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# Lower Columbia Ecological Conservation Knowledge Report

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Report prepared for the Okanagan Nation Alliance, Project Lead:
***Lower Columbia Rare Species & Ecosystem Enhancement Project***

## Abstract

Before developing prescriptions for habitat enhancement and ecological restoration sites under the *Lower Columbia Rare Species & Ecosystem Enhancement Project*, it is imperative to understand what are historical wildlife patterns, and what conservation actions have been taken in the past. Before the mid-1990s, conservation actions in the lower Columbia River basin region were led, on a community level, by local sportspeople and outdoor enthusiasts. Using a semi- structured interview format, this study explores the understanding and memory of these local "experts" on what can be termed local conservation knowledge. Results of the interviews are compiled into a themed narrative, supported by maps created to illustrate information from respondents. Thus, this report provides an overview of historical conservation efforts, which can be a valuable background document to guide future restoration work in the Lower Columbia River region of British Columbia.

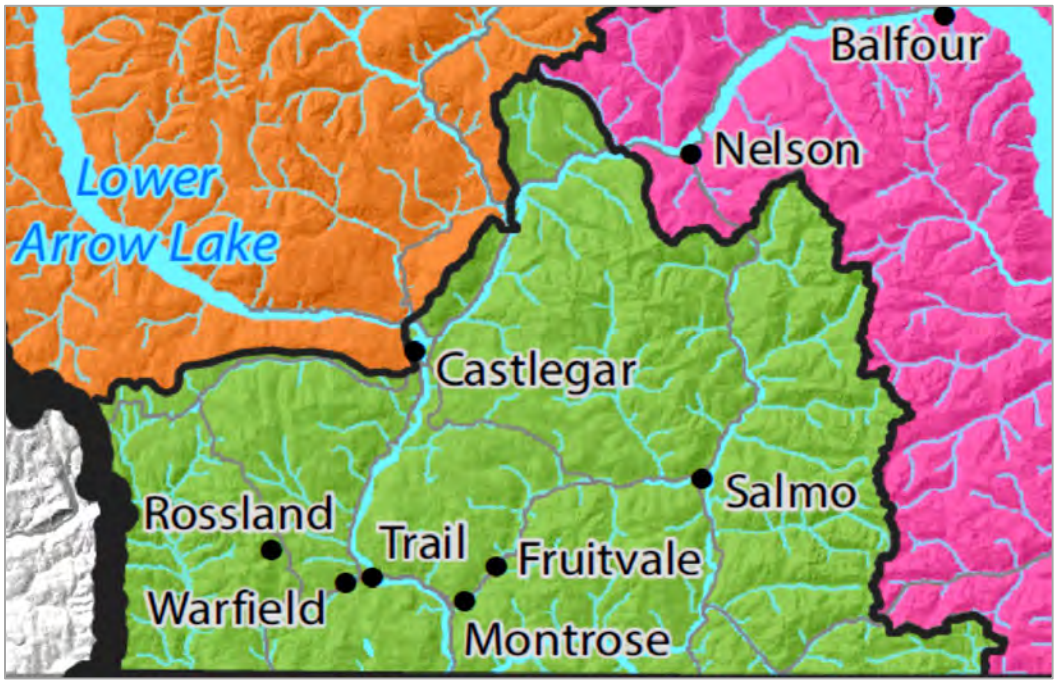


Figure 1. The overall project area of the *Lower Columbia Rare Species & Ecosystem Enhancement Project* (in green); lower edge is the U.S. border.

## 1. Introduction

The *Lower Columbia Rare Species & Ecosystem Enhancement Project* is a five- year program being led by the Okanagan Nation Alliance (ONA) Natural Resources department, in close partnership with the Trail Wildlife Association (TWA) and FLNRORD (BC Government wildlife management branch). The project focuses on ecological restoration and species inventories of rare and threatened ecosystems (SARA listed) and wildlife species. Target ecosystem types for restoration include *riparian areas* (containing cottonwood stands), *dry fire-maintained forests*, and open *brushlands* across multiple locations in the Lower Columbia sub- region (Figure 1, green area of map). An additional objective of the project is to develop strategic partnerships and establish a network for collaboration and coordination of future stewardship activities in the region, including with local communities, conservation groups, government agencies, academic institutions, and industry.

To develop treatment plans for habitat enhancement and ecological restoration work, more must be known about past conservation work, animal transplants, migration corridors, and historical game counts. Past government-driven studies and conservation projects in the area are generally well documented, although the reports are not always easy to find. Additionally, local sportspeople, especially TWA members, engaged in club-driven projects to support ungulate populations in the lower Columbia and Pend d'Oreille valleys for the past 50 years.

The present study specifically explores the local conservation knowledge of non-indigenous hunters and fishers, whom we refer to here as local sportspeople. Using a semi-structured interview format with these sportspeople, this study seeks to learn about past community-driven conservation projects in terms of: what the project objectives were, where they were implemented, how successful they were, and whether documentation of them exists. Further, this study seeks to learn about past and current population trends, observations, and animal movement patterns.

The underlying premise for this study approach is that hunters and fishers, whether Indigenous or non-indigenous, have an intimate relationship with, and knowledge of the ecosystems in which they operate. Local conservation knowledge is demonstrated in local people's place-based, empirical knowledge from observation over their lifetimes, of species abundance and distribution, and how the environment was used by both humans and animals during that period (Berkes 1999; Bélisle, Asselin, LeBlanc, & Gauthier 2018). Following Berkes (1999), indigenous Traditional Ecological Knowledge (TEK) is the cumulative body of knowledge that is handed down across generations through cultural transmission of relationships living things have with each other and with their environment.

To avoid confusion, we choose the term “local conservation knowledge” to describe the local expertise of these non-indigenous hunting and fishing communities. Hunting, fishing, and conservation traditions are passed down among sportspeople, both within families and between people from other communities. Arnett & Southwick (2015) observe that, “modern-day hunters frequently volunteer for participation in wildlife habitat improvement projects, hunter education programs, or wildlife surveys, and engage in other conservation related activities”.

## 2. Methods

### 2.1 Semi-structured interviews

Thirteen semi-structured interviews were held with TWA members as well as other members of the greater sportspeople and conservation community who, in the past, are known to have been involved in conservation work. The semi-structured format uses a set of common questions to steer the interview overall but allows respondents to drive conversations in directions of their own interests, yielding rich depth of information. This common approach in social science work has also been applied in research about ecological knowledge and conservation practices such as by Anadòn *et al*. (2009). The starting questions for this study were developed with input from the ONA (Appendix I).

It is critical to discover who are the local experts in ecosystem knowledge (Davis & Wagner 2003). In the course of each interview, respondents were asked whom else we should be talking to. In this form of snowball sampling, participants of the study help make sure that the right people have been included in the sample. Regrettably, many of the identified "best" people, in terms of held knowledge and their history of mentorship, are no longer alive. A challenge to the study was that Covid-19 protocols precluded any in-person interviews. Instead, the interviews were held by phone. Several potential respondents could not participate at all because of the phone format. Their insights might be added at a future date.

One aim of this study is to map the locations of events, such as animal transplants, controlled burns, etc. The original plan was to ask respondents to "show me" on maps, so that mapping could be more accurate. Because of the phone-only format, however, this approach was not possible. Four maps were generated and shared with respondents online, in which creeks and rivers featured boldly (Appendix II). While some respondents looked at the maps before the interviews, none referred to them during the conversation; their understanding of the landscape is from being a part of the landscape.

Information from participants was used to populate a spreadsheet of actions and issues across the locations in the study area. We collated similar and related statements into topic fields and noted the respondents' identification number. Based on respondent's place-descriptions, and our own intimate knowledge of the project areas, we generated starting geolocations and polygons of areas using Google Earth ProTM. These were then exported to the online Web GISTM for further processing. The outputs are incorporated into this report's findings.

Respondents in this research are promised confidentiality. To that end, information furnished by respondents is referred to only with an interview identification number. Accredited quotes are made with express permission of the sources.

### 2.2. Map-making

Maps within the main pages of this report were produced by Kayla Tillapaugh (ONA), in QGIS® Online software from Esri. The polygon for the greater Fort Shepherd area is based on author-knowledge, current maps of the Fort Shepherd Conservancy, and information from survey respondents. Watershed polygons (Bear Creek, Billy Creek,

Murphy Creek, Blueberry Creek, Stagleap Creek, Syringa Creek, Sullivan Creek, Nine Mile Creek) are derived Freshwater Atlas of Named Watersheds[1]. Mount Heinze is outlined from 1,200 meters and up - polygons are formed to the 1,200-meter contour.

Generally, study areas follow contours or landforms (e.g.: Salmo wetlands, which uses contours and the highway; the sites on the south facing sloped above Pend d'Oreille reservoir, which follow the mountain ridge). Burn areas follow descriptions of past TWA members, avoiding – as much as possible – rock bluffs and otherwise un vegetated areas. Burn sites are shown upslope to the 1,000-meter contour lines; except in some areas such as on the south facing slopes above the Pend d'Oreille River, where they go up to the 1200-meter contour line.

Planting icons are generally placed near creek mouths; bird boxes are placed near waterways/shoreline. Animal and other icons are placed as near as possible to where respondents indicated seeing them. Migration corridors are placed per respondent descriptions, and follow landforms and contours such as valleys, flat areas, and watercourses.

Maps in Appendix II were produced by Karen Trebitz and Al Mallette, on the baseline of Apple/Macintosh's Maps application. Location names were superimposed with text boxes, and stream courses were enhanced by hand.

## 3. Results

### 3.1. West Kootenay sportsmen as local experts

The sportsmen interviewed in this study received their first hunting experiences through mentorship of their elders. A common statement during our conversations was, "I was brought into the club by…, and I was taught to hunt by…" They share deep cultural connections and camaraderie through hunting experiences and their 40 plus years of shared project work (Interview 11). Individual professions were relatively unimportant, except that many of the respondents worked at Teck Metals (previously Cominco). Club members in project work frequently leveraged Teck's capacities and materials. For example, drip torches used for large-scale burning projects were built at Cominco. Much of the plant stock was grown in Cominco's greenhouses. Cominco supplied gates for access control, and especially near Trail, much of the burning activities occurred on Cominco lands and by Cominco's permission.

All but three of the thirteen interviewees are present or recent past members of TWA. The one past member stopped participating only because of health issues. The age range of all interviewees was from 40-88 years old, the youngest of whom is one of the non-TWA members. The majority of respondents joined TWA early in their lives, when they were between 18 and 22 years old, and have remained in the club for the duration. Some, in fact, have been board members for 40 years. This group thus represents a core set of local experts in the community.

[1] https://catalogue.data.gov.bc.ca/dataset/ea63ea04-eab0-4b83-8729- f8a93ac688a1#edc-pow

While the focus questions of the semi-structured interviews were anticipated to take 30 minutes or less, the interviews—in practice—often took more than an hour to complete. Small talk about relatives and local contexts was required to put the subjects at ease. The semi-structured questions usually began by asking when the interviewee joined TWA or began working on conservation issues. Memories of the respondents were organized around experiential narratives (story format), which were place-based and not focused on dates. In the course of the interviews, it was necessary to circle back questions from different angles to ultimately come to relatively complete answers.

The following excerpt about an elk capture-and-transfer project is a particularly vivid example of such an event-recollection: When did this project take place? “I don’t know.” Well, how old were you? “Well, lets see…” After connecting various life events, he concluded that he was “under 50 at the time”. But his vivid memory of the event itself is critical: The elk were captured using a 10-foot high log stockade that the animals were herded into. Unbelievably, the largest bulls escaped the corral by leaping up and clawing and climbing their way over the walls (Interview 07). The level of detail in his description of the event was impressive.

Each person’s recollected narrative is rooted in his or her status within the organization, personal interests in both conservation methods, and more specifically, in the types of hunting engaged in (e.g. ungulates, cougar, wolves, etc.). Personal interests within club activities generally involved extensive time “in the bush”. Activities included supplying support to the animals via feeding stations, planting and burning activities, spawning channel creation and stewardship, or working with government agencies. Yet, these members did not keep extensive personal records. The collective written narrative of the club’s activities appears to be in meeting minutes, which have been kept by the club since it’s founding in 1925. These records are currently stored in the TWA’s clubhouse; digitizing, archiving, and reviewing them is a massive future project.

### 3.2. Conservation activities

In the following sections, we first sketch TWA conservation activities that occurred throughout the target areas on the map (Figure 2). We then discuss the scope of those activities by area and in general time frames. It is important to note—reflecting Anadòn’s (2009) observations—that dates and years of conservation activities were occasionally somewhat vague. Photos within the report were discovered in a carousel of slides bearing the date stamps of 1988, and a box of prints that were mostly unlabeled; no one recalls who did the photography. Respondents were able to identify many of the people on the photos, but with maps to place respondent observations. The maps in Appendix II were provided, via email, to respondents to support visualization of the activities. The lead in this study is himself a current board member of TWA, though not for nearly as long as most of the interviewees. We add, as needed for context, observations from the author’s hands-on experiences in the club’s conservation history, cited in parentheses as: (pers. obs.).


Figure 2. General areas of conservation activities within the Lower Columbia area of the West Kootenay region.

### *3.2.1. Animal transplants*

TWA members instituted collaborative processes resulting in the transplant of elk, Rocky Mountain big horn sheep and mountain goat, relocating to sites within the project area (Interviews 01, 07, & 09). These transplants were for the most part, initiated, implemented, and funded by TWA and other local sportsmen, sometimes over the protest of regional government officials (The nearest goat transplants by other groups appear to have been released on Mt. Thompson at Creston, B.C. in 1978; Hebert et al, 1980). Transplants were designed to provide and or increase hunting opportunities for local hunters. In some cases, such as the elk and big horn sheep, these were new introductions. Mountain goats were endemic, but scarce in the area. Game transplant projects were significant undertakings requiring large amounts of planning, resources, manpower, and expertise.

In the long term, the goat and sheep transplants were not successful in bolstering hunter opportunity. Elk were a different matter, however. This non-native species flourished and currently competes with endemic species, especially in browse-scarce winters (Interview 09). Elk are generalists, able to adapt to different forage regimes afforded even in changing landscapes. Mule deer are specialists. They have particular nutritional requirements that change through the year, which afforded by specific mixes

of landscapes (Hurley 2016). Food resources available in their home range have become limited, mule deer numbers declined. In time, elk have eclipsed mule deer as the principal game animal available to local sportsmen in the West Kootenay (pers. obs.).

The transplanted elk that were sourced from Jasper and Skookumchuk possessed highly valued genetics that produced a lot of "trophy" bulls (Interview 09). The elk were transplanted to Syringa Creek and the Christina Lake region. The first transplanted elk were sighted at Fort Shepherd in 1972 (Interview 05). Other elk wandered into the West Kootenays from the east, over the Kootenay Pass (Interviews 01, 06, & 09). At the time of the introductions in the late 1960s, the Provincial government agreed to allow only a limited entry hunt to maintain strong bull numbers. In about 2000, over the strenuous objections of many clubs, the BC government changed the limited entry rules to an open season. This was the beginning of a mass take of trophy bull elk. At the same time, many hunters additionally took their mule deer tags. Combined, these factors further contributed to the massive decline in ungulate populations (Interviews 06 & 09).

### *3.2.2. Ungulate counts, trapping, collaring, and vaccination*

For many years, TWA members have conducted winter ungulate population surveys using binoculars and spotting scopes from strategic positions throughout the study area. The most recent organized survey for mountain goat occurred in June 2018 (Interview 10). Overall, animal surveys indicate a significant decrease in study area ungulate populations (endemic and transplanted), beginning as a result of two catastrophic winters, and being driven into further decline by changes in hunting rules, land use, and access, especially via off-terrain vehicles (OTV).

Six of the interviewees related that in their early hunting years, mule deer were very abundant. They related that there were so many mule deer in the area that they would shoot the first buck for meat, and spend the rest of the hunting season searching for a quality trophy buck to enter into local big game competition (Interviews 04, 05, 06, 07, 08, & 09). Respondents indicate that records of competition entry results would be a good way to track historical trends in buck sizes and quantities.

There were several "hot" areas for especially mule deer. Interview 04 described the populations Murphy Creek drainage (Figure 3) as follows:

> *01: Murphy Creek was huge. The deer that were up there, was, I can't even explain how many deer…*
> A: Mule deer and whitetails?
> *01: Muleys and whitetail, mostly whitetails, but there was a lot of mule deer up there, ya.*
> A: [remembering] '76 to '78, "deer alley", everybody smoked deer there…]
> *01: Exactly. There was that many, and ah, it's sad, you don't even see any buck go across there anymore.*

Figure 3. Mule deer bucks in the Murphy Creek drainage. Location identified by Interview 01. The left-most animal appears to have an ear-tag.

Interview subjects further recall winter counts of 300-500 mule deer and white tail deer on Fort Shepherd during the 1960s, before the first bad-winter event of 1968-69. Following this deep-freeze and deep-snow winter, there were hundreds of carcasses scattered on the Fort Shepherd benches (Interview 05). The winter of 1996-97 brought extremely deep snows, which also resulted in massive die-offs.

The bellwether of population metrics has been the Fort Shepherd Conservancy, which has been the focus of the most intense survey activities over the years. The most recent wildlife assay, done by glassing from a popular and reliable vantage point on Dec. 18, 2020, yielded a count of only 32 white tailed deer, one bald eagle, one golden eagle and ten wild turkeys (Interview 06). TWA club observations are supported by FLNRORD data: In 1992 the mule deer buck harvest count for the West Kootenay was approximately 1,000 animals. There were only 204 harvested after the killing winter of 1996-97. The numbers continued to drop precipitously, as evidenced by only 82 mule deer bucks harvested in 2013 (Dreger 2015).

> *04: Alphonse, up until about, I want to say, seven, eight years ago roughly, I never used to go out without seeing deer, something up in the bush. The last few years its gotten so bad, that I've gone days on end without seeing a deer or an elk, or whatever […]. It's horrible, no, I mean, it's depressing. It's very depressing to, to hit all the spots I used to hit, and to not see the game, and to see where it's gone now. It's very sad.*

For Fort Shepherd, Interviewee 04 also reported significantly reduced counts:

> *04: Yeah, I know, it's surprising, but that seems to be one of their winter ranges, is obviously the Pend d'Oreille. And Fort Shepherd, I mean, shit, last year, I talked to a bunch of guys. I counted, me and Grant [Grant Conzen] counted thirty or somethin' on our one day. Most of the guys I talked to, that's all they were getting, around thirty. Where we used to [flippin'] count, oh, like two hundred.*

In 1989 and 1998, TWA members, collaborating with Provincial government biologists, trapped and collared a total of 11 mule deer, in an attempt to monitor their annual range (Figure 4). The first trapping resulted in ear tags on the animals, which were visible with field glasses. In 1998, TWA volunteers monitored collared deer with telemetry equipment (Interview 09). An interview subject was also involved in two instances of the collaring cougars suspected of preying on big horn sheep associated with the Kootenay Pass feeder (Interview 01).

Additionally, TWA volunteers have worked with veterinarians to vaccinate populations of bighorn sheep in Kootenay Pass and Syringa Creek areas against *Mannheimia haemolytica* pneumonia, a respiratory disease that is transmitted from domestic sheep and goats, and can be fatal to the bighorns (Interviews 01 & 09).

Figure 4. TWA members with a mule deer at Fort Shepherd, mid- to late-1980s. Interview 01 recalls that only does were captured on this occasion.

Figure 5. TWA members put out a feeding station at Fort Shepherd using an old army truck.

*3.2.3. Feeding stations*

In the midst of a severe winter in 1984-85, TWA members constructed and placed a series of feeding stations at strategic winter range zones throughout the Columbia River and Pend d'Oreille valleys (Figure 5). The feeders were "adopted" by individual members who replenished the feeders with hay, grain, and alfalfa pellets during subsequent "killing" winters. During the winter of 1994, volunteers reportedly fed 250 deer through this method, shuttling hay and feed by boat or carrying it in on pack-frames (Figure 6). The program lapsed as volunteers aged and the trend to supplement with extra feed fell out of favour. The consensus, amongst the interviewees is that this program cushioned the stress—particularly on mule deer—of hard winters, associated also with ever-reduced habitat and increased predator impacts evident during severe weather (Interviews 01, 06, 07, 08, & 09).

Figure 6. TWA members supply hay to adopted feeding stations by various methods, e.g., by boat to Fort Shepherd (left), and packing in on foot near Miral Heights (right).

In the early 1990s a feeding station for Rocky Mountain bighorn sheep was established along the Kootenay Pass, about 10 km. east of Salmo. It is maintained to this day, and replenished by the Trail Wildlife Association and the Nelson Rod and Gun Club. The consensus is that the feeding station has reduced sheep mortality due to road kill. However, poaching and predation, particularly by cougars and bobcats, is winnowing numbers (Interviews 01 & 09). In the winter of 2020-2021, two cougars have been killed in the Kootenay Pass bighorn range area (Interview 01). An added hazard to bighorn sheep comes from the Salmo-Creston highway traffic.

*3.2.4. Planting, brushing, pruning, and fertilizing*

Planting, brushing, and other projects were begun at Fort Shepherd to enhance ungulate habitat after the catastrophic winter of 1968–1969, when persistent freezing temperatures and deep snows led to a massive die off of wintering mule deer. The results of the harsh winter, as described by TWA member Rick Filmore, were truly shocking:

> *"In 68-69, the winter, very cold temperatures and lots of snow…and the deer came down. Now, I wasn't in a position to come, exactly, but…the game warden, Pete Jurich, said there were probably 500 [mule] deer down there. And the poor buggers were on their hind legs chewing juniper and pine trees…that's dire starvation, … the next spring we went down there and there were carcasses all over the place."*

Cattle and horse grazing, utility corridor development, logging, placer mining, and the long-term effects of acid precipitation from Cominco, had degraded the site's carrying capacity. The study area and adjacent lands in the boundary district constituted the most productive mule deer region in British Columbia—possibly in Western North America (Interviews 01 & 12). Fort Shepherd and adjacent bench lands along the Columbia River south into Washington state, as well as the western reach of the Pend d'Oreille Valley, constituted the lynchpin in a regional ecosystem, as these areas constituted essential winter ranges and migration corridors.

Figure 7. A TWA a member gathers scat to replant the seeds contained in it (left). Chainsaws were used to reduce excess deadwood and to stimulate new growth (right).

Beginning in 1969, Cominco (now Teck Metals, Ltd.), in collaboration with TWA, implemented a series of initiatives explicitly intended to reduce mortality from starvation in the likely event of another severe winter. These included planting and brushing (Figure 7), and fertilizing. The various prescriptions developed at Fort Shepherd were eventually implemented at other wintering grounds north along the Columbia River valley and the western end of the Pend d'Oreille River valley. These actions took place mostly between 1970 and 1995 (consensus across interviews; largely corroborated in Machmer 2008). The development and implementation of these treatment prescriptions were apparently locally driven, and not overseen by provincial government ministries.

In 1973, TWA members and other local volunteers planted apple trees on the low benches along the southern border of the Fort Shepherd property. This was the area that was most degraded by cattle and horse grazing. Most of the fruit trees, a favoured browse option, died of drought in the first year. In subsequent years, TWA members planted thousands of "waxy leaf ceanothus" (presumably *Ceanothus velutinus*), and the preferred browse, red stem ceanothus (presumably *Ceanothus sanguineus* Pursh). The apple trees were grown in Cominco's greenhouses, and the ceanothus came from a home nursery in Trail (Interview 05).

In 1980, volunteers planted browse shrubs along the newly installed B.C. Hydro power line for the Seven Mile Dam. This right-of-way corridor became a primary vector for invasive plants such as knapweed (Interview 06). Also between 1975 and 1980, tons of Cominco fertilizer, were spread around the property to enhance productivity. In 1990 and 1992, thousands of Douglas fir and Ponderosa Pine trees were planted on the lower benches (many around the cairn marking the site of the historic Hudson's Bay Company fort) to provide cover and thermal breaks for deer. In subsequent years, coniferous trees were limbed to six feet to fireproof trees and provide shelter for ungulates in deep snow (Interviews 05 & 08). Additionally, work crews of volunteers cut brush, especially hazelnut, and hawthorn, in full-day, multi-generational TWA club events (Figure 8).

It appears that, as the volunteer cohort aged and members took on responsibilities of marriage and family, fewer conservation events took place. With the exception of some references to planting in the upland Fort Shepherd Basin, none of the landscape-level conservation actions were implemented in other parts of the study areas, as the volunteers did not have access to additional manpower and other resources.

Figure 8. Planting and limbing work at Fort Shepherd in the early 1990s were multi-generational TWA club events.

In 1972, presumably in collaboration with Cominco, TWA members began a systematic program of prescribed burning at Fort Shepherd. The practice was designed to enhance winter range habitat by rejuvenating decadent fire dependent shrubs on the property. Local photographer Pat Archibald manufactured drip torches (Figure 9) that were used by TWA crews of sometimes up to 30 men. TWA members felt that mimicking natural fire regimes was an exceptionally cost efficient means to enhance carrying capacity of critical winter ranges whose fire dependent forage plant communities had become decadent during decades of active fire suppression. As sprawl and logging was already eroding total availability of primary range, they needed to make remaining acreage more productive (Interviews 05 & 07).

Figure 9. Drip-torches used to start fires in controlled burns were manufactured by local photographer Pat Archibald.

Until the mid-1990s, there appeared to be no regulatory pressures to limit prescribed fires. Burning proceeded apparently without notice to a ministry, and with no permits. The burning took place on a stunning scale (Figure 10), as described in the following transcript excerpt (Interview 05):

*05: And then in the 1980s we started burning, right. We had carte blanche, we just started burning everything…*
A: And how many guys would be on the crew?
*05: About 20,30. we all had drip torches…we burned lots, and had good success doing it…*
A: So you burned everything on the lower benches?
*05: Well, we did it probably in three or four years. Like, we started on the bottom and worked our way up to the back…*
A: So did you fertilize before you burned?
*05: No we fertilized before.*
A: And when did you do this, in spring, March?
*05: Just as soon as we could get down there…*

Figure 10. Local prescribed burns were done on stunning scale. The burn in this photo, taken from across the Columbia River, encompassed an area from above Glenmerry to the Montrose Cut-off.

Prescriptions were employed in "primary" and "secondary" winter range sites throughout the study area (Figure 11), with particular focus on primary bench land and south and west facing uplands [secondary sites]. Interviewee 05 describes the two range types:

> *…They're primary and secondary ranges. I call the primary ranges at the bottom. At Fort Shepherd, up above on those ridges there, we burnt up there too, but, um…That's all part of it, because they [the deer] stage up there. They start coming down late in the year, a year like this… they're not going to move from elevation…to winter range. So anyways we burned all that, and we burned right into the basin of Fort Shepherd, I call it Seifert's Ridge, that's where I used to hunt. We burned that too.*

Another respondent stated that, with respect to a single prescribed burn on southwest slopes of the Murphy Creek drainage (Interview 07):

> *We burned the whole [flippin'] place, hundreds of acres, along a game trail on the right side of the creek to the upper basin where they were logging.*

As the 1990s progressed, a tighter regulatory climate and the appearance of more formal conservation actors (such as FWCP), coupled with attrition in the volunteer ranks, appears to have reduced role of TWA in use of fire in project area. It is unclear when and why prescribed burning for wildlife habitat stopped altogether. The last prescribed burn in project area involving TWA seems to have occurred on Seifert's Ridge (pronounced Seefert) where a helicopter was used instead of the drip torches (Interviews 05 & 12).

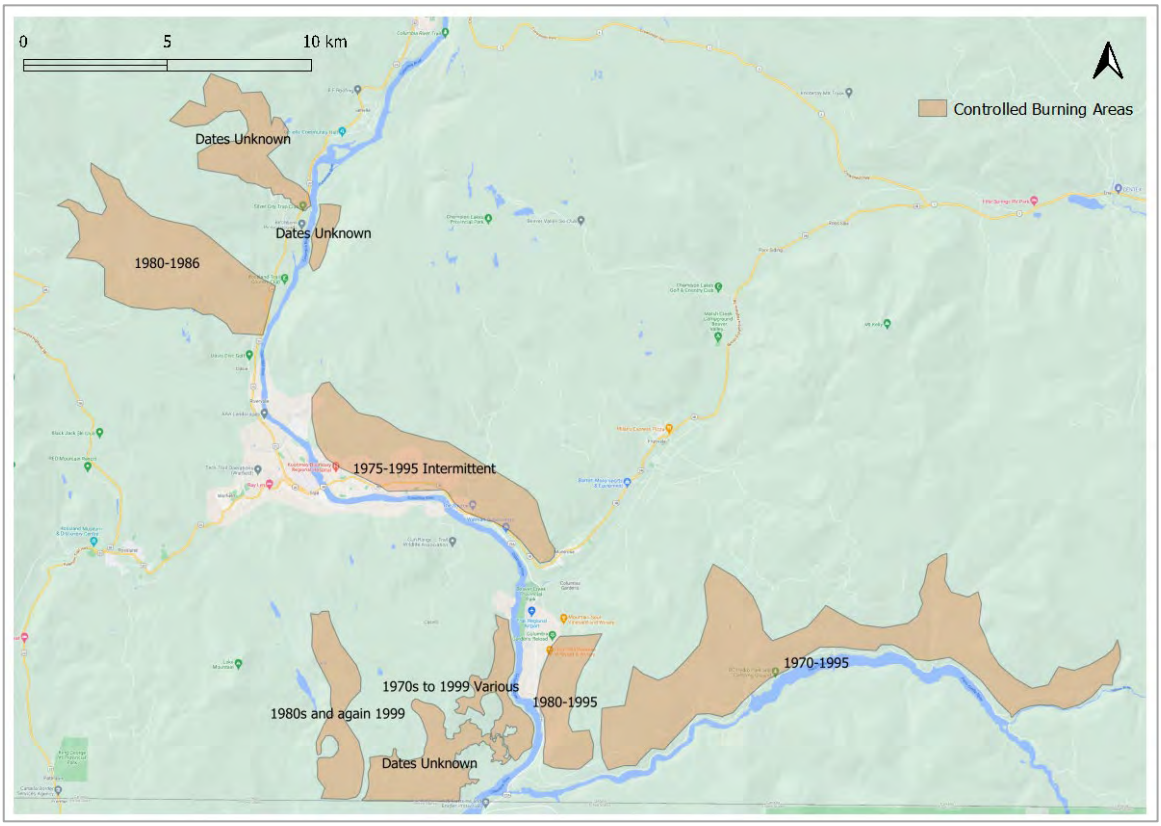


Figure 11. Areas that were historically burned in local conservation efforts.

### *3.2.6. Fish passage*

Throughout the 20th Century, residents had used the Columbia River north of the Cominco's smokestacks and outfalls from its lead smelter operations in Trail to recreate. Fishing along with boating and picnicking was very popular, particularly around the mouths of tributary creeks. Many Trail families had summer homes or hobby farms upriver from Trail, in Kinnaird or Castlegar as well as in the Arrow Lakes region.

Highway modernization, in the 1960s and 70s involved replacement of open bridges over area tributary streams by steel culverts, blocked passage of resident and spawning rainbow trout to and from the river. Fish passage hindered or blocked by culverts occurs on Hanna Creek, Murphy Creek, Sullivan Creek, and China Creek. Blueberry Creek runs through the old Canadian Pacific Railroad (CPR) tunnel, which with time has also become a barrier to fish passage. Modifications in the tunnel and on

the plunge pool of Blueberry Creek allow limited passage to the 25 km of prime spawning habitat upstream of the tunnel (Interview 02).

In the early 1980s, TWA member Harry Connell became concerned about the plight of spawning rainbow trout that were unable to access upper reaches of Murphy Creek, spawning instead in the intake pool of the adjacent golf course's irrigation system. During the-1980s, as a stopgap measure, TWA members worked with the biologist from Fisheries and Oceans Canada (DFO) to trap spawning rainbow trout staging in the plunge pool below an 80 m long steel culvert supporting Highway 22. In subsequent years, the fish were trucked around the barrier and released in the stream.

TWA membership began to petition provincial ministry biologists in the 1990s, for permission to construct a spawning channel parallel to the creek's run, extending from the golf course irrigation pool intake at the base of the highway culvert plunge pool. The club secured supplies (such as gravel, quarried and transported to the site courtesy of Cominco), funding, and permits to construct the channel. Despite setbacks—notably a freshet pulse that topped a barrier wall and destroyed the initial channel works in the spring of 1992—the project was completed in 1993. An expansion occurred in about 1995, doubling the length of system to roughly 200 meters, with water bars and 26 pools (Figure 12). Construction, and subsequent operation of the channel was driven by TWA membership (Pers. conversations with various club members). A former TWA member instrumental in securing funding and permitting said, "We knew nothing of management, we just built the project" (Interview 03). By all accounts, the spawning channel was already a success in 2003 (Arndt & Klassen 2004).

Figure 12. Murphy Creek spawning channel undergoes expansion in 2000 (left); the naturalized spawning channels in 2021 (right; photo by Al Mallette).

The spawning channel has been upgraded over the years, notably 2013-2014, when TWA's Rob Frew secured funding and supervised the rebuilding of the intake structures, allowing a secure year-round supply of water. But the club's ability to manage the facility on it's own in the long term was not secure. Club members who managed the site sought out opportunities to work with committed fishery professionals. In 2016-17,

driven mainly by Rob Frew and Al Mallette, a collaborative emerged between TWA and Okanagan Nation Alliance to jointly manage the operations and maintenance of the channel (Mallette, pers. obs.). In the fall of 2021, the Murphy Creek spawning channels were added to the Fish & Wildlife Conservation Program's "core funding" projects list, which provides some ongoing stability for ongoing maintenance.

Over time, TWA members also focussed on remediating two other instances of highway culverts impeding fish passage along tributary streams: 1) Elevating the plunge pool below the highway culvert at the mouth of Bear Creek, East bank of the Columbia, and 2) Members helped install highway no-posts [concrete barriers] in the abandoned CPR tunnel through which Blueberry Creek flows to facilitate fish passage (Figure 13), and, 3) assisted with elevation of weir at CPR tunnel and the construction of fish passage at Blueberry community water system uptake [~1990]. These measures employed at the CPR tunnel worked for a time, but freshets have changed the plunge pool structure to make it difficult for fish to enter the tunnel (Mallette, pers. obs.; Interview 02).

Figure 13. The Blueberry Creek culvert fish passage bars were installed in 1998.

### 3.3. Conservation activities by area

The following section shows areas that were identified by TWA members and other community participants as having had past conservation activities. For each area we provide a bulleted list of activities that occurred in that area, accompanied by a map to aid in visualization of the landscape. A further envisioned output of this project is an interactive online map, where viewers can explore the locations in more detail. We begin with the Salmo-Creston area, at the southeast corner of our study area, and move west and north, to finish at Syringa Park at the northeast limit of the Lower Columbia zone.

### *3.3.1. Salmo-Creston Highway*

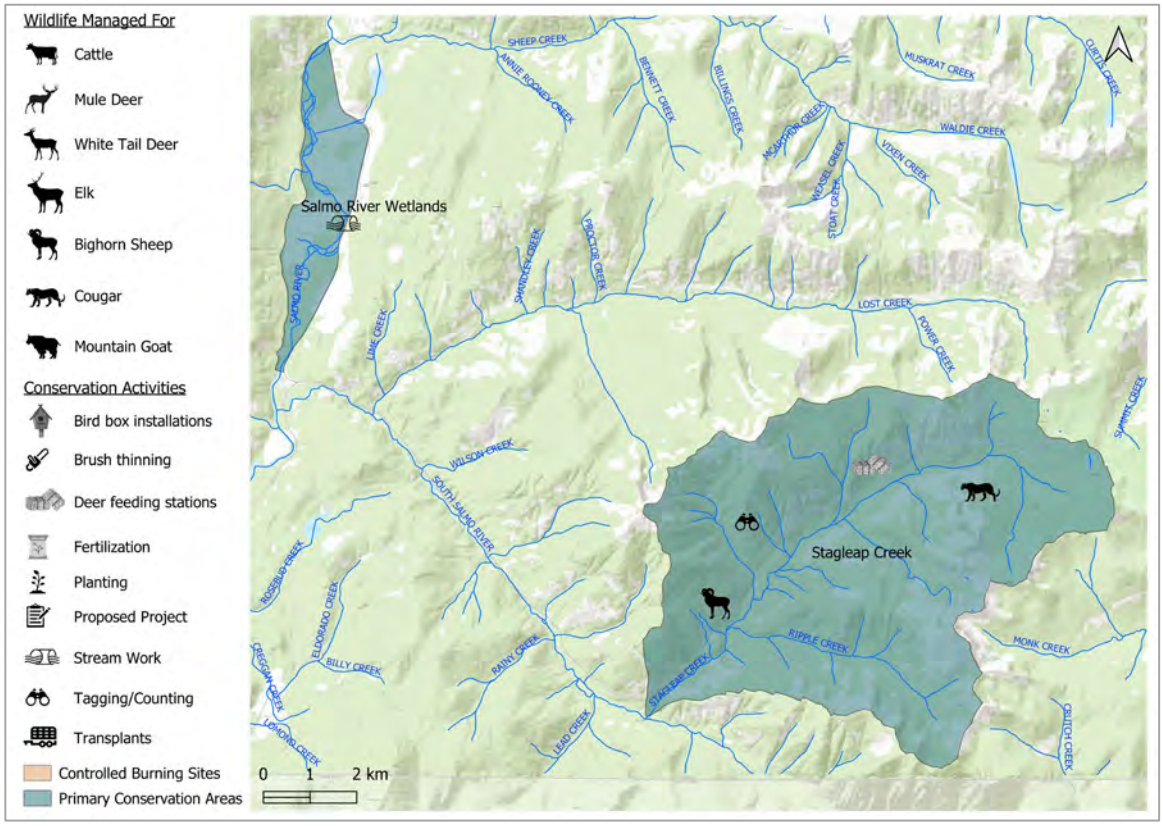


Figure 14. The area around Salmo-Creston Highway/ Kootenay Pass, and the South Salmo River drainages.

Activities in the area of the Salmo-Creston Highway (Highway 3) following the old Dewdney Trail over Kootenay Pass and the South Salmo River drainage (Figure 14) included:

- Transplants – specifically bighorn sheep
- Trapping, collaring, inoculations, counts
- Feeding stations for sheep
- Predator control – specifically cougar

### *3.3.2. Fort Shepherd area*

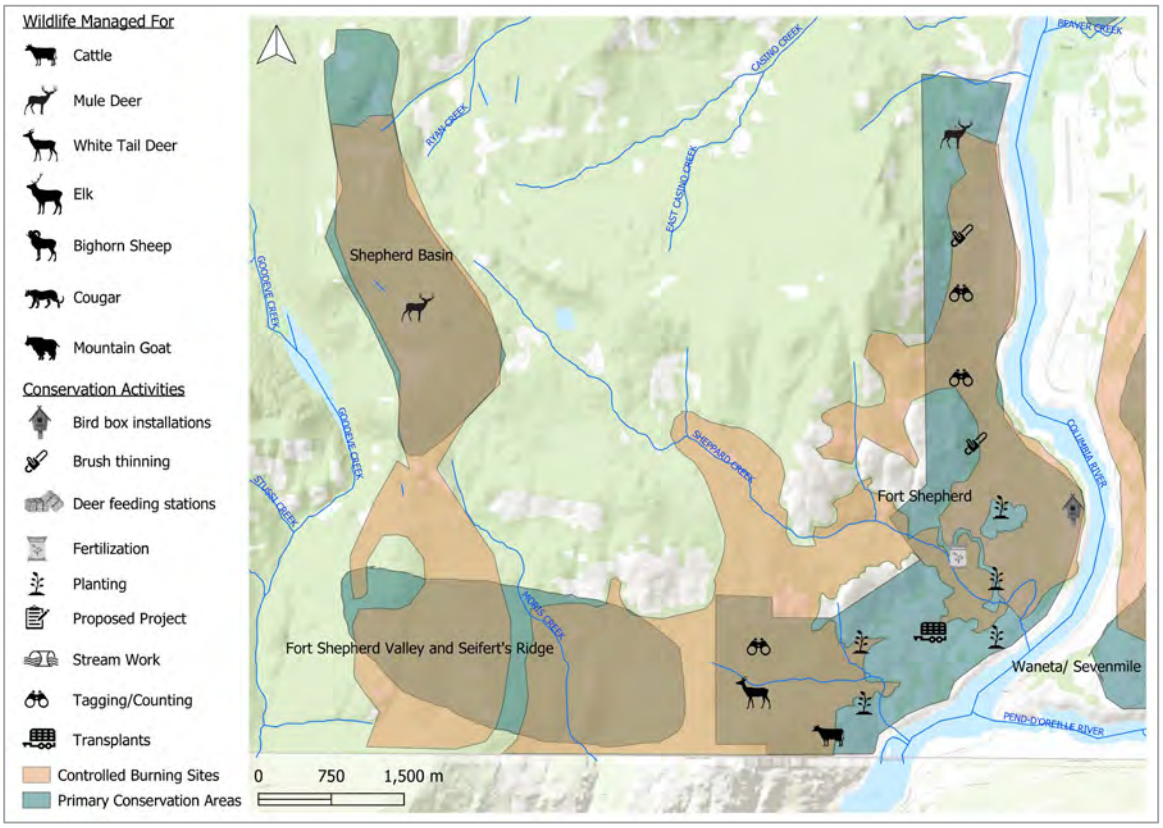


Figure 15. The Fort Shepherd area, which includes the present-day Fort Shepherd Conservancy and Teck-owned lands upslope.

Activities in the Fort Shepherd area (Figure 15) included:

- Trapping, collaring, counts
- Feeding stations
- Planting, brushing, pruning, bulk fertilizer application
- Burning
- Bird houses
- Predator control

### *3.3.3. Antenna Trail, Montrose Cut-off, Quadra Ridge, and Pend d'Oreille River*

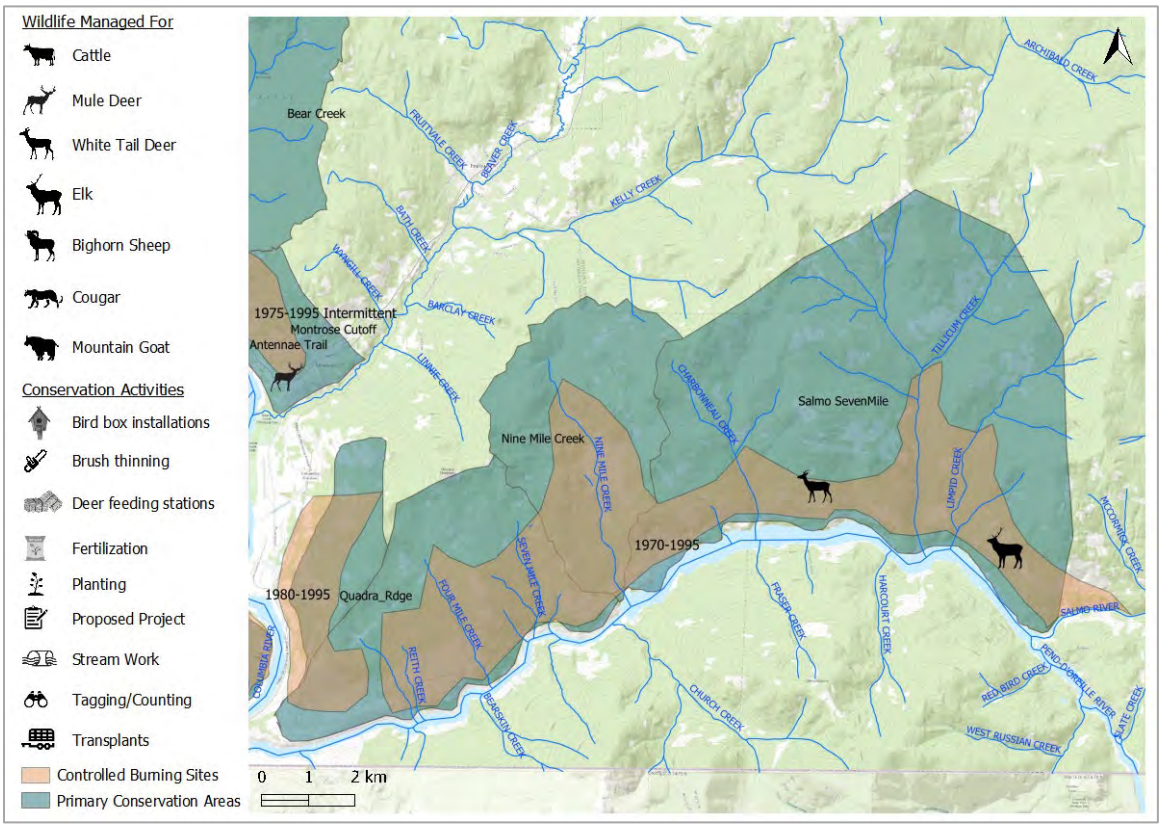


Figure 16. Areas known locally as the Antenna Trail, the Montrose Cut-off, and Quadra Ridge, and the Pend d'Oreille River drainage.

The area on the north side of the Columbia River, east of Trail, have local common names, the Antenna Trail, the Montrose Cut-off, and Quadra Ridge, which runs generally east to form the boundary of the Pend d'Oreille River drainage near its mouth (Figure 16). Activities in this area included:

- Feeding stations
- Counts
- Burning
- Predator control

### *3.3.4. Glenmerry, Bear Creek/ Mt. Heinze, Billy Creek*

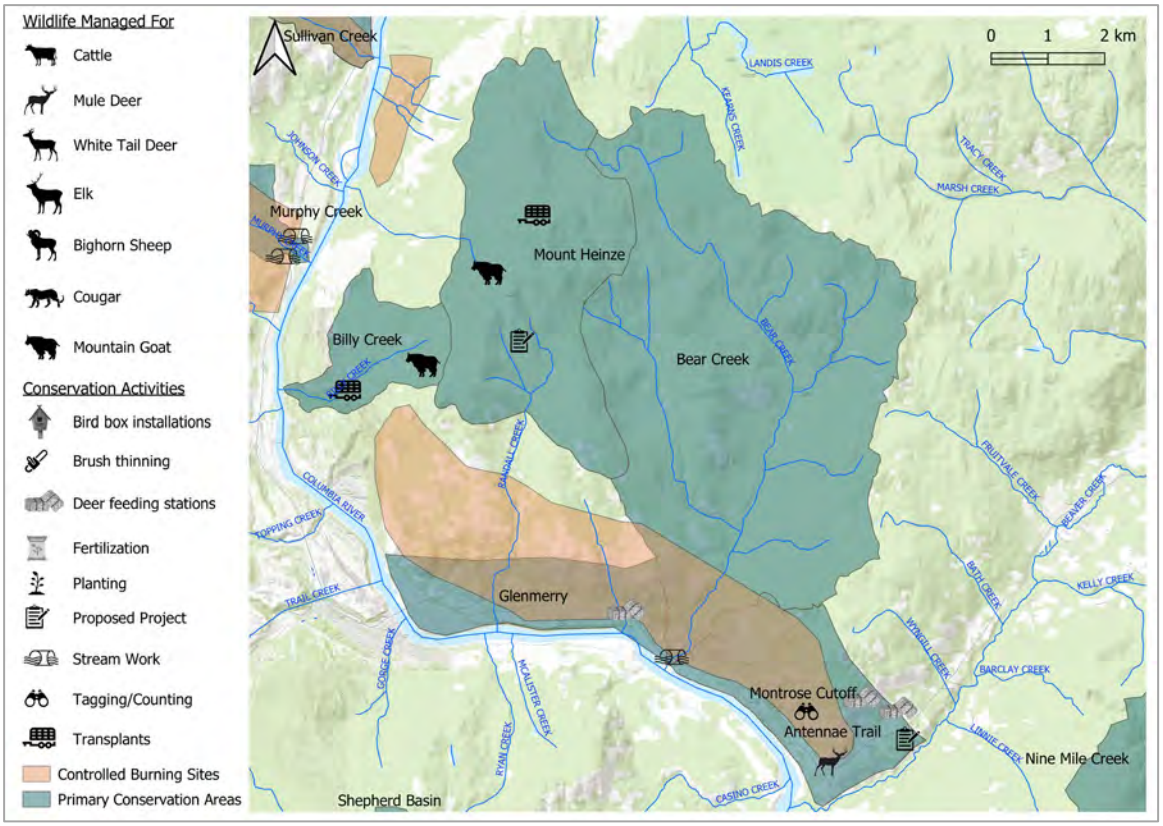


Figure 17. Glenmerry, Bear Creek/ Mt. Heinze, and Billy Creek drainages

Activities in the areas of Glenmerry, Bear Creek drainage/ Mt. Heinze, and Billy Creek drainage (Figure 17) included:

- Transplants – specifically mountain goat
- Counts
- Feeding stations
- Burning
- Predator control

### *3.3.5. Murphy Creek, Birchbank, Genelle, Sullivan Creek, Blueberry Creek*

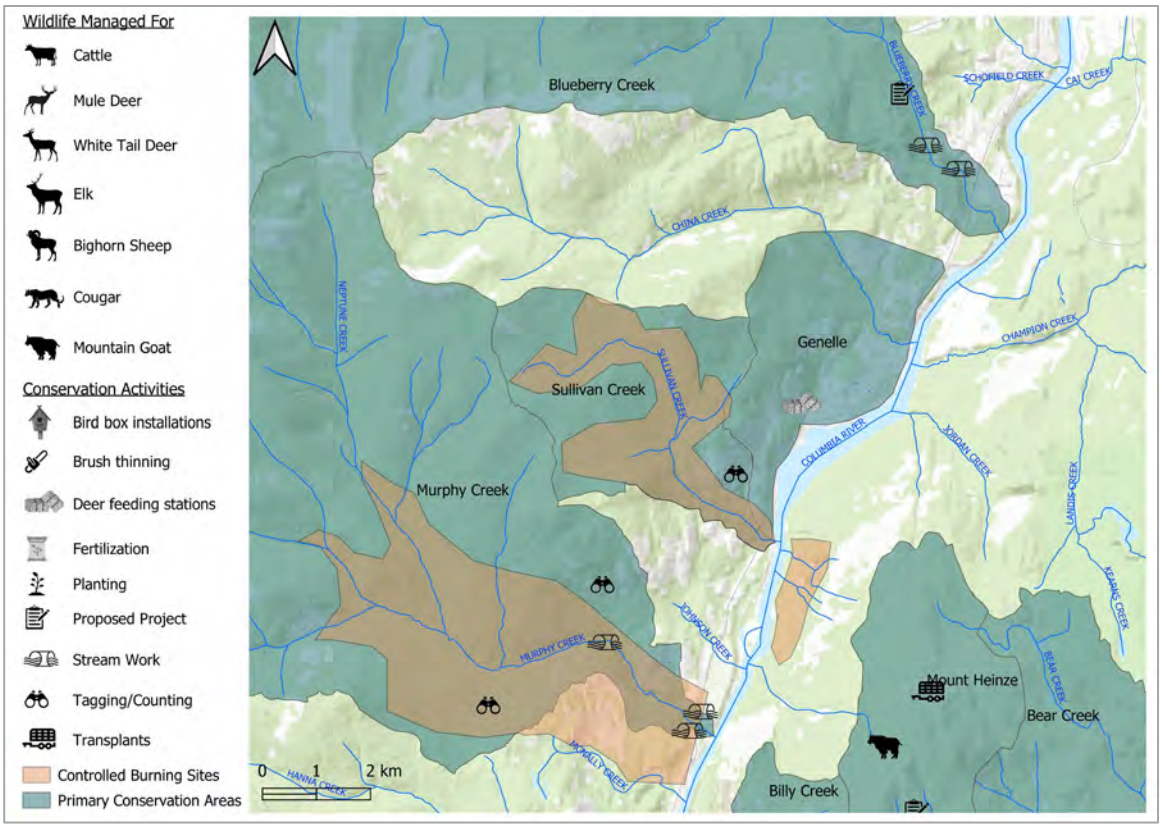


Figure 18. The areas around the unincorporated towns of Birchbank and Genelle, and in the Murphy, Sullivan, and Blueberry Creek drainages

Activities around Genelle and Birchbank, and in the Murphy Creek Sullivan Creek, and Blueberry Creek drainages (Figure 18) included:

- Feeding stations
- Burning
- Development of fish passage projects

### *3.3.6. Syringa Park and the adjacent watershed*

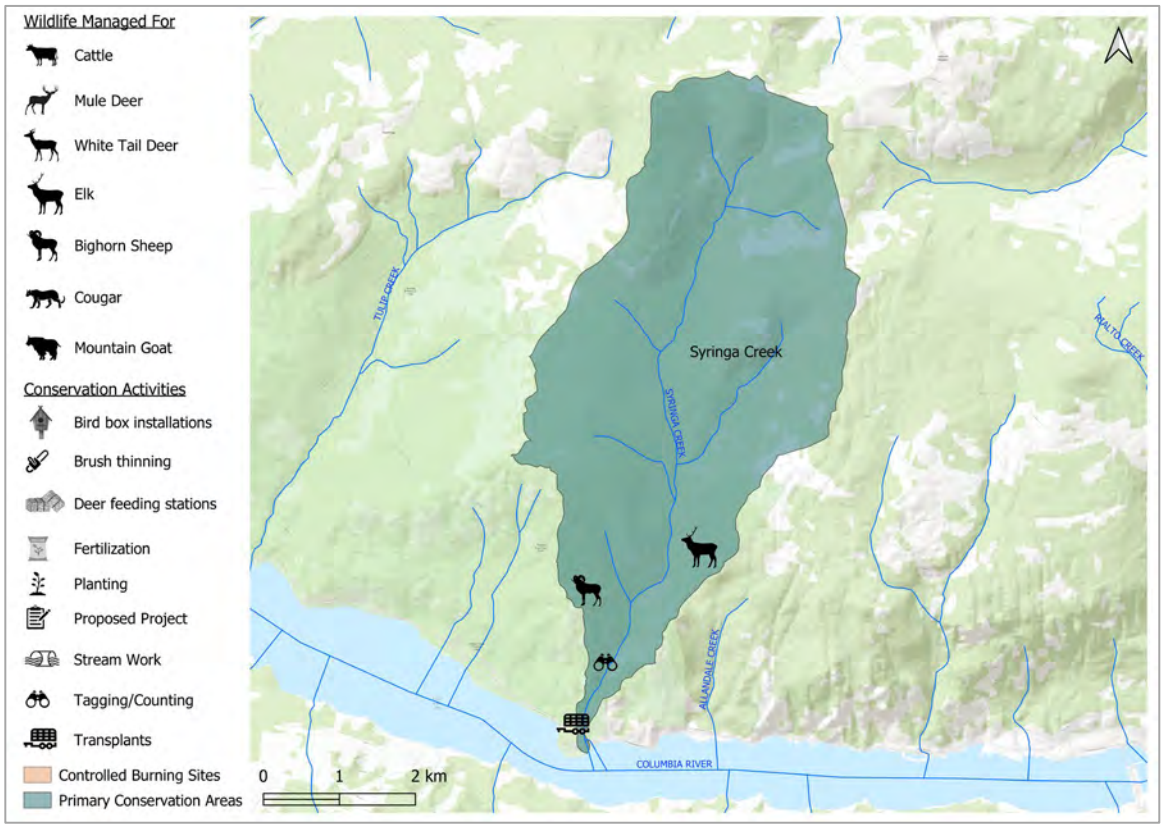


Figure 19. Syringa Provincial Park and the adjacent Syringa Creek watershed

Activities around Syringa Provincial Park (est. 1968) and the adjacent Syringa Creek watershed, which drains to the Arrow Lake Reservoir (Figure 19) included:

- Transplants – specifically bighorn sheep and the first elk transplant in the West Kootenay region
- Trapping, collaring, inoculations, counts

### 3.4. Migration corridors

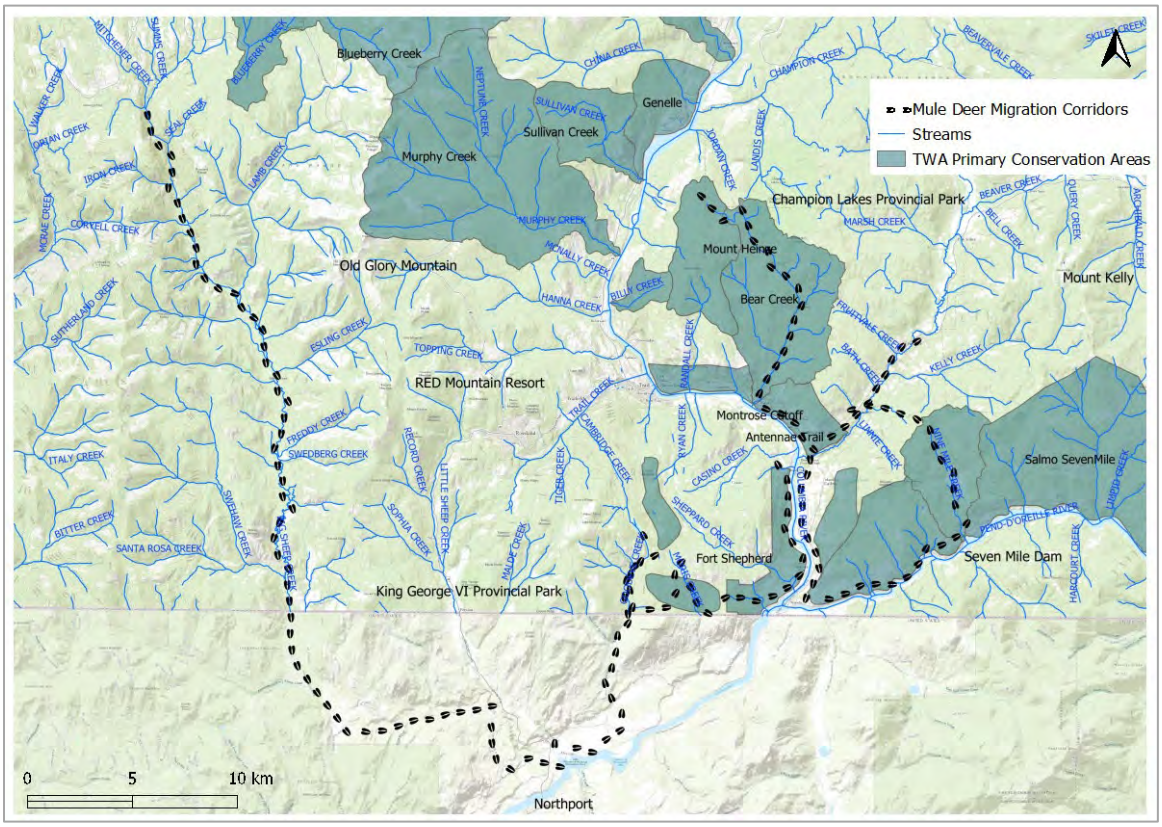


Figure 20. Migration corridors in the study area

The consensus of the interviewees is that historic migration corridors (Figure 20) are generally still accessible to game, and are not being unduly impacted by infrastructure development. A caveat to this observation is that highway development from 1960 to 1980 significantly increased fatalities from vehicle collisions. Respondents agree that the massive amounts of logging clear cuts disrupt animal movement from work disturbances and the resulting large-scale landscape changes. For example, Interview 04 offered these observations about club activities and logging issues:

> A: [Y]ou guys have basically been involved as a club, I would say, Lower Columbia, or the Columbia Corridor, oh, lets call it Castlegar to the border, and the Pend d'Oreille. That's essentially where we've worked, right, over the years?
> *04: Ya.*
> A: With the exception of what I call the South Salmo, which is basically that area around the base of the Salmo-Creston highway where the bighorn, up to where the sheep feeder is.
> *04: Ya. I mean, we didn't have a lot to do, I mean, most of the areas we took care of is the Pend d'Oreille, Fort Shepherd, used to be Murphy Creek was huge. At one time that was one of the biggest corridors for*

> *mule deer and whitetail, we used to do a deer count up there 'cause there used to be so many deer on those ridges there. And, ever since they started the logging up top there, of Murphy Creek area, of Hadigan's there… Yeah, it's gone from hundreds of deer to basically couple, two or three.*

The migration corridors used primarily by mule deer—but also by white tail deer and elk—to reach Fort Shepherd (and the low bench lands south of the border along the Columbia River), involves the use of defined creek drainages. This is because the terrain West of the river, while very productive, is also extremely rugged. Sheep Creek, which drains the western slope of the Rossland Range, and whose northern boundary is B.C. highway 3, west of its intersection with highway 3B, and which joins the Columbia at Northport WA (USA) is a major north-south migration corridor. Traditionally, mule deer and whitetail deer would spend the year in the Murphy Creek drainage basin, bordered on its North and West by Highway 3 that runs from Castlegar to the intersection with Highway 3B at Nancy Greene Provincial Park. In fall, the game would move west, over the Rossland Range, into Sheep Creek and south to the wintering grounds along the Columbia River. A second migration corridor, originating in the Rossland Range and the Topping, Trail, and Hanna Creek drainages, involves game moving south into the Violin Lake drainage, east into Fort Shepherd Basin and down-slope into the Fort Shepherd Conservancy along the river.

Game animals on the east side of the Columbia River moved south and west through the study area, skirting the flanks of Kelly Mountain. As the terrain is less severe in this component of the study area, game diffused by a number of routes to the north bank of the Pend d'Oreille River, Quadra Ridge, the Montrose Cut-off/ Bear Creek area, and the lower flanks of the Mount Heinze massif. While there were some mule deer in the Pend d'Oreille drainage, it was used primarily by whitetail deer.

A third migration pattern involves movement from the northern slopes of Mount Kelly and Bombi Pass (Hwy. 3A), through the Hudu Creek drainage to Beaver Creek, and down into the Columbia River basin proper. This secondary migration route was historically used by mule deer but is now more important to elk (Interview 05; pers. obs.).

## 4. Issues of concern and opportunities for future conservation projects

In the following narratives, we begin each section by identifying specific issues. We then elucidate the related conservation opportunity that has been identified.

### 4.1 Brushing and burning

Our interview respondents are in general agreement that some form of brushing or burning program needs to return to the West Kootenays. Prescribed burns are their preferred method, but they acknowledge that this option is unlikely to gain approval. As an alternate, they suggest aggressive manual brushing on Quadra Ridge and in the Pend d'Oreille valley (Figure 16), and at the Fort Shepherd Conservancy (Figure 15).

### 4.2. South Salmo – Salmo River confluence

The entire Salmo Creek drainage has been considerably altered by historical logging, mining, and settlement activities, where much of the floodplains were drained and filled. Highway 3 runs very close to the Salmo River near its confluence with the South Salmo River (Fig. 9). This remaining marshy bottomland is an important wintering and staging area for mule deer, whitetail deer, and moose. Moose, bear, and elk sightings are common from the road, and road-kills are not uncommon (Interview 13; pers. obs.; other personal communications).

There is a need for assessment and potential for mitigation of this important marsh zone. This watershed is unusually high in private ownership of the river frontage, however, making project work challenging (Interview 13). Mitigation could include collaborations with local property owners for fencing passages to facilitate safe migration routes (Interview 13; pers. obs.).

### 4.3. Bear Lake

Bear Lake was a beaver-dammed cleft in the Bear Creek basin that drains the north- and east-facing slopes in the western extent of the Bear Creek Valley (Fig. 5). Together with Champion Lakes just over the watershed divide to the west, and Kern Lake, Bear Lake provided some of the only reliable summer water. The area was therefore an important migration staging area.

Bear Lake was also a popular fishing spot for rainbow trout and (anecdotally) also cutthroat trout. Kootenay Fly Fishers and the Backcountry Hunters and Anglers built handicap accessible pathways and a fishing platform on the Lake (Interview 10).

The beaver dam was breached, purportedly with dynamite, in approximately 2000, and the beavers were trapped out and eradicated (Interview 01). There was no surface water remaining in the Bear Creek basin during the summer drought of 2019. Elk were forced down drainage to the Columbia River. This resulted in at least three elk kills on the road near Montrose, of a cow and two calves (pers. obs.).

There is considerable local interest in rebuilding the dam and rejuvenating the fishery at Bear Lake (Interviews 01, 10; pers. communications with other community members). Community cohesion with area sportsman’s clubs could be built with such a project. Except for potential permitting issues, this project could be considered a “low-hanging fruit” (pers. obs.).

### 4.4. Fish spawning and fish passage

My sources advocate for mitigation on several area creeks to enhance fish passage for spawning rainbow trout, and in advance of the salmon reintroduction efforts in the Columbia River system. The Columbia River, from the US border to Keenleyside Dam, is the longest free flowing stretch of the main-stem Columbia with the exception of Hanford reach by the Hanford Nuclear Plant in Washington State. TWA’s members have long been involved in fisheries projects and consider ongoing work as an imperative (Interviews 03, 11; pers. obs.).

The following are suggested projects: Blueberry Creek needs work to make access through the CPR tunnel/culvert more fish friendly (Interview 02). Restoring fish passage to Blueberry Creek would open 25 km of great spawning habitat to the fish, from the Columbia River all the way upstream to Nancy Greene Lake. China Creek needs improved passage through its highway culvert, which should include a fish ladder to mitigate the height difference from the plunge pool to the culvert. The already successful spawning channels at Murphy Creek could be expanded to a second, parallel system; with the caveat that this is a completely engineered system that needs to be maintained.

### 4.5. Raptors and owls

There is a need to identify and protect large owl and raptor (bald eagle and osprey) nesting and perching trees throughout the riparian zones of the study area (Interview 02). Especially large cottonwoods should be protected from beaver chew. Private landowners would have to be approached for access permission, which could encourage local stewardship (pers. obs.).

### 4.6. Forestry practices, land management, and access issues

Several long-time TWA members have shifted their focus in recent years from direct support (i.e. feeding and habitat enhancement actions) of animal populations in the primary and secondary winter ranges zones to lobbying for better forestry practices, especially in logging operations. Forestry practices in the study area are problematic for two principle reasons. First, Professional advice that could assure that logging operations have minimal impact on diversity wildlife abundance is not being incorporated in practices (Interviews 05 & 12). Respondent 05 observes that:

> *05: Well, it is frustrating, but you don't have to deal with all the hunters and stuff like that worryin' about, you know, is it a four-point season or this or that. We go in there and we deal with ATCO and BC timber sales, and deal on winter range, you know?*
> A: What kind of success do you think you have?
> *05: Very low success. But at least they… We put lines all through the valley. Anything below that you have a loggin' area, you have to consult us. Which they agreed to, eh. We only have to leave thirty percent. So when we say… and John [Gwilliam] with his intimate knowledge of a lot of places says well, you gotta leave that place there, that's a good place, you know, for the deer…*
> A: leave those hollows…
> *05: More wildlife trees, not just … they think deciduous trees are wildlife trees, well they are, and that's their token. We want coniferous trees left.*

The second major issue with forestry practices is that government ministries as well as forest companies are very reluctant to decommission inactive forest roads. Their reasons include worries about closing access to wildfire response, plans for future silviculture, and that there is a high incidence of vandalizing gates (Interview 12). My

respondents overwhelmingly agree that rampant ORV use has become a problem to ungulate health and safety, especially in the Pend d'Oreille valley. Unrestricted access to ungulate ranges is identified as a significant factor in the downturn in ungulate numbers in the study areas (Interview 12). Interviewee 04 adds detail:

> *04: Forestry, there's access issues, too much access in all the areas, it's huge. Just to give ya a quick story. We hunted the Elk Valley for 30 years. The only time it got really good hunting was when they did road closures that went back into the valleys and the big mountains and stuff. And guys stopped going there because either you had to have a horse, or you hiked. And we all were hikers, me, and Donald [Nutini] and Danny [Abenante]. And we loved it there because there was nobody around. And we saw game, which was incredible! Well, now over there, you'd be lucky to see an elk. We used to see twenty, thirty elk a day, every one of us, in different spots. […]*

The access issues have wider implications than just best management practices in forestry. Illegal cutting of standing dead trees for firewood has become a common practice in the Pend d'Oreille and the Bombi Pass areas, which reduces available wildlife trees. Off-road vehicles have been a large problem in the Pend d'Oreille valley, and more so since the South Pend d'Oreille wildfire that severely burned large swaths of the valley in 2007 (Interviews 04, 05, 09, 12). Respondent 04 was very vocal about the access issues:

> *04: So that's what's happened here. Access, we'll get back to that. Access is a huge thing, that's somethin' Rick [Filmore] has always pushed for. He's always wanted the companies to close the roads, but they never do. I call this a small area [the Pend d'Oreille Valley], but a lot of people call it a big area. It's a small area. We've just got a lot of young hunters, and they're growing up with the quad thing. They don't go anywhere without their [flippin'] quads and shit, so they hit all these spots tremendously, I mean, it's just incredible.*

A regulatory Access Management Area (AMA) can be imposed on forest zones by the Wildlife Branch of FLNRORD, in which they prohibit motorized access. This has the same effect as decommissioning roads, with the caveat that the rules must be respected. Interview 12 stated that, "*Trying to get an AMA from the Wildlife Branch is like pulling teeth.*"

An attempt by FLNRORD to impose an AMA in the Pend d'Oreille valley around 2016 was a disaster, because it delimited too much land (Interview 09, 12). Yet, access control has been found to be an effective tool. Vehicle access to the Fort Shepherd Conservancy has been prohibited for several years, which is further supported a Teck gate at the far end of the access road. This approach has been so successful at Fort Shepherd, that the Land Conservancy and its working partners have shifted their efforts from predominantly access control to a focus on ecosystem enhancement projects (Mallette & Trebitz 2021).

My informants recommend smaller, more strategic AMAs that protect prime habitat areas. They add that community buy-in is necessary to have these rules respected (Interviews 04, 05, 09, 12). It is therefore imperative that senior TWA members are broadly supported in their efforts at pressuring the BC government for better access management in the Pend d'Oreille valley.

### 4.7. Hunting limits

Hunting regulations are contentious among the area sportsmen. On the one side, hunters wish for increased hunting opportunities. But others advocate for tighter hunting rules in the face of rapidly dwindling ungulate numbers and quality. At the 2016 TWA-hosted conference in Kelowna, Chief Joseph Alphonse of the Tŝilhqot'in First Nation stated that, "we will be fighting over who can kill the last moose".

Addressing ungulate numbers through political action is another approach that could be supported. Members feel that the provincial government should be pressured to reduce hunting either to a shorter season, or to lower bag limits (Interviews 04, 05, 06, 09). The province could also create a mandatory tag-check system, as is done in the neighbouring US states, Idaho and Washington. This latter approach would lead to better hunting harvest records and a more accurate idea of the true state of ungulate populations in each management zone.

### 4.8. Predators and predator control

The issue of the impact of large predators (i.e. cougars and wolves) on the shrinking ungulate populations in the area has always been a contentious issue in TWA and among local hunters. While cougar hunting is prohibited on the Washington (US) side of the international border, the cougar season in BC is from December 1 to March 31. TWA members have actively hunted cougars as pest animals for at least the past 40 years. They lament that hunting has been prohibited at the Fort Shepherd Conservancy, as they feel the cougar population there is reducing ungulate numbers. Respondents believe that cougars are the most significant danger to the study area's bighorn sheep populations. As Interviewee 01 shares:

> *01: Our objective is, to kill, to lower the numbers, in critical areas: Salmo-Creston feeder areas, the Fort Shepherd wintering grounds, certain areas in the Pend d'Oreille, certain areas in the Arrow Lakes, you know, when you're following it all. Most of the sheep in the Arrow Lakes have been killed off by predators in the last couple of few years. Cougars have just about annihilated the whole pack. It's terrible, I mean, everybody knows what's going on with the deer, okay?[…]*

> *01: The non-hunters don't see it because they're not out there. They kinda see things on the media, they kinda hear people talking about it. No one knows what's going on with a predator more than a cougar hunter – a dedicated cougar hunter, not just a guy who's out a couple times a year. I go maybe thirty, forty, sixty days cougar hunting from December first to*

> *March thirty-first. So that's sixty days out of a hundred and twenty days. That's fifty percent of the time allotted to cougar hunting he's out there. Those are the guys that know what's goin' on.*
> A: So you think that predator population is a big issue in what we're noticing as a fall down in ungulate numbers?
> *01: Oh, number one. Number one. And don't let them tell you, "oh the mining", or "oh the habitat", or "oh the frickin' cars that hit 'em on the highways". Number one is predation, okay? Number one is predation.*

Wolves, whose populations are increasing in the area, are the other predator of concern. Many respondents report that they are seeing wolf sign (excrement, tracks, and kills) in places where they had never observed them before. For example, there were reportedly no wolves in the Pend d'Oreille valley in the 1980s, but Respondent 12 recently saw more wolf-sign in one day than he had seen in 40 years in this part of the country. Wolf reports were especially for the Pend d'Oreille valley near Nelway, in the Beaver Creek drainage north of Fruitvale, Blizzard Mountain (Interviews 01, 05, 06, 12). Wolves appear at but do not reside in the Fort Shepherd area (Interview 04).

An important insight that springs from the interviews is the need to separate predator control hunting from other types of hunting (Interview 09). The avid TWA hunters believe that hunting wolves and cougars is necessary to stabilize ungulate populations. One respondent proposed a club-supported bounty for each time someone kills a wolf. More critically, however, the respondents signalled uniformly that they would not continue supporting conservation efforts at places like the Fort Shepherd Conservancy if hunting is not considered in some way—especially the hunting of wolves and cougars, but also for turkeys, which are invasives that they fear are impacting other species.

## 5. Discussion & Conclusion

The interview transcripts support that traditional TWA member involvement extended far past basic rod and gun club activities. Since it's founding in 1925, there have always club members engaged in conservation projects, as well as interacting with government (primarily provincial, but also federal) with respect to creation of conservation areas and setting wildlife and environmental policy. The TWA was instrumental, for example, for creating the Purcell Wilderness Conservancy on the eastern shore of Kootenay Lake. TWA also strongly supported transition of Fort Shepherd into a Conservancy (now owned by The Land Conservancy of British Columbia, in Victoria), and TWA members are involved in its Stewardship Committee as well as in current on-the-ground conservation efforts.

These local sportspeople are, indeed, passionate holders of local conservation knowledge. The work that they have done in the lower West Kootenay area is extensive and has led to an intimate sense of ownership of the local ecosystem, as well as a strong community around hunting, fishing, recreation, and conservation.

As other researchers have noted however, integrating the knowledge from such local experts is not a straightforward task. Covid-19 protocols prevented sitting down

directly with respondents. Locations are therefore less precise than they might have been if respondents could have pointed them out or drawn them on the maps. The interviewees referred to areas and locations often using local names (e.g. Quadra Ridge, Bouma's Farm, etc.) that are not actually place-names on official maps. Some ridges and draws were just described as a starting point, and then "go" or "walk" in a certain direction. Face-to-face meetings would have provided the opportunity for us to draw locations on physical maps. Some respondents would even have preferred visiting the sites in person.

The other inaccuracy may occur in the temporal reporting. Respondents often could not recall the year or span of years, in which events took place. In some cases, we could corroborate the year from another interview, from formal reports, or even from our own involvement in conservation activities. Confirming the dates and locations of conservation activities requires more substantial research resources than were allotted to this project.

A potential weakness in the present study is in the low sample size and informant pool on which it is based. The TWA elders are largely from the same generation, social influences, and hunting culture. The short timeline of this study did not allow for me to seek out and interview a more diverse group of local experts. We wished, especially, to include more local conservation interests that could provide information on other types of projects in the area. One potentially valuable source group that we could not reach, for example, is the Rossland Streamkeepers. Additionally, we would like to include some trained biologists and practitioners, such as the faculty at Selkirk College currently, and in the past, worked on conservation projects and citizen science activities. An even more bold approach would be to expand the study to include insights from biologists in the provincial government's local offices. This would also help locate more of the formal studies and study reports for the area.

The TWA members interviewed constitute much of the "heart and soul" of the club (pers. obs.). At least a half dozen additional members were mentioned during interviews who are unavailable or deceased. The present sample represents a group of conservation elders whose knowledge the community is in danger of losing. These club elders are deeply concerned that there is a break in the passing of traditional values from their generation to the next. They point to big changes in technology and modes of transportation. In the "instant" world, they feel, the younger generation has become highly dependent on virtual technology to help them find locations in the landscape, rather than learning the landscape itself. Furthermore, the use of off-road vehicles has become entrenched in the hunting culture, to the point of high impact and high stress to the very animals that hunters are trying to stalk. At the same time, there has been a reduction in the level of volunteering in ecological stewardship.

By the account of respondents, most of TWA's conservation activities were recorded in meeting minutes across years spanning the club's life. Almost a century's span of documents is stored in in paper format in a club building. It is important to procure resources so this trove of data can be collated into a cohesive club history. The data in those documents could confirm the dates in the present research assignment, and also could be used for a deeper study of the accuracy of the connected conservation memories and information.

In conclusion, this report provides a basic overview of conservation efforts by the local sportsmen (and women) and conservation enthusiasts in the study area. As such, it

can be a valuable resource to both the current project, and the TWA community itself. The study provides a methodology template by which research could be continued. The maps can be updated as more information emerges, and additionally they can be used to integrate data sourced from published studies and reports by biologists in academia, and the in the employment or contracts of provincial government offices.

**Acknowledgements**

We are grateful to our interviewees, for their open and frank discussions. We honour the mentors and vetran TWA members, both living and passed, who were mentioned during interviews: Pat Archibald, Harry Connell, Vic Conzon, Reg Conway, Rick Filmore, Gordon Frew, Rob Frew, John Gwilliam, and Graham Kenyon. This study was funded a Columbia Basin Trust Ecosystem Enhancement Project grant and matched contributions form other organizations.

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**Appendix I. Starting questions for semi-structured interviews**

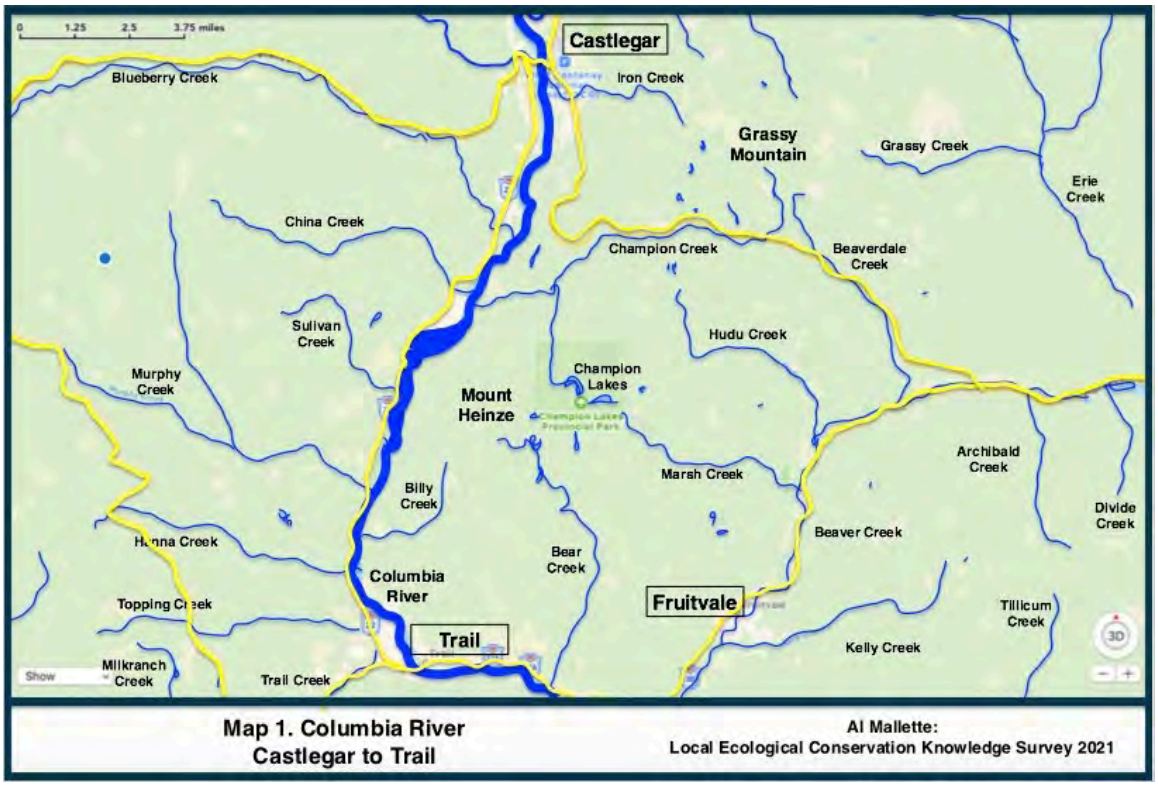
The starting questions for this study were developed with input from the ONA. Respondents were also provided with a confidentiality statement before beginning the interviews. During the interviews, we proposed to refer to the map, Figure 1 of report, and the maps in Appendix II. Interviews were anticipated to take approximately 30 minutes.

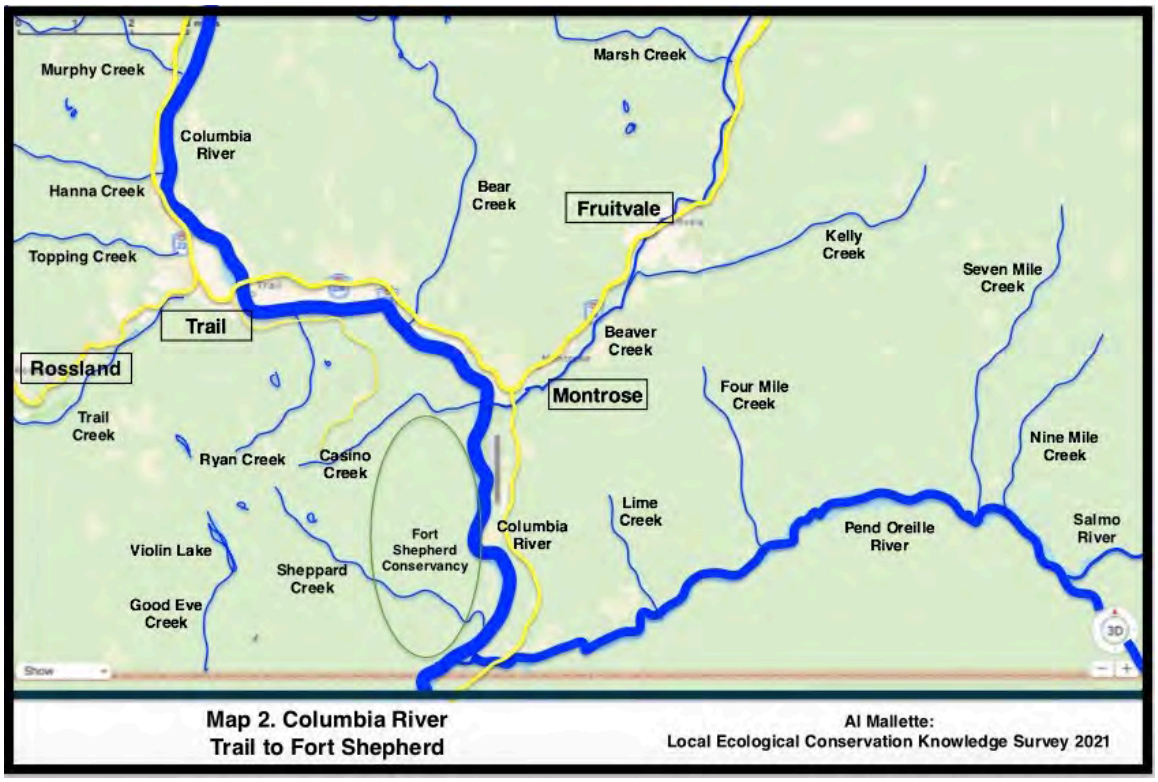
The following questions are starting points for semi-structured interviews:

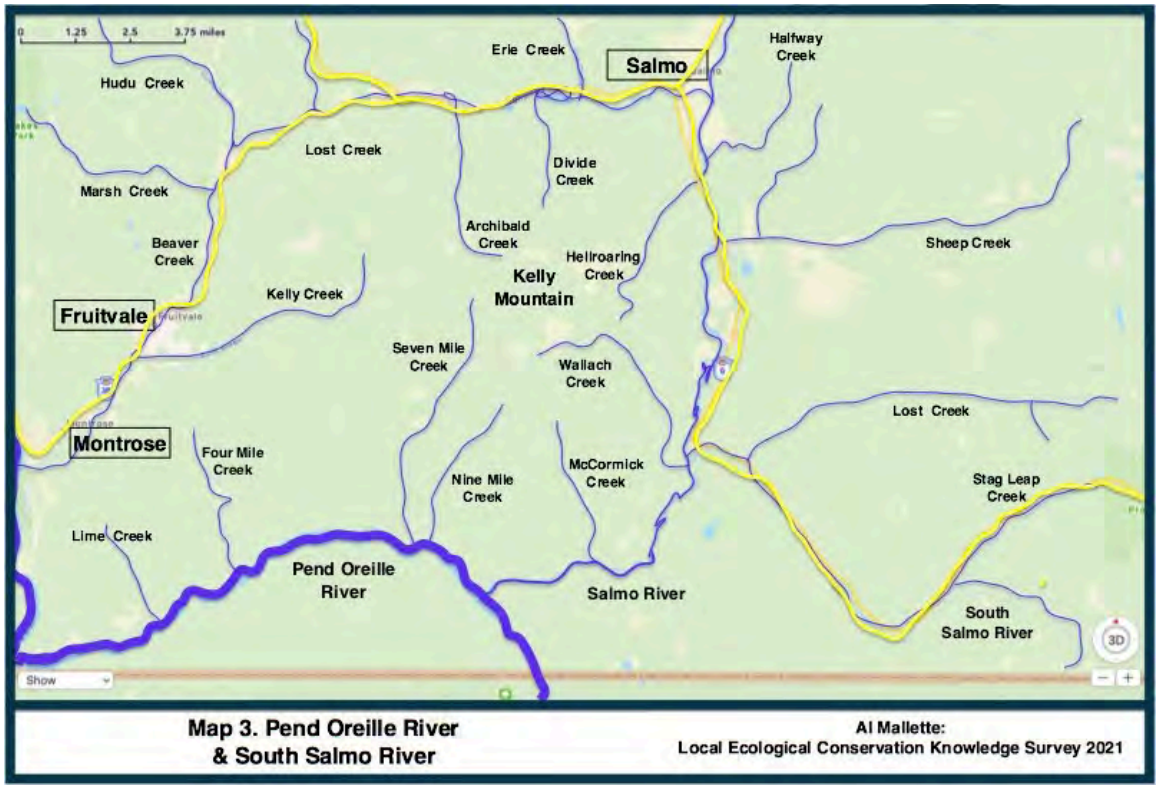
- Do you have any experience with conservation projects in one or more of these study areas?
    - Lower Columbia (Castlegar to the border)
    - Pend d'Oreille Valley
    - Salmo River Valley – especially the South Salmo
- If yes: What was the focus of the project(s)?
    - Who did you work with on these project(s)?
    - What were the projects' foci?
    - Where were the projects located (identify on a map if possible)
    - When were the projects conducted
    - What were project outcomes?
        - Do you feel the project (i.e. habitat restoration/enhancement/ mitigation of damage) was effective?
        - What were positive benefits?
        - What, if any, were negative outcomes?
- Did anyone keep records on the project?
    - What kind of records exists?
    - Are those records available to share?
    - Do you have personal notes or photos you can share?
- In your area, what do you feel conservationists need to focus on going forward (i.e.: what species or ecosystems are in need of stewardship actions)?
- Have you personally observed changes in wildlife numbers and use of habitat locations? Who else should I talk to that has local knowledge conservation projects?
    - Can you give contact information or make an introduction?

**Appendix II. Maps for use in interviews**

The following four maps were provided via email to survey respondents:






**Map 3. Pend Oreille River & South Salmo River**

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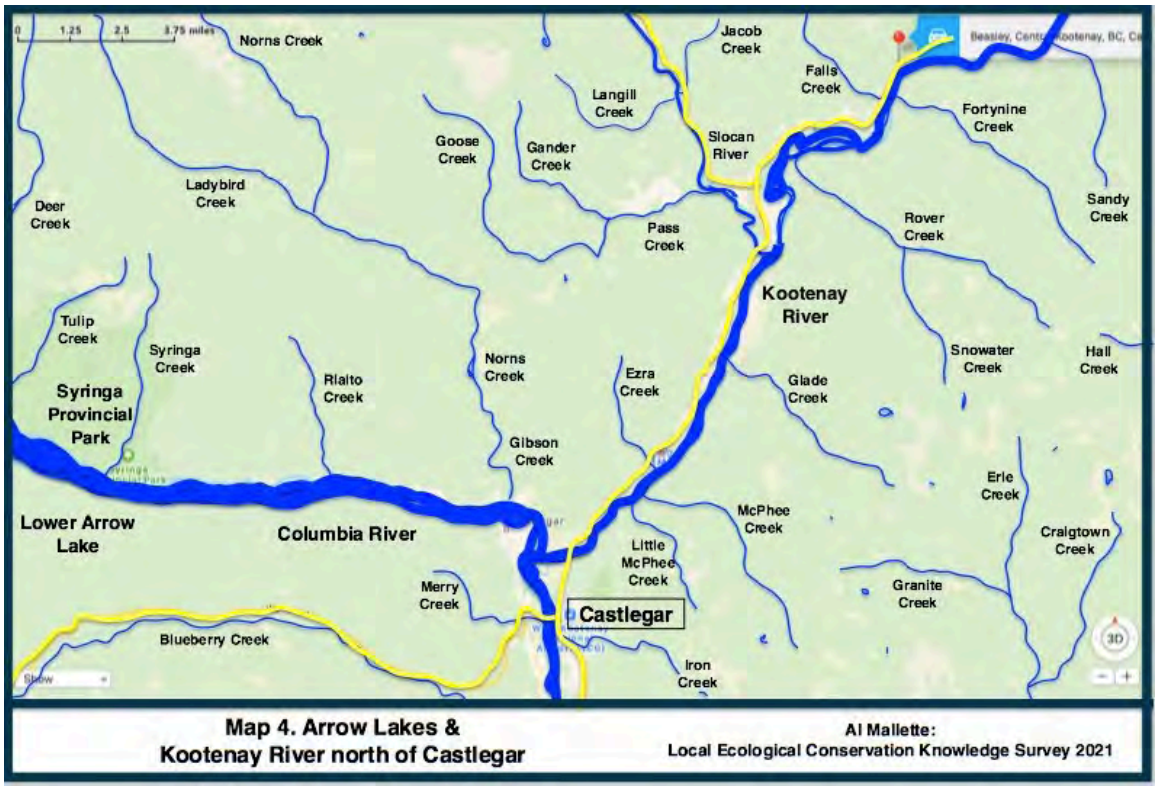


**Map 4. Arrow Lakes & Kootenay River north of Castlegar**

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