

Wallowa Lake

Wallowa County

Grande Ronde Basin

Location	
Area	1,508 acres (610.3 hect)
Elevation	4,383 ft (1,335.9 m)
Type	natural lake w ith dam
Use	recreation, irrigation
Location	0.5 miles south of Joseph
Access	from Wallowa a Lake State Park at south end of lake
USGS Quad	Joseph (24K), Enterprise (100K)
Coordinates	45° 20' 06" N, 117° 13' 15" W
USPLSS	tow nship 03S, range 45E, section 32

Wallowa Lake, lying at the foot of The Wallowa Mountains in a spectacular alpine setting, is one of northeastern Oregon's finest scenic and recreational resources. Behind the lake, a precipitous mountain front rises dramatically to the summit of Chief Joseph Mountain, nearly a mile higher than the lake. The glacial origin of the lake is evidenced by the spectacular morainal deposits which enclose it; and by the glaciated valleys that lie above it in the Wallowa Mountains. It is one of the finest examples of a morainal lake anywhere in the United States. Formation of the lake was due to the combined result of the damming of the Wallowa River by the two high lateral moraines, one on each side, and a lower terminal moraine at the north end. These lateral moraines are remarkable topographic features: the crests extend 900 feet above the lake, and their bases are beneath the water line. At the north end, morainal heights decrease gradually toward convergence with the level of the outwash plain. The deposits of at least four periods of glaciation make up these composite moraines (Crandell 1967). The morphometric characteristics of lakes are determined by the mode of origin. It is approximately three and one-half miles in length from north to south and three-fourths of a mile wide, and has a distinct curve to the northwest in its lower portion. Maximum depth of the lake is 299 feet and, as noted on the bathymetric map, it is situated in a U-shaped basin typical of a glacial valley. The littoral zone, or shoal area, is only 3 percent of the lake area.

Wallowa Lake lies at an elevation of 4383 feet above sea level. It is fed by the Wallowa River which is the result of the union of two streams less than a mile above the lake. West Fork, the larger of the two, heads ten miles upstream in a broad expanse of cirques, ridges, and peaks between altitudes of 8000 and 10,000 feet. East Fork originates five miles upstream in a high cirque that encloses Aneroid Lake. Because of the steep longitudinal gradient of these streams, the Wallowa River flows turbulently at high velocities and is thus able to transport a substantial load of coarse sediments. Deposition then occurs at the south end of the lake where the river enters, forming a prominent alluvial delta which continues to build lakeward and fill the basin (Larson 1981). The abrupt northwest-trending front of the Wallowa Mountains is bordered by a plain that is drained by the Wallowa River after leaving the lake. Forty-five miles downstream, the river joins the Grande Ronde River, a tributary of the Snake River.

Although it is a natural lake, Wallowa Lake has been regulated to some degree since 1884 when a rough dam was built across the outlet to service a nearby shingle mill. In 1890, a heavier dam was constructed and an irrigation ditch laid out. Subsequent enlargements of the dam have increased the total capacity of the lake to over 240,000 acre feet. Water from the lake now irrigates a large amount of acreage in the Wallowa Valley and is an integral part of the agricultural economy. One unfortunate result of damming the lake was to terminate a natural run of sockeye salmon. Until about 1890, Wallowa Lake was one of the few non-coastal lakes in the Pacific Northwest used for spawning by migratory salmonoids. Construction of a larger dam for power generation in 1916 terminated the fish runs permanently. As a consequence, some fish, which came to be known as kokanee salmon, remained in the lake as a naturally reproducing, landlocked population (Bartlett 1975).

Wallowa Lake is best known as a recreational area. In addition to the native fish, rainbow trout, mackinaw, and Dolly Varden have been stocked and the lake offers excellent fishing. A good highway skirts the eastern shoreline and provides access to a large state park at the south end. Those wishing to explore the back country of the Wallowa Mountains, the Eagle Cap Wilderness, must proceed on any one of a number of scenic trails. Recreational use at the lake has increased dramatically in the last two or three decades and so has the number of lakeside residences, from a scattered few in the 1940s to over 300. Shoreline ownership is about 56 percent private land, while the remainder is state park.

During the summer, the lake develops a distinct thermal stratification. The surface layer remains cool, but is warm enough for swimming and water-skiing, especially at the southwestern end of the lake where there is a small sandy beach. The water below about 130 feet (40 meters) is perennially cold, near 39 degrees Fahrenheit (4 degrees Celsius). Winters in northeast Oregon are quite cold and the lake frequently freezes over; sometimes the entire surface is frozen. Thus, the annual cycle of temperature in the lake is a classic illustration of a dimictic lake, with two periods of mixing, one in the spring, the second in the fall. The



Source: Oregon National Guard, 1981-82. View looking southwest.

Drainage Basin Characteristics					
Area	50.8 sq mi (131.6 sq km)				
Relief	steep				
Precip	25-70 in (64-178 cm)				
Land Use %					
Forest	11.7				
Range	2.6				
Water	5.9				
Irrig	-				
Non Irrig	-				
Urban	-				
Other	79.8				
Notes	Other - Rock outcrops				
Lake Morphometry					
Area	1,508.0 acres (610.3 hect)				
Depth	299 ft (91.1 m)				
Ave/Max Depth Ratio	0.540				
Volume	243,517 acre ft (300.82 cu hm)				
Shoal area	3%				
Volume factor	1.62				
Shape factor	1.51				
Length of Shoreline	8.2 mi (13.2 km)				
Retention time	2.5 yr				
Notes	-				
Water Quality					
Trophic status	oligotrophic				
Sample date	08/01/82				
Temp	64.4F (18.0C)				
Diss. Oxygen (mg/l)	9.2				
Transparency	23. ft (7.0 m)				
Phosp (mg/l)	0.002				
Chlorophyll a (mg/l)	1.9				
Alkalinity	30				
Conductivity (umhos/cm)	82				
pH	8.2				
Major Ions					
Na	K	Ca	Mg	Cl	SO4
1.4	0.8	12.7	0.6	0.5	5.7
Notes	Temp and D.O. at 1 meter.				
Sample date	06/24/82				
Temp	59.0F (15.0C)				
Diss. Oxygen (mg/l)	10.4				
Transparency	18 ft (5.5 m)				
Phosp (mg/l)	0.045				
Chlorophyll a (mg/l)	0.7				
Alkalinity	33				
Conductivity (umhos/cm)	93				
pH	8.0				
Major Ions					
Na	K	Ca	Mg	Cl	SO4
1.8	0.8	15.3	0.8	0.7	6.6
Notes	Temp and D.O. at 1 meter				

concentrations of major ions in Wallowa Lake are moderate, but somewhat unusual because of the relatively high concentrations of sulfate and calcium. The pH is also above average for a lake which in most respects appears to be oligotrophic. It is likely that the calcium, sulfate, and bicarbonate are largely derived from the weathering of glacial flour and other fine particulates brought into the lake by the Wallowa River. The lake is saturated with oxygen at all depths. The bottom sediment is relatively coarse. The banks are very steep and in many places strewn with large boulders left behind by the retreating glacier. Consequently the annual raising and lowering of the lake level for irrigation causes no noticeable bank erosion. There is also no suitable substrate for macrophytes and they are nearly absent from the lake. The lack of any shallow sediment and the great average depth also contribute to the oligotrophic character of the lake. The populations of phytoplankton are low to moderate. The dominant species (Dinobryon divergens) indicates oligotrophic to mesotrophic conditions. Total phosphorus is usually low, and water transparency is moderate to excellent. Turbidity is very low (less than 1 JTU) and suspended solids are less than 2 mg/L (Larson 1981). The general character of Wallowa Lake is distinctly oligotrophic, although primary productivity by phytoplankton may be somewhat more than expected in a very oligotrophic lake.

Phytoplankton Surveys:

6/24/82

Alga	#/ml	%
Dinobryon sp.	64	79.0
Ankistrodesmus falcatus	4	4.9
Synedra rumpens	2	2.5
others (11)	11	13.6
Total	81	100.0

8/1/82

Alga	#/ml	%
Dinobryon sp.	77	88.5
Rhodomonas minuta	2	2.3
others (8)	8	9.2
Total	87	100.0

8/20/82

Alga	#/ml	%
Dinobryon sp.	133	93.7
Ankistrodesmus falcatus	3	2.1
Synedra rumpens	3	2.1
others (3)	3	2.1
Total	142	100.0



Source: US Forest Service, 1976. Vertical photograph.

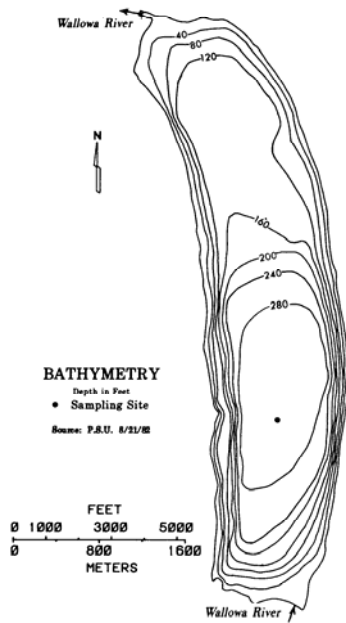
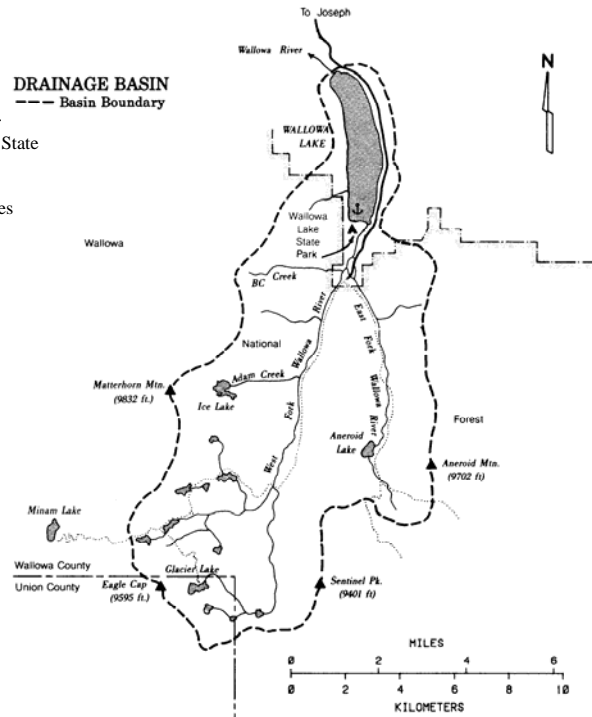


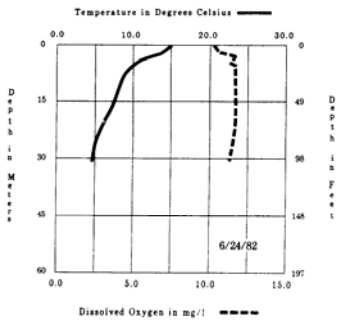
Photo captions

1. Wallowa Lake
2. Wallowa River
3. Wallowa Lake State Park
4. Joseph (town)
5. Lateral moraines

DRAINAGE BASIN
--- Basin Boundary



TEMPERATURE AND OXYGEN



TEMPERATURE AND OXYGEN

