

## Lake Chelan -- Chelan County

The outlet of Lake Chelan is located at the city of Chelan. It is the longest and deepest natural lake in the state. It extends 50.4 miles northwest from the dam at the outlet to the mouth of the Stehekin River. The dam at the outlet was built in 1928 and the water level is controlled by Chelan County PUD No. 1. There are numerous inlets along the west and east sides, and the Stehekin River at the head of the lake is the principal inlet tributary. It drains via the Chelan River to the Columbia River.

Size (acres)	33,300
Maximum Depth (feet)	1486
Mean Depth (feet)	474
Lake Volume (acre-feet)	1,756,198.
Drainage Area (miles <sup>2</sup> )	924
Altitude (feet)	1110
Shoreline length (miles)	109.2

Estimated Trophic State:	Oligotrophic
Mean Trophic State Index* (Secchi):	21
Trophic State Index* (Total Phosphorus):	29

\* From Carlson (1977)

### Summary of Questionnaire Results and Information From the Volunteer

The following are from the volunteer's remarks and questionnaire responses. Lake Chelan is used for fishing, boating, swimming, rowing, jet skiing, and camping. Recreational facilities on the lakeshore include a park, a picnic area, a state park, a camping area, a beach, eight resorts, and seven boat ramps, and there are no restrictions for motorboat use on the lake. Lake water is withdrawn for drinking, municipal use, and irrigation. Currently the watershed is used for logging, animal grazing, crop agriculture, and the lakeshore is being developed further for residences. Grazing animals have direct access to the lakeshore and inlet tributaries. In the past, the watershed was used for animal grazing, crop agriculture, and mining, and the shoreline was altered. There are approximately 400 houses on the lakeshore; of these, 200 are occupied year-round. The lakeshore is about 70% sewerred. Fish were not reported as being stocked in the lake. Presently there is a sewer district, yacht and boat clubs, and a sports council for the lake. The worst problem in the lake, in the opinion of the volunteer, was algae growing along the shore in areas where it wasn't 10 years ago. Overall, the volunteer finds that Lake Chelan has excellent recreational water quality, and suggested that agricultural runoff and the large number of large boats that use the lake for long periods, may contribute to the water quality of the lake. The volunteer also noted that last year the health department closed the city park because of ducks.

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### Monitoring Results/Summary of Other Available Information

The volunteer monitored Lake Chelan at the center of the lake between 25 Mile Creek and Dutch Harbor. Because high winds frequently make the water surface choppy, a viewing tube was loaned to the volunteer to improve his ability to see the Secchi disk through the water. None of the other volunteers used viewing tubes.

Both the Secchi disk readings and the total phosphorus concentrations in the water indicate that Lake Chelan was oligotrophic.

From Patmont *et al.* (1989): Lake Chelan was monitored from November 1986 through December 1987, for an Ecology-funded study. The purpose of the study was to provide baseline information on the lake, to evaluate the existing and potential nutrient sources to the lake and their impacts, and to use the gathered information to provide recommendations for preserving the high water quality of the lake. Several aspects of the lake were evaluated, including groundwater, circulation patterns of the lake, lake productivity (phytoplankton and periphyton), bacteriological conditions in the lake, lake sediments and fish tissue. With respect to phosphorus concentrations, Lake Chelan was classified as ultra-oligotrophic, meaning that the lake was extremely unproductive and low in nutrients. The main water quality concern at the lake is with regards to nearshore water quality, because the lake is used for recreation and for drinking. Recommendations from the study included limiting development along the lakeshore so that phosphorus loading to the lake is minimized, maintaining the lake as ultra-oligotrophic. This may limit further development to 500 or fewer dwellings in the lower basin. Recommendations also address agricultural runoff to the tributaries and loading from septic systems. In order to maintain the lake at an ultra-oligotrophic classification, the mean annual concentration of total phosphorus should not exceed 4.5  $\mu\text{g/L}$ ; during the 1986-1987 study the concentration of epilimnetic total phosphorus in the upper basin of the lake was 3.0 (+/-0.2)  $\mu\text{g/L}$ .

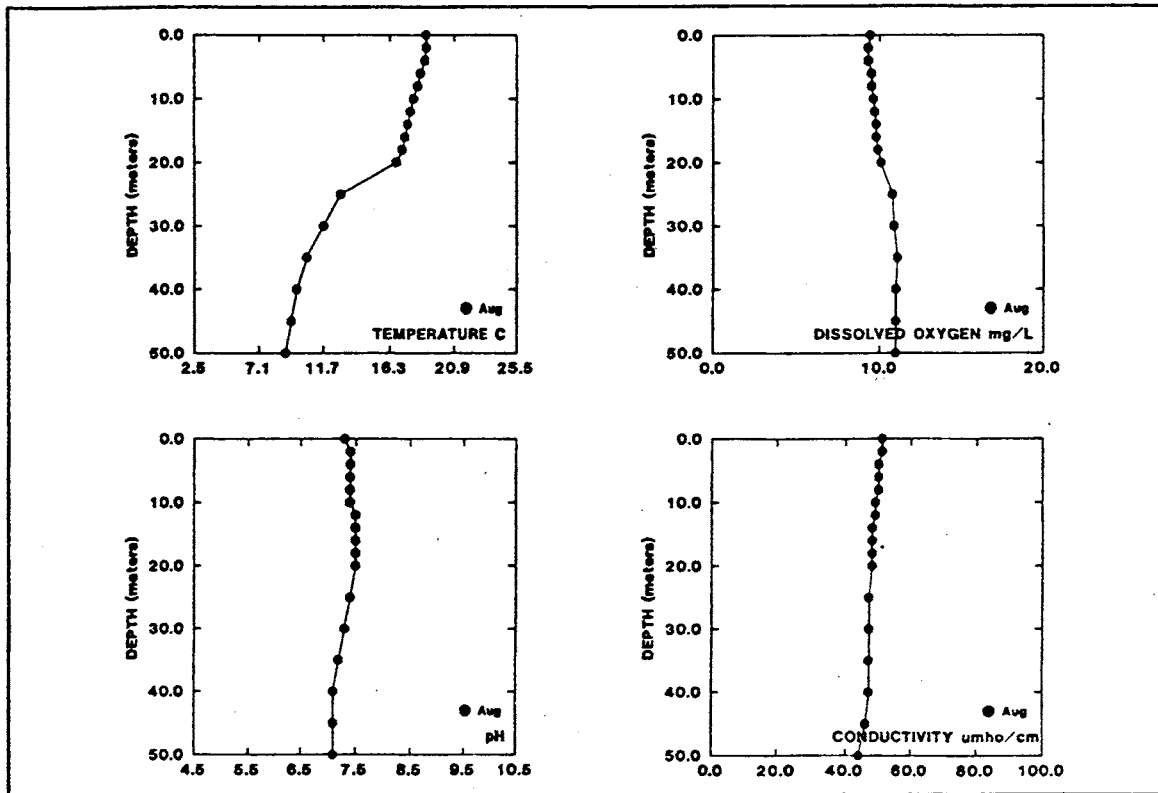
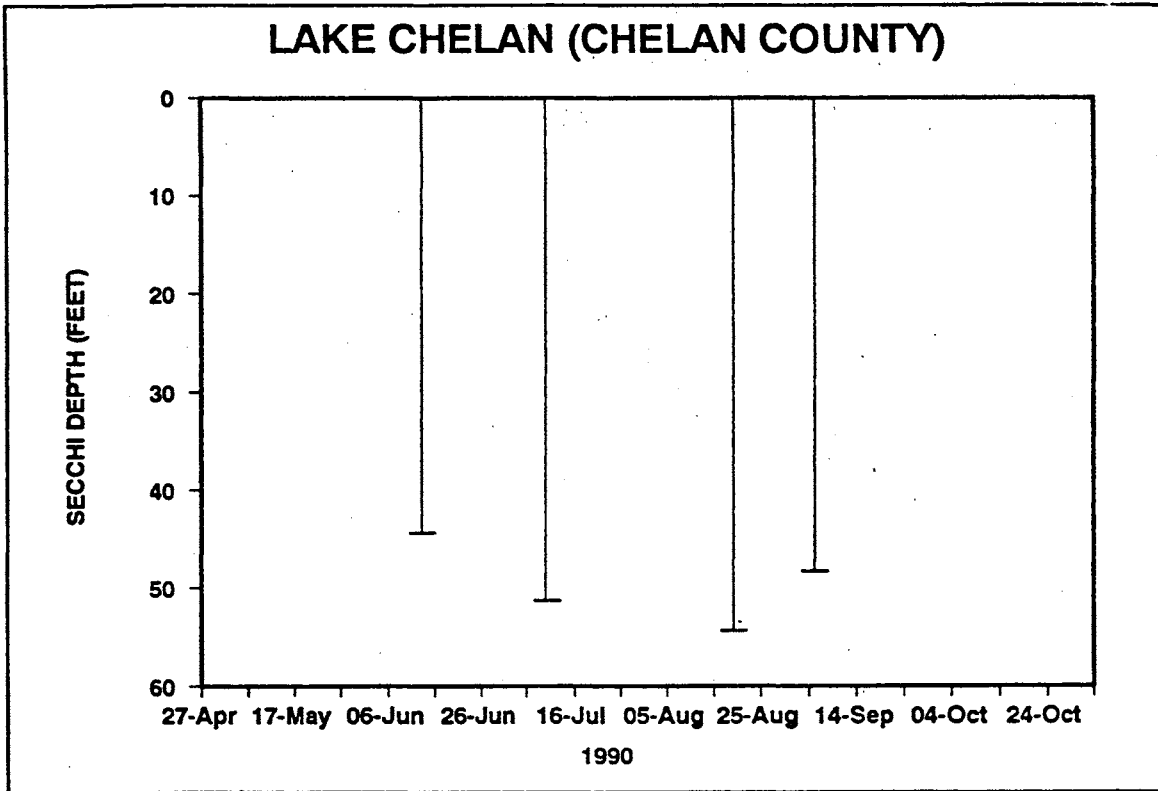
### Comments

Lake Chelan consistently had the greatest water clarity of all the lakes monitored for the program during 1990. Only Lake Crescent, monitored for the program during 1989, had greater water clarity, having a mean summer average water clarity of 79 feet in 1989. Lake Chelan also had the lowest concentration of total phosphorus of the lakes monitored during 1990.

### Acknowledgement

I thank Keith S. Marney, for volunteering his time to monitor Lake Chelan during 1990.

# Secchi Depth and Profile Data Graphs



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### Volunteer-Collected Data

Date 1990	Temperature (°C) (°F)		pH	Water Color	%Cloud Cover	Recent Rain	Wind	Secchi (ft)	Lake Hit(in)	Abbreviated Comments
14-Jun	13.3	55.9	6.5	Clear	25	Light	Calm	43.0	95.6	Lots of rain but not much runoff last 10 days.
11-Jul	17.2	63.0	6.0	Bl-Green	0	None	Calm	50.0	100.0	
20-Aug	17.2	63.0	6.5	Blue	25	Light	Strong	53.0	100.0	White caps; used view tube with Dave or would have been too rough to see Secchi.
06-Sep	17.8	64.0	6.0	Blue	25	None	Calm	47.0	99.0	Lots of boat use over Labor Day weekend!

### Onsite Visit Data

Date 1990	Depth (meters)	Temp (°C)	pH	Dissolved oxygen (mg/L)	Conductivity (µmhos/cm)	Composite sample depths (m)	Total phosphorus (mg/L)	Total nitrogen (mg/L)
08/20	0.0	18.9	7.3	9.4	51	5, 10, 15	0.006	112.0
	2.0	18.9	7.4	9.3	51			
	4.0	18.8	7.4	9.3	50			
	6.0	18.5	7.4	9.5	50			
	8.0	18.3	7.4	9.5	50			
	10.0	18.0	7.4	9.6	49			
	12.0	17.8	7.5	9.7	49			
	14.0	17.6	7.5	9.8	48			
	16.0	17.4	7.5	9.8	48			
	18.0	17.2	7.5	9.9	48			
	20.0	16.8	7.5	10.1	48			
	25.0	12.9	7.4	10.8	47			
	30.0	11.7	7.3	10.9	47			
	35.0	10.5	7.2	11.1	47			
	40.0	9.8	7.1	11.0	47			
	45.0	9.4	7.1	11.0	46			
	50.0	9.0	7.1	11.0	44			