

**NATIVE
TROUT
CRITICAL
HABITAT
LOSS IN
SOUTHERN
ALBERTA**



ACKNOWLEDGEMENTS

Thank you to the [Calgary Foundation](#) for their support of this project, and to all of the generous community members and individual supporters who made this project possible.

All photos in this report, except for page 2, were taken by Amber Toner. The photograph on page 2 was taken by Duncan Abercrombie.

CPAWS Southern Alberta acknowledges that they work in the traditional territories of the Siksikaitsitapi (Blackfoot Confederacy), comprised of the Siksika, Kainai, Piikani, and Amskapi Piikani First Nations; the Tsuut'ina First Nation; the Îyârhe Nakoda, including the Chiniki, Bearspaw, and Goodstoney First Nations; the Ktunaxa Nation; and the Otipemisiwak Métis Nation of Alberta. Today, southern Alberta is home to Indigenous people from all over North America.

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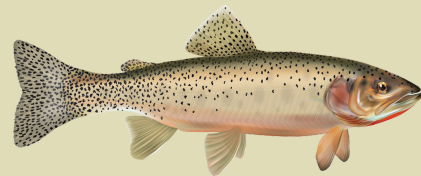


OVERVIEW

There are three threatened and endangered species of native trout in Alberta: westslope cutthroat, bull, and Athabasca rainbow.

Because all three species are listed under the Species at Risk Act (SARA) and have recovery strategies, their habitat is legally protected as critical habitat.

Despite being legally protected, habitat loss continues to occur.



Westslope cutthroat trout



Bull trout



Athabasca rainbow trout





We identified over 100 crossings of critical habitat, all of which caused riparian critical habitat destruction. None had received a SARA permit.

Habitat destruction can be permissible under the SARA under specific circumstances through a permitting system; however, it is striking that from 2020-2024 there have been only three SARA permits issued for forestry operations — a small fraction of the total number of operations that have proceeded in critical habitat during this time.

FORESTRY IMPACT

In this report we quantify the **habitat loss caused by forestry operations** for westslope cutthroat and bull trout in southern Alberta, specifically in the provincially managed headwaters of the South Saskatchewan region, which contains most remaining westslope cutthroat trout habitat and a significant proportion of remaining bull trout habitat. Athabasca rainbow trout habitat was outside our study area but is likely impacted in similar ways.

While there are many factors that have contributed to native trout population decline, habitat loss is a major one. It is also one which is, in large part, **within the ability of forestry regulators and industry to control.**





We found that since legal protection of habitat for westslope cutthroat and bull trout was enacted, there has been **continual and significant loss of critical habitat due to forestry operations.**

HABITAT LOSS

We used Geographic Information System (GIS) analysis to quantify critical habitat loss that has occurred since the species' critical habitat was designated in 2020/21, up to 2023.

Critical habitat includes watercourses themselves and surrounding riparian areas, defined as areas within 30 m* of the high-water mark of identified watercourses. We used publicly available data sources, including company operating plans, to estimate the amount of critical habitat lost to harvest areas and to access roads crossing watercourses.

Harvest areas regularly occurred in critical habitat, including watercourses and riparian areas. For westslope cutthroat trout, an estimated 28 km of critical habitat watercourse was impacted by harvest areas. For bull trout, an estimated 85 km of critical habitat watercourse was impacted by harvest areas.

In total, this translates to an **estimated loss of:**

73 ha westslope cutthroat riparian critical habitat

212 ha bull trout riparian critical habitat

*This 30 m riparian area is necessary to protect key stream attributes such as clean and cold water with low sediment and silt, maintain channel configuration and habitat structure, and provide terrestrial food inputs and woody debris into the aquatic environment.





Crossings over critical habitat watercourses were also a common occurrence, with each structure and its associated access road leading to small but additively serious loss of riparian habitat; these crossing structures also increased the risk of erosion.

See Appendix I (page 21) and [online map](#) for critical habitat loss locations.

It is important to recognize that data availability for estimating critical habitat loss is poor and, as such, all metrics provided are estimates and should be treated with discretion. However, we have endeavoured to use conservative assumptions in our analysis. It is probable that these estimates may be underestimating critical habitat loss during the time period mentioned above. The survival and recovery of native trout populations in Alberta depends upon ensuring the long-term protection of critical habitat.

CHANGES ARE NEEDED to forest management practices in Alberta to prevent further loss of critical habitat and thereby safeguard the future of these species.





1. INTRODUCTION

The headwaters of the South Saskatchewan River Basin play a crucial role in supplying water to southern Alberta, including the City of Calgary, Treaty 7 territory, and much of the province’s irrigated land. Nearly all the water flowing through the basin originates in the forested headwaters of the Rocky Mountains,¹ home to the westslope cutthroat trout and bull trout. These native trout species depend on the cold, clean, complex, and connected habitat² found in the watersheds of the Eastern Slopes. Unfortunately, both westslope cutthroat trout and bull trout are declining and listed as Threatened under the federal Species at Risk Act (SARA) and the Alberta Wildlife Act.

Historically, westslope cutthroat trout occupied most rivers and streams in the South Saskatchewan River Basin, but now only a few isolated populations remain. Bull trout, Alberta’s official provincial fish, are more widely distributed but have also experienced significant range contractions. As indicator species, the health of native trout and the presence of intact, minimally disturbed forested watersheds

¹ Cantafio & Ryan (2014). Quantifying baseflow and water-quality impacts from a gravel dominated alluvial aquifer in an urban reach of a large Canadian river. *Hydrogeology* 22: 957–970.

² D’Angelo & Muhlfeld (2011). Factors influencing the distribution of bull trout and westslope cutthroat trout west of the continental divide in Glacier National Park.

in this region are directly linked to the availability of resilient and reliable water sources for Albertans. Consequently, concern over native trout populations carries broader ecological and ecosystem services implications.

Factors that have contributed to the decline of these two species include hybridization and competition with non-native trout species (e.g., rainbow trout), overfishing, climate change, and habitat degradation.³ Important progress has been made to address causes of decline, particularly hybridization and competition with non-native species and overfishing. Extensive genetic sampling has been conducted to delineate the distribution of species and guide re-stocking initiatives and the expansion of populations and habitat ranges. The East Slopes have been established as a priority area for the Species at Risk program as part of the Fisheries and Oceans Canada (DFO) Fish Habitat Restoration Priorities,⁴ spurring investment in restoration. Community and environmental groups, including the Blackfoot Confederacy Native Trout Recovery Project and the Alberta Native Trout Collaborative, have also made important contributions through habitat restoration projects and awareness campaigns.



³ Cleator et al. (2009). Information Relevant to a Recovery Potential Assessment of Pure Native Westslope Cutthroat Trout, Alberta Population. Department of Fisheries and Oceans Canada Sci. Advis. Sec. Res. Doc. 2009/036. iv + 26 p.

⁴ Government of Canada. Rocky Mountains' eastern slopes priority place (AB) (dfo-mpo.gc.ca). Accessed June 2024.

While these actions are vital to the survival and recovery of westslope cutthroat trout and bull trout, they cannot reverse the overall trend of habitat loss, degradation, and fragmentation if they are not complemented by the protection of undisturbed habitat. Recovery strategies outlined under SARA provide a basis for the protection of habitat for these species. The first recovery strategy was published for westslope cutthroat trout in 2014, and subsequently updated with more inclusive habitat requirements and an [action plan](#) in 2019.⁵ A [bull trout recovery strategy](#) followed in 2020.⁶ These strategies define critical habitat and set strategic direction and objectives for ensuring the survival and recovery of the species.

It is important to note that critical habitat is a legal term with a specific definition and is distinct from habitat that is referred to as key, important, or crucial. The legal definition of critical habitat is found in SARA, which recognizes that habitat protection is needed to prevent wildlife species from becoming extinct.

SARA defines critical habitat as:

“the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species’ critical habitat in the recovery strategy or in an action plan for the species.”

When a species is first listed under the act, a process of identifying the critical habitat for the species is carried out by the Federal Government in partnership with the relevant provincial government(s). Once critical habitat has been formally identified, it is subsequently protected through a legal mechanism known as a critical habitat order. This makes it illegal to destroy any part of the critical habitat of a listed species.

⁵Fisheries and Oceans Canada. 2019. Recovery Strategy and Action Plan for the Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi*) Alberta Population (also known as Saskatchewan-Nelson River Populations) in Canada. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa. vii + 60 pp + Part 2

⁶Fisheries and Oceans Canada. 2020. Recovery Strategy for the Bull Trout (*Salvelinus confluentus*), Saskatchewan-Nelson Rivers populations, in Canada [Final]. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa. vii + 131 pp.

The critical habitat order for bull trout defines critical habitat:

“The Order triggers the application of the prohibition set out in subsection 58(1) of SARA against the destruction of any part of bull trout critical habitat and results in the legal protection of the critical habitat identified in the recovery strategy. Maps of the areas that contain critical habitat can be found in the recovery strategy. Only those areas within the identified geographical boundaries possessing features and attributes necessary to support defined life stage functions comprise the critical habitat.

A width of 30 m from the high water mark on both stream banks is included in the identified critical habitat. This 30 m riparian area is necessary to protect key stream attributes such as clean and cold water with low sediment and silt, maintain channel configuration and habitat structure, and provide terrestrial food inputs and woody debris into the aquatic environment.”⁷

Despite critical habitat having been defined several years ago for native trout species, critical habitat loss continues across the region, putting these species at ever greater risk. Habitat loss and degradation is continuing to fragment populations, altering water flow and temperature, and increasing surface erosion risks. Sedimentation from surface erosion is particularly problematic for native trout species, as even low levels can reduce reproductive success. Roads are a major source of fine sediment entering streams,⁸ particularly affecting smaller headwaters streams that are considered minor watercourses and receive less protection. Increasing habitat impacts of this nature are largely the result of the greater frequency and magnitude of land-use pressures in the relatively intact eastern parts of the South Saskatchewan River Basin, including industrial forestry, coal mining developments, and off-highway vehicle (OHV) use.

In this report, we outline the scale of current footprint and tenure in the headwaters of the South Saskatchewan River basin. We then analyze the impacts of forestry operations on native trout habitat since the publication of the westslope cutthroat and bull trout recovery strategies.

⁷Critical Habitat of the Bull Trout (*Salvelinus confluentus*) Saskatchewan-Nelson Rivers Populations Order: SOR/2021-31

⁸Al-Chokhachy et al. (2016). Linkages between unpaved forest roads and streambed sediment: why context matters in direction road restoration. *Restoration Ecology* 24: 589-598.



2. METHODS

2.1. Study Area

The study area encompasses the provincially managed headwaters of the South Saskatchewan region. It was defined by the intersection of two provincially delineated boundaries, the South Saskatchewan Regional Plan and the Rocky Mountain Forest Reserve.

The South Saskatchewan Regional Plan was developed under the Government of Alberta 2008 Land-use Framework⁹ to facilitate land-use planning. The Rocky Mountain Forest Reserve¹⁰ was designated in its current form in 1948 and provides for the conservation of the forests and the protection of the watersheds and rivers on the eastern slopes of the Rocky Mountains.

The study area captures the majority of provincially managed forested headwaters and trout habitat within the region. 45% of the study area is

⁹ <https://landuse.alberta.ca/>

¹⁰ <https://open.alberta.ca/opendata/gda-76618ff2-60a1-4d22-aca0-9ed0013e731b>

managed as parks and protected areas, while 49% is managed under two Forest Management Agreements¹¹ (FMAs), the latter of which are owned by West Fraser Cochrane.

The study area contains 90% of the remaining critical habitat for westslope cutthroat trout and 33% of the remaining critical habitat for bull trout (Figure 1). Almost all of the remaining westslope cutthroat trout critical habitat in the province that is located outside of parks and protected areas is found within the two FMAs, as is a quarter of unprotected bull trout critical habitat.

2.2. Footprint & Tenure

We assessed the existing footprint and existing tenure within the study area. All analysis was completed using PostgreSQL 15. The following data sources were used:

- Alberta Biodiversity Monitoring Institute (ABMI) Human Footprint data (2021)
- Forest Management Agreements (AltaLIS, 2023)
- Parks and Protected areas (AltaLIS, 2023)
- Coal and Petroleum Natural Gas Agreements (Alberta Energy, 2024-03-18)
- Petroleum Natural Gas well locations, status (Alberta Energy Regulator ST37 report, 2024-03-18).

¹¹ <https://www.alberta.ca/forest-management-agreements>

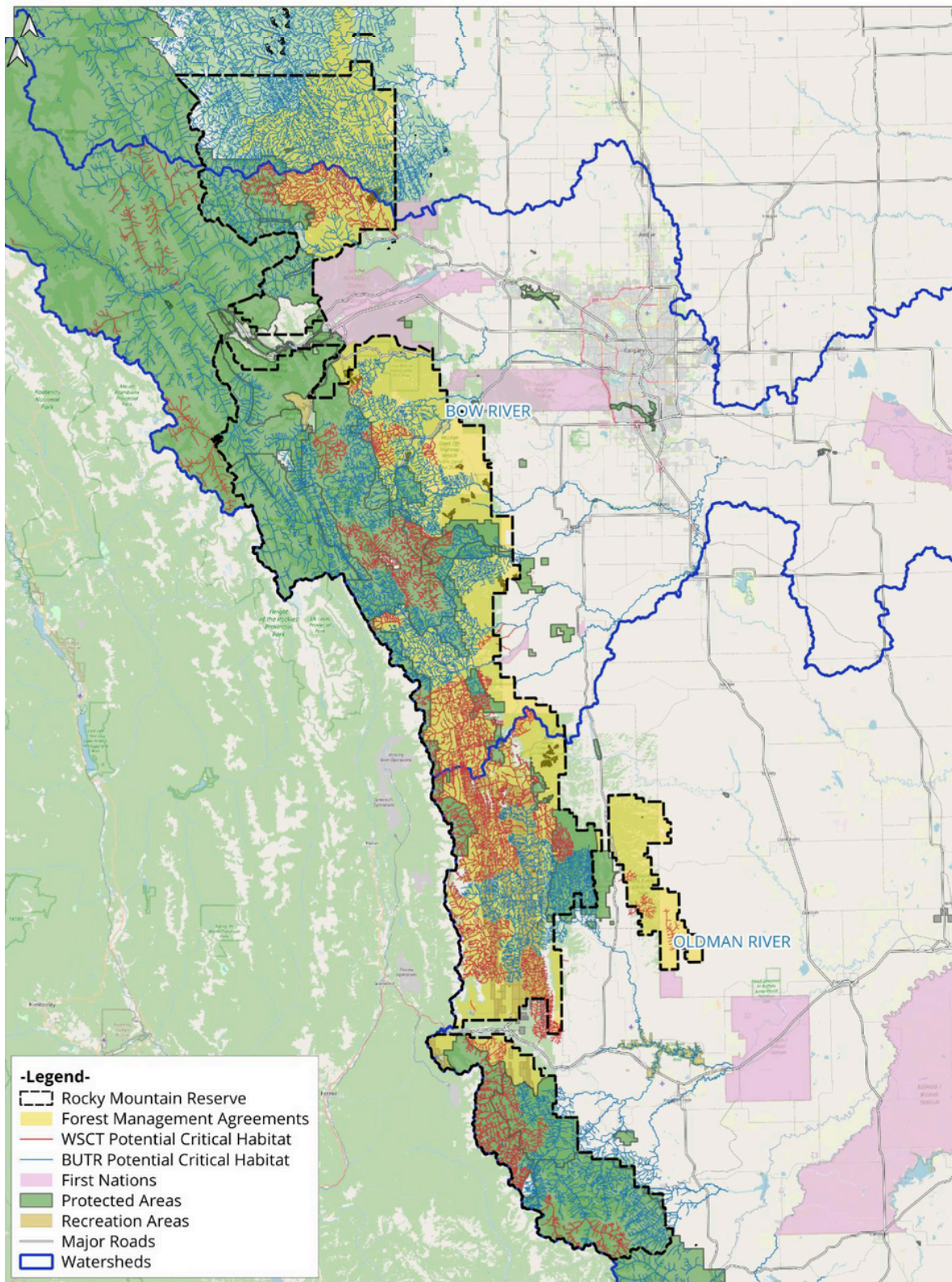


Figure 1. The portion of the Rocky Mountain Forest Reserve that is within the South Saskatchewan River Basin. The majority of unprotected lands in this area are part of Forest Management Agreements. Note that westslope cutthroat trout is shown above bull trout critical habitat. Most locations with westslope cutthroat trout critical habitat also contain bull trout critical habitat.

2.3. Forestry Analysis

Given the extent of industrial forestry activities on the landscape, we were particularly interested in examining impacts to critical habitat since the publication of the most recent recovery strategies under the Species at Risk Act. The updated recovery strategy for westslope cutthroat trout — which updated critical habitat definitions to extend beyond identified genetically pure populations to include areas where genetically pure populations of species formerly occurred and have the potential to be reintroduced — was published in December 2019, and the bull trout recovery strategy was published in September 2020.

However, accessible data for the forestry footprint within the sub-region was unavailable for the most recent years, making it difficult to assess the impacts of forestry on native trout habitat since the recovery strategies were published.

Therefore, we conducted a detailed analysis of recent disturbances from forestry activity. To do this, we collated, reviewed, and analyzed company Annual Operating Plans (AOPs) to quantify current disturbance levels more accurately. We used this information, along with satellite imagery, to estimate the amount of critical habitat lost since the formal identification and protection of critical habitat.

2.3.1. Data

- Bull Trout Recovery Strategy (2020-09-10) and associated critical habitat maps.
- Westslope Cutthroat Trout Recovery Strategy / Action Plan (2019-12-12) and associated critical habitat maps.
- Alberta Biodiversity Monitoring Institute (ABMI) Human Footprint data was used as a baseline for determining harvest areas
 - This data was only available up to and including 2021.
- For the period from the end of 2021 to the end of the 2023/24 operating season, Annual Operating Plans (AOPs) were used to identify harvest areas, access roads, and crossings.
 - AOPs are not always implemented as described (variance). For example sometimes blocks are moved back into later AOPs or moved forward from future plans, and sometimes block boundaries are adjusted.

- o As a result, wherever possible, we used the latest AOP information available. In some cases, this includes mapping of completed blocks from previous years, which are assumed to be more accurate than the pre-harvest AOP mapping. Wherever possible harvest area boundaries were cross-referenced with more recent AOPs and/or publicly available satellite imagery. See Appendix II for details of AOPs used.
- o Note that bridges were not marked on the 2023/24 AOPs and so bridge locations for this year were ascertained by visual inspection of satellite imagery and AOP maps from other years, where possible.
- Satellite imagery for cross-referencing was obtained from Copernicus Sentinel.

2.3.2. Processing

Digitizing and collating harvest boundaries, access roads, and crossings data was completed in QGIS (v. 3.30.1). Analysis of data was completed in PostgreSQL 15.

Habitat loss due to forestry activities was considered likely in the following circumstances:

- Harvest areas within 30 m of critical habitat streams. In these cases, a direct loss of riparian critical habitat is likely to have occurred and can be estimated based on harvest boundaries and watercourse locations.
 - o Harvest areas were buffered by 30 m and then length (km) of critical habitat within harvest areas and the 30 m buffer was calculated. This value provides an estimate of the length of watercourse where critical habitat has been directly impacted by harvest areas.
 - o The area (ha) of riparian critical habitat directly lost due to harvest areas was estimated by buffering the critical habitat by 30 m and calculating the overlap of this buffer with harvest areas.
- Harvest areas within 100 m of critical habitat. While 30 m was used in the federal recovery strategies, the scientific literature suggests that a buffer of at least 100 m on critical habitat may be required to minimize impacts. This buffer distance was originally included by federal officials in a draft recovery plan for westslope cutthroat trout but was reduced to 30 m after Alberta

officials expressed concern with the impact of this on forestry operations.¹²

- o The process followed was the same as for the 30 m buffer analysis, but instead used a 100 m buffer.
- Crossings of critical habitat. In these cases, a direct loss of riparian habitat is likely to have occurred through either side of a watercourse's riparian habitat, the area (ha) of which can be estimated based on the assumed or measured width of the access road and adjacent cleared vegetation.
 - o Crossings are typically shown in AOPs, but do not always align with mapped critical habitat watercourses due to differences in data sources. It is likely that in this region, where most watercourses are critical habitat of either westslope cutthroat trout or bull trout, that most crossings have an impact on critical habitat in some way. However, taking a more cautious approach, we identified any crossing within 30 m (to account for data inaccuracy/mismatch) of critical habitat as being a crossing over critical habitat.
 - o The critical habitat lost from crossings was estimated by assuming a cleared area width of 15 m, which includes both the road itself and any cleared vegetation alongside it. This value is based on estimates used by forestry companies.
 - o Based on this, we estimated that each crossing removes 900 m² of critical habitat: 30 m (riparian area) * 15 m (road width) * 2 (either side of watercourse) = 900 m² = 0.09 ha.

¹² Fluker, Shawn C. and Mayhood, David W. (2020) "Environmental Stewardship of Public Lands? The Decline of Westslope Cutthroat Trout Along the Eastern Slopes of the Rocky Mountains in Alberta," Public Land & Resources Law Review: Vol. 42 , Article 6.



3. RESULTS

3.1 Footprint & Tenure

Close to half of the South Saskatchewan River Basin headwaters study area is part of various provincially managed parks and protected areas, with relatively low levels of disturbance footprint. However, the remaining area has substantial footprint. This includes 49% of the study area that is under Forest Management Agreement and has significant footprint from harvest areas and associated access. It also has extensive designated and unofficial trail networks, widely utilized by recreational off-highway vehicles. There is some petroleum natural gas infrastructure and approximately 10% of the study area has petroleum natural gas tenure (Table 1).

Coal tenure is found only in the southern part of the headwaters study area in the Oldman River watershed (Table 2). There is extensive overlap of native trout critical habitat and coal tenure within this region, with 1,073 km of bull trout and 562 km of westslope cutthroat trout critical habitat found within areas under coal tenure.

Table 1. Percentage under FMA (data: AltaLIS), area harvested (data: ABMI Human Footprint 2021), percentage under petroleum natural gas tenure (data: Alberta Energy), number of wells (data: Alberta Energy Regulator), length and density of linear features by class (data: ABMI Human Footprint 2021) for each study area.

SSRB HEADWATERS		
AREA	km ²	9,384
CRITICAL HABITAT WESTSLOPE CUTTHROAT TROUT	km ²	5,157
	% of all habitat	90.2
	unprotected km	3,087
	% of all unprotected	95.1
CRITICAL HABITAT BULL TROUT	km ²	14,190
	% of all habitat	33.1
	unprotected km	7,584
	% of all unprotected	24.5
PARK OR PROTECTED AREA	km ²	4,196
	%	44.7
FOREST MANAGEMENT AGREEMENT	km ²	4,598
	%	49.0
AREA HARVESTED 1982-2021	km ²	657.6
	%	7.0
AREA HARVESTED 2012-2021	km ²	182.4
	%	1.9
PETROLEUM NATURAL GAS TENURE	km ²	949.6
	%	10.1
COAL TENURE	km ²	510.0
	%	5.4
WELLS - ACTIVE	count	209
WELLS - INACTIVE	count	150
WELLS - RECLAIMED	count	140
ROADS	km	2,933
	km/km ²	0.31
PIPELINES	km	575.0
	km/km ²	0.06
SEISMIC LINES/TRAILS	km	9,138
	km/km ²	0.97
TRANSMISSION LINES	km	110.4
	km/km ²	0.01
TOTAL LINEAR	km	12,756
	km/km ²	1.36

3.2. Critical Habitat Loss

Habitat loss since the 2019/2020 recovery strategies were finalized has occurred across the two Forest Management Agreements for both westslope cutthroat trout and bull trout. For westslope cutthroat trout an estimated 28 km of critical habitat watercourse was within 30 m of harvest areas and 73 km within 100 m of harvest areas. For bull trout an estimated 85 km of critical habitat watercourse was within 30 m of harvest areas and 223 km within 100 m of harvest areas.

In total, when examining a 30 m riparian zone, this translates to an estimated loss of 73 ha of westslope cutthroat riparian critical habitat and a 212 ha loss of bull trout riparian critical habitat (Table 2). Note that westslope cutthroat trout and bull trout critical habitat frequently overlaps.

Crossings of critical habitat watercourses are a common and regular occurrence, with each leading to small but additively significant losses of riparian habitat, as well as creating erosion risks.

Table 2. Estimated losses of critical habitat to harvest areas and crossings since 2020/21. Note that westslope cutthroat trout and bull trout critical habitat often overlap, so habitat loss metrics for each species are not directly additive.

SSRB HEADWATERS		
AREA	km ²	9,384
CRITICAL HABITAT WESTSLOPE CUTTHROAT TROUT	within 30 m of harvest since Jan 2020 (km)	27.8
	within 100 m of harvest since Jan 2020	73.1
	lost to harvest area (ha)	72.7
	crossings (count)	45
	lost to crossings (count)	4.1
CRITICAL HABITAT BULL TROUT	within 30 m of harvest since Jan 2021 (km)	84.7
	within 100 m of harvest since Jan 2020	223.0
	lost to harvest area (ha)	211.6
	crossings (count)	175
	lost to crossings (count)	15.8




4. DISCUSSION

Despite the finalization of recovery strategies and publication of critical habitat orders for westslope cutthroat trout and bull trout, which make the destruction of critical habitat illegal, the loss of critical habitat for native trout species in the South Saskatchewan River Basin forested headwaters has continued.

Forestry operations are major causes of loss of riparian critical habitat as a consequence of harvest areas with insufficient buffers, crossings of critical habitat watercourses, and building of new access. Roads built for access not only cause direct losses of riparian areas, but also create surface erosion risks that have a major impact on native trout habitat. Riparian areas 30 m from high water mark, defined as critical habitat, are regularly impacted by harvest operations, particularly on smaller tributaries that often receive little protection but have great importance for water quality. If we look to the larger, biologically defensible 100 m buffer distances, the impact of habitat losses are even more apparent.

In this analysis we only examined critical habitat loss since the publication of the recovery strategies, as it was at this point that critical habitat was legally defined (updated and expanded, in the case of westslope cutthroat trout) and



subsequently protected. However, the process of reaching this stage was beset by lengthy delays, including in finalizing critical habitat identification. While a recovery strategy was published in 2014 for westslope cutthroat trout, it identified critical habitat in a highly limited way – for only remaining genetically pure populations and not including upstream tributaries or riparian habitat. This definition was expanded in the 2019 strategy to include areas where genetically pure populations of species formerly occurred and have the potential to be reintroduced, as well as limited riparian areas.

During the long delays in the listing of the species under SARA, and updating the recovery strategy in the case of westslope cutthroat trout (summarized in Fluker & Mayhood, 2020),¹³ critical habitat was undoubtedly lost. Therefore, it should be recognized that the habitat loss estimates from forestry operations provided here only represent a small portion of the overall habitat loss experienced by these species since their original designation as Threatened under COSEWIC (2005 for westslope cutthroat trout and 2012 for bull trout) and listing under SARA (2013 for westslope cutthroat trout and 2019 for bull trout).

Moreover, a significant barrier to understanding the scale of critical habitat loss is a severe lack of publicly available data. In this study, we used company Annual Operating Plans to identify many forestry roads, crossings of critical habitat, and in some cases harvest block boundaries. These plans are not produced in such a way as to be amenable to analysis, are unavailable for many years and locations, and sometimes outcomes of the plans cannot be directly verified. This means that critical habitat loss estimates provided in this study are subject to uncertainty. This is particularly the case for critical habitat crossings, which are poorly documented. Given that requirements already exist for companies to submit roading and block boundary information to government regulators, it would seem prudent for that data to be collated, verified, and published in an accessible format.

There is also a distinct lack of transparent data reporting on critical habitat impacts throughout the region from both industry and government regulators, making it difficult to assess overall impacts. A key example is the SARA

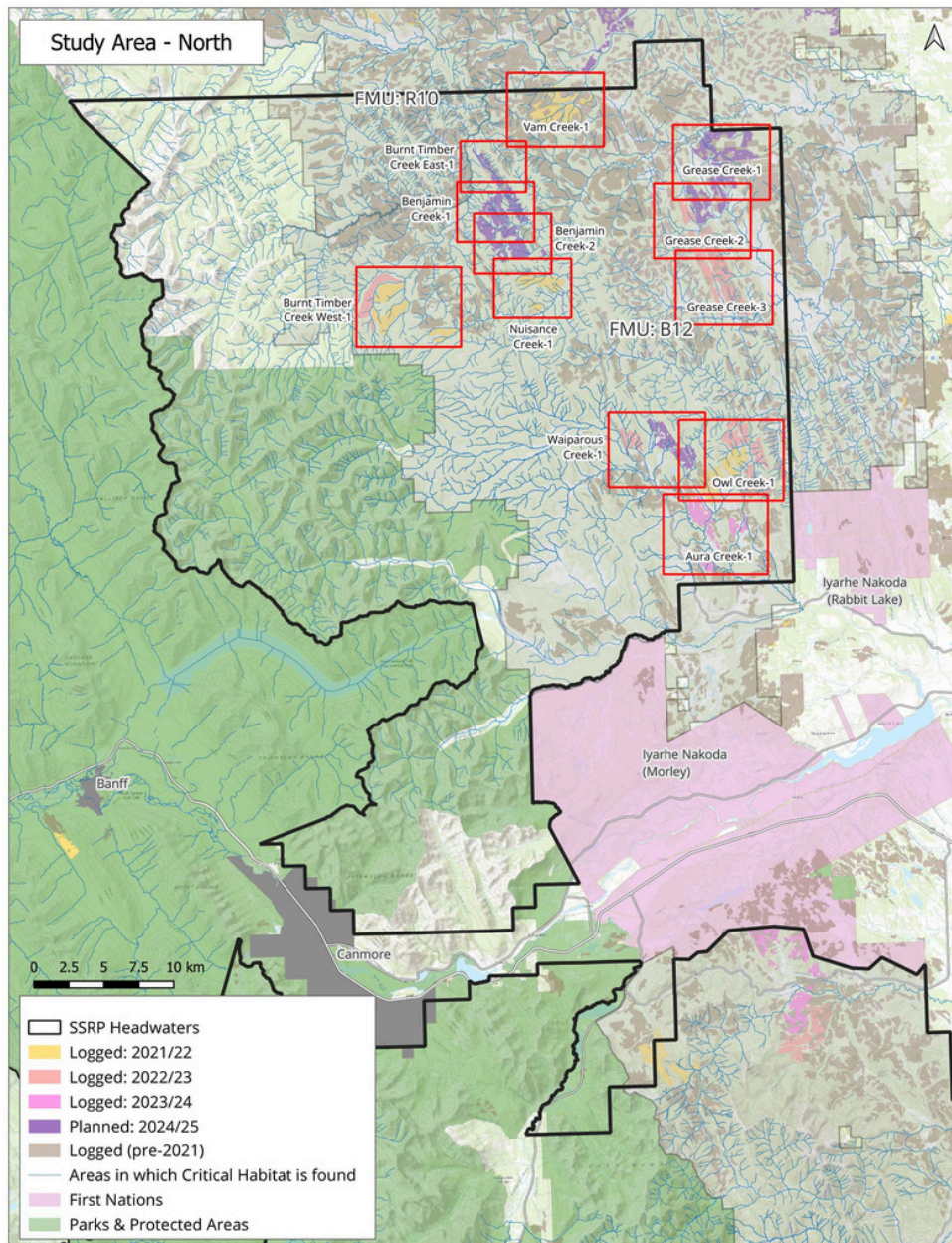
¹³ Fluker, Shawn C. and Mayhood, David W. (2020) "Environmental Stewardship of Public Lands? The Decline of Westslope Cutthroat Trout Along the Eastern Slopes of the Rocky Mountains in Alberta," *Public Land & Resources Law Review*: Vol. 42 , Article 6.

permitting system, which does not provide information on whether permits have been applied for, refused, or issued. For example, while we identified dozens of crossings of critical habitat in this study, which should require a SARA permit, no details on such permits are found on the SARA registry at the time of writing. Cumulatively, the impacts of critical habitat loss and surface erosion are considerable, and act against the aims of recovering the westslope cutthroat trout and bull trout. Alongside these regular losses, the total cumulative disturbance footprint from all sources, including forestry, coal mining, petroleum natural gas development, and motorized recreation, continues to increase in the watersheds upon which native trout rely. Clearly, the intent of the recovery strategies to ensure the survival and recovery of these threatened species is not being met.

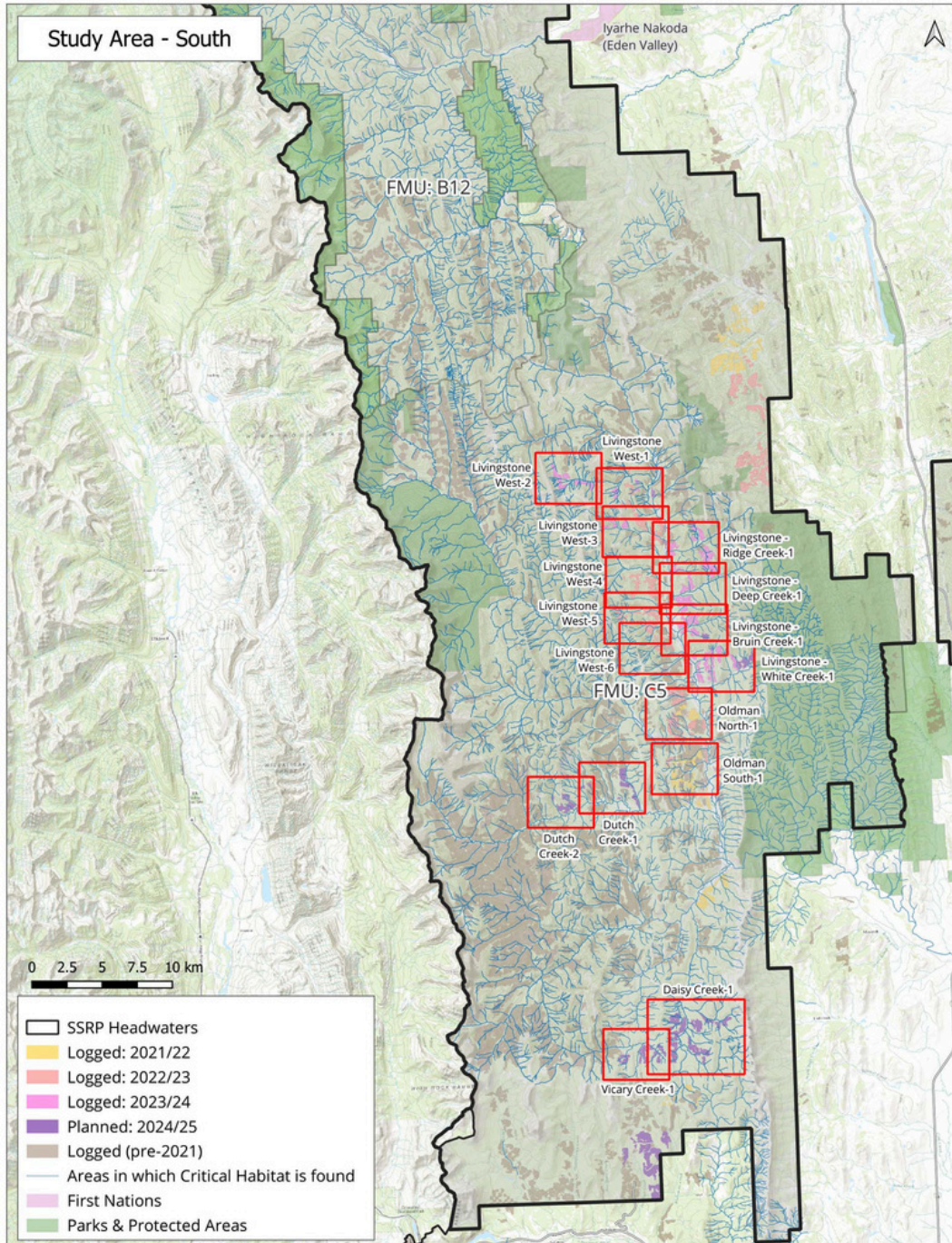
APPENDIX I

Maps

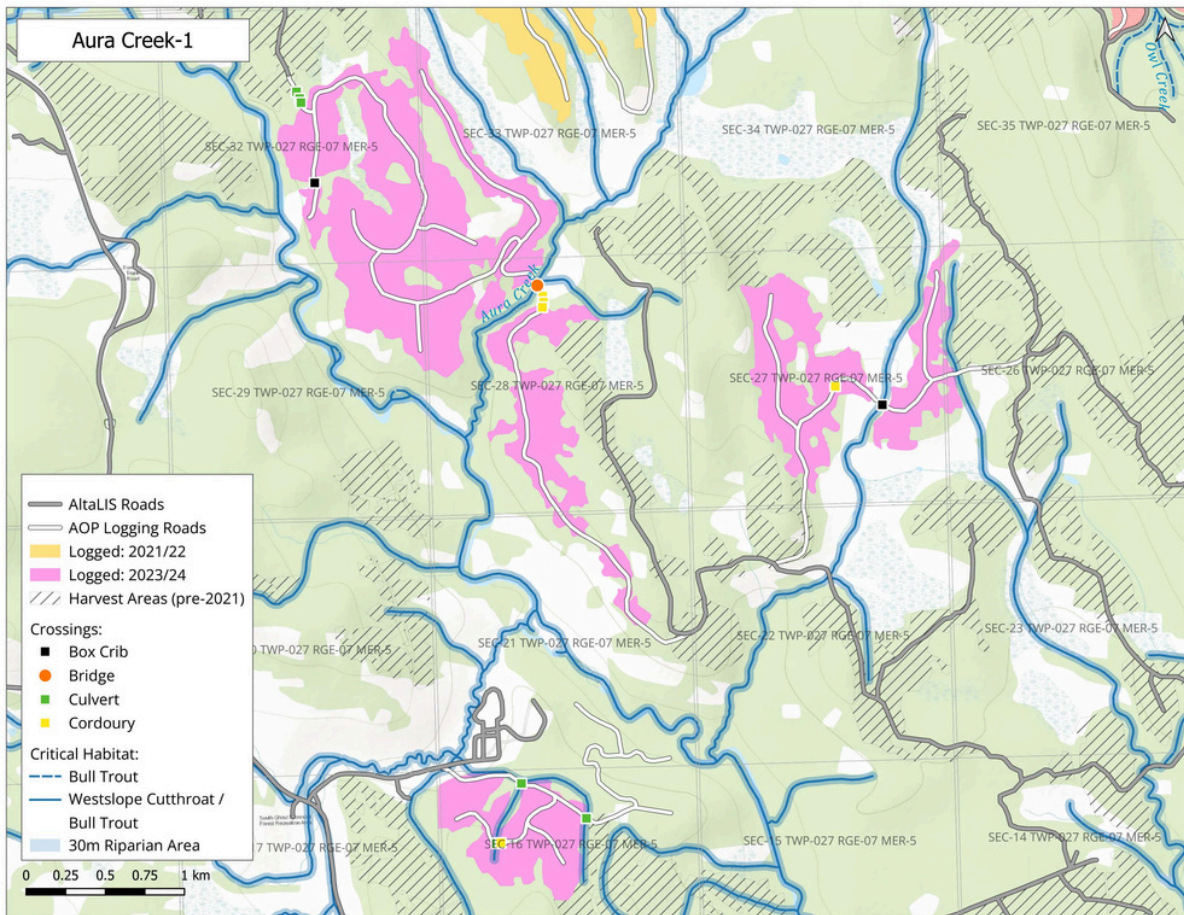
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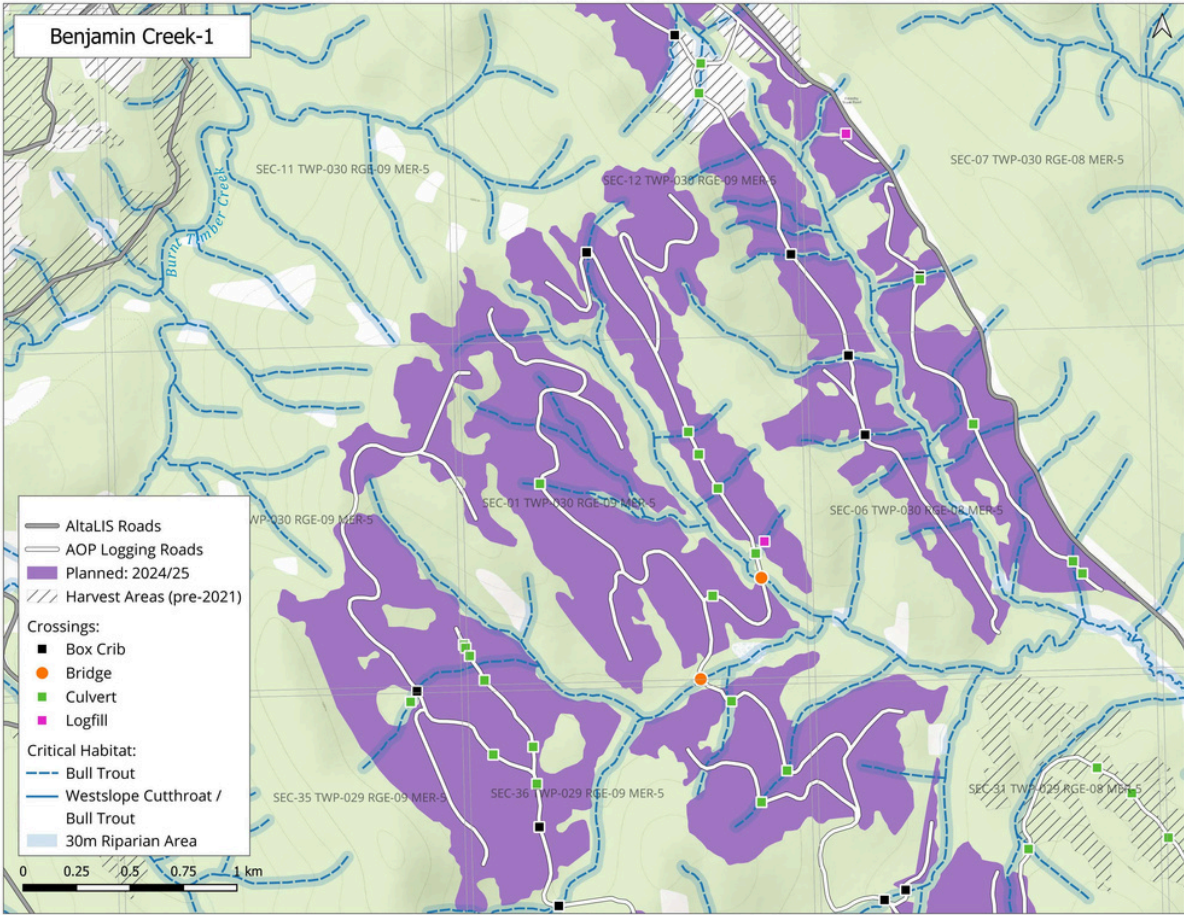
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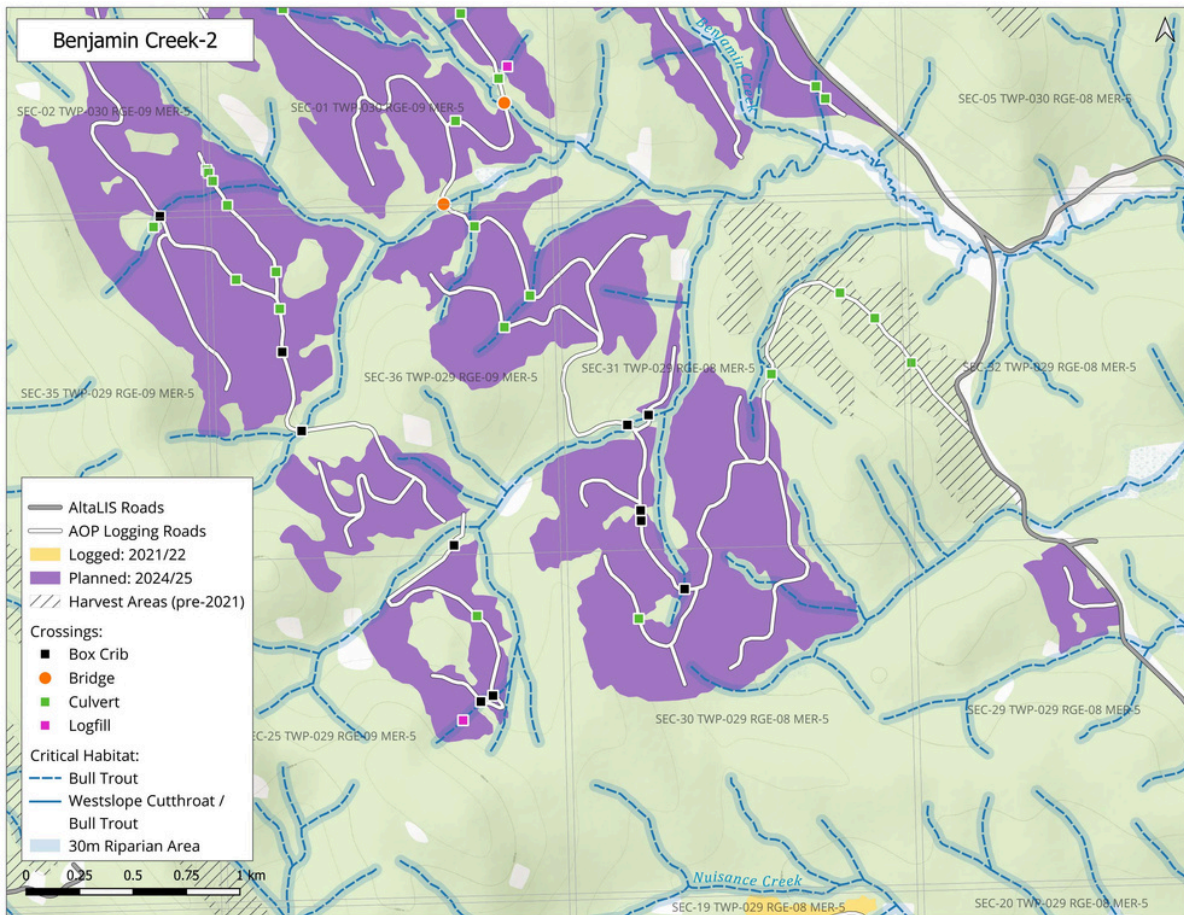
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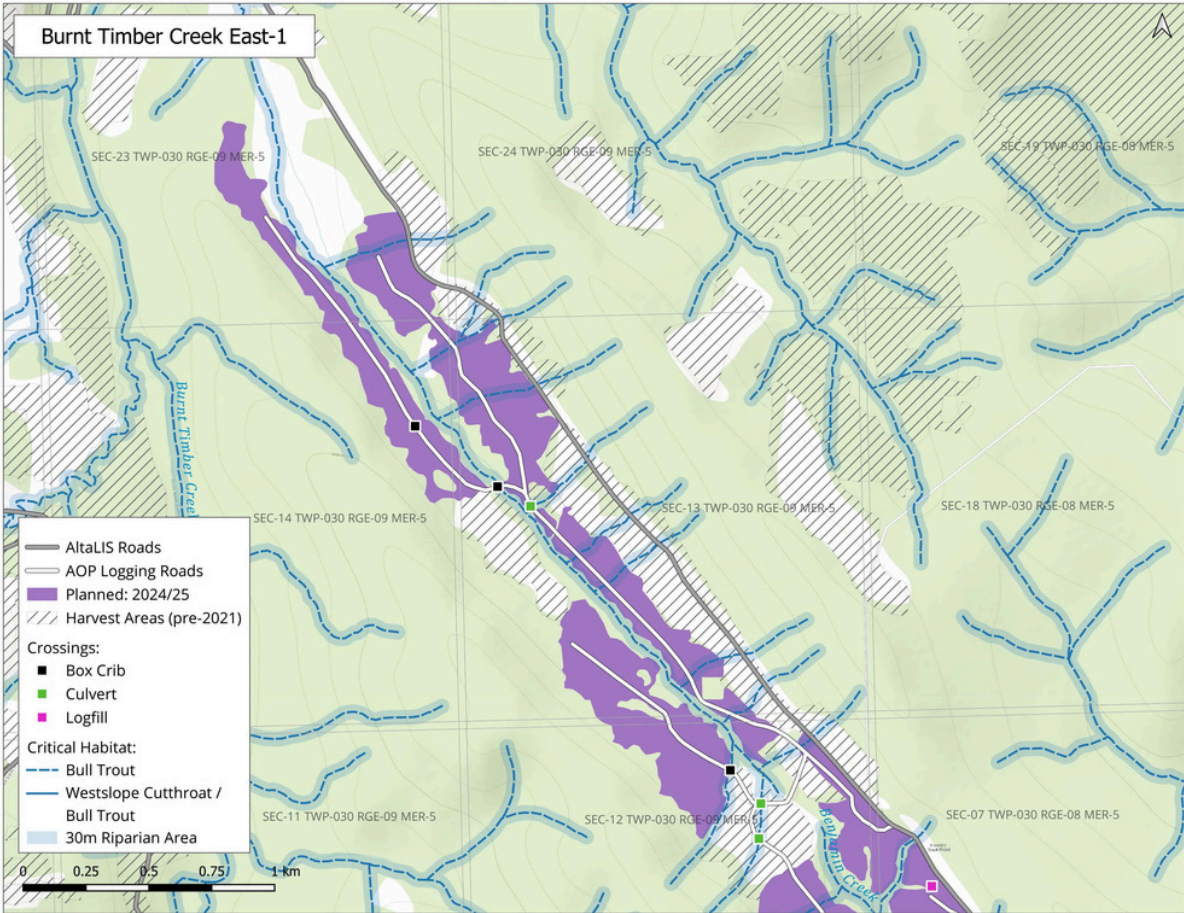
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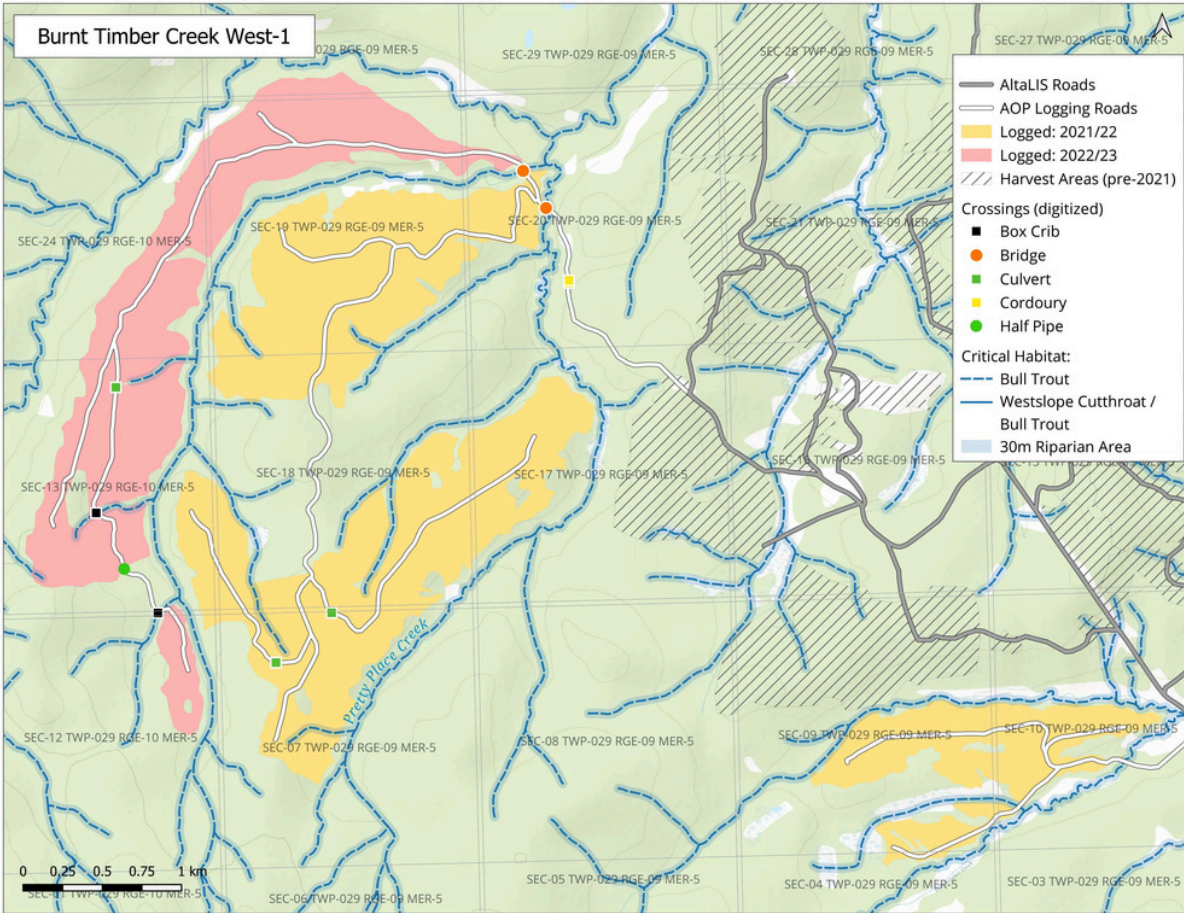
Benjamin Creek - 2



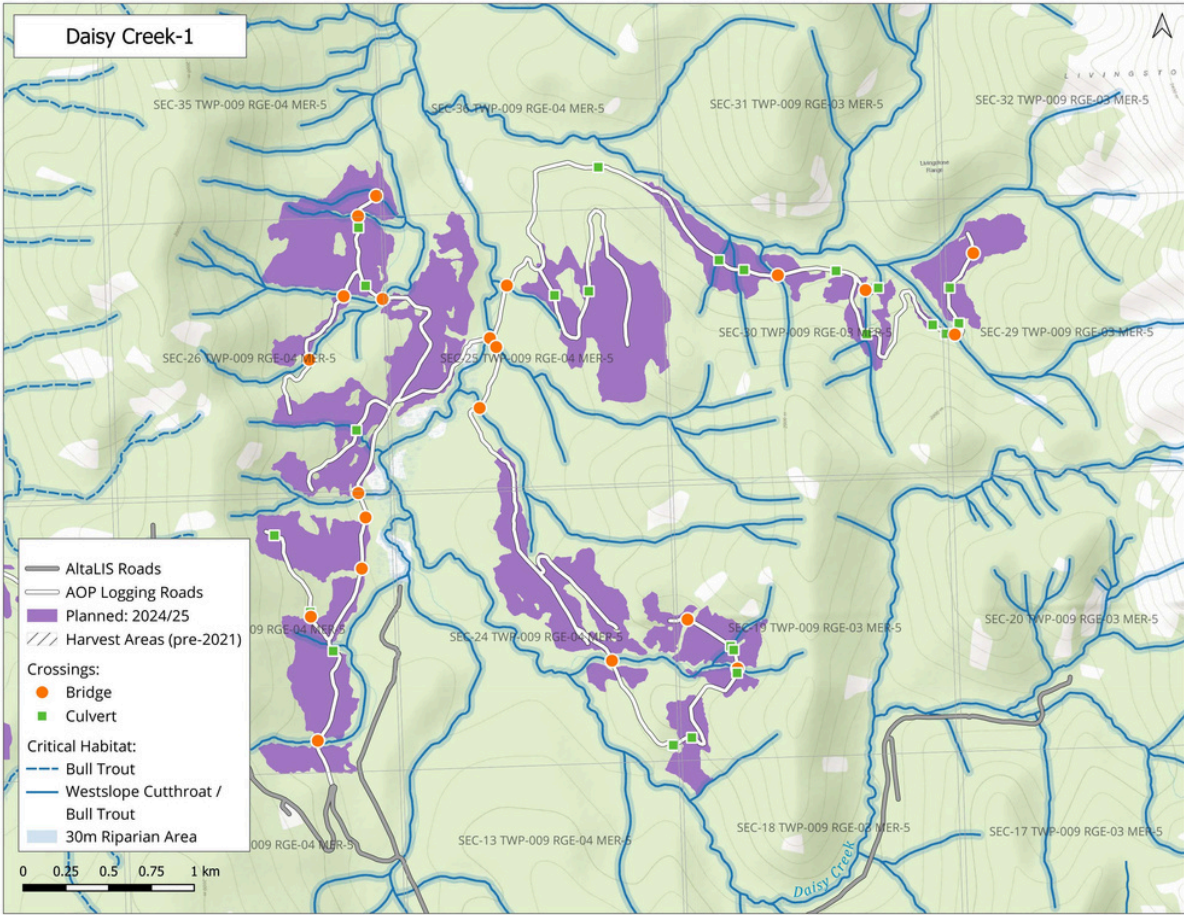
Burnt Timber Creek East - 1



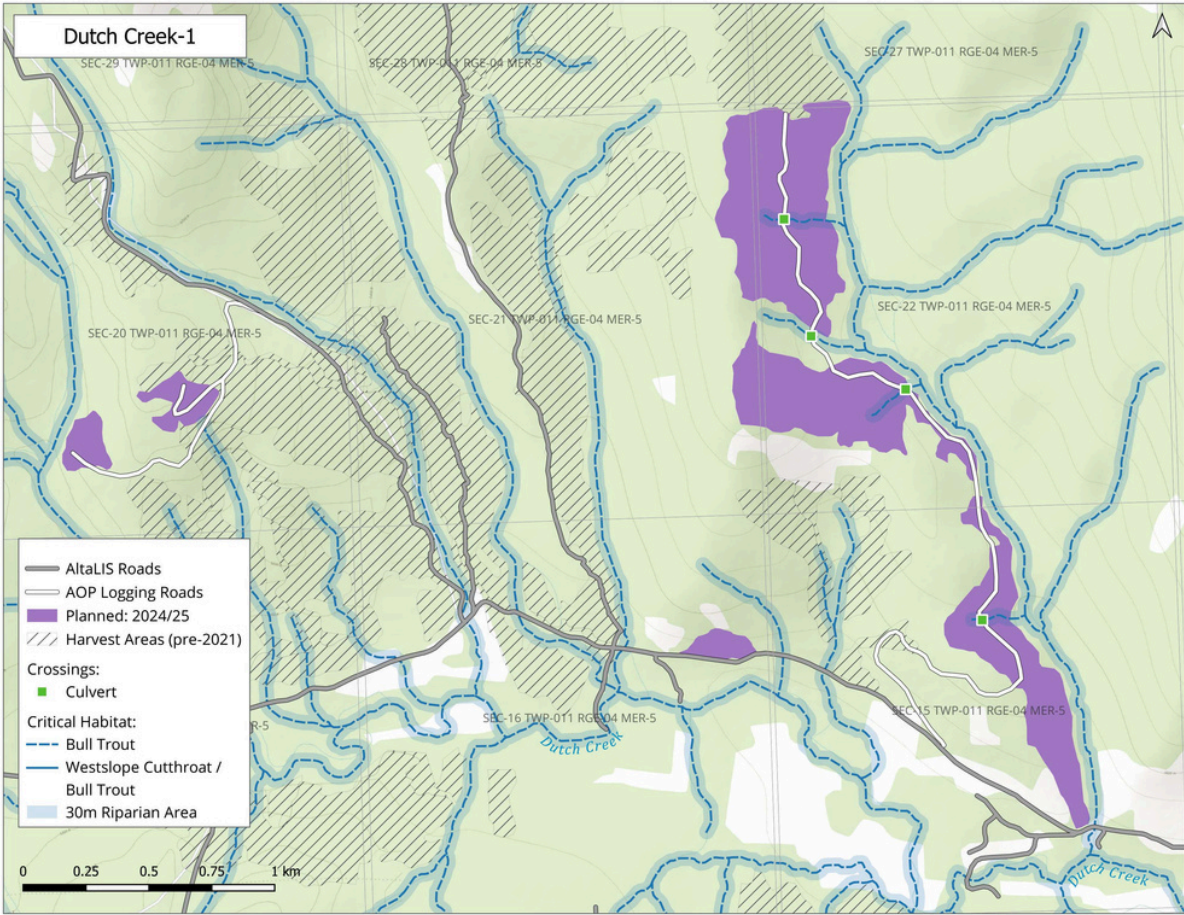
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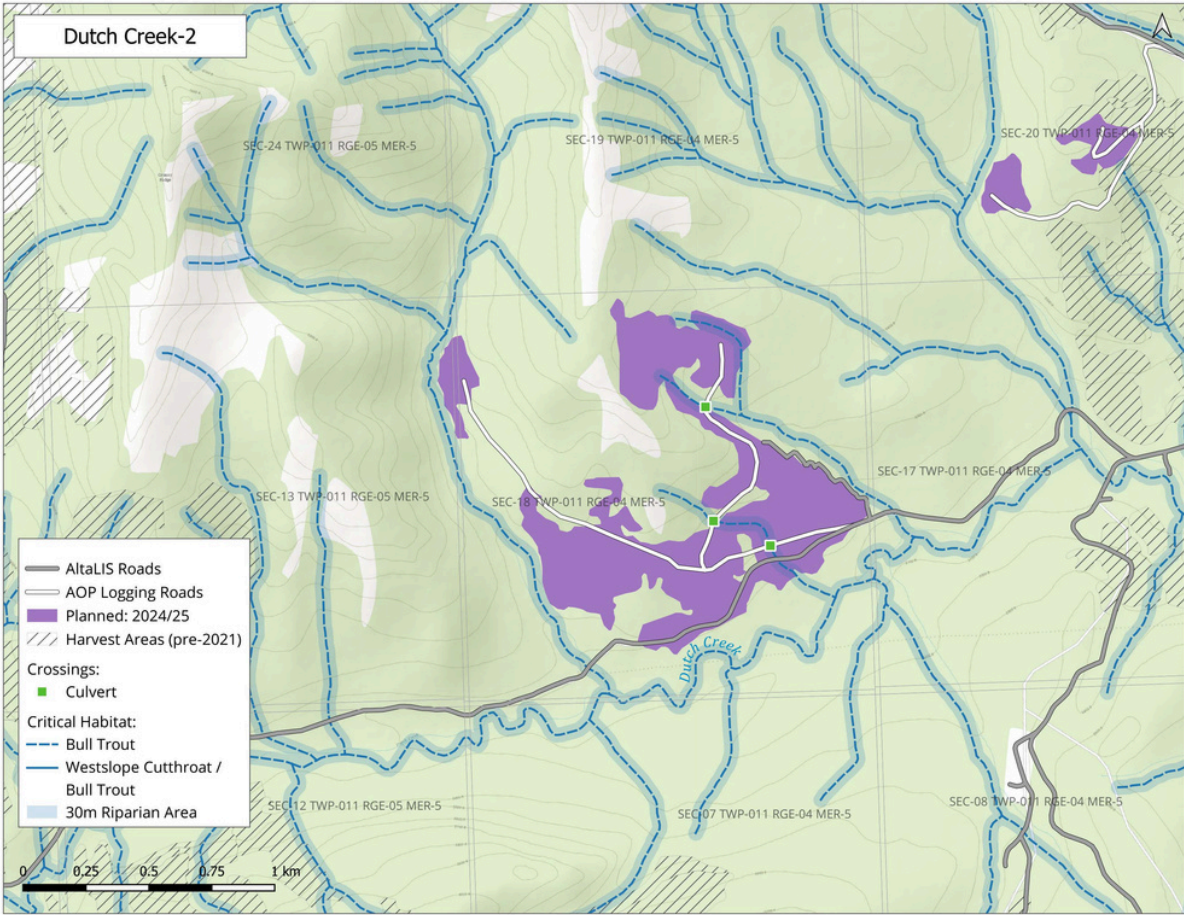
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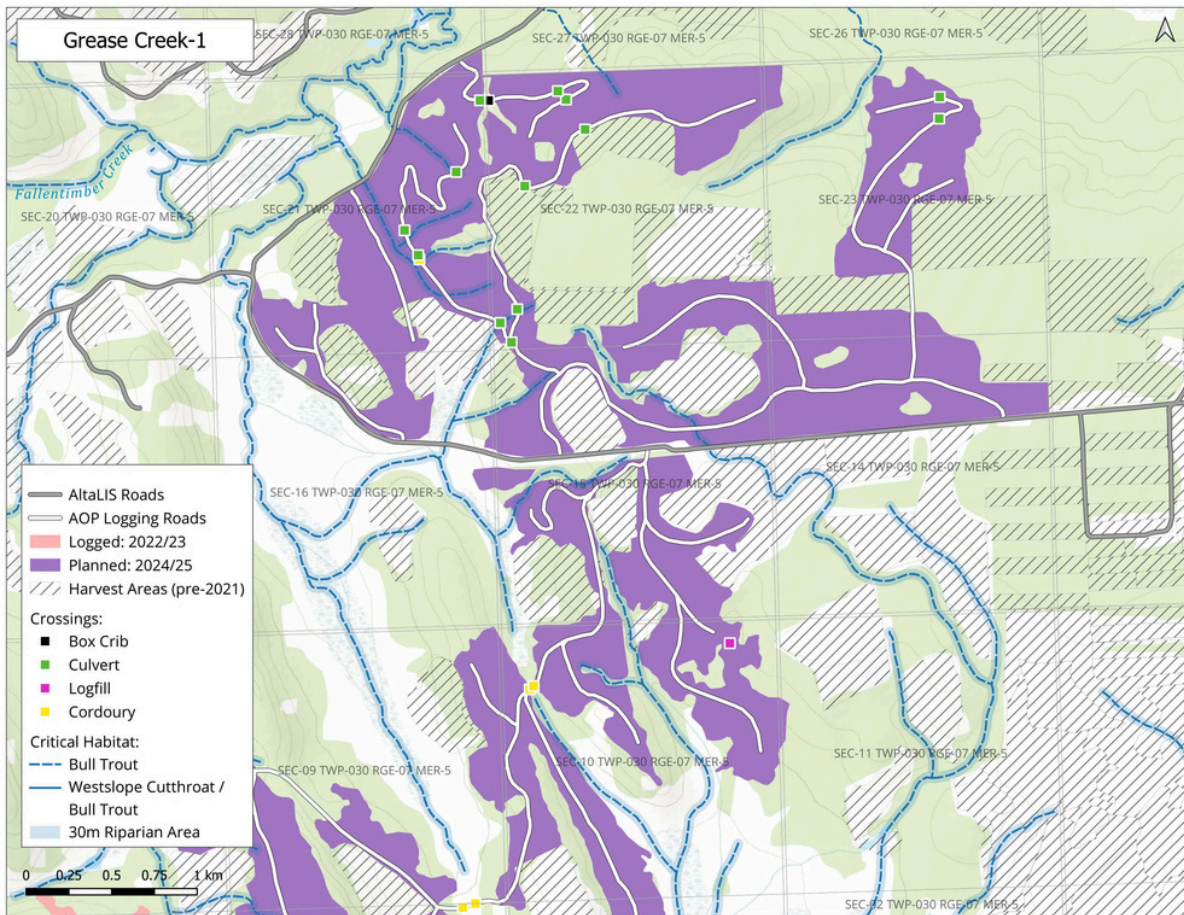
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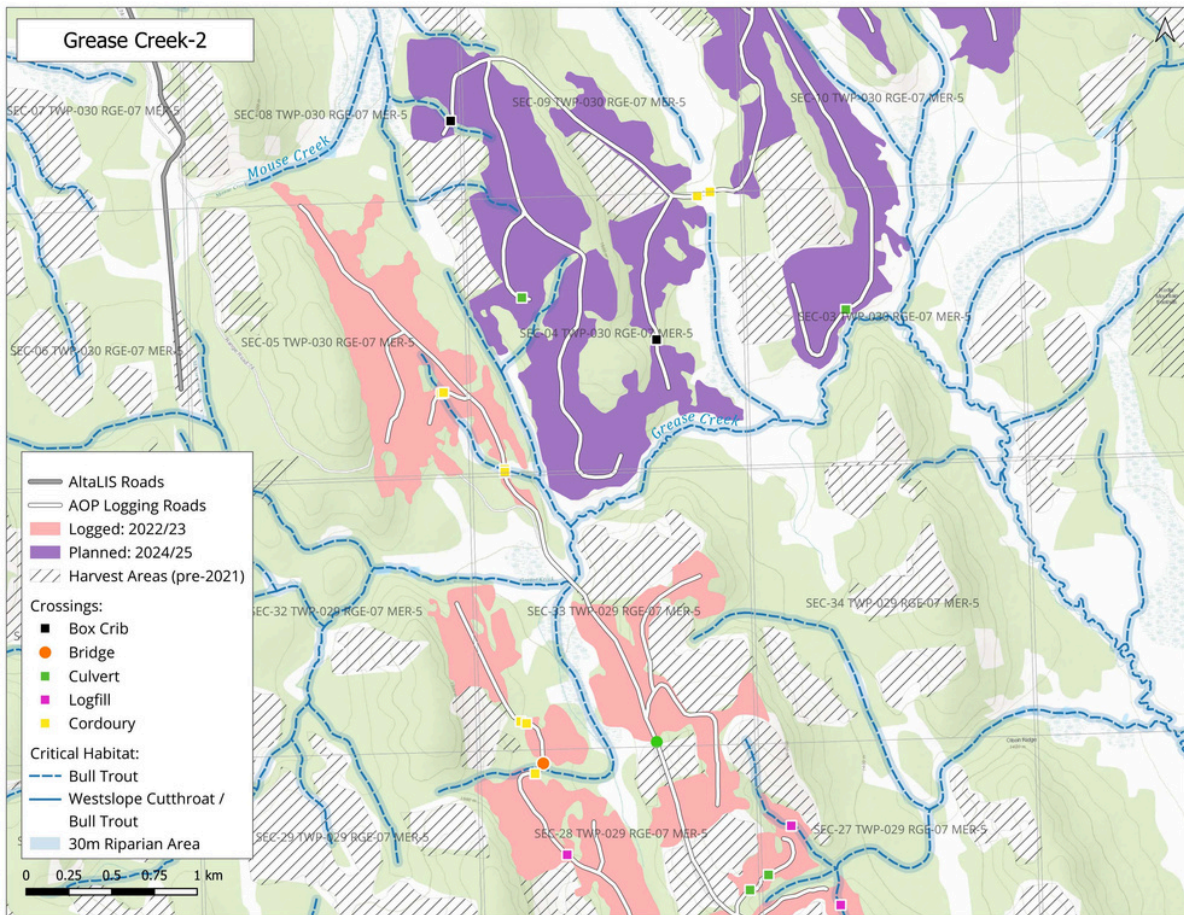
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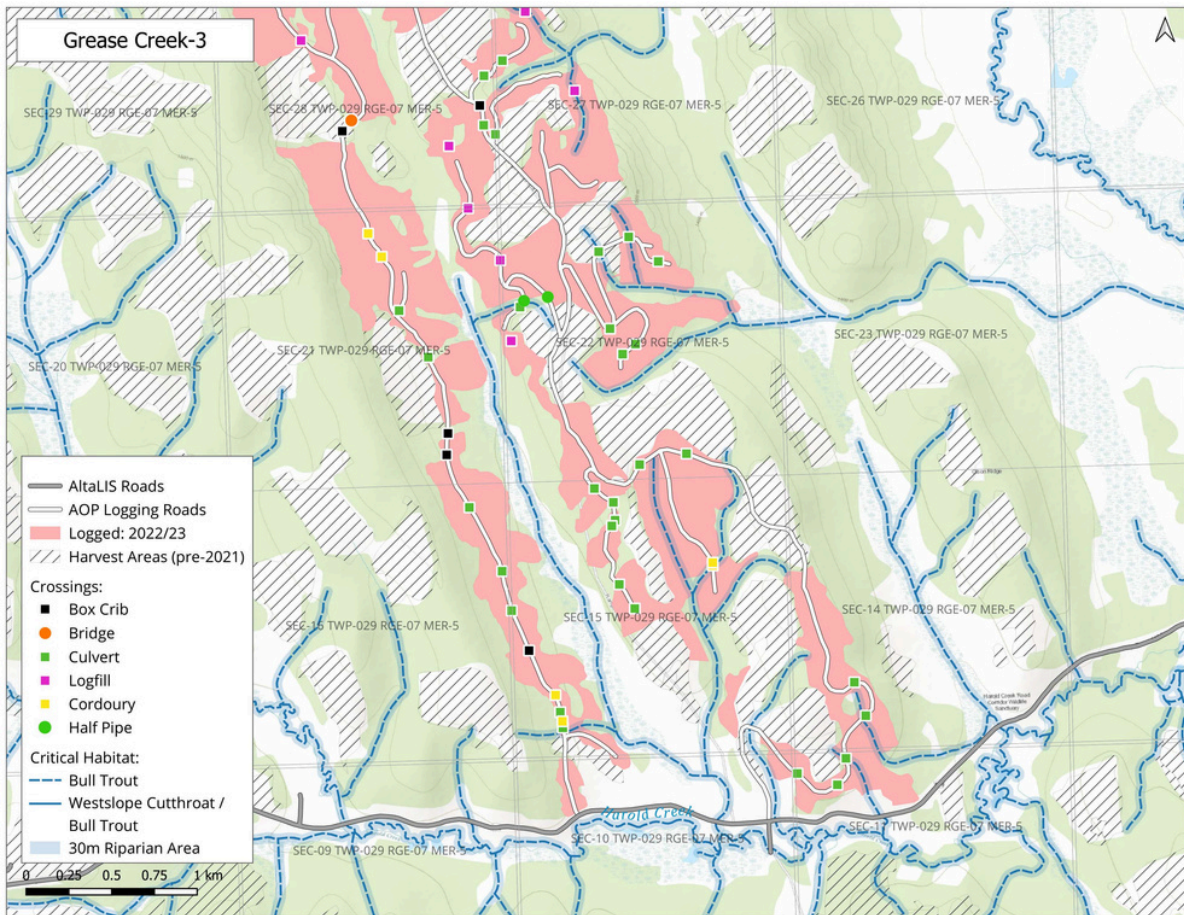
Grease Creek - 1



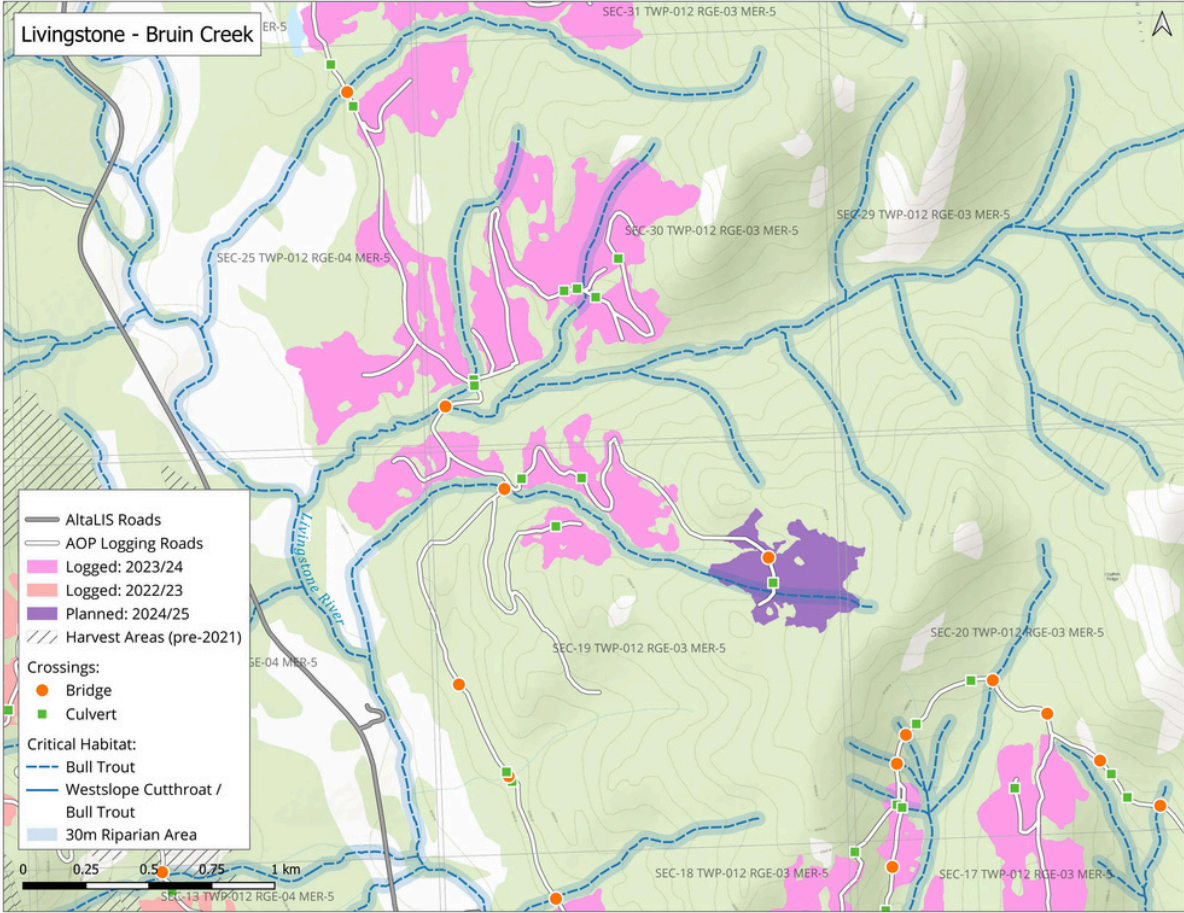
Grease Creek - 2



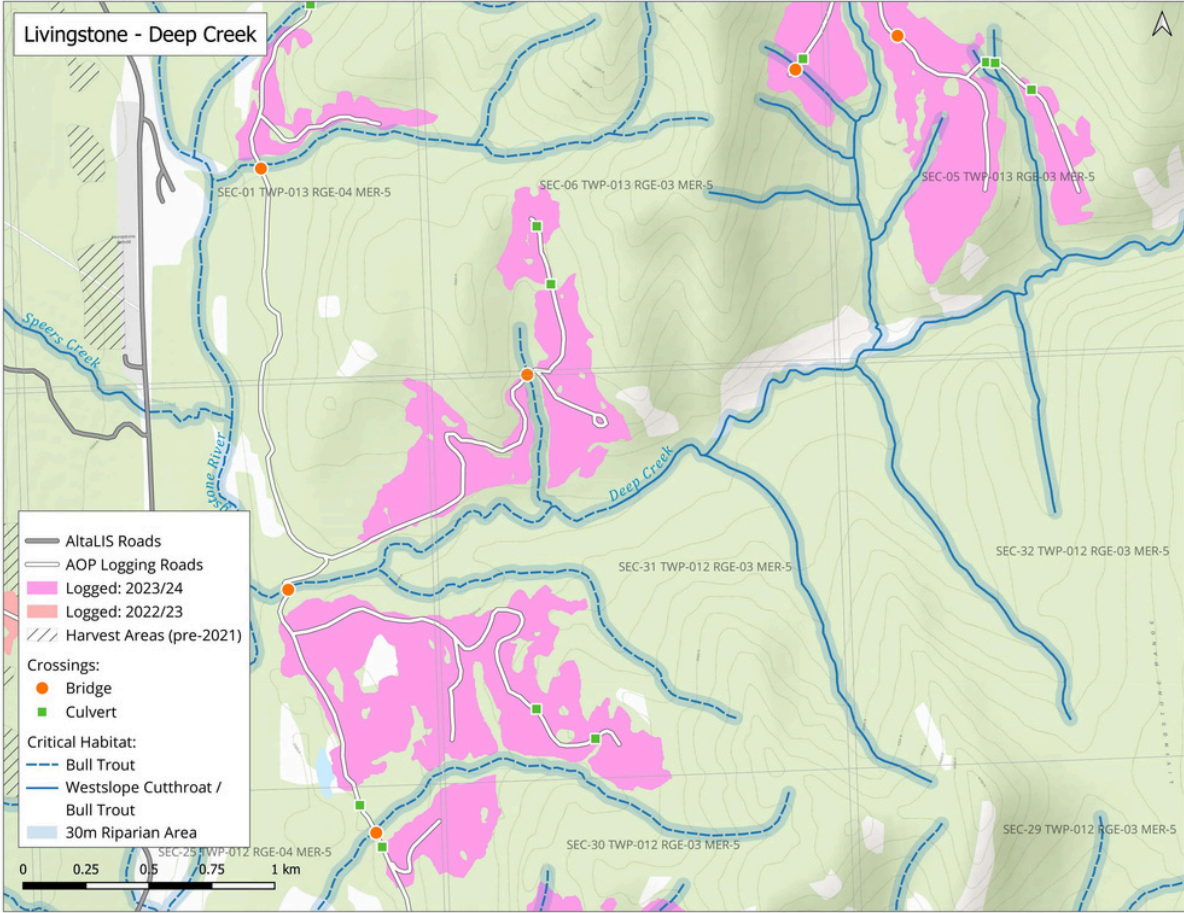
Grease Creek - 3



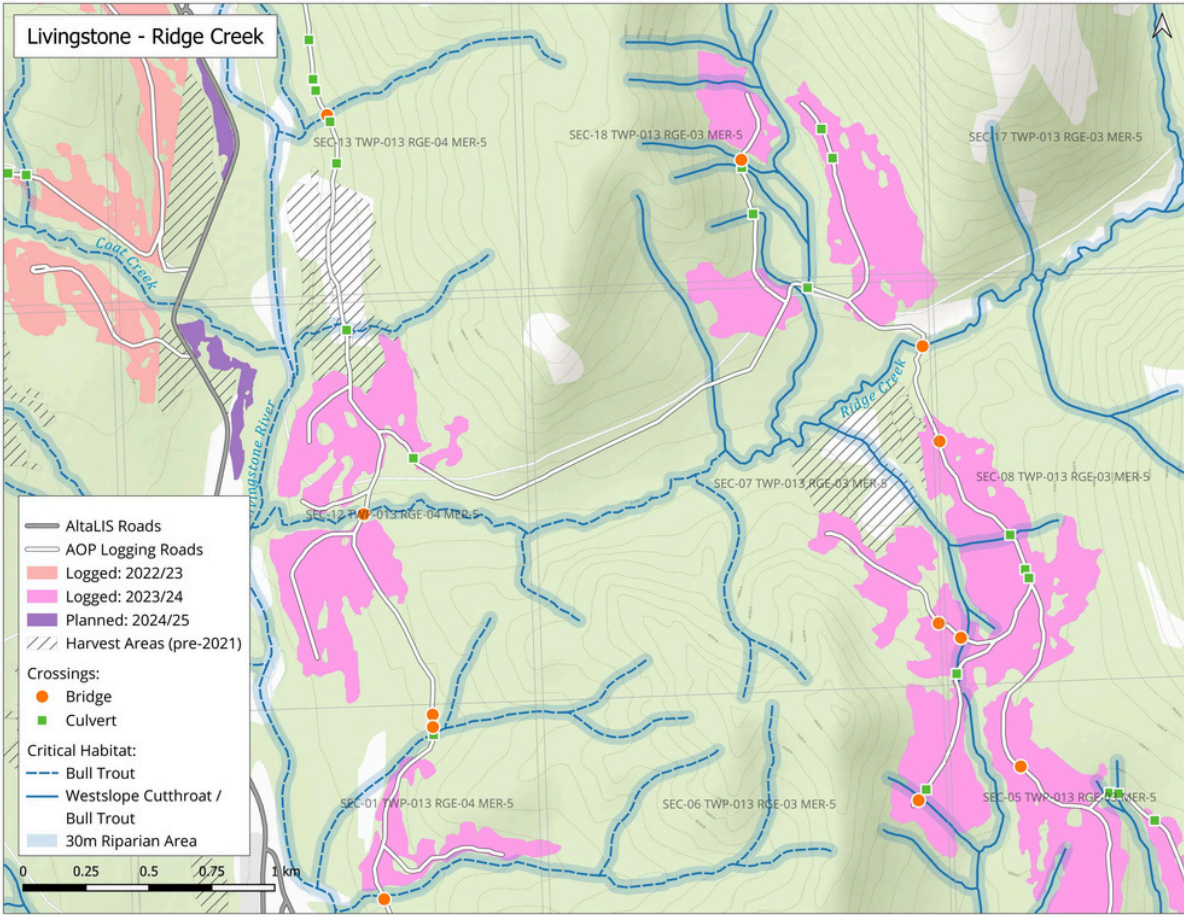
Livingstone - Bruin Creek



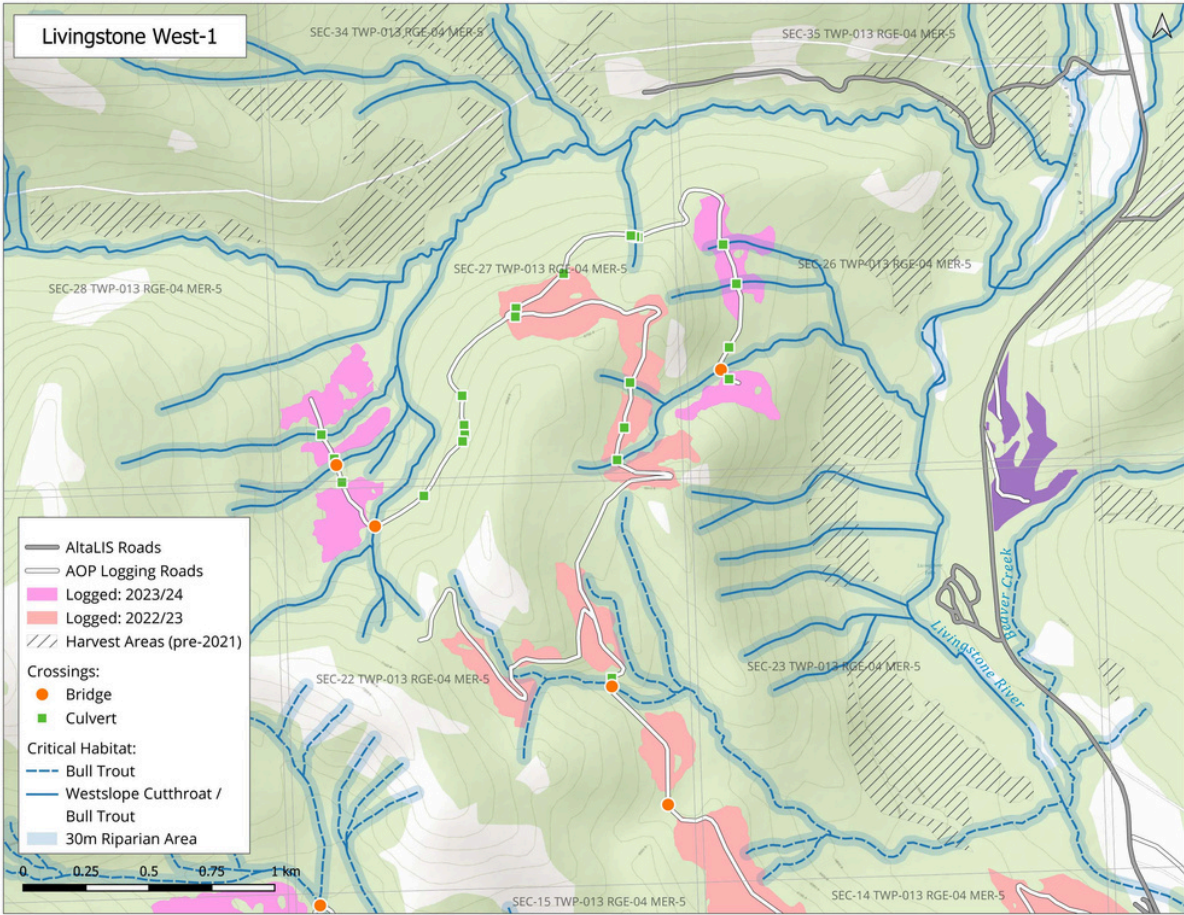
Livingstone - Deep Creek



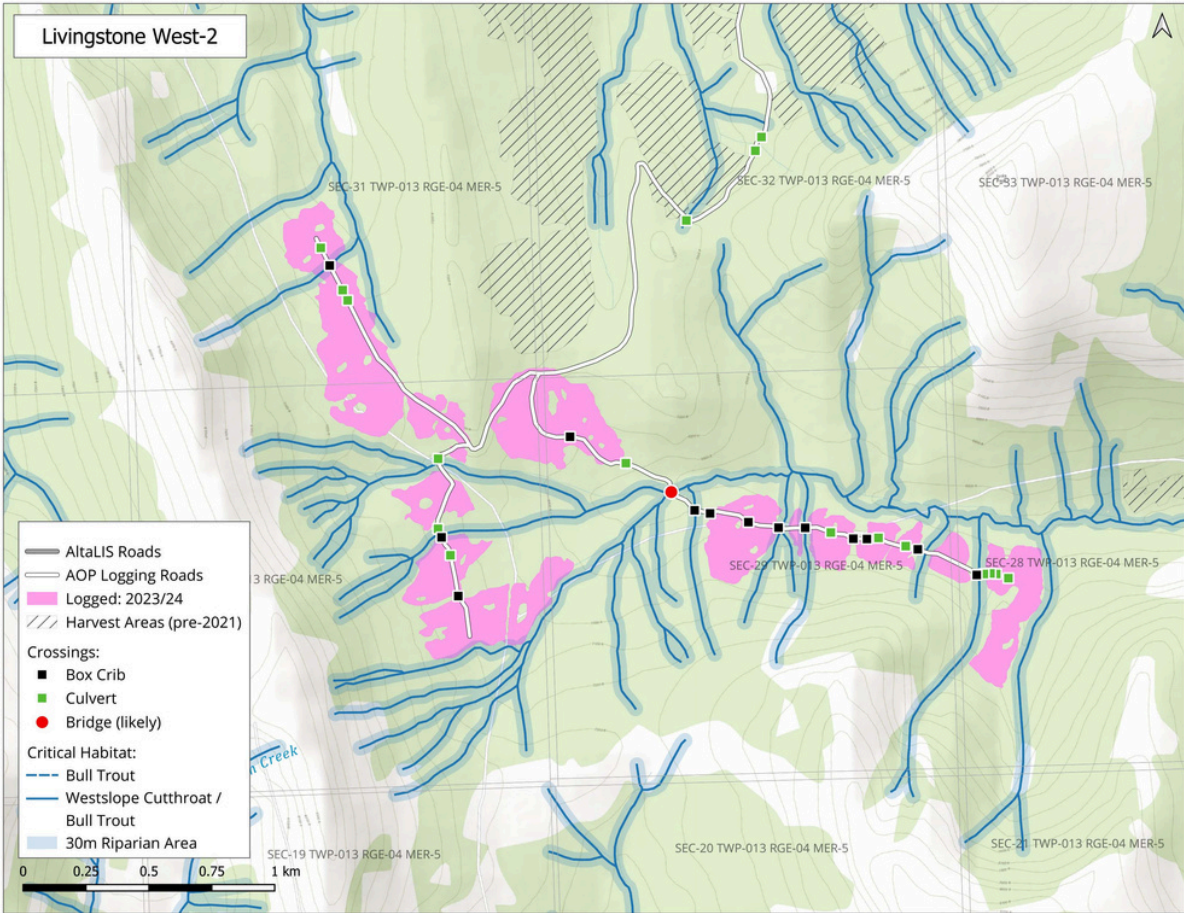
Livingstone - Ridge Creek



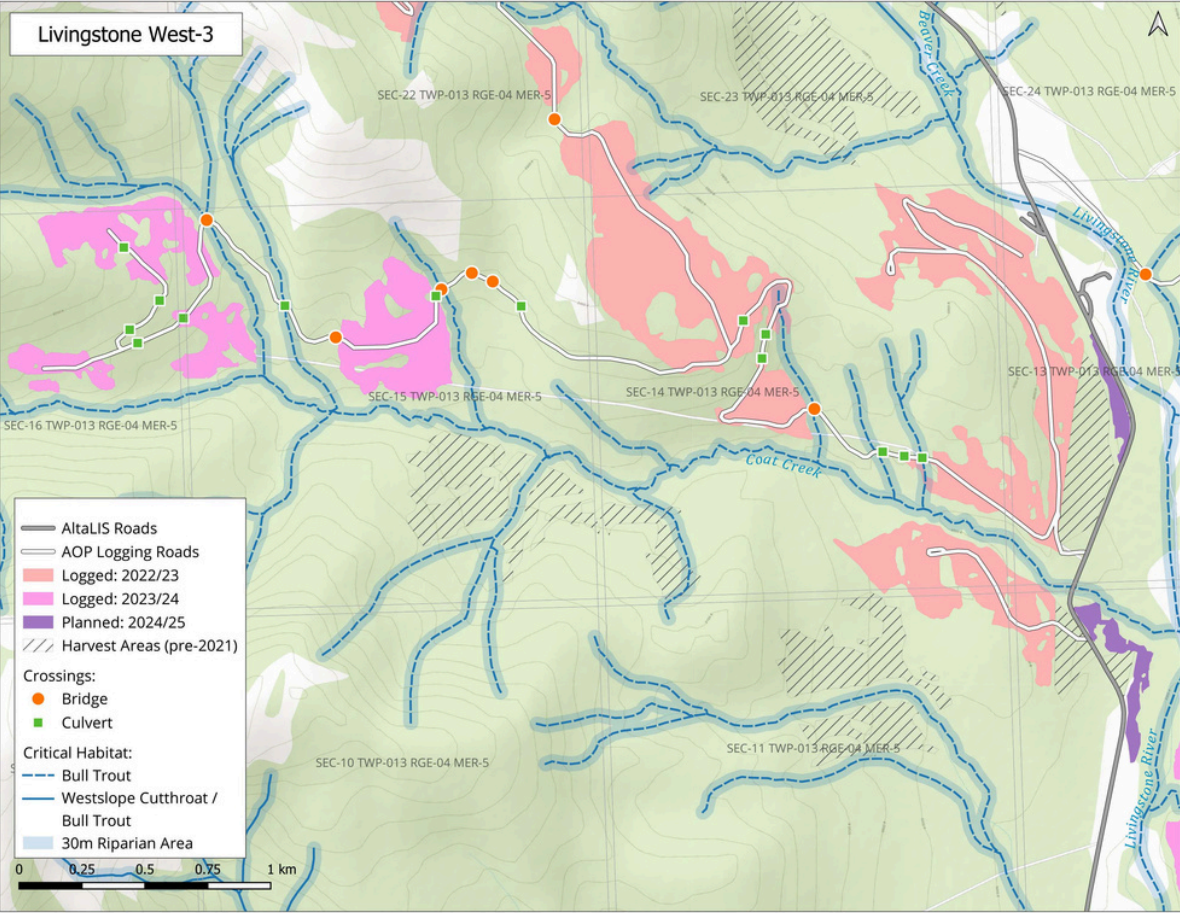
Livingstone West - 1



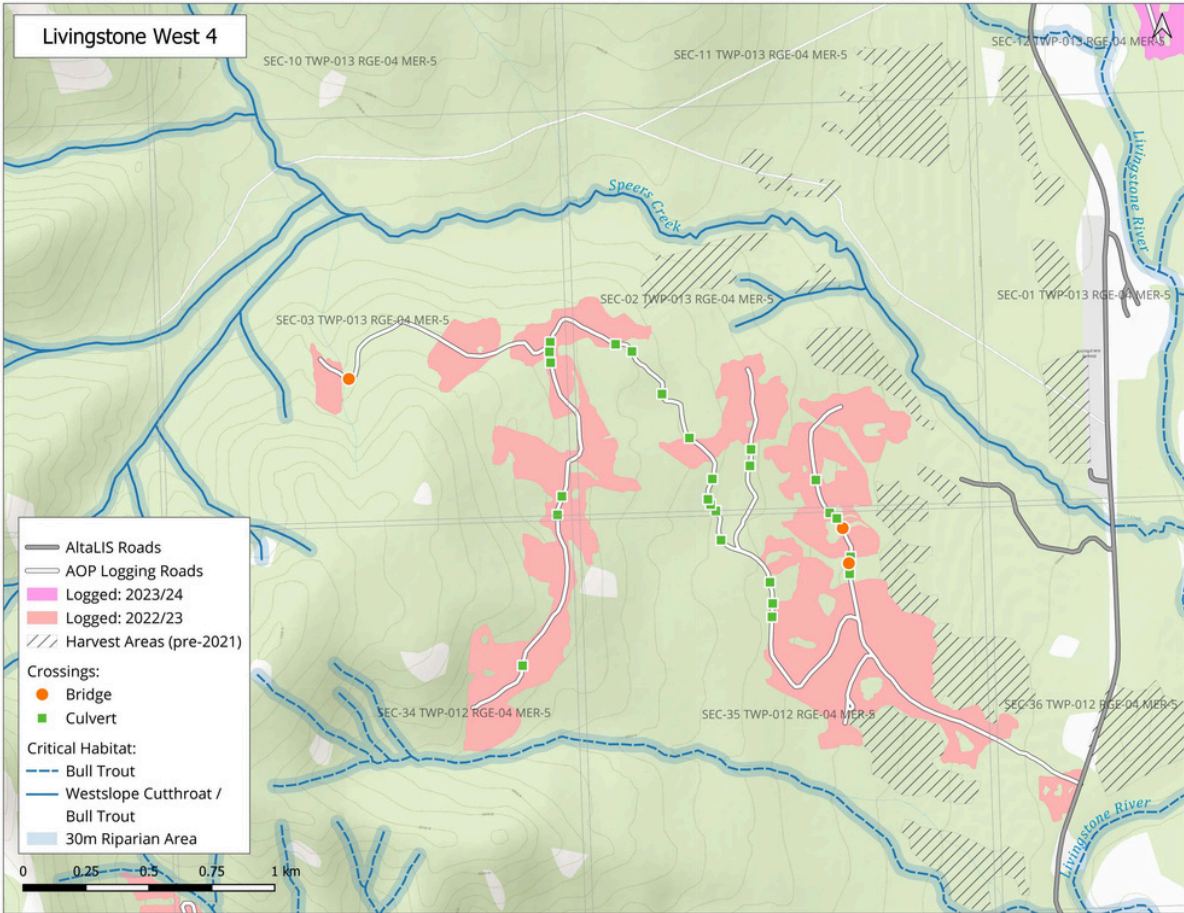
Livingstone West - 2



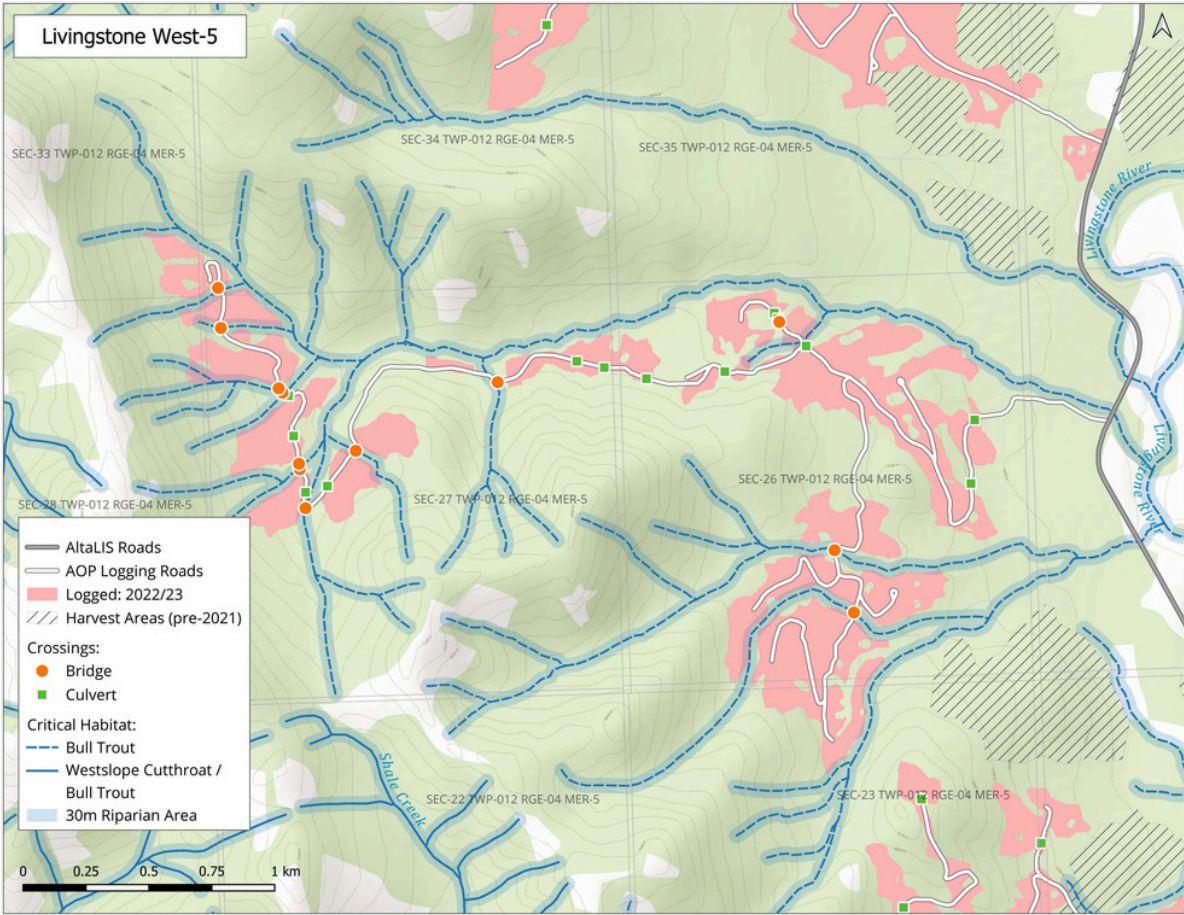
Livingstone West - 3



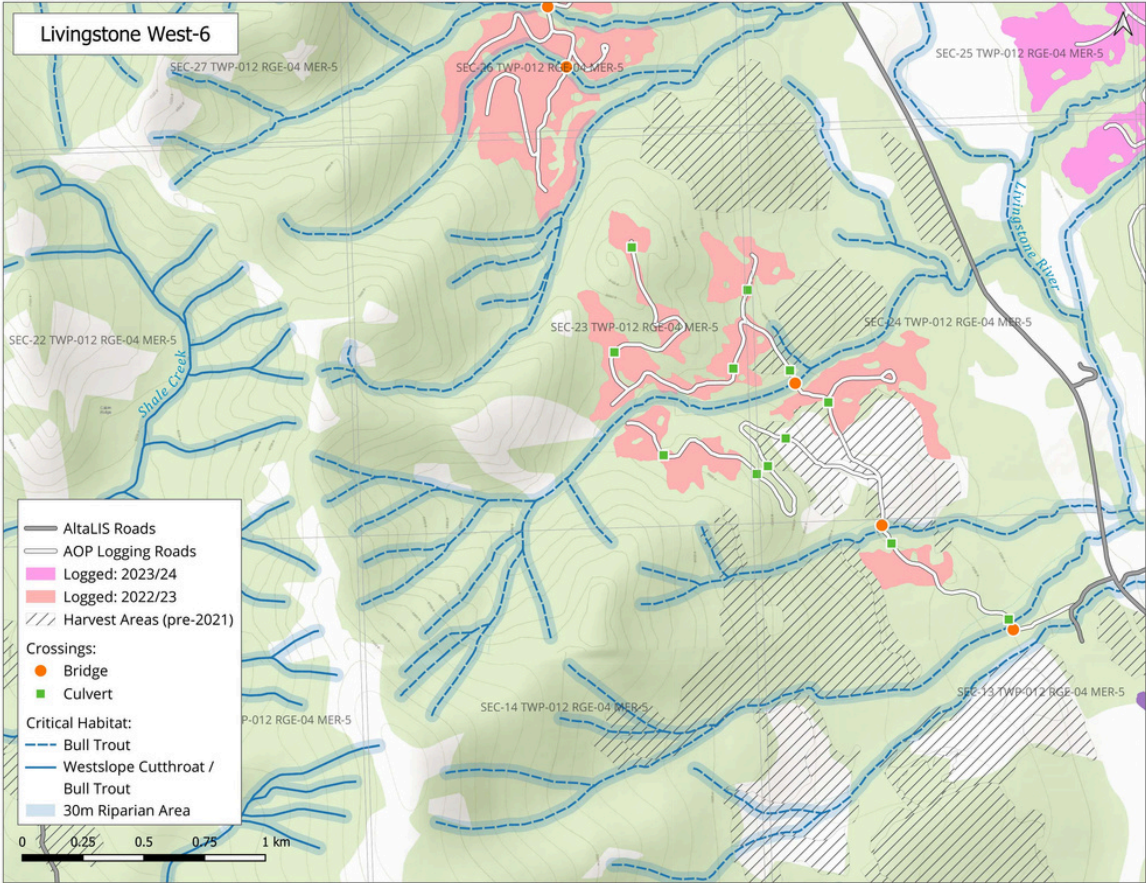
Livingstone West - 4



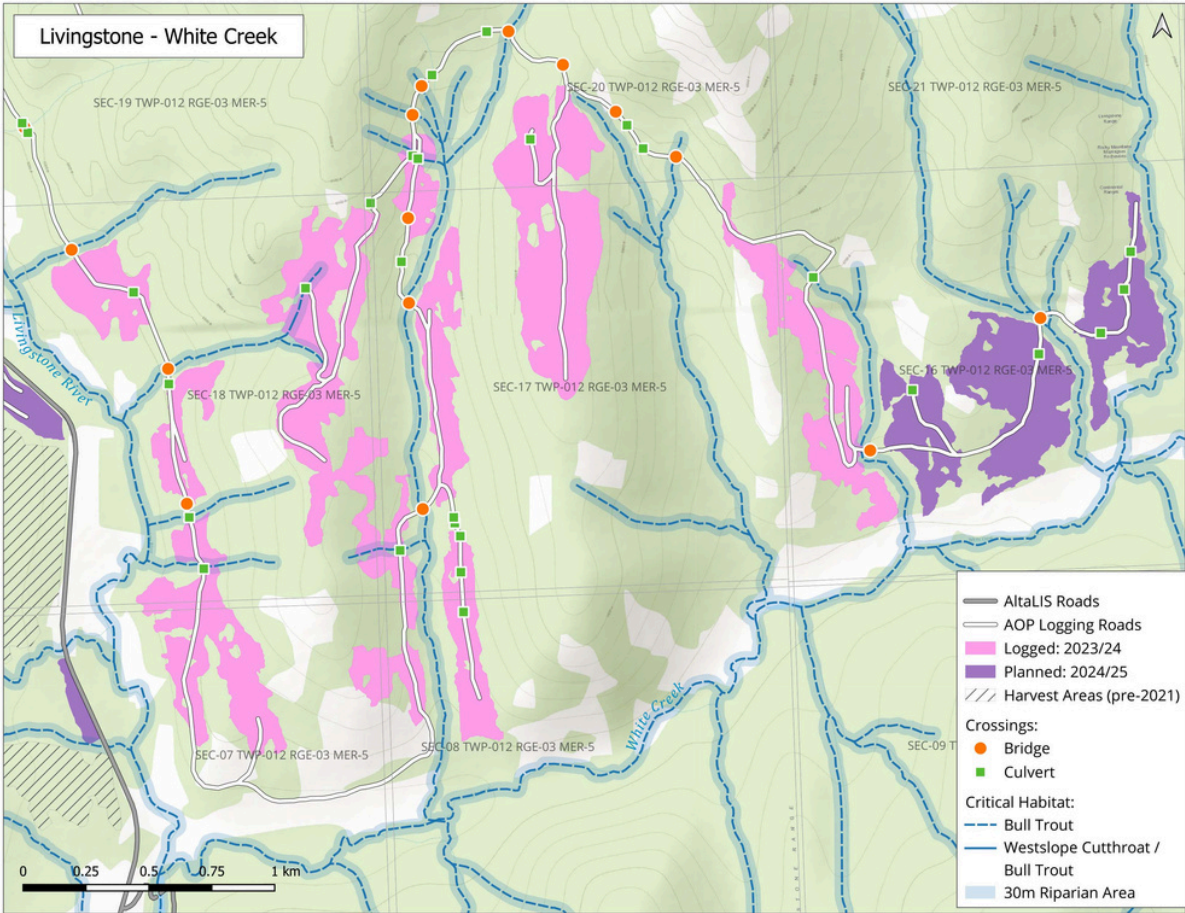
Livingstone West - 5



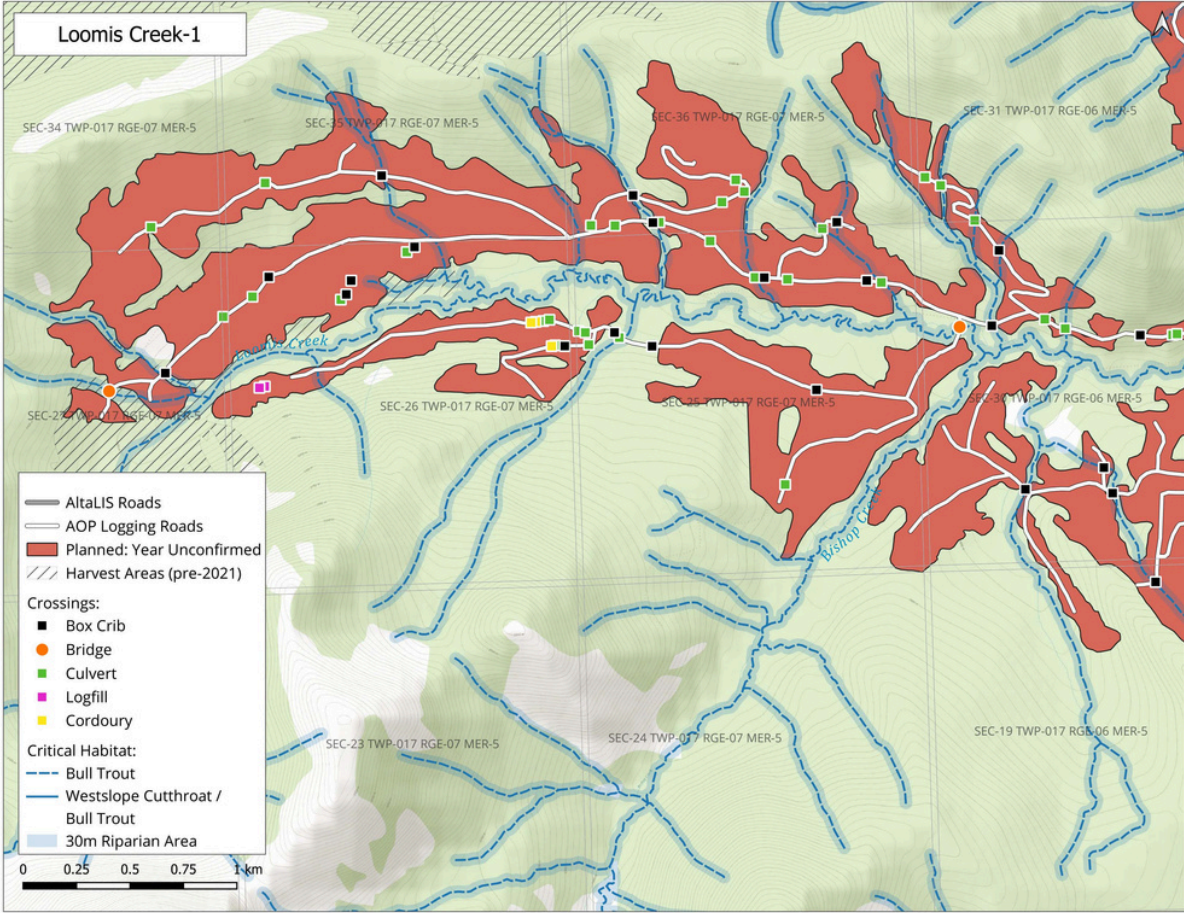
Livingstone West - 6



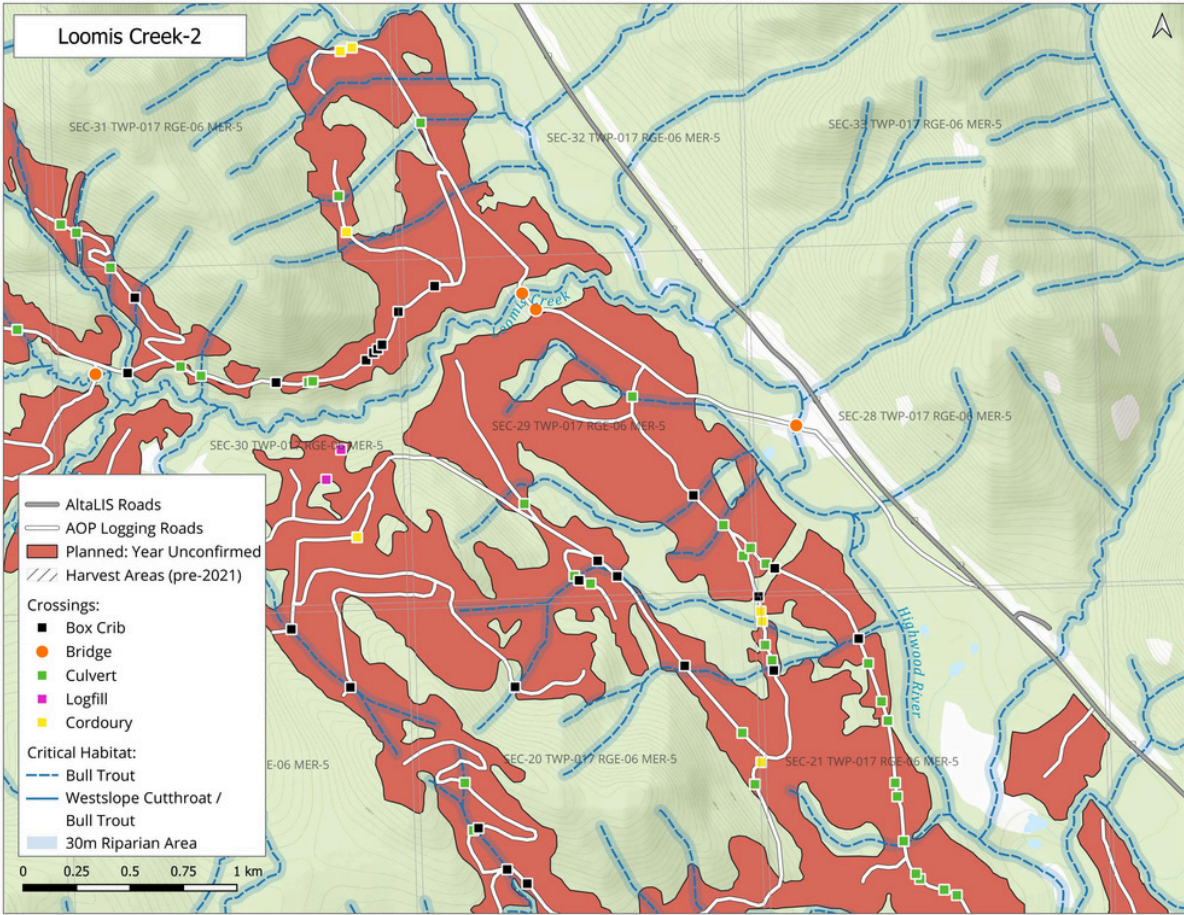
Livingstone - White Creek



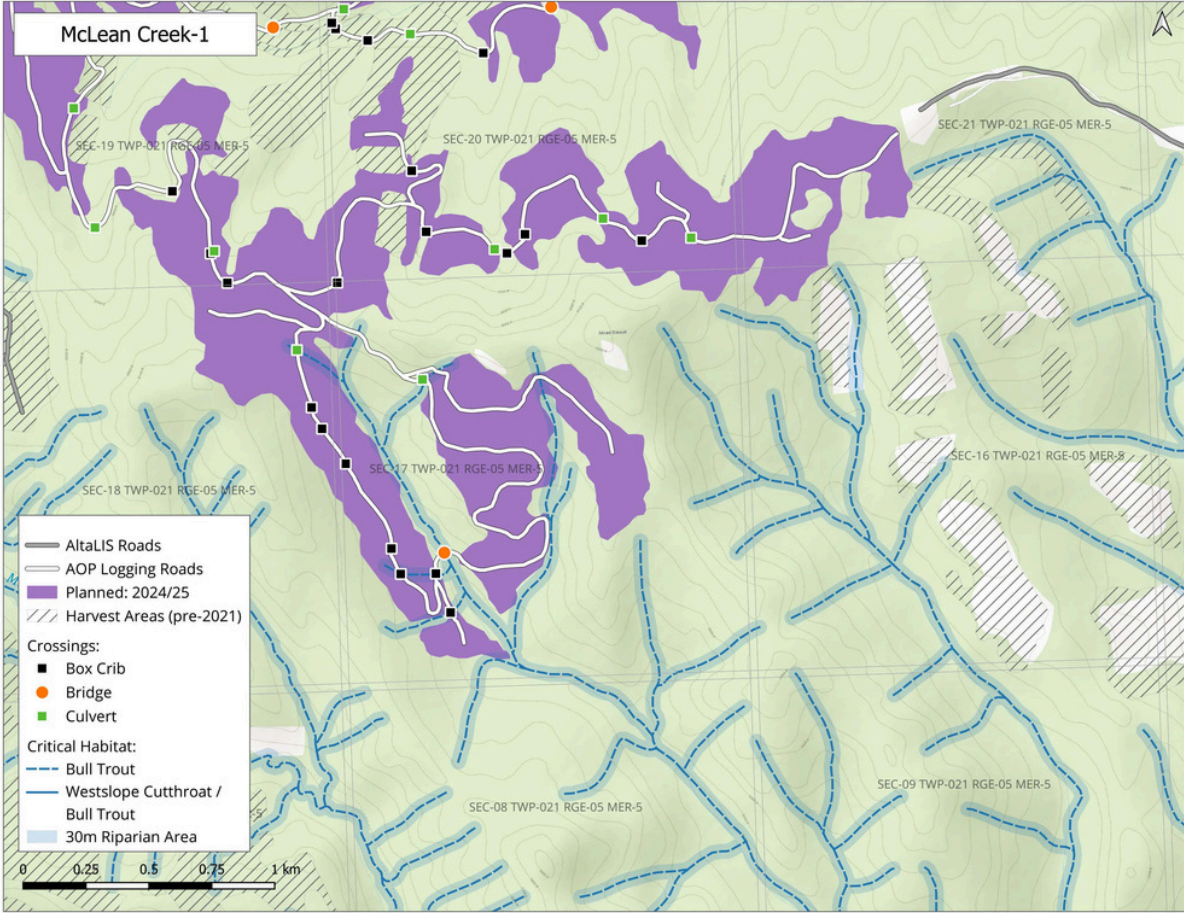
Loomis Creek - 1



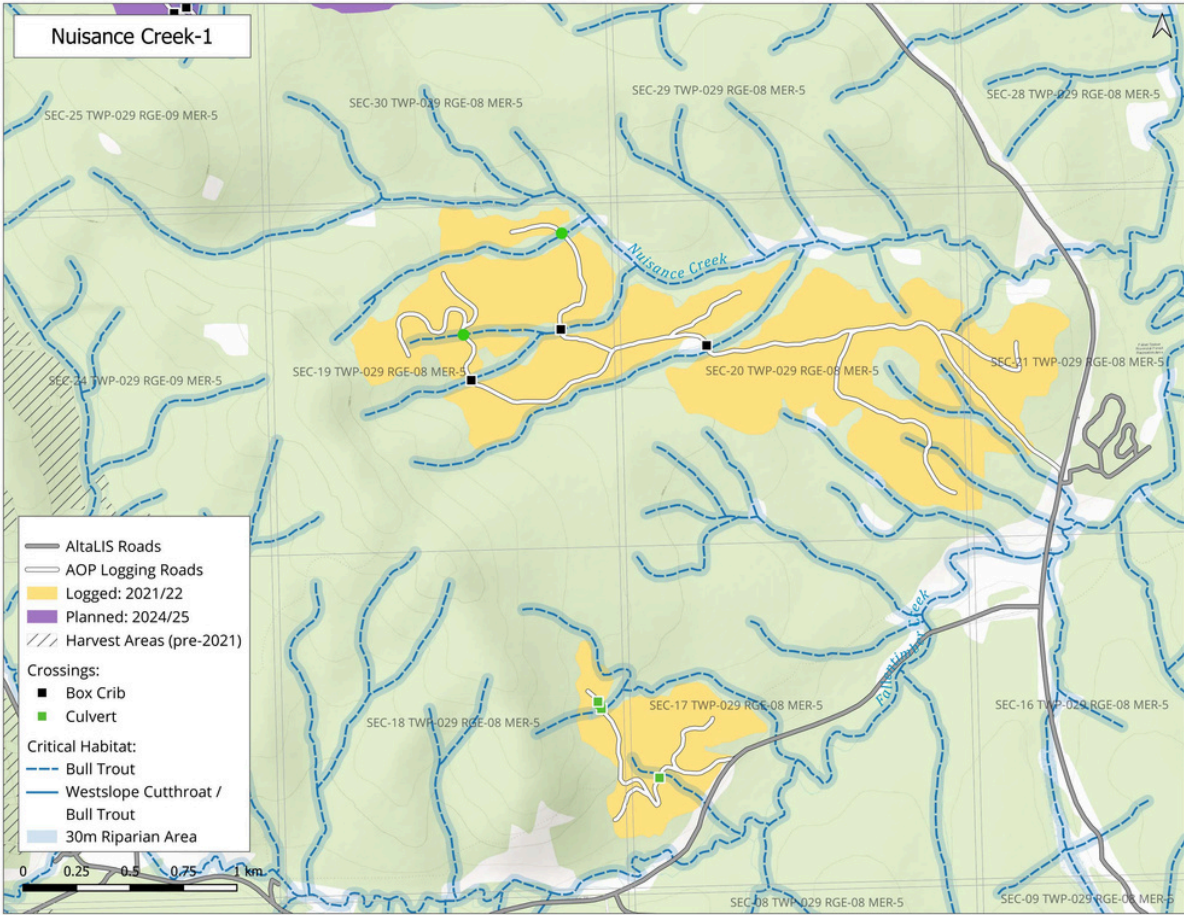
Loomis Creek - 2



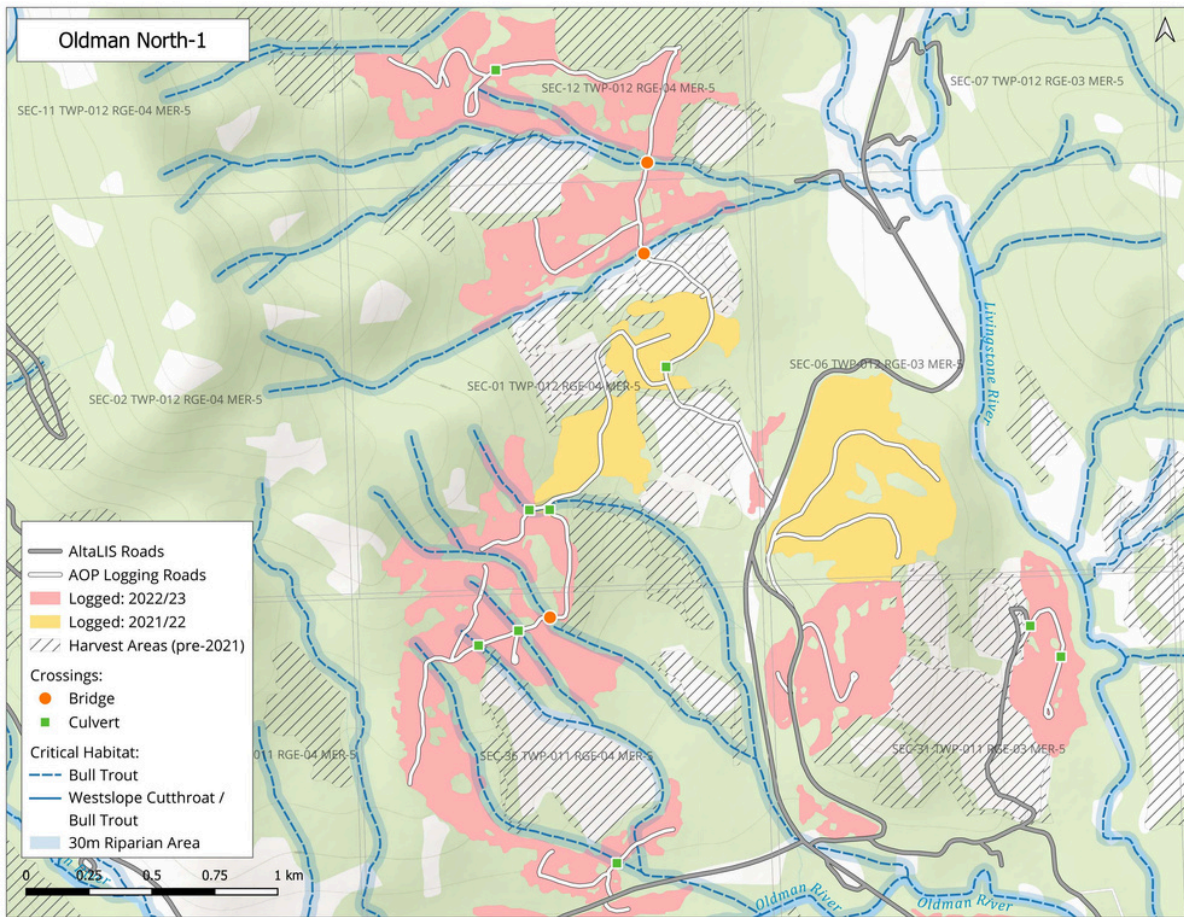
McLean Creek - 1



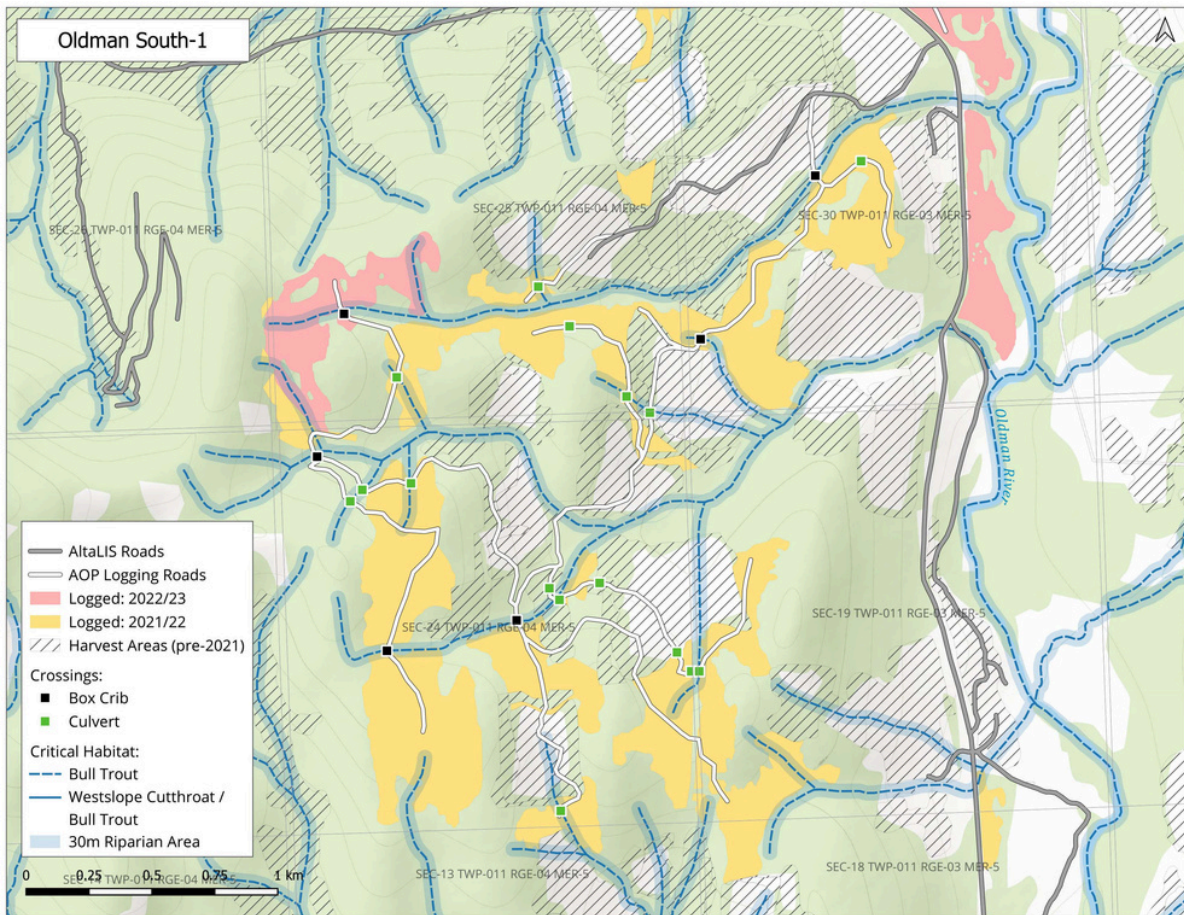
Nuisance Creek - 1



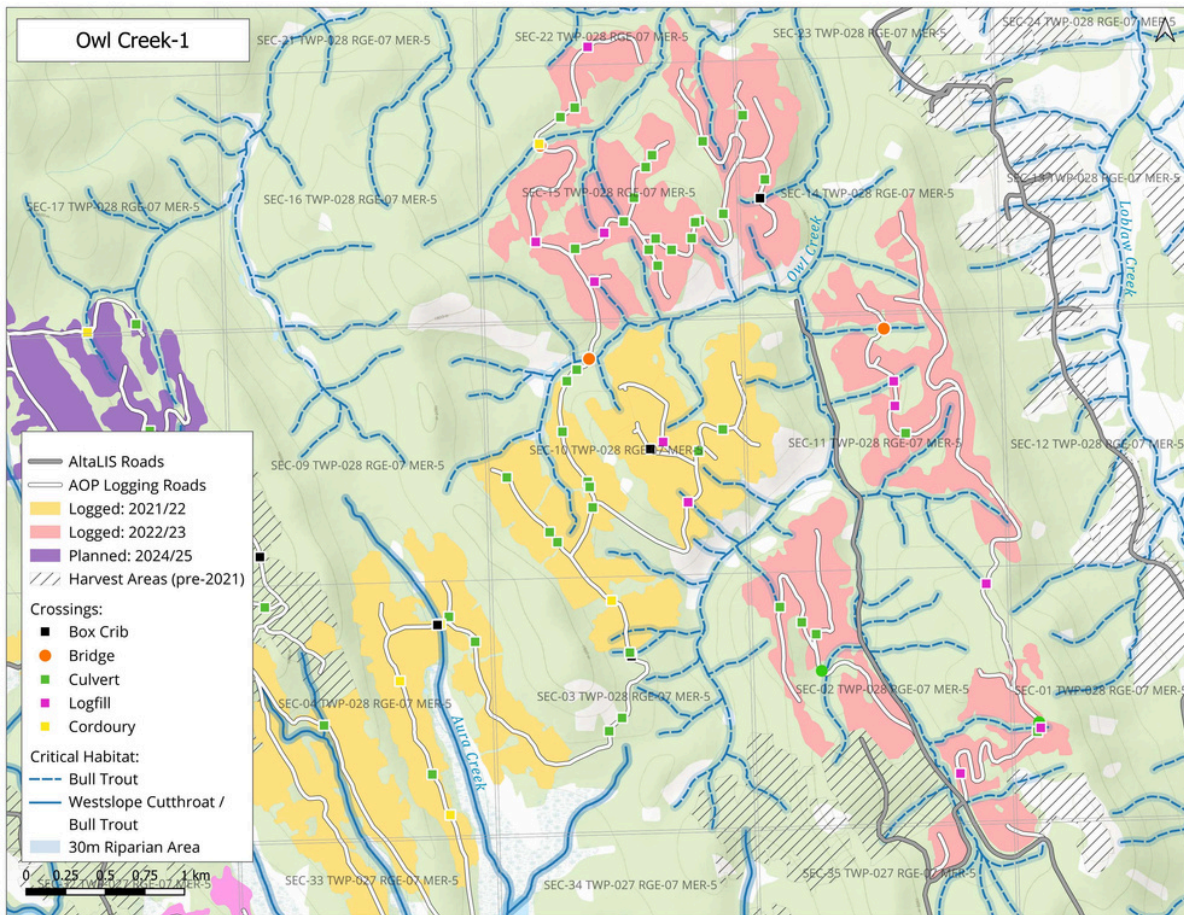
Oldman North - 1



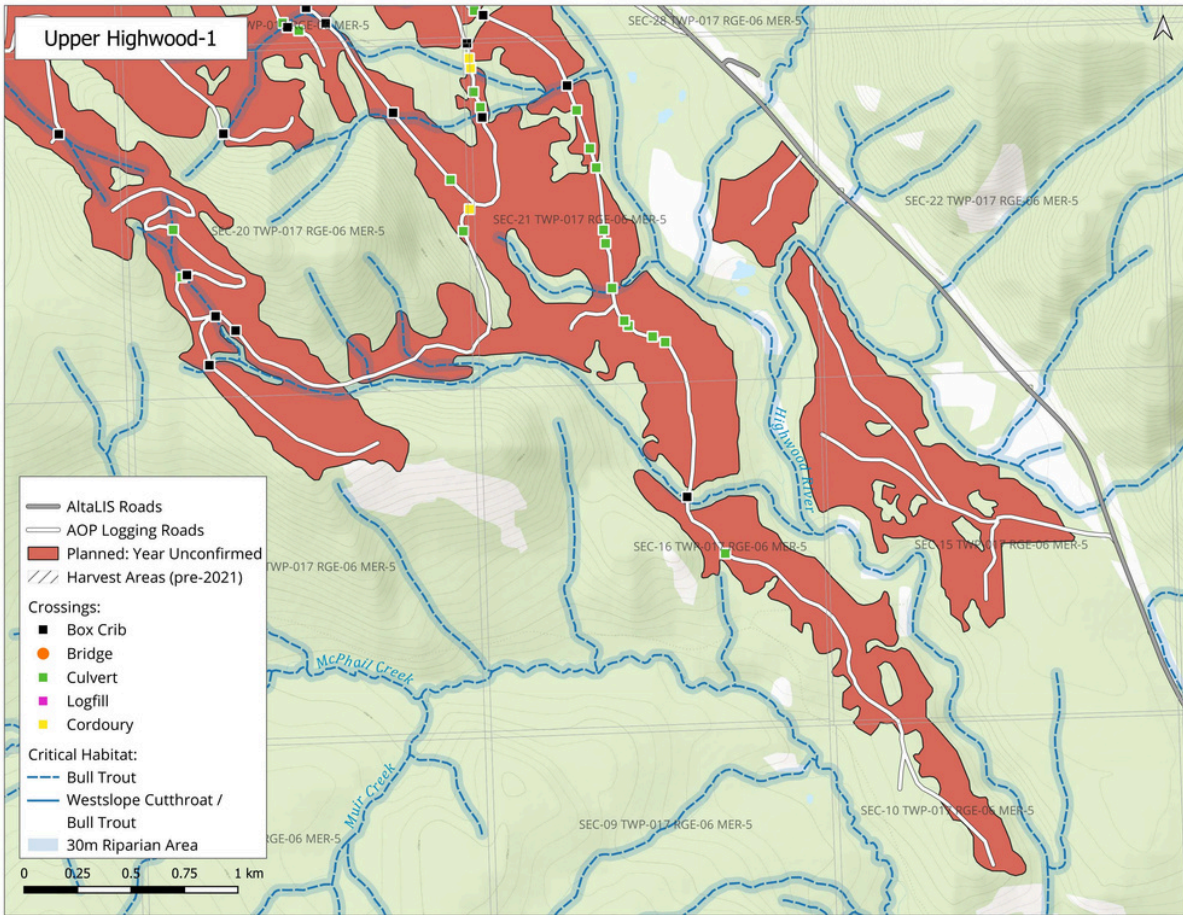
Oldman South - 1



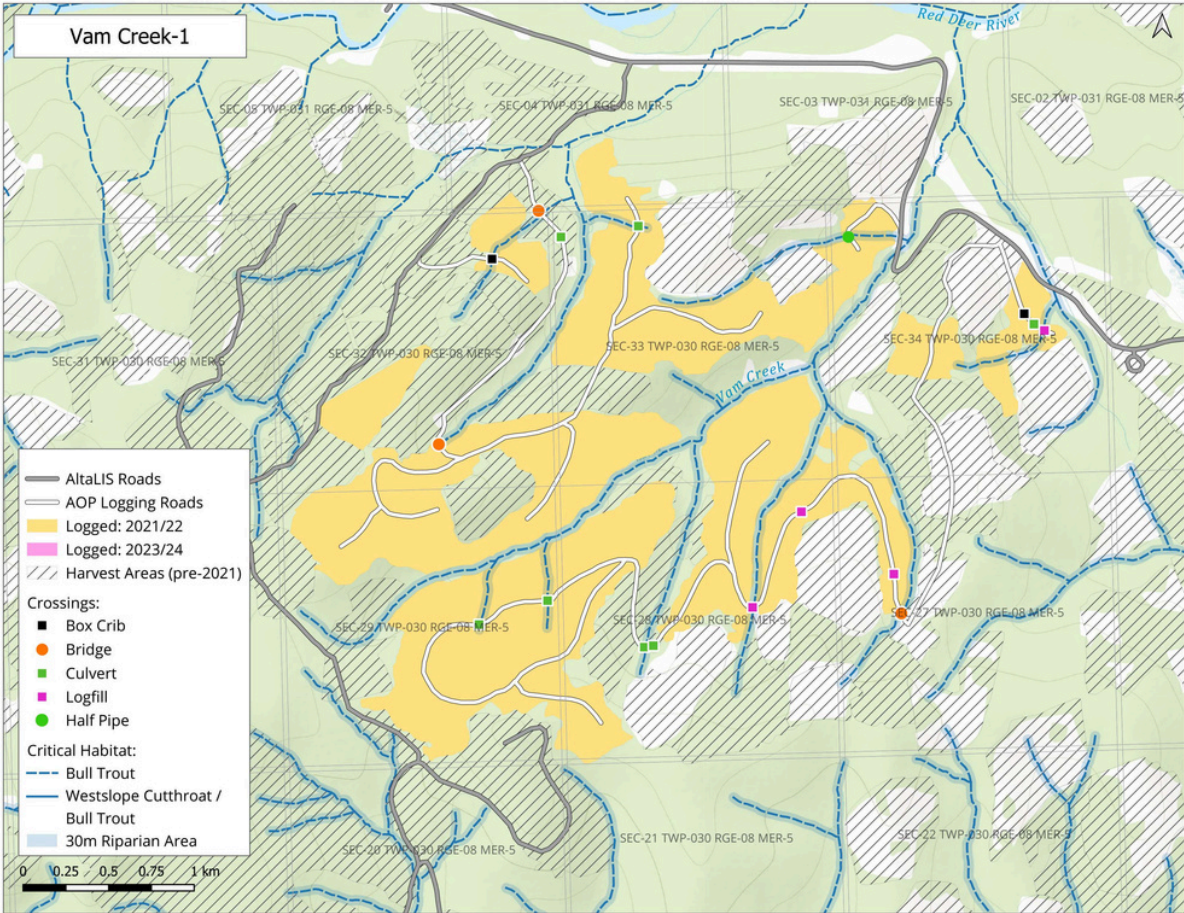
Owl Creek – 1



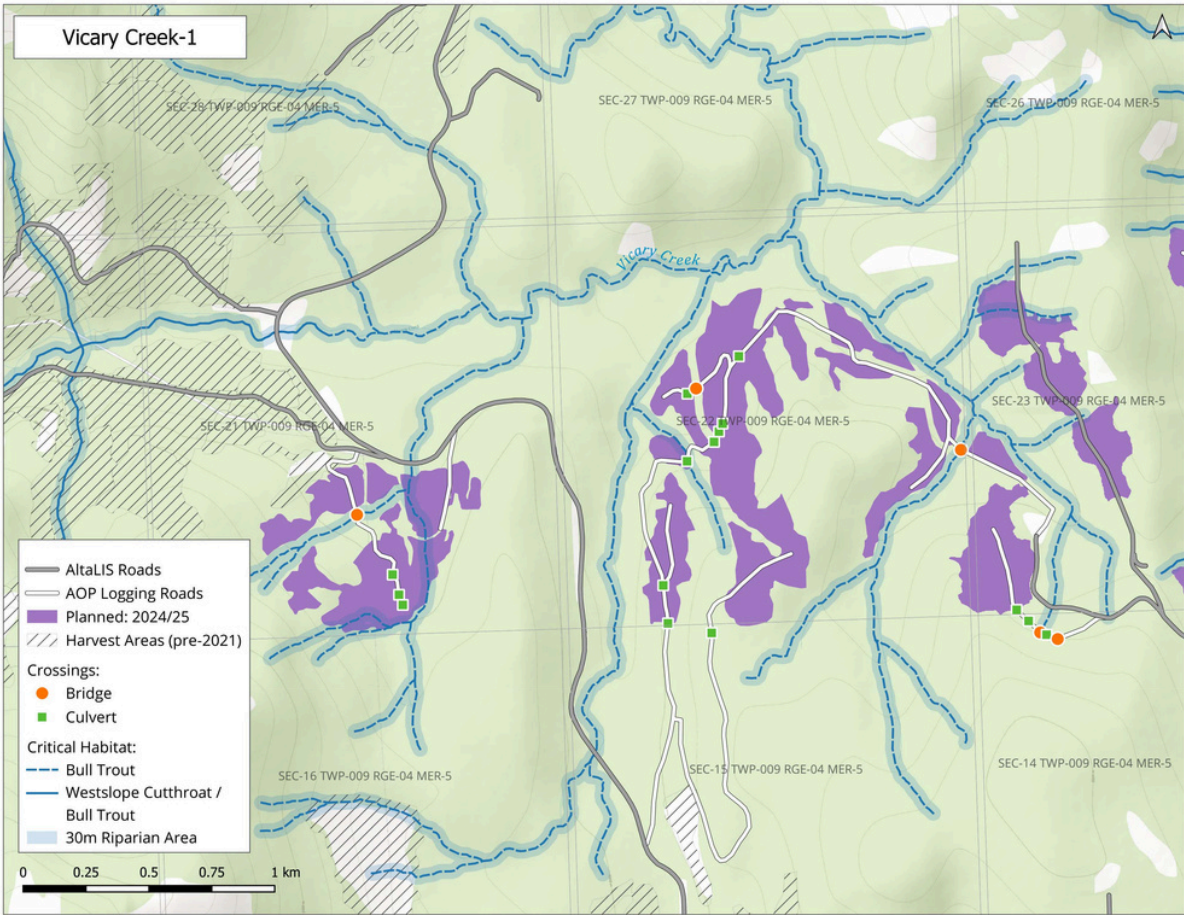
Upper Highwood – 1



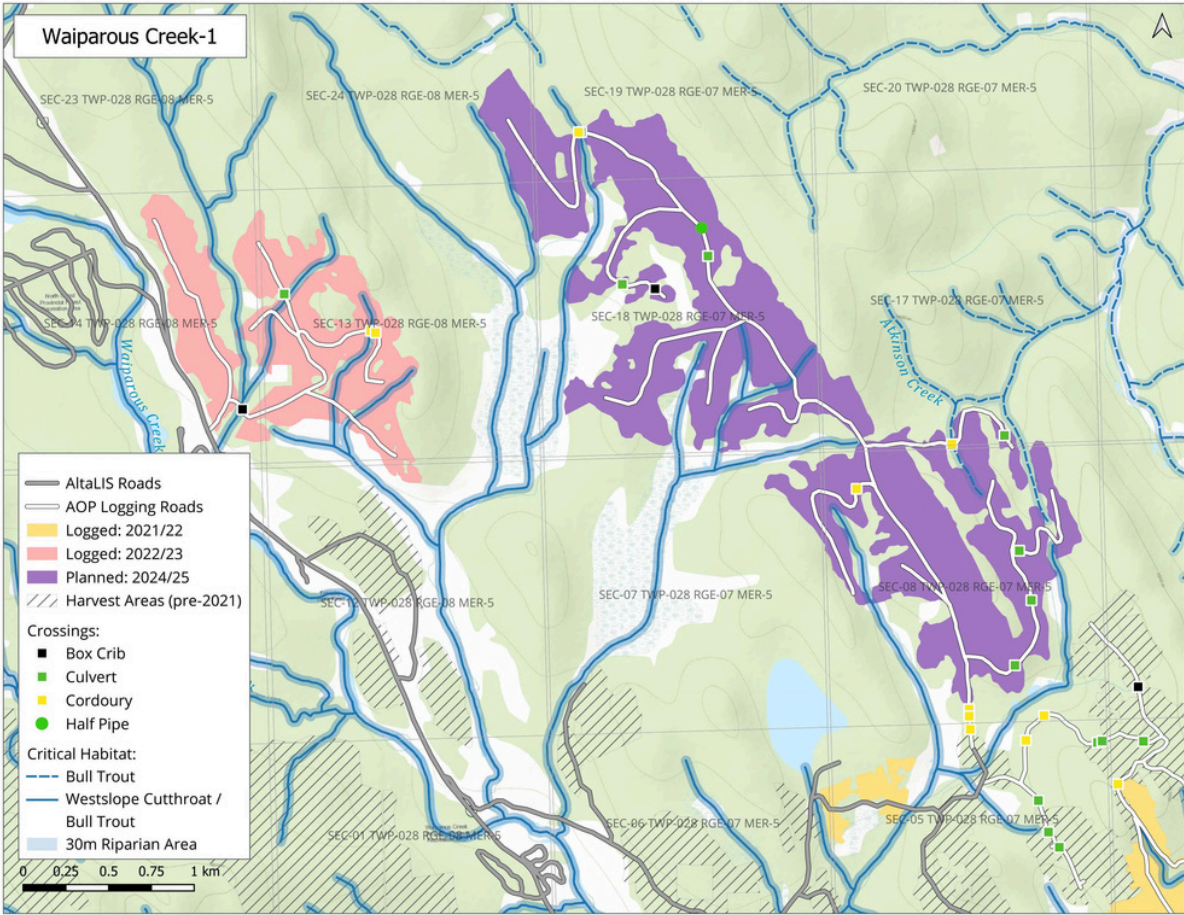
Vam Creek - 1



Vicary Creek - 1



Waiparous Creek - 1





APPENDIX II

Annual Operating Plans

The following sources were utilized to identify harvest areas and crossings.

Forest Management Unit C5

2023 Open House:

- **AOP-Map-C509_C526**

- 2023-24
- Blocks, crossings and roads digitized.
- Some blocks shown in the “C2L26-Upper-Livingstone-West” 2022-23 AOP are shown (and were digitized from) this map. Others were moved forward from the 2022-23 AOP into this 2023-24 AOP and are therefore recoded with harvest year “2023” (2023-24).

- **AOP-Map-C524**

- 2023-24
- Blocks, crossings and roads digitized.

- **AOP-Map-C525**

- 2023-24
- Blocks, crossings and roads digitized.
- Some blocks shown in the “AOP-C2L25-Lower-Livingstone” 2021-22 AOP are shown (and were digitized from) this map.

- **Preliminary Planning Area Dutch Creek**

- Preliminary layout, not used.

- **Preliminary Planning Area Pelletier Creek**

- Preliminary layout, not used.

2022 Open House:

- **Savanna-Upper-Lower-Livingstone**

- 2021-26

- Forest Harvest Plan.

- Not used as covered by 2023-24 “AOP-Map-C509_C526” and “AOP-Map-C525”.

- **West-Chain-Lakes**

- No date range provided. Maybe 2021-26.

- Forest Harvest Plan.

- Some blocks captured by 2021 ABMI data.

- Blocks, crossings and roads digitized. Used “AOP-Map-C509_C526” where possible to refine block boundaries.

- **Harvest-Plans-Dutch-Creek**

- Preliminary layout, not used.

- **Harvest-Plans-Oldman**

- Preliminary layout, not used.

- **Harvest-Plans-Vicary-Creek**

- Preliminary layout, not used.

2021 Open House

- **AOP-C2L25-Lower-Livingstone**

- 2021-22

- Has a highlighted orange defined as blocks planned 2021-22, but also has an undefined unhighlighted orange.

- Some blocks are in ABMI 2021, others are shown (and were digitized from) the more recent “AOP-Map-C525”, recorded with harvest year “2022” (2022-23).

- **AOP-C5L4-Regal-Creek**

- o 2021-22
- o Has a highlighted orange defined as blocks planned 2021-22, but also has an undefined unhighlighted orange.
- o Some blocks are in ABMI 2021, others are shown (and were digitized from) the more recent “AOP-Map-C525”, recorded with harvest year “2022” (2022-23).
- o Five smaller blocks near Dutch Creek were digitized from this map as they were not included elsewhere in more recent maps.

- **AOP-C5L19-West-Chain-Lakes o 2021-22**

- o Most blocks are shown (and were digitized from) 2022-23 “West-Chain-Lakes”, but a selection in the vicinity of Langford Creek that were not present on other maps were digitized from this map.

- **C2L24-Vicary-Creek o 2024-25**

- o Partially overlaps with “AOP-Map-C524”
- o Preliminary layout, not used.

- **C2L25-Lower-Livingstone-East**

- o 2023-24
- o Not used as superseded by “AOP-Map-C525”.

- **C2L26-Upper-Livingstone-East**

- o 2022-23
- o Overlaps significantly with “C2L26-Upper-Livingstone-West”.
- o Some blocks shown in this AOP were not harvested in 2022-23. Some were moved into the 2023-24 harvest year and are shown on (and were digitized from) “AOP-Map-C509_C526”. Others were not harvested.

- **C2L26-Upper-Livingstone-West**

- o 2022-23
- o Has a highlighted orange defined as blocks planned 2021-22, but also has an undefined unhighlighted orange.
- o Some blocks shown in this AOP were not harvested in 2022-23. Some were moved into the 2023-24 harvest year and are shown on (and were digitized from) “AOP-Map- C509_C526”. Others were not harvested.
- o Doesn't appear like this area has been harvested since this map was produced.

- C5L9-Savanna
 - 2022-23
 - Mostly overlaps with “AOP-Map-C509_C526”.
 - Blocks were moved into 2023-24 and are shown on (and were digitized from) “AOP-Map-C509_C526”.

- C5L7-Upper-Oldman
 - 2022-23
 - Partially overlaps with “AOP-Map-C525” and “AOP-Map-C509_C526”.
 - Preliminary layout, not used.

Forest Management Unit B12:

2023 Open House:

- **AOP-Jumpingpound-Topo**

- 2023-24
- Blocks, crossings and roads digitized.
- Some blocks from previous year are cut off, but are shown (and were digitized from) the 2022 “Jumpingpound_Topo” map.

- **AOP-Highwood-Topo**

- 2023-24
- Blocks, crossings and roads digitized.

- **AOP-Atkinson-Topo**

- 2023-24
- Blocks, crossings and roads digitized.

- **Gas-Plant-Topo**

- 2023-24
- Blocks, crossings and roads digitized for 2022-23 AOP year where not already shown on the “Grease_Topo” map.
- Also shows some 2024 plans but did not use these as they do not appear to have been harvested to date (Spring 2024) and presumably will be shown in the 2024-25 AOP maps.

2022 Open House:

- **Jumpingpound_Topo**

- o 2022-23
- o Blocks, crossings and roads digitized if not already shown in 2023 AOP-Jumpingpound- Topo

- **Grease_Topo**

- o 2022-23
- o Blocks, crossings and roads digitized from southern portion.
- o Some blocks cut off but are shown (and were digitized from) the 2023 “Gas-Plant-Topo” map.

- **Burnt_Timber_Topo**

- o 2022-23
- o Split into halves, northern half is correctly georeferenced but southern half isn't.
- o Blocks, crossings and roads digitized from northern portion and cross-referenced with 2021 “Burnt-Timber-West-Topo” map.

- **Atkinson_Topo**

- o 2022-23
- o Not used except in north where 2023-24 map is cut off. Most blocks, crossings and roads digitized from the 2023-24 “AOP-Atkinson-Topo” map.

- **Highwood_Topo**

- o 2022-23
- o Not used as all covered by 2023-24 “AOP-Highwood-Topo”

2021 Open House:

- **Burnt-Timber-West-Topo**

- o 2021-22
- o Not used, blocks, crossings and roads digitized from 2022-23 “Burnt_Timber_Topo”.

- **Burnt-Timber-East-Topo**

- o 2021-22
- o Blocks, crossings and roads digitized.

- **Grease-Creek-South-Topo-1**

- o 2021-22

- o Also shown on 2022-23 “Grease_Topo”, possibly was delayed?

- o Not used, blocks, crossings and roads digitized from 2022 “Grease_Topo”.

- **Grease-Creek-North-Topo**

- o 2021-22

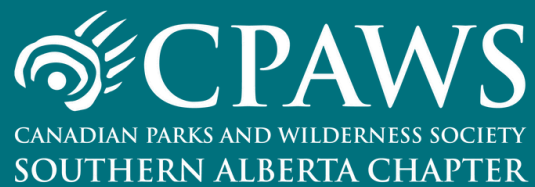
- o Blocks, roads digitized.

- o Crossings taken from “Grease_Topo” and also some adjustments to roads made based on this more recent map.

- **McLean-Creek-Topo**

- o 2021-22

- o Blocks, roads digitized.



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www.cpaws-southernalberta.org

Email | infosab@cpaws.org

Telephone | (403) 232-6686
