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THE PEACE WATERSHED

CURRENT AND FUTURE WATER USE AND ISSUES, 2011

MARCH 2012

Mighty Peace Watershed Alliance

Watrecon Consulting

EXECUTIVE SUMMARY

This study was undertaken to assist the Mighty Peace Watershed Alliance (MPWA) in developing its state of the watershed report. The objective of this report is to summarize what is currently known about water quantity, water quality, water use and potential water supply and quality issues throughout the Peace watershed.

The Watershed

The scope of this study is the entire Peace Watershed within Alberta; including the main stem and all major tributaries. The Peace River is about 1,923 kilometres (km) in length and stretches from the head of the Finlay River, located in British Columbia, to Lake Athabasca. Water from the Peace watershed and the Athabasca river system then join to form the Slave River which travels 434 km before draining into Great Slave Lake in the Northwest Territories. The Peace watershed drains an area of approximately 302,500 square kilometres (km^2), of which 60% (182,500 km^2) is in Alberta. The Peace watershed covers about 28% of the landmass of Alberta. There are six sub-basins in the watershed, including three along the mainstem of the Peace River (upper, central and lower), one for the Slave River, and two for the major tributaries (Smoky/Wapiti and Wabasca). This report provides an overview of water quantity, quality, use and issues for each of the six sub-basins as well as for the entire watershed.

The People

In 2006, approximately 136,800 people lived in the Alberta portion of the Peace River Watershed. This represents about two-thirds of the population of the entire Peace River basin and 4% of the Alberta population. People living in the Smoky/Wapiti sub-basin, which includes the City of Grande Prairie, account for two out of three people living in the Alberta portion of the watershed. The remaining third of the population is relatively equally distributed throughout the upper, central and lower Peace sub-basins and the Wabasca sub-basin. Only 85 people are estimated to live in the Slave sub-basin. Compared to the Alberta average, the population of the Peace watershed tends to be younger, with a higher percentage of Aboriginal people. People living in the Peace watershed are more likely to participate in the labour force and be employed in natural resource-based industries. Median incomes in the watershed are similar to the Alberta median income.

Land and Resource Use

Agriculture, oil and gas, forestry and other human activity has disturbed about 57% of the watershed. The upper reaches of the watershed are more disturbed than the lower reaches, parts of which are located in Wood Buffalo National Park. Agriculture occurs on about 25% of the land in the watershed, with 50% of farms occurring in the Smoky/Wapiti sub basin and 25% in the Upper Peace sub-basin. Nearly two-thirds of farms (62%) raise livestock. In 2006 there were five times as many cows as people in the watershed and slightly more than one pig per person. Livestock generated 7.2 million tonnes of manure.

About 6.4 million cubic metres of timber were harvested in the Peace watershed in 2009/10. This represents one third of all wood harvested in Alberta. Much of the land in the watershed is being harvested under the terms of a Forest Management Agreement (FMA).

There are 61,851 oil and gas wells, 305,400 km of cutlines, and 34,216 km of pipelines in the Peace watershed. The highest land disturbance from oil and gas occurs in the Upper Peace sub-basin where there are 6.6 kilometres of seismic lines and pipelines for each square kilometre of non-agricultural land. The average for the watershed is 2.1 km/km^2. High levels of disturbance are also found in the Smoky/Wapiti sub basin (4.1 km/km^2). However, the Wabasca sub-region accounts for 35% of all seismic lines in the watershed.

Surface Water

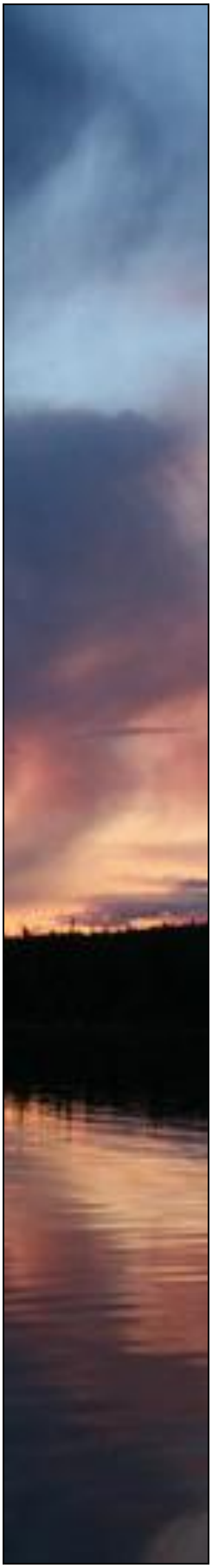
The Peace River is a regulated river, which means that flows in Alberta are strongly influenced by releases from the Williston Dam in British Columbia that produce hydroelectric power. The effect of these releases has been to increase flows during winter flows (when power is required) and to reduce flows during the spring and summer (when water is being stored for power production in the following winter). The effects of flow regulation occur along the entire length of the Peace River, although the effects are partially buffered as a result of inflows from major tributaries, such as the Smoky River and the Wabasca River. The Peace River contributes about 65% of the average flow of the Slave River.

Water Use

As of 2011 water licences and registrations issued to people and companies allow withdrawals of up to 148,728 cubic decametres (dam^3) of surface water for use. This represents 89% of water allocations in the watershed. Allocations of surface water account for about 0.3% of the average annual flow of the Peace River at Peace Point.

Nearly two thirds of these allocations are for commercial purposes, including pulp mills, coal mines and thermal power projects. Another 19% of surface water allocations are for municipal purposes, with 7% for industrial purposes (oil and gas). Allocations for agricultural use (including agriculture, irrigation and registrations) account for 5% of total allocations. Allocations of surface water in the Smoky Wapiti sub-basin account for 57% of total allocations, while the Central Peace sub-basin accounts for another 36%. The Upper Peace sub-basin accounts for only 5% of total allocations while the Lower Peace and Wabasca sub-basins account for only 1% of the total. There were no surface water allocations in the Slave sub-basin.

Under the terms of water licences, 38% of licensed withdrawals can actually be used; the remainder is expected to be returned after use. Commercial users are expected to return 53% of withdrawals after use while municipal users are expected to return 72%. Available information suggests that 29,397 dam^3 of surface water was actually used in 2011. This represents 20% of total surface water allocations and 52% of licensed surface water use. Municipal and commercial water use each accounted for 22% of total surface water use in the Peace watershed, with agricultural water uses accounting for 27%.



Water Quality

The quality of surface water in the upper parts of the Peace watershed, including the Smoky River, is generally considered to be 'good' based on the CCME guidelines for the protection of aquatic life. However, water quality declines slightly in the lower reaches of the Peace River and in the Slave River, due to increased amounts of suspended solids, nutrients and metals, as well as increased biological oxygen demand and turbidity. The water quality in some of the smaller tributaries in upper parts of the watershed has been rated 'marginal' due to high levels of nutrients resulting from agricultural activities.

In the past, there were concerns about the effects of pulp mills in terms of their discharges of nutrients (which increase biological oxygen demand) and chlorinated compounds (such as adsorbable organic halides). However, recent changes in pulp mill technology have significantly reduced the amounts of these materials being discharged. Each of the pulp mills in the watershed (one in Grande Prairie and one near Peace River) monitors its effects on aquatic health and periodically reports this information to Environment Canada and Alberta Environment and Water.

Groundwater

Groundwater can be drawn from deeper bedrock aquifers, or shallower surficial or over-burden aquifers, such as the Grimshaw Aquifer. Within the Peace watershed, the highest groundwater yields are found in shallow overburden sands making up the Grimshaw Aquifer and from buried valley aquifers in the Wabasca sub-basin where yields in excess of 100 imperial gallons per minute (IGPM) are noted. The lowest yields are found in the Upper Peace sub-basin (less than 5 IGPM).

Water Use

Water licences and registrations issued for groundwater allow withdrawals of up to 18,684 dam^3 of water for use. This represents 11% of water allocations in the watershed. Just over half of these allocations (51%) were for industrial purposes (oil and gas), 26% was for municipal purposes, and 13% was for agricultural purposes. Allocations of groundwater in the Smoky/Wapiti and Wabasca sub-basins accounted for 84% of total groundwater allocations within the Peace watershed.

Under the terms of water licences, 85% of licensed withdrawals can actually be used. Municipal users are expected to return 55% of water after use. Available information suggests that 8,402 dam^3 of groundwater was actually used in 2011 in the Peace watershed. This represents 45% of total groundwater allocations and 53% of licensed water use. Industries accounted for 39% of actual groundwater use, while agricultural uses accounted for 21% and municipal use accounted for 21%.

Water Quality

The quality of water from both surficial and bedrock aquifers in the Peace River watershed is generally chemically hard and high in dissolved iron, and high in Total Dissolved Solids (TDS). The best quality groundwater is found in the west-central portion of the watershed. Many of the surficial aquifers underlying the agricultural areas in the Wapiti/Smoky and Upper and Central Peace sub-basins are vulnerable to contamination from underlying saline water.

The quality of groundwater is being monitored by Alberta Environment and Water at observation wells within the Peace River watershed in the general vicinity of Grande Prairie, Peace River, and Fort Vermilion.

Future Water Use

Over the period from 2011 and 2025, water use in the Peace watershed is predicted to increase by 40%. Industrial water use, especially related to oilsands and the use of in-situ thermal (steam) technology, is expected to account for 61% of the increase. Population growth in some parts of the watershed will continue to increase the demand for water and there are expected to be relatively small increases in water use by the agricultural sector. Most of the predicted increases in water use will occur in those parts of the basin that have oil sands and heavy oil deposits, specifically in the Central Peace and Wabasca sub-basins. Groundwater use will increase from 22% of total water use in 2011 to 31% by 2020.

Current and Future Water Issues

Despite the perception that the watershed has an abundance of surface water, water shortages are an important issue because most users are not located on one of the major rivers in the watershed. Many municipalities and other users have licences that allow them to take water from more than one source. During a prolonged drought, senior water users (those with the oldest licences) have priority so junior licensees will have to cease water withdrawals, resulting in lost production and economic hardship. Management of available water during drought periods will necessitate a better understanding of allocations and actual water use, and this is currently problematic because not all licensees, especially those with licences issued for irrigation, agricultural or other water uses, have been reporting actual water use, and very few water users report return flows.

Increased demands for surface water will place increasing demands on rivers and lakes and, at present, there is limited information on the health of aquatic ecosystems in the Peace watershed and on whether ecosystem health is remaining the same or deteriorating. A key challenge will be to undertake instream flow needs assessments for most of the main tributaries of the Peace River in order to determine how much water can be withdrawn without compromising the health of aquatic ecosystems. This not an issue for the mainstem of the Peace River; releases for hydroelectric power generation have resulted in higher flows during the summer periods than would occur under normal conditions.

An existing and increasingly important issue in the Peace watershed and elsewhere in Alberta relates to the protection of groundwater quantity and quality, especially in regard to the effects of coal bed methane (CBM) extraction, mining, drilling, seismic activities, and the practice known as “fracking”. However, the Alberta Government has established a regulatory framework to protecting aquifers from over-use and physical damage or impairment.

The most important future issue for the Peace watershed is the development of additional hydroelectric capacity and the resulting effects on river flows. Changes in flows as a result of the Williston Dam are believed to have changed the frequency of ice jams on the lower Peace River and these effects, combined with drought conditions, have already resulted in a serious reduction in perched lakes and wetlands in the Peace Athabasca Delta (PAD).

Planned hydroelectric projects include a small run-of-river project on the Peace River near Dunvegan (approved but not yet built) and the proposed Site C hydroelectric project in British Columbia. There is also potential for hydroelectric development on the Slave River.

Concerns associated with additional hydroelectric development are related to changes in downstream flows (especially during reservoir filling), changes in the ice regime (especially in terms of the PAD), effects on navigation, and effects on fish habitat, mortality and migration. It is expected that issues will be addressed during regulatory reviews for the proposed projects.

Climate change may also be an issue in the watershed. There are already reduced snowpacks (due to less snow and more rain) that result in lower flows and a reduced probability of ice jams. Climate change is also expected to affect the thickness and location of river ice.