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Alberta Water Security Bulletin Summer 2022

Included in this issue:

- 2022 Outlook summary
- Snow cover area 2021 - 22
- Rainfall predictions for 2022
- Drought conditions in Southern Alberta
- Mountain runoff forecast

Alberta Water Bulletin - Summer 2022

Summer 2022 Outlook

Water is one of the most valuable natural assets we have and taking care of it should be our top priority. This limited resource keeps changing its state on Earth between atmosphere, ocean, rivers, snowpack and underground. Water availability, both as surface water and groundwater, is essential for agriculture, human consumption, industry, and energy generation. There are several factors which can affect the water availability but the most important one is the local and regional climate.

There has been a loss of 11% glacier cover in Western Canada from 1985 to 2005 with area loss exceeding 20% on the eastern slopes of Canadian Rockies. The loss of this stored water is now beginning to show its effects on annual streamflows, particularly during the winter season. Global warming projections indicate that glaciers on the eastern slopes will lose 80%-90% of their volume by the year 2100. As such, glacier contributions to streamflow in Alberta could decline from 1.1 km³/annum, as noted in the early 2000s, to 0.1 km³/annum by the end of this century.

The annual mountain snowfall also acts as a natural reservoir for storing precipitation during the cold season. Then, during the spring months it melts and flows to the rivers adding to the supply of water for many users. Understanding the seasonal snow melt, rainfall events, and how this affects streamflow is essential to effectively manage water resources through the year.

Hydrological & Hydraulic Modelling

Climate change is likely to result in water scarcity and more frequent extreme events. Integrated water resources management can help address risks and lead to better decision making regarding the use of our water supplies. It has become increasingly important to evaluate the current hydrological conditions and use this information (e.g. precipitation, evapotranspiration, infiltration, snowmelt) in hydrological modelling processes to help with better management and administration of water resources.

Integrated Sustainability has the capacity to help its client regarding the key issue of water security and sustainable management with the use of hydrological and hydraulic modelling. These kinds of models can predict the volume of water (quantitatively and qualitatively) in streams or reservoirs, which can benefit decision making for water-reliant activities.

If you are looking for a comprehensive, reliable water forecast tool, Integrated Sustainability can help and provide the necessary skills and support.



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Snow Cover Area 2021-22

Analyses of how the amount and timing of these hydrological events vary are crucial to the water supply systems in basins dominated by snow and ice-melt. Figure 1 shows the average snow-covered area (SCA) in Alberta for the last 20 years. From December 2021 to February 2022, SCA has been about ~20% above average. In this water year (Oct 21-Sep 22), the SCA started accumulating and remained a little longer than the previous 20 years average. By the second week of June 2022 nearly all the snow had melted, with most streams in Alberta commencing the spring freshet. As the Figure 1 depicts, the overall SCA area was about average this water year and resulted in the normal flows in snow fed streams.

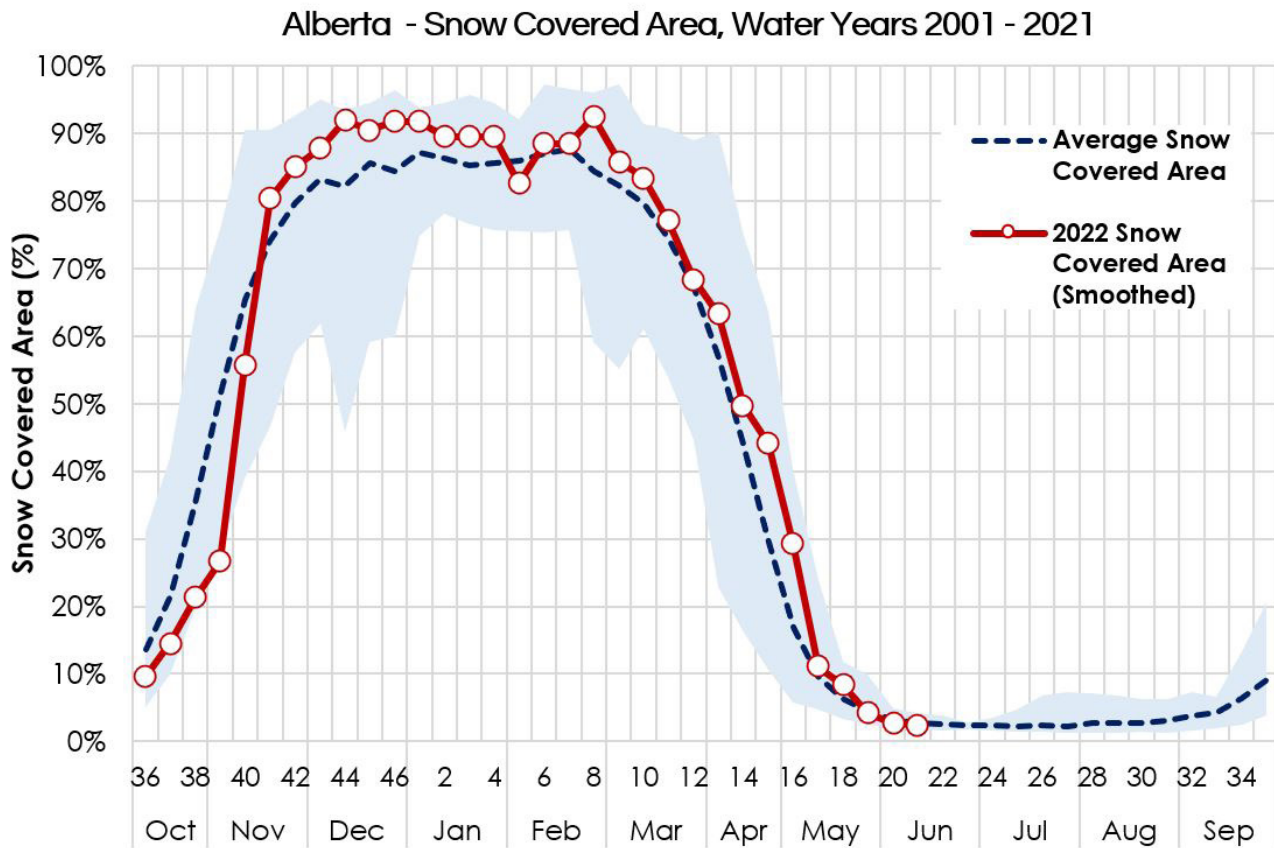


Figure 1: Average and Year 2022 Snow Covered Area of Alberta (MODIS/Terra Snow Cover 8-Day)



Rainfall in 2022

In Alberta, most of the early season rainfall occurred in April through July. Figure 2 shows the average monthly precipitation in Alberta over the last 20 years. The graph shows data only up to the date this report (i.e. 11 July 2022). According to the Global Precipitation Measurement (GPM) mission, Alberta has experienced about 35% more precipitation through January to June this year than the historic average. The graph also shows the precipitation for the year 2021 as comparison, which was below normal. The rain in June 2022 was ~15% above normal and resulted in a state of local emergency for the city of Calgary and Municipal District of Bighorn during the period of 13 June to 17 June.

Figure 3 (opposite) shows this year's summer precipitation as percentage of normal. About 40% of Alberta received above normal rainfall from May 2022 to June 2022. It is important to mention here that we are talking about precipitation only in the geographical bound of Alberta whereas about 50% total annual flow volumes comes from river catchments outside of the province.

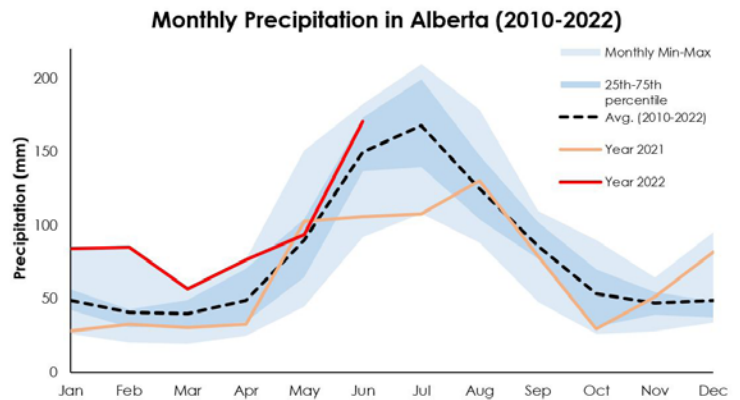


Figure 2: Monthly Average Precipitation in Alberta (GPM v6)

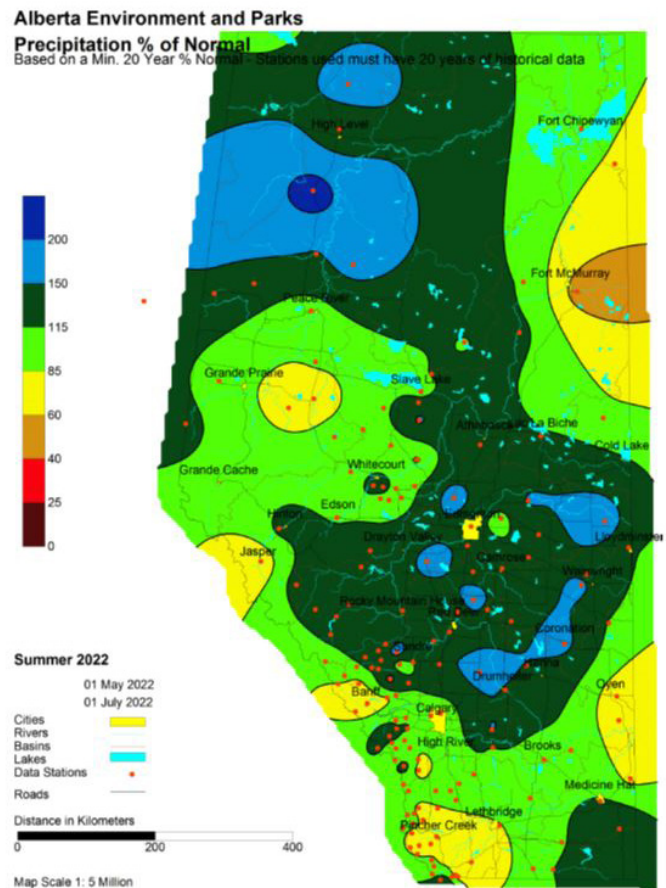


Figure 3: Summer precipitation (01 May 2022 to 01 Jun 2022) in Alberta as a percent of normal conditions.

Drought Condition in Southern Alberta

Alberta Environment and Parks has published a map showing this winter's (Nov. 2021 to May 2022) precipitation as a percentage of normal (Figure 4). More importantly, this map shows that there is a significant part of southern Alberta which had only 25% to 60% of average precipitation in last 12 months (AEP, 2022). This deficit has resulted in drought-like conditions throughout the region. According to the North American Drought Monitor, some parts of southern Alberta are still under "Extreme Drought" as of the end of May 2022 (Figure 5).

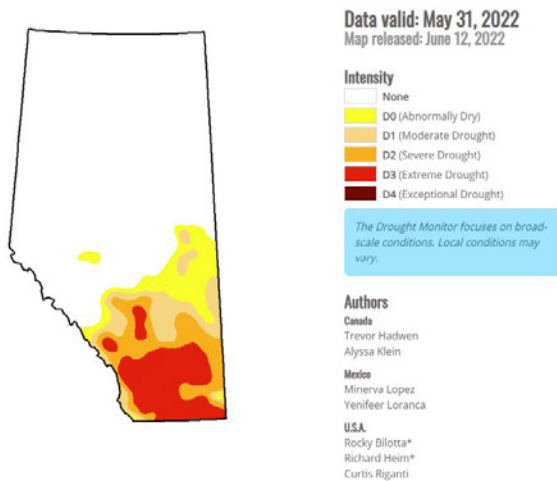


Figure 5: North American Drought Monitor (June 2022). (<https://www.ncdc.noaa.gov/temp-and-precip/drought/nadm/>)

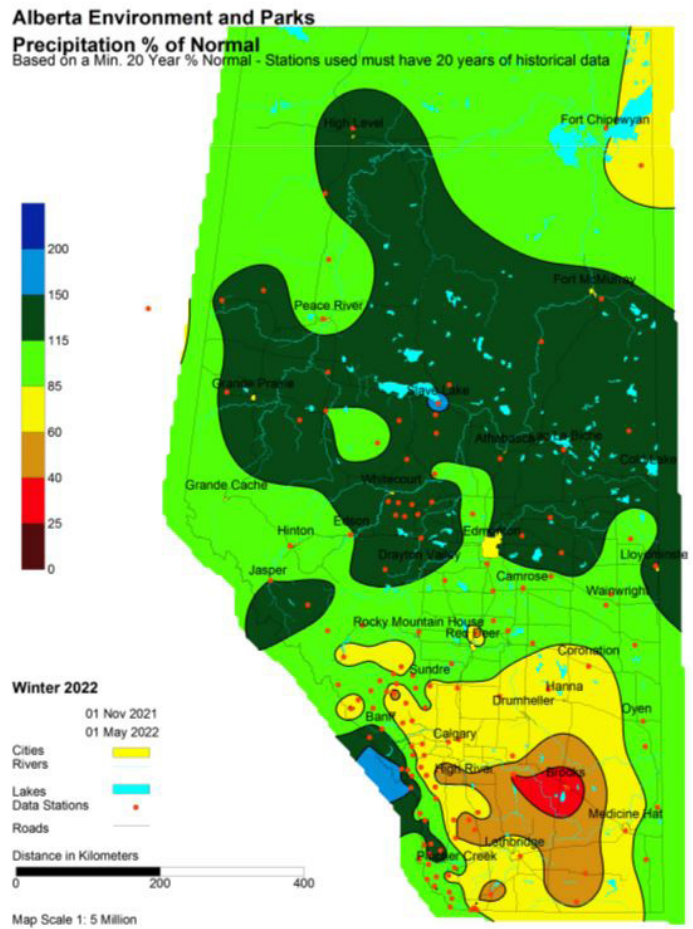


Figure 4: Winter precipitation (01 Nov 2021 to 01 May 2022) in Alberta as a percent of normal conditions.



Drought Condition in Southern Alberta - cont.

Southern Alberta is currently experiencing drier than normal conditions, which is likely to aggravate the situation. If these conditions persist, the southern half of the grain belt could see a reduction in the crop production as well as an increase in wildfire risk. Looking at the forecasted rainfall over next four weeks, this drying condition seems to persist, Figure 6 illustrates that more rains are expected on the western side of Alberta rather than on southeastern side.

Mountain Runoff Forecast

The amount of runoff contributing to river flow varies both seasonally and from year to year, as snowpacks dwindle in the summer and rivers become more dependent on rainfall and groundwater base flow. The analysis of this year's hydrological data suggests that this year major river basins of Alberta are expected to receive below average or average flows. According to AEP's Water Supply Outlook, Oldman River basin, North Saskatchewan River basin and Bow River basin could receive below average or average flows and Milk River basin is expected to receive much below average flow until September if precipitation over the remainder of period remains normal.

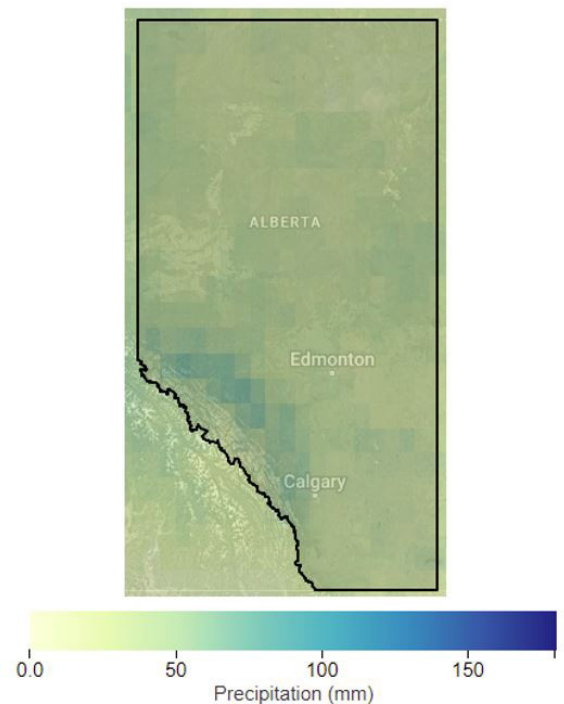
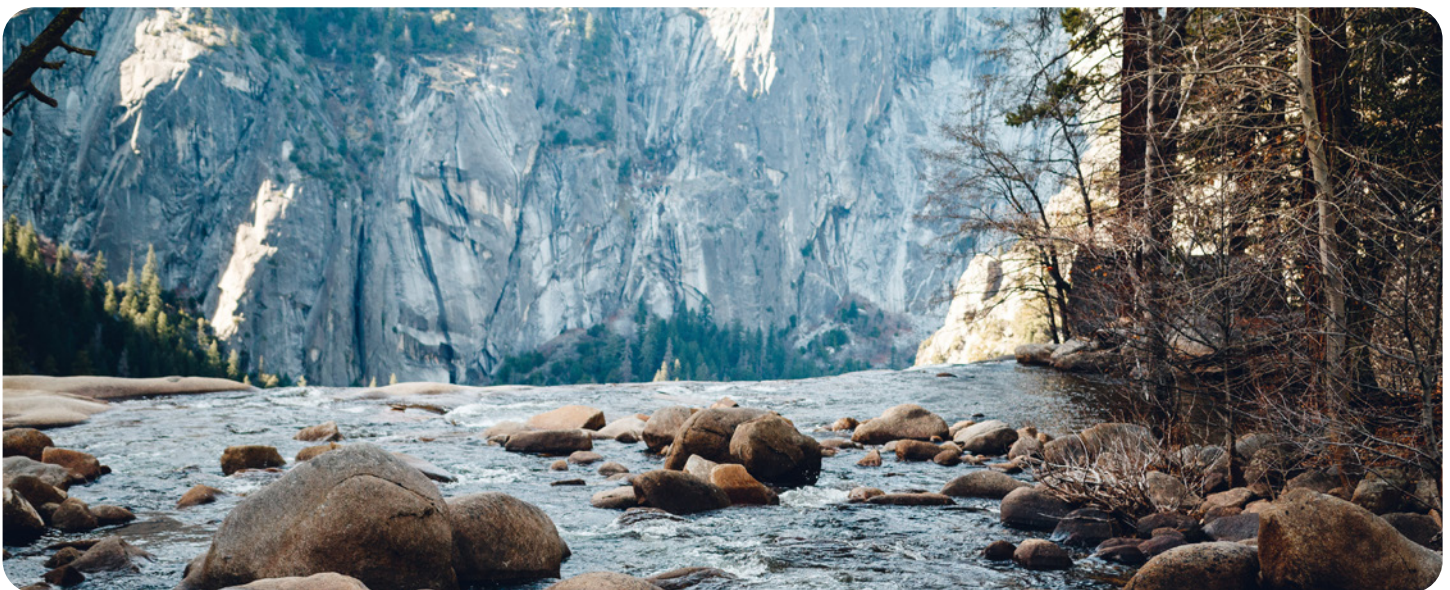


Figure 6: Global Ensemble Prediction System 4 Week Median Total Forecast 2022-06-30 to 2022-07-27 (accessed on Jul 11 2022)



Works Cited

Works Cited

AEP. (2022). Alberta Environment and Parks. Retrieved from <https://rivers.alberta.ca/>

Henderson, J. (2022, April). Low snow pack leaves southern Alberta dry. Retrieved from Toronto Star: <https://www.thestar.com/news/canada/2022/04/05/low-snow-pack-leaves-southern-alberta-dry.html>

Institute, A. G. (n.d.). Water Availability. Retrieved from American Geosciences Institute: <https://www.americangeosciences.org/critical-issues>

North American Drought Monitor. (2022, May). Retrieved from droughtmonitor.unl.edu: <https://www.ncdc.noaa.gov/temp-and-precip/drought/nadm/>

Selim Sengül, M. N. (2022). Predicting Snowmelt Runoff at the Source of the Mountainous Euphrates River Basin in Turkey for Water Supply and Flood Control Issues. *Water*.

Shawn J. Marshall, E. C. (2013). Glacier Water Resources on the Eastern Slopes of the Canadian Rocky Mountains. *Canadian Water Resources Journal*.



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Integrated Sustainability acknowledges that our Vancouver Office is located on the unceded territories of the x̓m̓əθk̓'əy̓əm (Musqueam), Sk̓wx̓wú7mesh (Squamish), and Sel̓íl̓wítl̓h (Tsilil-Waututh) Nations.

Furthermore, we also acknowledge that our Calgary Office is located on the traditional territories of the Blackfoot Confederacy (Siksika, Kainai, Piikani), the Tsuut'ina, the Îyâxe Nakoda Nations, the Métis Nation (Region 3), and all people who make their homes in the Treaty 7 region of Southern Alberta. We thank all these peoples for having cared for these lands and waters since time out of mind.