



## East Lake

Deschutes County

Deschutes Basin

Location	
Area	1,044 acres (422.5 hect)
Type	natural lake
Use	recreation
Location	15 mi NE of LaPine, 25 mi SSE of Bend, in Deschutes N.F.
Access	18 mi on paved Forest Service road from U.S. Hwy 97
USGS Quad	East Lake (24K), La Pine (100K)
Coordinates	43° 43' 04" N, 121° 12' 53" W
USPLSS	tow nship 21S, range 13E, section 31

East Lake is one of two lakes occupying Newberry Crater, a volcanic caldera nearly five miles in diameter. It is slightly smaller and is about 40 feet higher in elevation than its neighbor to the west, Paulina Lake. The caldera, estimated to be 20,000 to 25,000 years old, is the result of volcanism similar to that which created Crater Lake (Williams 1953). Newberry Volcano is a shield-type volcano, a type which forms over "hot spots" where lava is rising from deep within the earth. It has a base of about 20 miles in diameter and dominates the landscape of the high lava plateau southeast of Bend. More than 150 cinder cones occur on its flanks. The original conical peak collapsed after radial drainage had removed support for the higher slopes. Explosive activity has occurred at intervals throughout recent geologic time; the topmost pumice layer between the lakes was laid down about 2050 years ago and there are lava flows on the slopes of Newberry Mountain that are probably no more than 1000 years old.

After formation of the caldera, snow and ice associated with the most recent period of glaciation accumulated to depths of several hundred feet; flowing ice may have helped to scour the outlet from Paulina Lake that cuts through the flank of the crater (Russell 1Q05). Ash and lapilli from late phases of volcanic activity formed deposits that partly sealed the bed of the lakes. It is apparent that the caldera was once occupied by one lake, but subsequent volcanic action built up a series of cinder cones running north and south across the middle of the caldera, dividing it in two and forming two lakes. Were it not for the breaching of the crater by Paulina Creek the water level in Newberry Crater would be much higher and the caldera would more resemble that of Crater Lake. However, the end result is equally as spectacular. The crater rim rises steeply above the lakes to a high point of 7984 feet at Paulina Peak. Slopes, where not exposed by bare rock and lava flows, are covered by a forest cover typical of mountain terrain in regions of moderate precipitation; that is, a lodgepole pine forest with ponderosa pine scattered throughout. There are also some hemlocks, and alders. The physiographic setting is similar to that of Crater Lake except that surface area of the lake occupies only 8.4 percent of the caldera.

Phillips and Van Denburgh (1968) described the hydrologic regime of East Lake. The maximum depth of the lake is about 180 feet and much of the northern half is deeper than 100 feet. There is no visible inflow to the lake; seasonal runoff from snowmelt provides water, but the major source is a number of small, mineralized hot springs near and below the lake surface on the southeast shore. Other springs probably exist at greater depths around the lake. The elevation of the water surface has experienced a range in this century from about 6366 feet to 6382 feet above sea level, although it rarely varies more than two feet in a single year. Several factors account for this minimal fluctuation: the lack of surface streams, a close balance between annual precipitation and evaporation, and an apparently low rate of seepage loss. There is no surface outlet from East Lake; water is lost by seepage and since the water in the lake is fresh, the rate out must be at least as large as the rate of flow into the lake from mineralized springs. It is likely that a large part of the topographic basin for East Lake does not contribute water to the lake, but drains out to the flanks of the volcano. There is thought to be a substantial contribution from East Lake to Paulina Lake which is about 40 feet lower, a fairly large gradient in an area of recent lava flows.

Trout fishing is the primary attraction for visitors to East Lake. However, at the time of the lake's discovery in the early 1800s only warm water, non-game fish were present, and those only in the area of the hot springs. Late in the century, a Central Oregon sportsman packed in rainbow trout and released them in the lake. Sometime around the turn of the century, eastern brook trout and German Browns were also planted. The latter did so well that East Lake was for years the state's main source of German brown trout eggs, which were used to stock other waters in Oregon. Over the years, the population of Browns has been reduced and very few are now caught, although a lake record German Brown (22 pounds, 8 ounces) was caught in May 1982. Rainbow and brook trout now make up the majority of fish taken by anglers. There are three distinct under-water ridges or reefs in the lake, above which fishing for trout seems to be particularly successful. There is one resort providing a range of facilities and services, the East Lake Resort, which is located near the submerged hot springs. There are also three large Forest Service campgrounds on the shoreline.

The water chemistry of East and Paulina Lakes is exceptional in many respects, and is strongly influenced by their presence in a volcanic crater where there is a significant flow of water from hot springs. These springs contribute high quantities of major ions and algal



Source: Portland State University, 1982.

Drainage Basin Characteristics						
Area	8.9 sq mi (23.1 sq km)	Relief	very steep	Precip	35 in (89 cm)	
Agriculture						
Land Use %	Forest 76.1	Range -	Water 18.2	Irrig -	Non Irrig -	Urban 5.7
Notes Other - Lava fields						
Lake Morphometry			Maximum	Average		
Area	1,044.0 acres (422.5 hect)	Depth	180 ft (54.9 m)		67ft (20.3 M)	
Ave/Max Depth Ratio	0.370	Volume	69,567 acre ft (85.94 cu hm)			
Shoal area	12%	Volume factor	1.11	Shape factor	1.31	
Length of Shoreline	5.9 mi (9.5 km)	Retention time	18 yr			
Notes -						
Water Quality						
Trophic status mesotrophic						
Sample date	08/21/82	Temp	63.0F (17.2C)	Diss. Oxygen (mg/l)	-	
Transparency	33.5 ft (10.2 m)	Phosp (mg/l)	0.016	Cholorophyll a (mg/l)	0.7	
Alkalinity	103	Conductivity (umhos/cm)	310	pH	7.9	
Major Ions	Na 23.1	K 4.0	Ca 24.3	Mg 11.8	Cl 0.9	SO4 82.7
Notes -						
Sample date	09/13/81	Temp	-	Diss. Oxygen (mg/l)	-	
Transparency	29 ft (8.9 m)	Phosp (mg/l)	0.015	Cholorophyll a (mg/l)	1.0	
Alkalinity	104	Conductivity (umhos/cm)	310	pH	8.1	
Major Ions	Na 26.3	K 3.9	Ca 23.4	Mg 11.5	Cl 0.5	SO4 244.5
Notes -						

nutrients which in turn stimulate biological productivity. The concentrations of major ions in East Lake are exceeded only by a few Oregon lakes in areas of internal drainage. Conductivity (310 umhos/cm) and alkalinity (103 ppm) are also unusually high. The concentration of sulfate (as much as 80 ppm) is exceptionally high, and probably results from the inflow of water from the hot springs located near the eastern edge of the lake. Paulina lake, which has higher concentrations of most major ions than does East Lake, has much less sulfate than East Lake. The reason for this discrepancy is unknown. East Lake develops a thermal stratification during the summer, and sometimes freezes over in the winter. The summer thermal stratification is unusual in some respects: the deep water in the lake is slightly warmer (41 degrees Fahrenheit, 5 degrees Celcius) than might be expected, and the conductivity decreases with depth (conductivity 201 near the bottom and 250 at the surface on 9/13/81), suggesting a complicated mixing process involving both heat and salinity in the lake.

The concentrations of phosphorus and chlorophyll were moderate in samples collected during this study, suggesting mesotrophic conditions. However, water transparency is good and indicates a lower trophic state. The species of phytoplankton present (Dinobryon, Oocystis, and Sphaerocystis) are associated with oligotrophic to mesotrophic conditions, in agreement with other indicators. It should be noted that *Fragilaria crotonensis*, a eutrophic diatom, was present in both phytoplankton samples, but at low densities. Overall, East Lake is mesotrophic, but at the lower end.

Phytoplankton Surveys:

9/13/81

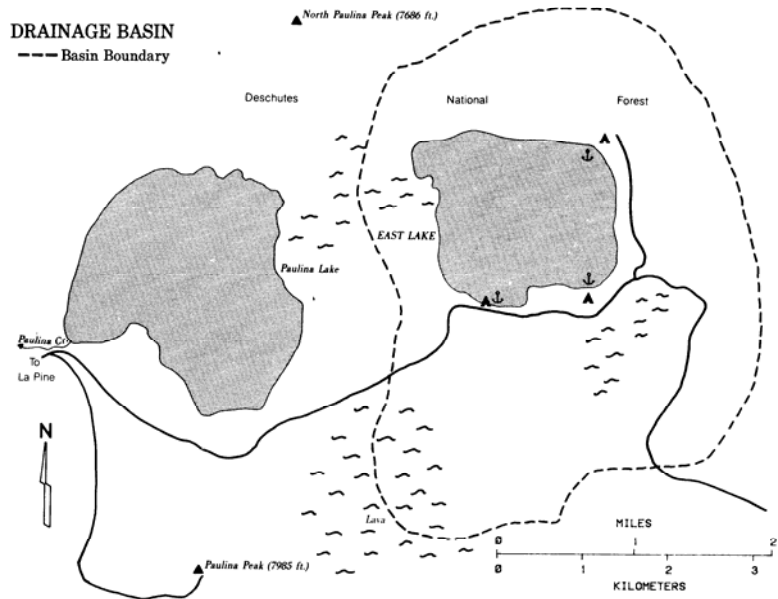
Alga	#/ml	%
<i>Dinobryon sertularia</i>	113	75.3
<i>Ankistrodesmus falcatus</i>	10	6.7
<i>Rhodomonas minuta</i>	9	6.0
<i>Oocystis pusilla</i>	6	4.0
others (7)	12	8.0
Total	150	100.0

8/21/82

Alga	#/ml	%
<i>Rhodomonas minuta</i>	134	69.8
<i>Ankistrodesmus falcatus</i>	25	13.0
<i>Kephyrion spirale</i>	17	8.9
<i>Sphaerocystis Schroeteri</i>	5	2.6
others (8)	11	5.7
Total	192	100.0

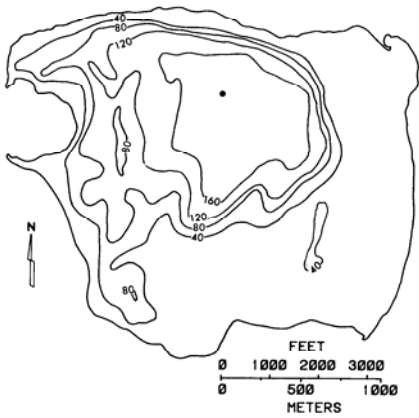
DRAINAGE BASIN

--- Basin Boundary



BATHYMETRY

Depth in Feet  
 • Sampling Site  
 Source: O.D.F.W. 1/4/65



TEMPERATURE AND OXYGEN

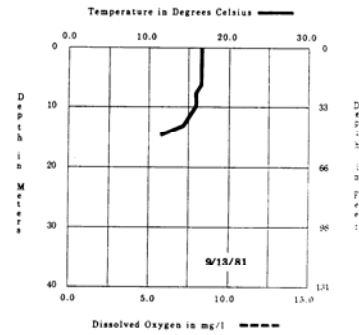
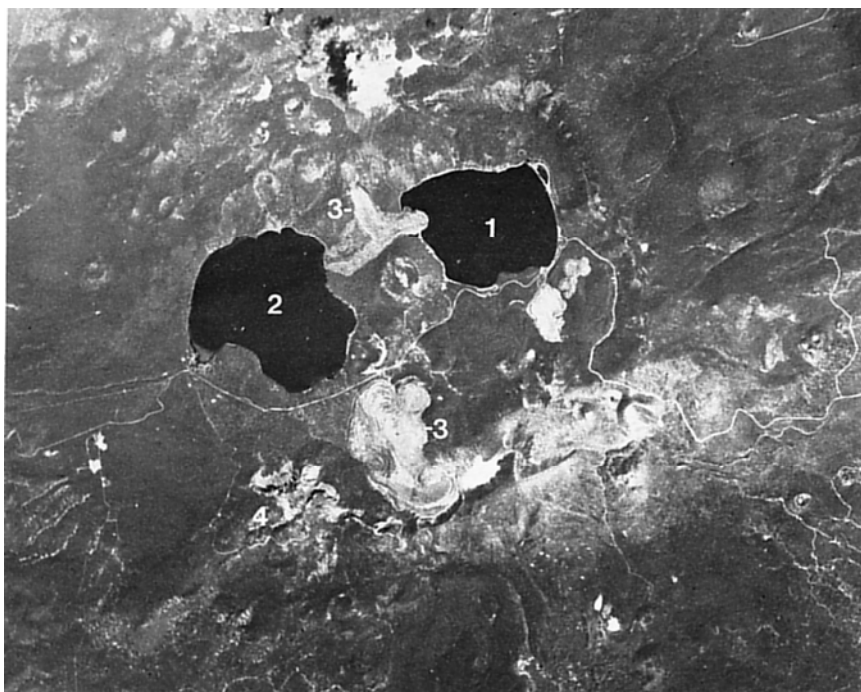


Photo Captions

1. East Lake
2. Paulina Lake
3. Lava flows
4. Paulina Peak



Source: NASA, 1978. Vertical photograph.