

## **Environmental Indicator: Water Use in British Columbia**

**Primary Indicator:**      *Percentage of licensed stream length that has water allocation restrictions by decade.*

**Selection and Use of Indicator:** The percentage of licensed stream length that is over allocated or nearing over allocation is a *pressure* indicator, showing demand for water use. The number of water allocation restrictions placed on streams is both an indicator of the intensity of water use and of limitations in water supply. The term “streams” also includes rivers and lakes.

Restrictions are designed to protect water supplies in, and downstream of, a given water body.

Water allocation restrictions are applied in areas where water demand threatens the sustainability of water supply. They are placed on streams when any additional use or users of that water might jeopardise the availability of water to others license holders for the same stream, or for other, non-human users. The type of restriction varies with the situation. For example, in the absence of supporting storage, additional licences to withdraw irrigation water from a particular river might be prohibited. Other water licences might contain a minimum fish flow clause, prohibiting licensees from withdrawing water during times of the year when the water flow drops below a specified minimum level required to support fish populations.

The data for this indicator shows a increase over the last century in the percentage of licensed stream length that is restricted. Before the 1980’s generally only human requirements received consideration; the significant rise in restrictions occurring in the 1980’s is likely due to the recognition of in-stream flow requirements for health of fish populations. Following this rise, however, percentages have levelled off at just under 30 percent.

**Data and Sources:**

**Table1. Licensed stream lengths and water allocation restrictions on streams in British Columbia by decade (1860-2000).**

<b>Decade</b>	<b>Kilometres Licensed</b>	<b>Kilometres Restricted</b>	<b>Percentage Restricted</b>
1860	861	0	0
1870	2486	0	0
1880	4296	7	0
1890	7032	7	0
1900	10851	7	0
1910	12941	21	0
1920	16493	362	2
1930	18857	854	5
1940	22595	995	4
1950	28082	1712	6
1960	37664	3758	10
1970	47797	7672	16

**BRITISH COLUMBIA  
MINISTRY OF WATER, LAND AND AIR PROTECTION - 2002**

<b>Decade</b>	<b>Kilometres Licensed</b>	<b>Kilometres Restricted</b>	<b>Percentage Restricted</b>
1980	55526	15118	27
1990	63201	17728	28
2000	63240	17735	28

Source: BC Ministry of Water, Land and Air Protection, Water Management Branch, Water Allocation Section, 2001.

**Methodology and Reliability:** The data that were analysed to arrive at the measures in this document came from the following sources:

1. Stream license points (points of diversions) and stream restrictions came from three separate ArcInfo coverages supplied the Water Inventory Section of the BC Ministry of Sustainable Resource Management. All points in these coverages were collected at a scale of 1:20,000 using TRIM (Terrain Resource Inventory Mapping)
2. Stream lengths and watershed group boundaries were drawn from the BC Watershed Atlas stream layer produced by the BC Ministry of Fisheries. This is a 1:50,000 map of all streams on the 1:50,000 series NTS maps. A provincial stream coverage was created by linking together the relevant layers from all 246 watershed groups in the province. A complete discussion of the Atlas and maps are available at:  
<http://www.bcfisheries.gov.bc.ca/fishinv/basemaps-technotes.html>
3. Date and stream name information for the points of diversion and for the stream restrictions were obtained from the Ministry of Water, Land and Air Protection water licensing database. Further information and access to licensing data are now available from Land and Water BC Inc, at: <http://lwbc.bc.ca/water/surface.html>

Once the base data were assembled into a single set of coverages, the point data were edited to remove unusable or unwanted data. These included points for which there was no date or status information and points with an “Active” status, meaning that had yet to be issued licenses. A few points were removed because they were reserves, not restrictions, or because they had no tag identifier.

The most challenging aspect of calculating the percentage of licensed streams in the province that had restrictions was obtaining the actual stream lengths. The main problem is that the base points are collected on TRIM (1:20,000) for which topological intelligence has not been built. That meant there is no way of identifying the spatial relationships between arc segments that make up a stream. The method used to acquire the stream lengths was the same for both points of diversion (licenses) and restrictions. ArcView’s geoprocessing extension was used assign each point the attributes from the nearest arc segment in the atlas. An additional field was added to the output table to record the distance from the point to the arc segment from which the attributes were taken, then a query was done on this field to select all points within 100 metres of an arc segment. This table was then joined to the table of points within 100 m of a stream to give the total length of stream for each point (license or restriction).

**BRITISH COLUMBIA**  
**MINISTRY OF WATER, LAND AND AIR PROTECTION - 2002**

An attempt was made to reduce the number of points that were assigned to the incorrect stream by using the gazetted name from the watershed atlas and the stream name from the points files. This process was of particular importance for restrictions at the mouth of streams as many such restrictions were spatially allocated to the parent stream instead of the tributary where the restriction was actually located. This resulted in significant over-estimates of restricted stream length, returning percentages much higher than 100. Where a stream crossed watershed groups (e.g., the Fraser River) only the stream length found within the watershed group in which the point was located was used, not the entire stream length through the province.

Before final totals could be calculated by decade, tables of the minimum dates for points of diversion and restrictions were created to ensure that each stream length was only counted once, beginning at the date of its first license or restriction (in cases where multiple licenses existed on the same stream). A Visual Basic for Applications script was then used to loop through the minimum decade table at 10-year intervals beginning in 1860 (decade of first point of diversion record). For each decade the data was grouped by watershed group and the length of licensed streams and length of restricted streams was summed and added to tables. When decade 2010 was reached the process was stopped and the point of diversion and restriction tables were joined by decade and watershed group and appended to a final table which stored the license length and restriction length for each decade and for each watershed group. From this table the percentage of licensed stream length that is restricted was calculated.

**Reliability of Data:** The data contained in this report should be used with caution. Although efforts were made to reduce the number of incorrectly assigned points to streams, the spatial variation between TRIM and the Watershed Atlas will invariably produce some errors. The data, however, are considered sufficiently accurate to indicate provincial trends and to show areas of the province that are fully, or nearing full, allocated.

**Secondary Measure:** *Percentage of licensed stream length that was fully allocated or approaching full allocation in 1950, 1970 and 2000.*

**Selection and Use of Indicator:** This indicator shows both the geographic distribution and trends in water allocation restrictions for watershed groups in British Columbia.

**BRITISH COLUMBIA  
MINISTRY OF WATER, LAND AND AIR PROTECTION - 2002**

**Data and Sources:**

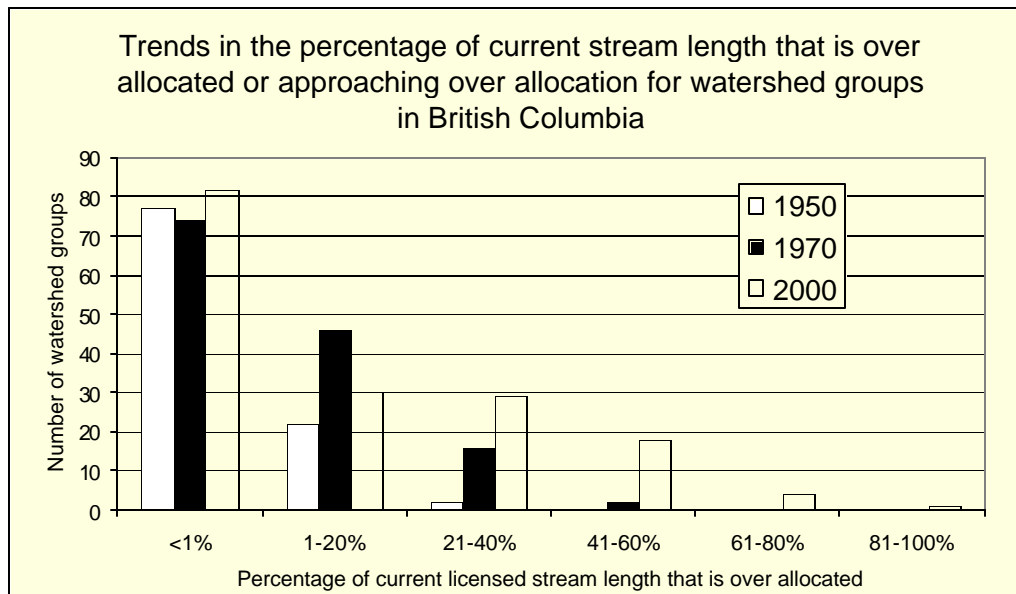
**Table 2. Number of watershed groups in British Columbia categorized by percentage of total licensed stream length that is fully allocated or approaching full allocation.**

Percentage	Number of watersheds		
	1950s	1970s	2000s
<1%	77	74	82
1-20%	22	46	32
21-40%	2	16	31
41-60%	0	2	19
61-80%	0	0	3
81-100%	0	0	1
Total number of watersheds with stream licenses	101	138	168
Total number of watersheds with no licenses	145	108	78

Source: BC Ministry of Water, Land and Air Protection, Water Management Branch, Water Allocation Section, 2001. Data for each watershed group available in Appendix A.

Note: Analysis was standardized to 2000 values by dividing the restricted stream length for the decade by the length of stream that was licensed in 2000.

**Figure 1.**



Source: BC Ministry of Water, Land and Air Protection, Water Management Branch, Water Allocation Section, 2001.

**BRITISH COLUMBIA  
MINISTRY OF WATER, LAND AND AIR PROTECTION - 2002**

**Methodology and Reliability:** The data set used was the same as described in the primary indicator. To show geographic distribution, licensed stream length and restricted stream length was sorted by watershed group. To calculate the percentage of licensed stream length that was fully allocated or approaching full allocation, the restricted stream length for the decade was divided by the length of stream that was licensed in 2000. This was done to standardize the analysis to 2000 values to avoid the following anomaly in the data: without this step, a watershed that showed 80% of the licensed stream length restricted in 1970 could show a drop in percentage by 2000 if the total licensed stream length increased; since the licensed stream length in 1970 could be shorter than the 2000 stream lengths, it was decided that it would be more realistic to use the 2000 total length as the divisor. The disadvantage of this method is that by standardising the data to a base year, the maps will change in future as the base year is changed.

**Secondary Measure:** *Daily municipal water use per capita in British Columbia.*

**Selection of Indicator:** The daily municipal water use per capita is a *stress* or *condition* indicator. It shows the demand that municipal water use is placing on British Columbia's supply of fresh water. Municipal water use includes water used for domestic, industrial, commercial and other uses. In past reports, only domestic water use obtained from the Environment Canada Municipal Water Use database (MUD) was used as the water use indicator. It was decided not to continue with reporting on domestic water use because it is only a portion of municipal water use (it accounts for about half of municipal water use) and it is often estimated by municipalities that do not have appropriate metering to determine actual amounts (V. Mercier, pers. comm. 2001).

Current water use patterns in British Columbia can have environmental and economic consequences, including seasonal water shortages. Excessive water use can draw down natural water flow levels and reduce the natural ability of aquatic ecosystems to deal with pollutants. Increased water use also dilutes wastewater, reducing wastewater treatment efficiency and effluent quality. Excessive water use increases the cost of providing drinking water treatment and supply infrastructure. This can leave less money for maintenance; deteriorating water infrastructure can result in the loss of high volumes of water through leaks (e.g., in some areas in Canada, leaks account for approximately 30% of water use).

**Data and Sources:**

**Table 3. Per capita municipal water use in British Columbia 1983-1999.**

<b>Year</b>	<b>litres/person/day</b>
1983	722
1986	732
1989	752
1991	726
1994	672
1996	642
1999	678

Source: Environment Canada, Municipal Water Use Database. Compiled from spreadsheets of BC data from the years listed.

**BRITISH COLUMBIA  
MINISTRY OF WATER, LAND AND AIR PROTECTION - 2002**

**Methodology and Reliability:** The Municipal Water Use Database (MUD) lists water and sewage data for municipalities that have a population of 1,000 or greater, collected at 3-year intervals. The MUD data used for this indicator were:

- Average daily flow (ADF)—the water used by a municipality. The ADF includes water for domestic, industrial, commercial and other purposes.
- Municipal population served water – the population in the municipality served by any water system, which comes from census records maintained by the municipality. It does not include population external to the municipality or population on private individual groundwater supplies. Planning departments in each municipality estimate the population in non-census years.

The municipal water use per person in British Columbia was derived by summing the ADF (cubic metres per day) and dividing by the total municipal population served water. This was done for all the listed municipalities. If a municipality did not have municipal water use data, the population of that community was not included as part of the calculation. This number was then converted to litres by multiplying it by 1000 (1 m<sup>3</sup> equals 1,000 litres). These calculations were made for each of the survey years.

**Additional Information:** The average municipal water use for all of Canada was 678 litres per person in 1999 (MUD 2001). National data (see Table 4.) show the Atlantic provinces with the highest per capita municipal water consumption. Higher water use levels in coastal provinces can be attributed to a relatively plentiful supply and a flat rate pricing systems that is used in most coastal municipalities.

**Table 4. Provincial Trends in Municipal Water Use, 1983-1999.**

Region	1983	1986	1989	1991	1994	1996	1999
Atlantic Provinces	822	660	797	813	841	832	871
B.C.	722	732	752	726	672	642	678
Ontario	606	583	603	545	529	557	549
Prairie Provinces	552	562	562	542	494	472	492
Quebec	747	869	856	838	825	779	798
<b>National Average</b>	<b>690</b>	<b>681</b>	<b>714</b>	<b>693</b>	<b>672</b>	<b>656</b>	<b>678</b>

Source: Environment Canada, Municipal Water Use Database (MUD), 2001.

Canada is also one of the highest per capita users of water globally (see Table 5).

**Table 5. Average Daily Domestic Water Use<sup>1</sup> (per capita), 1996.**

Country	litres/person/day, 1996
United States	425
Canada	326
United Kingdom	200
Sweden	200
France	150
Israel	135

<sup>1</sup> Note that this is not municipal water use which includes all other uses of water in the municipality. Domestic water use accounts for more than half of municipal water use in Canada.

Source: Environment Canada, 2000. Water Use: Average daily domestic water use (per capita).

<http://www.ec.gc.ca/water/images/manage/use/a4f4e.htm>

**BRITISH COLUMBIA  
MINISTRY OF WATER, LAND AND AIR PROTECTION - 2002**

**References:**

Environment Canada, Municipal Water Use Database (MUD)  
[http://www.ec.gc.ca/water/en/info/misc/e\\_data.htm](http://www.ec.gc.ca/water/en/info/misc/e_data.htm)

Mercier, V. Bureau national des indicateurs et de l'évaluation. Environnement Canada.

**Secondary Measure:** *Effect of metering on per capita domestic water use in British Columbia.*

**Selection of Indicator:** The effect of metering on per capita domestic water use in British Columbia shows the average volume of water consumed by the population with water meters (priced by volume) compared to the volume of water consumed by the population that pays a flat rate for water use. Under a flat rate schedule, the customer pays a fixed amount in return for unlimited access to water services. Metering refers to payment for water services based on the volume of water used as recorded by in-line water meters.

For all of Canada, flat rate users consumed 70% more water (457 litres per person per day) compared to those that had water meters (269 litres per person per day). In British Columbia, however, flat rate users consumed 524 litres per person per day, which is only 15% more water than the 455 litres per person per day consumed by people who paid based on volume. The smaller difference for British Columbians may be due to the fact that metered rates are among the lowest prices in Canada.

Water pricing has a direct influence of the amount of water used, the capital and operating costs for water infrastructure and the amount of revenue raised.

**Data and Sources:**

**Table 6. Per Capita Domestic Water Use for Metered and Un-Metered Users in British Columbia, 1999.**

<b>Metering Status<sup>1</sup></b>	<b>Total Water Use</b>	<b>Population Served</b>	<b>L/person/day</b>
Metered (Price by volume)	228 449	501 682	455
Unmetered (Flat rate)	513 665	979 452	524

<sup>1</sup> A municipality is considered to have metered status if 100% of the population is metered. A municipality is considered to be unmetered if 100% of the population pays a flat rate.  
Source: Environment Canada, Municipal Water Use Database 2001.

**Methodology and Reliability:** The data in the summary table and graph came from Environment Canada's Municipal Water Use and Pricing Surveys of 1991, 1994, 1996 and 1999 (the last year for which the survey has been carried out to date). These surveys are sent out to municipalities with populations greater than 1,000 to solicit information regarding water use, wastewater use and treatment and pricing.

**BRITISH COLUMBIA**  
**MINISTRY OF WATER, LAND AND AIR PROTECTION - 2002**

The effect of metering on per capita domestic water use was calculated for 1999. The Municipal Water Use Database (MUD) data used for this indicator were:

- Percent metering by municipality – The proportion of residential water metering as a percentage of the population served.
- Domestic water use – a municipal estimate of the total average daily flow (ADF) used for domestic purposes (in cubic meters per day converted to litres per day). The ADF includes water used by a municipality for domestic, industrial, commercial and other purposes.
- Municipal population served water – the population in the municipality served by any water system. It does not include population external to the municipality or population on private individual groundwater supplies.

All municipalities were included that had either 100% of the population served by metering or none of the population served by metering. To determine the metered domestic water use per person, the total domestic water use for the metered population was divided by the population served by those municipalities. This figure was converted to litres per day. The same calculation was completed for all the municipalities where the none of the population had metered service.

**References:**

Environment Canada, Municipal Water Use Database (MUD). 2001.  
[http://www.ec.gc.ca/water/en/info/misc/e\\_data.htm](http://www.ec.gc.ca/water/en/info/misc/e_data.htm)

Environment Canada, Environmental Economics Branch. 2001. Municipal Water Pricing 1991-1999. Government of Canada. This publication is available at <http://www.ec.gc.ca/erad/>

**Secondary Measure :**

(not included in  
*Environmental Trends*  
2002 report)

*Percentage of municipal population with water meters in British Columbia.*

**Selection of Indicator:** This indicator shows the percentage of the province's municipal population with water service that pays for the volume of water used (metered service).

In British Columbia, there has been very little change in the percentage of the municipal population that is served water with water meters between 1991 and 1999. The majority of British Columbians (76%) currently pay a flat rate for water service.



**BRITISH COLUMBIA  
MINISTRY OF WATER, LAND AND AIR PROTECTION - 2002**

**Data and Sources:**

**Table 7. Percentage of Municipal Population in British Columbia with Water Meters.**

<b>Year</b>	<b>Population Metered</b>	<b>Population Un-metered</b>
1991	22%	78%
1994	23%	77%
1996	25%	75%
1999	24%	76%

Source: Environment Canada, Municipal Water Use Database 2001.

**Methodology and Reliability:** The methodology and source of data are the same as in previous indicators.

The percentage of the municipal population with water meters was derived by dividing the metered population by the total population serviced. This was done by aggregating the population with water meters for all the listed municipalities and dividing this total by the total population of all municipalities listed. (If a municipality did not have municipal water use data, the population of that community was not part of the calculation.) These calculations were made for each of the survey years.

**References:**

Environment Canada, Municipal Water Use Database (MUD). 2001.  
[http://www.ec.gc.ca/water/en/info/misc/e\\_data.htm](http://www.ec.gc.ca/water/en/info/misc/e_data.htm)

Environment Canada. 2001. Municipal Water Pricing Database 1991-1999.  
[http://www.ec.gc.ca/water/en/info/misc/e\\_data.htm](http://www.ec.gc.ca/water/en/info/misc/e_data.htm)

**Secondary Measure:** *Volume of water licensed for bottled water sales in British Columbia.*

**Selection and Use of Indicator:** The volume of water licensed for sale is a *pressure* indicator, showing demand on this natural resource for commercial purposes.

This indicator was included to provide information on this activity and to show the trend over time.

**BRITISH COLUMBIA**  
**MINISTRY OF WATER, LAND AND AIR PROTECTION - 2002**

**Data and Sources:**

**Table 8. Volume of Water Licensed for Bottle Sales in British Columbia**

<b>Year</b>	<b>Volume Licensed (m<sup>3</sup>/yr)</b>	<b>Cumulative Total (m<sup>3</sup>/yr)</b>
1972	13,267	13,267
1973	0	13,267
1974	0	13,267
1975	0	13,267
1976	0	13,267
1977	0	13,267
1978	0	13,267
1979	0	13,267
1980	0	13,267
1981	0	13,267
1982	0	13,267
1983	0	13,267
1984	0	13,267
1985	0	13,267
1986	0	13,267
1987	214,300	227,567
1988	132,667	360,234
1989	14,925	375,159
1990	0	375,159
1991	1,301,795	1,676,954
1992	622,508	2,299,462
1993	82,917	2,382,379
1994	124,375	2,506,754
1995	66,333	2,573,087
1996	0	2,573,087
1997	1,691,504	4,264,591
1998	101,159	4,365,750
1999	818,389	5,184,139
2000	422,000	9,407,700
2001	0	9,407,700

Source: BC Ministry of Water, Air and Land Protection 2002.

**BRITISH COLUMBIA**  
**MINISTRY OF WATER, LAND AND AIR PROTECTION - 2002**

**Methodology and Reliability:** The data show the volume *licensed* for bottled water sales, not the volume actually *used* for that purpose. Licence holders may use only some, or none, of the volume licensed, therefore the graph shows maximum allowable use, not absolute use.

Licences usually have no expiry date, and are therefore active unless revoked for reasons such as non-payment, non-compliance or non-use. The data shown are only for licences active as of November 1999. Data on revoked licences were not kept prior to 1992, therefore, it is not certain that all the licences issued prior to that date are still active.

The indicator is for surface water only. Because groundwater is not licensed, there are no data on the volume of groundwater that may be used for bottled water sales. Since “spring water” is often a marketing feature of bottled water, it is important to note that springs reaching the surface of the ground (for even part of the year) are considered surface water and the use of this water must be licensed.

For nine of the early licences, the date of issue was not listed in the data provided because they were issued before the computerized water allocation system was in place. For these licences, the priority date was used instead (the priority date is the same as the application date), which usually only differs from the issue date by a year or two and was therefore considered an acceptable substitute. The two licences from 1972 were checked manually.

**BRITISH COLUMBIA  
MINISTRY OF WATER, LAND AND AIR PROTECTION - 2002**

**Appendix A: Data for Stream Allocation Restrictions in British Columbia**

The table below shows the stream length licensed and restricted for each watershed group for three decades. The 4-letter acronyms for the watershed group are from the BC Watershed Atlas, which stores files by watershed group rather than by mapsheet. See <http://www.bcfisheries.gov.bc.ca/fishinv/basemaps-watershed.html> for map images that can be used to locate the Group/acronym in the Province or to select the Group(s) covering the area of interest to download files from the ftp site.

When calculating the data for the primary indicator the total length of licensed stream was used as the denominator. When displaying the information in map form the total stream length licensed in 2000 was used as the denominator. Without this standardization, the percentage of restricted stream length decreased over time for a number of watershed groups as more of the stream length was licensed.

Watershed group	1950		1970		2000		
	Stream length licensed (km)	Stream length restricted (km)	Stream length licensed (km)	Stream length restricted (km)	Stream length licensed (km)	Stream length restricted (km)	Percent Restricted 2000
ADMS	84.2	33.0	348.2	33.0	383.9	257.2	67.0
ALBN	247.0	0.0	373.0	4.8	432.7	47.0	10.9
ATLL	0.0	0.0	70.7	0.0	160.5	0.0	0.0
ATNA	0.0	0.0	106.9	0.0	197.9	0.0	0.0
BABL	0.0	0.0	218.5	21.3	232.4	21.3	9.2
BABR	21.3	0.0	12.1	0.0	12.1	0.0	0.0
BBAR	514.7	46.1	585.5	72.5	730.8	278.1	38.1
BELA	37.3	0.0	55.7	0.0	220.9	63.0	28.5
BIGC	219.9	0.0	283.4	0.0	343.3	28.2	8.2
BLAR	0.0	0.0	81.0	0.0	129.5	36.1	27.9
BONP	843.7	74.0	944.3	208.5	1011.5	376.2	37.2
BOWR	0.0	0.0	63.7	0.0	374.2	61.1	16.3
BRID	286.9	0.0	406.1	36.2	454.1	354.7	78.1
BRKS	44.8	0.0	68.7	0.0	77.4	0.0	0.0
BULK	429.1	0.0	965.8	308.1	1229.7	483.0	39.3
BULL	340.9	15.2	472.7	18.7	534.8	106.7	20.0
CAMB	156.9	0.0	171.0	0.0	219.3	0.0	0.0
CANO	0.0	0.0	34.2	0.0	99.4	0.0	0.0
CARP	0.0	0.0	0.0	0.0	48.8	0.0	0.0
CARR	9.9	0.0	16.3	0.0	256.7	0.0	0.0
CHES	53.7	0.0	104.9	0.0	129.1	0.0	0.0
CHIL	0.0	0.0	0.0	0.0	8.5	0.0	0.0
CHIR	0.0	0.0	62.1	0.0	217.4	0.0	0.0
CHWK	204.3	0.0	386.4	8.4	429.7	8.4	2.0
CLAY	10.0	0.0	20.0	0.0	34.6	4.3	12.5

**BRITISH COLUMBIA**  
**MINISTRY OF WATER, LAND AND AIR PROTECTION - 2002**

Watershed group	1950		1970		2000		
	Stream length licensed (km)	Stream length restricted (km)	Stream length licensed (km)	Stream length restricted (km)	Stream length licensed (km)	Stream length restricted (km)	Percent Restricted 2000
CLRH	0.0	0.0	0.0	0.0	3.1	0.0	0.0
CLWR	111.6	0.0	344.5	0.0	364.5	177.8	48.8
COLR	628.2	32.5	887.5	92.3	960.5	157.9	16.4
COMX	170.7	41.0	326.6	50.9	435.9	138.2	31.7
COTR	37.6	0.0	438.0	172.6	768.8	319.6	41.6
COWN	550.8	9.0	628.0	137.2	681.8	299.5	43.9
CRKD	6.0	0.0	6.0	0.0	19.4	0.0	0.0
DEAD	312.0	0.0	356.6	116.6	381.9	230.8	60.4
DEAL	0.0	0.0	17.4	0.0	130.4	0.0	0.0
DEAR	0.0	0.0	0.0	0.0	15.7	0.0	0.0
DOGC	254.5	0.0	438.1	12.9	457.2	197.2	43.1
DUNC	51.6	0.0	115.4	0.0	284.0	3.0	1.1
DUNE	0.0	0.0	0.0	0.0	85.1	0.0	0.0
ELKR	292.0	0.0	604.5	235.3	671.6	260.8	38.8
EUCH	0.0	0.0	13.0	0.0	148.6	0.0	0.0
EUCL	2.5	0.0	2.5	0.0	30.2	0.0	0.0
FINA	0.0	0.0	0.4	0.0	138.9	0.0	0.0
FINL	0.0	0.0	0.0	0.0	124.6	0.0	0.0
FIRE	0.0	0.0	0.0	0.0	6.2	0.0	0.0
FRAN	33.2	0.0	523.5	27.6	756.1	209.3	27.7
FRCN	317.8	50.3	344.5	50.3	418.1	94.7	22.6
GOLD	30.4	0.0	106.6	0.0	136.3	0.0	0.0
GRAI	0.5	0.0	21.7	1.1	73.4	7.4	10.0
GRNL	154.5	0.0	235.3	25.6	300.6	183.6	61.1
GUIC	366.9	0.0	424.9	84.5	459.2	184.3	40.1
HARR	177.0	24.5	351.6	24.5	367.3	78.8	21.5
HOLB	8.5	0.0	13.5	0.0	25.2	0.0	0.0
HOMA	211.7	0.0	305.9	20.9	510.5	44.1	8.6
HORS	36.4	0.0	377.3	131.1	452.0	134.8	29.8
INGR	0.0	0.0	0.0	0.0	10.7	0.0	0.0
INKR	0.0	0.0	0.0	0.0	4.5	0.0	0.0
JERV	295.8	31.9	456.5	46.8	568.0	88.7	15.6
KCHL	0.0	0.0	0.0	0.0	265.9	0.0	0.0
KETL	1032.1	37.9	1635.4	111.2	1796.2	780.6	43.5
KHOR	387.8	20.8	448.9	25.5	590.3	177.8	30.1
KISK	0.0	0.0	310.2	0.0	530.5	0.0	0.0
KISP	14.1	0.0	91.1	6.9	163.6	8.3	5.1
KITR	173.6	0.0	173.6	0.0	184.4	0.0	0.0
KLIN	329.5	0.0	342.4	0.0	352.7	0.0	0.0
KLUM	16.2	0.0	167.1	106.3	307.6	131.2	42.7

**BRITISH COLUMBIA  
MINISTRY OF WATER, LAND AND AIR PROTECTION - 2002**

Watershed group	1950		1970		2000		
	Stream length licensed (km)	Stream length restricted (km)	Stream length licensed (km)	Stream length restricted (km)	Stream length licensed (km)	Stream length restricted (km)	Percent Restricted 2000
KNIG	0.0	0.0	10.5	0.0	78.5	0.0	0.0
KOTL	1073.5	82.9	1550.2	387.5	1891.1	493.1	26.1
KOTR	17.4	0.0	28.7	0.0	34.7	0.0	0.0
KSHR	0.0	0.0	5.6	0.0	36.4	0.0	0.0
KTSU	0.0	0.0	4.3	0.0	8.7	0.0	0.0
KUMR	0.0	0.0	0.0	0.0	9.0	0.0	0.0
KUSR	0.0	0.0	0.0	0.0	7.2	0.0	0.0
LARL	717.1	31.0	1200.5	376.5	1335.4	530.2	39.7
LBTN	0.0	0.0	391.2	58.2	633.9	72.5	11.4
LCHL	20.6	0.0	365.4	38.8	459.7	58.1	12.6
LCHR	655.4	0.0	749.2	13.5	902.1	268.2	29.7
LFRA	677.7	13.4	1244.9	28.2	1492.0	219.2	14.7
LFRT	0.0	0.0	0.0	0.0	53.1	0.0	0.0
LHAF	0.0	0.0	93.2	0.0	370.1	0.0	0.0
LILL	218.3	0.0	425.9	0.0	680.2	0.0	0.0
LISR	0.0	0.0	0.0	0.0	2.8	0.0	0.0
LKEL	16.6	0.0	92.1	0.0	94.8	29.9	31.5
LMUS	0.0	0.0	9.1	0.0	136.0	0.0	0.0
LNAR	10.8	0.0	58.6	44.8	86.8	51.1	58.9
LNIC	894.1	114.9	979.2	194.6	1030.1	344.5	33.4
LNRS	92.0	0.0	95.0	0.0	104.8	0.0	0.0
LNTH	902.8	0.0	1312.4	362.4	1365.8	707.8	51.8
LOMI	0.0	0.0	0.0	0.0	100.3	0.0	0.0
LPCE	0.0	0.0	209.8	0.0	616.2	198.8	32.3
LRDO	36.3	0.0	36.3	0.0	36.3	0.0	0.0
LSAL	0.0	0.0	60.9	27.0	232.2	27.0	11.6
LSKE	0.0	0.0	19.1	0.0	83.5	4.3	5.2
LSTR	0.0	0.0	0.0	0.0	4.1	0.0	0.0
MAHD	21.0	0.0	428.2	37.7	478.4	37.7	7.9
MDEA	0.0	0.0	28.2	0.0	118.5	0.0	0.0
MFRA	383.4	0.0	549.2	65.1	646.4	354.4	54.8
MFRT	0.0	0.0	200.4	0.0	270.0	0.0	0.0
MIDR	0.0	0.0	0.0	0.0	76.8	0.0	0.0
MORI	0.0	0.0	28.6	0.0	38.7	14.8	38.3
MORK	38.2	0.0	178.0	0.0	341.1	5.6	1.6
MORR	0.0	0.0	89.4	0.0	103.9	0.0	0.0
MSTR	0.0	0.0	0.0	0.0	94.3	0.0	0.0
MURR	0.0	0.0	2.0	0.0	289.0	0.0	0.0
NARC	334.1	0.0	709.7	139.4	803.2	218.5	27.2
NASC	33.6	0.0	43.5	0.0	44.3	0.0	0.0

**BRITISH COLUMBIA**  
**MINISTRY OF WATER, LAND AND AIR PROTECTION - 2002**

Watershed group	1950		1970		2000		
	Stream length licensed (km)	Stream length restricted (km)	Stream length licensed (km)	Stream length restricted (km)	Stream length licensed (km)	Stream length restricted (km)	Percent Restricted 2000
NATR	0.0	0.0	0.0	0.0	8.7	0.0	0.0
NAZR	39.2	0.0	44.7	0.0	249.2	0.0	0.0
NECL	14.7	0.0	23.9	0.0	24.8	1.9	7.8
NECR	128.0	0.0	708.1	24.0	1033.8	323.4	31.3
NEVI	11.8	0.0	41.1	0.0	70.1	18.5	26.4
NICL	527.3	0.0	557.6	32.0	569.0	114.0	20.0
NIEL	17.2	0.0	17.2	0.0	20.6	0.0	0.0
NIMP	26.0	0.0	115.0	0.0	229.7	0.0	0.0
OKAN	2345.6	238.4	2740.8	1040.0	2944.2	1557.1	52.9
OWIK	36.5	0.0	63.3	0.0	116.1	0.0	0.0
PARA	0.0	0.0	32.4	0.0	98.9	0.0	0.0
PARK	213.3	0.0	366.5	10.5	422.1	18.2	4.3
PARS	0.0	0.0	17.7	0.0	19.8	0.0	0.0
PCEA	0.0	0.0	2.8	0.0	29.1	0.0	0.0
PINE	0.0	0.0	315.0	0.0	607.7	153.2	25.2
PORI	1.4	0.0	1.4	0.0	2.6	0.0	0.0
QUES	569.2	207.2	804.3	285.3	981.0	556.7	56.7
REVL	0.0	0.0	152.8	0.0	157.0	0.0	0.0
SAHT	0.0	0.0	0.0	0.0	237.8	0.0	0.0
SAJR	452.3	73.5	660.6	298.1	713.8	409.3	57.3
SALM	109.2	0.0	209.5	0.0	283.2	0.0	0.0
SANJ	192.5	0.0	343.1	12.4	442.6	91.5	20.7
SETN	734.6	0.0	1014.5	101.1	1206.0	171.8	14.2
SEYM	0.0	0.0	38.4	0.0	43.6	0.0	0.0
SHUL	288.4	0.0	584.6	81.7	681.9	260.3	38.2
SIML	1315.3	54.1	1449.9	158.4	1654.5	308.9	18.7
SKGT	1.6	0.0	19.4	0.0	19.9	0.0	0.0
SLOC	302.7	103.9	568.6	173.8	649.0	259.5	40.0
SMAR	609.7	54.1	951.4	280.0	1043.8	419.2	40.2
SMOK	0.0	0.0	0.0	0.0	95.8	0.0	0.0
SQAM	355.3	5.8	509.6	5.8	674.6	91.4	13.6
STHM	1081.6	87.4	1246.0	406.1	1297.1	715.2	55.1
STIR	0.0	0.0	18.8	0.0	162.3	13.7	8.4
STUL	0.0	0.0	87.7	0.0	197.4	0.0	0.0
STUR	0.0	0.0	113.9	0.0	201.5	0.0	0.0
SUST	0.0	0.0	0.0	0.0	150.2	0.0	0.0
TABR	36.1	0.0	378.3	51.9	437.2	80.6	18.4
TAHS	0.0	0.0	0.0	0.0	1.9	0.0	0.0
TAKL	0.0	0.0	0.0	0.0	23.8	0.0	0.0
TASR	0.0	0.0	49.1	0.0	51.3	0.0	0.0

**BRITISH COLUMBIA  
MINISTRY OF WATER, LAND AND AIR PROTECTION - 2002**

Watershed group	1950		1970		2000		
	Stream length licensed (km)	Stream length restricted (km)	Stream length licensed (km)	Stream length restricted (km)	Stream length licensed (km)	Stream length restricted (km)	Percent Restricted 2000
THOM	937.3	142.5	1078.5	346.9	1143.7	602.7	52.7
TOBA	115.5	0.0	159.4	0.0	342.9	1.2	0.4
TOOD	0.0	0.0	0.0	0.0	10.6	10.6	100.0
TSIT	28.8	0.0	41.7	0.0	41.7	0.0	0.0
TUTR	0.0	0.0	0.0	0.0	8.4	0.0	0.0
TWAC	377.9	0.0	511.5	110.1	616.5	366.5	59.5
UARL	113.4	0.0	282.0	14.6	414.0	38.7	9.3
UCHR	267.2	0.0	337.8	0.0	406.0	97.5	24.0
UDEN	59.3	0.0	488.4	14.5	703.5	67.6	9.6
UFRA	116.6	0.0	483.3	11.0	671.3	263.1	39.2
UHAF	0.0	0.0	0.0	0.0	254.9	0.0	0.0
UISR	0.0	0.0	118.1	0.0	131.0	9.7	7.4
UNRS	5.1	0.0	20.0	14.9	58.8	14.9	25.4
UNTH	101.3	0.0	510.1	2.8	598.6	334.2	55.8
UNUR	0.0	0.0	0.0	0.0	22.4	0.0	0.0
UOMI	0.0	0.0	0.0	0.0	61.2	0.0	0.0
UPCE	46.9	0.0	293.4	0.0	613.0	4.2	0.7
USHU	651.1	0.0	1070.9	104.8	1155.5	487.2	42.2
USIK	0.0	0.0	0.0	0.0	132.4	0.0	0.0
VICT	181.7	86.9	297.1	126.1	329.0	186.6	56.7
WILL	3.7	0.0	249.9	0.0	278.6	0.0	0.0
WORC	15.4	0.0	46.0	0.0	59.8	16.4	27.3
ZYMO	0.0	0.0	1.9	0.0	191.3	0.0	0.0