

# Current & Future Water Use in the Peace and Slave River Basins

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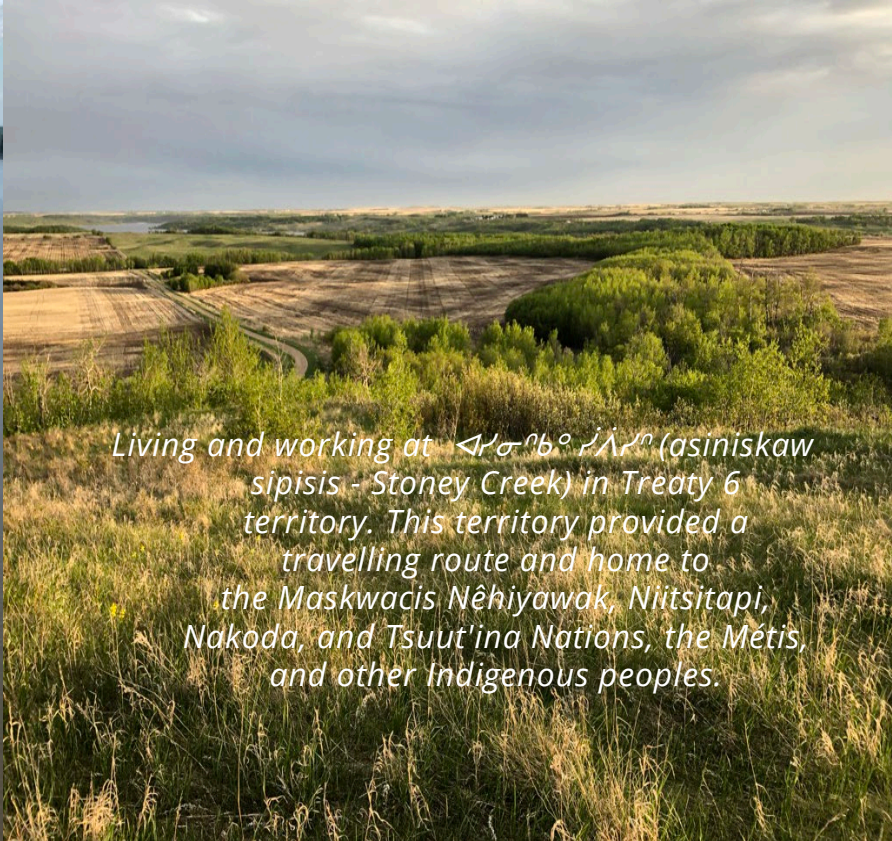




# Land Acknowledgement



*We acknowledge the traditional lands and territories of the Indigenous peoples who have lived on these lands and taken care of them since time immemorial. We are on Treaty 8 territory, as well as, the historical regional homeland of the Métis, which includes the Peace River Territory, the Lesser Slave Lake Territory, and the Lower Athabasca Territory. We acknowledge and respect the histories, languages, and diverse cultures of the First Nations, Métis, and all First Peoples that have taken care of this land. We are grateful for their contributions that continue to enrich our communities.*



*Living and working at ᑲᓴᓃᓇᓃᓂᓃᓂ (asiniskaw sipisis - Stoney Creek) in Treaty 6 territory. This territory provided a travelling route and home to the Maskwacis Nêhiyawak, Niitsitapi, Nakoda, and Tsuut'ina Nations, the Métis, and other Indigenous peoples.*

# Presentation Overview

## 1. Introduction

- The Value of Water
- Water Use
- Water Licensing and Allocations

## 2. Context

- Watershed Overview
- Indigenous Reconciliation and Treaty Rights
- Current and Future Issues

## 3. Background

- Literature Scan on Water Use
- Sector Overviews

## 4. Methods

- Sector-based projections
- Demand Scenarios

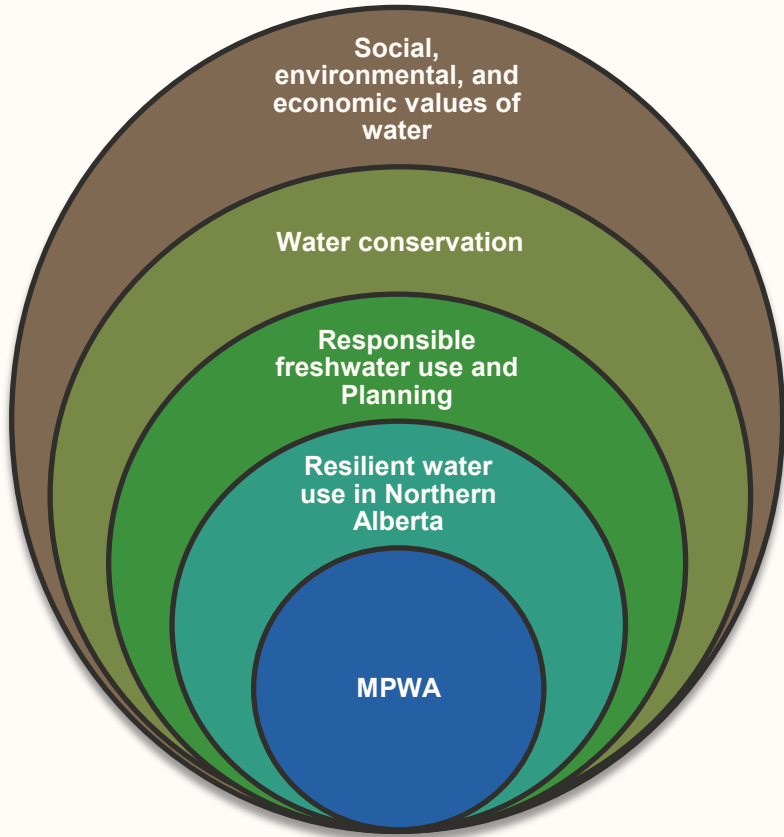
## 5. Sub-basin Analysis

- Smoky / Wapiti
- Upper Peace
- Central Peace
- Lower Peace
- Wabasca
- Slave

## 6. Watershed Analysis and Conclusions

- Current and Future Water Use
- Wetlands and Agriculture
- Questions

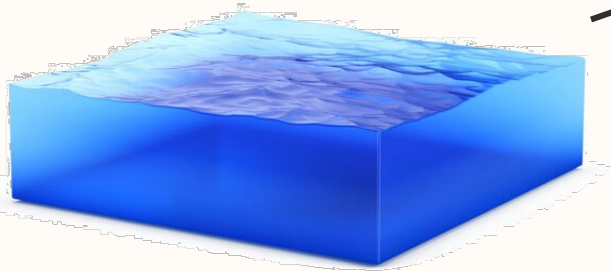
# Introduction



<b>Consumptive Water use</b>	Eliminates the overall volume of water available for other uses. <ul style="list-style-type: none"><li>• Irrigation</li><li>• Manufacturing processes</li></ul>
<b>Non-consumptive water use</b>	Water is made available for other uses, after its initial use. <ul style="list-style-type: none"><li>• Bathing or showering</li><li>• Fishing</li></ul>

# Measuring Water Use

- How is water use measured?
  - Water use volume is measured in cubic decameters ( $\text{dam}^3$ ), which equates to  $1,000 \text{ m}^3$  or 1 million liters of water



1 Cubic Decameter



3,311 Bathtubs



250,000 milk jugs



4,000,000 cups of coffee

# Water Licensing and Allocations

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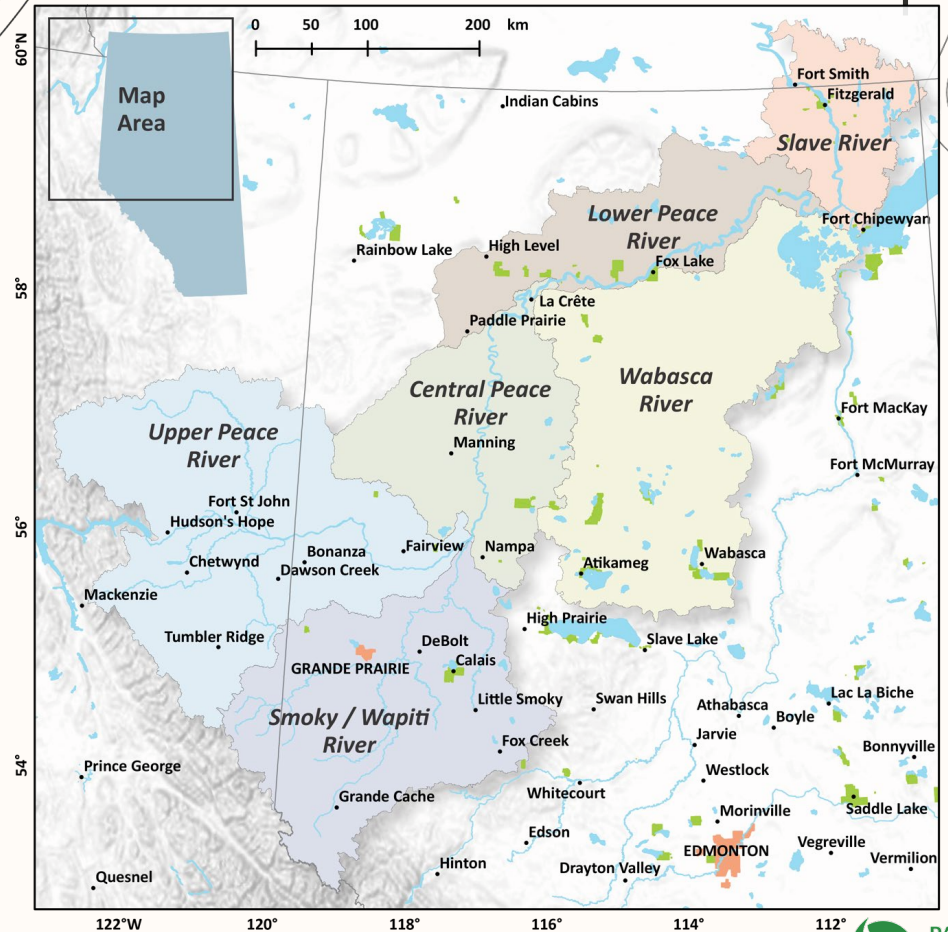
- Water Act
  - Water licenses; first in time, first in right
  - Exempt: household use, traditional agriculture, firefighting, hand wells, alternative watering systems
- **Water Allocation  $\neq$  Water Use**

Purpose	Description
<b>Municipal</b>	Urban use, camps, water use cooperatives, schools and institutions
<b>Agricultural</b>	Feedlots and stock watering
<b>Irrigation</b>	Crop agriculture
<b>Registrations</b>	Traditional agricultural users
<b>Commercial</b>	Aggregate washing, bottling, golf course, cooling, dust control
<b>Industrial</b>	Pulp mills, coal mines, gas and petrochemical plants, oilfield injection, power generation
<b>Other</b>	Water management, dewatering, lake level stabilization, recreation, fish farms, wildlife, wetlands, other purposes specified by a Director

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# Context



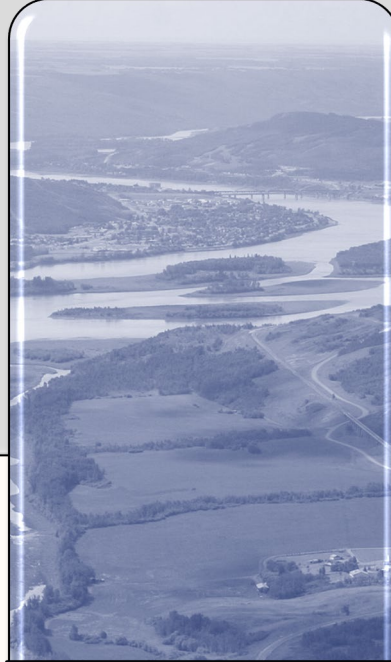
# Watershed Overview



Human Geography



Physical Geography



Environmental Flows



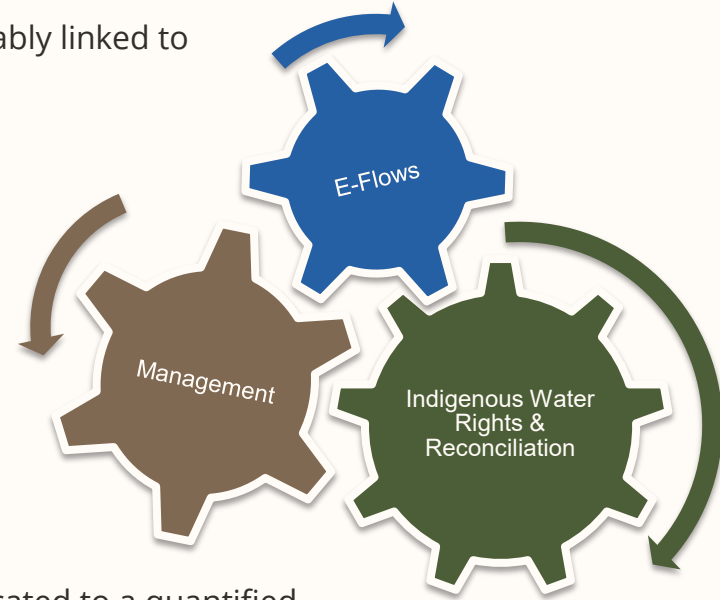


# Indigenous Water Rights and Reconciliation

+ The environmental flows of the Peace and Slave Rivers are inextricably linked to Indigenous water rights and reconciliation

- Connecting Indigenous and Western water management
  - Reliability
  - Conservation
  - Relationships
  - Policy

● **Limitation and Recommendations:** this project's scope was dedicated to a quantified sector-based water analysis. We recommend a dedicated analysis of Indigenous water rights and reconciliation to integrate these ways of knowing and honor the Indigenous people in this land.



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# Current & Future Issues



Climate Change



Lithium Mining



Transboundary Agreements



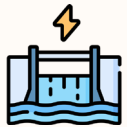
Bulk & Virtual Water Export



Hydraulic Fracturing



Nuclear Power



Hydroelectricity



Peat Extraction

# Current & Future Issues

Issue	Summary	Estimated Impact
 <b>Climate Change</b>	More extreme weather conditions, demands for wildfire fighting and preparedness, increasing irrigation opportunities for agriculture, and social and economic outcomes will occur in the relatively water abundant region.	Moderate
 <b>Transboundary</b>	Transboundary agreements between Alberta and B.C. and Alberta and Saskatchewan are slow, with Alberta completing its previous transboundary agreement with NWT in 2016	Low
 <b>Hydraulic Fracturing</b>	Hydraulic fracturing will persist in the Peace Basin and will continue to be regulated by the AER	High
 <b>Hydroelectricity and Site C</b>	Site C in 2025 will have a minimal impact on flow beyond the current impact of WAC Bennett Dam	Low
 <b>Lithium Mining</b>	Lithium mining will begin soon in the river basin and the industry is expected to expand slowly	Moderate
 <b>Bulk and Virtual Water Export</b>	No major virtual or bulk water export from due to long distances from markets	Low
 <b>Nuclear Energy</b>	SMRs are proposed for northern Alberta, but no indication at this point this will occur	Low
 <b>Peat Extraction</b>	Limited peat harvest in Alberta and not expected to increase significantly in the coming decade	Low



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# Literature Scan

1. Watrecon 2012

2. Alberta Environment 2007

3. MPWA Water Working Group 2016

4. Mackenzie River Basin Board 2021

5. WaterSMART Solutions 2024

6. Northern River Basins / Ecosystem Initiative 1996 and 2004

7. Wood Buffalo Action Plan – E-flows 2026?

8. Wapiti River: Water Management Plan 2020



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# Highlights

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- **Indigenous Considerations**
- **Unlawful Action**
- **Data Availability and Quality**
- **Methodological and Reporting Inconsistencies**
- **Uncertain Future Conditions**

# Sector Overview

## Municipal

## Forestry



Population Growth



Municipal Development Plans (MDPs)



Improvement, Expansion, Procurement, and Security

Sub-Basin	Company	Operation Type	Closest Population Center
Smoky-Wapiti	Canfor	Sawmill	Fox Creek
	Canfor	Sawmill	Grande Prairie
	Foothills Forest Products	Sawmill	Grande Cache
	Weyerhaeuser Company Limited	Sawmill	Grande Prairie
West Fraser	West Fraser	Panel Board	Grande Prairie
	International Paper	Pulp Mill (Kraft)	Grande Prairie
Upper Peace	Zavisha Sawmills Ltd.	Sawmill	Hines Creek
	Central Peace	Boucher Bros. Lumber Inc.	Sawmill
Manning Forest Products Inc.	Manning Forest Products Inc.	Sawmill	Manning
	Mercer International	Pulp Mill (Kraft)	Peace River
Lower Peace	Tolko Industries	Sawmill	High Level
	West Fraser	Panel Board	High Level
Wabasca	La Crete Sawmills Ltd.	Sawmill	La Crete
Slave	-	-	-

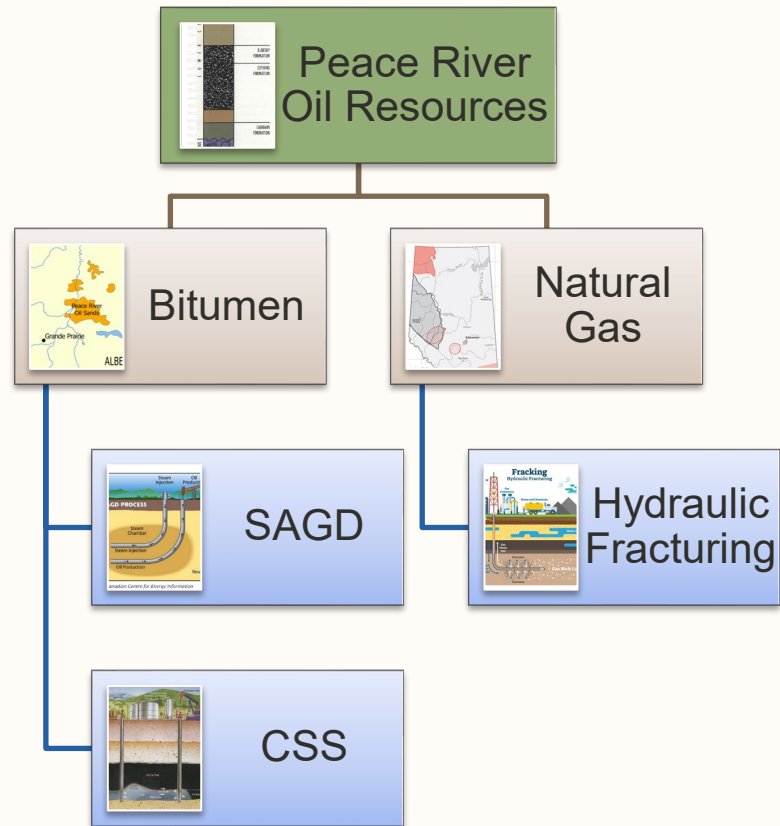
# Sector Overview

## Agriculture

Sub-Basin	Number Cattle farms		Cattle Inventory	
	2011	2021	2011	2021
Smoky-Wapiti	912	915	137,931	143,680
Upper Peace	529	550	67,404	88,581
Central Peace	187	178	23,127	26,985
Lower Peace	247	303	16,701	21,613
Wabasca	69	59	10,344	9,479
Slave	0	0	0	0
<b>TOTAL</b>	<b>1,944</b>	<b>2,004</b>	<b>255,507</b>	<b>290,338</b>

Sub-Basin	Number farms with land in crops		Cropped Acres	
	2011	2021	2011	2021
Smoky-Wapiti	2,159	1,709	1,714,860	1,710,893
Upper Peace	1,260	1,110	1,041,719	1,099,710
Central Peace	489	396	436,365	447,221
Lower Peace	580	753	323,593	491,411
Wabasca	151	122	106,084	131,050
Slave	0	0	0	0
<b>TOTAL</b>	<b>4,639</b>	<b>4,063</b>	<b>3,622,621</b>	<b>3,880,275</b>

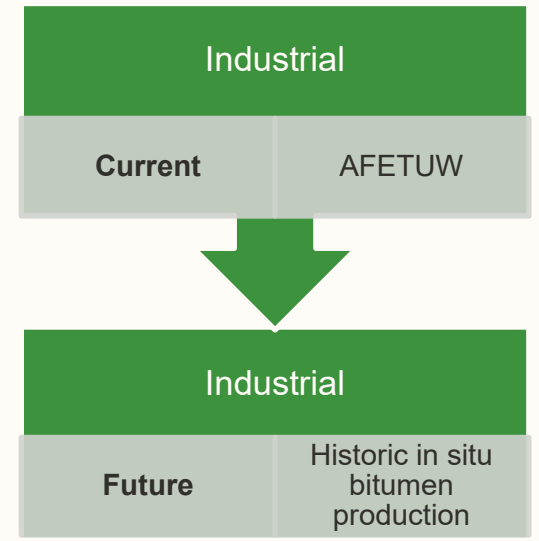
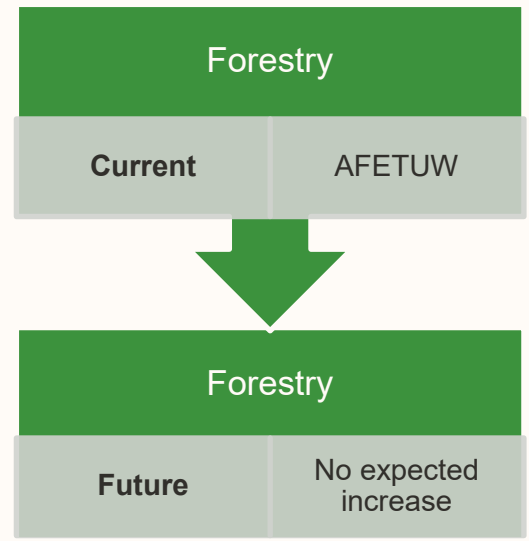
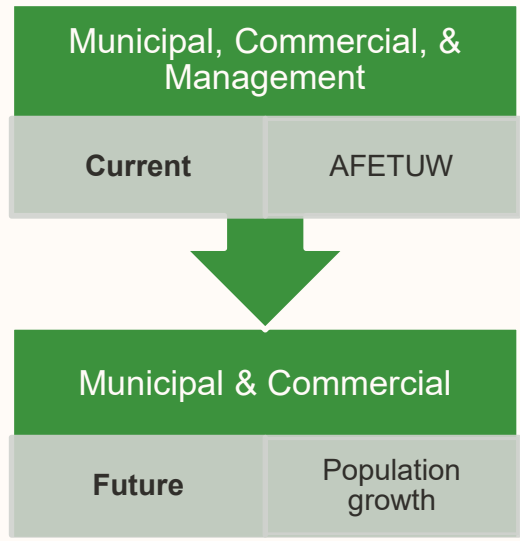
## Industrial





# Methods

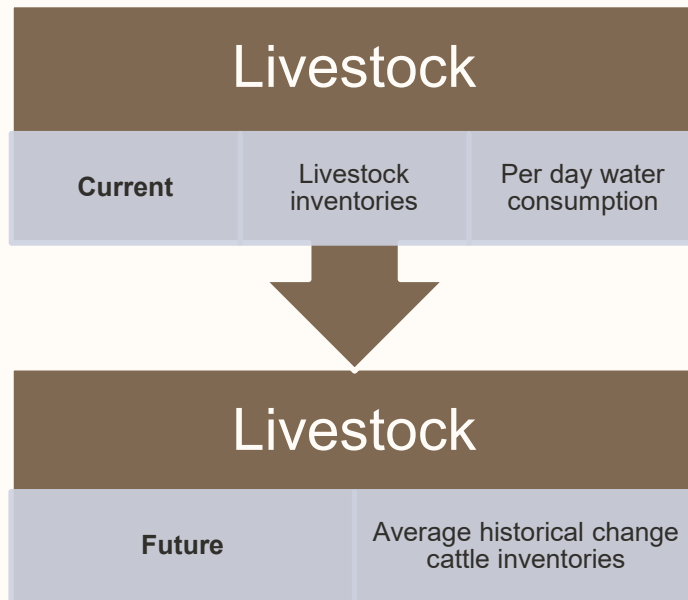
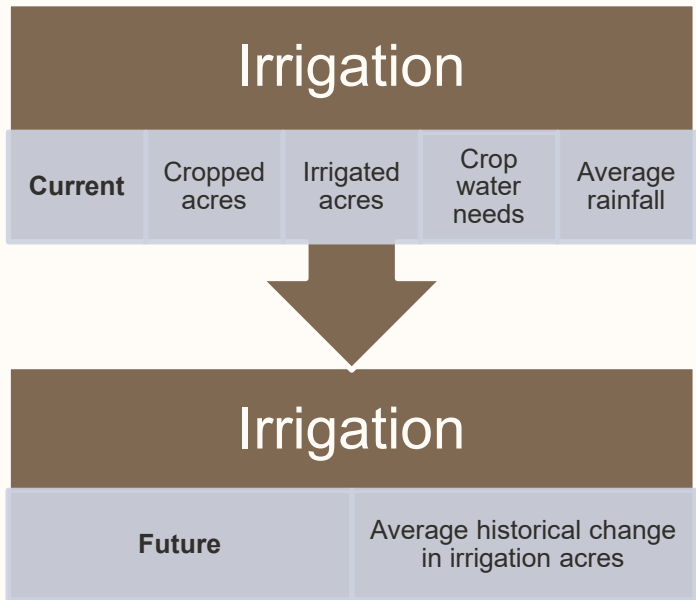
## Water Use Estimates



AFETUW = Alberta Flow Estimation Tool for Ungauged Watersheds

# Methods

## Water Use Estimates

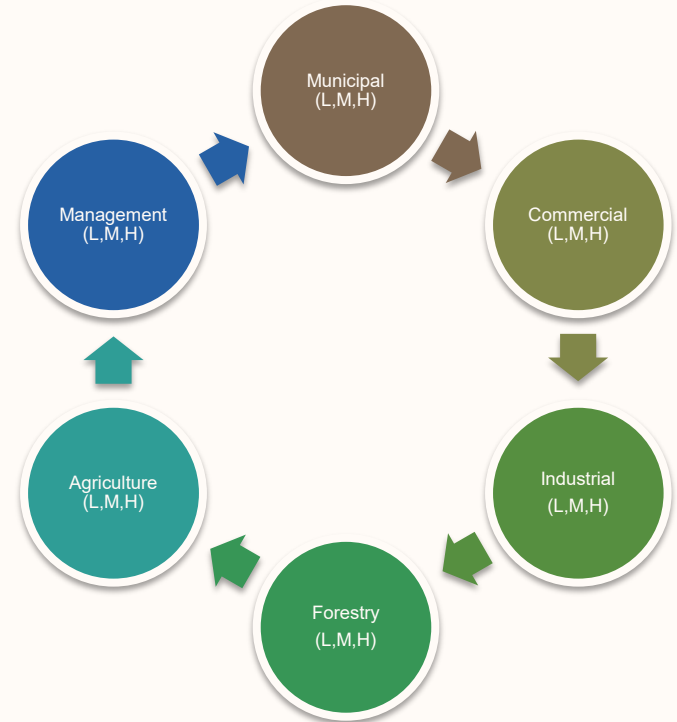




# Methods

## Demand Scenarios

Water Licence and Consumption Demand	Sectors
200% Increase	Municipal, Commercial, Agriculture, Forestry, Industrial and Management
100% Increase	Municipal, Commercial, Agriculture, Forestry, Industrial and Management
75% Increase	Municipal, Commercial, Agriculture, Forestry, Industrial and Management
50% Increase	Municipal, Commercial, Agriculture, Forestry, Industrial and Management
25% Increase	Municipal, Commercial, Agriculture, Forestry, Industrial and Management
Current (Base)	Municipal, Commercial, Agriculture, Forestry and Industrial





# Sub-Basin Analysis

# Smoky / Wapiti

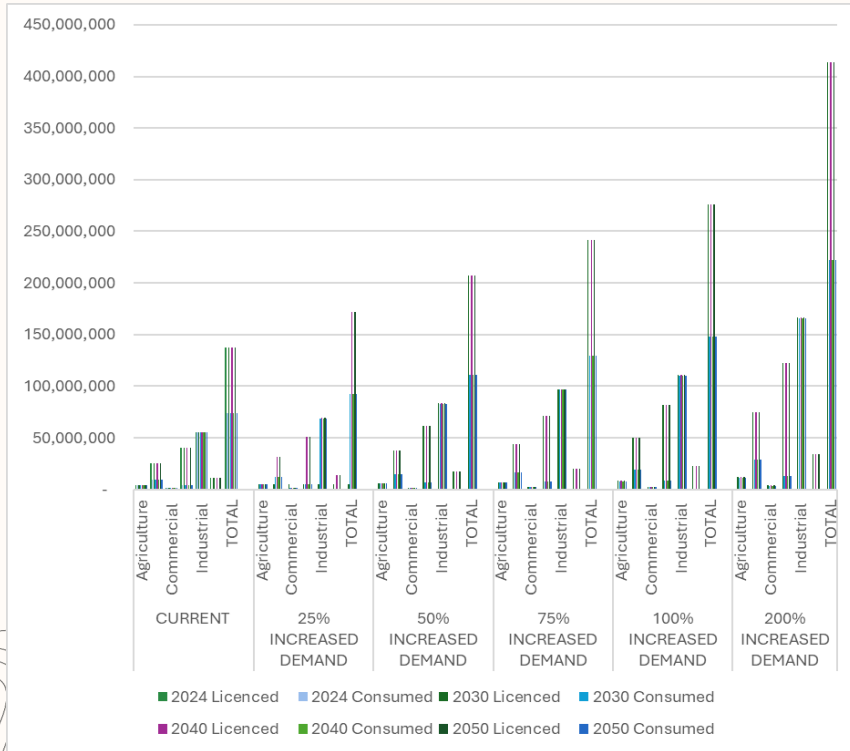


Sector	Current Allocation (dam <sup>3</sup> )	Current Use (dam <sup>3</sup> )	2030 <sup>‡</sup>	2040 <sup>‡</sup>	2050 <sup>‡</sup>
Municipal	23,980.5	11,398.9	11,625.9	12,004.3	12,382.8
Commercial	1,643.3	1,509.7	1,539.8	1,589.9	1,640.1
Management	11,378.8	207.9	-	-	-
Forestry	40,900.0	4,464.3	-	-	-
Agriculture <sup>‡</sup>	3,460.5	4,905.9	5,342.1	6,069.1	6796.11
Industrial <sup>‡</sup>	68,320.4	68,072.0	76,146.9	89,605.0	103,063.2
<b>Total</b>	<b>149,683.5</b>	<b>90,561.7</b>	<b>99,326.9</b>	<b>113,940.5</b>	<b>128,554.4</b>

<sup>‡</sup> Assumes future water use that is not projected is maintained at current levels

<sup>‡</sup> A more detailed analysis is available in the final report

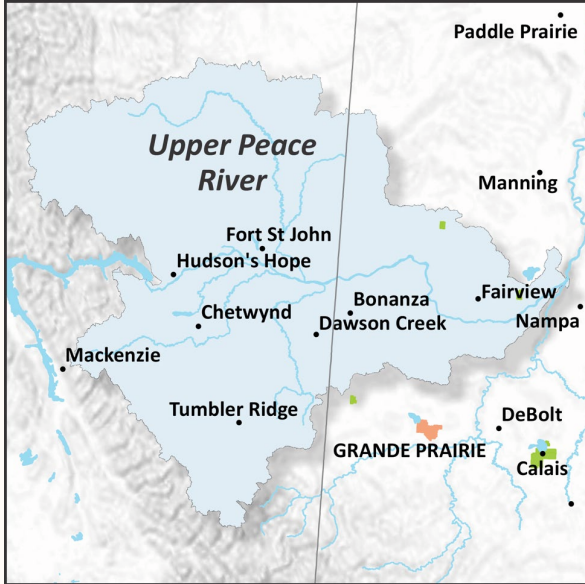
# Demand Scenarios



# Smoky / Wapiti Highlights

- High Water Allocation & Use
- Agricultural Water Use
- Future Oil and Gas Water Use
- Demand Scenario

# Upper Peace

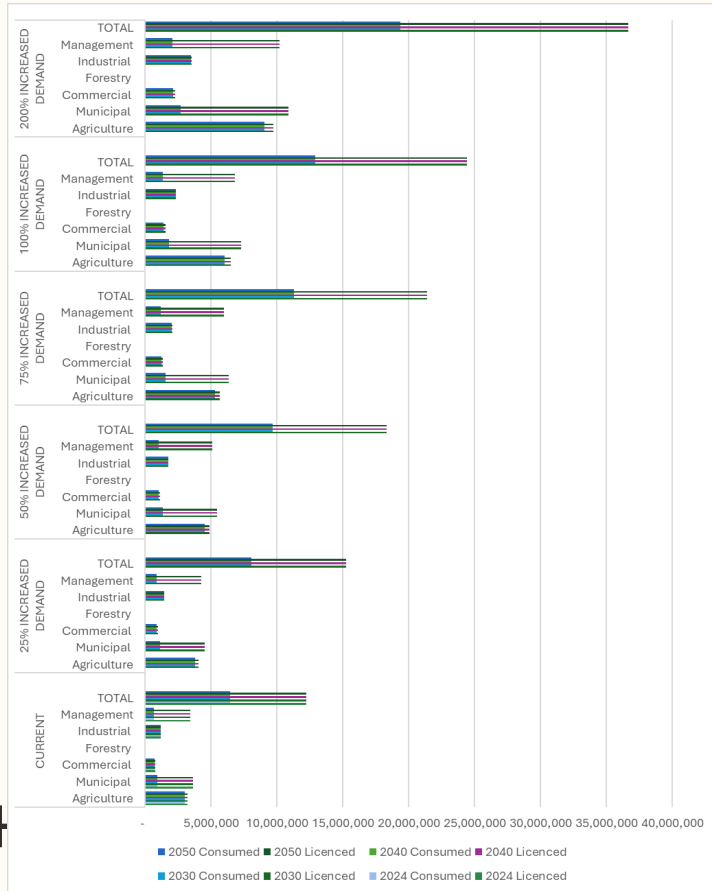


Sector	Current Allocation (dam <sup>3</sup> )	Current Use (dam <sup>3</sup> )	2030 <sup>‡</sup>	2040 <sup>‡</sup>	2050 <sup>‡</sup>
Municipal	4,375.0	1,553.7	1,584.6	1,636.2	1,687.8
Commercial	880.4	808.6	824.7	851.6	878.4
Management	3,403.1	682.0	-	-	-
Forestry	0	0	-	-	-
Agriculture <sup>‡</sup>	2,317.7	2,834.4	3,103.3	3,551.4	3,999.6
Industrial <sup>‡</sup>	1,525.3	1,509.3	1,728.0	2,092.5	2,457.0
<b>Total</b>	<b>12,501.5</b>	<b>7,388.0</b>	<b>7,922.7</b>	<b>8,813.7</b>	<b>9,704.8</b>

<sup>‡</sup> Assumes future water use that is not projected is maintained at current levels

<sup>‡</sup> A more detailed analysis is available in the final report

# Demand Scenarios



# Upper Peace Highlights

- Current Agricultural Use
- Overall Small Usage
- Surface Water Use
- Demand Scenario

# Central Peace

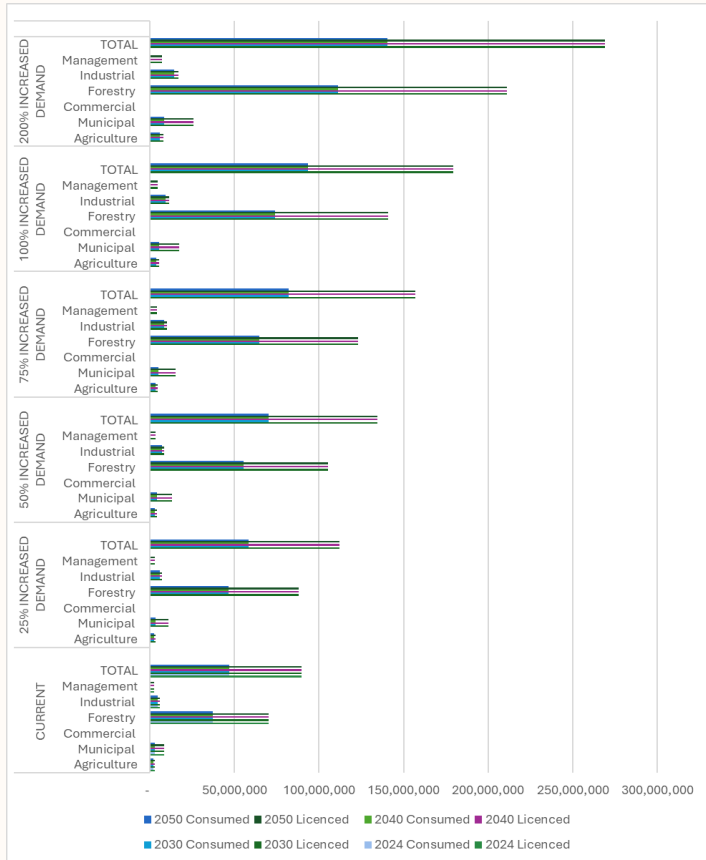


Sector	Current Allocation (dam <sup>3</sup> )	Current Use (dam <sup>3</sup> )	2030 <sup>‡</sup>	2040 <sup>‡</sup>	2050 <sup>‡</sup>
Municipal	9,513.6	3,180.5	3,243.8	3,349.4	3,455.0
Commercial	195.8	155.9	159.0	164.2	169.4
Management	2,332.3	149.4	-	-	-
Forestry	70,355.5	37,031.5	-	-	-
Agriculture <sup>‡</sup>	1,886.4	978.5	1,081.6	1,253.4	1,425.2
Industrial <sup>‡</sup>	5,900.1	4,948.0	5,665.0	6,859.92	8,054.9
<b>Total</b>	<b>90,183.7</b>	<b>46,443.80</b>	<b>47,330.3</b>	<b>48,807.8</b>	<b>50,285.4</b>

<sup>‡</sup> Assumes future water use that is not projected is maintained at current levels

<sup>‡</sup> A more detailed analysis is available in the final report

# Demand Scenarios

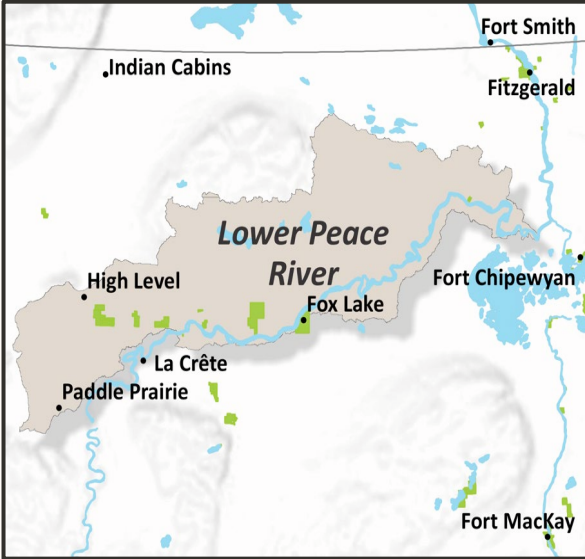


# Central Peace Highlights

- Forestry Sector Water Use
- Current and Future Industrial Water Use
- Municipal Use
- Water Demand Scenarios



# Lower Peace

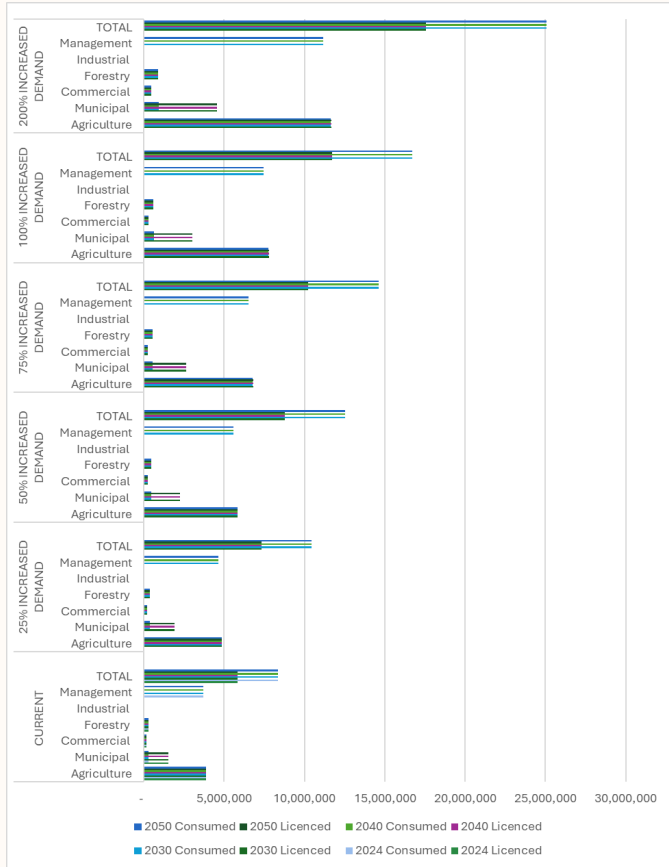


Sector	Current Allocation (dam <sup>3</sup> )	Current Use (dam <sup>3</sup> )	2030 <sup>*</sup>	2040 <sup>*</sup>	2050 <sup>*</sup>
Municipal	1,512.4	309.6	315.8	326.1	336.3
Commercial	152.8	151.8	154.8	159.8	164.9
Management	0.01	0.01	-	-	-
Forestry	437.6	341.6	-	-	-
Agriculture <sup>‡</sup>	3,793.4	948.2	1,057.2	1,238.4	1,419.6
Industrial <sup>‡</sup>	0	0	-	-	-
<b>Total</b>	<b>5,896.2</b>	<b>1,751.2</b>	<b>1,869.4</b>	<b>2,065.9</b>	<b>2,262.4</b>

<sup>\*</sup> Assumes future water use that is not projected is maintained at current levels

<sup>‡</sup> A more detailed analysis is available in the final report

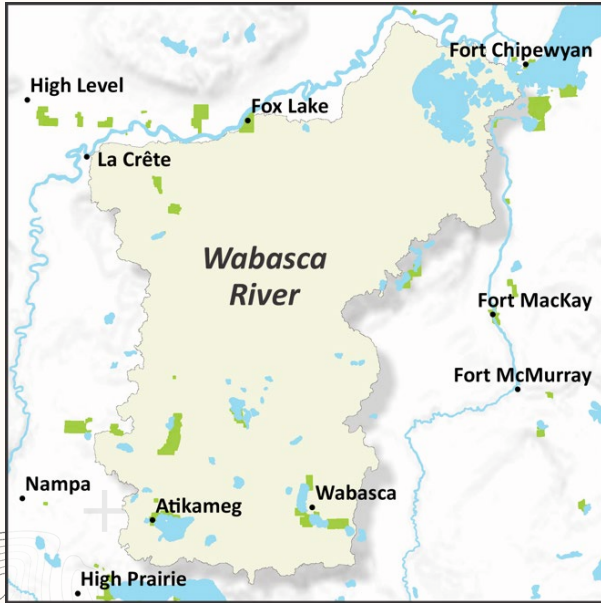
# Demand Scenarios



# Lower Peace Highlights

- Overall Low Water Use
- Future Agricultural Water Use
- Water Demand Scenarios

# Wabasca

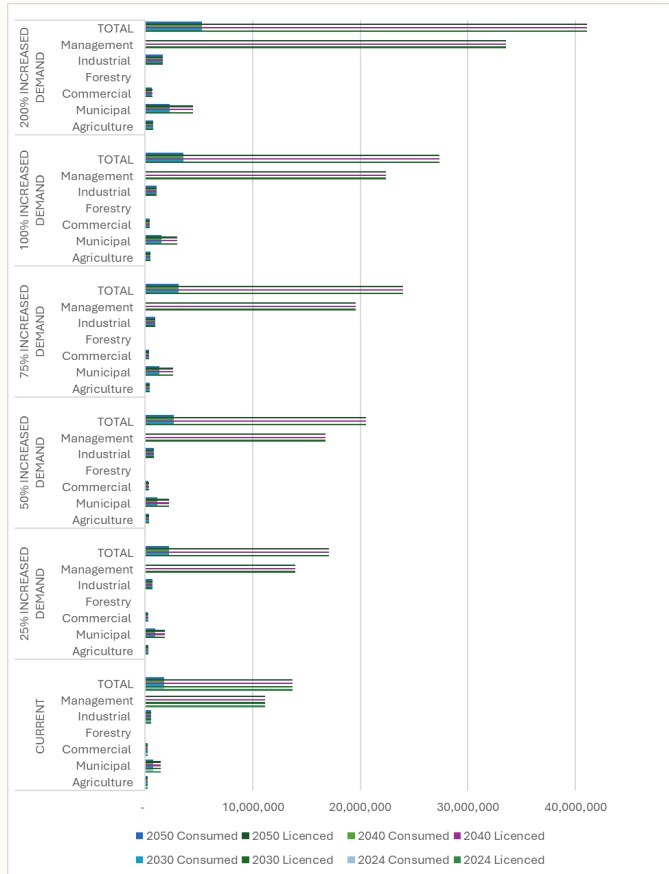


Sector	Current Allocation (dam <sup>3</sup> )	Current Use (dam <sup>3</sup> )	2030 <sup>‡</sup>	2040 <sup>‡</sup>	2050 <sup>‡</sup>
Municipal	2,371.6	1,111.3	1133.4	1170.3	1207.2
Commercial	280.1	260.8	266.0	274.7	283.3
Management	11,187.2	0	-	-	-
Forestry	0	0	-	-	-
Agriculture <sup>‡</sup>	173.0	312.9	344.1	396.0	447.9
Industrial <sup>‡</sup>	2,382.9	2,381.5	2,726.5	3,302.7	3,876.8
<b>Total</b>	<b>16,394.8</b>	<b>4,066.5</b>	<b>4,470.0</b>	<b>5,143.0</b>	<b>5,815.2</b>

<sup>‡</sup> Assumes future water use that is not projected is maintained at current levels

<sup>‡</sup> A more detailed analysis is available in the final report

# Demand Scenarios



# Wabasca Highlights

- Proportionally High Municipal Water Use
- Agricultural Over-consumption
- Current Industrial Sector Water Use
- Water Demand Scenarios

# Slave

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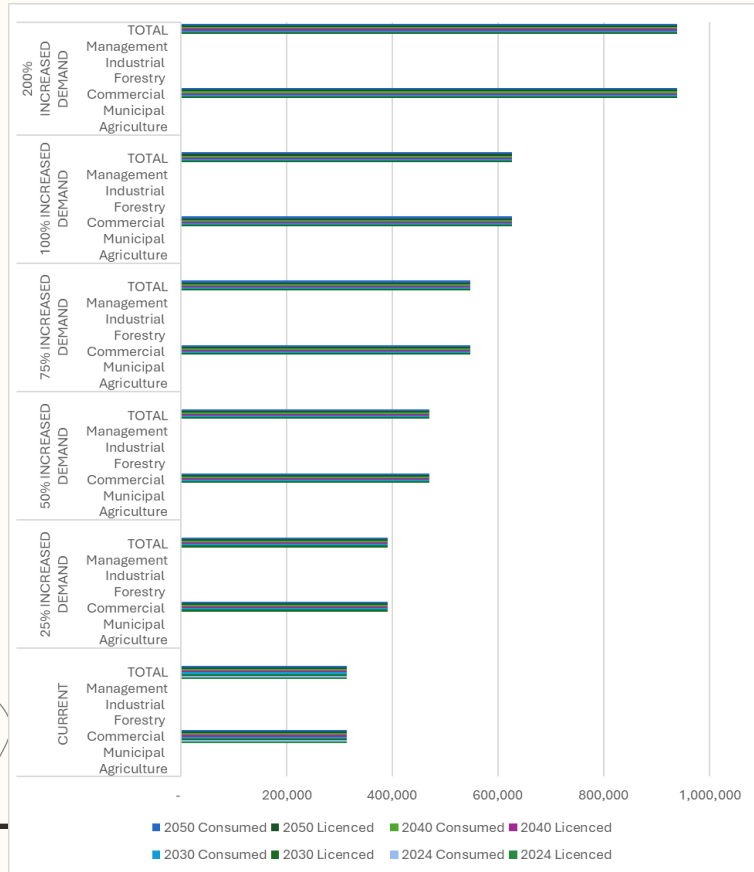
Sector	Current Allocation (dam <sup>3</sup> )	Current Use (dam <sup>3</sup> )	2030	2040	2050
Municipal	0	0	-	-	-
Commercial	313.1	313.1	-	-	-
Management	0	0	-	-	-
Forestry	0	0	-	-	-
Agriculture	0	0	-	-	-
Industrial	0	0	-	-	-
<b>Total</b>	<b>313.1</b>	<b>313.1</b>	<b>-</b>	<b>-</b>	<b>-</b>

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# Demand Scenarios



# Slave Highlights

- Protected Area Status
- Water Demand Scenarios

# Watershed Analysis

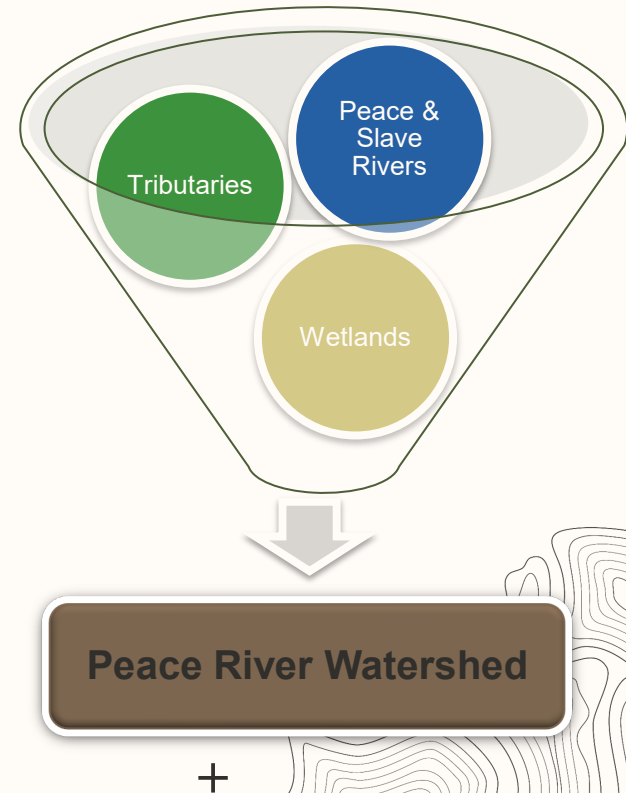






# Wetlands and Agriculture

- Wetlands are important water sources external to the Peace River and its tributaries
  - The Peace's wetlands are protected under the *Water Act* but face many drainage pressures, especially from cropped agriculture



# Wetlands and Agriculture Methods

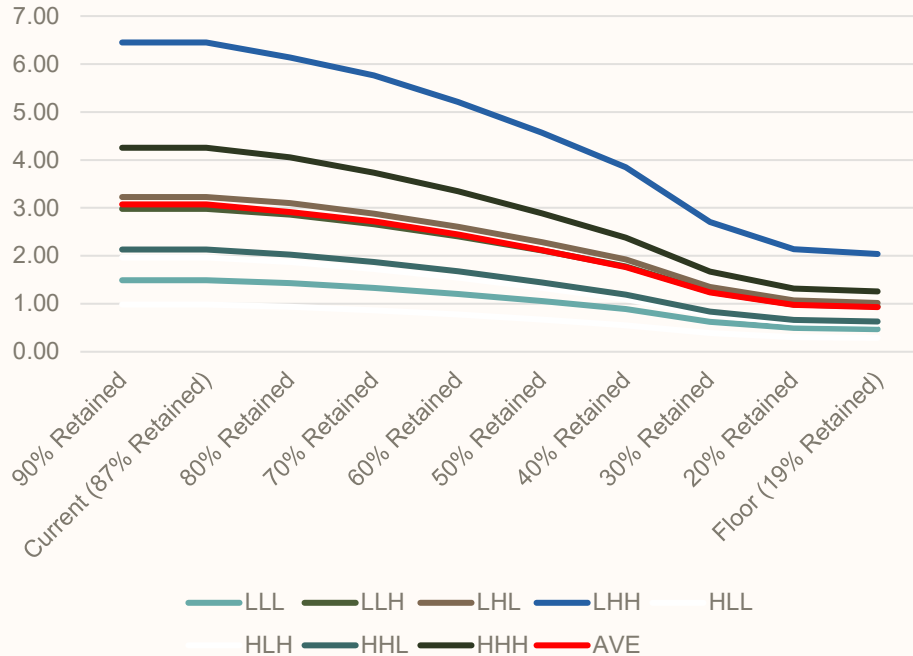
Research Question: *is agricultural wetland drainage profitable based upon different input and commodity prices?*

$$NPV_{Scenario} = \frac{\sum_{t=1}^T [(Yield * Price) - (Input Costs + Opportunity Costs)] - Drainage}{(1 + r)^t}$$

Code	Components of Code
LLL	Low Variable Costs, Low Prices, Low Yields
LLH	Low Variable Costs, Low Prices, High Yields
LHL	Low Variable Costs, High Prices, Low Yields
LHH	Low Variable Costs, High Prices, High Yields
HLL	High Variable Costs, Low Prices, Low Yields
HLH	High Variable Costs, Low Prices, High Yields
HHL	High Variable Costs, High Prices, Low Yields
HHH	High Variable Costs, High Prices, High Yields
AVE	Averages of variables from 2002 to 2023

# Wetlands and Agriculture

## Private Landowner Profitability Results



- *Wetland drainage is profitable at “early” stages of conversion*
- *As more wetlands are drained, the profits decrease*
- *Average scenario (RED) shows most realistic conditions facing farmers*
- *Social benefits (Ecosystem Services) not included*
- *Alberta Wetland Policy exists to prevent private agricultural drainage without approval.*

# Conclusions

- Current and future water use will be less than 1% of Peace Annual flows (consistent with previous reports)
  - Threats to the flows remain
  - Conservation now using a two-braided approach, instead of later
  - Local and Indigenous concerns

	2024	2030	2040	2050
Estimated Water use (dam <sup>3</sup> )	149,694.5	160,919.3	178,770.9	196,622.2
Peace River Annual flows (dam <sup>3</sup> )	~48,600,000	-	-	-
<b>Percent consumed<sup>‡</sup></b>	<b>0.31%</b>	<b>0.33%</b>	<b>0.37%</b>	<b>0.40%</b>

‡ Assumes the flows of the Peace are unchanged





# Acknowledgements

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- PRC respectfully acknowledges various people in the development of this report:
  - MPWA Technical Advisory Committee: Jim Webb, Ashley Rowney, Chris Thiessen, Dave Walty, Jill Henry and Richard Keillor and MPWA staff Adam Norris and Rhonda Clarke-Gauthier.
  - Alberta Environment and Protected Areas staff: Naba Adhikari, Janet Yan and Long Fu.

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# Questions



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