Skeena Salmon

Skeena River Basin

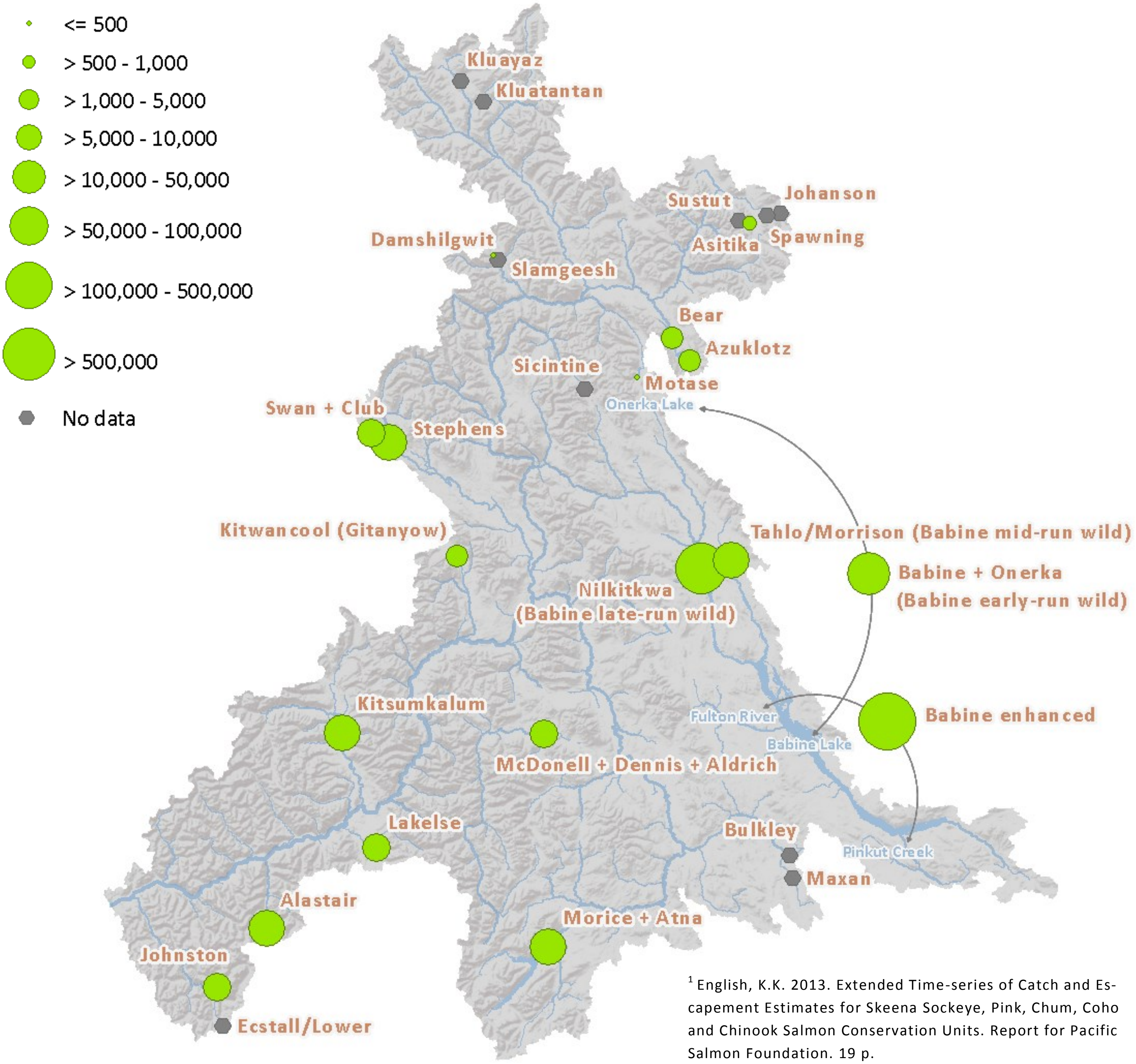
Version 1.1, February 2014

Introduction

This habitat report card was developed by the Pacific Salmon Foundation with technical support from ESSA Technologies. This project summarizes pressures on habitat used by Skeena salmon for migration, spawning, rearing and incubation, as well as their relative vulnerability to those pressures. Report cards are available for each individual CU in the Skeena watershed; this supplementary 'Skeena River Basin' report card summarizes information for indicators that are important for salmon in the Skeena but cannot be clearly associated with an individual CU. For a summary explanation of the indicators shown below, please see the end of this report card. All report cards, as well as a detailed report with full methods and results are available at www.skeenasalmonprogram.ca.

Sockeye Escapement (1991—2010)[1]

Average number of spawners



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[1] English, K.K. 2013. Extended Time-series of Catch and Escapement Estimates for Skeena Sockeye, Pink, Chum, Coho and Chinook Salmon Conservation Units. Report for Pacific Salmon Foundation. 19 p.

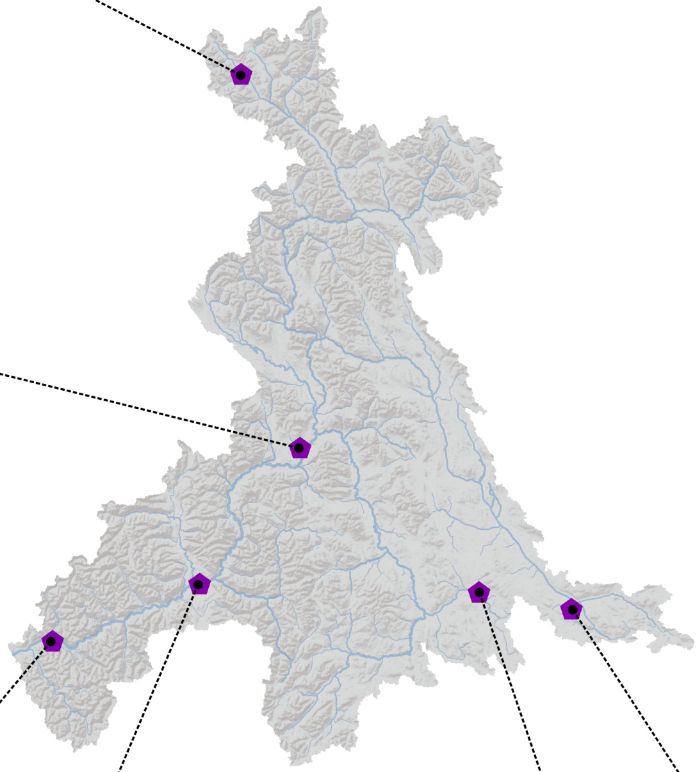
Historical & future climate[1]

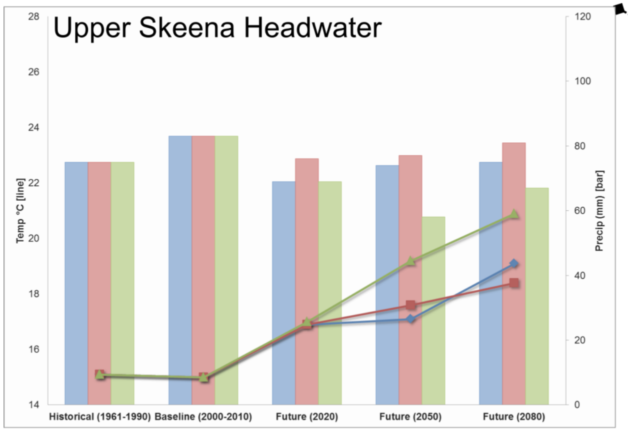
Minimum monthly average precipitation and maximum monthly average air temperature

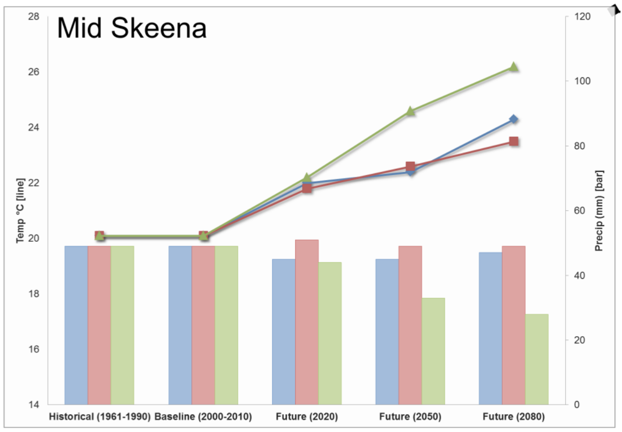
Summer low-flow period (July—September)

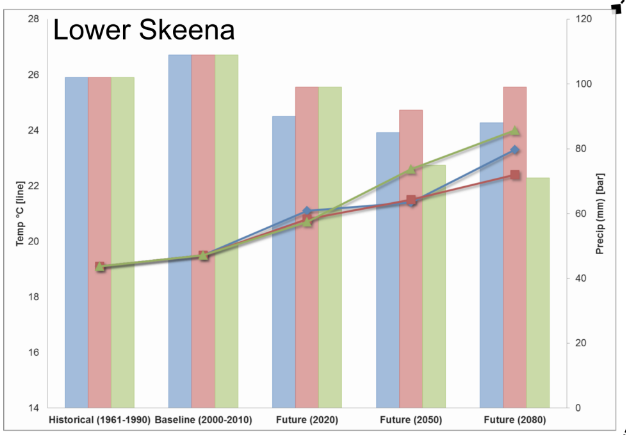
CHCM3 HADCM3 HADGEM

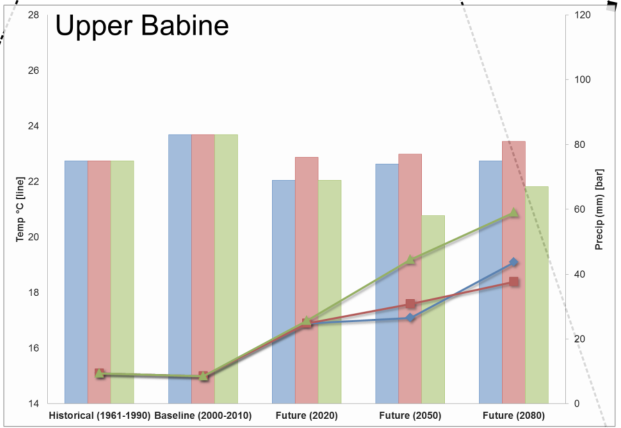
Illustrative alternative climate models for BC[2]

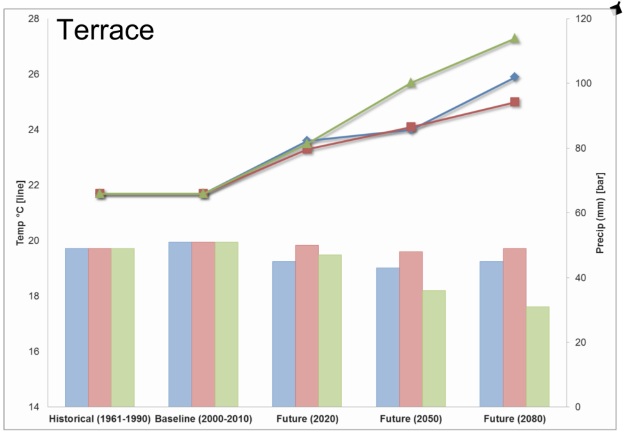


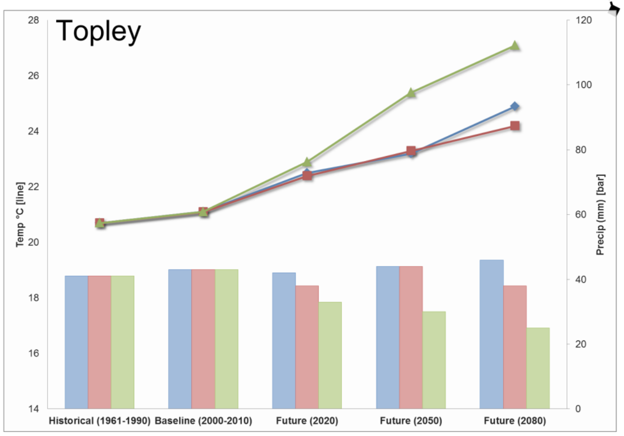

Upper Skeena Headwater


Mid Skeena


Lower Skeena


Upper Babine


Terrace


Topley

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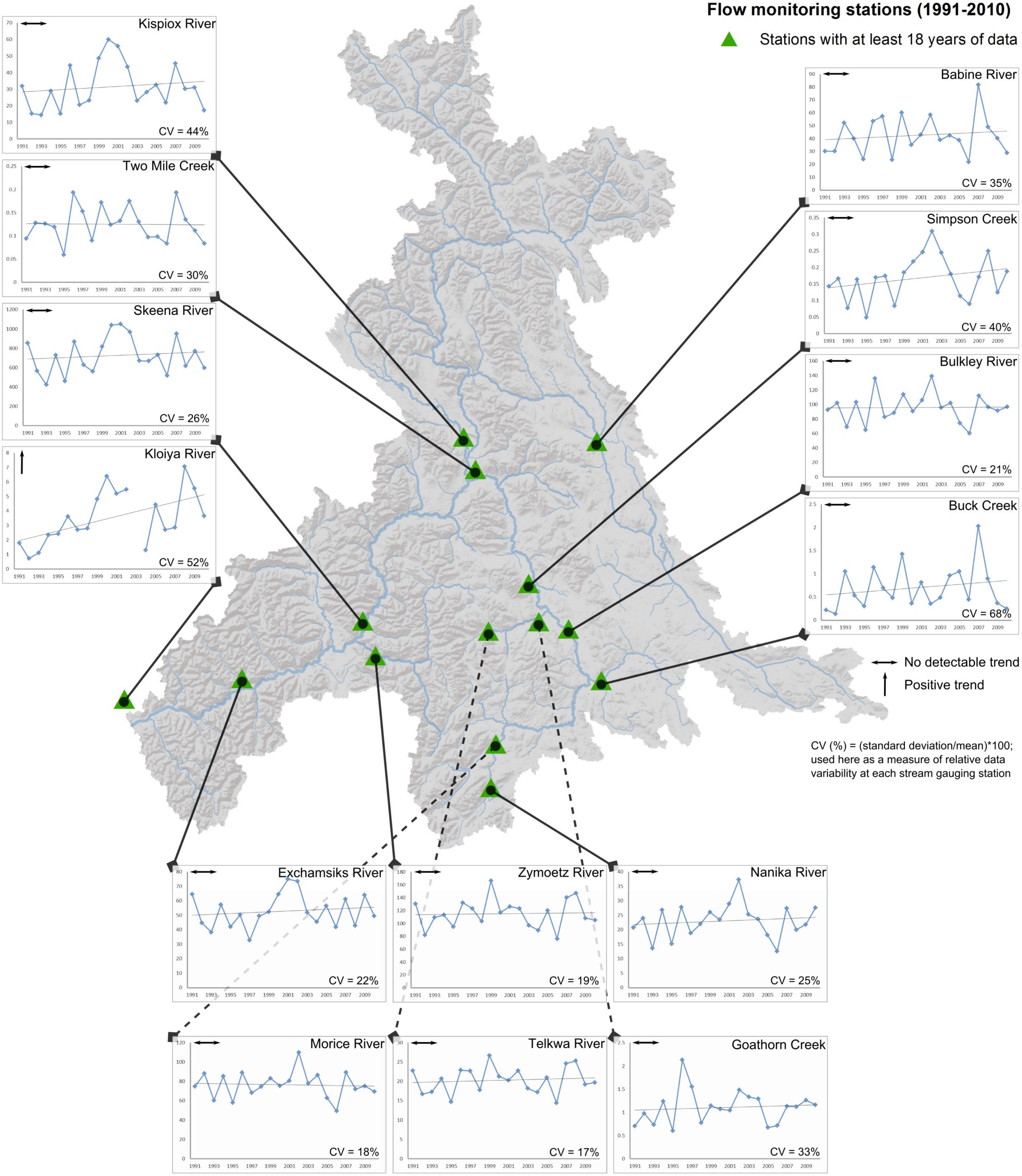
[1] ClimateBC/WNA—http://www.genetics.forestry.ubc.ca/cfcg/climate-models.html

[2] Murdock, T.Q. and D.L. Spittlehouse. 2011. Selecting and using climate change scenarios for British Columbia. Pacific Climate Impacts Consortium, University of Victoria, Victoria, BC.

Recent historical flows (1991—2010)[1]

Minimum monthly average flow (m^3s^{-1})

Summer low-flow period (July—September)



CV (%) = (standard deviation/mean)*100; used here as a measure of relative data variability at each stream gauging station

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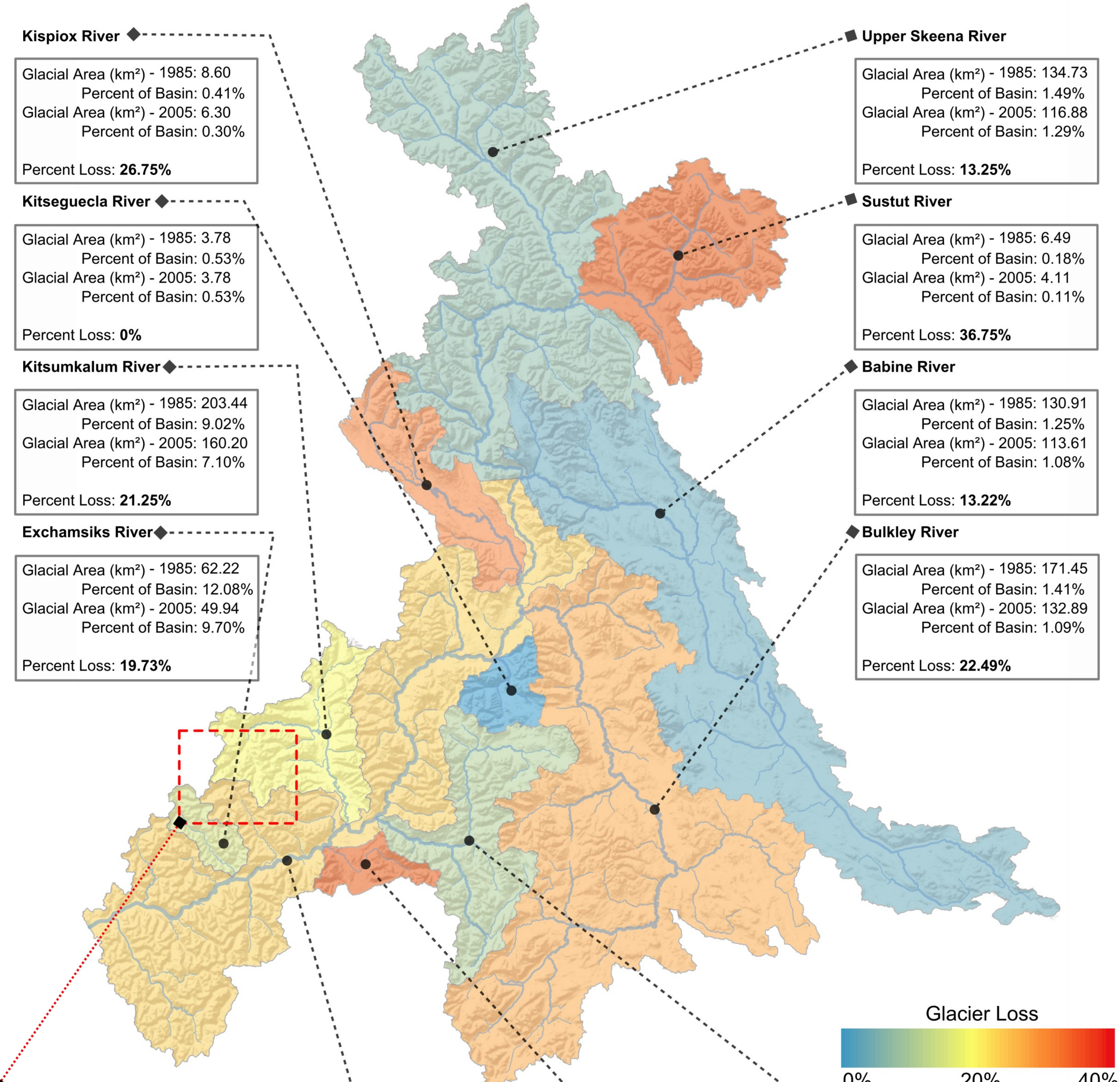
[1] Water Survey of Canada—Environment Canada—http://www.ec.gc.ca/rhc-wsc/

Glacier loss (1985—2005)[1]

Total glacial extent across major drainage basins[2]



Kispiox River

Glacial Area (km²) - 1985: 8.60
Percent of Basin: 0.41%
Glacial Area (km²) - 2005: 6.30
Percent of Basin: 0.30%

Percent Loss: **26.75%**

Kitseguecla River

Glacial Area (km²) - 1985: 3.78
Percent of Basin: 0.53%
Glacial Area (km²) - 2005: 3.78
Percent of Basin: 0.53%

Percent Loss: **0%**

Kitsumkalum River

Glacial Area (km²) - 1985: 203.44
Percent of Basin: 9.02%
Glacial Area (km²) - 2005: 160.20
Percent of Basin: 7.10%

Percent Loss: **21.25%**

Exchamsiks River

Glacial Area (km²) - 1985: 62.22
Percent of Basin: 12.08%
Glacial Area (km²) - 2005: 49.94
Percent of Basin: 9.70%

Percent Loss: **19.73%**

Upper Skeena River

Glacial Area (km²) - 1985: 134.73
Percent of Basin: 1.49%
Glacial Area (km²) - 2005: 116.88
Percent of Basin: 1.29%

Percent Loss: **13.25%**

Sustut River

Glacial Area (km²) - 1985: 6.49
Percent of Basin: 0.18%
Glacial Area (km²) - 2005: 4.11
Percent of Basin: 0.11%

Percent Loss: **36.75%**

Babine River

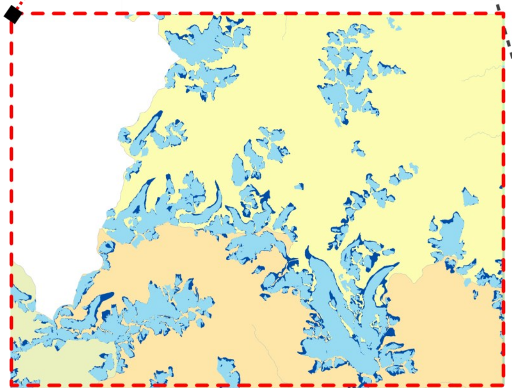
Glacial Area (km²) - 1985: 130.91
Percent of Basin: 1.25%
Glacial Area (km²) - 2005: 113.61
Percent of Basin: 1.08%

Percent Loss: **13.22%**

Bulkley River

Glacial Area (km²) - 1985: 171.45
Percent of Basin: 1.41%
Glacial Area (km²) - 2005: 132.89
Percent of Basin: 1.09%

Percent Loss: **22.49%**



Example area showing glacier extent in 1985 (dark blue) vs. 2005 (light blue).

Lower Skeena River

Glacial Area (km²) - 1985: 355.62
Percent of Basin: 3.56%
Glacial Area (km²) - 2005: 279.64
Percent of Basin: 2.80%

Percent Loss: **21.37%**

Lakelse River

Glacial Area (km²) - 1985: 5.17
Percent of Basin: 3.39%
Glacial Area (km²) - 2005: 3.39
Percent of Basin: 0.57%

Percent Loss: **34.53%**

Zymoetz River

Glacial Area (km²) - 1985: 136.89
Percent of Basin: 4.52%
Glacial Area (km²) - 2005: 116.99
Percent of Basin: 3.86%

Percent Loss: **14.54%**

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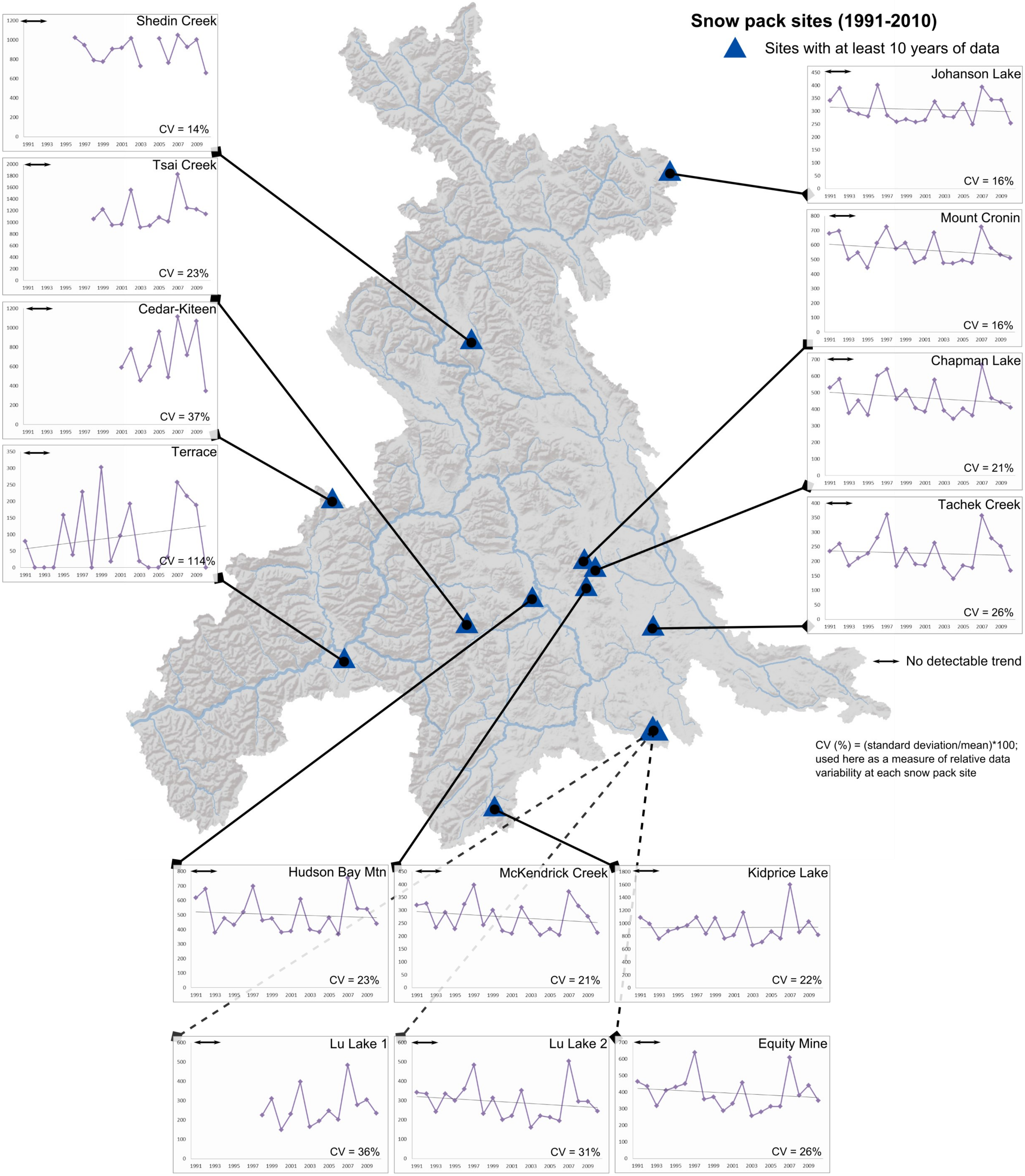
[1] Bolch, T., Menounos, B., and Wheate, R., 2010. Landsat-based inventory of glaciers in western Canada, 1985 - 2005. Remote Sensing of Environment 114: 127-137.

[2] GIS glacier data layer provided by University of Northern British Columbia (UNBC).

Snow monitoring (1991—2010)[1]

Snow water equivalent (mm) measured on April 1st



CV (%) = (standard deviation/mean)*100; used here as a measure of relative data variability at each snow pack site

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[1] BC River Forcast Centre (RFC) - http://bcrfc.env.gov.bc.ca/

Skeena River Basin report card summary

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1. Sockeye Escapement. Average escapement numbers for each lake sockeye CU provide a relative indication of the amount of marine-derived nutrient inputs to the CU rearing lake that are derived from the carcasses of returning sockeye spawners. Marine-derived nutrients deposited by salmon carcasses are retained in lakes and can be important for enhancing nutrient levels present in naturally low productivity coastal lakes.

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2. Historical and Future Climate (Precipitation and Air Temperature). High water temperatures and low flows can affect salmon by increasing energy expenditures, create physical or thermal blockages to migration, exacerbate the progression of diseases and parasites, and decrease fecundity of eggs. Modelling of future water temperatures and flow conditions within the Skeena watershed was beyond the scope of this project; we instead used air temperature as a surrogate pressure indicator with potential influence water temperatures, and precipitation as a surrogate pressure indicator with potential influence on stream flows. While snow melt and groundwater are also important in maintaining summer flows, there are undoubted linkages between rainfall patterns and seasonal stream flow. There is also a well-known relationship between air and water temperatures, although the strength of this relationship is highly variable as stream thermal response to air temperature can depend on a suite of local influences (e.g., groundwater inputs, riparian type, hydrology).

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3. Recent Historical Flows. Sockeye migrating and spawning through the summer months need adequate stream flows to provide unimpeded access to spawning areas and proper spawner distributions on the spawning grounds. In addition to potential impacts on water quality (i.e., water temperature and dissolved oxygen), low stream flows can limit sockeye spawner distribution to sub-optimal stream reaches, or force fish to spawn in the center of the stream channel which can lead to increased egg and alevin mortalities during winter floods.

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4. Glacier Loss. Glacier runoff can be a vital component of surface flows in glaciated drainage basins, especially during summer when water demand is high. Glaciers represent natural reservoirs that can yield the most water during the driest periods of late summer. As glaciers retreat the size of the reservoir shrinks and so does the available runoff to support sufficient flows to maintain salmon habitats (although the significance of this impact will vary by drainage dependent on the contribution of glacier runoff to natural stream flows).

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5. Snow Monitoring. Surface runoff from snowmelt can be essential for maintaining seasonal flows in coastal streams, especially during the summer when demand for water is high. Snow field extents can have significant influences on water quantity, water quality (e.g., water temperature), and timing of flow events; all critical factors for maintaining aquatic habitat conditions for salmon.

Acknowledgements

The Pacific Salmon Foundation and ESSA Technologies Ltd. would like to sincerely thank the members of the Skeena Technical Advisory Committee (TAC) for giving of their time and knowledge to guide the development of this report card. Their assistance has been invaluable. The following people participated in one or more workshop and many also contributed data to the project: Mark Cleveland, Sandra Devcic, David DeWitt, Alana Dickson, Hannes Eddinger, Jessica Hawryshyn, Walter Joseph, Derek Kingston, Greg Knox, Siegi Kriegl, Chrissy Melymick, Lana Miller, Don Morgan, Johanna Pfalz, Ken Rabnett, and Bruce Watkinson.

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