



## Odell Lake

### Klamath County

### Deschutes Basin

Location	
<b>Area</b>	3,582 acres (1,449.6 hect)
<b>Type</b>	natural lake with dam
<b>Use</b>	recreation
<b>Location</b>	3 mi N of Crescent Lake, adjacent to Hwy 58, in Deschutes N.F.
<b>Access</b>	via campgrounds at east and west ends of lake
<b>USGS Quad</b>	Odell Lake (24K), La Pine (100K)
<b>Coordinates</b>	43° 33' 01" N, 121° 57' 45" W
<b>USPLSS</b>	tow nship 23S, range 06E, section 25

Odell Lake, 3582 acres in surface area, is one of the largest lakes in the Oregon Cascades. It lies near the summit of the range and adjacent to Oregon Highway 58. The lake basin is generally considered to be a glacial trough formed during the Pleistocene Epoch when a layer of ice hundreds of feet thick covered the Cascades at high elevations. The lake probably filled 10,000 to 12,000 years ago behind a terminal moraine which impounded the headwaters of Odell Creek. An important subsequent event in the history of the lake was the eruption of Mt. Mazama 6600 years ago. Volcanic ash was carried northward where it showered onto the loamy soils and andesite lava of the basin. A mantle of this permeable, volcanic residue now covers the drainage basin and allows for rapid percolation of water. Thus, there is a considerable contribution of groundwater into Odell Lake, particularly along the south shoreline. One large surface stream, Trapper Creek, feeds the lake, and there are numerous short, smaller streams entering from the north. Odell Creek, the major outlet, flows eastward for 13 miles where it discharges into Davis Lake. The drainage basin of Odell Lake is 37.4 square miles and extends to the Cascade Divide. The vegetation cover is typical of this elevation in the Cascades. There are a number of true firs, including Pacific silver fir, Shasta red fir, subalpine fir, and white fir. Engelmann spruce, western and mountain hemlock, Douglas fir, ponderosa, lodgepole, and white pines also thrive in this region. A luxuriant growth of bushes such as huckleberries also adds to the diversity of species in the area.

Historic Odell Lake was named for William Holman Odell, a pioneer who came to Oregon from Indiana in 1852. He was involved with the surveying of a military wagon road which ran from Eugene to southern Idaho and, in 1871, he was appointed surveyor general for Oregon. The first access road to Odell Lake was built in 1910, and a resort lodge was built in 1927; but recreational use on the lake was low until the construction of Highway 58 in 1940. By the mid-1950s the lake had become a popular recreational site and use has increased steadily since. In 1981, the lake received 133,000 visitor days. Many summer homes, two private resorts, a marina, and five Forest Service campgrounds are on the shoreline. The primary activity is fishing for kokanee, but the lake also has mackinaw and rainbow trout; in 1974 a mackinaw weighing 35 pounds was taken. Kokanee are naturally spawning, but are also stocked (150,000 annually). Boating, swimming, and camping are other important activities.

The glacial trough in which Odell Lake lies determines its morphometry. It is a deep, elongate lake basin, with steep sides. Only a small percentage (4 percent) of the lake bottom is shoal area (less than 10 feet deep). There is very little growth of macrophytes because of this small amount of shallow water and for lack of suitable substrate; most of the lake shore is rocky. Because of the depth of the lake and its elevation, deep water remains very cold year round (approximately 39 degrees F; 4 degrees C). During the winter, the lake sometimes freezes over. In summer the water column develops a pronounced thermal stratification. The depth of the thermocline varies from 10 to 33 feet (3 to 10 meters), which is generally deeper than in most other lakes in the region. The deep thermocline is a result of the very vigorous mixing by wind. The long axis of the lake lies parallel to the strong winds which blow from west to east through Willamette Pass throughout the summer. The strong surface winds also sometimes generate internal waves (seiches) within the lake, causing the local displacement of the depth of the thermocline.

The phytoplankton in Odell Lake reflect varying ecological conditions. In the spring of 1982, a diatom bloom consisting mostly of *Tabellaria fenestrata*, with lesser amounts of *Asterionella formosa*, was observed. Although *Tabellaria* is considered to be an indicator of oligotrophic conditions, its relatively high density and the presence of the mesotrophic diatom *Asterionella* are more typical of a higher trophic state. Two summer phytoplankton samples, one collected in August of 1981 and the other in August of 1982, were dissimilar regarding both density and species composition, thus illustrating the variability that can occur between successive years of sampling. In 1981 the phytoplankton density was quite low, with no one particular species dominant, whereas in 1982 the density was higher and was dominated by the blue-green alga *Anabaena spiroides*. In the fall, there were high densities of *Melosira*, *Asterionella*, and *Fragilaria*.

For the most part, the chemistry of the water in Odell Lake is unexceptional. Major ion concentrations, alkalinity and conductivity are typical for lakes of the region which have porous pumice soils in their drainage basin. During summer, however, surface water pH may exceed 9 because of the photosynthetically induced depletion of free CO and HCO<sub>3</sub><sup>-</sup> by highly productive blooms of phytoplankton. Based upon measures of chlorophyll, phosphorus, and the species composition of phytoplankton, the lake can be classified broadly



Source: Oregon Department of Transportation, no date. View looking southwest.

Drainage Basin Characteristics					
<b>Area</b>	37.4 sq mi (96.9 sq km)	<b>Relief</b>	steep	<b>Precip</b>	48-70 in (122-178 cm)
<b>Agriculture</b>					
<b>Land Use %</b>	<b>Forest</b>	<b>Range</b>	<b>Water</b>	<b>Irrig</b>	<b>Non Irrig</b>
	81.0	-	15.0	-	-
				<b>Urban</b>	<b>Other</b>
				-	4.0
<b>Notes</b>	Other - Rock outcrops				
<b>Lake Morphometry</b>					
<b>Area</b>	3,582.0 acres (1,449.6 hect)	<b>Depth</b>	282 ft (86.0 m)	<b>Maximum</b>	<b>Average</b>
<b>Ave/Max Depth Ratio</b>	0.470	<b>Volume</b>	473,854 acre ft (585.35 cu hm)		
<b>Shoal area</b>	4%	<b>Volume factor</b>	1.41	<b>Shape factor</b>	1.59
<b>Length of Shoreline</b>	13.3 mi (21.4 km)	<b>Retention time</b>	8 yr		
<b>Notes</b>	-				
<b>Water Quality</b>					
<b>Trophic status</b>	mesotrophic, lake has change trophic status over last several decades				
<b>Sample date</b>	08/23/82	<b>Temp</b>	65.8F (18.8C)	<b>Diss. Oxygen (mg/l)</b>	9.9
<b>Transparency</b>	32.8 ft (10.0 m)	<b>Phosp (mg/l)</b>	0.028	<b>Cholorophylla (mg/l)</b>	2.2
<b>Alkalinity</b>	13	<b>Conductivity (umhos/cm)</b>	32	<b>pH</b>	9.3
<b>Major Ions</b>	<b>Na</b>	<b>K</b>	<b>Ca</b>	<b>Mg</b>	<b>Cl</b>
	2.4	0.8	2.8	0.9	0.7
					<b>SO4</b>
					0.3
<b>Notes</b>	-				
<b>Sample date</b>	05/20/82	<b>Temp</b>	44.6F (7.0C)	<b>Diss. Oxygen (mg/l)</b>	-
<b>Transparency</b>	13 ft (4.0 m)	<b>Phosp (mg/l)</b>	0.038	<b>Cholorophylla (mg/l)</b>	6.0
<b>Alkalinity</b>	13	<b>Conductivity (umhos/cm)</b>	32	<b>pH</b>	7.5
<b>Major Ions</b>	<b>Na</b>	<b>K</b>	<b>Ca</b>	<b>Mg</b>	<b>Cl</b>
	2.4	0.9	3.1	0.9	0.6
					<b>SO4</b>
					0.2
<b>Notes</b>	-				
<b>Sample date</b>	11/06/82	<b>Temp</b>	45.5F (7.5C)	<b>Diss. Oxygen (mg/l)</b>	-
<b>Transparency</b>	-	<b>Phosp (mg/l)</b>	0.220	<b>Cholorophylla (mg/l)</b>	8.0
<b>Alkalinity</b>	13	<b>Conductivity (umhos/cm)</b>	32	<b>pH</b>	7.60
<b>Major Ions</b>	<b>Na</b>	<b>K</b>	<b>Ca</b>	<b>Mg</b>	<b>Cl</b>
	2.4	0.8	2.8	0.9	2.2
					<b>SO4</b>
					-0.1
<b>Notes</b>	-				

as mesotrophic. On the other hand, most measures of water transparency indicate that the lake is oligotrophic; only during algal blooms does the transparency decrease to 16 feet (5 meters) or less. The active growth of phytoplankton is the base of a productive food chain which supports the successful mackinaw and kokanee fishery. Historical data indicate that Odell Lake has been strongly influenced by the input of nutrients associated with the use of the lake for recreation. The earliest data on the lake (Newcomb 1941) suggest that it was then distinctly oligotrophic. However, by the late 1960s the concentration of nutrients had increased substantially, stimulating an increase in the growth of phytoplankton including the initial appearance of blue-green algae (cyanophyta), and a decrease in water transparency; in short, the eutrophication of the lake (Larson 1970d). Odell Lake appears to be particularly susceptible to cultural eutrophication because of the inability of the unusually porous soils in its drainage basin to absorb and hold nutrients. Since the 1960s, the design of most of the sanitary facilities around the lake has been altered so that most of the nutrients are now removed. There has been a corresponding decline in nutrient concentrations and phytoplankton growth and an increase in water transparency, leaving the lake in its present mesotrophic condition.

Phytoplankton Surveys:

8/19/81

Alga	#/ml	%
<u>Ankistrodesmus falcatus</u>	4.4	25.0
<u>unidentified desmid</u>	3.1	17.6
<u>Cryptomonas erosa</u>	2.5	14.2
<u>Oocystis pusilla</u>	1.9	10.8
<u>Tabellaria fenestrata</u>	1.9	10.8
others (9)	3.8	21.6
Total	17.6	100.0

5/20/82

Alga	#/ml	%
<u>Tabellaria fenestrata</u>	264	66.7
<u>Asterionella formosa</u>	82	20.7
<u>Stephanodiscus sp.</u>	32	8.1
others (5)	18	4.5
Total	396	100.0

8/23/82

Alga	#/ml	%
<u>Anabaena spiroides</u>	129	56.6
<u>Ankistrodesmus falcatus</u>	97	42.5
<u>Achnanthes linearis</u>	2	0.9
Total	228	100.0

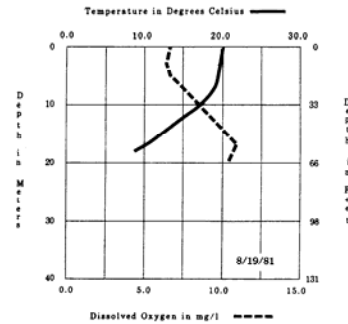
11/6/82

Alga	#/ml	%
<u>Melosira granulata</u>	402	82.5
<u>Asterionella formosa</u>	33	6.8
<u>Fragilaria crotonensis</u>	7	1.4
<u>Navicula sp.</u>	7	1.4
<u>Ankistrodesmus falcatus</u>	7	1.4
others (7)	31	6.5
Total	487	100.0

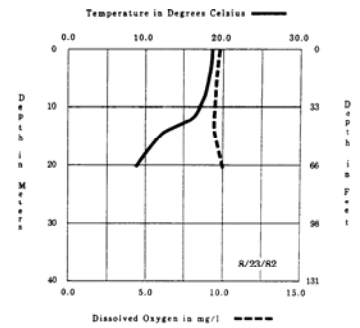


Source: US Forest Service, 1974. Vertical photograph.

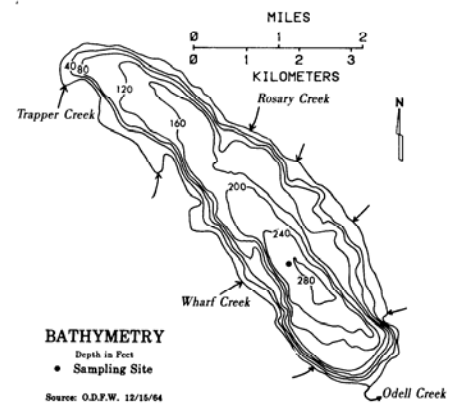
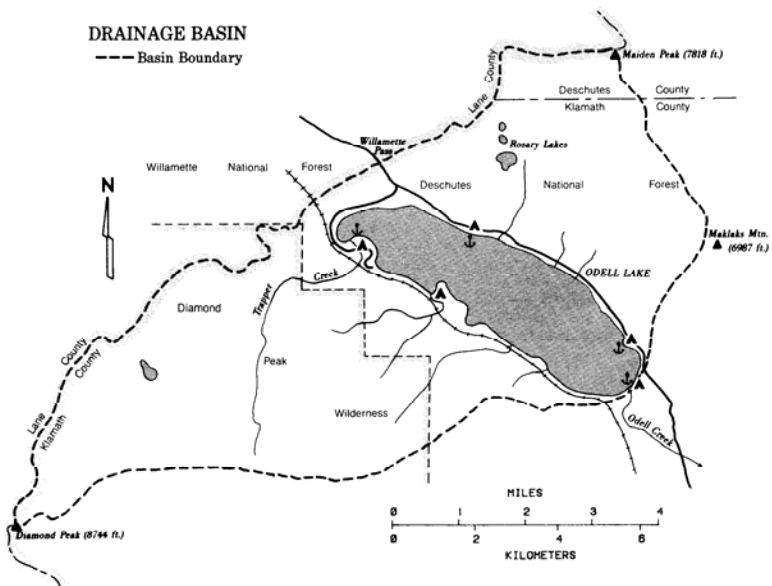
TEMPERATURE AND OXYGEN



TEMPERATURE AND OXYGEN



DRAINAGE BASIN



BATHYMETRY  
Depth in Feet  
• Sampling Site  
Source: O.D.F.W. 12/15/64