

Northwest Water Tool Report

Feb 10 2020

Lakelse Lake

54.36816N 128.56115W

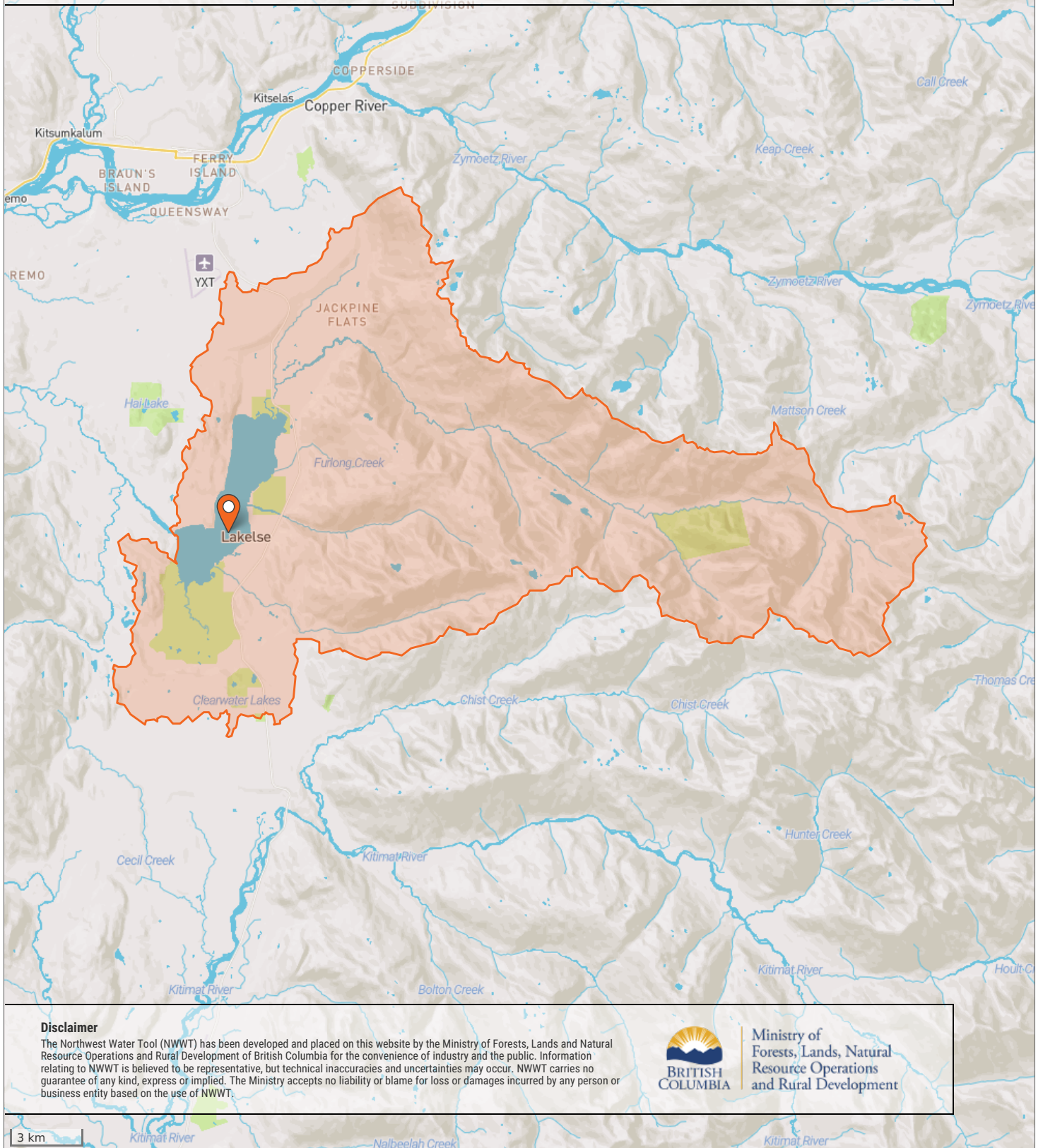
Query Location

382.6

Area (km²)

76 - 683 - 1,946

Elevation (m)
min - mean - max



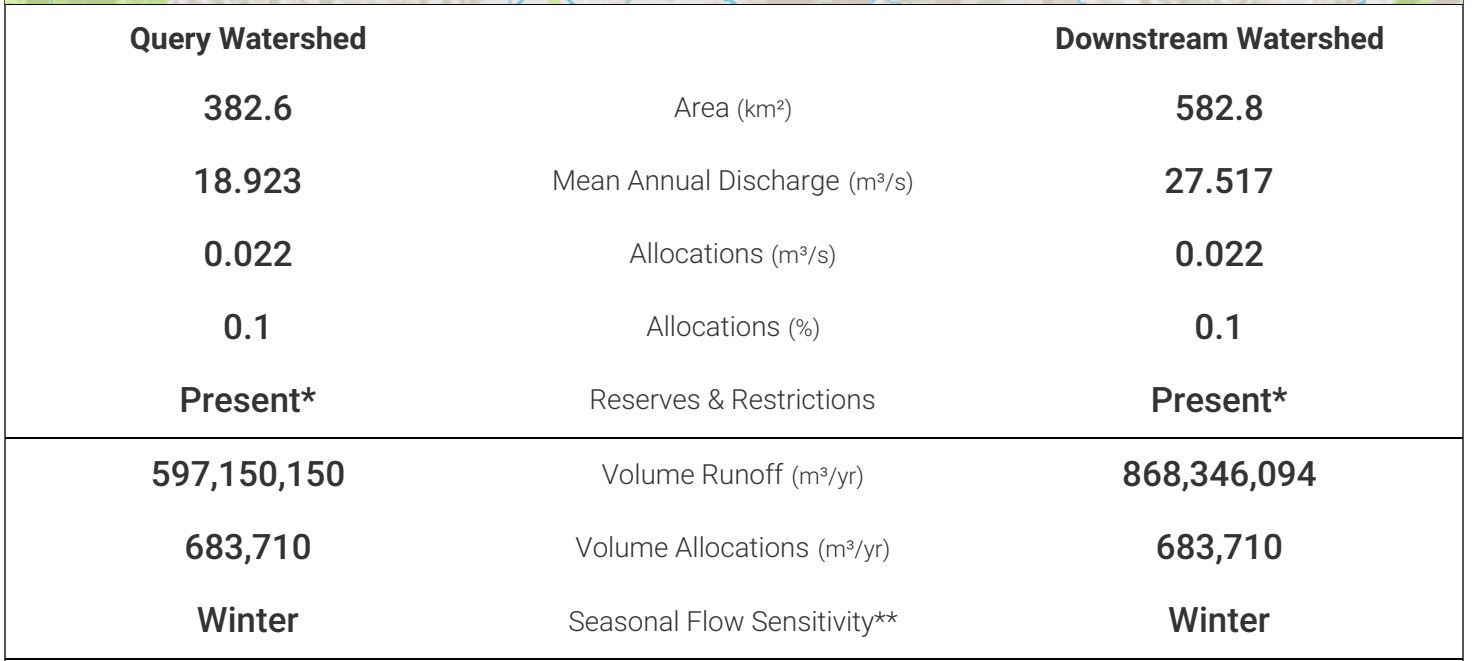
Disclaimer

The Northwest Water Tool (NWWT) has been developed and placed on this website by the Ministry of Forests, Lands and Natural Resource Operations and Rural Development of British Columbia for the convenience of industry and the public. Information relating to NWWT is believed to be representative, but technical inaccuracies and uncertainties may occur. NWWT carries no guarantee of any kind, express or implied. The Ministry accepts no liability or blame for loss or damages incurred by any person or business entity based on the use of NWWT.



Ministry of
Forests, Lands, Natural
Resource Operations
and Rural Development

The map shows the query and downstream watersheds. The table below provides an overview of hydrology and existing allocations in these watersheds.



* For more information on water reserves or restrictions present in the watershed, please visit the links below or contact FrontCounter BC.
 ☑ **FrontCounter BC:** www.frontcounterbc.ca ✉ **Email:** FrontCounterBC@gov.bc.ca ☎ **Toll Free:** 1-877-855-3222 📞 **Outside North America:** ++1-778-372-0729
 ☑ **Water Reservations:** <https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-licensing-rights/water-reservations>
 ☑ **Water Restrictions:** <https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-licensing-rights/water-allocation-restrictions>

**Ptolemy, R. Environmental Flow Protection in British Columbia. Presentation to 2015 IFC Panel, April 29, 2015.

Hydrology - Monthly Lakelse Lake

The chart and table show information on modeled hydrology and existing allocations in the query watershed. Notes are provided at the bottom on data sources, methods, and interpretation. Environmental flow needs risk levels are as defined in the Province of BC *Environmental Flow Needs Policy*.



Legend

Risk Management Level 1



Risk Management Level 2



Risk Management Level 3



Existing Allocations



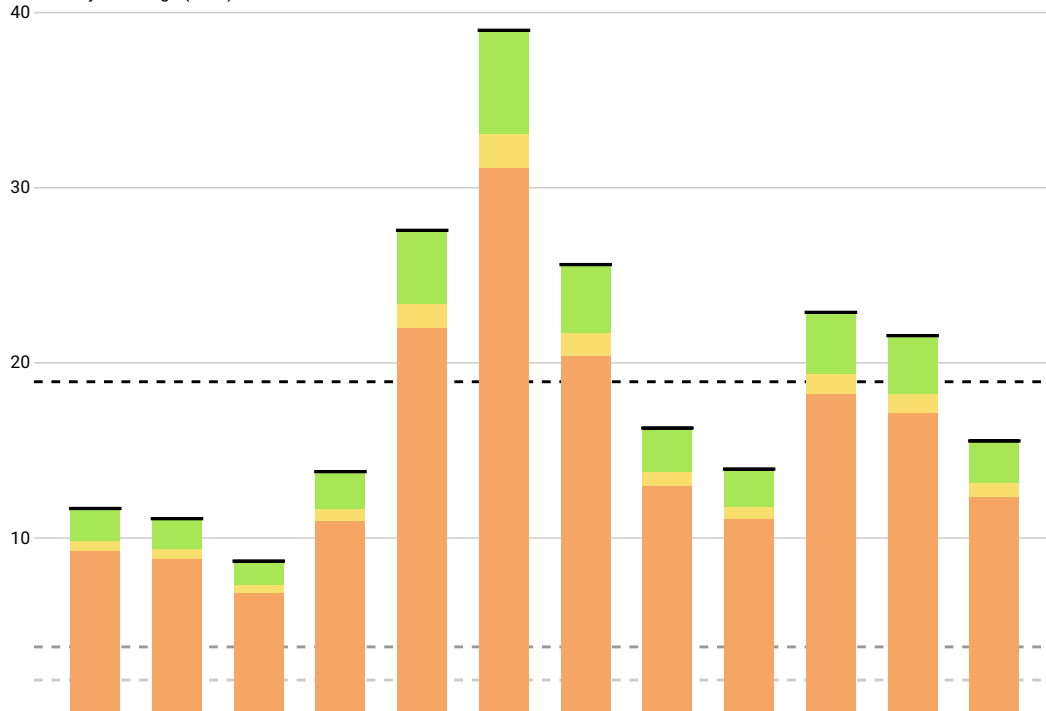
Mean Annual Discharge (MAD)

MAD ----- 18.923 m³/s

20% MAD ----- 3.785 m³/s

10% MAD ----- 1.892 m³/s

Monthly Discharge (m³/s)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean Monthly Discharge (m ³ /s)	11.615	11.033	8.609	13.720	27.496	38.917	25.540	16.206	13.862	22.814	21.484	15.471
% of MAD	61.4%	58.3%	45.5%	72.5%	145.3%	205.7%	135.0%	85.6%	73.3%	120.6%	113.5%	81.8%
Flow Sensitivity	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Existing Allocations (m ³ /s)	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022
Potential Allocation (m ³ /s, Risk Mgmt 1)	1.721	1.633	1.270	2.036	4.103	5.816	3.809	2.409	2.058	3.400	3.201	2.299
Potential Allocation (m ³ /s, Risk Mgmt 2)	2.301	2.185	1.700	2.722	5.478	7.762	5.086	3.219	2.751	4.541	4.275	3.073
Potential Allocation (m ³ /s, Risk Mgmt 3)	>2.301	>2.185	>1.700	>2.722	>5.478	>7.762	>5.086	>3.219	>2.751	>4.541	>4.275	>3.073

Methods: Monthly discharge estimates have been generated from a hydrologic model. Existing allocation volumes have been summarized from government water licence and short term approval databases. Potential allocations are determined using criteria established in the Province of BC *Environmental Flow Needs (EFN) Policy*. Risk management levels have been calculated assuming the presence of fish. If the source can be classified as non-fish bearing, this may affect risk management levels. For more information on the EFN policy: <https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-licensing-rights/water-policies/environmental-flow-needs>

Risk Management Levels: The Province of BC Environmental Flow Needs Policy establishes risk management levels to be used in the evaluation of applications for water rights. Risk Management Levels and associated Risk Management Measures are discussed on page 5 of this report.

Error: The query watershed is within the Skeena Region. The hydrologic modeling study conducted in this region employed a water balance approach to estimate runoff in ungauged basins. The model was calibrated using stream flow measurements from the Water Survey of Canada, and validated using a leave-one-out cross validation. The model used 123 watersheds with hydrometric gauges, and included detailed information on watershed climate, evapotranspiration, topography, vegetation and land cover. Error metrics calculated for the entire model domain are: Mean error = -2.8%, Median Error = -4.2%, Mean Absolute Error = 13.9%, Watersheds within +/- 20% = 80.5%.

Allocations: Existing allocation volumes are determined from digital databases and include *BC Water Sustainability Act* licences and short term approvals. These represent a maximum amount of water authorized, not actual use. In many cases, licences may have additional terms and conditions to those represented in the digital version which are not represented. This may result in existing allocation volumes being presented as larger than are actually approved, either in total (on an annual basis) or for individual months. On subsequent pages of this report, information on each licence occurring in the watershed is provided, along with links to scanned copies of complete water licence information. For more information on specific areas of concern, please contact Water Stewardship Staff via FrontCounter BC. Contact information for FrontCounter BC is provided on page 2 of this report.

Hydrology - Monthly Lakelse River

The chart and table show information on modeled hydrology and existing allocations in the downstream watershed, where the subject drainage meets with another drainage of comparable size. Notes are provided at the bottom on data sources, methods, and interpretation. Environmental flow needs risk levels are as defined in the Province of BC *Environmental Flow Needs Policy*.



Legend

Risk Management Level 1



Risk Management Level 2



Risk Management Level 3



Existing Allocations



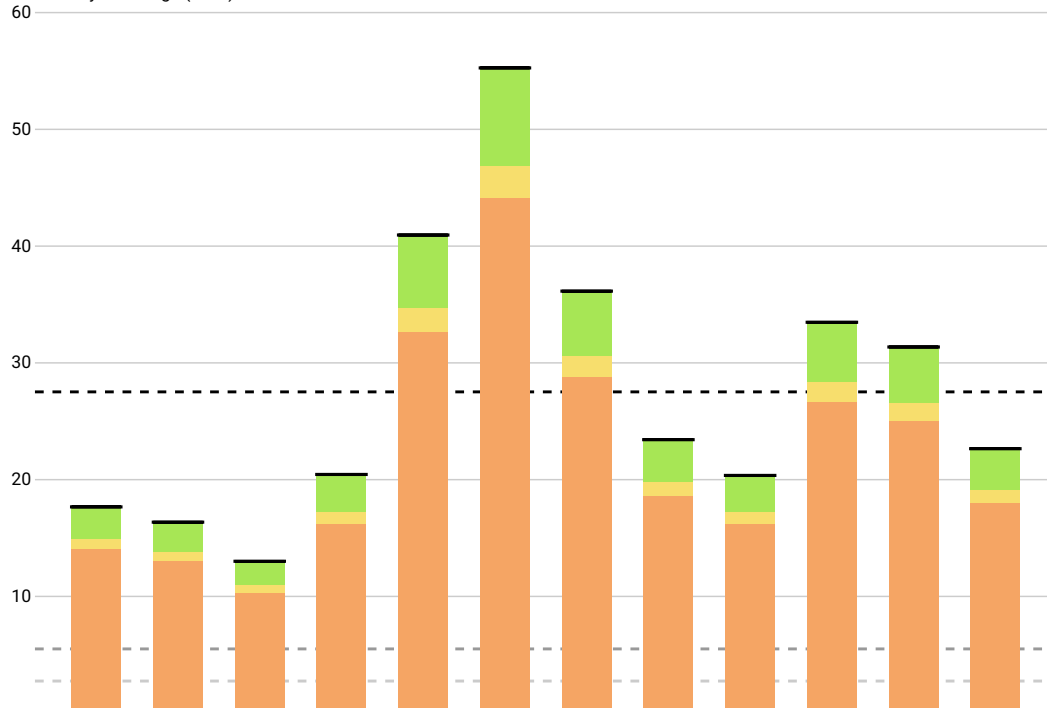
Mean Annual Discharge (MAD)

MAD ----- 27.517 m³/s

20% MAD ----- 5.503 m³/s

10% MAD ----- 2.752 m³/s

Monthly Discharge (m³/s)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean Monthly Discharge (m³/s)	17.552	16.245	12.895	20.331	40.836	55.147	36.031	23.309	20.247	33.364	31.247	22.536
% of MAD	63.8%	59.0%	46.9%	73.9%	148.4%	200.4%	130.9%	84.7%	73.6%	121.2%	113.6%	81.9%
Flow Sensitivity	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Existing Allocations (m³/s)	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022
Potential Allocation (m³/s, Risk Mgmt 1)	2.611	2.415	1.913	3.028	6.104	8.250	5.383	3.475	3.015	4.983	4.665	3.359
Potential Allocation (m³/s, Risk Mgmt 2)	3.489	3.227	2.557	4.045	8.146	11.008	7.184	4.640	4.028	6.651	6.228	4.486
Potential Allocation (m³/s, Risk Mgmt 3)	>3.489	>3.227	>2.557	>4.045	>8.146	>11.008	>7.184	>4.640	>4.028	>6.651	>6.228	>4.486

Methods: Monthly discharge estimates have been generated from a hydrologic model. Existing allocation volumes have been summarized from government water licence and short term approval databases. Potential allocations are determined using criteria established in the Province of BC *Environmental Flow Needs (EFN) Policy*. Risk management levels have been calculated assuming the presence of fish. If the source can be classified as non-fish bearing, this may affect risk management levels. For more information on the EFN policy: <https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-licensing-rights/water-policies/environmental-flow-needs>

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Risk Management Levels and Measures

Guide to interpreting potential allocation amounts in each environmental flow needs risk level as defined in the Province of BC *Environmental Flow Needs Policy*.

Water volumes presented as "Potential Allocations" within this report are determined in consideration of the Province of BC *Environmental Flow Needs Policy*. Within the Policy, risk management measures are suggested to assess or mitigate potential effects of withdrawals from a stream, and provide an ecosystem perspective on environmental flow needs. The measures are associated with risk levels 1, 2, and 3 and are intended to guide where more caution may be needed in reviewing an application or making a decision.

Where there are known species or habitat sensitivities, more detailed, site-specific studies may be required. Where detailed assessments or studies exist, they will supersede policy recommendations.

Risk management levels, for assessing new applications to withdraw water, are determined for each month using the relationship of mean monthly flows to the mean annual discharge, and also using a stream size threshold based on mean annual flows. The calculations presented within this report assume all streams are fish-bearing. Where no water is indicated as available under a risk level, the stream may be very flow sensitive during that time, or the stream may have existing allocations in excess of the relevant threshold.

Inter-annual hydrologic variability may affect the amount of water available in a given year. The impact of this variability on water allocations should be considered separately from the information presented in this report.

The following risk management measures may be appropriate for consideration before a decision is made, could be completed by regional staff to inform a decision, or could be a condition of the licence or approval.

Risk management measures may differ for short-term approvals vs. licences and may vary in relation to withdrawal amounts.

Risk Management Level:

1

Measures to assess or mitigate potential effects on low sensitivity flow periods:

1. Assess veracity of information and ensure appropriate methods are used, (e.g., RISC)
2. Consider downstream users and species/habitats

Risk Management Level:

2

Measures to assess or mitigate potential effects on moderate sensitivity flow periods:

In addition to Level 1 measures:

1. Establish adequate baseline hydrological data before withdrawals
2. Prepare reconnaissance-level fish and fish habitat impact assessment (e.g., Section 4.1.10.1 in Lewis et al. 2004)
3. Issue seasonal licence, or restrictions during low flow periods
4. Development of off-stream storage
5. Inclusion of a daily maximum or inst. withdrawal e.g., greater consideration of instantaneous demand over averages
6. Limit pump intake size
7. Monitor and report water use during higher risk flow periods, e.g., install flow gauge
8. Monitor low flows and limit withdrawals when flows drop below a certain level
9. Ministry staff to conduct audit of basin use/beneficial use review
10. Refuse application to withdraw water

Risk Management Level:

3

Measures to assess or mitigate potential effects on high sensitivity flow periods:

In addition to Level 2 measures:

1. Issue limited licence term, allowing for review and potential adjustment (e.g., 5 years)
2. Prepare detailed habitat assessment (e.g., Lewis et al. 2004; Hatfield et al. 2007)

References

Hatfield, T., A. Lewis, and S. Babakaiff. 2007. Guidelines for the collection and analysis of fish and fish habitat data for the purpose of assessing impacts from small hydropower projects in British Columbia. Lewis, A., T. Hatfield, B. Chilibeck, and C. Roberts. 2004. Assessment methods for aquatic habitat and instream flow characteristics in support of applications to dam, divert, or extract water from streams in British Columbia. Prepared for Ministry of Water, Land & Air Protection and Ministry of Sustainable Resource Management.

A. Lewis. 2002. Rationale for Multiple British Columbia Instream Flow Standards to Maintain Ecosystem Function and Biodiversity. Draft for Agency Review. Prepared for Ministry of Water, Land and Air Protection and Ministry of Sustainable Resource Management.

Resources Information Standards Committee: <https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/natural-resource-standards-and-guidance/inventory-standards>

Water Policies, including Environmental Flow Needs: <https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-licensing-rights/water-policies>

Existing Allocations Water Licences

Current approved and active applications for term water licences.

BC Water Sustainability Act - Water Licences - 62 Licences, 652,234.13 m³ Total Annual Volume

Licensee	Number	POD	Priority Date	Quantity (m³/year)	Flag
Private Individual Name Domestic from Hatchery Creek/granite	C023326	PD35593	1956-05-16	1,660.46	T
Triple E Holdings Ltd (14913) Domestic from Martinson Creek	C024410	PD35589	1958-07-11	830.23	T
Multiple Licence Holders Domestic from Sparkes Creek	C025673	PD34491	1959-08-24	830.23	T
Multiple Licence Holders Conservation: Construction Works from Williams Creek	C026727	PD34484	1960-10-26	0.00	M, N
Multiple Licence Holders Conservation: Construction Works from Williams Creek	C026727	PD34485	1960-10-26	0.00	M, N
Multiple Licence Holders Waterworks (other than LP) from Lakelse Lake	C028104	PD34490	1962-04-26	66,418.37	T
Private Individual Name Domestic from Hatchery Creek (smith Outlet)	C043559	PD35620	1973-11-01	830.23	T
Private Individual Name Domestic from Collins Creek	C054003	PD34492	1978-01-19	1,660.46	T
Private Individual Name Domestic from Keynes Creek	C062000	PD34487	1984-11-29	830.23	T
Private Individual Name Domestic from Keynes Creek	C062001	PD34486	1985-03-29	830.23	T
Mount Layton Hotspings Resort Ltd (14915) Comm. Enterprise: Enterprise from Mountain Creek	C062038	PD62371	1967-02-13	99,627.56	T
Mount Layton Hotspings Resort Ltd (14915) Swimming Pool from Mountain Creek	C062038	PD62371	1967-02-13	99,627.56	T
Mount Layton Hotspings Resort Ltd (14915) Mineralized Water: Comm. Bathing Pool from Lakelse Hot Springs	C062039	PD35765	1967-02-13	90,328.99	M
Mount Layton Hotspings Resort Ltd (14915) Mineralized Water: Comm. Bathing Pool from Lakelse Hot Springs	C062039	PD35766	1967-02-13	90,328.99	M, N
Mount Layton Hotspings Resort Ltd (14915) Mineralized Water: Comm. Bathing Pool from Lakelse Hot Springs	C062040	PD35764	1967-02-13	249,068.91	T
Mount Layton Hotspings Resort Ltd (14915) Land Improvement: General from Gamelin Creek	C065484	PD35780	1986-12-17	0.00	M, N
Mount Layton Hotspings Resort Ltd (14915) Land Improvement: General from Garrick Creek	C065484	PD35781	1986-12-17	0.00	M, N

Water Licence Flag Description

D : Multiple PODs for PUC/qty at each are known/PODs on different sources
M : Max licenced demand for purpose/multiple PODs/qty at each POD unknown
P : Multiple PODs for PUC/qty at each are known/PODs on same source
T : Total demand one POD

Other

A : Active application status
N : Licence volumes not used in calculations
R : Rediversion

For more information on water licences:

Water Licence Query Tool: http://a100.gov.bc.ca/pub/wtrwhse/water_licences.input
Water Rights Databases: <https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-licensing-rights/water-licences-approvals/water-rights-databases>

Existing Allocations Water Licences

Current approved and active applications for term water licences.

BC Water Sustainability Act - Water Licences - 62 Licences, 652,234.13 m³ Total Annual Volume

Licensee	Number	POD	Priority Date	Quantity (m³/year)	Flag
Mount Layton Hotsprings Resort Ltd (14915) Land Improvement: General from Garand Creek	C065484	PD35785	1986-12-17	0.00	M, N
Private Individual Name Domestic from Lakelse Lake	C065489	PD35575	1986-06-11	830.23	T
Private Individual Name Domestic from Lakelse Lake	C065495	PD35768	1986-07-18	830.23	T
Private Individual Name Domestic from Jevons Creek	C065499	PD35591	1987-06-04	830.23	T
Multiple Licence Holders Domestic from Crystal Creek	C065509	PD35774	1986-09-17	830.23	T
Private Individual Name Domestic from Creech Creek	C065519	PD35578	1987-07-14	830.23	T
Multiple Licence Holders Domestic from Lakelse Lake	C072044	PD35769	1988-07-04	830.23	T
Private Individual Name Domestic from Norths Creek	C072051	PD35590	1989-08-28	830.23	T
Private Individual Name Domestic from Creech Creek	C072052	PD35582	1989-08-28	830.23	T
Munson Enterprises Ltd. (143190) Domestic from Morgan Brook	C101241	PD61135	1990-03-08	830.23	M
Munson Enterprises Ltd. (143190) Vehicle & Eqpt: Truck & Eqpt Wash from Morgan Brook	C101241	PD61135	1990-03-08	1,660.46	M
Munson Enterprises Ltd. (143190) Domestic from Morgan Brook	C101241	PD61136	1990-03-08	830.23	M, N
Munson Enterprises Ltd. (143190) Vehicle & Eqpt: Truck & Eqpt Wash from Morgan Brook	C101241	PD61136	1990-03-08	1,660.46	M, N
Private Individual Name Domestic from Creech Creek	C101321	PD35578	1991-02-06	830.23	T
Private Individual Name Domestic from Wylie Creek	C101983	PD63288	1991-06-06	830.23	T
Multiple Licence Holders Domestic from Norths Creek	C102163	PD35590	1991-06-17	830.23	T
Kinsmen Club Of Terrace (44909) Camps & Pub Facil: Non-Work Camps from Lakelse Lake	C106089	PD67287	1993-01-27	4,981.38	T

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Water Rights Databases: <https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-licensing-rights/water-licences-approvals/water-rights-databases>

Existing Allocations Water Licences

Current approved and active applications for term water licences.

BC Water Sustainability Act - Water Licences - 62 Licences, 652,234.13 m³ Total Annual Volume

Licensee	Number	POD	Priority Date	Quantity (m³/year)	Flag
Private Individual Name Domestic from Creech Creek	C107977	PD74283	1994-04-08	830.23	T
Multiple Licence Holders Domestic from Norths Creek	C111045	PD72088	1991-06-17	830.23	T
Multiple Licence Holders Domestic from Gainie Creek	C113307	PD35592	1998-05-15	830.23	T
Private Individual Name Domestic from Mountain Creek	C114743	PD63170	1990-09-19	830.23	T
Private Individual Name Domestic from Mountain Creek	C114744	PD62370	1990-09-19	830.23	T
Private Individual Name Domestic from Gainie Creek	C117927	PD35592	1953-11-05	1,245.35	T
Private Individual Name Domestic from Gainie Creek	C117928	PD35592	1953-11-05	1,245.35	M
Private Individual Name Domestic from Gainie Creek	C117928	PD77513	1953-11-05	1,245.35	M, N
Private Individual Name Domestic from Lakelse Lake	C123894	PD34489	1986-11-03	830.23	T
Private Individual Name Domestic from Sparkes Creek	C124369	PD82335	2008-03-06	830.23	M
Private Individual Name Domestic from Bufo Spring	C124369	PD82337	2008-03-06	830.23	M, N
Private Individual Name Irrigation: Private from Cole Creek	C125725	PD34488	1949-10-24	2,430.00	T
Multiple Licence Holders Domestic from Creech Creek	C127896	PD35580	1967-05-23	2,490.69	T
Fisheries And Oceans Canada (113112) Conservation: Use of Water from Williams Creek	C128854	PD184934	2012-05-16	5,333,234.40	T, N
Private Individual Name Domestic from Edward Creek	C133162	PD189302	2016-01-26	730.50	T
Private Individual Name Domestic from Morgan Brook	F019812	PD35588	1955-05-02	830.23	T
Private Individual Name Domestic from Hatchery Creek (smith Outlet)	F019814	PD35619	1956-08-27	830.23	T

Water Licence Flag Description

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Existing Allocations Water Licences

Current approved and active applications for term water licences.

BC Water Sustainability Act - Water Licences - 62 Licences, 652,234.13 m³ Total Annual Volume

Licensee	Number	POD	Priority Date	Quantity (m³/year)	Flag
Private Individual Name Domestic from Edward Creek	F019909	PD35585	1961-09-27	830.23	T
Private Individual Name Domestic from Mccoll Brook	F020457	PD35600	1953-10-08	830.23	T
Private Individual Name Domestic from Crystal Creek	F021533	PD35778	1966-08-16	830.23	T
Private Individual Name Domestic from Hatchery Creek (north Outlet)	F038110	PD35613	1968-07-25	830.23	T
Private Individual Name Domestic from Hatchery Creek (north Outlet)	F038111	PD35608	1968-10-16	830.23	T
Private Individual Name Domestic from Edward Creek	F038112	PD35587	1965-04-15	830.23	T
Private Individual Name Domestic from Crystal Creek	F044301	PD35777	1967-09-05	830.23	T
Dr. L. M. Huang Inc. #535862 (113448) Domestic from Hatchery Creek (north Outlet)	F125705	PD35617	1953-07-07	830.23	T
Private Individual Name Domestic from Hatchery Creek (south Outlet)	F132417	PD35597	1955-09-26	830.23	T
8056587 Canada Inc. (120092) Power: General from	WLA2012	PD185215		0.00	N, A
8056587 Canada Inc. (120092) Stream Storage: Power from	WLA2012	PD185215		0.00	N, A

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Existing Allocations Short Term Approvals (Section 10)

Current approved applications for temporary use of water, with a maximum term of 24 months.

BC Water Sustainability Act - Short Term Approvals (Section 10) - 4 Licences, 31,411.50 m³ Total Annual Volume

Licensee	Number	POD	Start Date	End Date	Quantity (m³/year)
Ministry Of Transportation & Infrastructure - Ske... Industrial(transportation & Infrastructure) from Hatchery Creek	6001856 *	PD193136	2018-03-15	2020-03-14	5,113.50
Ministry Of Transportation & Infrastructure - Ske... Industrial(transportation & Infrastructure) from Williams Creek	6001856 *	PD193140	2018-03-15	2020-03-14	14,975.25
Ministry Of Transportation & Infrastructure - Ske... Industrial(transportation & Infrastructure) from Lakelse Lake	6001856 *	PD193139	2018-03-15	2020-03-14	5,113.50
Ministry Of Transportation & Infrastructure - Ske... Industrial(transportation & Infrastructure) from Lakelse Lake	6001856 *	PD193138	2018-03-15	2020-03-14	6,209.25

Water Licence Flag Description

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For more information on water licences:

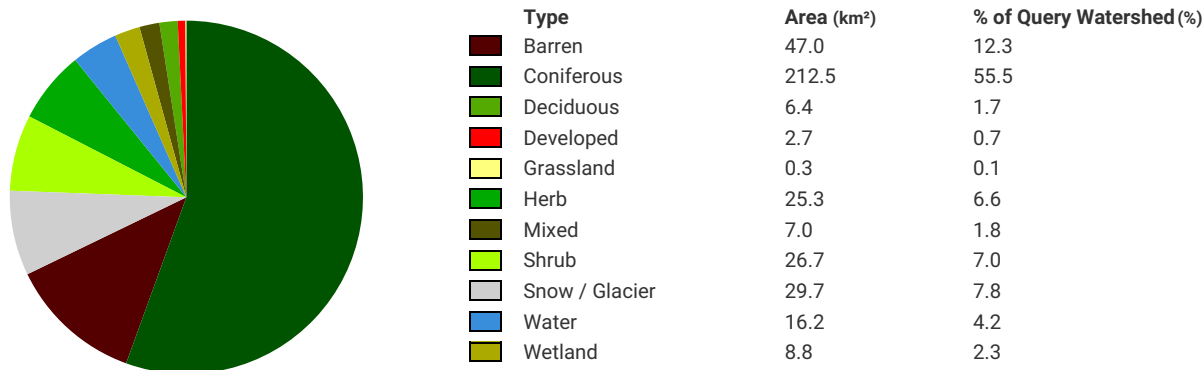
Water Licence Query Tool: http://a100.gov.bc.ca/pub/wtrwhse/water_licences.input
Water Rights Databases: <https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-licensing-rights/water-licences-approvals/water-rights-databases>
*BC Ministry of Forests, Lands and Natural Resource Operations and Rural Development is statutory decision maker.
**BC Oil and Gas Commission is statutory decision maker.

Land Cover and Topography

Characteristics of the query watershed. For more information on watershed characterization in British Columbia please refer to Pike and Wilford (2013).

Land Cover

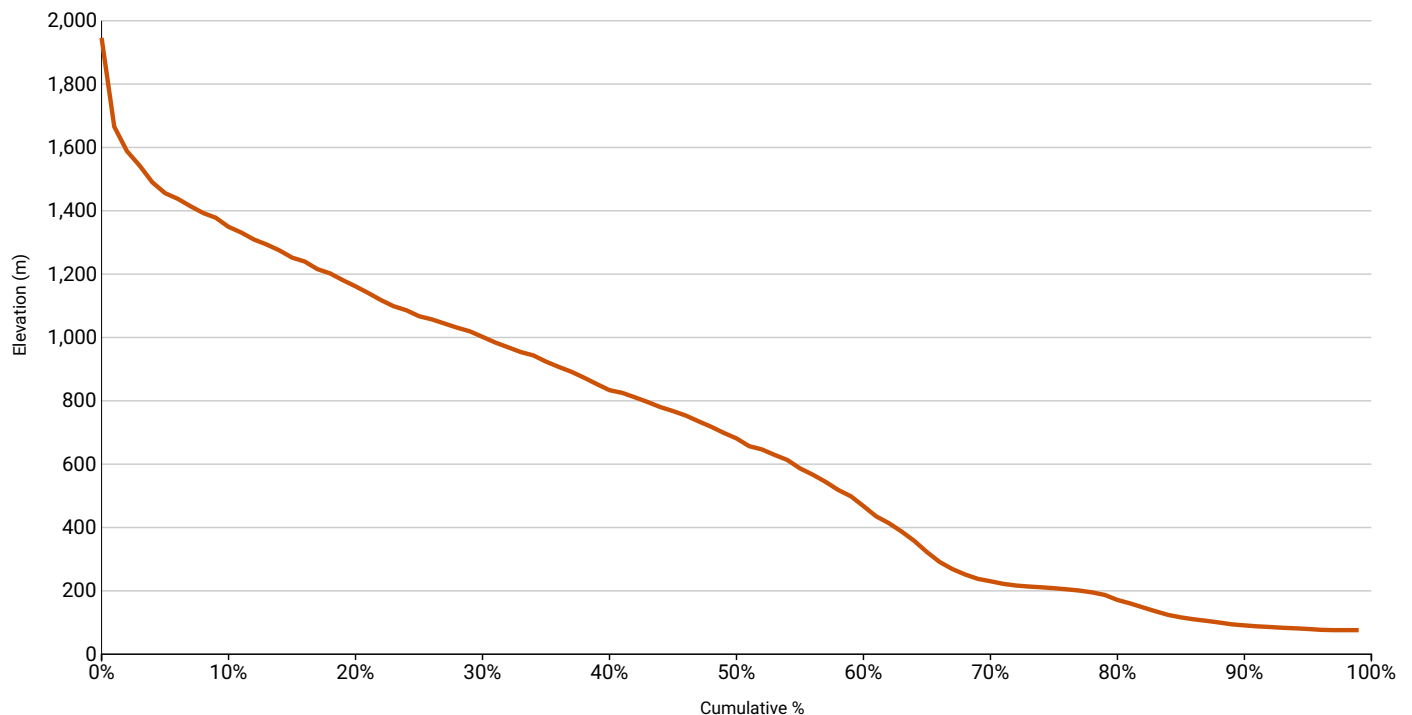
The land cover characteristics chart illustrates the composition of vegetation and land cover types in the query watershed. These land cover components are incorporated in the hydrologic model, to represent the variations in evapotranspiration rates amongst the classes.



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Topography

Elevation of the query watershed influences hydrology in a number of ways. The amount, and state of precipitation (as rain or snow) is influenced by elevation substantially. Likewise, temperatures will vary by elevation in value and also direction of temperature gradient throughout the course of the year.



The elevation characteristics of the query watershed are shown using a hypsometric curve, which shows the cumulative distribution of elevation by area in the watershed. Percent values can be used to identify the percentage of the watershed above a given elevation value.

Reference:

Pike, R.G. and D.J. Wilford. 2013. Desktop watershed characterization methods for British Columbia. Prov. B.C., Victoria, B.C. Tech. Rep. 079. www.for.gov.bc.ca/hfd/pubs/Docs/Tr/Tr079.htm.

Climate

Historic normal conditions and predicted future change.

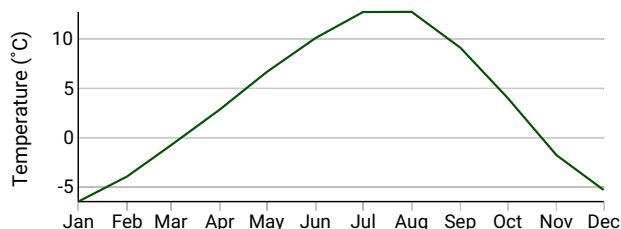
The climate of the query watershed has been characterized using ClimateWNA (Wang 2012). In the left hand column, charts are presented for the reference time period 1961-1990. In the right hand column, three illustrative climate change scenarios have been selected to estimate a wide range of potential future change in the query watershed (Murdock and Spittlehouse 2011).

Scenario A illustrates the UKMO HadGEM A1B run 1 global climate model (GCM), scenario B shows the CGCM3 A2 run 4 GCM and scenario C shows the UKMO HadCM3 B1 run 1 GCM. The combination of these three climate models and emissions scenarios were chosen because, over most of British Columbia, they provide a range of generally hot/dry, warm/very wet, and moderately warm/wet for HadGEM A1B, CGCM3 A2, and HadCM3 B1 respectively.

Historic and future climate change information has been provided to assist in understanding potential changes in the basin as temperature and precipitation are intricately related to stream flow. For example, snowpack levels affect many aspects of water resources, from instream flows for fish to community water supplies to soil moisture, groundwater, and aquifer recharge. Climate studies generally indicate a trend of rising air temperatures for all seasons across BC while precipitation trends vary by season and region (Pike *et al.* 2008, Rodenhuis *et al.* 2007). Local responses to changing precipitation and temperature will differ due to BC's inherent hydrological diversity as well as varying climate trends. These charts are intended as a quick glance starting point to basin climate change assessment.

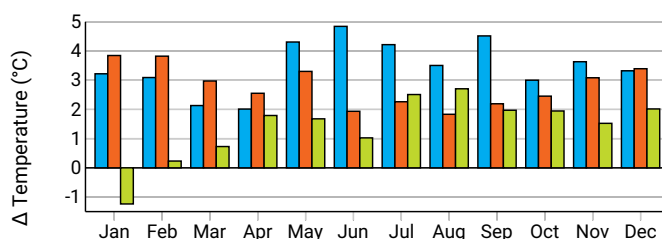
Normal (1961 - 1990)

Monthly temperatures are presented as averages of the monthly mean temperature for the query basin as a whole. Projected changes in temperature may affect the hydrology in the watershed by influencing the time of freeze and thaw, evapotranspiration rates, form of precipitation, and vegetation composition, among other factors.

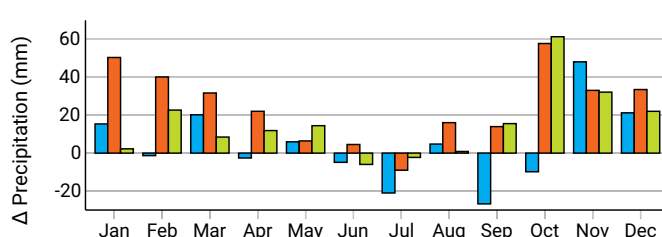
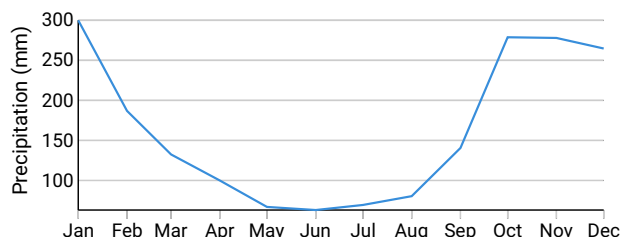


Predicted Change (2041 - 2070)

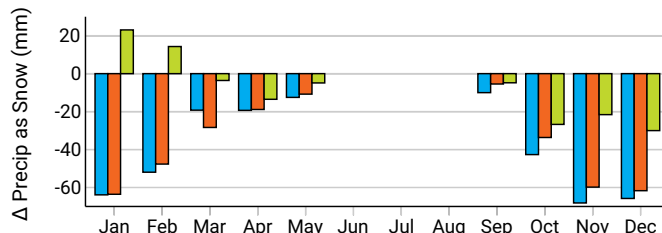
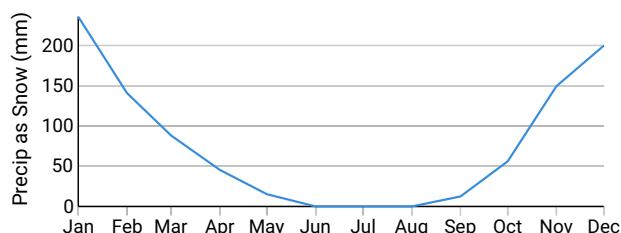
Scenario A Scenario B Scenario C



The precipitation in the query watershed is shown as an average unit precipitation for the watershed. Changes in precipitation timing and amount may affect the hydrology in the watershed by influencing the timing and magnitude of peak and low flow conditions. These changes may affect availability of water for environmental flow needs and human use, and modify the physical characteristics of river channels and associated needs for engineered structures.



Precipitation as snow in the query watershed is presented as an average unit precipitation for the query basin as a whole. Changes in the amount of precipitation as snow may affect winter snowpack volumes and associated melt related hydrology in the spring. An increase in rain-on-snow events may be associated with elevated natural hazard risk from avalanche or other slope stability failures.



References

- Murdock, T.Q., Spittlehouse, D.L. 2011. Selecting and Using Climate Change Scenarios for British Columbia. Pacific Climate Impacts Consortium, University of Victoria, Victoria, BC. <http://www.pacificclimate.org/sites/default/files/publications/Murdock.ScenariosGuidance.Dec2011.pdf>
- Pike, R.G., D.L. Spittlehouse, K.E. Bennett, V.N. Egginton, P.J. Tschaplinski, T.Q. Murdock, and A.T. Werner. 2008. Climate Change and Watershed Hydrology: Part I - Recent and Projected Changes in British Columbia. Streamline, Watershed Management Bulletin 11-2 8-13. <http://www.pacificclimate.org/sites/default/files/publications/Pike.StreamlineHydrologyPartI.Apr2008.pdf>
- Rodenhuis, D., K.E. Bennett, A. Werner, T.Q. Murdock, and D. Bronaugh. 2007. Hydro-climatology and future climate impacts in British Columbia. Pacific Climate Impacts Consortium. <http://www.pacificclimate.org/sites/default/files/publications/Rodenhuis.ClimateOverview.Mar2009.pdf>
- Wang, T., Hamann, A., Spittlehouse, D., and Murdock, T. N. 2012. ClimateWNA - High-resolution spatial climate data for western North America. Journal of Applied Meteorology and Climatology 61: 16-29.