Alberta

Government of Alberta

Agency Report to the Mackenzie River Basin Board 2020

Meeting #66 of the Mackenzie River Basin Board November 25-26, 2020

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1 Bilateral Water Management Agreements

BC-Alberta Water Management Agreement

British Columbia and Alberta reached an 'Agreement in Principle" I February 2020. Andrew Wilson (AB) and Ted Zimmerman (BC) are working toward a collaborative engagement strategy. The agreement could be completed and signed by summer of 2021.

Saskatchewan – Alberta Water Management Agreement

Alberta and Saskatchewan have committed to resuming negotiations once the team contacts have been confirmed for both jurisdictions.

2 Water-Related Legislation / Policy / Regulations / Planning

Water Management Planning

Background

The *Water Act* provides the legislative authority to develop and implement water management plans that provide guidance and advice to decision-makers when their decisions could impact water quantity, water quality and aquatic habitat.

Water management plans include strategies to maintain, restore or enhance the conditions of the aquatic environment. These strategies are considered within all resource planning activities that may affect the waterways. Public consultation is also an essential component of water management planning processes, as Albertans must have opportunity to understand, participate in, and provide input to water management plans.

There are two main planning outcomes for water management plans:

1. Water Management Plans provide broad guidance for water management and set direction on how water should be managed. Water Management Plans are authorized by a designated Director under the Water Act. The recommendations of the plan are considered when making day-to-day decisions.
2. Approved Water Management Plans are authorized by the Lieutenant Governor in Council. According to the Water Act, approved water management plans must be considered when making subsequent license and approval decisions under the Water Act.

Status

Wapiti River Water Management Plan (WRWMP)

The Wapiti River basin provides a wide range of uses and services to the area. Besides being an important area for Indigenous traditional use, the Wapiti River basin also provides a source of water for the City of Grande Prairie, the surrounding municipalities and industry in the area (i.e., forestry, agriculture, and oil and gas).

The WRWMP establishes a Water Conservation Objective (WCO) that balances the growing demands for water in the region and provides protection of the aquatic environment, especially during periods of low flow conditions. The WRWMP will provide policy direction to AEP and the Alberta Energy Regulator when making water allocation decisions under the *Water Act* and where appropriate, under the *Environmental Protection and Enhancement Act*.

Engagement (stakeholder, public and Indigenous) on the draft plan is complete and the plan is currently being considered for approval by government.

Further Information

Once approved, the WRWMP will be posted publicly on the AEP website.

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Land Use Framework

Background

The Government of Alberta's Land-use Framework (LUF) sets an approach to managing our province's land and natural resources to achieve Alberta's long-term integrated economic, environmental and social goals. The LUF includes establishing regional plans for seven land-use regions which are generally based on watersheds, and the *Alberta Land Stewardship Act* establishes the legislative basis for plan development and makes regional plans binding on all provincial government departments, decision-making boards and agencies, municipalities, industry and Albertans. The regulatory plans: integrate existing provincial policies and strategies at the regional scale to reflect the uniqueness of each region; align policies with regional economic, environmental and social outcomes; provide clear policy direction for land users and land-use decision-makers; and provide cumulative effects management

Two of seven intended regional plans are established and being implemented – the Lower Athabasca and South Saskatchewan Regional Plans. Both regional plans include elements regarding the management of water quality and quantity, which includes regulatory features related to surface water quality management frameworks. Work on the North Saskatchewan Regional Plan was initiated; the plan is not complete.

Status

Lower Athabasca Regional Plan (LARP)

The Lower Athabasca region covers approximately 93,212 km^2 and is located in the northeast corner of Alberta. The region, known for its abundant oil sands deposits, spans the catchment areas of three major river basins – the Athabasca River, the Beaver River and the Peace/Slave River basins – with the Athabasca River being the main source of water for oil sands mining activities. The Lower Athabasca Regional Plan (LARP) sets resource and environmental management outcomes for air, land, water and biodiversity, and will guide future resource decisions while considering social and economic impacts to the region.

The LARP was established in September 2012, and includes resource and environmental management outcomes for air, land, water and biodiversity, and guides resource decisions while considering social and economic impacts to the region. The LARP includes regulations to enforce the environmental management frameworks (EMFs) for air quality, surface water quality and groundwater. The Surface Water Quantity Management Framework and a Tailings Management Framework were approved in 2015. A draft Biodiversity Management Framework for was released for public review; work is continuing to complete this framework.

The Surface Water Quality Management Framework includes commitment to monitoring and reporting 61 parameters in the lower Athabasca River, downstream of major industrial activity, and evaluating quality against thresholds (triggers and limits) set in the framework to ensure water quality is protected from unacceptable impacts, for current and future water uses. Investigations are underway to understand potential surface water quality issues that have been identified in the implementation of the framework.

The Surface Water Quantity Management Framework includes weekly withdrawal limits for oil sands operators, based on flow rates in the lower Athabasca River. Adaptive management thresholds are used to track any changes in water flow, allocation and use in the basin. No thresholds have been exceeded since the implementation of this framework.

Both the surface water quality and quantity frameworks have been developed to support transboundary commitments, including those under the Mackenzie River Basin Transboundary

Waters Master Agreement. Under the Wood Buffalo National Park Action Plan (2019) the Government of Alberta committed to continue work with Indigenous communities and stakeholders on regional EMFs, including the surface water quantity and surface water quality frameworks.

Reporting on the LARP and its EMFs is available at https://www.alberta.ca/lower-athabasca-regional-planning.aspx.

As specified in the *Alberta Land Stewardship Act*, a 10-year review of the LARP to ensure its ongoing relevancy and effectiveness must be initiated prior to September 2022, or the plan will expire. The review would include all elements, including EMFs and cumulative effects management. The Act requires consultation occur with the public, stakeholders and Indigenous communities to inform any plan amendments.

South Saskatchewan Regional Plan (SSRP)

The South Saskatchewan region is located in the southern area of Alberta, and has comparatively fewer water resources than the Lower Athabasca region. The region includes the Bow, Oldman, South Saskatchewan and Milk River basins. The SSRP was established in September 2014, and it was amended in 2017 to accommodate the creation of the Castle Wildland and Provincial Parks and in May 2018 to include the Livingstone-Porcupine Hills-Land Footprint Management Plan and Livingstone-Porcupine Hills Recreation Management Plan to manage footprint and recreational activity for those areas.

The SSRP supports the Approved Water Management Plan for the South Saskatchewan River Basin that manages for water quantity. The regional plan did not establish new thresholds or objectives for water quantity. However, the plan provides strategic direction on enhanced watershed management, headwaters protection (including a review and potential update of water conservation objectives), wetland and riparian management, and flood and drought mitigation.

In addition, the SSRP contains regulations to enforce the EMFs for air quality and surface water quality established in regional plan. The Surface Water Quality Framework directs the monitoring and managing of long-term, cumulative changes in water quality within the main stem Bow, Oldman, South Saskatchewan and Milk Rivers. Water quality indicators and thresholds (triggers and limits) protect surface water quality from unacceptable impacts, for current and future water uses. The framework has been developed to support and manage for transboundary commitments, including the Master Agreement on Apportionment. A management response is underway for indicators that have exceeded thresholds under the framework.

In addition to air and water quality frameworks, a draft Biodiversity Management Framework was completed and released for public review; work continues to complete it. An approach for regional groundwater management is being developed.

Reporting on the SSRP and its EMFs is available at https://www.alberta.ca/south-saskatchewan-regional-planning.aspx.

North Saskatchewan Regional Plan (NSRP)

The North Saskatchewan region is in central Alberta, and includes the capital region. The region includes the North Saskatchewan and Battle River watersheds.

The Government of Alberta initiated development of the NSRP in 2014 with public engagement, received recommendations in 2018, and initiated a focused conversation related to the Bighorn area in 2018. The plan was not completed.

The planning work to date considers air and water management frameworks as well as development of a biodiversity management framework. The planning work to date also considers strategies and direction for water quality and quantity, enhanced watershed management (including headwaters protection), wetland and riparian management, and lakes, flood and drought mitigation.

The North Saskatchewan region also includes the area covered by the Approved Water Management Plan for the Battle River Basin.

The plan would likely include strategies to support and manage for transboundary commitments, including the Master Agreement on Apportionment.

Other Regional Plans

The remaining regions for development of regional plans are the following: Lower Peace, Upper Peace, Upper Athabasca and the Red Deer regions.

Further Information

More information about the Land-use Framework and regional planning can be found here: www.landuse.alberta.ca.

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Tailings Management Framework—Alberta Environment and Parks

Background

As a commitment under the Lower Athabasca Regional Plan, the Tailings Management Framework (TMF) for the Mineable Athabasca Oil Sands was released in March 2015.

This framework provides direction to manage fluid tailings volumes during and after mine operations to manage and decrease liability and environmental risk resulting from the accumulation of fluid tailings on the landscape.

To ensure tailings management is aligned with the intent of the TMF the Alberta Energy Regulator
(AER) developed Directive 85: Fluid Tailings Management for Oil Sands Mining Projects (2017). Directive 085 provides application and performance monitoring and reporting requirements for fluid tailings volume, and management plans.

Status
As of summer 2020, decisions on all tailings management plans for existing oil sands mines have been made.
Additional work to implement the TMF is underway with the establishment of two new stakeholder and Indigenous community engagement forums. The Oil Sands Reclamation Interest Group (OSRIG) provides strategic policy advice on a broad range of reclamation topics, while the Oil Sands Mine Water Science Team provides technical expertise to inform the development of regulatory guidance documents.

Further Information
- Government of Alberta's Lower Athabasca Region: Tailings Management Framework for Mineable Athabasca Oil Sands (TMF).
- Alberta Energy Regulator's Directive 085: Fluid Tailings Management for Oil Sands Mining Projects.

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Tailings Management Framework—Alberta Energy Regulator

Background
The Alberta Energy Regulator (AER) works to ensure that the oil sands are developed within government policy and in an environmentally responsible way. We are committed to protecting what matters to Albertans—public safety and the environment—ensuring the rules are followed at every stage of energy development.

Under the Government of Alberta's Tailings Management Framework (TMF), companies must progressively treat and reclaim their tailings so that they are ready to reclaim within 10 years after mining has stopped.

Under the TMF and the AER's Directive 085: Fluid Tailings Management for Oil Sands Mining Projects, companies were required to submit tailings management plans to the AER. These plans list the actions that companies will take over the next several decades to ensure their tailings are progressively reclaimed when the life of the mine ends.

To ensure a company's tailings management activities remain on track, the AER has set thresholds for fluid tailings volumes that companies must maintain (i.e., limits and triggers). These thresholds will remain in place for the approved life of a mine.

The TMF and Directive 085 do not address waterfowl protection, dam safety, or emissions from tailings ponds. These issues are addressed through other AER requirements.

The AER continues to work with all stakeholders, including industry, environmental groups, and indigenous groups to ensure all tailings management and operational plans meet Government of Alberta policy and AER requirements.

Status
The AER has approved tailings management plans for all eight of Alberta's oil sands mines. Decision reports are posted to the Tailings Notices and Decisions page on aer.ca.

In September 2020, the AER published 2019 *State of Fluid Tailings Management for Mineable Oil Sands*. The report shows that the volume of fluid tailings increased by approximately 3 per cent in 2019 compared to 2018, while bitumen production rose by approximately five per cent during the same period.

From 2015 to 2019, the reported total volume of fluid tailings in the Athabasca oil sands region was below the aggregate of approved tailings profiles. Each company's tailings management plan has one or more profiles that track the volume of tailings that must be treated and reclaimed over the lifecycle of the mine.

Based on the volumes reported in 2019 annual reports submitted by operators, all operators remained in compliance with Directive 085.

Further Information
Additional information about the AER's approach to tailings management is available at aer.ca

Contact
Contact the AER at inquiries@aer.ca

Surface Water Quality Framework for Peace Region
Background
The Peace Region covers approximately 40% of Alberta's total land area. The region encompasses five major sub-watershed, all of which eventually drain to the Mackenzie River. The Peace Region supports a large agricultural community and diverse industrial operations, with about 43% area developed. Recreation, fishery, and wildlife are also important management aspects in the region. A large percentage of the Alberta Indigenous population resides in the Peace Region.

The Government of Alberta will be returning to regional and sub-regional planning processes for the Peace Region. This planning will focus on goals and objectives for Alberta's economy, environment, and communities. A key aspect of regional planning is working collaboratively with stakeholders, Indigenous communities, municipalities, and the public on future land use discussions. Through regional planning, AEP will develop Surface Water Quality Management Plan for the strategic, key waterbodies.

The development of the Peace Regional Plan will include Surface Water Quality Management Frameworks that will provide strategies and direction for water quality for two important water resources: the Wapiti River and Smoky River. These rivers are tributaries to the Peace River.

Status
The Surface Water Quality Management Framework development process has been recently initiated. The timelines for project stages and completions are yet to be determined.

Further Information
More information about the Land-use Framework and regional planning can be found at www.landuse.alberta.ca.

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Wapiti River Water Management Plan

Background

The Wapiti River basin lies within the larger Smoky/Wapiti basin of the Peace River watershed. Of all basins in the Peace River watershed, the Wapiti basin has the highest concentration and diversity of human water withdrawals and municipal and industrial wastewater discharges. The Wapiti River Water Management Plan (the plan) was developed to address concerns about water diversions from the Wapiti River, particularly during winter low-flow periods and the potential negative impacts on the aquatic environment. The Wapiti River is a transboundary watercourse that originates in BC.

In response, a steering committee of local stakeholders including municipalities, Sturgeon Lake Cree Nation, industry, agriculture, the Department of Fisheries and Oceans Canada, and the Mighty Peace Watershed Alliance (MPWA), supported by technical experts from Alberta Environment and Parks (AEP), was established.

The steering committee initiated the development of a water management plan that includes a Water Conservation Objective (WCO) and watershed management recommendations for the Wapiti River basin from the British Columbia border to its confluence with the Smoky River. A WCO is a limit to the volume of water that can be withdrawn from the Wapiti River, ensuring that water flow remains in the river system to meet ecological objectives.

The plan provides guidance and recommendations on balancing the needs of municipal water supply, industrial uses, agriculture, and other uses while maintaining a healthy aquatic ecosystem in the Alberta portion of the Wapiti River basin.

Status

Both public and indigenous engagement have been completed, and the plan is pending final authorization from AEP.

During this final phase, prospective licensees and water licence applicants have been proactively designing their plans with due consideration given to the Wapiti River Water Management Plan objectives. Water licence applicants within the basin are expected to make adjustments to their applications where necessary to meet the plan's water diversion limits.

Further Information

The draft Wapiti River Water Management Plan document can be obtained from https://open.alberta.ca/publications/wapiti-river-water-management-plan-draft

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Alberta Wetland Policy: Wetland Replacement Program

Background

Wetlands are a vital part of Alberta's ecological landscape and are necessary for a sustainable economy and healthy communities.

The Wetland Replacement Program (WRP) aims to re-establish wetlands in partnership with Albertans by providing resources for collaborative restoration projects across the province. Under the Alberta Wetland Policy, the WRP will offset wetlands lost due to approved development activities. A priority of the Alberta Wetland Policy and the WRP is to replace wetlands in watersheds and municipalities, that have had the highest amount of lost wetland area and value since 2015, as well as areas of high historical loss.

Under this program, wetland replacement includes the following activities:

- Wetland restoration: Returning natural/historic functions to a former or degraded wetland
- Wetland construction: Creating a wetland on a site that was historically non-wetland

Partners in this program will undertake wetland restoration or construction projects in order to achieve specific environmental outcomes, including but not limited to flood attenuation, drought resiliency, groundwater recharge, water quality improvement, habitat for wildlife and biodiversity, and for social, recreation and education value to the public.

Status

In 2020, the WRP formed partnerships with municipal and non-profit participants who will restore or construct wetlands in the Peace, Athabasca, North Saskatchewan, South Saskatchewan, and Milk River Basins. The WRP is currently accepting wetland replacement and construction project proposals from these participants and aims to replace more than 300 ha of wetland area each year.

Further Information

More information about the Alberta Wetland Policy and the Wetland Replacement Program can be found at https://www.alberta.ca/alberta-wetland-policy-implementation.aspx.

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3 Science, Monitoring and Information

WaterSHED (Water: Saskatchewan Headwaters Edmonton and Downstream) Monitoring Program

Background

The North Saskatchewan River Basin (NSRB) is one of Alberta's key river basins as it supplies drinking water to over one million residents, provides important natural resources for industry, accommodates a rich terrestrial and aquatic biodiversity, and offers citizens quality recreational opportunities. In recognition of the importance of the NSRB, a novel aquatic monitoring program, WaterSHED (Water: Saskatchewan Headwaters Edmonton and Downstream), was formally implemented across the basin in 2019/20. This program is a unique collaboration between Alberta Environment and Parks (AEP), EPCOR, the North Saskatchewan Watershed Alliance (NSWA) and the City of Edmonton.

The primary impetus behind the establishment of this program is to help guide long-term sustainable management of the NSRB by providing a solid scientific understanding of the links between watershed processes and changes in water quality, quantity and overall ecosystem functioning. Consequently, expertise within the collaborative WaterSHED program, with support of $1 million per year from EPCOR Water Canada for an initial four years (2018-2021) from City of Edmonton water rate payers, have conceptualized and implemented a multi-disciplinary river water-monitoring program across the NSRB.

The WaterSHED monitoring program is integrated into AEP's core river water quantity and quality monitoring programs and utilizes new deployments of enhanced water monitoring across the diverse landscapes of the NSRB to assess near continuous changes in river water quality and quantity. The program also employs targeted focused studies each year to address problem-based environmental issues across the basin.

Status

Eleven tributaries (11) within the existing Provincial water quantity monitoring program which are maintained by either AEP or Water Survey of Canada (WSC) have been upgraded with continuously recording water quality data sondes to become fully functional for the program. Seven (7) additional tributaries have been installed with new hydrometric stations as well as continuously recording water quality data sondes. All stations report their continuous data in near real time. In addition, all sites are sampled for discrete water quality samples on a monthly or higher frequency depending on season. In addition to monitoring flows and water quality, an assessment of the Aquatic Ecosystem Health (AEH) is underway in the watershed as part of an Alberta Innovates Water Innovation Program, along with further focused studies looking at dissolved organic matter and the development of maximum allowable loads, specific to the NSRB. In 2020/21, two more stations will be included in the monitoring network to complement the existing ones: the Cline River in the headwaters of the NSR basin, and Pakan in the mainstem NSR downstream of the City of Edmonton. The network will also be expanded with a new, high-elevation meteorological station within the Siffleur River area in the headwaters of the NSR.

Further Information

All stations report water level/quantity in near real time and are fitted with cameras that are updated daily. Access to this data is via the https://rivers.alberta.ca/web page. The inventory of verified and validated water quality data collected by the program is available via https://environment.extranet.gov.ab.ca/apps/WaterQuality/dataportal/ , under the Tributary

Monitoring Network layer. Requests for the full data suites can be made to swg.requests@gov.ab.ca.

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Alberta River Forecast Centre

Background

River Conditions

Flows in the Athabasca and Peace River basins at mid-October are generally average to above average for this time of year. The Peace River at Peace Point gauge shows flow to be average, however this has been consistently above the upper quartile since spring breakup. On the Athabasca River below Fort McMurray, flows have been consistently above the upper quartile since spring breakup.

Detailed, but preliminary, flow information for rivers in Alberta can be obtained at the following webpage: https://rivers.alberta.ca/.

River Forecast Centre Upgrades

Alberta's River Forecast Centre is continuing with the program to review and update its forecasting processes. This includes work on the Deltares Delft-FEWS (Flood Early Warning System), upgrades to the rivers.alberta.ca website and the ongoing review of flood forecasting hydrological modeling tools.

Status

The Deltares Delft-FEWS (Flood Early Warning System) will be operational for the 2021 season including upgrades to the ingestion of Sentinel 1 and 2 satellite information for ice. Testing of the Beta version of the 2019.02 Delft-FEWS base build is ongoing through the fall. Updates are being made to the Advisory Creator function of the rivers.alberta.ca website to improve ice advisory scope and functionality. The model test builds are complete for the Mike-SHE and UBC Watershed Models, the WaSim test builds were not completed and will not pursued further. Evaluation of all models will be complete by the spring of 2021.

Further Information

Further information can be provided by Colleen Walford and will be made available to the Committee on Flow Forecasting.

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Incident response in Alberta's energy industry

Background

The Alberta Energy Regulator (AER) ensures the safe, efficient, orderly, and environmentally responsible development of energy resources. This includes ensuring operators are ready and able to appropriately respond to energy incidents.

The AER responds to energy-related incidents 24 hours a day, 7 days a week to protect the public and the environment. Companies are required to immediately report incidents to the AER's 24-hour emergency telephone number.

The AER regularly monitors, inspects, and audits energy sites to ensure companies are meeting requirements. The AER requires companies to have comprehensive emergency response plans (ERPs) in place for all potential energy development risks, as outlined in *Directive 071: Emergency Preparedness and Response Requirements for the Petroleum Industry*. This includes requirements to train emergency response personnel and regularly test their ERPs through exercises or tabletop simulations.

If an incident occurs, companies are required to respond immediately to limit impacts to public safety, property, and the environment. Incident information is posted to the AER's Compliance Dashboard. Incidents posted to the Compliance Dashboard meet the following criteria:

- a reportable release that involves hydrogen sulphide (H_2S),
- a reportable release that affects a water body, whether on or off lease,
- a reportable release of hydrocarbon or produced water that migrates off lease or on pipeline right-of-ways; or
- a seismic event of local magnitude (ML) 4.0 or greater in the Duvernay Zone (subject to Subsurface Order No. 2) or 2.5 ML or greater in the Brazeau area (subject to Subsurface Order No. 6) or 3.0 ML or greater in the Red Deer area (subject to Subsurface Order No. 7).

During an incident, the AER works with the company, local authorities, and other provincial agencies, including Alberta Environment and Parks, and the Alberta Emergency Management Association, to coordinate an efficient and effective response. AER staff are deployed to many energy-related incidents to ensure appropriate response is being undertaken by the responsible party, that necessary emergency response protocols are in-place, and to ensure that impacts are to the public or environment are minimized. The AER reviews the cause and circumstances of all incidents to determine if any of our requirements were not met.

When a company does not follow our rules, we take steps to stop the noncompliant activity, ensure public safety, restore the environment, and if necessary, apply enforcement action against the responsible party. The AER has a number of enforcement tools that it can take against a company if it fails to follow our rules in reporting or responding to an incident.

The AER's incident response does not cover employee health, safety, and working conditions. These fall under the jurisdiction of Alberta Occupational Health and Safety.

The AER regulates all aspects of energy development including: exploration, construction, operation (including incident response), closure and reclamation.

Further Information

Additional information about how the AER manages energy incident response and frequently asked questions are available at aer.ca.

Contact
Contact the AER at inquires@aer.ca

Alberta Flow Estimation Tool for Ungauged Watersheds (AFETUW)

Background
Alberta Environment and Parks (AEP) developed a new web-based application, Alberta Flow Estimation Tool for Ungauged Watersheds (AFETUW), for both government and external stakeholders. This user-friendly tool allows watershed delineation (at any point along a stream in the province), querying of water licences issued under the Water Act (in any user specified watershed), and estimation of stream flows in ungauged watersheds to support decisions on new water licence applications and compliance with licence conditions.

AFETUW automates many computational and time intensive processes and provides a practical province-wide approach for management of water resources in the province. It is anticipated that AFETUW will result in significant cost and time savings to government, industry, academia, Watershed Planning and Advisory Councils, engineering consulting companies and other non-government organizations.

Status
AFETUW will be released publicly in two phases:

- Phase 1 in fall 2020 - includes watershed delineation and Water Act licence query tools.
- Phase 2 - To be released after the flow tools are calibrated to estimate stream flows in ungauged watersheds in Alberta, including environmental flow, real-time flow, historic daily flow, and flow statistics.

Further Information
Once released, AFETUW can be accessed online at https://afetuw.alberta.ca. A comprehensive user's guide will also be made available on the website.

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State of Groundwater and Subsurface Knowledge in Transboundary Aquifers between Alberta and the Northwest Territories

Background
A Bilateral Water Management Agreement (BWMA) between Alberta and NWT was signed on March 2015. It lays the foundation for long-term cooperative management of the water shared between two provinces. The agreement describes how groundwater may be shared reasonably and equitably. Given the limited data and knowledge available about the quality, quantity and location of groundwater shared between Alberta and the NWT, the two jurisdictions agreed under

the BWMA work plan for 2019-20, to inventory existing groundwater-related information and associated metadata in the Hay River basin, and further extended the inventory to the Petitot, Buffalo and Little Buffalo basins. The aim of this inventory is to arrive at a delineation, mapping of transboundary aquifer between the AB and the NWT and to model groundwater flow processes within the aquifers.

Status

The Alberta Geological Survey (AGS), has completed an initial review of the state of subsurface information and knowledge and summarized their finding in a report titled: State of Subsurface Knowledge to Support Aquifer Mapping across the Alberta–Northwest Territory Border. The report identified that state of knowledge is variable across the study area which can be divided into three geographic zones based on data density and availability. The efforts required for future aquifer mapping differs between each of these zones and further effort is required to resolve the information discrepancy. Additionally, acquisition of new information is required to enable future mapping of transboundary aquifer between AB and the NWT.

There are ongoing efforts to continue the data acquisition process including sampling the Hay River for naturally-occurring isotopic tracers to gain insight to the hydrogeology of the Hay River Corridor.

To supplement this work, literature review of current state-of-the-knowledge information on the spatial extent of permafrost was initiated in collaboration with David Olefeldt and Laura Thompson from the University of Alberta and William Quinton and Olivia Carpino from Wilfrid Laurier University. The aim of the review is to understand the distribution of the permafrost in the area, identify the permafrost landform present and their potential degradation mode.

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Aquatic Invasive Species

Background

Aquatic invasive species pose one of the greatest threats to Alberta's freshwater resources. Impacts from harmful aquatic species range from outcompeting native species, to negatively impacting the economy by deterring recreation opportunities, decreasing property values, and changing native fisheries important to Alberta.

Alberta is invested in aquatic invasive species (AIS) prevention through the development of the Aquatic Invasive Species Program with five elements: 1) policy and legislation, 2) education and outreach, 3) monitoring of water bodies, 4) watercraft inspections and decontaminations, and 5) response.

The Alberta program is the result of a collaboration of many creative partnerships between ministries including, Environment and Parks (former Policy, Operations, and Parks Divisions), Agriculture & Forestry and Justice & Solicitor General. Numerous municipal governments have also entered collaborative programs with the department in prevention and response to aquatic invasive species that threaten Alberta waters.

The aquatic invasive species program has numerous partners that carry AIS program knowledge & messaging further than the dedicated staff could leverage in isolation.

Status

1. Policy & legislation

Decontamination Protocol for Work in or Near Water endorsed for industry use, while this document was spurred by Whirling Disease presence, it is minimizing the risk for all invasive species. Any industry now working in or near water will have to at a minimum Clean, Drain, Dry all equipment touching water, and higher risk zones will require chemical and/or water temperature requirements for additional levels of decontamination.

2. Education & Outreach

Don't Let It Loose (DLIL) campaign materials have shifted to Canadian standards since being adopted for national use earlier this spring. Alberta did have our own DLIL branding but have begun phasing this out for the national standard. A national reaching brand will have exponential power in reaching public across Canada with a unified look. Attached below is example of new logo.

The red prohibition symbol is very much common knowledge to the public that something is not allowed. Don't Let It Loose tag line is combined with a call to action "Stop Aquatic Invasive Species" for context. The dumping bucket refers to the action of introduction or release. The silhouette showcased in front, in this case goldfish, can be tailored to species/industries being targeted in materials. There are 5 silhouettes developed for target industries; pet store (goldfish and plant), live food (crab), sportfish and bait depictions. The water being dumped out of the bucket also shows various other species silhouettes as other species may also be introduced unintentionally in the act of release/introduction.

3. Monitoring

Monitoring was still a priority despite COVID 19 protocols/restrictions. Monitoring continued thanks to our creative partnerships with internal and external partners willing to conduct water sampling, substrate and shoreline inspections despite a pandemic. 60 lakes and reservoirs across the province were monitored. Alberta remains free from invasive mussel and spiny water flea.

Watercraft Inspections

Alberta is exposed to the highest risk of an AIS introduction (mussels and plants) from surrounding jurisdictions through the movement of watercraft. Therefore, watercraft inspections continue to be an important element of the AIS Program. With US-Canada international borders remaining closed, more travelers from Eastern Canada were coming west for travel and watercraft inspectors have intercepted a record setting amount in 2020, currently at 28 interceptions. Final count still to be determined, as stations are still operational. Dunmore watercraft inspection station remains open until end of October.

4. Response

Response was still a priority despite COVID 19 protocols and restrictions. Alberta managed to still utilize an emergency use aquatic herbicide registration obtained using Habitat Aqua (imazapyr) against populations of Flowering rush and invasive Phragmites.
Chinese Mystery Snail confirmed in one waterbody late last year and now working towards containment since there is no feasible control method. Collaborated with the University of Alberta to explore the potential effects this snail is having to food webs. Also looked at the entire lake and downstream to delineate the infestation scope.

Oriental Weather Loach seized from a pet store distributor in Alberta, despite being a prohibited species since 2015. Working with pet stores to educate and find out how prevalent this species is in pet store distribution. Looking to ensure pet stores are aware of prohibited species and to ensure they do not import any of the 52 prohibited fish, invertebrates or plants.

Further Information

Further information can be found at https://www.alberta.ca/Aquatic-invasive-species.aspx

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4 Major Initiatives

Source Water Protection Project

Background

In 2019, the Alberta Water Council completed a project to provide guidance on protecting sources of drinking water in Alberta. This project included development of the *Guide to Source Water Protection Planning* and an associated Companion Document that provides additional resources and details. Source water protection planning is a voluntary and collaborative process in Alberta typically led by drinking water providers. This project has filled a gap in providing provincial guidance on how to undertake source water protection planning and integration with other land and water management approaches. The documents provide direction and references to tools, resources, best practices and case studies for addressing source water protection issues in Alberta. There is the need for a more integrated and collaborative approach between drinking water providers and other stakeholders in the watershed to address current issues and plan for future risks.

Status

In June 2020, the Alberta Water Council Board approved an additional source water protection project proposed by the Government of Alberta to develop and deliver additional tools and resources to assist drinking water providers to understand, assess and mitigate risks to drinking water sources. A working group was recently formed to develop a Terms of Reference to guide this project and will be taken to the Alberta Water Council Board for approval in early 2021.

Further Information

The Alberta Water Council's website provides additional information about this project: www.awchome.ca/projects/protecting-sources-drinking-water-alberta-2/

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Irrigation Infrastructure Investment

Background

- The department of Agriculture & Forestry together with the Canada Infrastructure Bank (CIB), and eight irrigation districts, have signed a Memorandum of Understanding to pursue a collaborative $815 million investment in irrigation infrastructure modernization and increased water storage capacity.
- Projects will be intended to increase water conveyance efficiency, improve water security, and allow more acres to be irrigated within the irrigation districts' current water allocations.
- The irrigation districts are located in the South Saskatchewan River Basin in Alberta, which is largely closed to new water licence applications.
- Irrigation districts have historically increased water efficiencies through improved water management and rehabilitation of district infrastructure. Concurrently, individual irrigators within the districts have modernized their on-farm irrigation systems, further increasing water

efficiencies. The combined water savings from district and on-farm improvements have been leveraged by irrigation districts through adding new lands for irrigation in the districts.
- The proposed investment in modernization projects will focus on installation of buried pipelines to replace open channel canals, reducing return flows or spilled water, and eliminating seepage and evaporation losses.
- The proposed investment in increased water storage will see irrigation districts expand existing district reservoirs and construct new off-stream storage facilities.
- The proposed projects will support expansion of agriculture production capacity and value-added processing, and create construction and permanent jobs.
- As this potential investment is still in development, detailed information is not available at this time.

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Irrigation District Water Quality Project

Background

Alberta has the largest irrigated area in Canada, with nearly 680,000 hectares of irrigated land. More than 80% of this area is held within 13 irrigation districts, and includes 55 reservoirs and over 8,000 kilometres of conveyance works. This irrigation infrastructure provides water not only for crop and livestock production, but also supports rural municipalities, domestic users, wildlife habitat, and recreational activities.

Status

Data collected in 2006-2007 and 2011-2019 are currently being compiled into a series of reports due for publication in 2021, which will provide a baseline of water quality that will allow long-term evaluation of change in southern Alberta's irrigation water. The results show that:

- Irrigation water in southern Alberta generally achieves excellent or good water quality index scores, which is an aggregated measure of the number and magnitude of water quality guideline exceedances;
- In most irrigation districts, the quality of the irrigation water is found to degrade as it moves through the irrigation infrastructure, with return water having poorer quality than source water;
- Most parameters do not exhibit regional or local temporal trends, but moderate to weak negative trends (i.e., decreasing concentrations) were found for total nitrogen, total dissolved solids, and several pesticides (2,4-D, Dichlorprop, MCPA, Dicamba, Mecoprop, and Simazine).

Further Information

Project data and information may be accessed at the project website: www.idwq.ca

Alberta's Water Research and Innovation Strategy (AWRIS)

Background

"Alberta's Water Research and Innovation Strategy 2014: A Renewal" (AWRIS) was released in 2014. AWRIS directly guides the six-year, $28.3 million provincial investment in Alberta Innovates Water Innovation Program (WIP). AWRIS also guides Alberta's post-secondary institutions and other research organizations in response to the challenges faced by the province's water resource system, and supports the knowledge needs of Water for Life (WFL): Alberta's Strategy for Sustainability. AWRIS supports the WFL knowledge and technology gaps, and Alberta's Our Water, Our Future: A Plan for Action.

AWRIS is a strategy co-led by two ministries, Jobs Economy and Innovation (JEI) and Alberta Environment and Parks (AEP). JEI collects and consolidates information from all provincial contributing partners to report on progress occurring under AWRIS toward the actions and enabling outcomes on an annual basis.

AWRIS has three key outcomes:

- **Innovation Focus:** Investments in water research and innovation generate relevant, credible, and reliable knowledge that supports the strategic needs of Alberta's water resource system.
- **Innovation Platforms:** Technological and organizational environments are conducive to discovery and application, fueling innovation in Alberta's water resource system.
- **Innovation Capacity:** Water knowledge is effectively mobilized to create innovative solutions to Alberta's water resource system.

The provincial investment in WIP has been a key implementation tool to achieve the AWRIS outcomes and this, alongside other provincial investments and collaborative actions, have recorded success in the last five years. The four previous AWRIS annual reports have highlighted how Government of Alberta investments have achieved tangible impacts on the water research and innovation system. These reports highlight how strategic investments, platforms, synergies, and partnership are making a difference in the province's water research and innovation system. The achievements identified in these reports reflect the collective efforts of researchers, service providers, and various private and public organizations.

Status

Key highlights for each respective outcome in 2019 include:

- **Innovation Focus** – the GoA invested $16.49 million through water research themes. Alberta Innovates invested $33 million and attracted $250 million through the Clean Energy Program, and $5.3 million, and attracted $54.7 million through WIP. WIP projects have 150 collaborative and funding partners which has led to more than 60 publications.
- **Innovation Platform** – the GoA invested $3.03 million in water related research infrastructure (specifically JEI invested $1.96 million). Alberta has more than 18 publicly funded facilities for conducting water-related research and innovation activities, and more than eight GoA ministries and agencies provide data access to the public on various water-related topics.
- **Innovation Capacity** – WIP-funded projects supported more than 40 highly qualified personnel, Alberta's post-secondary institutions (PSIs) offered 36 water-related programs and 43 specializations with approximately 2,035 students enrolled in these programs.

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Alberta Innovates Water Innovation Program (WIP)

Background

Alberta Innovates is a provincially funded corporation that invests in research, innovation and entrepreneurship to drive provincial economic growth and diversity. Alberta Innovates provides technical expertise, entrepreneurial advice and support, opportunities for partnerships and funding to advance the best ideas. Programming supports a broad range of research and innovation activity – from discovery to use. Collaboration is at the heart of what Alberta Innovates does, bringing together bright minds and great ideas.

The Alberta Innovates Water Innovation Program (WIP) is designed to help the Government of Alberta achieve the outcomes of AWRIS and the goals of the Water for Life (WFL) Strategy: (1) safe, secure drinking water; (2) healthy aquatic ecosystems; and (3) reliable, quality water supplies for a sustainable economy. The priority is to make certain Alberta has the quality and quantity of water, when and where it's needed into the future.

The program builds on a history of world class research and innovation, and helps create and apply relevant, reliable and credible knowledge and information that will lead to a high-performing, innovative and responsive water system for the province of Alberta, as called for in AWRIS.

The WIP research portfolio supports investments that advance knowledge and innovation in four key themes: (1) future water supply and watershed management, (2) healthy aquatic ecosystems; (3) water use conservation, efficiency, and productivity; and (4) water quality protection.

The WIP grant offers funding through continuous intake and competitive, time-limited calls to support the creation and application of relevant scientific knowledge and innovative technology solutions needed to address the goals of WFL/AWRIS strategies. Recipients include post-secondary institutions, government organizations, private sector companies, and not-for-profit organizations. High level results from 2019/20 WIP grant activity include:

- 36 ongoing projects and 32 completed projects.
- 316 HQPs supported by projects to date with 138 jobs created and 146 collaborations.
- Program leverage of 2:1 with other funding sources.
- Role out of a monthly Water Innovation Connect Series.

Status

The WIP grant is currently in effect with the current phase ending in 2024 (extended from 2022). To date, Alberta Innovates has held three WIP calls: one in October 2015, a joint Water Technologies call in partnership with Sustainable Development Technologies Canada (SDTC) in 2016, and a third call in August 2018. All grants from the 2018 call have been executed with projects well underway. Brief summaries for funded projects are available online at: https://albertainnovates.ca/focus-areas/clean-resources/project-library/.

The annual WIP Forum, normally held in May each year, was cancelled in 2020 due to the COVID-19 pandemic. A monthly Water Innovation Connect Series was established to continue efforts to share outcomes of projects funded through WIP and maintain a network of water stakeholders in the province. Recordings of the monthly sessions can be found at: https://albertainnovates.ca/programs/water-innovation/water-innovation-webinar-series/

Four ongoing or recently completed projects are highlighted below.

Rapid multi-parameter assessment of natural recreational waters in Alberta (University of Alberta)

Innovative approaches to monitoring recreational water are required to advance the ability to protect both the natural water ecosystems of Alberta as well as recreational water users. The University of Alberta team has designed molecular tests that are able to amplify specific DNA or RNA targets from biological recreational water hazards that are relevant to Alberta. These targets include, swimmer's itch-causing parasites, toxin-producing cyanobacteria, and two species of invasive mussel. These are organisms that are considered either health or environmental risks in Alberta, as well as in Canada, and their presence is commonly associated with the closure of lake beaches to recreational use, and/or significant economic impacts to local or provincial economies.

In accomplishing the project objectives, the project team developed, validated and thereby provided, viable and appealing replacements for many recreational water monitoring tests, while also collecting important environmental, ecological and biological data related to the indicated organisms. The data collected here will provide the foundation for adoption of improved water monitoring techniques, and thus, will improve our capacity to protect the health of recreational water users. Moreover, this project will facilitate more informed risk assessments and predictive modelling of organisms related to recreational water in Alberta with the goal of minimizing risks in the future.

This project was originally approved to advance the above objectives for swimmer's itch parasites, microcystin-producing cyanobacteria, and quagga and zebra mussels. The scope was extended to include whirling disease.

Nutrient Objectives for Small Streams in Agricultural Watersheds of Alberta – Phase 2 (Alberta Agriculture and Forestry)

This project represents a second phase in the ongoing development of nutrient objectives for small streams in the province. The stressor-response approach will be applied to agricultural areas within the Boreal Forest Natural Region, a key area that is positioned for agricultural expansion. The nutrient objectives derivation process will also be applied to an alternate watershed classification system that reflects differences in topographic, climatic and physiographic features of the landscape that may influence stream hydrology and stressor-response relationships. Experiments that assess nutrient limitations on algal growth will be conducted in an effort to identify mechanistic links between aquatic ecosystem responses and nutrient ratios. Outcomes from the overall work will include surface water nutrient objectives that can be applied across the agricultural area (white zone) of Alberta according to either a regional or watershed classification, and an improved understanding of aquatic ecosystem response to nutrients, both which will help guide watershed-scale management programs.

Groundwater contributions to the North Saskatchewan River and Edmonton region water resources (University of Alberta)

The North Saskatchewan River (NSR) provides drinking water to nearly 900,000 people in the Edmonton area and a further 300,000 people in ~70 neighbouring communities. Most of the water in the NSR is derived from the mountains and foothills. Smaller contributions flow from local tributaries, complemented by an unknown amount of groundwater. The impact of changes in climate (e.g., levels of precipitation) and how land is used (e.g., agricultural, residential and industrial development) can substantially influence both the quality and quantity of water available in the region. Historical evidence of very low water flow in the NSR, as well as issues such as contamination and population growth drive a need to better understand the current and

potential role of groundwater in the region. This project aims to quantify and map groundwater resources and NSR flows in the greater Edmonton area.

The team will develop a novel framework by integrating hydrologic modeling (coupled surface water – groundwater (SW-GW) models), with field-collected data from techniques such as novel geochemical tracers, geophysical measurements, and age-dating, to characterize groundwater sources, evaluate recharge and discharge rate dynamics, and trace groundwater entering the NSR and its tributaries.

The research will provide the first detailed understanding of how groundwater impacts NSR flows in the Edmonton Region. In doing so it facilitates municipal and regional water and disaster planning, lays the groundwork needed to examine the long-term impacts of regional land use and climate change on the quantity and quality of water in the NSR, and facilitates the goals of Alberta's water strategy in support of a healthy and sustainable society, economy and environment.

Sustaining Healthy River Valleys: Health Assessment Tools for the South Saskatchewan River Basin and other Dryland Rivers of Western North America (University of Lethbridge)
Relatively modest changes in operation of the Oldman, Waterton and St. Mary dams has led to substantial environmental recovery. However, adaptive management is complex and directly hindered by the lack of timely and cost-effective indicators. This research project will develop indicators for river health and will utilize emerging widespread and inexpensive satellite imagery, coupled with imaging from unmanned aerial vehicles (drones) and field analyses. The project will verify and apply these for the rivers of the South Saskatchewan River Basin (SSRB) and, along with other global leaders in this emerging scientific field, will also apply these indicators to rivers in BC and in semi-arid regions of the western United States. The tools that will result from this study will provide rapid and widespread measures that utilize the existing public resources of remote sensing. This will accelerate the expansion of the Functional Flow strategy to other regulated rivers across Alberta, Canada and worldwide.

Further Information:
Water Innovation Program (WIP): https://albertainnovates.ca/programs/water-innovation/

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5. Other

Watershed Stewardship Groups

Background

Water for Life, Alberta's Strategy for Sustainability, embraces a philosophy of shared responsibilities, partnership and collaboration with other governments, stakeholders, Indigenous people and local volunteer groups to manage watersheds.

Watershed Stewardship Groups (WSGs) are one of the key partners of the Water for Life Strategy carrying out watershed stewardship activities. These activities are foundational to watershed management and include improving water quality by relocating livestock off creeks, shoreline clean up and planting, improving fish and other wildlife habitat, restoring riparian areas and wetlands and collaborating with local landowners to share and encourage best practices that support watershed health. The mandate of these groups is often gathering the best information available, education and awareness, and translating knowledge into actions through implementation of best management practices.

Government of Alberta staff may assist watershed stewardship groups with start-up, administration and technical support. Staff provide technical assistance, best management practice advice and knowledge of legislation relative to proposed actions. The provincial government may provide funding for specific stewardship projects, programs or products that meet the provincial government priorities and objectives.

There are growing stewardship initiatives across the province. The following highlights some of the key ongoing stewardship initiatives:

- **Lac La Biche Watershed** is located in the boreal mixed wood ecoregion of Athabasca River Basin. The lake is the seventh largest permanent waterbody in Alberta and provides important habitat for many fish species, colonial and migratory water birds, and aquatic mammals. The lake is a source of water for local communities, agriculture, forestry and oil and gas. The lake is valued for its sandy beaches, forestry parks, and recreational opportunities. Lac La Biche watershed management is led by the county in collaboration with local steering committee. The purpose of the plan is to develop a comprehensive, science-based plan to coordinate actions for the protection and improvement of Lac La Biche and its watershed. A technical summary report has been completed as a foundation to the plan development and provides current updates and benchmarks to key issues and environmental indicators.

- **Heart River Watershed Management Plan Initiative** – The Heart River is a tributary of Peace River Basin at the Town of Peace River. The river is a source of municipal and regional rural water supply for Northern Sunrise County, the village of Nampa, and other rural communities. The river's water quality and aquatic ecosystem are affected by resource extraction including oil and gas, forestry, agriculture and other human development within the watershed. The watershed management plan is led by local municipalities in collaboration with the local community and Indigenous people. The purpose of the plan is to provide recommendations to all levels of government and resource managers to maintain and enhance the quality of water in the Heart River Watershed. The plan will provide direction to other resource stewards, including local residents, agriculture producers, and land owners to make wise stewardship decisions to protect the watershed.

- **Pigeon Lake Watershed** is a large recreational lake located in central Alberta in the Battle River Watershed. The 2019 watershed management plan is currently being implemented. Major projects include enhancing lake and algal bloom monitoring programs, development of watershed-focused bylaws and regulations, creating a shoreline naturalization guide, and producing low impact development resources for municipal drainage systems. They continue to work closely with First Nations and local communities to realize their vision of working together for a healthy watershed, heathy lake, and healthy community.

- **Wabamun Lake Watershed** is a large recreational lake located in Central Alberta in the North Saskatchewan River Watershed. Since the formation of the Wabamun Watershed Management Council in 2006, development of a watershed management plan has been a goal. A State of the Watershed report was developed in 2013, and work began on the Watershed Management Plan in 2018. The management council is now consulting on the draft watershed management plan, focusing on four overarching goals: 1.) Good Water Quality, 2.) Healthy Aquatic Ecosystems and Biodiversity, 3.) Wise Land Use, and 4.) Engaged Stewardship. The intent is to engage as many people before finalising to ensure the plan addresses the issues and is well-supported by everyone who lives, works and plays in the Wabamun watershed.

Further Information
Information about Alberta Stewardship initiatives is available at: http://stewardshipdirectory.com/

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Watershed Planning and Advisory Councils (WPACs)

Background
Watershed Planning and Advisory Councils (WPAC) are non-government, multi-stakeholder organizations designated by the province under Water for Life - Alberta's Strategy for Sustainability (2003), renewed in 2008. Their precise membership varies, but they generally include regional industries, environmental non-government organizations, provincial government departments, municipal and federal government representatives, First Nations, and Métis. Their roles include watershed assessment and state of the watershed reporting, integrated watershed management planning and education. They bring interested parties together to address watershed issues and encourage collaboration.
There are eleven WPACs in Alberta with one designated for each of Alberta's major river basins. Three WPACs are found in the Mackenzie River basin;

- Mighty Peace Watershed Alliance
- Athabasca Watershed Council
- Lesser Slave Watershed Council This is the only lake-based WPAC. Lesser Slave Lake is in the Athabasca River basin.

The Alberta Government provides funding for the 11 Councils' core operations ($2.72 million in 2020 -21) and has representatives on their boards of directors. The government also provides funding, staff resources and information to support specific WPAC projects. There is

considerable collaboration between the government and its WPAC partners and there is ongoing communication to encourage alignment with current government objectives.

Status

The following provides highlights from the past year for each of the WPACs.

Mighty Peace Watershed Alliance (MPWA)

- **Integrated Watershed Management Plan (IWMP)** – Completed and endorsed by all stakeholders and Indigenous representatives. The plan presents directions and recommendations of four main issues: a) water quality, availability and consumptive use, b) wetland and wetland loss c) non-saline groundwater and d) Peace River Flow Regime.
- **Grimshaw Gravel Aquifer Source Water Protection plan** – Completed. Grimshaw Gravels Aquifer is a glacio-fluvial deposit of coarse sand and gravel located within the Peace river Basin. It has excellent water quality and high yield. It is source of water supply for about 7000 residents. The purpose of the plan is to identify potential contaminants to the aquifer, assess associated risks and develop management actions to reduce these risks.
- **Wapiti River Watershed Source Protection Plan** – in-progress. The purpose of the plan is to identify and assess potential contaminant hazards in the watershed and develop management actions to reduce risks. The plan is led by MPWA in collaboration with local municipalities, industry stakeholder, agriculture producers and landowners. An inventory and evaluation of non-point pollution sources in the watershed was completed. The plan is expected to be completed by early 2021.
- **Watershed Restoration Projects** – through Alberta Environment and Park's Watershed Resiliency and Restoration program and Environment and Climate Change Canada's Environmental Damages Fund, MPWA has undertaken several watershed restoration projects. These include a streambank stabilization and extension project in the Wapiti River, fish passage improvements in Beaverlodge River, and restoration efforts for the Redwillow watershed.

Lesser Slave Watershed Council (LSWC)

- **Integrated Watershed Management Plan (IWMP)** - Implementation is ongoing and in August 2020 the LSWC completed an implementation update report.
    - IWMP is a guidance document and includes recommendations that, when implemented by partners in the watershed, will lead to the long-term health and sustainability of the watershed.
    - LSWC completed the IWMP in 2019 and has moved into the implementation phase of planning, establishing an Implementation Committee from local and provincial governments, Indigenous partners, the forestry sector, the oil and gas sector, and NGO's who work in the watershed.
    - Implementation projects underway include tributary water quality monitoring, mapping priority wetlands and sharing the maps with stakeholders, stream crossing remediation in the Upper Swan watershed, and providing flood hazard maps to our stakeholders and communities.
- **Tributary Monitoring Program** - LSWC completed its third year of monitoring, which includes 15 sites on five major tributaries of Lesser Slave Lake.
    - Data is publicly available here: https://mackenziedatastream.ca/#/
    - LSWC has partnered with Swan River First Nation to collect additional water quality parameters on the Swan River sites and we are working with Big Lakes County to conduct fecal source tracking on sites along the West Prairie River.

- **Trade Show and Local Events Participation** - Attendance to promote the organization and share the popular Lesser Slave Lake Stewardship Handbook.
- **Kids Can Catch, third annual ice fishing event** (February 2020) in Joussard saw over 100 anglers participate.
- **Watershed Enhancement Projects** - The LSWC has received Watershed Resiliency and Restoration Program grant support, and financial support from Big Lakes County Agricultural Service Board, to deliver on-the-ground watershed enhancement projects with landowners.
    - The overall goal is to improve watershed resiliency to floods and droughts by creating healthy wetlands and riparian areas.

Athabasca Watershed Council (AWC)

- **Integrated Watershed Management Plan (IWMP)** – Draft completed. The IWMP addresses watershed management issues that transcend water use, ecosystems, and water issues in the watershed. The technical committee is currently preparing to release to the public for feedback and input. The AWC will also start an outreach strategy to bring it to the stakeholders and indigenous communities for support and endorsement.
- **The Pembina Project** will build on data gaps that were identified in the State of the Watershed Reports to increase watershed resilience through wetland and riparian habitat restoration and implementation of best management practices. The Athabasca Watershed Council is working with Fiera Biological Consulting (Fiera) that has developed and applied a GIS methodology to rapidly map and assess riparian areas and generally assess pressure on riparian system function throughout the Pembina sub-watershed.
- **Education and Awareness –**The AWC's Children's Programs provide watershed science educational and outreach activities that support learning outcomes of Alberta's curriculum, to increase watershed literacy in the Athabasca Watershed.
- **Athabasca Watershed Community-Based Monitoring Program** - The AWC is launching a 3-year community-based monitoring program in collaboration with the CABIN Eastern Slopes Collaborative to assess local community needs, share expertise and resources required for the Athabasca Watershed. Organizations will complete necessary training, identify local study objectives and sites, and collect data from streams using national CABIN sampling protocol and STREAM eDNA metabarcoding analysis. The AWC is currently working on a study design and they were trained in CABIN protocol early September.
- **Board Development and Training** - The Athabasca Watershed Council Board has approved the Terms of Reference for a Board Development and Training Committee and appointed members.

Further Information

For further information about Watershed Planning and Advisory Councils, see **https://www.alberta.ca/watershed-planning-and-advisory-councils.aspx?utm_source=redirector**

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