

# Background Report for West Bragg Creek Trails Master Planning

September 2022

*Alberta* 

DRAFT

Environment and Parks, Government of Alberta  
September 2022  
Background Report for West Bragg Creek Trails Master Planning

# Table of Contents

1. About this Report .....	4
2. Legislation and Policy .....	4
3. Land Use and Socio-economic considerations .....	9
4. Environmental Considerations and Historic Resources.....	22
References .....	37

# 1. About this Report

This report contains background information for the draft West Bragg Creek Trails Master Plan. It present the relevant legislation and policy, land use, socio-economic, environmental and historical resources components considered in the trail planning process.

# 2. Legislation and Policy

Development and use on land managed by AEP is guided by a number of over-arching frameworks for decision-making including legislation, regulations, policy, strategy, and management plans.

**Table 1 Legislation and Regulation**

Item	Considerations	Plan
<i>Public Lands Act</i> and regulations	The <i>Public Lands Act</i> is provincial legislation that ensures that land-use activity involving public land – including contemplation for trail planning, development and management – is done in a way that is safe and orderly and that protects the land for future generations.	As the plan area falls within public lands; the plan is required to comply with the direction given by the <i>Public Lands Act</i> .
<i>Trails Act</i> and regulations	This Act supports trails on public land to adapt to the growing demand of outdoor recreation for tourism and business. This act updates the legal framework to align trails and their management with how trails are currently used, helping ensure the sustainability of trails so that they will be enjoyed for years to come.	The plan will ensure contemplation for trail development within the plan area will comply with the direction given by the <i>Trails Act</i> and associated regulations, including and not limited to the Trail Management Plan requirement (effective May 2022).
<i>Provincial Parks Act</i> and regulations	The Act provides for the establishment, protection, management, planning and control of provincial parks, wildland parks and provincial recreation areas, for the preservation of Alberta’s natural heritage and ecological integrity, as well as for the benefit and enjoyment of current and future generations.	Under the <i>Provincial Parks Act</i> , parks are established and maintained to protect natural diversity and intact habitat for supporting biodiversity; and to support a range of recreation and tourism experiences. Activities within the West Bragg Creek Provincial Recreation Area are subject to compliance with the terms of this Act.

Item	Considerations	Plan
<p><i>Water Act</i> and related Code of Practice</p>	<p><i>The Code of Practice for Watercourse Crossings</i> provides guidance for crossing watercourses based on specific classification.</p>	<p>This Code provides guidance to address trail designs in order to minimize watercourse crossings. The Code classifies watercourses and applies regulations for crossings of these watercourses. For unclassified watercourses, the <i>Code of Practice for Watercourse Crossings</i>, including <i>Guidelines for Complying with the Code of Practice</i>, should be used to support route planning and watercourse site selection. Trails should approach the watercourse as perpendicular as possible and minimize bank disturbance. Trails should also conform to the natural topography to avoid extensive cut or fill sections and reduce the potential for erosion.</p>
<p>Plan for Parks</p>	<p>The Plan for Parks (Tourism, Parks and Recreation, 2009) identifies desired outcomes whereby parks provide recreational opportunities while conserving Alberta's natural heritage and supporting and long-term sustainability of park ecosystems.</p>	<p>The <i>Plan for Parks</i> involves the implementation of four (4) integrated priority actions: Strategy #1- involve Albertans; Strategy #2- Offer Modern facilities, Policies &amp; Programs; Strategy #3- Provide Recreational Opportunities; and Strategy #4- Conserve Landscapes. These strategies aim to ensure park management is undertaken in a responsible and accountable way.</p>
<p>South Saskatchewan Regional Plan</p>	<p>The South Saskatchewan Regional Plan (SSRP) (Government of Alberta, 2017) recognizes the Kananaskis region for its year-round recreational opportunities and for its potential to become an internationally renowned nature-based tourism destination.</p>	<p>The SSRP identifies the need for additional recreational management planning building on existing plans and tourism destination management planning to enhance the region's potential as a tourism destination. An expansion of the West Bragg Creek PRA was approved as part of this plan.</p>

**Table 2 Policy**

Item	Considerations	Plan
Kananaskis Country Provincial Recreation Areas (PRAs) Management Plan	Kananaskis Country Provincial Recreation Areas (PRAs) Management Plan (2012) specific to the West Bragg PRA.	The West Bragg PRA houses the parking area serving as the primary staging area and trail head access for the plan area. The parking area has been expanded and upgraded to accommodate four season, multi-recreational users. Through reclassification, consolidation and expansion, this PRA will form part of the Elbow Valley Provincial Park.
Kananaskis Country Subregional Integrated Resource Plan	The 1986 Kananaskis Country Integrated Resource Plan (IRP) is a land use plan that continues to provide direction to the allowable and compatibility of uses in Kananaskis Country (Government of Alberta, 1986)	The Plan area is located within the Elbow/Jumpingpound Resource Management (RMA) Area C. Zoning for the RMA is Zone 5- Multiple Use. The first management priority in this IRP RMA is to maintain the water quality, quantity and flow regime. Second-level priorities are to provide for recreational opportunities, and for the management and development of renewable and non-renewable resources. The third level priority is to maintain or enhance the abundance, diversity, distribution and recreational use of the fish and wildlife resources, and the fourth level priority is to protect areas of ecological, archaeological and historical significance.
Alberta Tourism Framework (2013 – 2020)	The Alberta Tourism Framework presents a foundation for growing the tourism industry by developing a collaborative framework within Alberta’s tourism industry, unifying and focusing the efforts of both private and public partners in the tourism industry to meet the needs of travellers.	An expressed driver of the Tourism Framework identifies a provision for Public Land access relies on streamlining of Crown Land access for tourism to be established.
Kananaskis Country Recreation Policy (1999)	The Kananaskis Recreation Policy (Government of Alberta, 1999) sets the development parameters for the area, clarifying that there will be no town sites, and permanent or non-permanent residency. The intent of the policy is to preserve the wilderness character of Kananaskis Country.	The surrounding communities are meant to be service centres for Kananaskis Country and no large-scale developments (over 15,000 square feet) are permitted in Kananaskis Country. Small-scale recreation developments are permitted in PRAs and public lands.
Alberta’s 20-Year Strategic Capital Plan	The 20-Year Strategic Capital Plan supports Alberta’s Recovery Plan by focusing infrastructure planning on supporting jobs, growing communities, boosting economies, and helping ensure Alberta remains a world-class	The Capital Plan commits to sustaining Alberta’s environment and building tourism destinations through a vision for the future of environment, public lands, and parks infrastructure by acknowledging that Alberta’s quality parks and public lands

Item	Considerations	Plan
	destination for people to live, work and raise a family.	infrastructure provide exceptional recreational opportunities that continue to enable tourism and curate world-class experiences.
Alberta Crown Land Vision	This plan guides a modern approach to managing Crown land that better meets the needs of stakeholders without compromising conservation values and recreation opportunities.	The implementation of this plan will benefit from the directives indicated by this vision document. The Alberta Government has indicated a commitment to follow by updating legislation, working with partners, supporting sustainable use of trails and backcountry land, and considering socio-economic and environmental impacts when reviewing major proposals.
Trail Development Guidelines for Alberta's Public Land (2019)	The Trail Development Guidelines for Alberta's Public Land (Government of Alberta, 2019) are a guide for the planning, classification, design, construction and management of trail experiences on public lands.	The Guidelines provide provincial consistency for public lands management to ensure lasting, sustainable trails that avoid or mitigate environmental impacts, improve or reduce risk to public safety and are operationally viable.

**Table 3 Kananaskis Improvement District planning and development directives**

Item	Considerations	Plan
<i>Land Use Order: Kananaskis Improvement District</i>	A Land Use Order specific to Kananaskis Improvement District as directed by the related Ministerial Order MO 10/10 TPR.	This Land Use Order offers full direction to any party who is contemplating planning or development within Kananaskis Improvement District. To ensure compliance with legislation, contemplation of infrastructure development should be reviewed against this Land Use Order.
Ministerial Order MO 10/10 TPR	A Ministerial Order supporting the application of the associated Land Use Order.	This Ministerial Order serves as the directive to ensure all land use planning and development within Kananaskis Improvement District are governed by the provisions of the associated Land Use Order in accordance with the terms of the Municipal Government Act (MGA).

## Adjacent municipal planning considerations

The support and development of a regional and interconnected trail network is guided by various policies and master planning documents held by adjacent municipalities. The Hamlet of Bragg Creek is a gateway community for accessing outdoor recreational opportunities in the region. The community is vibrant and offers a vast array of commercial, educational and institutional offerings to resident and visitors alike. The community has an established full time residential population within the Hamlet boundaries, in addition to numerous country residential acreage subdivisions. Rocky View County has approved a suite of policy and guidance plans which address the concern of cumulative impacts that downstream development may have on upstream systems. Below are the relevant plans and policies for Rocky View County and a short description of their relevance to trail planning for West Bragg Creek:

- *Rocky View County: County Plan:* Policy section 12 of the Plan indicates collaboration with adjacent municipalities for the development of the TransCanada Trail. In addition, the Plan also indicates support for partnerships, connectivity and respect for environmental preservation through application of responsible design and standards.
- *Greater Bragg Creek Area Structure Plan:* This statutory planning document includes considerations for connectivity and mitigation of environmental impacts are identified within the plan.
- *Pedestrian and Cycling Network Development Policy:* This policy includes regional collaboration when considering connectivity, specifically; Policy item #8: “*The County collaborates with adjacent municipalities in an effort to establish seamless active transportation network connectivity across jurisdictional boundaries*” and Policy item #9: “*The County pursues opportunities for collaborative relationships in order to develop and facilitate the expansion of its active transportation network.*”
- *Wetland and riparian land conservation and management Policies:* These policies are relevant due to the shared watershed with Kananaskis Improvement District and the ongoing country residential subdivision of rural properties.
- *Active Transportation Plan: South County:* Included in the plan are a variety of Bicycle Facility Design Guidelines which help inform identification of gaps in the network and to realize opportunities for connectivity within and external to the County.



## 3. Land Use and Socio-economic considerations

West Bragg Creek has become a regionally important recreation and tourism asset, attracting tens of thousands of outdoor enthusiasts for activities for hiking, biking, skiing, horseback riding and more. It is also an area of traditional use for First Nations. Existing tenures include grazing, trapping, timber harvesting, and gas extraction.

This section describes the many land use in this multi-use landscape, including detailed descriptions of recreation opportunities.

### A Multi-Use Landscape

Public lands in West Bragg Creek are multi-use; the land and resources support forestry, agriculture, mining and energy industries, outdoor recreation and tourism and Indigenous land uses. Enhanced recreation management is required to manage thoughtfully the impacts on ecological values and integration with other land uses.

### Indigenous Traditional Land Use

West Bragg Creek is within land associated with the Treaty 7 agreement, and the traditional territory of several Indigenous groups. The area was once used as a rich hunting area, a trade route, and is home to sacred sites. West Bragg Creek is a cultural landscape, with Indigenous stories and traditions that are important for intergenerational Indigenous cultural transmission. The trails in West Bragg Creek provide access for Indigenous peoples to continue traditional use activities.

### Hunting and Trapping

A number of Registered Fur Management Areas overlap with the trail network. AEP will contact current registered trappers with occupied trap lines that intersect with proposed trails during the detailed trail design stage.

### Forestry

The plan area is within the B12 Forest Management Agreement (FMA) area, which provides for the right to establish, grow, harvest and remove timber. Spray Lake Sawmills is the primary tenure holder regulated under the *Forests Act*. Harvesting is subject to many provincial

regulations, policies, guidelines and operating ground rules designed to protect the watershed and the environment, minimize conflict with other land uses and ensure prompt and effective reforestation. Forest Management Plans (FMPs) must be completed by the tenure holder and approved by the Government of Alberta every 10 years. FMPs provide the twenty-year strategic plan for the FMA and include a 20 year spatial harvest sequence and a visual quality strategy map. A revised forest management plan was approved by the Government of Alberta in May 2021.<sup>1</sup>

## **Gas Extraction and Utilities Supply**

Two companies, Calendonia (formerly Husky Oil Operations Limited) and Pieridae Energy (formerly Shell Canada Limited) operate oil and gas wells and facilities in the area. Mountain Road is an access road operated by Pieridae Energy under a License of Occupation. The access road continues to the west to a wellsite outside of the trail planning area. Four gas wells in the area are dry and abandoned. Three gas batteries and two compressor stations operate in the nearby area, accessed by the Moose Mountain Road and the gated Canyon Creek and Prairie Mountain roads. Pieridae Energy's pipeline traverses the northwest edge of the planning area and intersects with Mountain View West trail.

Fortis Alberta operates power lines for electricity to the West Bragg Creek PRA and the Elbow Ranger Station adjacent the Fullerton parking lot.

## **Livestock Grazing**

The plan area includes portions of three range allotments: the Bragg Creek, Jumpingpound and McLean Creek allotments. The season of use is typically from June 15 - October 30 with some variation year to year. Range inventories have been conducted for all three allotments, providing information on vegetation types in the area, and range and riparian health assessments. This information supports determination of ecologically sustainable stocking rates and is the basis for developing range management plans for each allotment. The Bragg Creek range allotment has a signed range management plan, and the Jumpingpound and McLean Creek range allotments have draft plans. Seasonal grazing occurs throughout the area where grass is present and forbs are dominant, mostly along roadsides, in grassland areas in the valley bottoms, or in the trembling aspen communities with grass cover. Any trails that cross allotment boundaries are of particular concern because cattle may use these as vectors for travel from one unit to another. Mitigation may include rerouting the trail, altered trail tread design, employing fences, gates, cattle guards, and signage for users. Any new trails that may affect livestock grazing will be

---

<sup>1</sup> The current forest management plan and operating ground rules are available at <https://spraylakesawmills.com/woodlands/forest-management-planning/>

reviewed by AEP's rangeland agrologist and range allotment holders during the detailed trail design stage.

## **Tourism and Events**

The Bragg Creek and Area Chamber of Commerce promotes the outdoor recreation opportunities in the area with the tagline “Your Bragg Creek, Adventure Begins Here” (Bragg Creek and Area Chamber of Commerce, 2022). The West Bragg Creek trail network is promoted as a destination for a variety of summer and winter activities, and Bragg Creek as the hub for shopping, dining and accommodations. A trailhead staging and adventure centre was identified for future development in the Hamlet core in the 2015 Hamlet of Bragg Creek Revitalization Plan. The Centre is meant to serve as an orientation and destination centre intended to encourage visitors to spend more time in the hamlet.

The Foothills Tourism Association is the Destination Marketing Organization for the region and its strategy highlights the importance of the visitor economy and sets a target of increasing tourism revenues by 50% by 2050 (Foothills Tourism Association, 2020). It recognizes the importance of understanding the travel patterns and preferences of Calgarians and their visitor profiles, also called Explorer Types, which are a combination of demographics, geography and psychological characteristics. A recognized strength of the region is its natural and recreational assets, such as those found in the West Bragg Creek area.

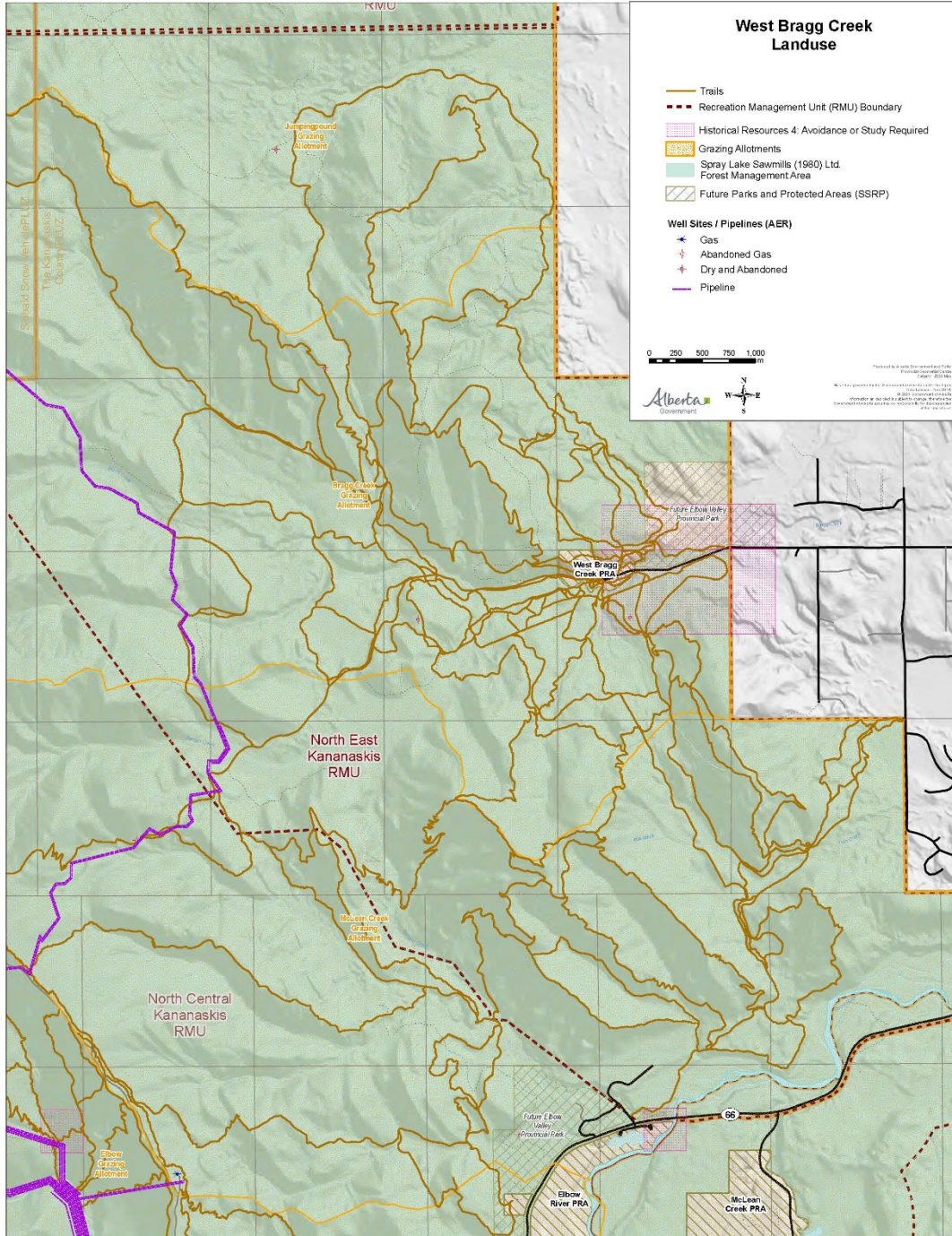
Destinations that are most successful at maximizing the benefits of trail tourism recognize that it is about much more than the physical trail itself. Of importance for trail tourism destinations are the interconnectedness and interdependency of the tourism network, the important role each entity in the system plays, and the deliberate work to coordinate, align and collaborate with the players across the entire network.

Over 20 companies conduct commercial tourism nature-based services in the West Bragg Creek trail network. The activities include mountain biking tours and training, guided hikes, trail races, filming and nature education tours.

West Bragg Creek trails network has been host to many events including:

- Lewiston Ultra Events Moose Mountain Trail Race Event
- Run for the Braggin' Rights
- Alberta Youth Cross Country Ski Championships
- Youth 2.4 hours of Adrenaline Cross Country Ski Event by XC Bragg Creek

Figure 1 Land Use in West Bragg Creek area



## Recreational Opportunities

The volume of visitors to West Bragg Creek area is not precisely documented but estimates are that over 285,000 person trips are taken to the area in a year, with peaks of 37,000 trips during the month of January and over 32,000 trips during the month of July.<sup>2</sup>

Trails provide a means for people to be active, explore the natural world and improve their health and well-being. In the report “Cost-Benefit Analysis of Physical Activity Using Bike/Pedestrian Trails” (Wang, et al., 2005), it is estimated that for each dollar spent on building, maintaining and using trails, nearly three dollars were realized in reduced health care costs by the trail users due to improvements in their health.

The diversity of recreational opportunities in West Bragg Creek is valued by local users and is a driver for visitors to travel to the area. Recreation opportunity is “the ability for an individual to engage in a preferred recreation activity within a desired recreation setting and natural region to obtain a desired experience” (Government of Alberta, 2019). It is the combination of the activity, the level of challenge, the natural region and setting that changes the recreation experience.

A recreation setting is the “combination of physical, biological, social and managerial conditions that give value to a place for recreation or tourism purposes” (Clark & Stankey, 1979). See below for a description of the recreation settings in the area. An understanding of the settings and variety of experiences within them informs land managers and trail operators on appropriate level of use, development and type of features.

**Table 4 Recreation Settings and Opportunities**

<b>Front-Country Setting and Opportunities</b>			
Character: Highly intensified and modified landscape with basic services to public.			
Accessibility: Year-round paved road access with fully-serviced facilities and amenities allowing general barrier-free access and travel to the Provincial Recreation Area parking lot.			
Naturalness: The area has significant modifications in the parking lot.			
Usage: The area is used year round for day use activities, supporting over 300 Average Annual Daily Traffic Vehicles (one-way) at West Bragg Creek PRA.			
On-site Operations: The area has extensive winter grooming and summer trail maintenance operations, a trail host program and temporary trail centre.			
<b>Activities</b>	<b>Natural Features/Landscapes</b>	<b>Regulations &amp; Policies</b>	<b>Operations &amp; Services</b>

<sup>2</sup> Estimates based on combination of data from 2020 and 2021 from highway traffic counter into West Bragg Creek PRA and trail counter on Elbow Trail near the Fullerton parking lot.

Non-motorized Winter and summer use	<ul style="list-style-type: none"> <li>Modified landscape, including areas managed for Firesmart</li> </ul>	<ul style="list-style-type: none"> <li>Activities are regulated or restricted as per the Provincial Parks Act-General Regulations.</li> </ul>	<ul style="list-style-type: none"> <li>Operated by BCT under Agreement</li> <li>Winter trail grooming and summer trail maintenance</li> </ul>
<p><b><u>Mid-Country Setting and Opportunities</u></b></p> <p>Character: Easily accessible trail network sustains higher levels of use.</p> <p>Accessibility: Several different types of difficulty and activity type opportunities provided.</p> <p>Naturalness: Trail corridors have significant modifications.</p> <p>Usage: Day-to-day use levels impact the experience, as well as different user types (i.e., sport development vs casual; skill level and activity type).</p> <p>On-site Operations: The area has extensive winter grooming operations; trail hosts on site.</p>			
Non-motorized Multi- use	<ul style="list-style-type: none"> <li>Foothills and valley bottom terrain and viewsapes</li> <li>Natural snow accumulation</li> </ul>	<ul style="list-style-type: none"> <li>Designated trails</li> </ul>	<ul style="list-style-type: none"> <li>Operated by BCT under Agreement</li> <li>Winter grooming operations and summer trail maintenance</li> </ul>
<p><b><u>Backcountry Setting and Opportunities</u></b></p> <p>A natural landscape that is largely undisturbed with no formalized infrastructure or services to support use; use levels are expected to be low; no services or managerial presence.</p> <p>This recreational setting does not exist in the West Bragg Creek trail network.</p>			

## Trail Opportunities

Trail opportunity descriptions are provided here for mountain biking and cross-country skiing only due to the variety of sources of information for these activity types.

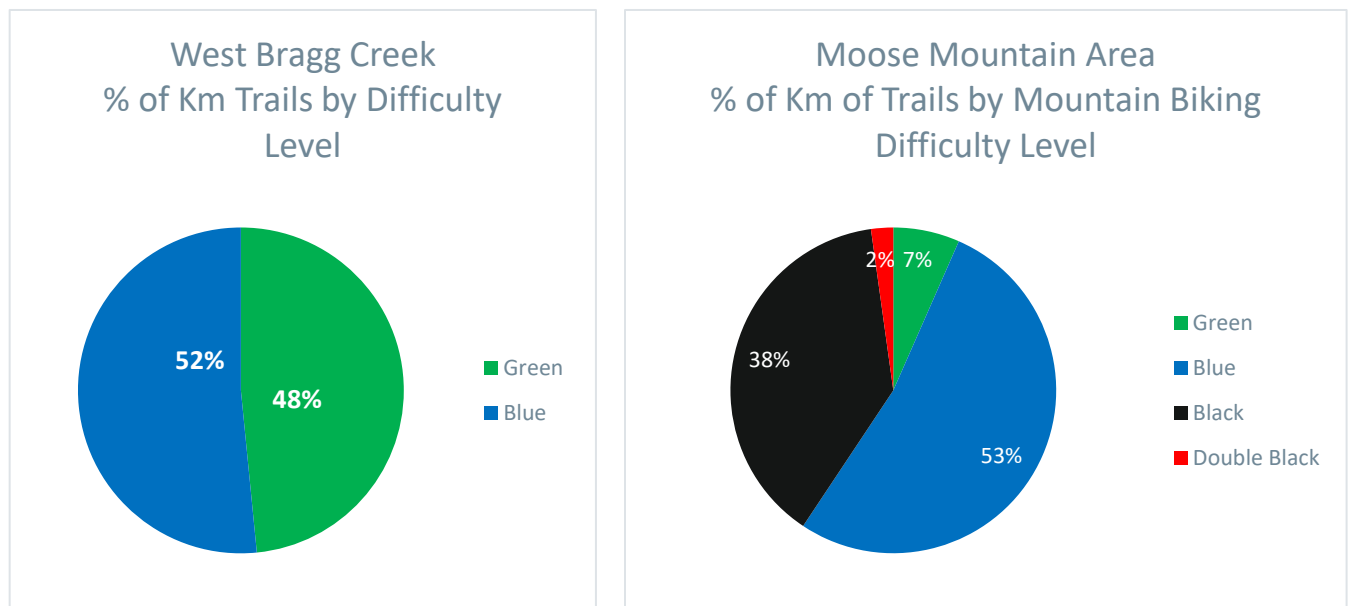
### Mountain Biking

The West Bragg Creek trail network is a regional riding destination. A comparison of the kilometres and number of mountain biking trails listed on Trailforks for regional riding destinations in Alberta and BC is provided in Table 13 below. From a mountain biking perspective, the West Bragg Creek trail system, combined with the adjacent Moose Mountain trail system, provides users with options for different levels of riding experiences. The charts below (Figure 8) show the percentage of trails in each difficulty rating type across the West Bragg Creek and Moose Mountain trail networks. Figure 9 and Figure 10 depict the trail network as shown on Trailforks and Strava.

**Table 5 Trailforks Summary of Number and Kms of Trails of Interest for Mountain Biking by Region<sup>3</sup>**

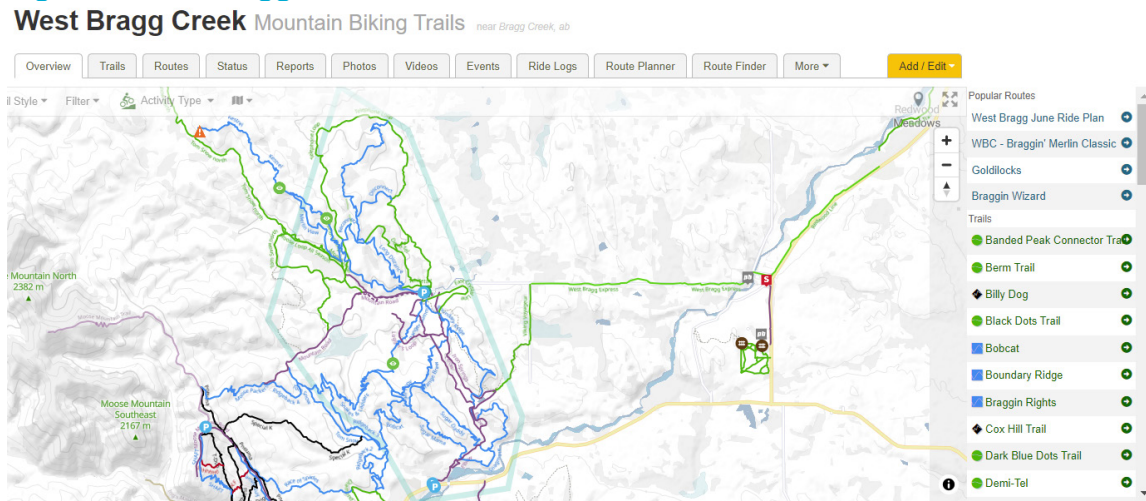
	Bragg Creek and area, AB	Canmore and area, AB	Fernie, BC	Rossland, BC	Nelson, BC	Squamish, BC	Revelstoke, BC
Total Number of Trails	136	222	378	163	232	439	213
Total Km of Trails	445	369	776	278	481	457	372

**Figure 2 West Bragg Creek and Moose Mountain Area % of Km of Mountain Bike Trail by Difficulty Level**



<sup>3</sup> trailforks.com; retrieved December 1, 2021

**Figure 3 West Bragg Creek on Trailforks<sup>4</sup>**

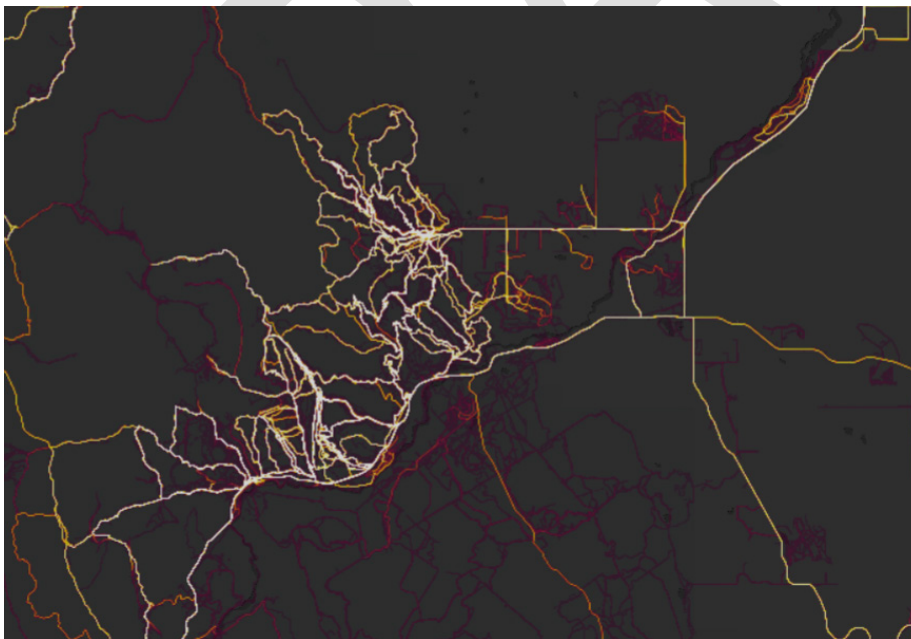


West Bragg Creek is a day use area in Kananaskis Country, a 45 min drive southwest of Calgary, Alberta and ~10 km west of the charming hamlet of Bragg Creek. Here BCT builds and maintains some 166 km of multi-use trails in the foothills of the Rocky Mountains. The terrain is mostly gentle and rolling and the forest is a mix of aspen and evergreens which has been logged in places, opening up many lovely vistas. Creeks, springs and wetlands add variety to the landscape. All trails are well marked with trail markers and maps at major intersections, making it virtually impossible to get lost.

Activities [Click to view](#)

Mountain Bike	E-Bike	Hike	Trail Running
38 trails	23 trails	40 trails	38 trails
Horse	Nordic Ski		
37 trails	12 trails		

**Figure 4 Strava Heat Map, All Activities<sup>5</sup>**



<sup>4</sup> Retrieved March 18, 2022

<sup>5</sup> Retrieved March 18, 2022



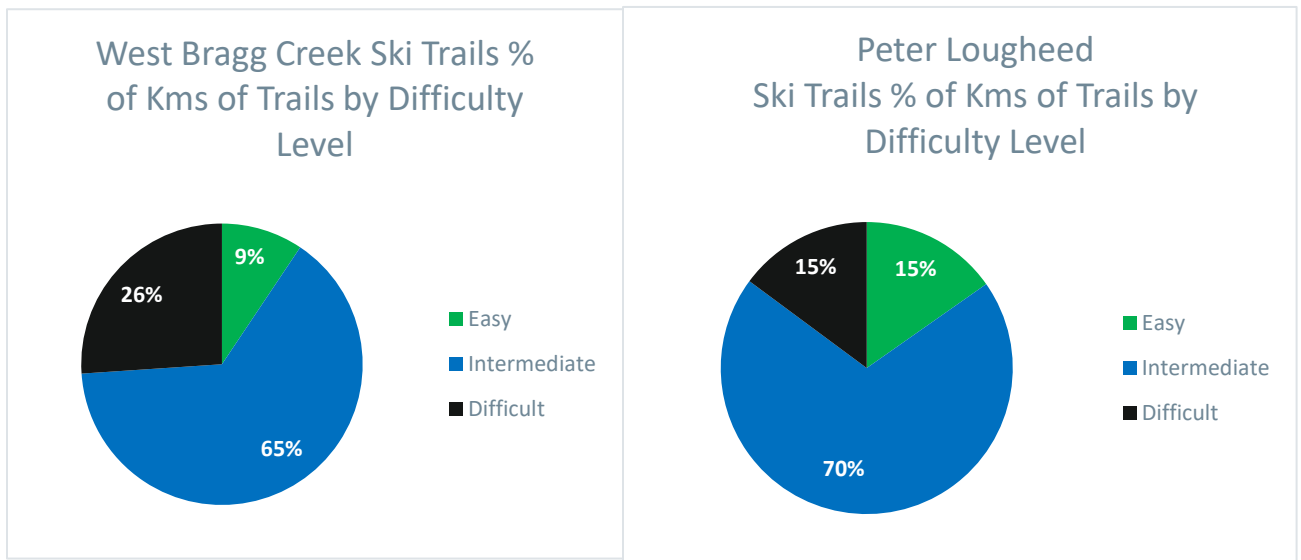
## Cross-Country Skiing

West Bragg Creek is the closest ski network to the City of Calgary. A comparison of the kilometres and number of cross-country ski trails accessible as day trips from Calgary is shown in Table 14. Figure 11 compares the difficulty of ski trails at West Bragg Creek, Canmore Nordic Centre and Peter Lougheed Provincial Park.

**Table 6 Summary of Number and Kms of Trails of Interest for Cross-country Skiing by Trail Network<sup>6</sup>**

	West Bragg Creek	Canmore Nordic Centre	Peter Lougheed
Total Number of Trails	14	31	25
Total Km of Trails	57.8	51	79.3

**Figure 5 West Bragg Creek and Peter Lougheed % of Kms of Ski Trail by Difficulty Level**



<sup>6</sup> trailforks.com; retrieved December 1, 2021

## Demographics

Visitors to West Bragg Creek are mostly day users traveling from less than 100 km away. A recreation use and experience survey conducted in the summer 2020 and winter 2021 (Alberta Environment and Parks, 2022; Alberta Environment and Parks, 2022) revealed the following:

- Ninety-eight percent of visitors to the West Bragg Creek trail network were from Alberta.
- In the summer, over 80% of visitors originated from within 100km of West Bragg Creek and in the winter, over 90% were estimated to be from within 100km of West Bragg Creek (Ibid).
- In the summer 2020, 97% of respondents at West Bragg Creek PRA and 81% of respondents at Fullerton parking lot were day users. In the winter 2021, 98.4 % of all respondents were day users (Ibid).
- Summer survey respondents were 65.9% male and 33% female (Ibid). This likely reflects the dominance of mountain biking in the summer, which is historically a male dominated activity (Newcomb, 2020), although the fastest growing sector of the mountain biking market is women (International Mountain Bike Association Canada, 2019).
- Winter survey respondents were more evenly distributed across genders: 50.4% male and 49.6% female.
- Age class distribution in the winter was slightly older with approximately 11% more respondents in the 55 and up age categories than in the summer. In the summer there were 10% more respondents from the 35 and below age categories.

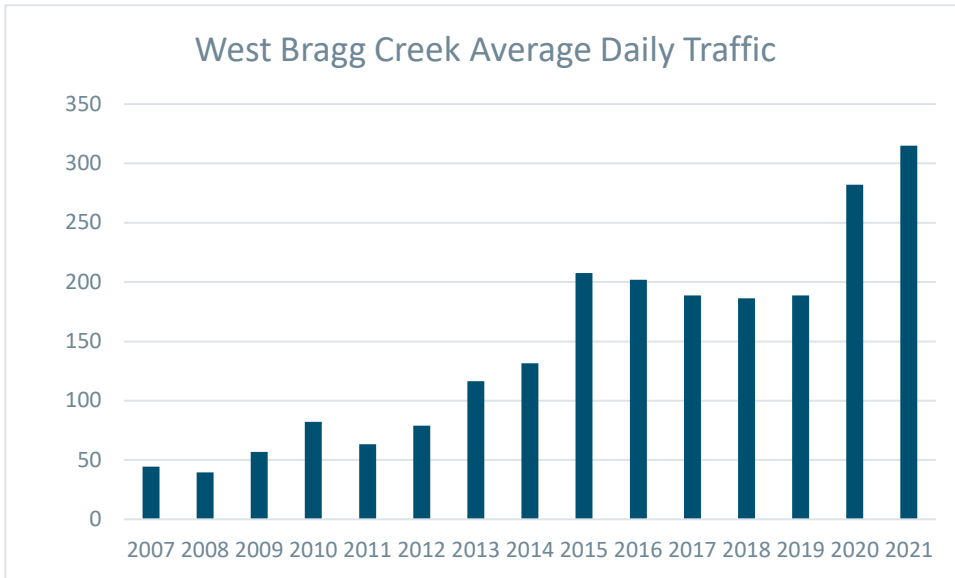
## Visitor Use and Experience

Average annual daily traffic (AADT) into West Bragg Creek PRA and along the Elbow Valley High 66 show a dramatic growth in use over time (see Figure 12 and Figure 13).<sup>7</sup> The AADT along the Elbow Valley Highway #6 in 1987 was 1090 compared to 1890 in 2016, a 73% increase. Lower AADT in 2017 may be a result of having several day use areas closed for flood restoration work. Lower AADT in 2019 was due to the COVID-19 restrictions on travel in the spring of that year.

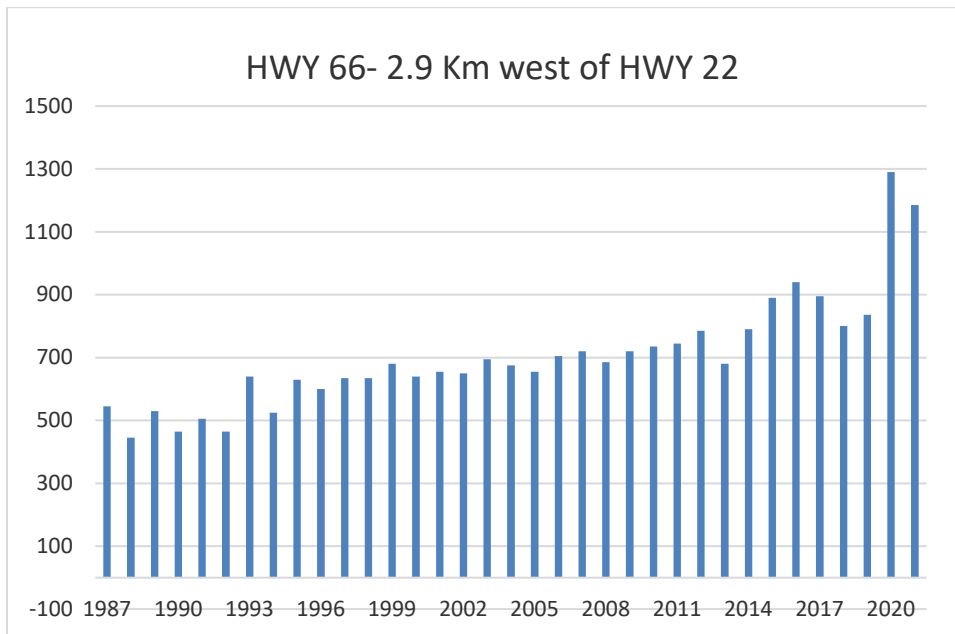
---

<sup>7</sup> The Average Annual Daily Traffic (AADT) is determined by counting the total number of vehicles to cross a point in both directions on a highway during a year and dividing this value by the number of days in that year (January 1 to December 31).

**Figure 6 West Bragg Creek Average Annual Daily Traffic (AADT) One Way**



**Figure 7 Elbow Valley Highway 66 (2.9km West of Hwy 22) Average Annual Daily Traffic (AADT) One Way**



Generally, traffic volumes are higher on the weekends and are the heaviest from 11am to 6pm. Some weekday evenings also tend to be busy as Calgarians travel for evening recreation.

Based on the 2020 and 2021 West Bragg Creek survey, the main reason users chose the area is because of its proximity to them as a day use area. Respondents also appreciated the area for having a variety of quality, maintained trails and because they are familiar with it. Users are drawn to the area by the natural environment, the scenery and opportunity to connect with nature.

The large parking lot at West Bragg Creek, expanded in 2017, is appreciated as it provides easy access, but users highlighted that lack of parking and overcrowding are issues (there is slightly higher concern about overcrowding in winter than in summer). Some respondents choose to go to Moose Mountain trail network because they consider the trails in the West Bragg Creek network too busy.

A large proportion of users visit West Bragg Creek frequently as part of their regular exercise and recreation routine. In the 2020 summer survey, 47% of respondents visited the area once or more than once per week. Another 31% of respondents visit once or twice a month in the summer. In the winter 51% of respondents visited once or more than once per week. Another 37% of winter respondents visited once or twice a month (Alberta Environment and Parks, 2022; Alberta Environment and Parks, 2022).

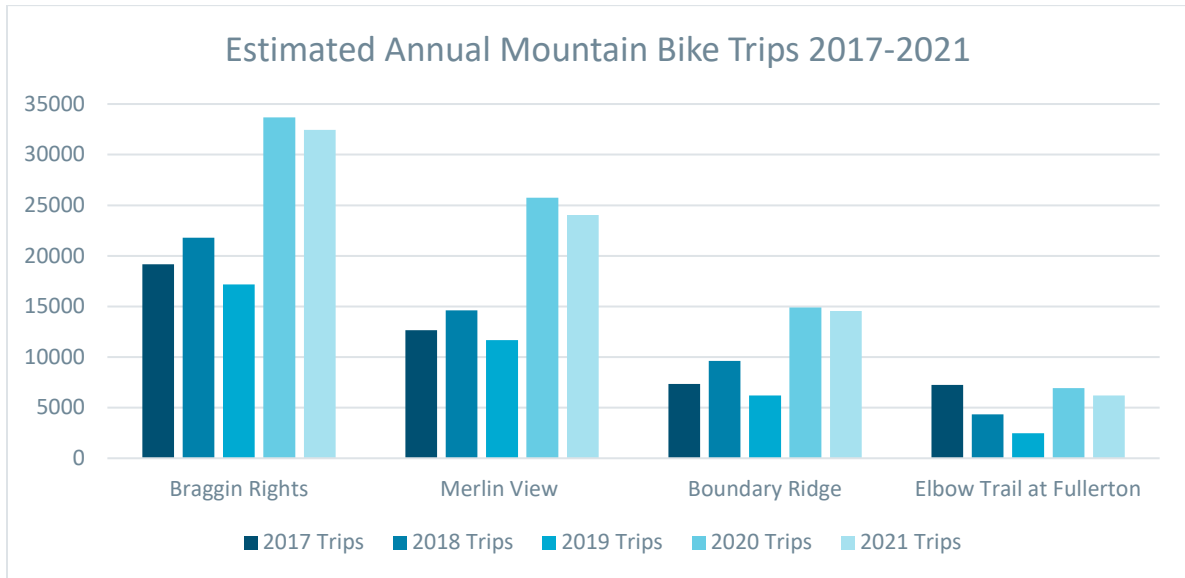
A closer look at visitor volumes by activity type is possible using the trail cameras and online activity tracking apps. Strava Metro data going back to 2017 reveals the varying levels of mountain biking use across a number of popular trails and the variation across years.<sup>8</sup> Figure 14 shows estimated total trips on popular trails in the network.<sup>9</sup>

---

<sup>8</sup> This report used aggregated and de-identified data from Strava Metro.

<sup>9</sup> Strava Metro data for these trails was multiplied by 59% given an estimated 41% of mountain biker users in the West Bragg Creek network reported using Strava to track their activities in AEP's summer 2020 recreation use and experience survey.

**Figure 8 Estimated Annual Mountain Bike Trips 2017-2021 on Popular West Bragg Creek Trails (multiplied by Strava Metro data)**



Alltrails.com lists the top trails in an area by activity type, see Table 15.

**Table 7 Top Trails by Activity type, Alltrails.com<sup>10</sup>**

Top Hiking Trails and Loops	Top Walking Trails and Loops	Top Trail Running Trails and Loops
Strange Brew, Braggin Rights and Merlin View Loop, Snowshoe Hare Loop, Ranger Summit and Boundary Ridge	Braggin Rights and Merlin View Loop, Telephone, Telephone and Hostel Loop	Braggin Rights and Merlin View Loop, Ranger Summit, Boundary Ridge, Moose Meadows Loop and Snowy Owl to Boundary Ridge Loop

<sup>10</sup> Retrieved March 13, 2022

## 4. Environmental Considerations and Historic Resources

The purpose this review is to provide an overview of any known environmental, cultural and historic resources found within the plan area, and to identify potential mitigation and recommendations to address negative impacts to environmental, cultural and historic resources. The Environmental Review process is designed to ensure that the ecological values are considered and managed for development, operational activities, and recreational events and activities while providing a consistent approach for the review of proposed projects or activities. In addition, the review identifies environmental conditions and provides proposed mitigations based on legislative requirements and professional ecological expertise.

This review is summarized in the following sections:

- Ecoregions and Landforms;
- Soils;
- Vegetation;
- Wildlife;
- Aquatics;
- Climate Change; and
- Historical Resources.

This assessment was prepared with a context review of the Moose Mountain Bike Trail Society-Trails Master Plan (2021) which is located adjacent to the plan area. In addition, findings presented in past research and scientific studies of the area informed a comprehensive desktop review of publicly available background data.

### **Ecoregions and Landforms**

The plan area is located within the Montane Natural Subregion of the larger Rocky Mountain Natural Region (Downing, 2006). The Rocky Mountain Natural Region is defined by mountains, high foothills and deep valleys created from glaciation. The Montane Natural Subregion spans the front range of the Rocky Mountains and serves as a transition between the Foothills Parkland Subregion to the east and the Subalpine Subregion to the west. Although wetlands are not commonly found in the Montane Subregion; the plan area has numerous wetlands in various low-lying locations.

The various landforms found within the plan area are generally below tree line and exhibit predominantly forested ridges, valleys and wetlands. Elevations range from 1700 metres above

sea level at the highest point known as Ranger Ridge, to approximately 1400 metres above sea level within the valley bottom close to the West Bragg Creek PRA parking area. The landform is typical foothills terrain, exhibiting higher elevations in the western extent of the plan area closer to Moose Mountain, transitioning to gentle, treed slopes levelling off along the eastern edge.

## **Soils**

The soils within the plan area are varied; however, the soils are typically loam textured (fine-grained) overlaid by a clay subsoil. Depending on aspect and vegetation cover, the soils are generally moist under forested terrain and a drier fine loam on open slopes.

Foothill ridges consist mainly of sandstones and shale bedrock with a few small outcrops near ridge summits. Most of the plan area consists of ridge slopes which are composed of eroded sandstone material which tends to be well drained. Upper slopes exhibit shallow rocky soils with little grass cover and dominated by low, ground cover vegetation. The loam/silty loam topsoil is shallow, and once disturbed the fine textured soil becomes dry and 'powdery'. Lower slopes may see local sandy materials mixed with glacial debris in the form of terraces etc., which tend to be mostly well drained but can tend to be comprised of more mixed material. In valley bottoms, a wide range of alluvial (water borne) deposits are found, including gravels, sands, silts and clay. Alluvial deposits often define riparian zones along creeks or wetlands, and are associated with more diverse, shrubby vegetation and thus are often significant from a watershed, fish and wildlife protection perspective.

Organic soils are found in many low-lying locations such as shrubby and graminoid fens, which are predominantly wet or moist with little drainage. Two large mixed fens are located in the central portion of the plan area with a substantial fen located immediately north-east of the West Bragg Creek PRA parking area.

## **Vegetation**

The plan area is located within a forested area consisting of predominantly trembling aspen, spruce and pine, with a woody understory include prickly rose and creeping juniper and various native grasses and forbs consistent with the Montane Natural Subregion. There are patches of grasslands located throughout the plan area. Vegetation and ground cover can contribute to soil stability and enhance user experience. Within the Montane Natural Subregion, which dominates the majority of the plan area, woodlands on the north and east facing slopes are commonly found, with grasslands on the south and west facing slopes, shrubs and willows on wetter soils and ridges of pine trees through the valley.

An Alberta Conservation Information Management System (ACIMS) desktop search resulted in several non-sensitive element occurrences observed within the southern portion of the plan area. These non-sensitive species are noted in the below table with the corresponding land location (section).

**Table 8 Alberta Conservation Information Management System (ACIMS) Search of Species in the Area**

Common Name	Scientific Name	Sections where found
Little Copper	<i>Lycaena phlaeas</i>	(Outside of plan area) S16, 9, 10, 4, 3-23-6-W5
Liverwort	<i>Anastrophyllum michauxii</i>	29-22-5-W5, and 30-22-5-W5
Moss	Multiple species	Multiple locations: S29,30, 31, 32-22-5-W5; S25, 26, 35, 36-22-6-W5

ACIMS is a data centre that provides biodiversity information on Alberta's species, natural ecological communities and sites. Information about the location, condition, status and trends of selected elements is collected, updated, analyzed and disseminated.

## Limber Pine

Alberta Fish and Wildlife Internet Mapping (FWIMS) data has identified that Limber Pine is deemed to be endangered and threatened, and can be found within the majority of the plan area. Limber Pine is generally present at higher elevation areas near the treeline and is tolerant of windy and dry conditions (Government of Alberta and Alberta Conservation Association, 2007) (Government of Alberta, 2018). Occurrences are associated with south- and west-facing slopes, rocky ridges, and steep rocky slopes.

Limber Pine can exist in mixed stands and quickly establishes itself after forest fires. There is the potential for Limber Pine to occur within the trail system area, particularly in poorly established soils and higher elevation areas that are regionally mapped as being within the Subalpine Subregion (Government of Alberta, 2006).

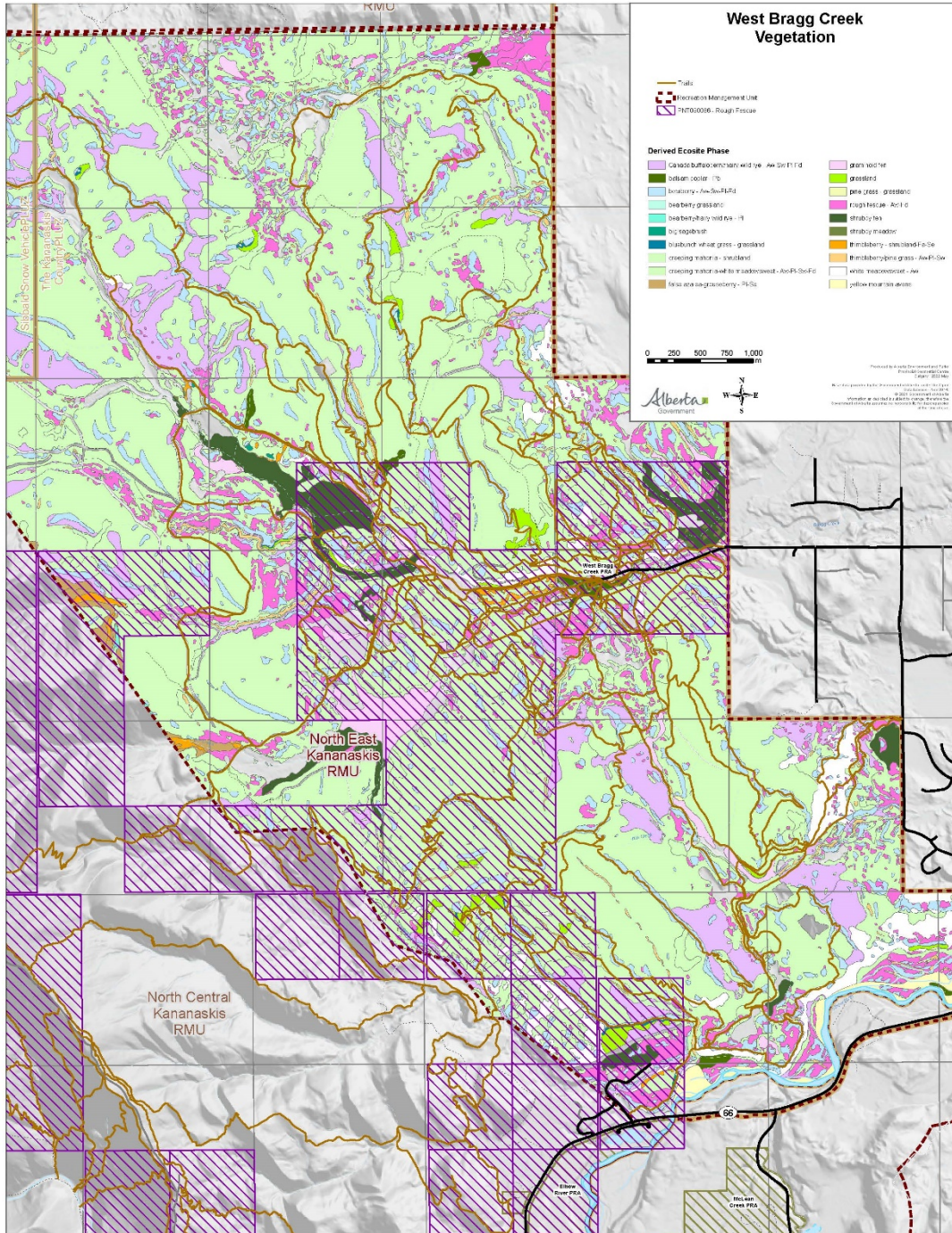
## Foothills Rough Fescue Communities

The trail network is within potential terrain for foothills rough fescue grassland communities. Foothills rough fescue communities are important to overall species diversity and provide essential winter grazing for wildlife. These grasslands are important in maintaining the local plant biodiversity (Willoughby, 2001). Fescue communities are known to occur in the area primarily on open east, south and west slopes. These noted fescue communities are contiguous between the North Central Kananaskis recreation Management Unit (RMU) and the North East Kananaskis RMU where the plan area is located. Several of these rough fescue communities have a protective notation for foothills rough fescue (PNT 090086) and noted in



Figure 15. The PNT is administered by Environment and Parks - Rangeland Management and indicates the proposed trail system may fall within an area of foothills fescue grassland, which is limited in remaining area, sensitive to development and difficult to reclaim.

Figure 9 Vegetation



## Wildlife

The plan area is home to many large mammals including black and grizzly bear, cougar, bobcat, lynx, wolf and coyote, as well as deer, elk and moose and many species of smaller mammals. The plan area is also within a winter range for elk and the year round range for moose.

A FWMIS desktop search conducted for the plan area revealed the potential presence of the following birds, mammals and amphibians and their associated status as per the Alberta Government Wild Species General Status Listing 2020 (Government of Alberta, 2022).

**Table 9 Fish and Wildlife Management Information System (FWMIS) Search - Birds**

BIRDS		
COMMON NAME	SCIENTIFIC NAME	STATUS (AB General Status- 2020)
Alder Flycatcher	<i>Empidonax alorum</i>	Secure
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Sensitive
Bank Swallow	<i>Riparia riparia</i>	Sensitive
Barn Swallow	<i>Hirundo rustica</i>	May Be at Risk
Brown Creeper	<i>Certhia americana</i>	Sensitive
Common Nighthawk	<i>Chordeiles minor</i>	Sensitive
Common Yellowthroat	<i>Geothlypis trichas</i>	Sensitive
Great Blue Heron	<i>Ardea herodias</i>	Sensitive
Great Grey Owl	<i>Strix nebulosa</i>	Sensitive
Harlequin Duck	<i>Histrionicus histrionicus</i>	Sensitive
Least Flycatcher	<i>Empidonax minimus</i>	Secure
Northern Pygmy Owl	<i>Glaucidium gnoma</i>	Sensitive
Olive Sided Flycatcher	<i>Contopus cooperi</i>	May Be at Risk
Western Tanager	<i>Piranga ludoviciana</i>	Sensitive
Western Wood Pewee	<i>Contopus sordidulus</i>	May Be at Risk

**Table 10 Fish and Wildlife Management Information System (FWMIS) Search - Mammals**

MAMMALS		
COMMON NAME	SCIENTIFIC NAME	STATUS (AB General Status 2020)
Badger	<i>Taxidea taxus</i>	Sensitive
Bobcat	<i>Lynx rufus</i>	Sensitive

Canada Lynx	<i>Lynx canadensis</i>	Sensitive
Cougar	<i>Puma concolor</i>	Secure
Fisher	<i>Martes pennanti</i>	Sensitive
Grizzly Bear	<i>Ursus arctos</i>	At Risk
Wolverine	<i>Gulo gulo</i>	May be at Risk

**Table 11 Fish and Wildlife Management Information System (FWMIS) Search - Amphibians**

AMPHIBIANS		
COMMON NAME	SCIENTIFIC NAME	STATUS (AB General Status 2020)
Boreal Toad	<i>Anaxyrus boreas boreas</i>	Sensitive
Columbia Spotted Frog	<i>Rana luteiventris</i>	Sensitive

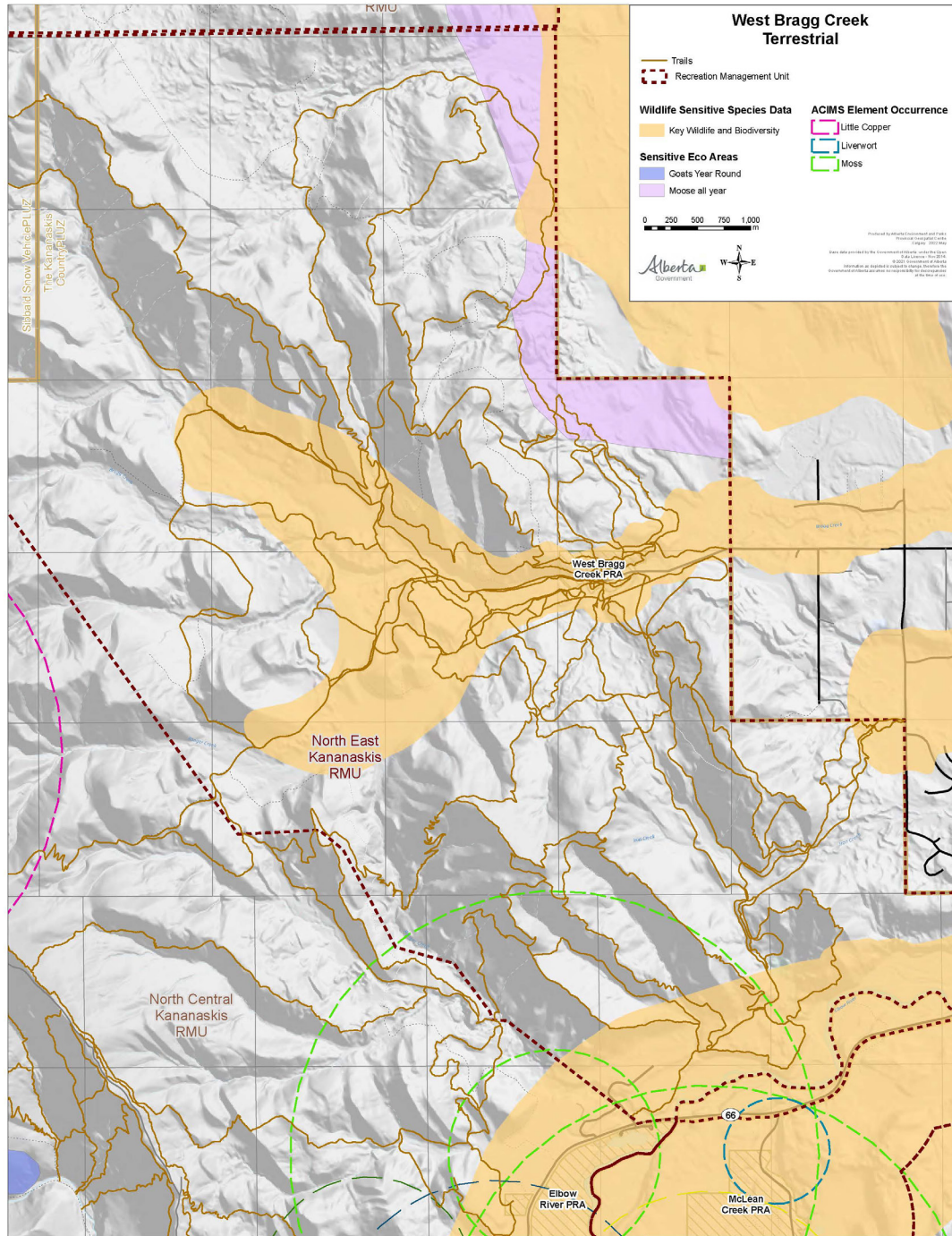
The classification of species status is as follows:

- **“Secure”** - a species that is not At Risk, May be at Risk or Sensitive.
- **“At Risk”** - a species known to be at risk after formal detailed status assessment and legal designation as *Endangered* or *Threatened*.
- **“May be at Risk”** - a species that may be at risk of extinction or extirpation and is therefore a candidate for detailed risk assessment.
- **“Sensitive”** - any species that is not at risk of extinction or extirpation but may require special attention or protection to prevent it from becoming at risk
- **“Exotic/Alien”** - a species that has been introduced as a result of human activities.

### Key Wildlife and Biodiversity Zone (KWBZ)

Common best practices within the KWBZ suggest a preference for avoidance of new development. The KWBZ identified within the plan area is a combination of key winter habitat for ungulates such as deer, elk, and moose as well as a zone that has been identified as being considered as high value for overall biodiversity. As such, construction activities between December 15 and April 30 are recommended to be avoided. In addition, due to extended sun exposure and reduced vegetation cover, open south facing meadows should be avoided. These are important foraging habitat for a number of species.

Figure 10 Terrestrial



## Aquatics

The plan area contains a large portion of the Bragg Creek drainage as well as portions of both Ranger Creek and Iron Creek drainages. It is acknowledged these are not large streams; however, all three are tributaries of the Elbow River, which supplies a substantial amount of drinking water for the City of Calgary. Coordinated planning and monitoring within the Elbow River watershed has occurred with direction from the *Bow Basin Watershed Management Plan* with support of the Elbow River Watershed Partnership. The preservation of a safe water supply and maintaining an overall healthy aquatic system have been considered paramount and of utmost importance. One important principle of the Elbow River plan is to protect source areas, such as West Bragg, from deterioration due to human activities. Within the plan area, the two most susceptible areas from impact of trail development include stream crossings and wetlands. Over time, trail use has the potential to remove protective vegetation and increase siltation into streams. This is especially concerning where silty soils are present at through crossings where trail users ford the stream.

Fish habitat is negatively impacted by water that experiences prolonged or intermittent siltation, or areas where silt deposits on gravel beds where fish spawning typically occurs. When snow and ice cover is present, siltation of streams is considered to be negligible.

## Aquatic Species at Risk

Within the front ranges of Alberta, numerous studies have been conducted to assess aquatic conditions, including identification and tracking of fish populations. On-site inspections and habitat assessments bolstered by the use of remote sensing technology have been used to assemble data sets to enable identification and classification of water bodies, riparian areas and areas of concern where variables create challenging conditions or threaten aquatic habitat.

Bull Trout are threatened under Alberta's *Wildlife Act* and the Federal *Species at Risk Act* (Government of Alberta, 2021) (Government of Alberta, 2021). Critical habitat orders have been given for both species according to subsection 58(1) of the *Species at Risk Act*, which prohibits the destruction of any part of the critical habitat identified in the recovery strategy for the species (Fisheries and Oceans Canada, 2020). The critical habitat is meant to be protected to provide the "functions and features necessary to support the species' life-cycle processes, and to achieve the species' population and distribution objectives" (Fisheries and Oceans Canada, 2020).

Some creeks and tributaries in the Plan area [including Bragg Creek and Ranger Creek], are designated as critical habitat by Fisheries and Oceans Canada (Fisheries and Oceans Canada, 2022). Critical habitat includes the riparian area width, which extends from the high-water mark to a width of 30 metres on both banks of the waterbody (Fisheries and Oceans Canada, 2020).

While some existing structures are exempt, any work or activity that might impact aquatic species of risk or that results in permanent alteration or destruction of critical habitat must be reviewed by Fisheries and Oceans Canada to determine if additional authorizations are required.<sup>11</sup>

The FWMIS Fish Survey revealed the Elbow River provides a variety of conditions to provide preferred habitat for a variety of fish species including dace, trout and whitefish.<sup>12</sup> Brook Trout was observed to be the predominant species revealed in the FWMIS Fish Survey for Bragg Creek while Bull Trout was observed to be the most prevalent found in the Elbow River. Further, the FWMIS Fish Survey revealed that Brook Trout have been observed in Bragg Creek, which flows west to east and in close proximity of the West Bragg Creek PRA parking area.

**Table 12 Fish and Wildlife Management Information System (FWMIS) Search - Fish**

FISH		
COMMON NAME	SCIENTIFIC NAME	STATUS (AB General Status 2020)
Brook Trout	<i>Salvelinus fontinalis</i>	Exotic/Alien
Brown Trout	<i>Salmo trutta</i>	Exotic/Alien
Bull Trout	<i>Salvelinus confluentus</i>	At risk
Longnose Dace	<i>Rhinichthys cataractae</i>	Secure
Mountain Whitefish	<i>Prosopium williamsoni</i>	Secure

## Legislation and guidance

Alberta relies on legislated Acts which direct the consideration for development of trails in close proximity to water bodies or water courses within Crown lands. These pieces of legislation include:

### **Alberta Water Act**

The Alberta Water Act objective is to ensure Alberta’s water management legislation and policy could more effectively address current water management demands and challenges. The Act

<sup>11</sup> DFO Request a review of your project near water, <https://www.dfo-mpo.gc.ca/pnw-ppe/reviews-revues/request-review-demande-d-examen-004-eng.html>

<sup>12</sup> The FWMIS dataset comes with the following disclaimer: “The fish and wildlife inventory data accessible from this site does not represent a complete record of all fish and wildlife collections and observations available. It only represents the data currently residing in the Fish and Wildlife Management Information System (FWMIS). Many areas in Alberta have not been subjected to a comprehensive species inventory. Information accessible through this site is not intended to be a definitive statement on the presence, absence, or status of a species within a given area, nor as a substitute for on-site surveys” (Minister of Environment and Parks, Government of Alberta, 2022).

supports and promotes the conservation and management of water, through the use and allocation directives.

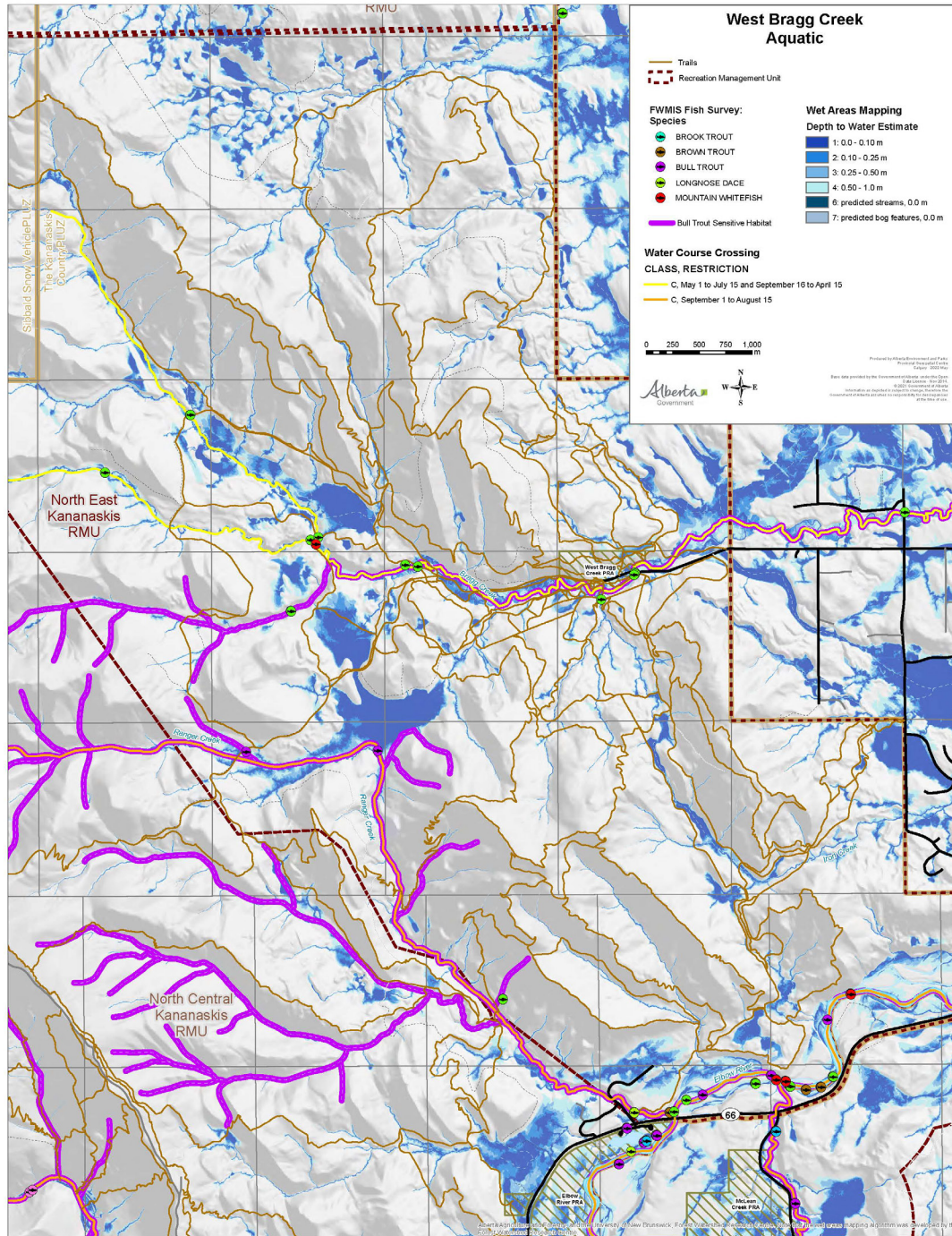
***Alberta Fisheries Act and the Federal Fisheries Act***

Alberta's fisheries are managed through the *Alberta Fisheries Act*, while fish habitat in Alberta is managed and protected through the federal **Fisheries Act** (Canada). The Federal Fisheries Act aims to manage and protect Canada's fisheries resources. It contains requirements for preventing pollution in Canadian waters and includes new protections for fish and fish habitat in the form of standards, codes of practice, and guidelines for projects near water.

Through these two pieces of legislation, the *Alberta Fish Conservation and Management Strategy- 2014* guides the overall management and protection of the fisheries resource in Alberta. Its guiding principles include: no net loss of the productive capacity of fish habitat, and the biological diversity of fish fauna is to be maintained.



Figure 11 Aquatics



## Climate Change

The mean annual temperature in Alberta is projected to increase between 2-4 °C by the 2080s, and possibly as high as 6.5 °C under the maximum-change scenario (Schnieder, 2013). In the Kananaskis region, mean annual temperatures are projected to increase from 1.1°C to 3.3-6.8 °C by 2051-2080 under the business as usual scenario, where greenhouse gas emissions increase at current rates. Annual mean precipitation is projected to increase 11% by 2051-2080 (Ibid.). Despite this increase, the summer months are projected to have no increase in mean precipitation (Ibid.) The frost free days will increase by 56 days. The winter months will be warmer with an estimate change in mean temperatures of -9.1°C to -5.2°C in 2051-2080. Overall warmer temperatures will increase the rate of evapotranspiration, from the moisture loss from soils and vegetation. (Nixon, Shank, & Farr, 2015). Lower summer flows and higher peak flows are expected in the future.

Extreme weather events such as flooding (Kharin, Zwiers, Zhang, & Hegerl, 2007) and unpredictable natural disturbances such as forest fires are repercussions of climate change. Ecosystems are expected to shift northwards and upslope (Schnieder, 2013). In the Rocky Mountain natural region, vegetation communities will not move at the same rate, resulting in elements of new and old communities as the climate warms. Grassland and open woodlands sub-region species are expected to expand into higher elevations in the montane sub-region, and the montane species of today will move upslope to the subalpine (Ibid.)

Recognizing the above data, it is imperative that future detailed trail planning take into consideration the impacts that climate change has on the plan area. Prior to implementation of this plan, AEP will undertake an environmental review to ensure purposeful evaluation occurs to better inform critical decision making and intends to provide broad information on how trail planning:

- Reduces negative impacts such as erosion to the landscape/environment;
- Avoids hydrological obstacles where possible and address and improve water, swamp or bog crossings to reduce effects on riparian habitat; and
- Improves visitor experience, satisfaction and safety.

## Historical Resources

The *Listing of Historic Resources*<sup>13</sup> was reviewed to identify any lands that contain historic resources, including archaeological and paleontological sites, Indigenous traditional land use sites of a historical resource nature and historic structures. Collectively, these four types of

---

<sup>13</sup> <https://www.alberta.ca/listing-historic-resources.aspx>

historic resources are protected under the *Historical Resources Act* and are regulated by Alberta Culture and Status of Women (CSW).

There are three locations within the West Bragg Creek trail planning area identified through the *Listing of Historic Resources* (see Figure 7):

- Overlapping with a portion of the PRA, there is one recorded Indigenous traditional land use site, classified as HRV 4c;
- Near the Fullerton parking lot, there is an archaeological site classified as 4p; and
- The Elbow Ranger Station is recognized as having historic standing structure status.

The interpretive potential of sites is represented through CSW's Historic Resources Value (HRV) rating system:

- HRV 4: sites that contain a significant historic resource that may require further investigation or avoidance before *Historical Resources Act* approval is granted.

Historic and cultural resources in the area adjacent West Bragg Creek are known to date from at least the last 8,000 years and are among the oldest cultural representations in the province. The evidence of paleontological, archaeological and historic structural presence adjacent the West Bragg Creek area would indicate that there is high historic resource potential within the trail network.

Any trail upgrading or construction activities that will result in ground-disturbing impacts will require *Historical Resources Act* approval before proceeding. This can be achieved through submission of a Historic Resources Application to CSW, who will review the project and provide the proponent with either *Historical Resources Act* approval to proceed, or *Historical Resources Act* requirements that must be fulfilled before final project approval can be granted.

Under Section 31 of the *Historical Resources Act*, if a historic resource is unexpectedly identified during the maintenance or construction of the trails, even in situations where the trail has been granted *Historical Resources Act* approval, the volunteer or contractor must immediately halt work and contact CSW's Heritage Division (Historic Resources Management Branch) for further instructions about the actions that will be required. Procedures for notification are available in "Standard Requirements under the *Historical Resources Act*: Reporting the Discovery of Historic Resource"<sup>14</sup>.

In the *Elbow Valley Provincial Park Concept Plan*, which consolidates the West Bragg Creek PRA into a shared management plan with other PRAs and day use areas in the Elbow Valley, a Special Protection Zone is designated for the former hostel site located within the SSRP

---

<sup>14</sup> <https://www.alberta.ca/historic-resource-impact-assessment.aspx/>

expansion lands at West Bragg Creek. The site highlights the historical importance of the former 1977 Bragg Creek Hostel which was the first hostel of its kind in North America.

DRAFT

# References

- Alberta Environment and Parks. (2022). *Recreation use and experience survey results : Elbow Valley summer 2020*. Government of Alberta. Retrieved from <https://open.alberta.ca/publications/recreation-use-and-experience-survey-results-elbow-valley-summer-2020>
- Alberta Environment and Parks. (2022). *Recreation use and experience survey results : West Bragg Creek winter 2021*. Government of Alberta. Retrieved from <https://open.alberta.ca/publications/recreation-use-and-experience-survey-results-west-bragg-creek-winter-2021>
- Bragg Creek and Area Chamber of Commerce. (2022). *Visit Bragg Creek*. Retrieved from <https://visitbraggcreek.com/>
- Clark, R. N., & Stankey, G. H. (1979). *The Recreation Opportunity Spectrum: A Framework for Planning, Management, and Research*. Pacific Northwest Forest and Range Experiment Station, U.S. Department of Agriculture Forest Service.
- Downing, D. a. (2006). *Natural Regions and Subregions of Alberta*. Edmonton, AB.
- Fisheries and Oceans Canada. (2020). *Recovery Strategy for the Bull Trout (Salvelinus confluentus), Saskatchewan-Nelson Rivers populations, in Canada [Proposed]*. Ottawa: Fisheries and Oceans Canada. Retrieved from <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery-strategies/bull-trout-proposed-2020.html>
- Fisheries and Oceans Canada. (2022, June ). *Critical Habitat of Species at Risk*. Retrieved from <https://open.canada.ca/data/en/dataset/db177a8c-5d7d-49eb-8290-31e6a45d786c>
- Foothills Tourism Association. (2020). *Unlocking the Foothills Tourism Potential - Final Report*. WMC. Retrieved from [https://foothillstourism.com/pdf/FTA\\_Final\\_Report\\_Unlocking\\_the\\_Foothills\\_Tourism\\_Potential\\_July\\_2020.pdf](https://foothillstourism.com/pdf/FTA_Final_Report_Unlocking_the_Foothills_Tourism_Potential_July_2020.pdf)
- Government of Alberta. (2006). *Range Plant Community Types and Carrying Capacity for the Subalpine and Alpine Subregions*. Edmonton: Sustainable Resource Development Public Lands and Forest Division. Retrieved from <https://open.alberta.ca/publications/0778540669>

- Government of Alberta. (2018, March). *Species at Risk - Limber Pine and Whitebark Pine*. Retrieved from Alberta Fish and Wildlife Website: <http://aep.alberta.ca/fish-wildlife/species-at-risk/species-at-risk-publications-web-resources/plants/documents/SAR-WhitebarkandLimberPine-Dec2015.pdf>
- Government of Alberta. (2019). *Trail Development Guidelines for Alberta's Public Land*. Edmonton, AB: Alberta Environment and Parks.
- Government of Alberta. (2021). *Bull Trout*. Retrieved from <https://www.alberta.ca/bull-trout.aspx>
- Government of Alberta. (2021). *Cutthroat Trout*. Retrieved from <https://www.alberta.ca/cutthroat-trout.aspx>
- Government of Alberta. (2022). *Wild Species Status Search*. Retrieved from <https://extranet.gov.ab.ca/env/wild-species-status/default.aspx>
- Government of Alberta and Alberta Conservation Association. (2007). *Status of Limber Pine (Pinus Flexilis) in Alberta, Wildlife Status Report No.62*. Edmonton: Alberta Sustainable Resource Development. Retrieved from <https://open.alberta.ca/publications/9780778570691>
- International Mountain Bike Association Canada. (2019, May 1). *Changing the Narrative: More Women on Bikes*. Retrieved from <https://imbacanada.com/changing-the-narrative-more-women-on-bikes/>
- Kharin, V., Zwiers, F., Zhang, X., & Hegerl, G. (2007). Changes in temperature and precipitation extremes in the IPCC ensemble of global coupled model simulations. *American Meteorological Society*, 20, 1419-1444. Retrieved from <https://journals.ametsoc.org/doi/full/10.1175/JCLI4066.1>
- Minister of Environment and Parks, Government of Alberta. (2022). *Fish and Wildlife Internet Mapping Tool (FWIMT\_PUB) Metadata Guide*. Government of Alberta. Retrieved from <https://open.alberta.ca/dataset/06fc95bc-83c3-4978-8c00-5a4933776a7c/resource/d7db2dc2-c3fe-483f-b6e1-2dcb197b65af/download/aep-fwmit-metadata-guide-2022-02.pdf>
- Newcomb, T. (2020, July 13). Amid Cycling Surge, Sport Of Mountain Biking Is Seeing Increased Sales And Trail Usage. *Forbes*. Retrieved from <https://www.forbes.com/sites/timnewcomb/2020/07/13/amidst-cycling-surge-sport-of-mountain-biking-seeing-increased-sales-trail-usage/?sh=57551e423ddf>

- Nixon, A., Shank, C., & Farr, D. (2015). Understanding and Responding to the Effects of Climate Change on Alberta's Biodiversity. *Alberta Biodiversity Monitoring Institute*.
- Schnieder, R. (2013). Alberta's Natural Subregions Under a Changing Climate: Past, Present, and Future. *Alberta Biodiversity Monitoring Institute*. Retrieved from [https://eralberta.ca/wp-content/uploads/2017/05/Schneider\\_2013\\_Albertas\\_Natural\\_Subregions\\_under\\_a\\_Changing\\_Climate\\_ABMI.pdf](https://eralberta.ca/wp-content/uploads/2017/05/Schneider_2013_Albertas_Natural_Subregions_under_a_Changing_Climate_ABMI.pdf)
- Wang, G., Macera, C., Scudder-Soucie, B., Schmid, T., Pratt, M., & Buchner, D. (2005, April ). A Cost-Benefit Analysis of Physical Activity Using Bike/Pedestrian Trails. *Health Promotion Practice*, 6(2), 174-179.