

A Regional Approach to the Identification of Surface and Shallow Subsurface Water Resources - Montney Water Project, Northeast B.C.

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SUMMARY OF APPROACH

Focused on collecting, analyzing and interpreting available information for components of the hydrologic cycle

- Multi-disciplinary, multi-agency
- Collaboration between Geoscience BC, industry, Government and communities
- Integration of public data sources
- Spatial and database framework developed
- GIS analysis to generate project outputs

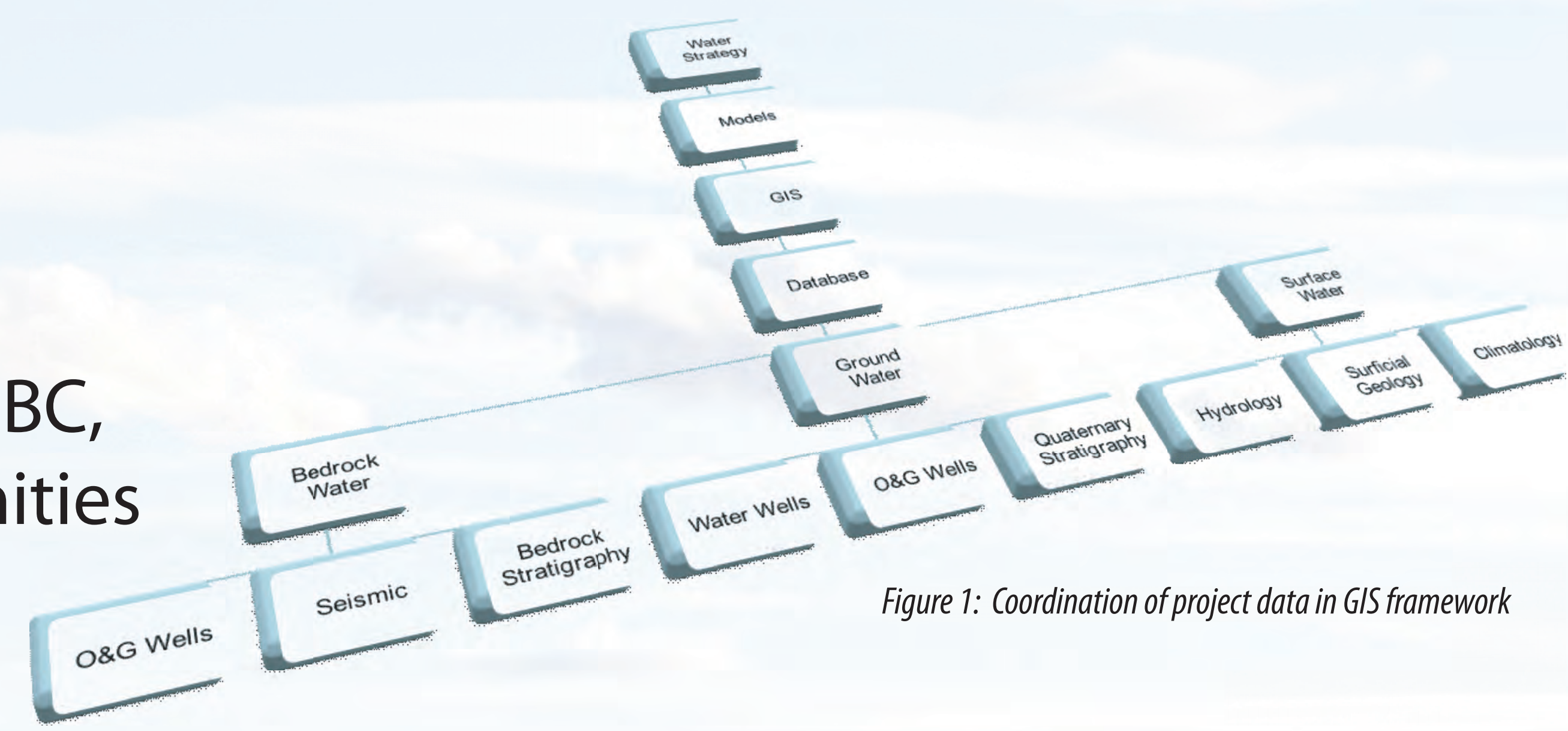


Figure 1: Coordination of project data in GIS framework

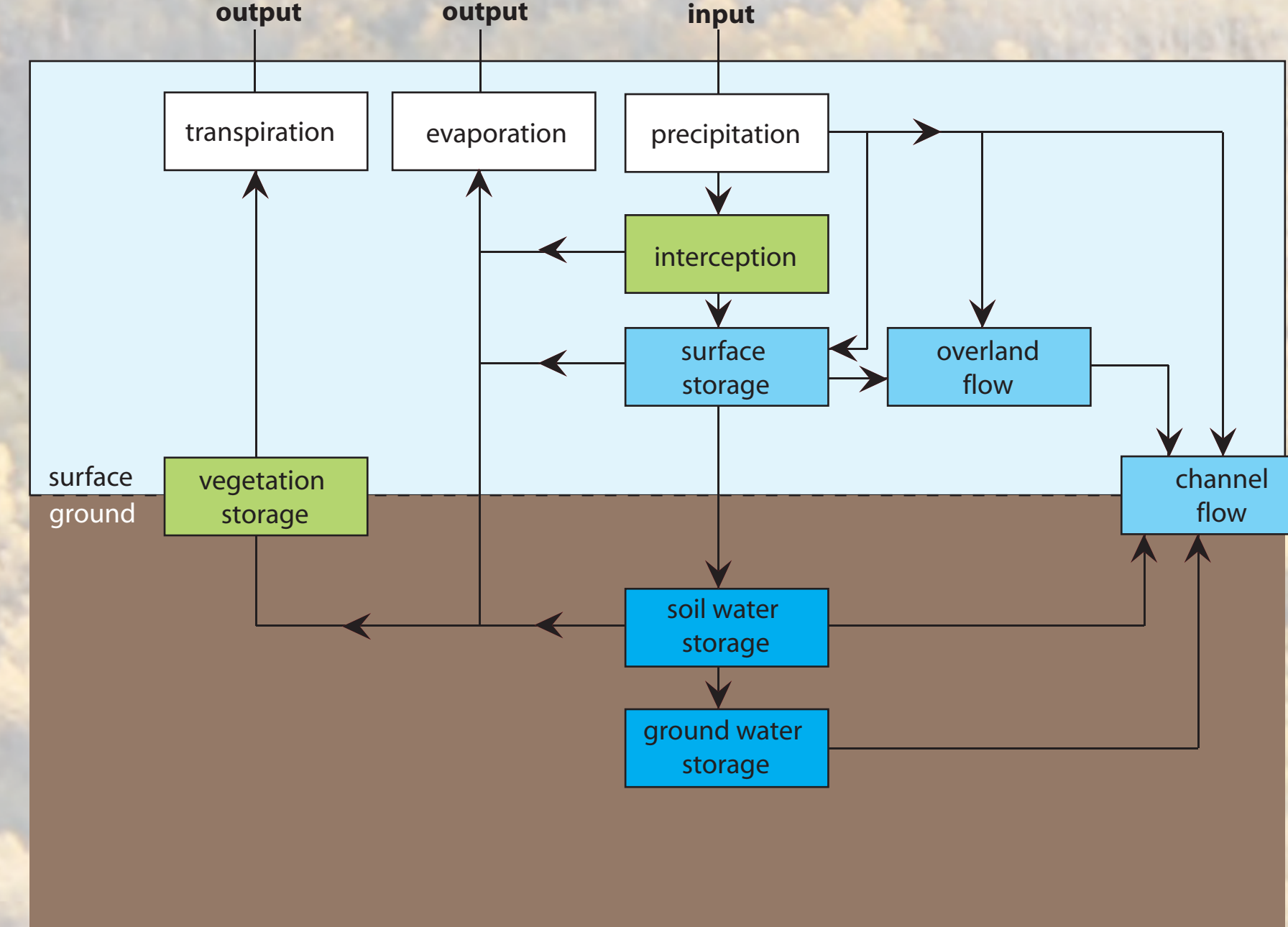


Figure 2: Storage and transfer in the hydrologic cycle.

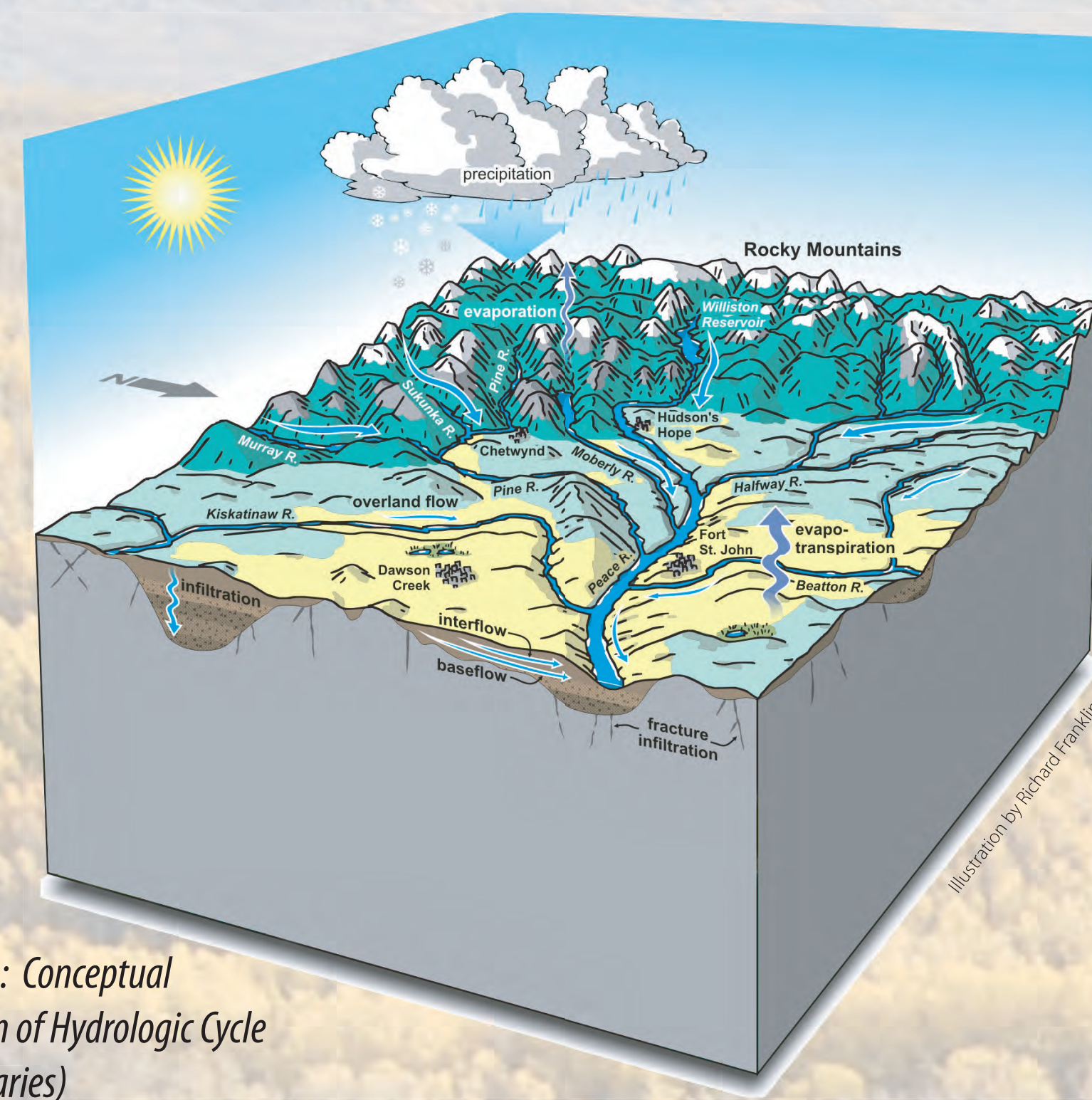
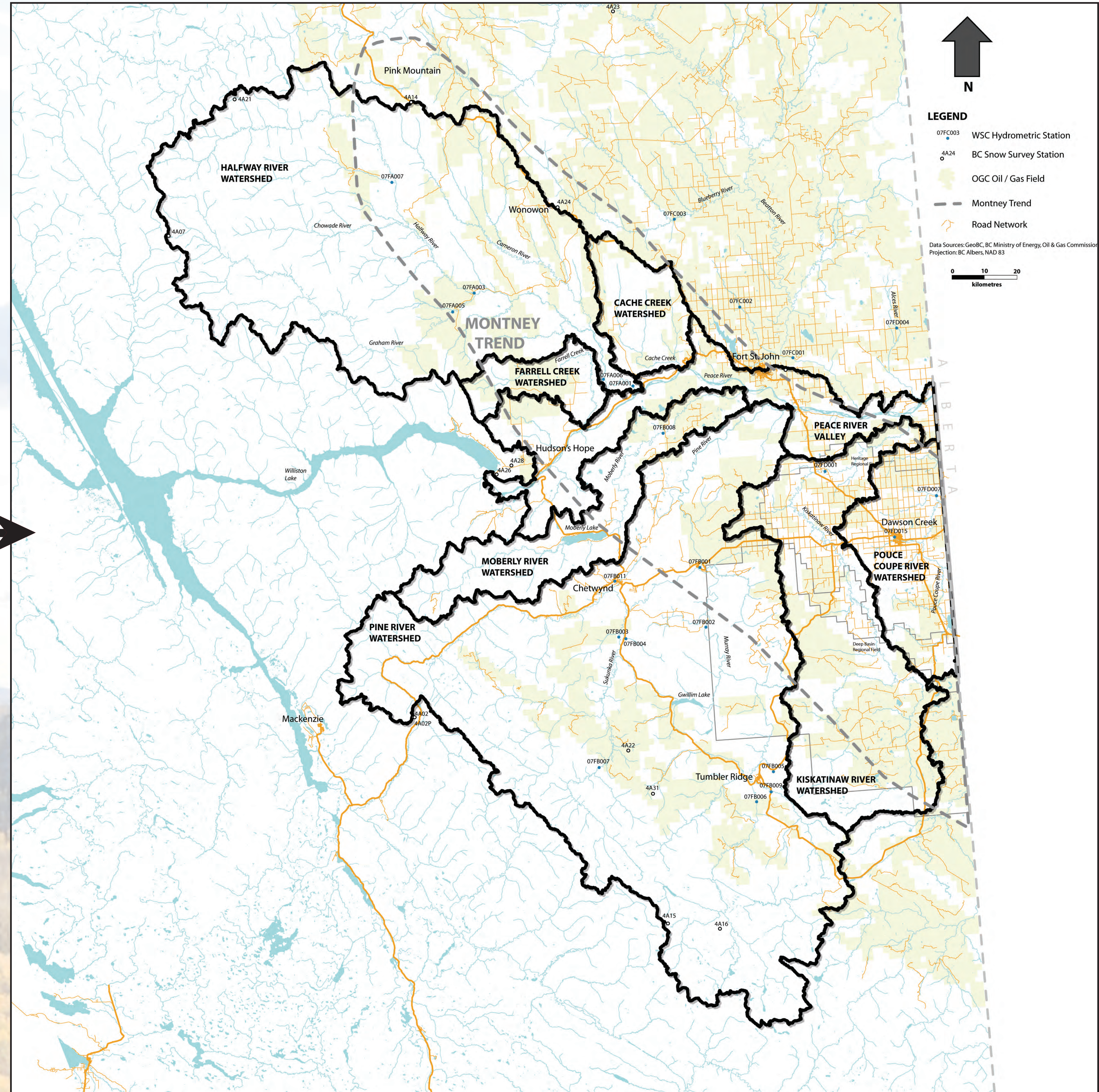
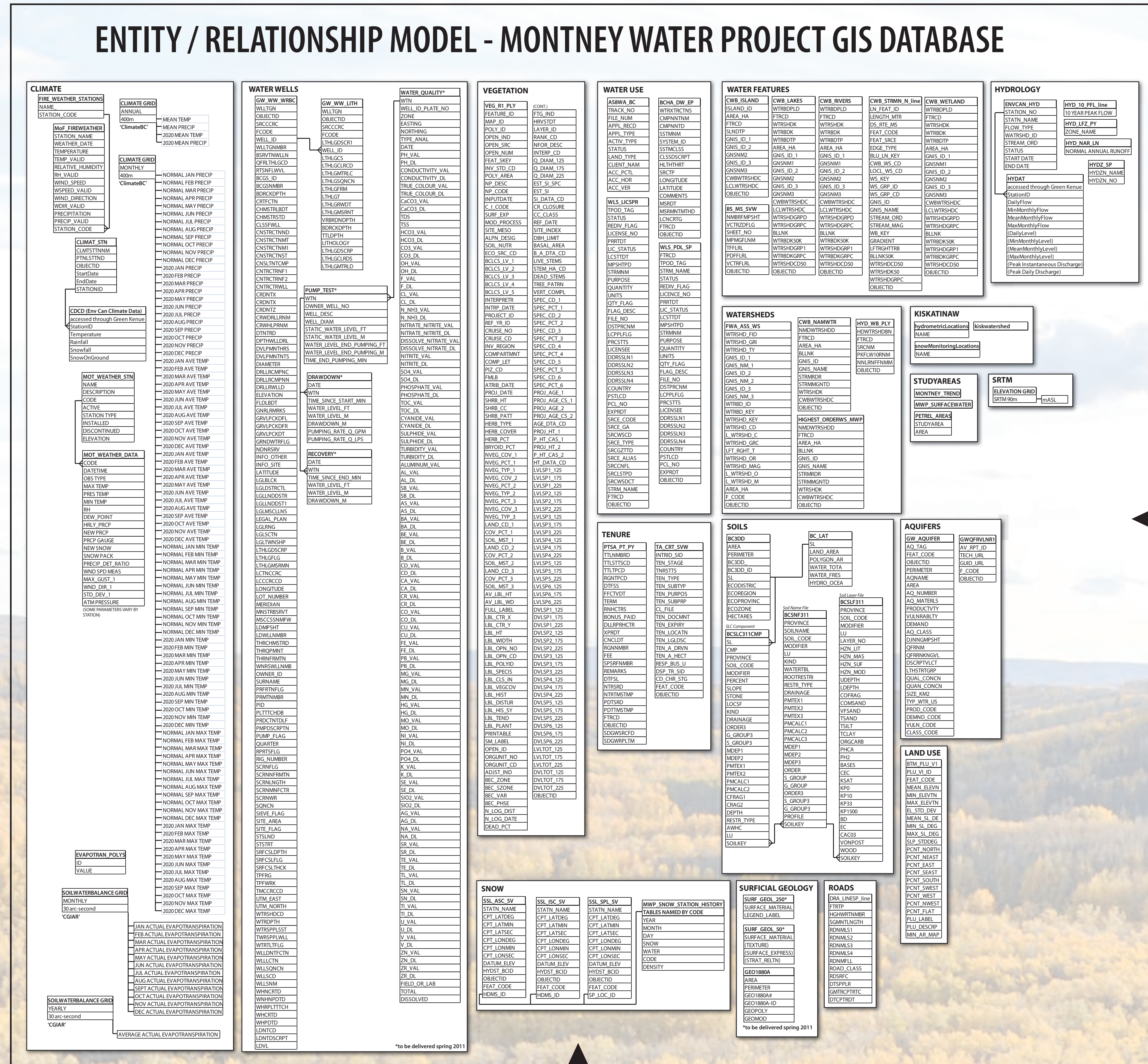


Figure 3: Conceptual Diagram of Hydrologic Cycle (scale varies)



WHAT IS THE MONTNEY PLAY?

The Montney gas play, in northeast British Columbia is a world-class unconventional natural gas resource. The tight siltstones and shales of the formation require horizontal drilling and hydraulic fracturing to liberate the gas. As operations transition into development drilling, the demand for water sources and deep sites for disposal of fluids increases.

MONTNEY WATER PROJECT OVERVIEW

The Montney Water Project was designed to provide a comprehensive inventory of water sources and potential zones for deep geological disposal sites in the Montney gas play area. Phase 1 of the project focused on collecting, analyzing and interpreting available water-related data. This phase included three general topics:

- Surface water
- Shallow subsurface water - Quaternary and shallow bedrock
- Deep bedrock water and disposal

The surface water component included collection of a variety of publicly available data; climate, hydrometric, lake volumes, vegetation and land use / land cover.

Most of the Montney play area is covered in glacial sediments which vary greatly in thickness. The first priority of the shallow subsurface component was to compile existing mapping and data and work towards a drift thickness / bedrock topography map.

The deep bedrock water and disposal component was completed by Petrel Robertson Consulting Ltd. and Canadian Discovery Ltd., and is not included on this poster.

MONTNEY WATER PROJECT PARTNERS

Geoscience BC and its seven industry partners, ARC Resources Inc., Conoco Phillips Canada, Devon Energy Corporation, Encana Corporation, Progress Energy Resources Corp., Shell Canada Ltd., and Talisman Energy Inc. provided funding for this project. In addition, the B.C. Oil & Gas Commission contributed funds through SCK. Funding supported work undertaken by the B.C. Ministry of Energy, Ministry of Environment and Ministry of Health Services, the Northern Health Authority, and the Kiskatinaw River Watershed Project being undertaken at the University of Northern British Columbia, in partnership with the City of Dawson Creek.



STREAMFLOW

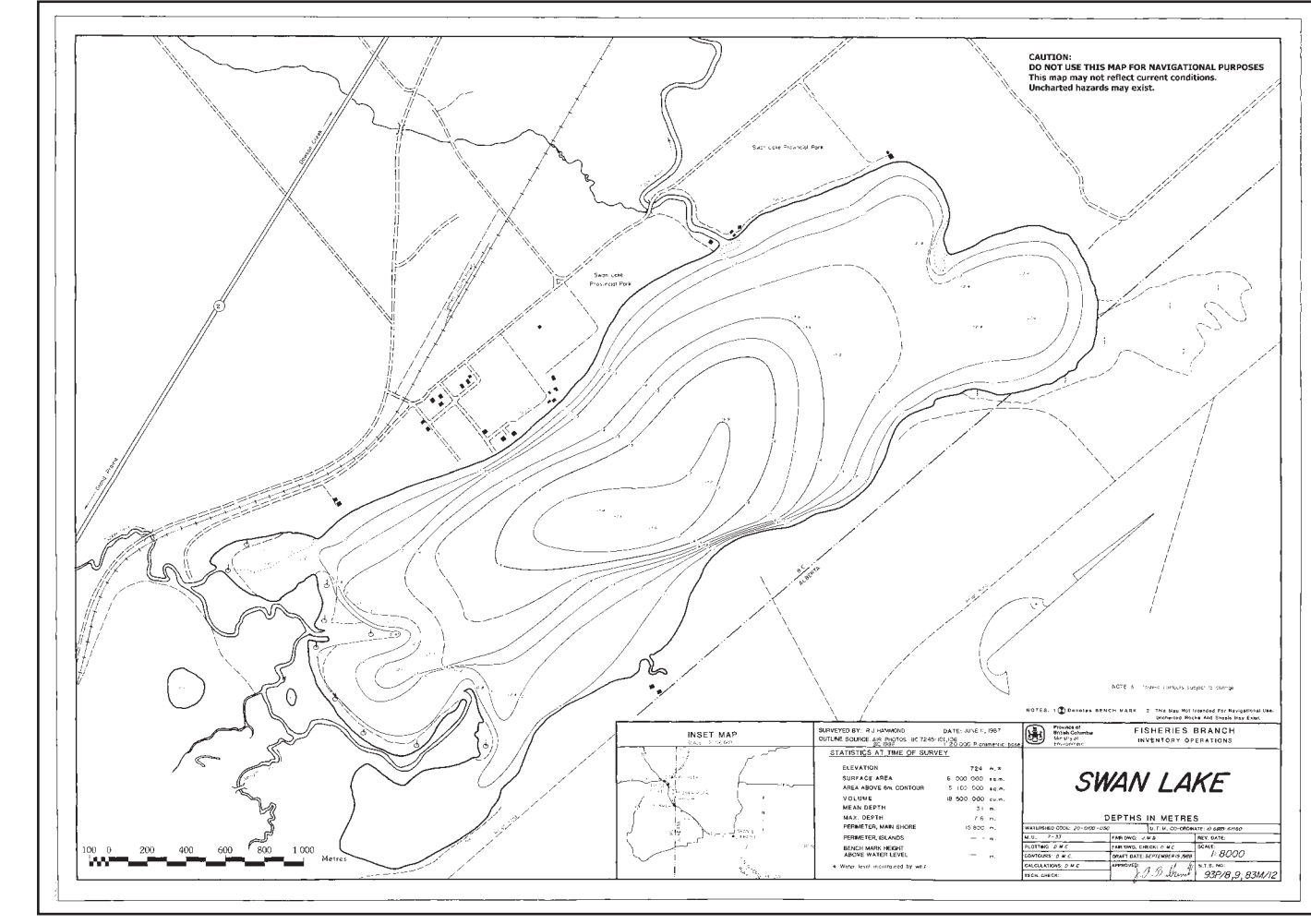
- Seasonal flow volumes
- Total annual discharge
- Peak flows
- Drought flows



Stream gauging. Photo credit: mmmmmmm on flickr

LAKES

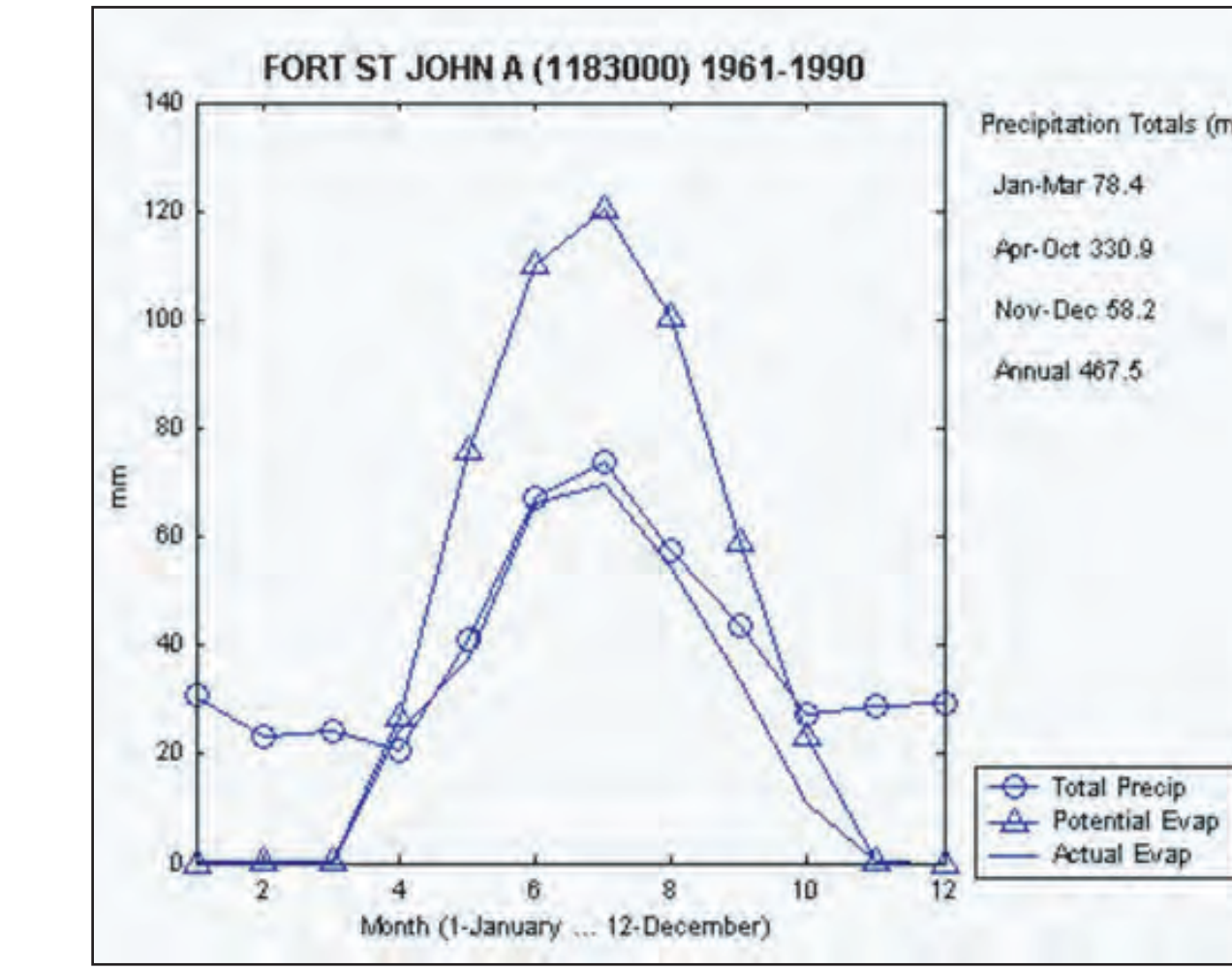
- Surface areas within assessment watersheds
- Bathymetry and volumes
- Frequency distribution within watershed groups



Bathymetry, Shiny Lake. Map credit: B.C. Ministry of Environment

WATER BALANCE

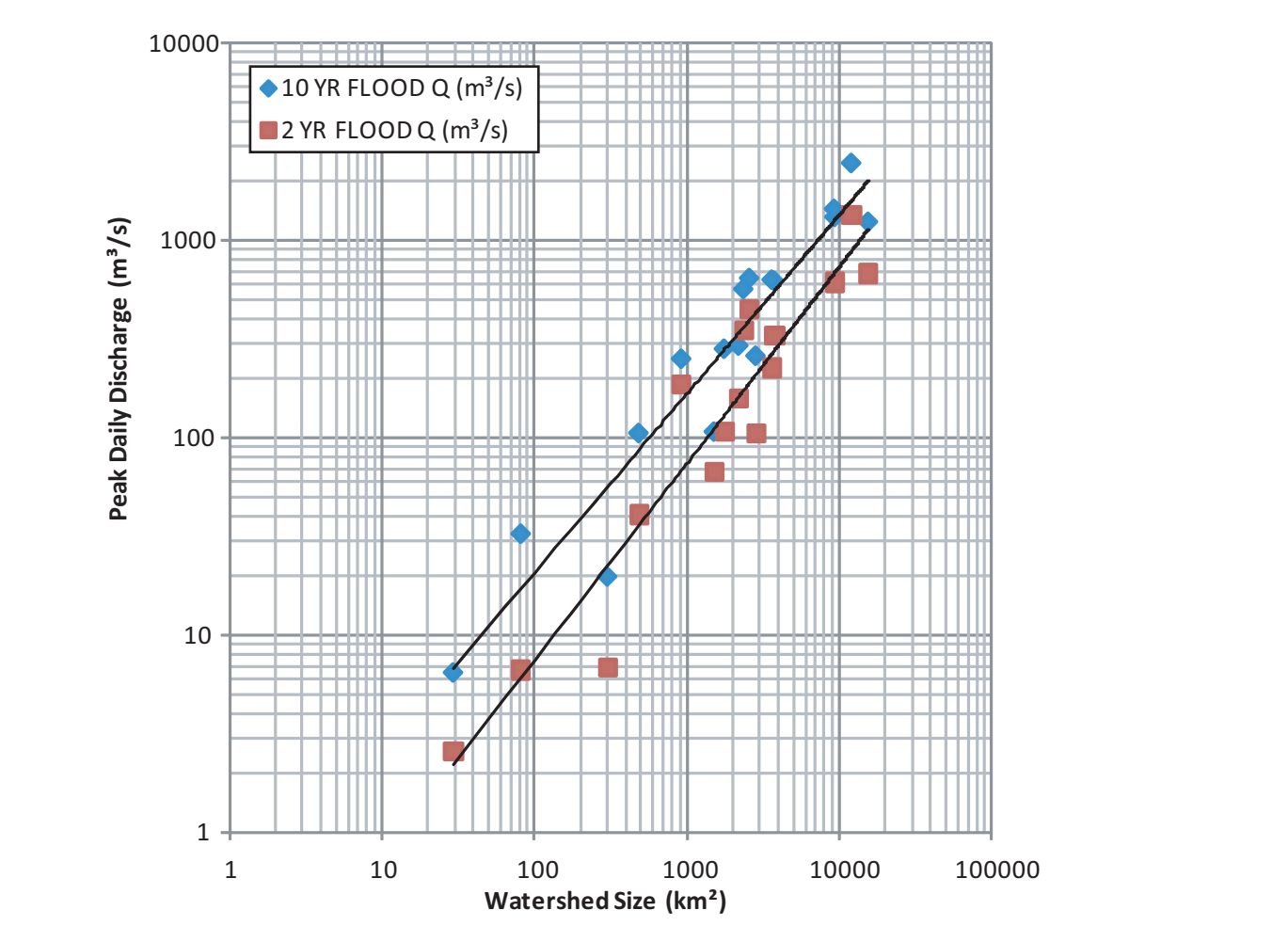
- Mass balance approach
- Input (precipitation) = output (runoff, evapotranspiration, ground water recharge)



Precipitation and evapotranspiration, Fort St. John. Chart credit: Canadian Institute for Climate Studies

UNGAUGED WATERSHEDS

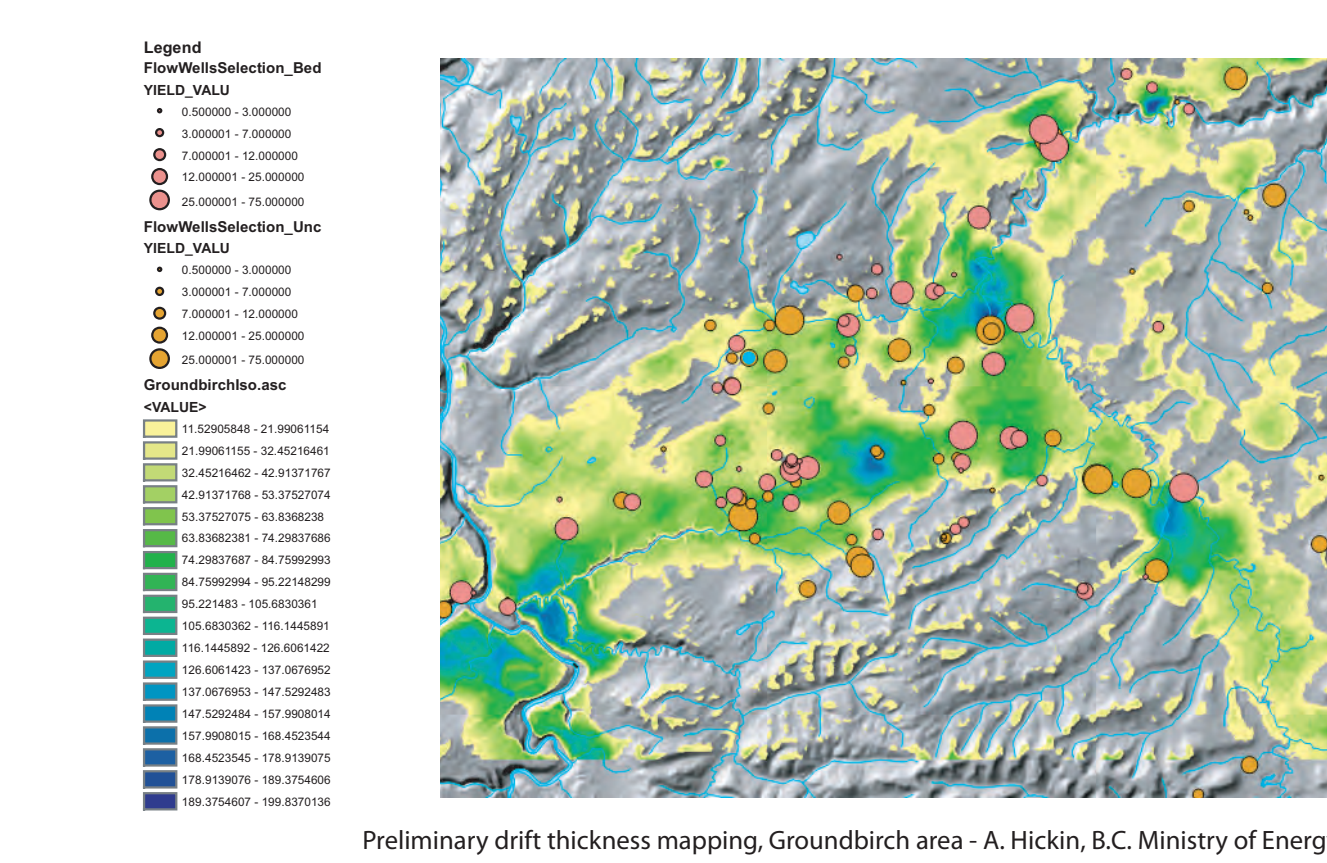
- Correlate flow conditions with watershed characteristics
- Estimate conditions in ungauged watersheds using correlation.



Watershed Size vs. Peak Daily Discharge, selected stations in the Montney gas play area

GROUNDWATER AND PALEOVALLEYS

- Flow statistics from existing ground water wells
- Drift thickness mapping to provide context for potential unconsolidated aquifers



Preliminary drift thickness mapping, Groundwater area - A. Hickin, B.C. Ministry of Energy

SURFICIAL MATERIALS, LAND USE AND VEGETATION

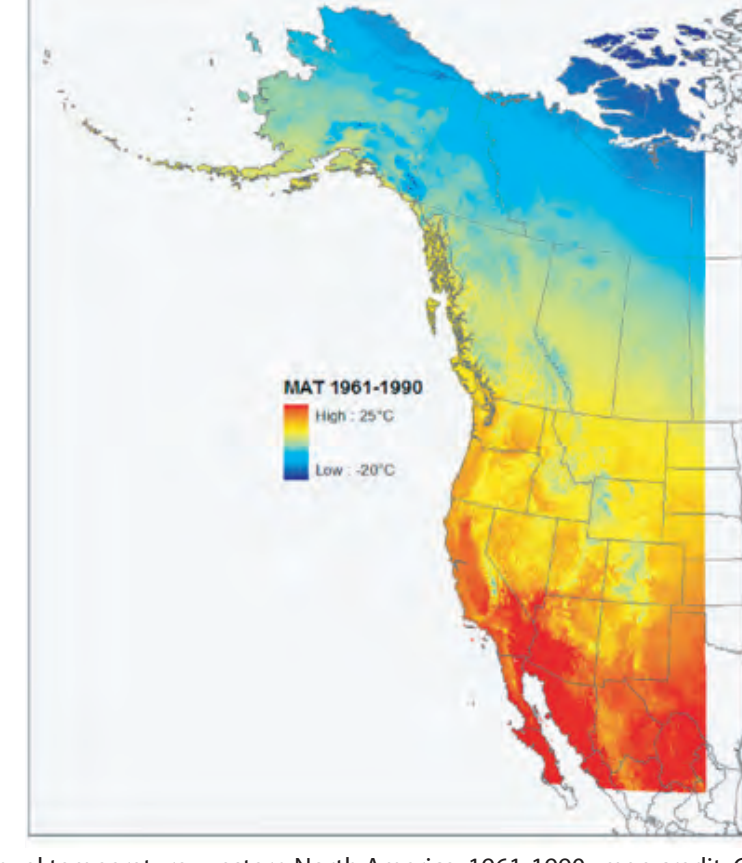
- Characteristics influence:
 - Runoff
 - Infiltration
 - Evapo-transpiration
 - Canopy interception



Exposed paleo-valley along Peace Coulee River. Photo credit: A. Hickin

CLIMATE

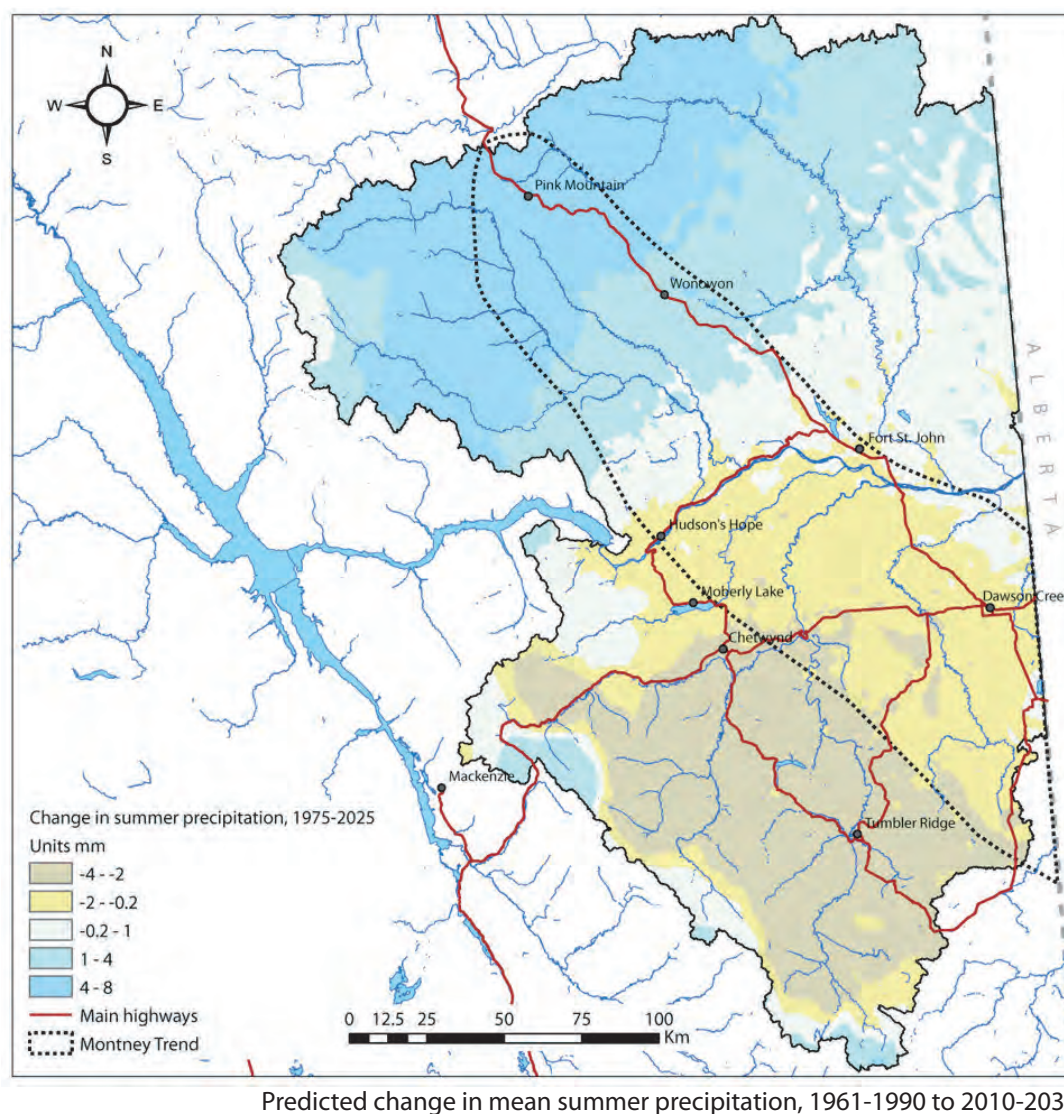
- Temperature
 - Snow vs rain
 - Evapotranspiration
- Precipitation
 - Timing
 - Amount



Mean annual temperature, western North America, 1961-1990. map credit: ClimateWet website, UBC

FUTURE CLIMATE

- Warmer, wetter
- Changes in timing and amount of precipitation -> impacts on water?



Predicted change in mean summer precipitation, 1961-1990 to 2010-2039