BEAVER RIVER INTEGRATED WATERSHED MANAGEMENT PLAN

KEY CONTENTS FROM WORKING DRAFT #1

1.0 BACKGROUND

The Lakeland Industry Community Association (LICA) initiated the Beaver River Integrated Watershed Management Plan (IWMP) to help guide watershed management activities and support the vision "*A healthy Beaver River watershed for the future*".

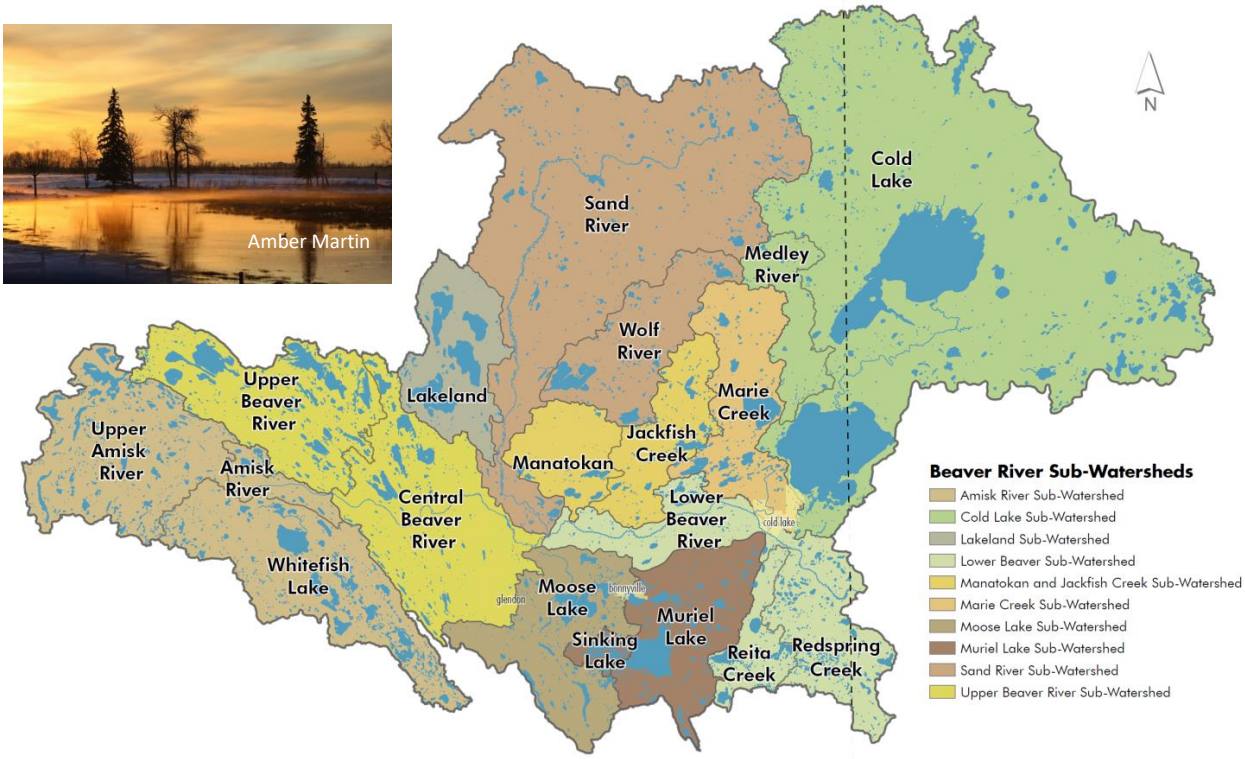
An IWMP is a guidance document and planning tool for resource managers, including governments, planners, First Nations, the Métis, other stakeholders, and landowners who manage water and land resources. The plan will identify goals for improving and/or maintaining watershed health, and will make recommendations on how to reach those goals.

LICA established an IWMP Committee to help oversee the development of the plan. LICA and the IWMP Committee are committed to engaging with stakeholders, First Nations and the Métis in the watershed throughout the development of the plan to ensure that it is relevant and reflects local and regional concerns.

This document summarizes key content from the more comprehensive Beaver River watershed plan Draft #1. It was created to support engagement during winter 2022. The full IWMP Draft #1 is available at https://lica.ca/watershed/iwmp/ .

2.0 PLANNING AREA

The Beaver River watershed is located in east-central Alberta and west-central Saskatchewan, in Treaty 6, 8 and 10 territories and the Métis homeland northeast of Edmonton (Figure 1). The Beaver River originates near the Town of Lac La Biche as the outflow from Beaver Lake and flows easterly into Saskatchewan to join the Churchill River at Île à-la-Crosse which flows into Hudson Bay. Although the Beaver River watershed spans Alberta and Saskatchewan, the Beaver River IWMP only applies to the Alberta portion.



3.0 SCOPE OF MATTERS

The summary of matters reflects concerns expressed by the community during engagement, IWMP Committee input, as well as best available science. Not all matters will apply to all areas in the watershed.

Surface Water

- Fluctuating water levels and streamflows caused by climate change and variability (temperature, evaporation, precipitation) that can:
  - Impact water availability for municipal water supplies, agricultural uses, First Nations, Métis
  - Increase risk of flooding, and impacts associated with drought
  - Impact recreation activity
  - Alter aquatic, riparian and upland habitat
  - Alter land use around wetlands and ephemeral streams.
- Surface water withdrawals.
- Altered drainage patterns and/or discharges of treated effluent, and stormwater.
- Water quality in lakes and streams does not meet desired end uses in some areas due to soil type and geology, climate change and variability, and/or influx of point and non-point source pollution from adjacent lands.
- The influx of nutrients originating from external sources and the internal natural cycling of nutrients contributes to eutrophication (enrichment) in many lakes in the watershed.

Groundwater

- Uncertainty regarding groundwater quantity resulting from climate change and variability, and withdrawals for human and industrial use.
- Limited understanding of the impact that groundwater withdrawals have on aquifer dynamics and on lake water levels and streamflows.
- Human health concerns related to naturally occurring and/or thermal mobilization[1] of trace metals (arsenic, uranium) in concentrations above drinking water guidelines.
- Concerns related to land use, including potential contamination from improperly abandoned water wells, landfills, agricultural activity, septic fields and, oil and gas activity (casing failures).

Wetlands and Riparian Areas

- Loss of wetland and riparian areas and their respective functions (water storage and water balance in lakes/streams, groundwater recharge, retention of nutrients, suspended sediment, soil and associated contaminants), biodiversity, and ecological services.

Biodiversity

- Fragmented and poor-quality habitat, due to increased road density, access, recreational activity, industrial activity.
- Changing abundance and/or size of certain fish and wildlife species in the watershed.
- Potential threat of terrestrial and aquatic invasive species in and adjacent to waterbodies.
- Berries, plants and animals are safe to eat.

Land Management

- Cumulative impact of development[2] and industry[3] on water resources, ecosystem and landscape function including riparian areas and wetlands, biodiversity, and First Nations and Métis traditional land use[4].

Climate Change

- Impacts of climate change as it relates to water availability and quality, increased risk of drought, fire and floods, pest management, altered landscapes and habitat conditions, risks to fish, wildlife, and vegetation

Knowledge and Understanding

- Gaps in knowledge and understanding of natural conditions and human-caused impacts on watershed function.
- Limited public understanding or use of First Nations and Métis Rights, Indigenous Knowledge[5] and Practices in the development and implementation of plans and policies.

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[1] The mobilization of trace metals when heat or steam is used to assist in the recovery of heavy oil

[2] Includes urban and recreation developments.

[3] Generally refers to oil and gas, forestry, agriculture, and sand and gravel extraction, among others

[4] Refers to any land use by an Indigenous person that is rooted in their cultural identity and ancestral connection to certain areas, including the Treaty right to hunt, fish, and trap for food, plant harvesting and/or spiritual ceremonies.

[5] Traditional Knowledge held by First Nations and Métis peoples that is transmitted from generation to generation.

4.0 VALUES, GOALS AND OBJECTIVES

Collaborative management of land and water resources that results in a healthy Beaver River watershed.

Table 1. Values, goals and objectives for the Beaver River watershed IWMP.

Value	Goal (Outcome)	Objective
Water Quantity	Secure, reliable water supplies are available for desired uses (i.e., environmental, First Nations and Métis, municipal, agricultural, industrial and recreational).	1. Review and determine status of existing Water Conservation Objectives in the original Cold Lake Beaver River Water Management Plan (CLBR WMP 2006). 2. Review the need to establish Water Conservation Objectives for streams and lakes outside of the original CLBR WMP planning area. 3. Recommend strategies to address fluctuating water levels at priority lakes where human impacts contribute to flooding or low water levels 4. Recommend strategies that encourage water conservation. 5. Understand the status of current surface water and groundwater initiatives and recommend strategies to better manage the resource.
Water Quality	Surface water and groundwater quality that is protected from contamination, maintained within the range of natural variability, and meets end-use criteria.	1. Establish Water Quality Objectives for the Beaver River and select tributaries that are compatible with the Surface Water Quality Management Framework. 2. Establish Water Quality Objectives for major recreational lakes. 3. Identify stormwater management targets and Low Impact Development strategies to minimize development impacts to water quality (and quantity). 4. Identify appropriate land use, management and stewardship strategies to maintain and/or improve water quality.
Riparian Areas and Wetlands	Healthy riparian areas and wetlands contribute to watershed resiliency with respect to flood and drought, quality water, and critical habitat.	1. Establish riparian[6] setbacks[7] and management objectives/targets that are applied consistently throughout the watershed. 2. Recommend actions that contribute to healthy riparian areas and wetlands.
Biodiversity	Fish, wildlife, and plants are healthy and resilient to changing environmental conditions. Their ecological, social, and cultural roles in the watershed are sustained.	1. Identify appropriate land use targets and thresholds (e.g., stream crossings and linear features) to better understand and track cumulative impacts on aquatic and terrestrial habitat. 2. Recommend best management practices and actions that improve wildlife habitat, health, and biodiversity. 3. Recommend appropriate actions to address risks associated with invasive species.
Land Management	Cumulative effects of diverse land uses are reduced or mitigated to maintain and/or improve ecosystem health.	1. Recommend appropriate water and land management practices that mitigate impacts of industry and development (i.e., urban, recreation, agriculture, oil and gas, forestry, and sand and gravel extraction), and maintain and/or improve ecosystem health.
Climate Change	Climate change considerations are central to all watershed-related planning and decision-making processes.	1. Recommend climate actions and climate change mitigation and adaptation strategies related to watershed management for consideration by decision-makers, resource managers and residents.
Knowledge and Understanding	Indigenous Knowledge and scientific research guide decision-making.	1. Assess and prioritize knowledge gaps in the Beaver River watershed. 2. Recommend outreach materials and other tools to disseminate Indigenous Knowledge, and scientific research related to watershed health.

[6] Riparian: Riparian lands are transitional areas between upland and aquatic ecosystems that have soil and vegetation characteristics that reflect the influence of water. They have variable width and extent both above and below ground.

[7] Setback: A minimum distance that must be maintained between a land use or development activity and a waterbody/watercourse.

5.0 INDICATORS

Environmental indicators are used to assess watershed condition through time. The Beaver River Integrated Watershed Management Plan identifies indicators and associated measures (summarized in the table below) to track watershed condition and to evaluate success in achieving watershed management goals and objectives.

The plan will also set targets and thresholds for indicators to determine how valued components in the watershed compare to acceptable or desired ratings. Targets can be either numerical or written statements. When a value falls below a target or threshold, management actions are triggered to bring the indicator back into acceptable range.

LICA is currently establishing targets and thresholds in collaboration with a watershed planning consultant and members of the IWMP Committee.

Table 2. Draft indicators and measures identified to assess conditions in the Beaver River watershed.

Value	Indicator	Measure	Significance
Water Quantity	Water Supply	Streamflow volume (deviation from natural condition)	Streamflow and water levels should reflect a normal range of condition and support channel processes (erosion/bank building), aquatic life, the riparian environment and communities.
		Lake water Levels	Maintaining appropriate water levels supports: - Water supplies for communities - Recreation (boat access, beaches) - Fish habitat and other aquatic life - Downstream needs for aquatic life and waste assimilation
		Water Conservation Objectives/Instream Flows	Established to maintain a minimum flow in streams to support aquatic life, or meet transboundary water apportionment.
	Water allocation and use	Water licences and registration; water use reports	Water supplies support aquatic life, communities and economic activity.
	Groundwater	Water levels	Groundwater is an important water supply.
			Groundwater contributes to the overall water balance in watersheds.
Water Quality	Lake trophic status	Phosphorus, chlorophyll *a* and secchi disk measurements	Deviation from normal conditions (established through long-term trend analysis) suggests a change in water quality (e.g., a degradation or improvement). Surface water quality should support designated or desired end uses.
	Water chemistry	Dissolved oxygen, salt, nutrients, metals, pathogens, other toxins (arsenic). Concentration and/or load, spatial and temporal trends	
		Number of parameters and frequency that parameters exceed established guidelines or objectives	Guidelines and objectives are established to determine water suitability for a variety of uses (e.g., drinking water, contact recreation, crop irrigation, livestock water, aquatic life).
	Aquatic Life	Species diversity and abundance	Tolerance of benthic invertebrates and fish to water quality conditions differs among species.
	Water temperature	Optimum (range) and maximum (threshold) water temperature	Optimum and maximum water temperature tolerance should be maintained to support all life stages of aquatic life.
Riparian Areas and Wetlands	Riparian function (lotic systems)	Riparian health scores (condition)	Functioning riparian areas contribute to water supply, water quality, river channel and shoreline stability, and biodiversity.
		Intactness (condition, extent)	
	Wetland cover (lentic systems)	Percentage wetland area	
		Wetland loss	

Value	Indicator	Measure	Significance
		Impact thresholds (i.e., footprint on each wetland type)	
Biodiversity	Fish, Wildlife and Vegetation	Species composition (variety of seasonal and resident species)	Aquatic and upland systems that support a diverse group of native fish, wildlife, and plant species are more resilient to ecological adversity or changes to environmental condition.
		Population estimates	
		Index of Biological Integrity	
		Regulated invasive plants, disturbance and rare plants	
		Percentage change in land cover (footprint, linear disturbance, critical habitat)	
		Watercourse crossings and stream connectivity.	Poorly placed or maintained crossings and culverts can increase sediment and erosion, and impede fish passage.
Land Use	Change to human footprint	Percentage change in land use cover (agriculture, forestry, oil and gas)	Monitors land use changes in the watershed, and quantifies cumulative impacts of multiple land uses in watersheds.
	Population	Number of people in the watershed	High road densities can impact fish through increased sedimentation, impassable culverts that prevent upstream migration and increased harvest due to improved accessibility.
	Access	Road density; traffic counts	

6.0 draft TARGETS, THRESHOLDS AND PRELIMINARY RECOMMENDATIONS

Note to Reader: *Recommendations will be developed collaboratively to address matters to achieve the objectives outlined in Table 1. At this stage, the recommendations in the IWMP are considered draft. The recommendations are intended to form the basis for further discussion with the broader watershed community. The draft recommendations may be refined or removed based on further discussions. Only select recommendations are presented in this summary of key IWMP content. The numbering system corresponds to those found in Section 9.0 of the full document.*

Watershed management is a shared responsibility. There are numerous governments, agencies, organizations, and industries represented in the Beaver River watershed; all have varying levels of responsibility for land and water resource management. The planning process is considered successful when stakeholders recognize and support their individual or shared responsibility for achieving the collective goals and objectives of the IWMP.

The IWMP will be successful when:

- It is fully implemented through the collaboration of all stakeholders.
- Targets and thresholds are achieved and/or measurable improvements are observed for established indicators.

Water Quantity (IWMP Section 9.2)

9.2.2 Targets and Thresholds

The draft Beaver River IWMP re-iterates the existing target outlined in the 1969 Master Agreement on Apportionment that stipulates sixty-eight percent (68%) of the natural flow of the Beaver River and Cold Lake basins must be allowed to flow to Saskatchewan, and confirms the continued use of water management targets recommended in the CLBR WMP (2006) specifically for the Beaver and Sand rivers, and for May, Manatokan, Muriel, Reita and Tucker lakes related to

- Diversions and withdrawals for industrial use (namely steam injection) or municipal purposes
- Licensed withdrawals (restrictions when water levels reach a particular threshold) (IWMP Table 4)

Household water use and traditional agricultural water use is regulated by the *Water Act*.

The IWMP recommends exploring additional targets for rivers and lakes in the watershed (IWMP Table 5), including:

- Future withdrawals should not impact on the aquatic environment.
- A net increase in hydrologic connectivity where possible.

- A net decrease in flood damage from high water.
- The number of unregulated streams and lakes in the watershed is maintained or increased.

9.2.3 Preliminary Recommendations

Water Conservation Objectives and Instream Objectives
9.2.3 a Currently, no Water Conservation Objectives or Instream Objectives are established for watercourses in the watershed, other than what is applied to the Beaver River in the Master Agreement on Apportionment (1969). In the absence of an Administrative Order, continue to apply the Surface Water Allocation Directive (GOA 2019) for lakes and rivers in the Beaver River watershed.

Groundwater
9.2.3 c Alberta Geological Survey in partnership with AER should complete the water allocation, availability and use mapping for deep groundwater and non-saline water use (south of Cold Lake).

Monitoring and Evaluation
9.2.3 f Improve understanding of hydrological processes and drivers of fluctuating water levels for lakes and associated catchments to aid land use decision-making and stewardship.

9.2.3 g Explore opportunities to implement collaborative lake level monitoring programs with First Nations and the Métis, as well as at other lakes in the watershed, particularly those proposed for increased recreational use, and/or where fish habitat restoration is a priority.

Development
9.2.3 k Maintain hydrologic connectivity in the watershed to minimize potential to isolate lakes and wetlands from their catchment.

9.2.3 l Development setbacks should account for natural variability in the hydrologic cycle, and be established with consideration for flood and drought conditions, as well as for riparian health.

9.2.3 m Stormwater inputs from urban areas to lakes should be managed to maintain the natural variability of flow rate and volume in each system.

9.2.3 o Explore tools to manage beaver activity where it has impacted infrastructure and hydrologic connectivity.

Water Conservation
9.2.3 q Review the water conservation target of a 30% reduction in use (Water for Life Strategy 2003). Determine if and how the water conservation target is being achieved.

Climate Change
9.2.3 r Climate change and climate variability should be considered in all land use planning activities, particularly as it relates to the aquatic environment, such that land use decisions related to urban and industrial development, and tourism and recreation accounts for and mitigates potential future impacts to the aquatic environment.

Water Quality (IWMP Section 9.3)

9.3.2 Targets and Thresholds

The draft Beaver River IWMP recommends use of existing Prairie Provinces Water Board (2021) Beaver River water quality objectives and provincial water quality guidelines (GOA 2018) to determine water quality condition in the Beaver River.

For some Beaver River or Moose Lake tributaries, available select water quality was summarized using descriptive statistics. This existing data, along with provincial guidelines (GOA 2018) should be used as an interim baseline for which to compare future water quality monitoring results.

For lake water quality, targets:
- No increase in total phosphorus (or nitrogen) above historic conditions should occur at all lakes in the Beaver River watershed. Where nitrogen and/or phosphorus have increased due to human activity, develop lake-specific nutrient objectives and management plans where warranted (GOA 2018).

Where quantified,
- Maintain (or improve where possible) productivity levels within the low end of the existing trophic class identified for individual lakes according to trophic status classification (Nurnberg 1996).
- Strive to reduce external sources of phosphorus that contribute to lake nutrient budgets.

9.3.3 Preliminary Recommendations

Water Quality Condition
9.3.3 a Improve and maintain water quality condition in rivers and lakes by reducing external nutrient and sediment inputs.

Monitoring
9.3.3 d, e and f Implement water quality monitoring programs for rivers, and main lake tributaries. Continue to

monitor lake water quality and expand the program to include lakes not previously monitored.

9.3.3 i In addition to water chemistry, the monitoring program should consider other water quality indicators, including fish and benthic invertebrates.

9.3.3 l Consider community-based groundwater monitoring programs.

Stewardship
9.3.3 m Reduce external phosphorus loads to lakes by implementing best (beneficial) management practices in rural, urban and industrial areas.

9.3.3 p Encourage lake stewardship. Consider adopting programs such as Love Your Lake to encourage participation from all stakeholders.

Riparian Areas (IWMP Section 9.4)

9.4.2 Targets and Thresholds

Refer to Table 3 for proposed riparian area targets and thresholds aimed at maintaining riparian function to support hydrologic, hydraulic and ecosystem processes.

9.4.3 Preliminary Recommendations

Healthy Riparian Condition
9.4.3 a Adopt the riparian area **condition** targets presented in Table 3. Effort should focus on decreasing the percentage of riparian area in the unhealthy poor and low intactness categories and increasing the percentage of sites in the healthy, good and high intactness categories.

Protection
9.4.3 f At the time of subdivision, development setbacks should be applied consistently to waterbodies and watercourses to maintain important riparian functions.

9.4.3 g, h, I Setbacks related to industry activities are established and regulated through legislation, operating ground rules, standards, guidelines and respected practices. These should be adhered to, to the highest standard.

Conservation
9.4.3 l-p Explore opportunities to conserve riparian areas that are healthy and intact.

Restoration
9.4.3 p For existing developed areas, explore opportunities to restore shorelines to meet watershed goals and targets.

Table 3. Proposed targets and thresholds to manage riparian areas in the Beaver River watershed. A combination of riparian Extent, Condition and Setback measures should be applied.

Measure	Method	Watershed-Wide Target	Watershed-Wide Threshold
Federal, Municipal, First Nations and Métis Lands			
Extent (Area)	Aerial Videography	≥75% of assessed riparian area at watercourses and waterbodies is rated good or high intactness	<10% of riparian area at watercourses and waterbodies rate poor, or very low+low intactness
	Riparian Intactness		
Condition (Score)[f]	Riparian Health Assessment and Inventory	Riparian areas rate healthy (Score ≥80)	Riparian areas rate healthy but with problems (Score ≥60). <10% of riparian areas score unhealthy or poor.
Setbacks (Buffer Width)	Fixed-Width	50 m	≥30 m
	Setback Guidelines (GOA 2012)	20 m to 60 m + Slope qualifier	
	Riparian Setback Matrix Model (Aquality 2012)	Variable based on site conditions	
Pressure	Riparian Intactness	No net increase in the pressure score for local catchments adjacent to streams.	
		Net increase in the cover of natural vegetation (e.g., forest) and/or wetlands within High Pressure catchments adjacent to streams.	
Industry			
Extent, Condition, Pressure	See Above	Apply Extent, Condition and Pressure targets and thresholds.	
Setbacks	Industry Requirements/Standards	Adhere to industry provincial requirements and standards (refer to full IWMP for details). Generally, a minimum 100 m setback from waterbodies and watercourses applies.	

Biodiversity (IWMP Section 9.5)

9.5.2 Targets and Thresholds

Table 4. Proposed fish and fish habitat targets.

Indicator	Target
Index of Biological Integrity (IBI) Scores	>90% of IBI scores rate "high" for a given stream.
	Increase IBI scores where scores rated poor (e.g., Amisk and Beaver River).
Lake Fish Sustainability Index (FSI) Scores	Fish habitat is restored, and fish harvest is in balance with a sustainable fish population.
	No lakes have fish species listed as Functionally Extirpated (Refer to Table 9.16)
	A decrease in the number of lakes that have Northern Pike or Walleye populations listed as High or Very High Risk to sustainability (Refer to Table 9.16)
Species Composition	The Beaver River supports a sustainable, coolwater fishery.
	Maintain a sustainable Lake Trout population in Cold Lake.
Stream connectivity	Achieve ≥90% stream connectivity in sportfish streams, with 100% connectivity in the mainstem reaches of third-order streams and higher.

9.5.3 Preliminary Recommendations

Fisheries
9.5.3 d Fall Index Netting programs should include additional key species in lakes (Burbot, Yellow Perch).

9.5.3 e Consider other methods to monitor fish populations (e.g., creel surveys) at lakes and electrofishing at streams.

9.5.3 f Continuous water temperature data should be collected at several locations in the Beaver River and its tributaries to assess current habitat condition.

9.5.3 p Explore opportunities to restore the fishery at lakes where fish populations have collapsed or have been extirpated.

Shoreline Management
Shorelines provides critical habitat for fish and waterfowl, and should be managed to maintain critical habitat (e.g., spawning areas, Important Bird Areas).

9.5.3 j Manage human-induced shoreline erosion by establishing wake-free zones and/or posting speed limits in areas most vulnerable to reduce suspension of bottom sediments and shoreline erosion induced by wave action.

Watercourse Crossings and Stream Connectivity
Poorly constructed or poorly maintained watercourse crossings can result in habitat fragmentation, habitat degradation, and barriers to fish passage.

9.5.3 r Engage stakeholders and land users in the monitoring of watercourse crossings using the provincial watercourse crossing app to improve the inventory in the Beaver River watershed and to identify restoration priorities.

9.5.3 s Prioritize stream crossing sites so stream crossings that fully impede fish movement with the highest sediment load are given a higher priority for remediation or replacement. Use the hanging culvert assessment and inventory (Worley Parsons 2012) as a starting place.

9.4.3 t Create and implement a watershed-wide stream crossing remediation plan.

Key Wildlife and Biodiversity Zones
9.4.3 u The Beaver River and the Sand River are indicated as key wildlife and biodiversity zones in the watershed. Maintain quality habitat:

- Avoid development in key zones; Minimize and mitigate impacts from future development
- Plan future tourism and recreation to avoid sensitive areas

9.4.3 v Effort should be made to restore habitat where the human footprint has already encroached on sensitive areas within key wildlife and biodiversity zones.

Land Management (IWMP Section 9.6)

Proposed targets align with those established in the draft Cold Lake Subregional Plan. Draft recommendations currently being developed.

Knowledge and Understanding (IWMP Section 9.7) Incomplete

7.0 FOR MORE INFORMATION

Kayla Hellum, LICA - Environmental Coordinator
Phone: 780-812-2182
Email: watershed@lica.ca
www.lica.ca

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Palliser Environmental Services Ltd.