Scarcity modeling shows Alberta is in hot water

New research shows southern river basins suffer from permanent water stress in certain months of the year.

By Katie Willis on January 17, 2017

Monireh Faramarzi and colleagues developed an agro-hydrological model to study Alberta’s water supply.

Photo credit: John Ulan

Each year, approximately 3.4 million Albertans experience water stress for at least one month. Of those, 1.7 million experience the same for three months—and this number is only expected to rise.

Monireh Faramarzi, assistant professor in the University of Alberta’s Department of Earth and Atmospheric Sciences, explains that Alberta’s southern river basins suffer from permanent water stress in certain months of the year.

Water stress

"During the summer months, agriculture is the largest water consumer. In the winter, high demand from municipality, industry, and commerce causes water stress," explains Faramarzi, Campus Alberta Innovates Program (CAIP) chair in watershed science.

Water stress occurs when the demand for water exceeds the available amount of safe, clean water during a specified time period. Water scarcity in Alberta changes throughout the year, since water supply and water consumption are dynamic factors.

"Water scarcity is dependent on climate factors, such as precipitation, temperature, humidity, solar radiation, and wind speed, as well as soil, land use, and water management practices" says Faramarzi.

Hydrological modeling

To map water scarcity and uncertainty in Alberta, Faramarzi and colleagues developed an agro-hydrological model to study the water supply. The model, which accounts for major water features, geo-spatial heterogeneity, and conflicts over water-food-energy resources, models water scarcity in 2,255 sub-basins in Alberta.

"Our research shows that the Oldman, Bow, and Milk River basins experience severe water stress during July and August due to high demand," explains Faramarzi.

"We found over-exploitation of the groundwater in southern sub-basins. While more detailed analysis is required, this study provides a general and unified approach for similar analyses in other jurisdictions around the world.

Using this data, Faramarzi and colleagues will work to predict water-related risks for ecosystem water demand under future climate change and variability as well as predicting risks and opportunities for Alberta’s beef industry. Faramarzi also works closely with Alberta Innovates on the Adaptation to Changing Water in Alberta project.

"Through my research, I am working on protecting water resources for our future—and that means a balance of both economic and environmental prosperity. Developing policies and management practices that maintain this balance is a critical next step."

The paper, “Uncertainty based assessment of dynamic freshwater scarcity in semi-arid watersheds of Alberta, Canada”, was published in the Journal of Hydrology, Regional Studies.

Source: Faculty of Science