

Okanagan Basin Water Quality Index Information

What is a water quality index?

A water quality index (WQI) is a standardized metric used to convey complicated multiparameter water monitoring data into an easily digestible report card that answers the question: is the water quality good or not? With multiple years of data, it is also possible to address whether the water quality getting better, worse, or staying the same.

How was the index calculated?

This index was based upon the peer reviewed [CCME Water Quality Index \(CCMEWQI\) framework](#) that has been employed by organizations throughout Canada and around the world.

The index is based upon three calculations:

- Scope - The percentage of parameters that did not meet their objectives or guidelines.
- Frequency - The percentage of individual samples that did not meet their objectives or guidelines.
- Amplitude - The amount that failed tests exceeded their objectives or guidelines.

The CCMEWQI produces a value between 0 and 100 with 0 equating to very poor water quality while 100 would indicate exceptional water quality based upon the parameters chosen. The spectrum of results was split into bins as per the CCME instructions.

- 0-44 = Poor: "water quality is almost always threatened or impaired."
- 45-64 = Marginal: "water quality is frequently threatened or impaired."
- 65-79 = Fair: "water quality is usually protected but occasionally threatened or impaired."
- 80-94 = Good: "water quality is protected with only a minor degree of threat or impairment."
- 95-100 = Excellent: "water quality is protected with a virtual absence of threat or impairment."

The results of the CCMEWQI can be visualized using a number of different visualizations (see 'How to use the Index' for more information)

What data were used to calculate the index?

The data used to calculate the index was obtained from the [British Columbia Environmental Monitoring System \(EMS\)](#) and stored in the [OBWB Water Quality Database](#). This is the longest continuous water quality data set for the Okanagan Valley.

Which parameters were included in the calculations?

The following parameters were used to calculate the index. While many more parameters are available within the EMS database, only those that could be compared against a relevant guideline or objective could be chosen for inclusion into the CCMEWQI calculation. These parameters cover a broad range of potential concerns such as water clarity, salt, dissolved oxygen loss, nutrients, and heavy metals. Not all parameters were available for each site during each time frame.

Parameter	Units	Guideline Value	Guideline Type	Guideline Source	Timeline	Description
Chloride	mg/L	150	BC 30-day chronic	BC ENV	per sample	Component of salt
Chlorophyll-a	ug/L	4.5	Okanagan Objective	BC ENV	growing season average	Photosynthetic pigment, measure of algae
Chromium	mg/L	0.05	Drinking water	BC ENV	per sample	Heavy metal
Copper	mg/L	formula	CCME-long term	CCME	per sample	Heavy metal
Dissolved Oxygen	NA	5	Okanagan Objective	BC ENV	annual minimum	Oxygen in water
Iron	mg/L	1	Maximum allowable concentration	BC ENV	per sample	Heavy metal
Lead	mg/L	0.005	Drinking water	BC ENV	per sample	Heavy metal
Nitrate	mg/L as N	3	BC 30-day chronic	BC ENV	per sample	Nitrate, a form of nitrogen that fuels algae growth
Nitrogen (total)	mg/L as N	0.23	Okanagan Objective	BC ENV	March sample	The total concentration of nitrogen in water
Organic carbon (total)	mg/L	4	Drinking water	BC ENV	per sample	Organic carbon concentration, affects water treatment
Phosphorus (total)	mg/L as P	0.008	Okanagan Objective	BC ENV	March sample	Phosphorus controls algae growth
Secchi Depth	m	5	Okanagan Objective	BC ENV	growing season average	Water clarity measure
Temperature	deg C	15	Fish protection	BC ENV	maximum	Temperature of water
Turbidity	NTU	1	Drinking water	BC ENV	per sample	Water clarity, affects water treatment
Zinc	mg/L	formula	Maximum allowable concentration	BC ENV	per sample	Heavy metal

What is the time frame used in the calculations?

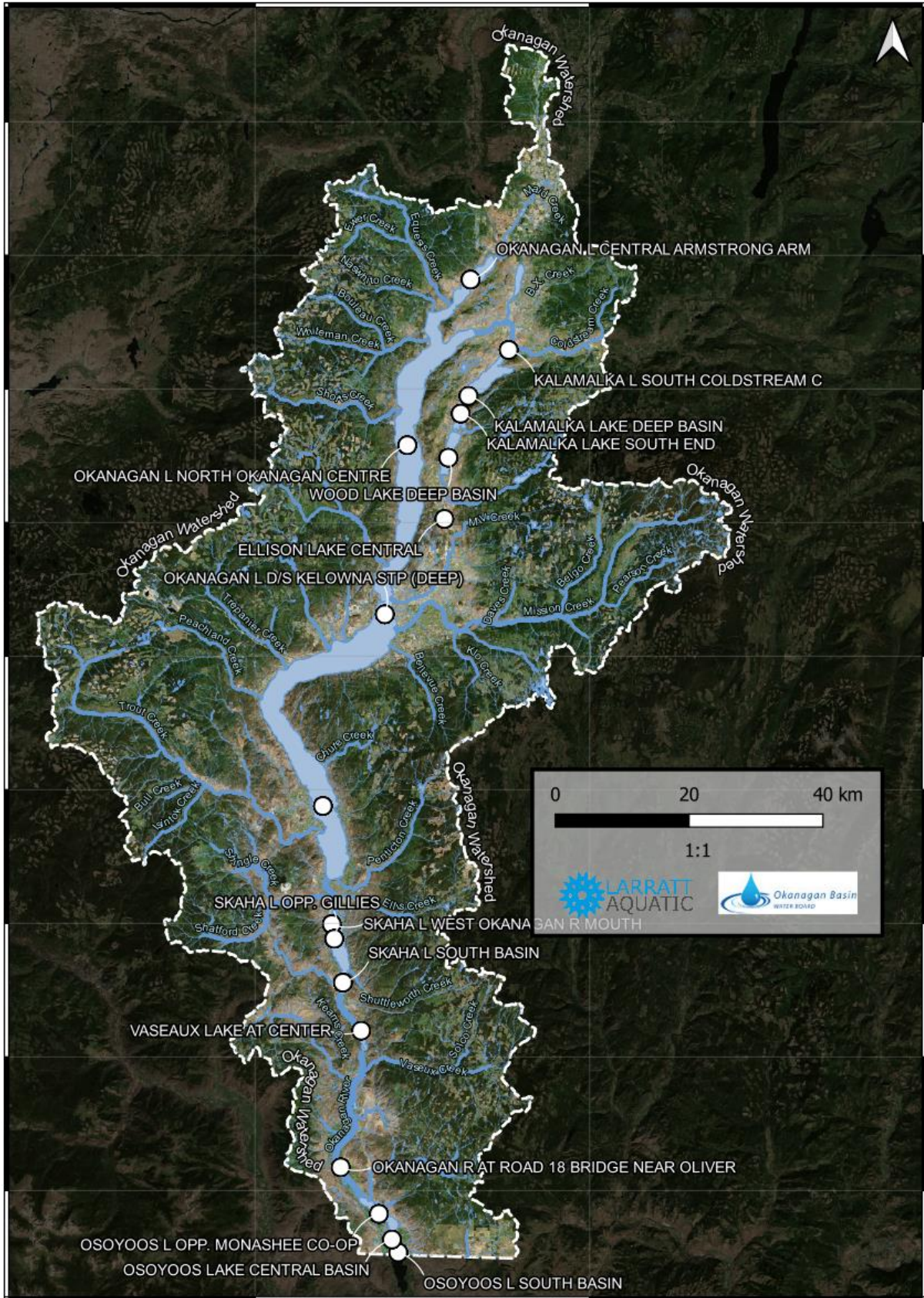
The data was lumped into three-year bins. The bins start with the most recent complete year of data.

Site Information

Site Information

This index is focused specifically on the Okanagan mainstem lakes and Okanagan River. The sites listed below have an extensive history of continuous monitoring by, [British Columbia Ministry of Environment](#) with data going back over 50 years.

EMS ID	Site	Latitude	Longitude	Start Year	End Year
0500239	Okanagan Lake (Armstrong Arm)	50.32	-119.36	1973	2023
0500461	Kalamalka Lake North	50.22	-119.27	1975	2023
0500847	Kalamalka Lake Centre	50.16	-119.35	1983	2023
0500246	Kalamalka Lake South	50.13	-119.37	1973	2023
0500730	Okanagan Lake (North Basin)	50.09	-119.48	1976	2023
0500848	Wood Lake	50.07	-119.39	1983	2023
0500265	Ellison Lake	49.99	-119.40	1969	2023
0500236	Okanagan Lake (Central Basin)	49.86	-119.51	1973	2023
0500454	Okanagan Lake (South Basin)	49.60	-119.63	1975	2023
0500453	Skaha Lake @ Okanagan River	49.44	-119.60	1975	2023
0500615	Skaha Lake Centre	49.42	-119.60	1985	2023
0500846	Skaha Lake South	49.36	-119.57	1985	2023
E220331	Vaseux Lake	49.30	-119.53	1993	2022
0500720	Okanagan River @ Oliver	49.12	-119.57	1979	2023
0500728	Osoyoos Lake North	49.05	-119.48	1976	2023
E220540	Osoyoos Lake Centre	49.02	-119.46	1994	2023
0500248	Osoyoos Lake South	49.00	-119.44	1973	2023

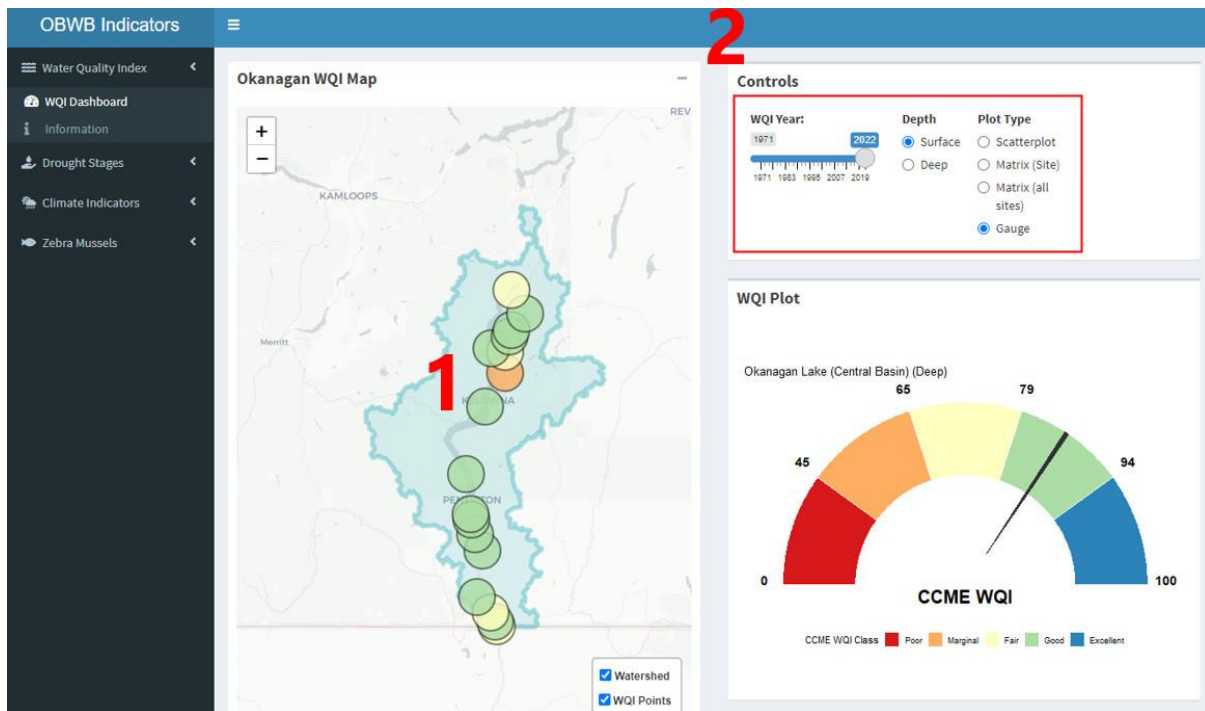


How to use the index

How to use the index

Using the WQI web dashboard involves two steps:

1. Click on a location - The large circles on the map represent each location listed above and are selectable. Hovering the mouse cursor over the point will display the site name. Clicking on a point will load its data into the Plot and Point Data boxes.
2. Adjust Controls - The dashboard includes several controls to adjust the WQI result (see below for more information).



What do the controls do?

The control panel contains three control options.

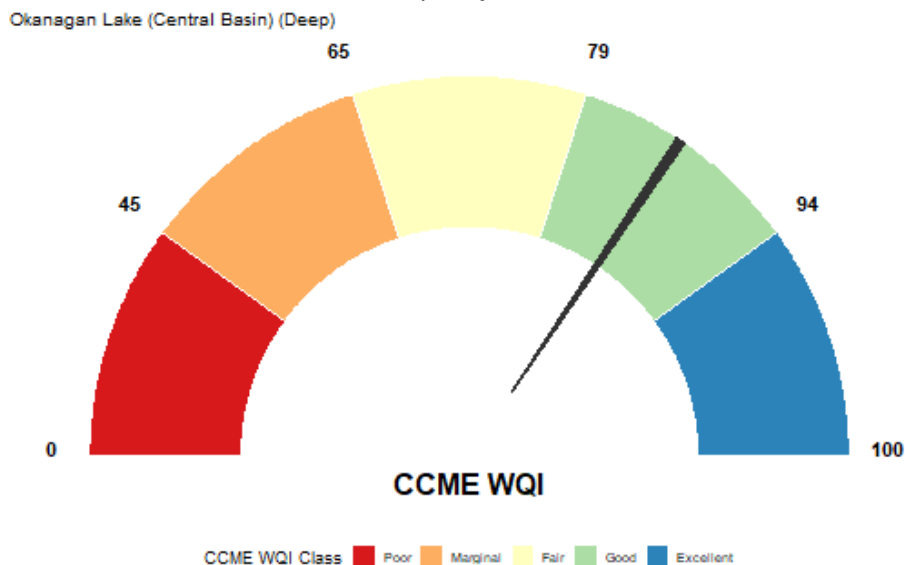
- WQI Year - Moving this slider adjusts the 3-year timeframe that the WQI is calculated upon. The Map, Plot, and Point Data boxes are all responsive to this slider and will update automatically as the slider is adjusted. This allows the user to quickly see how the WQI spatially throughout the valley and temporarily, moving back in time.
- Depth - Most of the lake sites are sampled at both the surface and deep water allowing comparison between those depths over time. As with the map and slider, this button automatically updates the Map, Plot, and Point Data boxes.
- Plot Type - The dashboard includes several visualization styles to display the WQI value for each location and timeframe selected. More information on the plot types can be found below.

What do the different plot types mean?

There are currently four visualization options for displaying the WQI in addition to the map view.

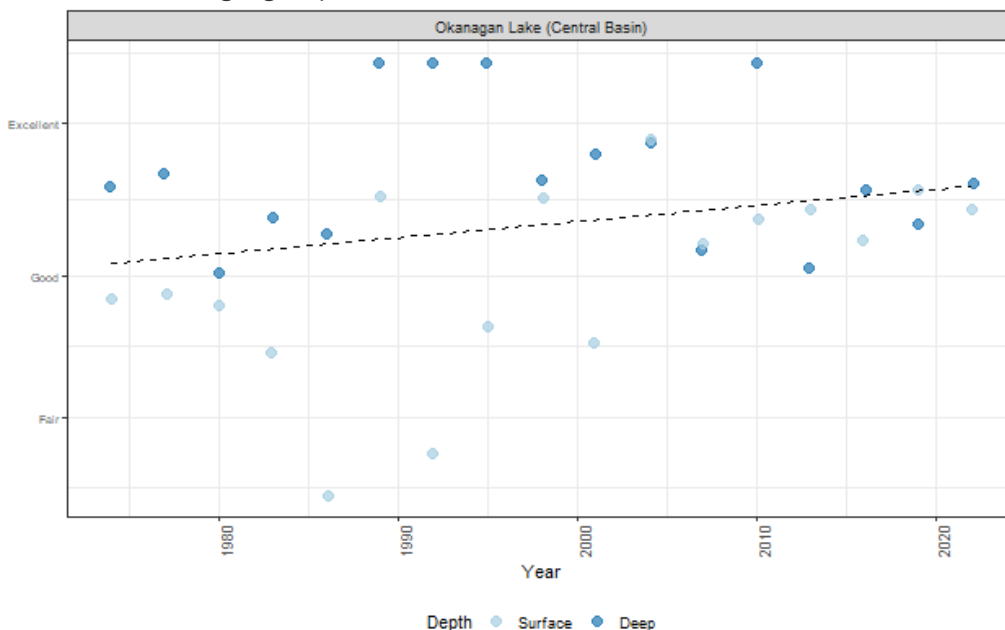
Gauge

The default plot type is the gauge plot. This is visually similar to a speed-o-meter and works similarly. The arch of the plot is coloured based on the WQI value categories listed in the CCME guidance documents above. Layered on top of this arch is a black line that indicates the specific WQI for the site and timeframe that were selected. This plot type allows for a very rapid assessment of the WQI value and what that means in terms of water quality.



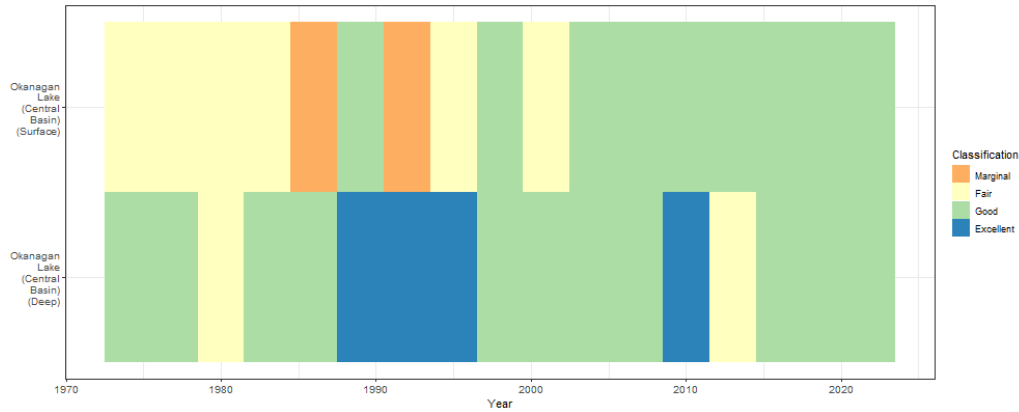
Scatterplot

The scatterplot option displays a series of points with the horizontal axis representing time and the vertical axis as the WQI value categorized by the associated water quality ratings from the CCME guidance document listed above. Layered upon the points is a dashed black line that is the linear line of best fit. This line highlights potential trends in the WQI value over time.



Matrix

The matrix style plot displays a coloured cell for each 3-year timeframe and each depth at a given site. It shows the same basic story as the scatterplot but uses colours to display trends. There is an alternate matrix option 'Matrix (all sites)' that produces a matrix plot showing all WQI values for all sites in one view. This serves as the most comprehensive visual produced through the WQI dashboard.



What information is displayed in the Point Data box?

The Point Data box displays the values for each parameter that fed into the calculation of the WQI at a given site for a given 3-year timeframe. The data table displays the parameter name as well as statistical values such as minimum (min), maximum (max), average (mean), median (med), number of samples (n), and standard deviation (sd). This data provides additional insight into what factors are driving the index value. The table updates automatically as the controls are adjusted.

Point Data

Show entries

Search:

	Depth	Parameter	max	mean	med	min
2	Surface	Chloride	5.97	5.59238095238095	5.54	5.16
3	Deep	Chloride	5.97	5.56619047619048	5.59	3.99
345	Surface	Chlorophyll.a	0.0066	0.0025852380952381	0.00212	0.00103
612	Surface	Conductivity	312.1	283.361538461538	287.7	207.2
613	Deep	Conductivity	292	287.833333333333	289	282
1321	Surface	DO	17.6	10.9935	11	3.26
1389	Surface	DOC	5.17	4.48	4.415	4.06
1390	Deep	DOC	4.48	4.315	4.31	4.2
1458	Surface	Hardness	132	121.95667	121.37001	116
1459	Deep	Hardness	130	121.677443333333	120.86908	115

Showing 1 to 10 of 44 entries

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