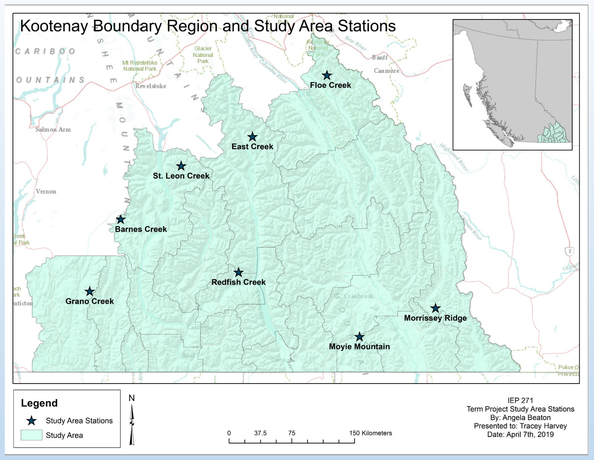
Understanding Temporal Changes in Snow Water Equivalency in the Kootenay Boundary Region



Methodology

- Collect data from BC River Forecast Centre website
- Sort over 50,000 points of data in Excel
- Condense and manipulate data (averaging monthly figures for every 3rd winter between 2005/2006-2017/2018 season) in Excel
- ArcGIS Pro Space Time Cube Training with Esri
- Create shapefiles from CSV files in ArcCatalog
- Create local scenes and layouts to display data using graduated symbols in ArcGIS Pro
- Create Time Slider in ArcGIS Pro

Introduction

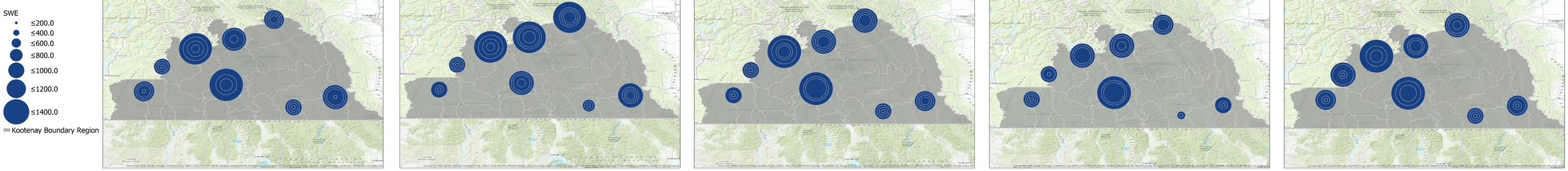
Snow and ice are highly important elements in the cryosphere (Earth's frozen water component) as they are a vital source of stored freshwater (Langlois et al. 2009). It stores freshwater through the winter months and release water into our ecosystems in the spring as spring freshet, and in the warmer and drier months of summer (Pyne K, Callegari G 2019). The water that is stored as snow and ice is what hydrologists call Snow Water Equivalency (SWE). It is this SWE that is of primary importance for climatological and hydrological processes (Langlois et al. 2009).

Water is important for all life; it's the release of cold water from snow and ice that recharges groundwater, helps our waterways stay cool, and supplies aquatic organisms with oxygen to breathe (Pyne K, Callegari G 2019). This water also supplies essential nutrients for plants and animals, including humans. Simply put, all ecosystems and life-forms are at the mercy of clean, available freshwater.

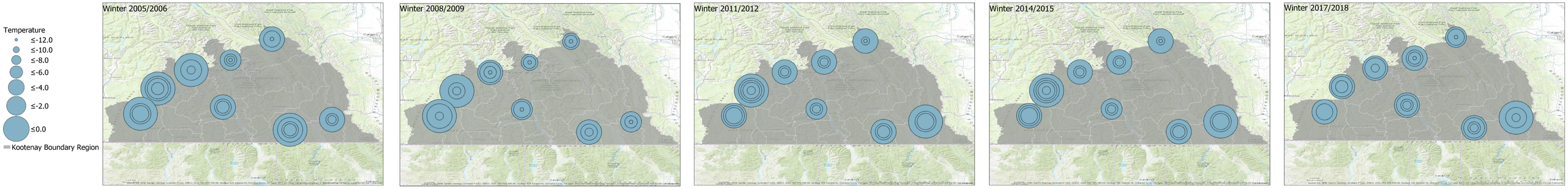
It is the significant role that freshwater plays and for all the sectors SWE impacts (power generation, irrigation, industry, fisheries, and wildlife) that makes it crucial to monitor and analyze any variations and trends (Mudryk et al. 2018).

*each winter season contains data for each month within that season (December, January, February and March) – each line represents a monthly average

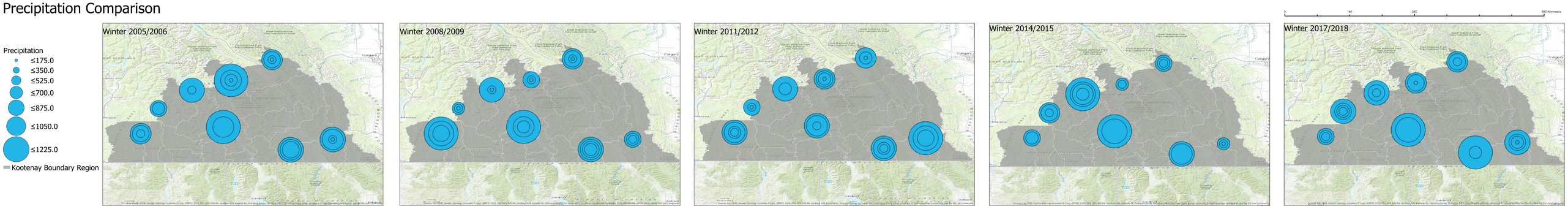
SWE Comparison



Temperature Comparison



Precipitation Comparison



Limitations & Constraints

- Consistency in data per station, per variable
- Lack of complete data sets for all themes
- Data manipulation, understanding data layout for Space Time Cube
- Having to revisit data and continuously manipulate data multiple times
- Space Time Cube visualization


https://www.mnn.com/earth-matters/translating-uncle-sam/stories/flaking-out-how-snow-forms

Results

- No obvious relationship between SWE with temperature and precipitation
- SWE is consistently lower in the East Kootenays than of the West Kootenays
- Only Floe Creek, East Creek and Redfish Creek Stations recorded temperatures below -12.0°C
- Fluctuation in precipitation varies between all years examined makes it difficult to recognize any trends
- 2008/2009 and 2014/2015 winter seasons have lowest amount of recorded precipitation


https://www.rss.stfc.ac.uk/Gallery/Water%20Image_Dreamstime.jpg

Sources:
BC Rivers Forecast Centre website

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