escaping, destroying the infrastructure or being harmed.

We brought in clean soil to build the ground level around the pool to pool edge, first laying strong wire mesh underneath the soil, up the pool sides and up the walls. We wrapped the original plastic plumbing into the pool in layers of chicken wire and arranged for the incoming water to fill from a hose placed in the rafters overhead beyond beavers reach. We created a ramp for getting in and out of the straight-sided pool, thinking especially of any young beavers that we might capture. We were concerned about daytime high July daytime temperatures in the building (metal roof, open ends), but after recording temperatures for a few days found the location beside Meadow Creek and tree shade kept temperatures moderate. The building needed to be fenced from large predators with a portable electric fence. *See all photos, Appendix A2.*

Live-trapping

By chance we discovered a BC registered trapper with an interest in live-trapping that lived near the source site at Pass Creek and we contracted him to live-trap the beavers. The legal owner of the trap line was contacted as well, and was supportive. Trapping began on July 7, 2023 after concern over newborn kits or pregnant female has passed. Four (4) Comstock chimney traps³ were used concurrently, set during the day when beavers are not active so they were ready for each evening. They were set on or slightly in dams or on trails and baited with Castor bait (purchased) and checked around 7 am the following morning.

We caught a total of 3 beavers between July 7 and July 26 .This was fewer and more slowly than we had hoped for, and far more slowly than the trapper had estimated based on his winter trapping experience. The most probable explanation for the slow trapping rate was the

³ We found the Comstock the most successful and the easiest to use -easy to carry, set etc. Hancock basket traps are extremely heavy

summer season. Beavers are more dispersed and may be less territorial in summer which may make them harder to capture.

Transporting, daily care and feeding

As soon as a beaver was caught, the trap was covered with a dark cloth and beaver plus trap transported immediately north 2.5 hours to the Meadow Creek holding quarters. It was mid summer, so we traveled early in the morning and we placed bags of ice on fabric tarps over the traps so the beavers stayed cool. (We had originally intended to use transport crates to move the beavers, but decided a second transfer would be more stressful for them than remaining in the traps). On arrival at the site the beavers exited the traps and plunged immediately into the pool. The beavers expressed obvious familiarity with one another upon being re-united.

The captive beavers were fed piles of branches daily (aspen, cottonwood, willow, red osier dogwood), roughly 1 loosely piled pick-up -load per day. They had good appetites for these foods, but would not eat the commercial pellets we had purchased and were not interested in any vegetables. They were provided fresh drinking water daily in a bowl. The pool water was refreshed every 2 to 3 days. Draining and refreshing the pool water became a problem as time went on as the beaver plugged the drain. Keeping the pool clean is a critical problem anyone needs to address in holding beavers in captivity; it was clear that beavers need and like to stay clean. (One of them liked to 'take showers' under the hose that filled the pool, scratching and preening and obviously enjoying the experience).

Veterinary procedures, sampling

When further trap-setting yielded little return and we did not want to hold the 3 beavers in captivity any longer (July 26), the 3 beavers were anaesthetized and sampled for parasites and disease according to a protocol developed with Amelie Mathieu. Amelie has provided a full write up on the procedure and this included in Appendix A3. For this process (and again for the final recapture for release) the beavers were recaptured by gently 'herding' them back into the live traps in about 20cm of water in the pool. The low water level and high pool sides prevented their escape from the pool during this process.

Selecting and preparing the release site

While we were waiting for the lab results, the release site location was finalized and a few preparations made there: the creation of a temporary 'den' and provision of a small amount of cut food. The criteria used in selection of the release site were:

- Water at least 60 m deep minimum with potential for deeper pond creation and sufficient flow to do so ('visible water movement)
- Preferred food species safely accessible within 10 m of channel edge
- Material available for damming

- Fine substrate for canal potential, bank den or lodge potential
- No existing beaver residence within 1 km

Releasing the beavers

We waited roughly 2 weeks for the lab results but when returned they all indicated the beavers were exceptionally healthy. All tests results for disease and parasites were negative. See Amelie's detailed report in Appendix A1.

After we had the lab results and after water levels at the release site had risen sufficiently from an exceptional summer low, the beavers were released into the wild. (August 16). On the release day the beavers were recaptured as described above, shaded and transported for about 15 minutes then the 3 traps carried for another ~ 15 minutes to the release site where they were opened to let the beavers out. Upon release, the beavers swam rapidly downstream to get away from us as fast as possible. *PHOTOGRAPHS in Appendix A-2*

In the 3 months following the release of the beavers we looked for sign as the method of monitoring their whereabouts, checking every few days in the first few weeks after release and approximately every 2 weeks after that before winter. We checked the slough and edges upstream and downstream from the releases site⁴ and looked for signs of cutting, digging, damming, dragging, or scent mounds.

We found that the beavers first swam downstream roughly 220 m from the release site and spent several days there creating a series of scent mounds and investigating. It was then evident that they moved back up the slough and past the release site roughly 250 metres, where they made more scent mounds and then constructed a dam (actually re-constructed a dam beavers has built in the 1980s). By September 14 the dam was holding back a significant amount of water, deepening a pond critical for Western Painted Turtles. By October 20 they had re-built two smaller dams downstream from the first dam, the lowest one being at the releases site. By early November there was a stretch of the slough roughly 350 metres in length that was been flooded somewhat by the beaver's work.

Prior to starting their winter food cache, however, the beavers were disturbed by an unknown person believed to be 'squatting' on nearby unoccupied land. Their main dam was broken and there may have been additional harm (unknown). After that event, signs indicate that the beavers moved upstream roughly 2 km to the top end of the Argenta Slough. There was a notable increase in the level of beaver activity⁵ and in the size of the food cache at the top end of the Argenta slough soon after the above mentioned disturbance and little to nil fresh sign

⁴

⁵ Two beavers established naturally at the upper end of the Argenta Slough concurrently with planning period for the translocation project. The lower Argenta Slough was selected as the release site in part so the upper and lower dams could work in tandem to avoid dehydrating the Argenta marsh/turtle pond which lies just upstream from the release site. We hoped the distance between locations was sufficient to avoid territorial fighting.

remaining around their main dam. The beavers spent the winter at the top end of the slough and as of mid March it appears they are still located there.

Conclusions as of March 2024

By the end of summer 2024 there should be a better measure of the real success of this subproject than there is at present. In the short term, it appears that the venture has been successful, in that the beavers survived the handling and captivity and appear to have survived and established in the wild thus far. The focus of their occupation is not located quite where originally planned due to the disturbance described, but this may change, and in any case the overall result is positive in terms of beaver numbers.

We were also disappointed that we were unable to re-unite and relocate the whole beaver colony as had been our original objective. There were an estimated 6 beavers in the colony but we needed to stop trapping at 3 in order to end the captivity period for the beavers we had while they were still healthy. To the extent the slow trapping success may have been due to the summer season, we recommend to others live trapping beavers in southern BC that they consider trapping in mid-late March and releasing in early April if there is a release site with sufficient water and a good supply of willow aspen or cottonwood

We also recommend exhaustive consideration of all potential human interference possibilities prior to releasing the beavers - even illegal squatters on unoccupied land - and preceding the release with appropriate communication to avoid unexpected problems..

.We learned that live-trapping, moving and caring for beavers requires a great deal of time, energy and forethought but it is likely this would become easier with practice and more permanent infrastructure arrangements.

APPENDIX A-1 _ Applications and Permits

Available on request - supplied in Spring 2024 to KLLCF and KCP



**FISH AND WILDLIFE MANAGEMENT BRANCH
ANIMAL CARE APPLICATION FORM**



PLEASE TYPE

(F11 key will tab you through to the next box requiring information)

For office use: Date Received:

Project Number:

1. Project Title: Duncan-Lardeau Beaver and Habitat Restoration Project: Re-locating 1 colony of "nuisance" beavers from the Castlegar area to vacant beaver habitat where beavers are needed in the Duncan-Lardeau Valley. 2023 MOF Work Order # WO24NLEO23)

2. Starting Date: Some aspects of this project have been ongoing since 2020 and are multi-year until 2026, but this ACA is to cover beaver trapping, holding and relocating between **July 1 and August 15, 2023**. Note that these dates are a change from our previous application.

3. Principal Investigator: Must be a Qualified Person as defined by the [Natural Resource Sector QP Guidance Document](#)

Name: Brenda Herbison, MSc.RPBio.

Mailing Address: 706 Argenta Road
Argenta, BC V0G 1B0

Position: Biologist

Department/Organization: North Kootenay Consulting Services Ltd.

Region/Institution: Region 4

Phone: 250-366-4378 APPROVED PENDING - Delete the incorrect response

Fax: N/A

E-mail: bjhnkcs@gmail.com

Experience related to the described species, methods and proposal (ensure that experience related to the taxa/activity concerned is emphasized):

Brenda Herbison has been investigating beavers and beaver-habitat relationships intermittently for over 12 years (research, inventory, habitat assessment restoration) and she has over 35 years of general experience in applied biology involving a variety of taxa. She will subcontract the trapping and handling to the investigators below.

4. Additional Investigators: copy and paste if you require more than two

Name: Larry Walker

Position: B.C. Registered Trapper and Live-trapper

Department/Organization: N/A

Region/Institution: Private/individual

Phone: 250-365-5354

Fax: N/A

E-mail: csswalker@shaw.ca

Experience related to the described species, methods and proposal ensure that experience related to the taxa/activity concerned is emphasized):

Larry has over 30 years of general trapping experience with beavers and 4 seasons of live-trapping experience with beavers with the Robson Water Board. His trapper registration number is CB 19-597126. He knows the watershed and area he will be trapping in and has made personal contact with the affected landowners who strongly support his live-trapping there. He lives 10 minutes from the trapping site and is

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Last updated: December 2017

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keen to do the work. Larry is more than well-qualified to do the live-trapping for this project.

Name: Amélie Mathieu, DMV, MSc
Position: Wildlife veterinarian
Department/Organization: Wildkin Veterinary Services
Region/Institution: Region 4
Phone: 421-1160
Fax: N/A
E-mail: wildkin.vet@gmail.com

Mailing Address: 4316 Hilltop Crescent
Cranbrook, BC V1C 6W3

Experience related to the described species, methods and proposal ensure that experience related to the taxa concerned is emphasized):

Dr. Amélie Mathieu is a zoo and wildlife clinician. She completed post-graduate internships in small animal medicine and surgery, zoo medicine and wildlife health in different Canadian institutions as well as an ACZM-accredited zoo and wildlife medicine residency and a Master of Science degree in wildlife conservation medicine at the Ohio State University, the Columbus Zoo and Aquarium and The Wilds. Her Master's thesis focused on the risk of disease transmission associated with wildlife translocations. She has clinical experience with captive beavers and several other species of small mammals. She has provided veterinary support for a variety of BC wildlife field projects involving caribou, bighorn sheep, white-tailed deer and mule deer since 2018.

Name: Amy Wilson, BSc
Position: Assistant in care/handling
Department/Organization: North Kootenay Consulting Services
Region/Institution: Region 4
Phone: 781-985-2826
Fax: N/A
E-mail: wilsonamyc@gmail.com

Mailing Address: General Delivery
Argenta, BC V0G 1B0

Experience related to the described species, methods and proposal ensure that experience related to the taxa concerned is emphasized):

Amy Wilson has extensive experience with live-trapping and handling animals. Although she has not worked with beavers specifically, she is very well-qualified to assist Dr. Mathieu. Her experience includes 6 months live-trapping wolves and undertaking sampling/health assessments, 4 seasons live-trapping and sampling seabirds and small mammals, and 4 annual animal care and safety courses from University of Oregon.

5. Project Proposal (be concise and write in lay language. The information in all sections of this application should be complete so that it can be evaluated as a stand-alone document. The proposal must include all applicable information about animals and their handling and care relating to the project. Only maps can be included as additional material.

A. Background – Goals and Objectives:

The project objectives are to restore beaver populations and beaver habitat on the lower Duncan-Lardeau River valley bottom and in that process restore habitat for over a dozen species listed At Risk and a myriad of additional species that depend on wetlands. A beaver inventory in 2020 indicated a decline of over 50% compared to 2010 and in that time period wetland habitat quality has also declined along the waterways once occupied by beavers. Since 2021, we have been investigating a range of potential habitat enhancement/restoration measures and this continues, but observations suggest direct augmentation of the beaver population would also be beneficial and would likely be the most effective restoration measure of all.

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B. Key Expected Results and Management Implications:

Beavers are well-recognized as "wetland engineers" and as a keystone species upon which a long list of other species depends. In recent years beaver works such as dams and ponds have been recognized as key elements in mitigating the impacts of climate change. If our relocated beavers establish successfully, and especially if the older offspring disperse and also establish successfully in Fall 2023, we expect to see significant areas of improved marsh wetland on the lower Duncan River floodplain over the next few years. From a practical management standpoint, beavers are the most economical habitat stewards for wetland-dependant species that government/society is trying to maintain in the face of climate change.

6. CCAC Invasiveness Category: (see Appendix A)

A ___ B ___ C X D ___

7. Species and Number of Animals Required: (include justification of animal numbers predicted to be captured/handled). If exact numbers are not known, please provide a reasonable order of magnitude based on your professional assessment of habitat, location, species etc. – for example, under 10, 100s or 1000s. For multi-species and multi-year projects, indicate expected numbers for each species and each year of the project.

Species (both standard common and Latin names preferred): American beaver (*Castor canadensis*)

Number expected for 2021 to 2021: We expect to capture and relocate a minimum of 4 to 6 beavers and a maximum 8 beavers.

Justification for numbers:

- We wish to catch all members of the family group to keep the colony together.
- Any beavers that would be left behind would likely be killed.

8. Details of Capture, Handling and Surgical Procedures and Final Disposition: (Be detailed and SPECIFIC. It is not sufficient to just refer to a particular protocol (e.g., RISC protocol). **Please refer to Appendix B – CCAC guidelines on the care and use of wildlife (2003) and other documents such as AVMA Guidelines for Euthanasia of Animals (2013) for appropriate and humane techniques and guidelines for handling and care.**

Capture Technique: Please give details of capture techniques used as well as reference to standards or reference researchers who have previously used the technique. If traps are to be used please specify the type of traps, how long the traps are to be set, modifications made for the target species and the interval they will be checked.

A total of 5 Koro and Comstock traps will be set at once to maximize chances of trapping the entire family group. He will use Castor (a beaver secretion used to mark territory) for bait which typically draws beavers selectively. If another species is found in the trap, it will be released on site immediately. The traps will be set near the edge of the water on drag trails. They will be checked at dawn and dusk from a distance. Both "Koro" and Comstock" beaver traps have been used for many years successfully; details are readily available on-line..

Methods for Handling:**Transport**

As soon as a beaver is found in a trap, the trap will be covered with an opaque cloth and gently carried to the transport vehicle. The trap containing the beaver will be weighted using a hanging scale. The weight

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of the crate will later be subtracted from the total weight to determine the approximate weight of the beaver. The beaver will passively be transferred from the trap to a large metal crate (cage) suitable for beavers. The transfer crate will be secured in the bed of a pick-up truck with a canopy or a van. Temperature within the truck bed or van will never exceed 20°C. The beaver will be immediately driven to the holding enclosure. The transport crate will be placed within the enclosure, and the beaver will be left alone to exit the crate into the enclosure on its own. The transport crate will be left in the enclosure and will become the beavers' den.

Holding Enclosure

The holding enclosure is located near the Ministry of Forest Meadow Creek Spawning Channel. The holding enclosure is a 12 X 14 roofed open-air building that will be extended to double the size before the beavers arrive in early July. It contains a 4' deep pool and includes a metal dig barrier. The enclosure will be surrounded by a 5-strand 20-volt electric fence to protect the beavers from grizzly bears and other predators. Logs and mud will be supplied as enrichment. One of the transport crates will remain in the enclosure as a 'den' and we will surround it with hay or straw bales.

Health Assessment

During the quarantine period, juvenile and adult beavers will undergo general anesthesia to allow for a physical examination and the collection of biological samples. If any kits are captured, they will not be anesthetized or sampled. Beavers will be immobilized by intramuscularly hand injection of BAM II (butorphanol tartrate 27.3 mg/ml, azaperone tartrate 9.1 mg/ml and medetomidine hydrochloride 10.9 mg/ml; Chiron Compounding Pharmacy Inc.) with supplemental ketamine as needed. Supplemental oxygen will be provided via facemask at a flow rate of 200 mL/kg/min and eye lubricant will be applied to both eyes. Vital parameters will be monitored using visual assessment of chest movements (respiratory rate), a stethoscope (heart rate), a rectal thermometer (rectal body temperature), and a pulse oximeter (heart rate, oxygen saturation). Animal will undergo a thorough physical examination before being positioned in dorsal recumbency to ease sexing as well as the collection of blood and feces. Each animal is assigned a unique animal Wildlife Health ID #. Animals will be sexed based on the color, viscosity and smell of the manually-expressed anal gland secretion (male: thick, brown, diesel smell; female: runny, creamy tan, cheese smell). Palpation of a baculum (os penis) will further confirm male sex. A maximum of 3.0 mL of venous blood will be collected from the ventral bypass vein or the segmental arteries and veins in the tail (EDTA tube: 0.5ml, serum tube: 2.5ml). A fecal sample will be collected directly from the cloaca when available. Body condition will be assessed on a scale of 0 (emaciated) to 5 (excellent). Animals will be weighed using a hanging scale and a weight bag. They will subjectively be classified as juvenile or adult based on body size (juvenile < 11–14 kg < adult). They will then be placed in sternal recumbency in a large dog kennel with straw where they will recover from anesthesia following the intramuscular administration of atipamezole (25 mg/ml, 5 mg of atipamezole per milligram of medetomidine) and naltrexone (50 mg/ml, Chiron Compounding Pharmacy Inc.; 1 mg of naltrexone per milligram of butorphanol). They will be returned to their enclosure once they are fully awake. The pool will be covered with a sheet of plywood or drained for a few hours to ensure no animal inadvertently drown in the hours following recovery. All data will be recorded on a data form developed for this project.

The serum tubes will be centrifuged within 8 h of collection. The serum will be frozen at -20°C and the fecal samples and whole blood tubes will be refrigerated at 4°C until transport to the laboratory.

Biological samples will be tested to assess the health of the animals as well as characterize the zoonotic risk associated with handling them. Whole blood will be submitted for a complete blood count with differential. Serum will be submitted for a chemistry panel as well as be screened for *Francisella tularensis*. Fecal samples will be tested for helminth eggs, coccidia, *Cryptosporidium* spp. and *Giardia* spp. cysts.

Biosecurity Procedures

Biosecurity protocols will be in place to minimize the risk of disease transmission between beavers and people. No domestic animals are permitted access and visitation will be limited to prevent disturbance.

- Controlled access
 - Access into the holding enclosure is restricted to project team, veterinarian and select

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- o visitors.
 - o All staff and visitors must follow all quarantine procedures.
- Personal protective equipment: Staff will wear disposable gloves, a disposable facemask and dedicated coveralls and boots whenever entering the holding enclosure or handling beavers.
- Footbath: A footbath using Virkon® (broad-spectrum disinfectant with virucidal, bactericidal and fungicidal activity) will be maintained outside the enclosure. The footbath will be changed at least 2-3 times a week, more frequently if they have accumulated dirt and organic material.
- Cleanliness: The pool will be drained as needed to maintain high water quality. Feces will be spot cleaned. The pool will be drained and disinfected after the animals are released.

Daily Routine

Beavers will be observed by staff a minimum of twice daily (morning and evening).

- Animal observations
 - o Each animal will be observed at least twice per day to assess demeanor, whether they are feeding, behaving normally or showing signs of stress and to confirm they are uninjured
 - o All observations will be recorded in Daily Animal Observation Log
- Daily enclosure maintenance
 - o The pool will be cleaned and the water refreshed every 2nd or 3rd day; more often if needed
 - o The electric fence voltage will be checked twice daily
- Feeding
 - o Beavers will be fed cottonwood, aspen, willow and other browse *ad libitum* as well as a small amount of low-starch garden vegetables (e.g., kale) and commercial pelleted diet suitable for beavers (e.g., Mazuri Wild Herbivore).
 - o Beaver will drink water from the pool and water bowls. Animals will be fed at dusk.
 - o Browse will be stored near the holding enclosure while vegetables and the pelleted diet will be stored off site.
 - o Vegetable will be thoroughly clean with clean water prior to feeding.

Veterinary Care

On-site staff will inform the project veterinary of any health concerns. Video recording and photos are a valuable tool for communicating potential issues to veterinarians and should be obtained as soon as possible upon discovery of any concerns.

Any mortalities will be documented. Deceased animals will be necropsied by the project veterinarian. Carcasses may be stored frozen whole if a necropsy is not immediately possible.

Release

The beavers will be maintained in quarantine in the holding enclosure until laboratory results confirm animals are healthy enough to be translocated. Once cleared from quarantine, animals will be trapped in their den/transport crate and moved to the release site following the same transport protocol as detailed above. Animals will be released at edge of the water in an area where food supply is abundant. An interim shelter and additional browse will be provided at the release site to help the animals acclimate to the release sites.

Released animals will be monitored following release using trail cameras and daytime reconnaissance.

Other Procedures: (Marking method, Sampling)

N/A

Chemical Restraint, Analgesics or other Pharmaceutical Agents used: (Drug names should be included with doses and volumes planned):

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Animals will be anesthetized using 0.65 mg/kg butorphanol, 0.22 mg/kg azaperone, and 0.26 mg/kg medetomidine intramuscular (which translated to 0.024 mL of BAM per kilogram of beaver), with supplemental 2 mg/kg ketamine as needed. Anesthesia will be reversed with intramuscular atipamezole at a dose of approximately 5 mg of atipamezole per milligram of medetomidine, and naltrexone at a dose of approximately 1 mg of naltrexone per milligram of butorphanol.

Weight (kg)	BAM II* dosage (ml/kg)	BAM (ml)	Ketamine dosage (mg/ml)	Ketamine (100 mg/ml) (ml)	Atipamezole (25 mg/ml) (ml)	Naltrexone (50 mg/ml) (ml)	Route
10	0.024	0.24	2	0.20	0.52	0.13	IM**
15		0.36	2	0.30	0.78	0.20	IM
20		0.48	2	0.39	1.05	0.26	IM

*Mixture of butorphanol tartrate 27.3 mg/ml, azaperone tartrate 9.1 mg/ml and medetomidine hydrochloride 10.9 mg/ml; Chiron Compounding Pharmacy Inc.

**IM: Intramuscular

Contingency Plan: (What training, preparations and equipment are available in event of animal injury during capture or handling). A contingency plan is mandatory because accidents are not predictable. Describe what preplanning, resources and contacts are available in the event of accidental animal injury during capture and handling.

In the event of a serious injury, the beaver will be taken to the local veterinary clinic (Dr. Pat Haegedorn) The project veterinarian will be contacted by phone to either advise or attend.

We will have additional supplies needed in case of emergencies, to include:

- Large dog kennel with straw bedding for beaver transport
- Coolers and frozen water bottles for transporting samples

Method of Euthanasia and Disposal Technique: (All projects must be prepared to humanely euthanize animals with an appropriate technique). Euthanized animals should be submitted to a museum collection, unless damaged beyond usefulness for archival purposes or other logistical constraints. If not retained for archival purposes, animals should be disposed of appropriately to avoid environmental contamination or other unintended consequences. See [Canadian Council on Animal Care guidelines](#) or [AVMA Guidelines for the Euthanasia of Animals \(2013\)](#) for appropriate species specific methods.

In the unlikely event that an animal suffers an injury or a medical condition that likely warrants euthanasia, it would be brought to the local veterinary clinic (Dr. Pat Haegedorn) for further assessment. The decision to euthanize the animal would be made in consultation with the project veterinarian. The beaver would be sedated and then euthanized using an intravenous/intracardiac euthanasia solution (i.e., sodium pentobarbital). The carcass would be either incinerated or deeply buried to prevent secondary poisoning of scavenging wildlife.

9. Details of Potentially Controversial Procedures and Justification: (Include any expected morbidity and methods used to avoid)

A risk assessment established that the risks associated with this project are acceptable:

- Risk to source populations: Removing individuals for translocation will not endanger the source population. If these animals weren't translocated, they would likely be lethally trapped to mitigate an ongoing human-beaver conflict.
- Risk to translocated individuals: The beavers will undergo stress during the translocation. However, several precautions (as detailed above) will be undertaken to maximize their welfare throughout the translocation. The main risk associated with beaver translocation is generally linked to the suitability of the recipient habitat and their post-release survival. In this project, the recipient site is considered suitable since it 1) is within indigenous range, 2) its climate will be

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suitable for the foreseeable future, 3) it meets biotic and abiotic needs of all beaver life stages, and 4) is relatively proximal to the donor site.

- Ecological risk: The translocated beavers are expected to have many positive impacts on habitat and other species. They are not expected to have any undesirable impacts.
- Disease risk: The risk of pathogen introduction to the recipient habitat will be assessed and mitigated through the quarantine process.
- Socio-economic risks: The beavers will be released in a site where there are no socio-economic concerns.

10. Budget:

Funding sources applied for:

- Project in process f(2022 MOF Contract # 6103058-001. New: WO24NLEO23 with additional funding in place through the KLLCF and ECCC

Are these peer reviewed? YES

Status: APPROVED

11. Region:

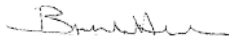
Identify the study area(s) in general and specific terms: (e.g. Region #, land status). Please attach maps if appropriate. For salvage permits, include maps indicating source and release sites.

Region 4, West Kootenay, Crown Land near private land on Goose Creek Castlegar and Crown land on the Duncan-Lardeau delta.

12. Permit:

Please send the completed BC Animal Care Form Application Form to FrontCounter BC along with a General Permit Application and permit fees (if applicable). For further information on how to apply, please visit the FrontCounter BC website at <http://www.frontcounterbc.gov.bc.ca/guides/fish-wildlife/general-permit/overview/>

Approval of an Animal Care Application does not constitute approval of any application to handle wildlife. Applicants must also have a valid permit, issued under the *Wildlife Act*, before engaging in any such activity.



Principal Investigator's

April 4, 2023

Signature Date of Application

Please ensure you save this document to your desktop to upload with your General Wildlife Application. Direct any comments about this form to FrontCounterBC@gov.bc.ca

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On May 10, 2023, at 1:34 PM, Walburger, Kenric FOR:EX

<Ken.Walburger@gov.bc.ca> wrote:

Hello Brenda,

Regional wildlife staff mentioned that there has been some local opposition to the Pass Creek beaver translocation project. I still support proceeding with the translocation, considering there are risks with private land flooding and property damage if no action is taken. Both your Wildlife Act permit and Animal Care Application have been approved so you are fully authorized to carry out this project.

Thank you,

Ken

Kenric Walburger, PhD PAg
Resource Manager, Stewardship
Ministry of Forests

205 Industrial Road G
Cranbrook, British Columbia V1C 7G5
Phone: (250) 420-6371
Cell: (250) 420-1786
Email: Ken.Walburger@gov.bc.ca

APPENDIX 2 - PHOTOGRAPHS



Preparing the quarantine hut. Wire under ~ 50 cm dirt and up the walls



Beavers in quarantine hut



Carrying the beavers to their new home



Releasing the beavers from the traps



Beaver released and free

APPENDIX B

Annual records of beaver activities along Argenta Slough 2023-2025

B-1

Beaver activities along the Argenta Slough Aug 2023-Mar 2025 with related notes on water levels and management challenges

2023

In July-August 2023, three 3 beavers were live-trapped in the Castlegar area and released on the Duncan Lardeau floodplain after a quarantine period and veterinary checks: a mated pair and their juvenile female offspring. An account of the 2023 beaver translocation process can be found in Appendix A. The account below starts with the release of the beavers.

The Site numbers in the text refer to locations on Figure ASBeav1

August 18 2023. Three beavers release at Site 2. The beavers swam rapidly downstream upon release to get away from us, though we left the site immediately.

August 19 ~ 26: the beavers explored the length of the slough south to Carter Creek (2) and north to (3) as evidenced by over 6 scent mounds and tracks.

Late August/early September: the beavers settled around Site 3 and constructed a dam (actually rebuilt a beaver dam remnant from the 1980s).

By September 14 the dam was holding back over 50 cm over water (Photo xx)

By September 30 the dam was holding back over 1 meter of water, which it successfully held through the low inflow (river) period in early October. (Photo xx) The deep pool created (restored) behind this dam is a key (critical) over-wintering site for Western Painted Turtles.

On November XX there was human damage done to the main dam. It was repaired immediately, but it was subsequently damaged again (and repaired) CHECK ON THIS after which the beavers moved upstream to (4).¹ as indicated by a sudden burst of activity at 4 and a cessation of activity at 3. At 4 they created a very large food cache, repaired an existing beaver dam that had fallen into disrepair and spent December through March in a bank den in old silt structure of unknown (human) origin. See photos ##

2024

In April through early June 2024, the beaver's shifted their primary activity back downstream. They rebuilt the dams at Site 3/3a and started a dam at the release site. During this period,

beaver activities and spring water supply were serving to expand the ponds and wetlands all along the Argenta slough, mostly noticeably around the 'turtle pond' and the bulrush wetland beside the WPT nest site. Counts of Painted turtles loafing on logs in the pond were at a ten - year high of 32 (A positive response to beaver activity?).

By the end of June, inflows to the slough had dropped, temperatures were rising, rainfall was scant and pond levels began to drop. Around this time, the beavers became increasingly active just south of the access road known as 'the Causeway' (5) where they built a dam entirely out of cattail (6) with an apparent interest in the tall wooded bank to the east of 6 as a potential lodge-den site suggested by dredging activities. The cattail dam expanded wetlands and pondage around the 'causeway'. The beavers showed no indication of dam-building under the bridge itself in 2024.

Through July and August, the beavers worked on an impressively large, stick dam at Site 7 , XXXXX metres south of the causeway. After the increase in discharge from Duncan Dam Aug 1 (and subsequent increase in subsurface flow to Argenta slough) this dam succeeded in flooding a sizable area (Figure XXX) upstream from the dam.

The flooding combined with dredging by beavers resulted in a deep pool at 6 next to the bank of interest and, by late August/ear/y September XX a very large, lodge -den had begun there. The flooding as;p facilitate harvesting the many choice Aspen and Cottonwood sapling available on both west and east edges of the Argenta Slough.

between 6 and 7

For two months, August and September, the river discharge was much higher than it had been all year, at 200m³/s. During the August-September period, water levels throughout the length of the slough upstream from Site 4 gradually rose, and by the end of September the wetland area in the mid and upper portion of Argenta Slough had roughly doubled as compared to its extent in Sept 2023.

In the first two weeks of October the river discharge dropped to around 50 m³ / s, as has been the normal pattern below Duncan Dam since 2008. The beavers responded by vigorously blocking all sources of water outflow from their dams and by building a new assistance dam, ~ 20 metres below the large stick dam stick dam at 7. The assistance dam was made largely of fine materials (small willow, grass sods X with mud and very effectively blocked all remaining water at that point. As a result of these efforts - impressively - water levels on the mid and upper Argenta Slough remained nearly constant in spite of the exceedingly low inflows. The 'turtle

pond' complex to the south suffered, however. While the Site 3 area (' behind channel) held water, the pond beside the Argenta road was largely dewatered for a 2-week period. . As inflows to the Argenta Slough gradually increased over November and December, the flooded area created by the beavers expanded and the turtle pond to the south filled to pre-October level. By mid-November, the beaver's lodge was well armored with mud and sticks, and a sizable food cache had been accumulated in the water beside the lodge. From late December through February 2025 the river discharge/level rose and water levels on the slough rose even further. The beavers appeared to remain in their winter den during these weeks, but their works held a good percentage of the water while also letting good volumes through to the lower slough. The dam at Site 3 is being maintained. In late November, the beaver stopped maintaining the dam at 4, which let more water through and further extended the flooding levels between 4 there and 7 most notably alongside the South Meadow at Lake Ranch.

DISCUSSION

In late 2023, the beaver's first Fall, human interference was the greatest (or most obvious) threat to their establishment on the slough. Their first main dam was damaged right before winter by a person using the "causeway (5) who felt the beavers were responsible for problems at the causeway. This evidently influenced the behaviour of the beavers, in that they moved upstream to 4 after that incident. Predators have not likely been a factor in 2024 or 2025, as cougars, wolves and black bear numbers appear low.

2024 was a challenging year from a hydrological standpoint, as both ground water and surface water bodies were exceptionally low during the late spring and summer months when they are normally high. Several of the smaller wetlands on the floodplain dried up completely to an extent not previously observed by BH.

The role of beavers in securing refugia of wetted pools through drought periods was well-illustrated in both July and early October of 2024, as was their general mastery of conserving and regulating water. They constantly fine-tuned their dam construction according to water supply. The extent to which flooded areas expanded behind their dams between 7 and 4 has been impressive. Much of the flooded area is occupied by Reed Canary-grass which, it is

hoped, will give way to native sedges, rushes and willows if water levels remain as they are now or higher, and this would be a tremendously beneficial change.

Clearly, the beavers themselves will decide where to construct their dams, and it may not align with the human vision - at least not initially. It is realistically possible, however, that if beavers are allowed to continue living and working along Argenta Slough they will gradually expand their operations southward and in a few years could potentially have dams built the whole length of the slough to near Kootenay Lake, as was the case in the late 1980s. If this were to occur, the wetland area along Argenta Slough would at least double in extent, benefiting WPTs, GBHE BUBOs and so many other species.

Water supply will be a critical factor in determining the capacity for wetland development by beavers along Argenta Slough and throughout the floodplain however, and thus any consideration of beavers and wetland enhancement on the Duncan-Lardeau floodplain needs to take into account the operations of the lower Duncan River and Kootenay Lake as well as the many variables of climate.

Figure 3 below illustrates beaver activity along the slough and Duncan River discharge levels as a proxy for Inputs along with rough water level measurements at two locations on Argenta Slough, below and above the large stick dam at Site 7 (4 and 8).

B-2

Activities of re-established beavers along Argenta Slough 2024-2025

Introduction

In August 2023, 3 beavers were released on lower Argenta Slough - a mated pair and their juvenile female offspring - as part of an effort to augment a declining Duncan-Lardeau beaver population and to restore wetland habitat conditions. The Argenta Slough was selected for restoration due to its unique hydrology, its present need for wetland habitat 'rescue' and its historic use by beavers but absence in 2023.

The released beavers established successfully and remained active along Argenta Slough through the 2023 and 2024, as reported in two previous reports.

Chronology 2025: Beaver activities and water levels

See Figure 4.1 for locations referred to below

The beavers continued to be active throughout 2025 along the length of Argenta Slough north of Carter Creek. Most of their activities (dams, canals, dredging, cutting and lodge-building) have taken place in the 'mid' portion of the slough, as reported from 2024.

After spending the '24-'25 winter in a substantial lodge-den supported by an unusually large food cache (labeled on Figure 4.1) there were indications in late May and early June that new beaver kits had been born in the den.

On June 11, the situation was suddenly disrupted as the water levels dropped by at least 1 metre due to human damage to the main stick dam. The beavers began to repair the break within 3 days. The repairs appeared to provide water sufficient depth for their continued occupation of the lodge and continued activity in the same section of the slough through the remainder of June and July, however water levels did not return to the pre--damage height over June and July, as the June-July inflow to the slough was unseasonably low. (The slough is fed via a subsurface channel that is strongly influenced by the river level). It is not known whether the beavers moved the kits at any point in this period, but there was no clear sign that this occurred (Ditto: no sign of direct harm to the beavers but can't rule out).

At the beginning of August, inflows to the slough rose considerably in response to the scheduled release from Duncan Dam. The beavers kept up with maintaining the dams and all pond levels along the slough's length rose. On August 12, however, another hole was blown in the main stick dam releasing ~ 1 m of depth again. This time, it was a larger hole (blown with stump remover?) and after this event, the beavers did not repair the stick dam for over a week, and for over a week after that it was only a partial repair. They renewed their activities downstream from the turtle pond during the remainder of August and early September, building up and repairing dams, dredging the pond at the original release site and gathering a food cache, sourced from a stand of sapling cottonwood. Observations during late August and September (when inflows to the slough were relatively high suggested the beavers might spend the winter below the old turtle pond. However, in early October, when the river (subsurface) inflow dropped to near nil (<50m³/s) for over 2 weeks, the beavers rapidly moved back upstream, as there was insufficient water for winter security in the downstream slough section. Through October and November, they repaired the stick dam, repaired the lodge (which had also been damaged by humans), dug canals and cut sapling cottonwoods for their food cache.

In summary, since their release in August 2023, the beavers have constructed and/or re-constructed a total of 7 dams (albeit some of these were temporary dams built to aid construction on the main dams). At present (Jan 2026) they are maintaining 4 dams, and 2 of the older dams others still function to form ponds without maintenance. The extent of the wetland area along the mid and upper portion of the Argenta slough has roughly tripled since the arrival of the beavers.

The observed ability of the beaver dams to hold water levels and maintain ponds in times of drought/low inflow has been impressive. As well as being vital to the beavers' own survival, this ability serves to provide critical short-term habitat refugia for obligate aquatic species such as Painted turtles as well as vital long-term climate refugia for a diversity of species in the landscape.

There are a roughly estimated 4 beavers on the slough including young and 1 to 2 beavers at on the river bend /Carter marsh complex# 9 on Inventory map Figure 2, one of which

could be the dispersed female beaver that was a 1-yr old juvenile in 2023. There has been new sign of beaver activity at that location since fall 2024.

Discussion

The actions of the beavers along Argenta Slough over the past 2.5 years have further substantiated their reputation as wetland engineers! It is apparent that their works have the potential to efficiently restore species-rich, productive wetland habitat conditions, conceivably delivering this benefit to the entire length of the slough to Kootenay Lake, over time.

There are, however, a number of significant constraints on the potential for beaver and wetland development along Argenta slough in addition to background climatic factors. The two primary constraints in evidence during the course of this study have been (and are):

A. The seasonal flow regime of the lower Duncan River: suppressed spring freshet and drought in early summer, abrupt low in early October and very high-velocity peak flows in mid winter

The problems for beavers and wetlands associated with operations of Duncan Dam and Kootenay Lake have been discussed to some extent with a technical committee involved in the CRT /negotiations and material provided in 2024. This process was put on hold, but potentially these or similar discussions will resume in the future. See Section 8.0 for more.

And

B. Intentional and direct harm by humans to beaver works and structures (unauthorized): dam breakage and lodge breakage X 2 in 2023-4 and X2 in 2025

As noted in the chronology, there were two instances of damage to the main beaver dam in 2025; both undertaken by un authorized residents of the Wasden property and both ostensibly due to annoyance about beaver-flooding of their bridge and road access. In seeking a long term solution to this kind of conflict, several phone conversations were held with the land owner about the possibility of an agreement allowing for some extent of flooding by beavers on his property in exchange for assistance from NTBC/MWLRS or ? with access or other needs related to beaver impacts, including a gate. A rough proposed draft of such an agreement is (will be) included in Section 8.0 Unfortunately, Tom Wasden lives in California and has not yet made a visit up to further discuss the idea or look at the situation. The present residents of the property are difficult to deal with and have no authority.

In August, one of the residents constructed a new (unauthorized) bridge over top of the old bridge across the slough. The new bridge will likely reduce reasons for resident/users to have problems with beaver-flooding of the bridge itself; however the roadway west of the bridge gets very wet in high water (or rainy) conditions and will likely continue to be seen as a beaver- exacerbated problem. Placing crush or other material to elevate that stretch of road might be one example of a measure that could be undertaken under the above-mentioned agreement.

Recommendations for 2026 and beyond

It is recommended that the following measures be considered for addressing the threats and deficiencies that limit beavers and wetland development along Argenta Slough

1. Work with Columbia River Treaty technical groups (and BC Hydro), as opportunities arise, towards instituting a more natural annual hydrograph for the Duncan River that avoids the June-July drought, the extreme sudden low in early October and the extreme high in mid winter for the benefit of the entire DL floodplain.
2. Develop an agreement with the landowner adjacent to Argenta Slough (Tom Wasden) that will allow beavers to develop wetlands in the low-lying zone along Argenta Slough free of human interference. To be effective, such agreements will need to meet the needs of the landowners and there will need to be communication with residents as well as landowners, when the two are not the same. This will also need to involve exerting conservation management authority over the Crown-owned riparian lands on the Duncan-Lardeau delta and along the river, including lands designated under 'Goals 2' (KBLUP).
3. Continue to improve the "Hamill Ditch" supplementary water supply to Argenta Slough, as needed. In 2024 a small project 'Hamill Ditch' was undertaken in hopes that it might moderate the extreme lows experienced along Argenta Slough in recent years. This involved cleaning out an old irrigation ditch capable of bringing water to the upper end of Argenta Slough from Hamill Creek and installing new culverts were crossed by driveways. In March of 2026 there were improvements made at the intake and all along the ditch that will facilitate the ditch carrying a greater flow volume, so we are hopeful that it will make a positive difference when the Duncan discharge on the DRL gauge is

less than 50m³/s in early October and when it is 100? m³/s or less in hot June-July summer periods.

Note: The pond leveler was not installed in 2025 due to the 2 dam disruptions, but we do have an 8 "20 ft metal culvert. We aim to both supplement water supply and install culvert.



APPENDIX C
Beaver Colony Inventory 2025-2026: Duncan Dam to Kootenay Lake

APPENDIX C

Beaver Colony Inventory 2025-2026: Duncan Dam to Kootenay Lake

Introduction

The beaver inventory of 2025-26 marks the third formal count of beaver colonies along the Duncan-Lardeau floodplain between Duncan Dam and Kootenay Lake. In 2010-11, the total number of colonies in the same area was 12 and the majority of these were large, very active colonies (Herbison 2011; Herbison and Rood 2014). In 2020, the numbers were significantly lower: 6 colonies and the majority of these appeared to be small with low or intermittent levels of activity (Herbison 2020). For additional background on Duncan-Lardeau beavers see Section 8.0 and Appendix 8.0.

Methods

Methods of investigation in 2025-26 were consistent with those applied in 2010-11 and 2020: searches along the banks/edges of water bodies for winter food caches and 'lodge-dens' (Most DL beavers combine a bank den with extensive outside armor of wood, mud, etc. resembling a lodge.) Each lodge/winter food cache was considered to represent one colony. Food caches/dens are normally accompanied by cutting, canalling, dredging and damming as well as scent mounds that mark territory perimeters.

In 2010-11 and 2020, rafts and canoes were used along with on-foot/wader surveys to search for colonies. Searches in 2025 have been largely on foot and using chest waders.

Results

The results of the 2025-26 survey are summarized in Table A3-1 and Figure A3-1.

Table C1 2025-2026 beaver colony inventory Duncan Dam to Kootenay Lake

ID	Location description	Details - Records from 2025-2026
1	Complex near dam	Likely occupied in 2025-6. A long-term beaver complex, confirmed to be occupied in 2010, 202 and 2024. Will revisit to confirm/refute in early 2026.
2	'Site 1A' and east side	Confirmed '25-26. Used in conjunction with side channel to the south and likely also in conjunction with the complex across the river (2i) <i>See Site 1A Section 3.0 in January file.</i>
3	Meadow Creek and Back Channel	Confirmed 2025-26 and earlier Intensive beaver activity in near confluence of Meadow Creek and east-west 'back channels', upstream and downstream (see below).
4	Lower Meadow Creek	Colony in area though did not locate main den. Look again Fall 2026
5	River islands	No confirmed presence amongst these islands and complex to the west since 2010-11.
6	Old meander off Lot 570	Beavers present - long established network of canals
7	H Islands complex	1 + colony confirmed in 2025. Extensive canals inland utilized at higher river levels; winter lodge-den near main river channel. In 2023-4 there were 2 colonies in this complex.
8	Argenta Slough	<i>1 colony, re-established - See full reports elsewhere</i>
9	River Bend	Small number; 1 or 2 beavers. Food cache and lodge effort on main river bank, but tucked into small channel that flows in from Argenta Slough. They have excavated the small channel and are using it to access wetlands inland to southeast.
10	West channel / Site 2A	Confirmed '25-26. New lodge on large side channel at bank height. These beavers have been cutting willow and some alder in the 2A area over the 2025 year. <i>See 2 A report Section 3.0</i>

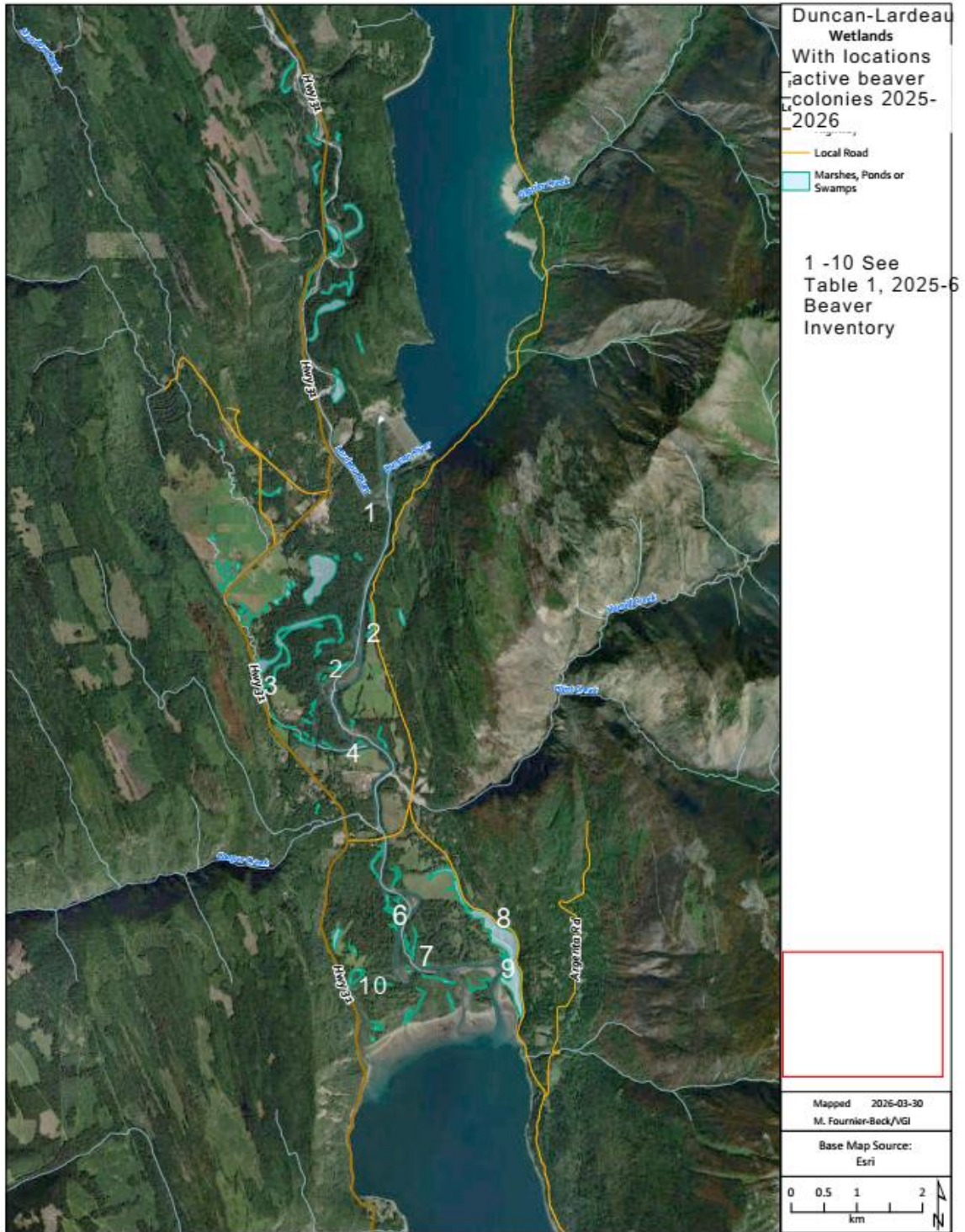


Figure C1. Beaver colony locations 2025-2026 in Duncan-Lardeau floodplain.