Athabasca
WATERSHED COUNCIL

Sub-Basins of the Athabasca Watershed

Upper Athabasca River Sub-basin

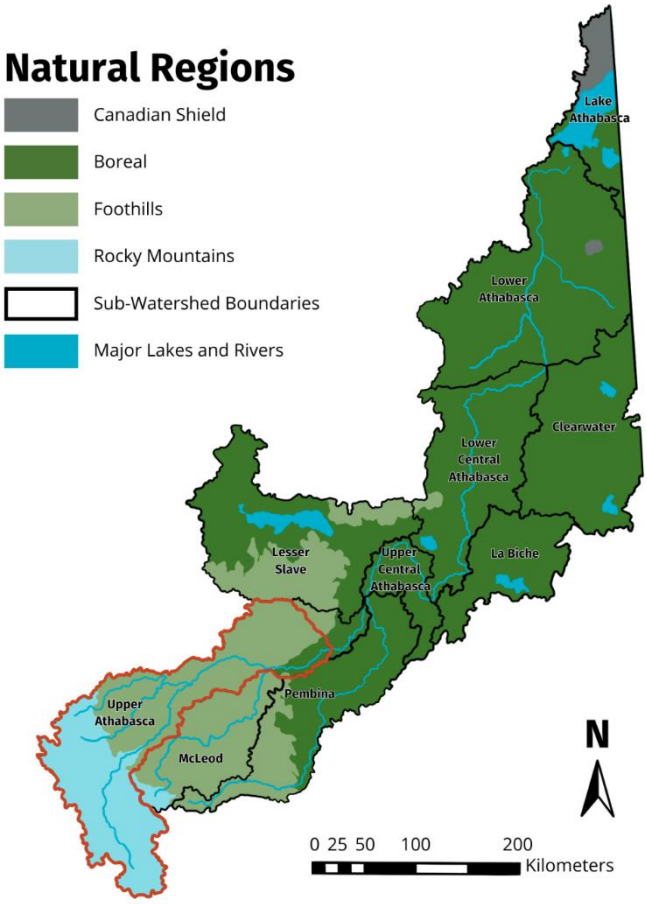
Introduction

The Athabasca watershed can be broken down into ten smaller units (or sub-basins). This document focuses on the **Upper Athabasca sub-basin**.

PART I – GENERAL DESCRIPTION

Sub-basin Description

All the lands that drain into the upper Athabasca River reach make up the Upper Athabasca sub-basin. This includes an area of 25,169 km² or 16.69% of the Athabasca watershed's total area. This sub-basin is the most southerly of the Athabasca watershed's ten sub-basins and includes the headwaters reach of the Athabasca River.



Beginning with the melt waters that flow out of the Columbia Icefield, the Athabasca River starts in the Rocky Mountains (at the Columbia Glacier), at an elevation of about 3747 metres (m). It is soon joined by the Sunwapta River (fed by the Athabasca Glacier) at an elevation of around 1286 m and continues down to the Athabasca Falls at 1176 m where Highway 93A crosses the river. From its headwaters to the eastern edge of Jasper National Park, the Athabasca River valley shows the jagged and smooth evidence of glaciers that formed the diverse, expansive landscape. The influence of these icesheets carved the paths that all rivers and streams take through the mountains. As one of Alberta's most prominent rivers, the Athabasca carries the honour of being designated a Canadian Heritage River, within the confines of Jasper National Park.

The Athabasca River continues through the foothills, joined by Hardisty Creek and Whirlpool River, following Highway 93 to meet the Municipality of Jasper at an elevation of around 1100 m. Before passing through both the Wapiti and Whistler Campgrounds, the river is joined by Astona River and leaving the campground area, by Miette River and Tekarra Creek at an approximate elevation of 1036 m. Just after Twin Lakes at the northern end of Jasper, the river continues along the Yellowhead Highway

towards Hinton. Along the way, it passes Mildred, Annette, and Edith Lakes. It is joined by Pyramid Creek and Maligne River before passing by the Jasper Airport at an elevation around 1000 m.

Before the Yellowhead highway crosses over the river, the Athabasca River is joined by Snaring River and Marro Creek. Following the highway still, it is met by Rocky River and Moosehorn Creek, then by Brown and Supply Creeks at the hamlet of Brule at an elevation of nearly 985 m. The Athabasca River passes by the Town of Hinton and then heads north. Before Sundance Provincial Park, the River is crossed by the Emerson Creek Road bridge at an elevation of about 913 m.

Continuing on, the river is crossed by Highway 947 before leaving Woodlands County and then meeting the McLeod River (one of the Athabasca River's major tributaries) and the Sakwatamau River at the Town of Whitecourt. At this point, the Athabasca River has flowed about 458 km and accounts for about 30% of the river's mean annual discharge, with a flow of about 247.8 cubic metres per second (m^3/s) and an annual volume of about 7,805,570,000 cubic metres per year (m^3/y).

Leaving Whitecourt, the Athabasca River follows the border of Woodlands County and the County of Barrhead until it is joined by Freeman River at Fort Assiniboine, the eastern limit of the Upper Athabasca sub-basin. Here, the river is at an elevation of 605 m, making the total drop from its origin about 3142 m.

Brief Human History

Water is both spiritually and culturally significant for the diverse peoples of Canada and the communities that have relied on these water systems for generations. The Upper Athabasca sub-basin is located on Treaty 6 and Treaty 8 Territories, as well as several Métis communities. The lands spanning the Upper Athabasca were traditionally home to the Anishinabe, Aseniwuche Winewak, Cree, Dene-zaa, Métis, Nakoda, Nêhiyawak, and Secwépemc and other Nations. Within the sub-basin, there are several Indigenous and First Nations communities, including the Alexis Whitecourt 232 Reserve and the Alexander 134A Reserve. The name "Athabasca" is believed by many to have come from the Cree word meaning "lake" or "the place where waters meet, and reeds grow".

Jasper House 1872. Photographer: Charles Horetzky

The Athabasca River has served as a longstanding transportation and trade route for First Nations and Métis, as well as early European explorers. It also provides a vital source of food, containing large fish populations and attracting other animals, in addition to the rich diversity of flora used for crafting materials and medicine.

In 1778 Peter Pond established the first trading post along the Athabasca, developing not only a point of rest for future explorers but also creating a relationship with Cree trappers along the river. Some

First Nations, including the Aseniwuche Winewak were displaced during the settlement of the area, when Jasper National Park and the post that would become the town of Jasper managed by Jasper Hawes in the early 1800s.

parks.canada.ca

Since 2005, Jasper National Park has been working with Indigenous communities to improve the relationship between the traditional peoples of the land and the modern community. In 2012, a Cultural Use Area was established for Indigenous partners of the Park to use for reconnecting with traditional lands and facilitating cultural education, ceremony, and celebration. Today, Jasper National Park engages with Indigenous communities through collaboration with the Jasper Indigenous Forum and the Upper Athabasca Valley Elders Council, lending traditional knowledge to management and conservation, supporting reconnection with the land and assisting economic interest/employment opportunities in the Park.

PART 2 WHAT WE KNOW ABOUT ...

Drinking Water

Today, the Upper Athabasca sub-basin sits within several Alberta counties/municipal districts including the Municipality of Jasper, ID 25 Willmore Wilderness, Yellowhead County, Woodlands County, the M.D. of Greenview No. 16, Big Lakes County, and a small portion in the southeastern end of the basin touching the County of Barrhead No. 11. These municipalities also include several communities, with a total population of about 24,600 people.

Brule (pop. 127) is the smallest of these communities and draws its drinking water from Supply Creek between the hamlet and Swan Landing further north. Hinton (pop. 9817) sits right on the Athabasca just north of Brule and draws its drinking water directly from the river. Whitecourt (pop. 9586) exists within both the Upper Athabasca sub-basin, as well as the McLeod and draws its drinking water directly from the McLeod River. Jasper (pop. 4738), Blueridge (pop. 211), and Fort Assiniboine (pop. 158) all get their drinking water from groundwater wells.

Community Resiliency

The Athabasca Watershed Council vision includes a healthy Athabasca watershed that supports resilient communities. Communities that are resilient are knowledgeable about what climate variability and climate change might look like in their area. The are also proactive in protecting their source drinking water and in mitigating risk from fires, floods, droughts and other climatic events.

The Government of Alberta's Watershed Resiliency and Restoration program ranks the upper portion of the Upper Athabasca sub-basin as a low priority for water quality and drought mitigation, but a high priority for flood mitigation. The lower portions of the Upper Athabasca are rated a high priority for water quality, with less concern for droughts (medium in the lower foothills to high in the upper) and floods (low to medium priority). The province has undertaken Flood Hazard mapping along the Upper Athabasca River at the Town of Hinton and in Woodlands County at the Town of Whitecourt.

Water Quality

Generally, water quality in the Athabasca River is good, but it can be affected by both point and non-point sources of pollution. Point sources in the Upper Athabasca sub-basin include municipal and industrial effluent (treated wastewater) regulated by Alberta Environment and Protected Areas.

Non-point source pollution comes from diffuse run-off and varies depending on upland cover and land use. There are multiple land uses in the Upper Athabasca, starting with recreation and tourism throughout the area. Coal mining and logging occur outside of park boundaries. There are pulp mills at Hinton and Whitecourt. Conventional gas extraction activities also occur throughout the sub-basin. The Upper Athabasca surface water quality management framework is used to monitor for the effects of development on surface water quality in the upper the Athabasca River. Additionally, there are several municipal and provincial planning documents, forest management agreements and disposition tools that guide and/or regulate land use activities in the Upper Athabasca River sub-basin.

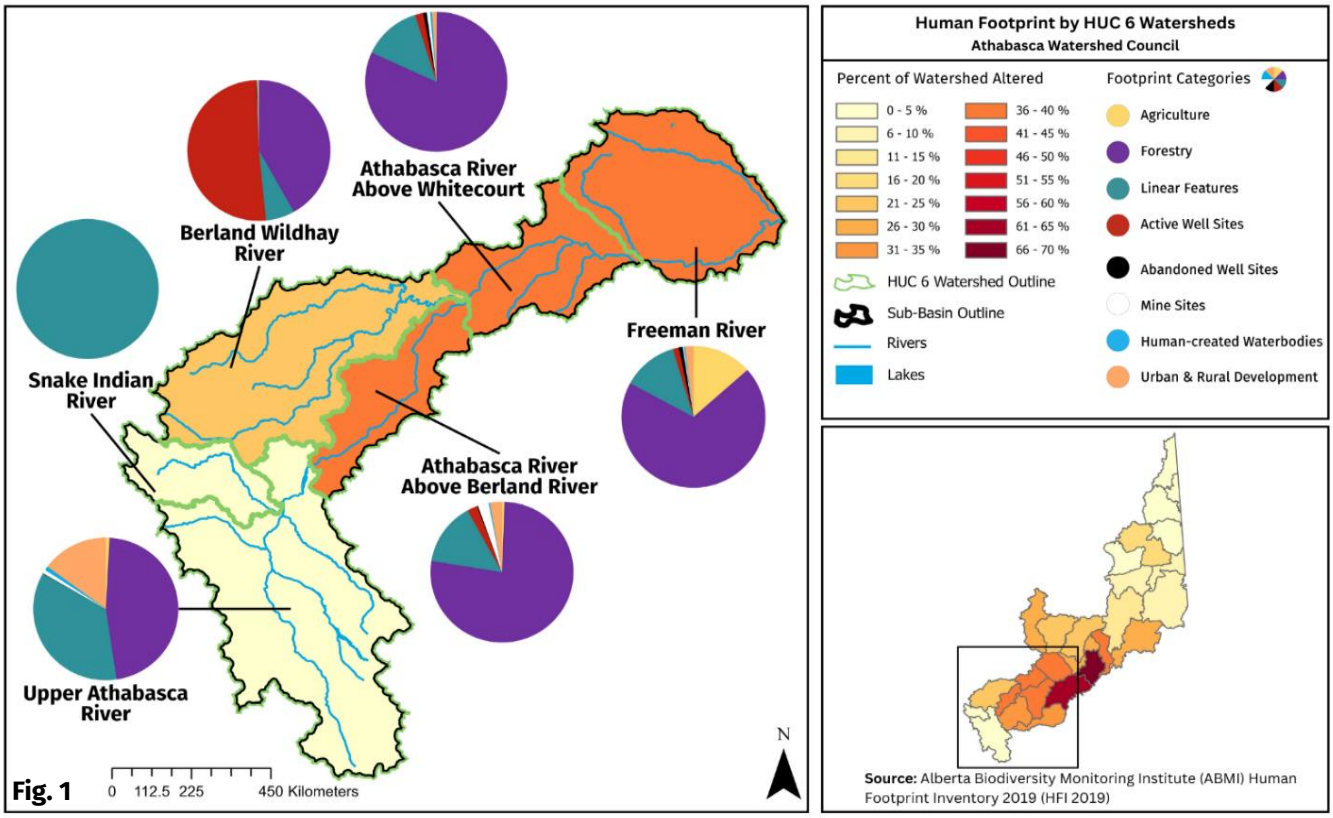


Fig. 1

Fig. 1 Human Footprint by HUC 6 Watersheds (Upper Athabasca sub-basin) *A localised map of the Upper Athabasca sub-basin (tertiary watersheds 07AA, 07AB, 07AC, 07AD, 07AE, and 07AH) showing the percentage of watershed altered by human activity.*

Instream Flow Needs and Reliable Supplies

The Athabasca River at Fort Assiniboine (the eastern extent of the Upper Athabasca sub-basin) has a mean annual discharge of about 292 m^3/s. Instream flow needs (IFN) include the quantity of water (usually as a measure of river flow, or discharge) needed by fish and other biodiversity, and for functions like scouring and maintaining river channels. Although there is currently no legislated amount set aside for IFN in the Upper Athabasca (via use of a Water Conservation Objective under the *Water Act*), the area does fall under the advisory Surface Water Allocation Directive which can include requirements on water allocation licences to protect IFN.

According to the Alberta Water Tool (using the AEPA Desktop Method; downloaded Jan. 3, 2024), the Upper Athabasca sub-basin has a sustainable withdrawal limit of 13.7% of its discharge. It currently has allocations of 1.68%. Hence it appears IFN is currently being met, with room for additional allocations. However, these amounts are based on desktop calculations and have not been ground truthed. Note also that licenced allocation amounts may not reflect actual water withdrawals and/or consumption.

The oil and gas, commercial, and agriculture sectors hold the majority of surface and groundwater allocations in this sub-basin. Other allocations are for 'other' (e.g., lake stabilization), municipal and power sectors. The bulk of oil and gas sector allocations in this sub-basin are though Temporary Diversion Licences (TDL), while all other sectors have mostly term allocations.

Biodiversity

The Upper Athabasca Sub-Basin begins in the Rocky Mountains in Jasper National Park, but quickly shifts into the Foothills, characterised by Lodgepole Pine, White Spruce, and Aspen dominating the upland canopy, Black Spruce and Larch the lowland. Labrador Tea and Low Bush Cranberry are characteristic of the underbrush. At the southeast cessation of the basin, there is a brief change to Boreal Forest where the Upper Athabasca meets the junction of the McLeod and Pembina Sub-Basins. For detailed descriptions of these regions, see Natural Regions & Subregions of Alberta.)

The majority of the Upper Athabasca sub-basin landcover is coniferous forests (about 45%), as well as mixedwood regions (about 21%), with cropland and grassland/shrub making up a relatively small portion of the basin (about 13%). A small portion of the Upper Athabasca is classified as barren (about 10%) with less than 10% vegetation cover. The remaining landcover is taken up by developed areas, wetlands, and deciduous forest.

The Upper Athabasca is home to many Alberta Indicator species, such as Arctic Grayling, Athabasca Rainbow Trout, Bull Trout, Burbot, and Northern Pike. The sensitivity of fish habitats along the Upper Athabasca River and its tributaries is rated high according to indicator species documentation. The native populations of Athabasca Rainbow Trout are restricted to the area of the Upper Athabasca and head water streams, which includes the Upper McLeod River.

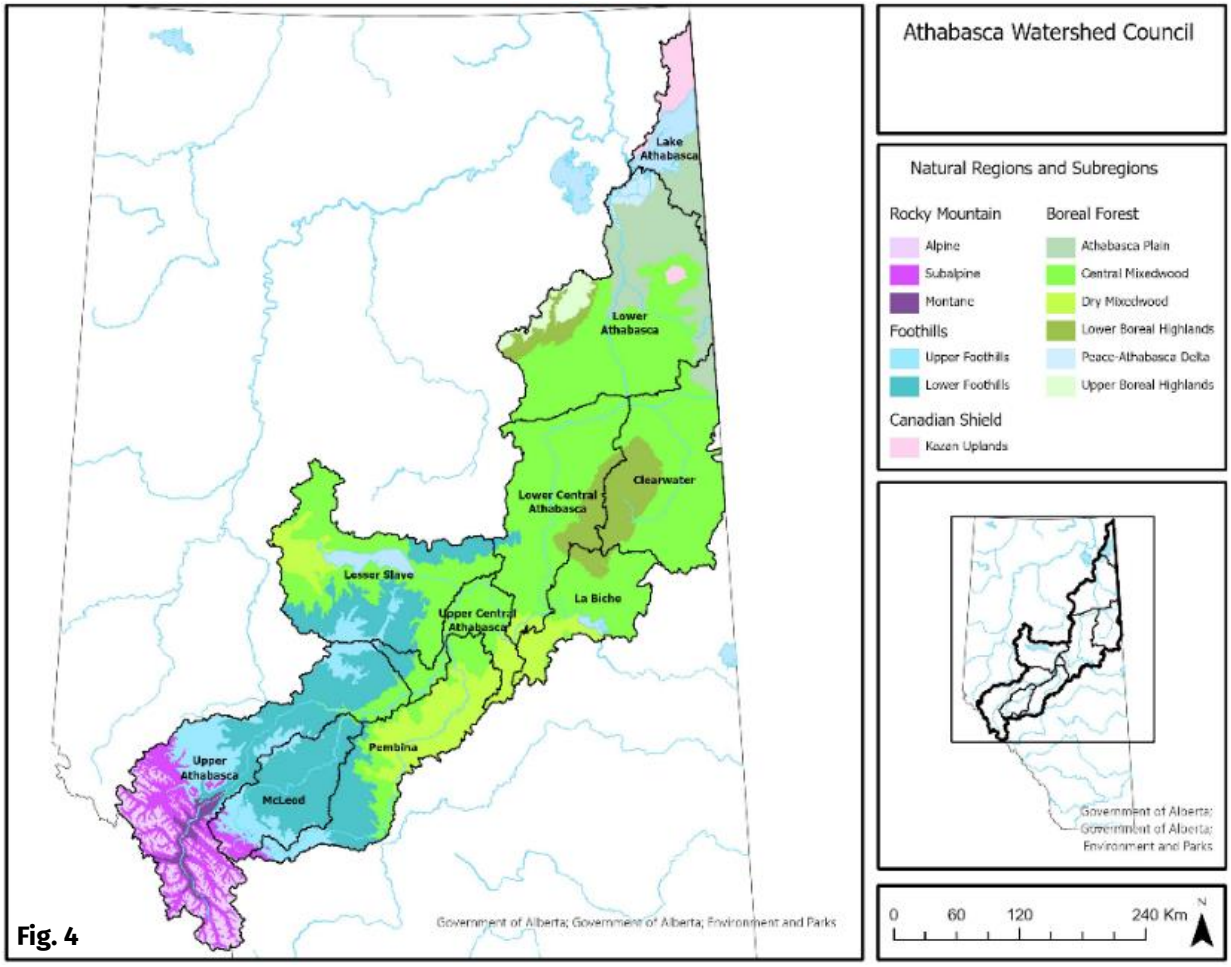


Fig. 4 Map of the Natural Sub-Regions in the Athabasca Watershed. *The Upper Athabasca sub-basin is located in the southwestern portion of the watershed and includes subregions upper and lower foothills, as well as Rocky Mountain areas.*

Upper Athabasca Sub-basin Total Area: 25,169 (km²)			
Natural Region	Natural Sub Region	Area (km²)	Area (%)
Rocky Mountain	Total	11,861	47.1 %
	Alpine	4,431	17.6 %
	Subalpine	6,152	24.4 %
	Montane	1,278	5.1 %
Foothills	Total	12,154	48.3 %
	Upper Foothills	5,016	19.9 %
	Lower Foothills	7,137	28.4 %
Boreal	Total	1,154	4.6 %
	Central Mixedwood	1,154	4.6 %

Upper Athabasca Sub-Basin Species Highlight

G. Sterling photo from the Hinton/Edson Wood/Forest Products Native Fish Species Habitat Conservation Strategy

Interesting Fact!

Athabasca Rainbow Trout are not considered a separate species from Rainbow Trout. However, they are distinguished by their biogeographic range as a "designatable unit" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Athabasca Rainbow Trout

Oncorhynchus mykiss

Family: Salmonidae	
Description	The Athabasca Rainbow Trout is a special, local version of the Rainbow Trout. It is a streamlined fish, dorsally bluish green with black spots and ventrally silvery yellowish green. During spawning season, mature individuals sport a clear red band that runs laterally along the body.
Distribution & Habitat	The Athabasca Rainbow Trout is confined to the cold headwaters of the Upper Athabasca River and its tributaries (McLeod, Berland, Wildhay and Freeman rivers). It requires spawning streams with fine sediments and temperate flow rates. The Athabasca Rainbow Trout differs from other populations of introduced Rainbow Trout in a few ways, such as later spawning times, slower maturation periods, and a greater tolerance for cold waters.
Conservation Status	Athabasca Rainbow Trout were designated endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2014, with >90% decline in abundance over 3 generations (15 years). They were formally listed under the *Species at Risk Act* (SARA) in 2019. Populations of Athabasca Rainbow Trout are threated by a number of anthropogenic activities including habitat loss caused, as well as increasing water temperatures due to climate change.
What's Being Done?	As of 2020, there is a 5-year Recovery Strategy for Rainbow Trout (*Oncorhychus mykiss)* in Canada (Athabasca River populations). Actions taken or planned include provincial regulations to manage fisheries harvest, research studies to identify critical habitat and population numbers required for recovery, stewardship and education, and the regulation of activities near habitat. For more information, see the Alberta Athabasca Rainbow Trout Recovery Plan 2014-2019.

Ecosystem Health

Wetlands

Wetlands are an important component of any watershed, providing services such as water storage, flood attenuation and groundwater recharge. Around 6% of the Upper Athabasca Sub-Basin is made up of wetlands, predominately fens, open water, and swamps, with the remaining made up of marshes and bogs. For more information regarding the wetlands in Alberta, see the Canadian Wetland Inventory (CWI) tool Canadian Wetland Inventory | Climate Change Data and Resources.

Wetland Class	Wetland Area (km^2)	% of Upper Athabasca sub-basin (25,169 km^2)
Fen	850	3.4
Open water	300	1.2
Swamp	260	1.0
Marsh	52	0.2
Bog	0.82	0.003
Total	1462.8	5.8

Riparian Areas

Riparian areas are transitional buffers between terrestrial and aquatic environments along the margins of waterbodies, such as rivers, streams, and lakes. Like wetlands, riparian areas also provide many important functions, such as reducing the amount of sediment discharge into the water to help maintain water quality, providing habitat for wildlife, and slowing flood waters. The Upper Athabasca River has not been reviewed for Riparian intactness at a landscape level, although there are a number of activities (such as Hardisty Creek in Hinton) to restore degraded areas. (To check out the health of Alberta's riparian areas, please visit riparian.info for an interactive map of Alberta's Watersheds.)

Major Lakes or Other Water/Ecological Features of Note

The Upper Athabasca sub-basin has a number of lakes, natural areas, campgrounds and other recreational areas to explore! Some key sites include:

- Carson-Pegasus Provincial Park
- Edith Lake
- Emerson Lake Campground
- Five Mile Island Campground
- Goose Lake
- Hinton Centre Campground
- Holmes Crossing Sandhills Ecological Reserve
- Jarvis Lake Campground
- Jasper National Park
- Marmot Basin Ski resort
- Noel Lake Natural Area
- Obed Lake Provincial Park
- Pyramid Lake Island and Pyramid Lake Lodge
- Sundance Provincial Park
- Wapiti Campground
- William A. Switzer Provincial Park

Knowledge (Research and Monitoring)

Alberta Environment monitors both flow and water quality in the Upper Athabasca sub-basin and this information supports the Upper Athabasca Surface Water Quality Monitoring Framework. Both government and non-government organizations have been involved in several decades of fish management in this sub-basin. Additionally, data on species biodiversity, wetlands and human footprint is available through the Alberta Biodiversity Monitoring Institute.

The AWC has completed several State of the Watershed reports with information about this sub-basin. To read these reports and to learn more check out https://athabascawatershed.ca/state-of-the-watershed/.

Despite the above activities, data gaps still exist, and further work is needed to better understand pollutant run-off rates, sources /tributary loading of pollutants to the main stem, risks to source drinking water and the future impacts of climate change and cumulative effects in this region.

Partnerships & Other Initiatives in the Upper Athabasca Sub-basin

Today, there are several agencies working on water and related issues in the Upper Athabasca sub-basin. For more information on their activities, check out their websites:

- Alberta Environment and Protected Areas
- Alberta Off Highway Vehicle Association
- Alberta Watercourse Crossing Collaborative
- Alberta Wilderness Association
- Canadian Parks and Wilderness Society (CPAWS)
- Foothills Research Institute
- Foothills Stream Crossing Partnership
- Hinton Fish and Game
- Jasper National Park
- Trout Unlimited Canada - Northern Lights Fly Fishers Chapter
- Parks Canada

IN CONCLUSION

The Upper Athabasca is an important sub-basin of the larger Athabasca watershed. In general, it has a relatively smaller human footprint than other Athabasca sub-basins, however, issues such as habitat loss and species at risk are present and require management action.

References and Resources

Literature

Alberta Environment. 2021. Surface Water Allocation Directive. Alberta Environment and Parks, Government of Alberta.

Alberta Sustainable Resource Development and Alberta Conservation Association. 2009. Status of the Athabasca Rainbow Trout (*Oncorhynchus mykiss*) in Alberta: Update 2009. Alberta Sustainable Resource Development. Wildlife Status Report No. 66 (Update 2009). Edmonton, AB. 32 pp.

Alberta Parks. 2015. Natural Regions and Subregions of Alberta. A Framework for Alberta's Parks. Alberta Tourism, Parks and Recreation. Edmonton, Alberta. 72pp.

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Fiera (Fiera Biological Consulting Ltd). 2013. State of the Watershed Report - Phase 3: Water Quantity and Basic Water Quality in the Athabasca Watershed. Report prepared for the Athabasca Watershed Council. Fiera Biological Consulting Report #1234.

Sawatzky, C.D. 2018. Information in support of a recovery potential assessment of Rainbow Trout, Oncorhynchus mykiss (Athabasca River populations). DFO Can. Sci. Advis. Sec. Res. Doc. 2018/022. x + 162 p.

Web Links

Alberta topographic map, elevation, terrain

Alberta Water Tool (alberta-watertool.com)

All Alberta RV Parks and Campgrounds (allstays.com)

Athabasca River | The Canadian Encyclopedia

Canadian Wetland Inventory | Climate Change Data and Resources

Consultant Report 6 - Hydrology (alberta.ca)

Culture and history - Jasper House National Historic Site (pc.gc.ca)

Flood Hazard mapping

Freshwater Conservation Canada | Non profit

GeoDiscover Alberta

Canadian Heritage Rivers

Rainbow Trout (Oncorhynchus mykiss), Athabasca River populations - Species search - Species at risk registry (canada.ca)

Rainbow Trout, Oncorhynchus mykiss (canada.ca)

Recovery Potential Assessment of Rainbow Trout, Oncorhynchus mykiss (Athabasca River Populations) (dfo-mpo.gc.ca)

Recovery Strategy Template Federal Feasible

Reports - ALMS

Riparian Management Resources Webpage – AWES | Agroforestry and Woodlot Extension Society of Alberta (awes-ab.ca)

Upper Athabasca Region surface water quality management framework for the Upper Athabasca River - Open Government (alberta.ca)