

LIMNOLOGY SYNOPSIS

Crater Lake is located in southern Oregon on the crest of the Cascade Range, 100 miles east of the Pacific Ocean. It lies in the caldera which remained when 12,000-foot Mt. Mazama collapsed approximately 6,600 years ago. The slopes now rise to a height of 8,156 feet above sea level. Rain and melted snow averaging 69 inches annually provide the source of water. It is estimated that if the historical climate were the same as today's climate, it would have taken from 600 to 800 years for the lake to have filled to its present depth of 1,932 feet.

Precise dates have not been determined for the formation of Wizard Island and the submerged Merriam Cone, but it is apparent that each was formed above the water. These formations and others helped seal the basin. Fluctuation of water level over the past 75 years ranges from one to three feet. The maximum variation is recorded at 16 feet. The highest recorded level was reached in 1958 when the water level rose 6,179 feet above sea level. The lowest recorded level occurred in 1942 when the water dropped to a level of 6,163.2 feet. The relative stability of the water level is due to a balance of input and output. The input consists of precipitation and drainage, and the output consists of seepage and evaporation. Seepage occurs primarily through pyroclastic, agglomerate, and glacial moraine formations.

Speculation and study has led to several points regarding the prehistoric lake level, namely 1) the mature trees growing near the present water level furnish proof that Crater Lake could not have been appreciably higher for the previous 200 years, 2) the absence of raised benches around the rim, and 3) the blocky lava flows west of Wizard Island, formed approximately 1,000 years ago as evidenced by trees 700-800 years old, were formed above water.

PHYSICAL CHARACTERISTICSTemperature

Surface temperatures vary from 32° to 65° F. with the usual summer temperatures ranging from 50° to 58° F. Below 350 feet, the temperature is approximately 38° F.

Thermal stratification is minimal. From the 15-65 foot depth, there is often a 1° F. drop per 1.5 feet. These regional and partial thermoclines may occur at certain times and places. However, they are readily destroyed by wave action and vertical currents.

The lake rarely freezes over, and the most recent freeze, lasting almost three months, occurred in 1949.

Water Circulation

Water circulation is confusing. Oxygen saturation occurs to the bottom, yet it is not indicative of circulation. The biota population is small so little diffusion is necessary to maintain saturation.

#### Light Penetration

Measurable light has been recorded at the bottom. Many Secchi disk readings of 40 meters have been made, five to ten times greater than in most mountain lakes.

#### Color

Color is affected by sediments, cloud layering, wind currents, suspended and dissolved material, and by algal growth and depth near shore. A vertical extinction of spectrum colors occurs--first red, then green, and finally blue. At depths beyond approximately 350 feet, blue light is the sole illumination.

#### Reasons for Pure Water

- 1) The lake is relatively young.
- 2) There are no inflowing streams.
- 3) There is a possible seepage loss of dissolved materials.
- 4) The basin-forming rocks are relatively insoluble.

#### Environmental Restrictions

- 1) The precipitous walls inhibit intrusion by plants and animals.
- 2) The lower three-fourths of the lake is void of life.
- 3) The low amount of carbonates inhibits development of a large number of shelled animals.
- 4) There is a well developed diatom flora, however, due to high silica content and high alkalinity of the water.

#### Minute Life

Most forms are cosmopolitan and include Spirogyra, Daphnia, Cladocera, Rotifera, Amphida, Nostoc, Calothrix, Oscillatoria, Ulothrix, Cladophora, Fontinalis, and Scleropodium obtusifolium.

True aquatic flora are restricted to Ranunculus, Juncus, Potamogeton, and Cardamine.

Sublittoral species are represented by various gastropods and pelecypods.

A moss, Drepanocladus adunus, grows to depths of 425 feet, possibly a record.

#### Sediment

Most lake sediments are transported from nearby slopes. Both organic and inorganic elements are represented, the latter including a significant amount of pollen. Seventy percent of the pollen is pine, even though mountain hemlock predominates around the rim. Mosses and diatoms constitute most of the sediments formed in the water. Colloidal clay adds to the impermeability in some parts of the basin.

General Data on Crater Lake

Crater Lake is the deepest lake in the United States, the second deepest in North America, and the seventh deepest in the world. They are listed below in order of their depth:

1. Lake Baikal, Russia	5,710 feet
2. Lake Tanganyika, Tanzania	4,708 "
3. Caspian Sea, Russia	3,104 "
4. Lake Nyasa, Nyasaland	2,316 "
5. Issyk-Kul, Russia	2,297 "
6. Great Slave Lake, Canada	2,015 "
7. Crater Lake, U.S.A.	1,932 "

General data on Crater Lake and the surrounding area is as follows:

Greatest depth	1,932 feet
Average depth	1,500 "
Shallowest depth	15-25 " at Phantom Ship dike and 30-60 " at Skell Channel
Surface area	20-42 square miles
Widest point	6.02 miles from Discovery Point to Grotto Cove
Narrowest point	4.54 " from Dutton Cliff to Llao Rock
Phantom Ship	167 feet above water
Hillman Peak	1,980 " high, highest point on rim
Palisade Point	507 " " , lowest " " "
Sinnott Memorial	900 " above lake
Average height of rim	1,000 " " "
Rim Village to Wizard Island	2 miles