

Stovian, C. S. - Stands of Mount St. Helens, Oregon

(1991)

HARVARD UNIVERSITY.



LIBRARY

OF THE

MUSEUM OF COMPARATIVE ZOOLOGY

36242

GIFT OF

Outram Bangs

November 10, 1910.

NOV 10 1910

36,242

Man-ll

MAMMALS

OF

LIBRARY

MOUNT MAZAMA, OREGON

CAMBRIDGE, MASS.

BY

C. HART MERRIAM

FROM *Mazama*: Vol. 1, No. 2, OCTOBER 1897

LIBRARY
MUSEUM OF THE
CIVIL ENGINEERING

NOTE.—Owing to the author's absence in the field when his article on the 'Mammals of Mt. Mazama' was going through the press, he had no opportunity to read the proof. As a result, a few errors have crept in and a few intended changes in nomenclature were not made.

The following corrections should be made:

Page 210, line 2 from bottom, after *alpinus* add *fuliginosus*.

Page 216, line 19, for *Sciuropterus alpinus* (Richardson), read *Sciuropterus alpinus fuliginosus* Rhoads.

Pages 215, 216 (and elsewhere), begin the specific names *columbianus*, *americana*, *alpinus*, *klamathensis*, and *californicus* with small letters instead of capitals.

Page 216, line 5 from bottom, add: Several additional specimens have been sent me by Mr. B. L. Cunningham, of Fort Klamath.

Page 217, line 11, for Bachman read Allen.

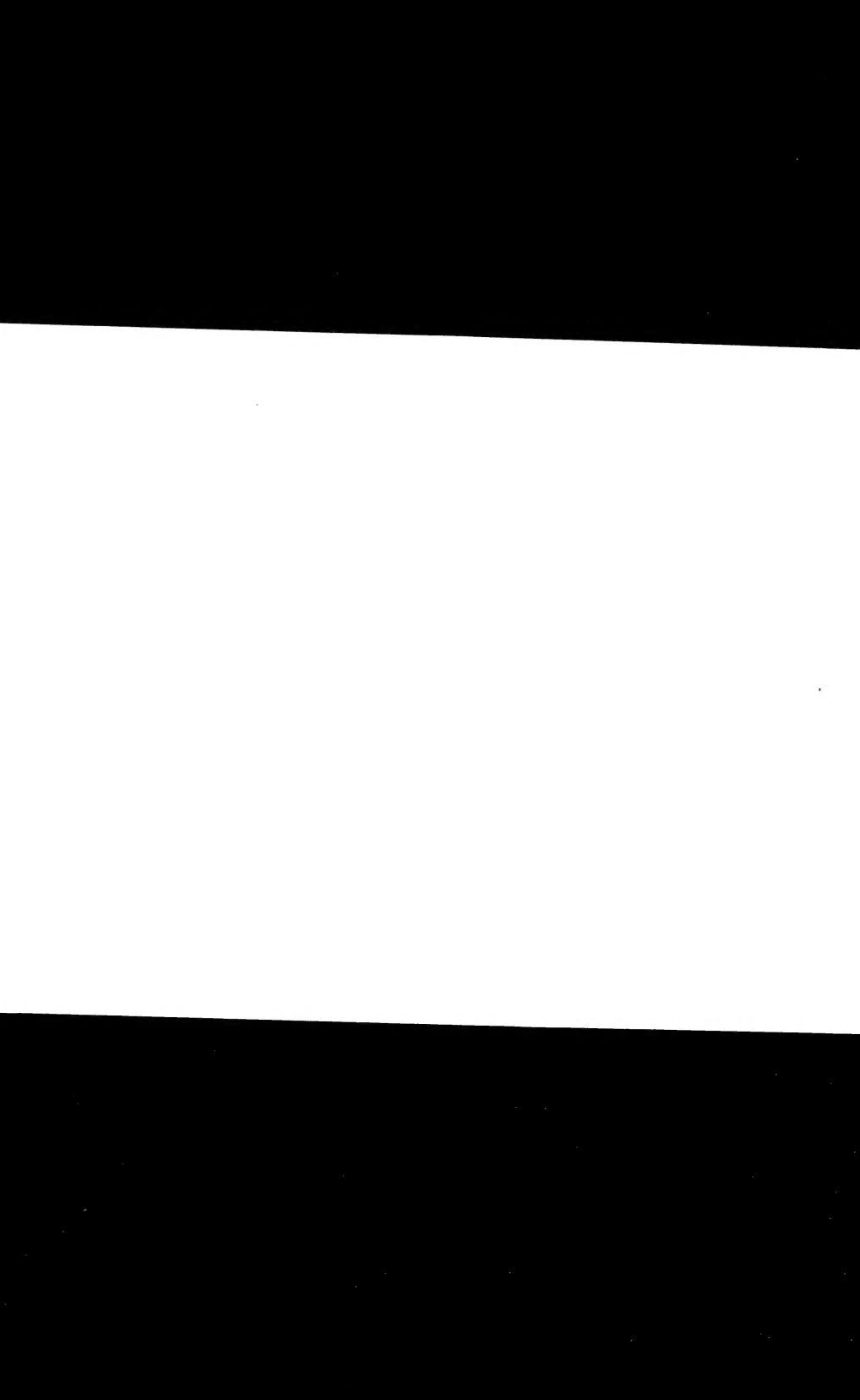
Page 229, line 12, for *Vespertilio gunnisonensis*, H. Allen, read *Myotis gunnisonensis saturatus* Miller.

Page 229, line 17, for *Vespertilio* read *Myotis*.

Page 229, lines 5 and 6 from bottom, for *Eptesicus* read *Vespertilio*.

Page 229 (and elsewhere), change the generic name *Vespertilio*, wherever it occurs, to *Myotis*.

Throughout the article strike out the comma between the specific name and the authority.



NOV 10 1910

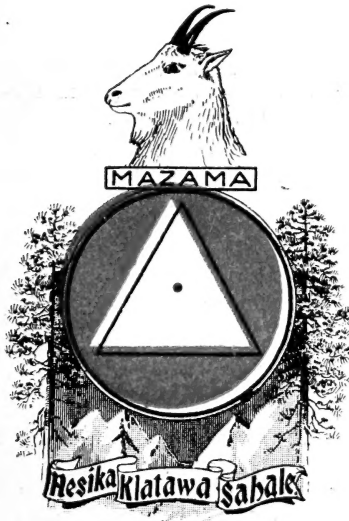
Mazama:

A RECORD OF MOUNTAINEERING

..IN THE..

Pacific Northwest.

CRATER LAKE NUMBER.



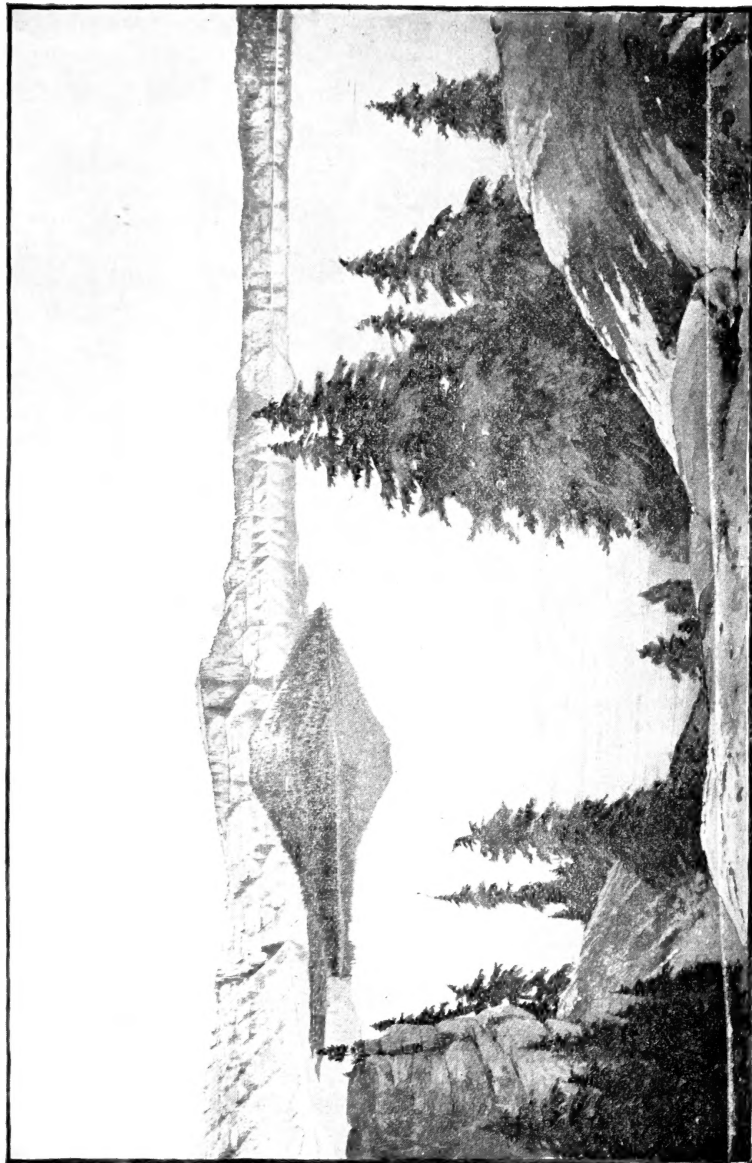
Volume 1. Number 2.

PORTLAND, OREGON:
PUBLISHED BY THE MAZAMAS.
1897.

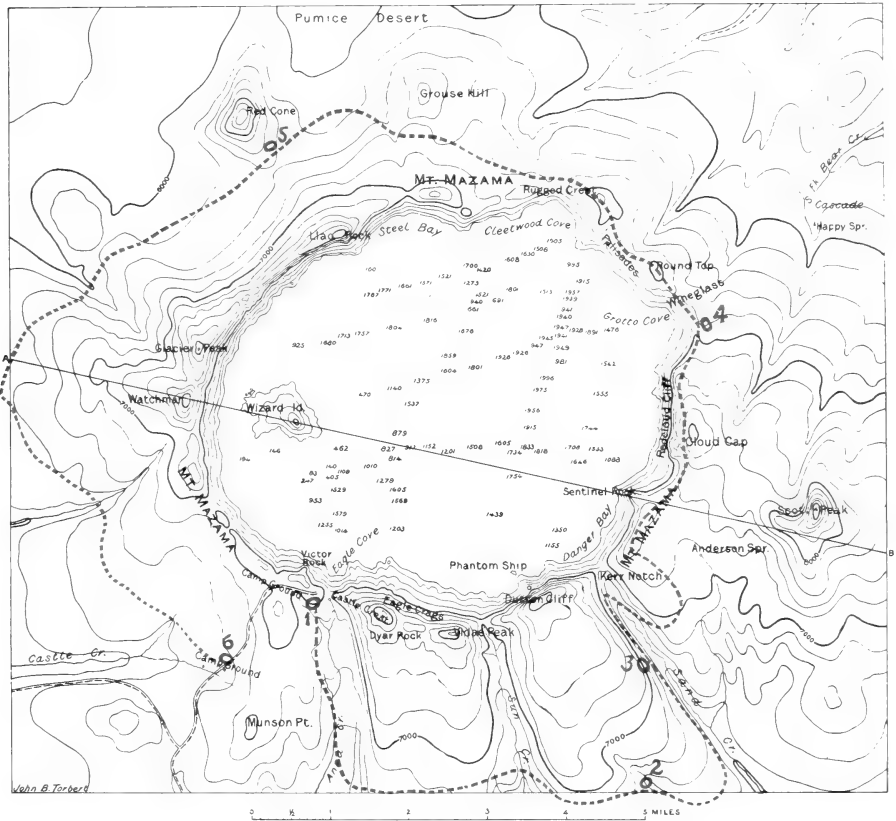
COPYRIGHT, 1897,
By EARL M. WILBUR, SECRETARY MAZAMAS.
All rights reserved.



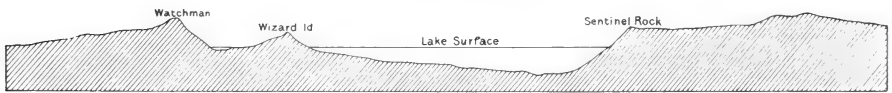




By permission of American Journal of Science.
VIEW ACROSS WESTERN PART OF CRATER LAKE.



Contour Interval 200 feet.



Reduced from U. S. Geological Survey Special Sheet

By permission of National Geographic Magazine.

MAP OF CRATER LAKE (Soundings in feet).

Trail around the Lake shown thus -----

Camping places shown thus ○

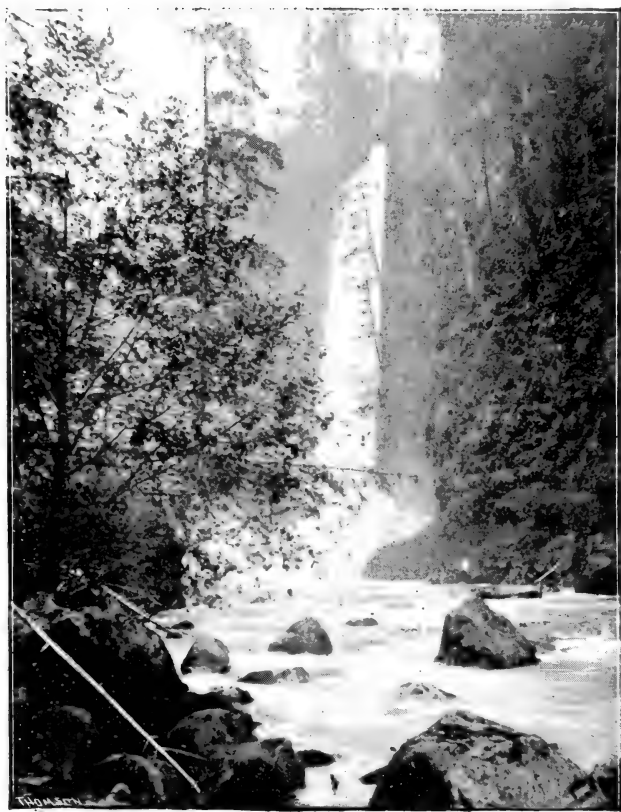


Photo. by C. C. Lewis.

MILL CREEK FALLS.

The Mammals of Mount Mazama, Oregon.

C. HART MERRIAM.

The mammal fauna of Mount Mazama is one of more than ordinary interest. In addition to the fact that no list of the mammals of any part of the Cascade Range has ever been published, and that the number of species inhabiting the region is rather large, it is of geographic interest to note that several peculiar west coast types occur here in company with species which do not occur farther west; and that certain northern and southern species find on this mountain, so far as now known, the extreme limits of their ranges. Among the west coast types referred to are the Sewellel (*Aplodontia*), Gibbs' Mole (*Neurotrichus*), the large Water Shrews of the subgenus *Atophyrax*, and Voles of the subgenus *Chilotus*. Besides these, a number of characteristic west coast species—as the Columbia Deer (*Cariacus columbianus*), Oregon Bassarisk (*Bassariscus raptor*), the large gray tree Squirrel (*Sciurus fossor*), Allen's Chipmunk (*Eutamias senex*), and round-tailed Woodrat (*Neotoma fuscipes*)—also inhabit Mount Mazama or the Fort Klamath plain, where they meet or slightly overlap the ranges of species characteristic of the mountains and plateaus farther east. Among the latter are the Rocky Mountain Black-tail Deer (*Cariacus hemionus*), Sierra Marmot (*Arctomys flaviventer*), Pika, or Little Chief Hare (*Ochotona schisticeps*), Golden-mantled Ground Squirrel (*Spermophilus chrysodeirus*), small Chipmunk (*Eutamias amoenus*), Belding's Ground Squirrel (*Spermophilus beldingi*), the sage plains Jackrabbit (*Lepus campestris*), and the Cottontail (*Lepus nuttalli*). A Boreal genus of Voles, *Phenacomys*, not previously known from the Cascade Range south of British Columbia, a Boreal subgenus of Voles (*Arvicola proper**), not previously known from Oregon, the Alpine Flying Squirrel, and several undescribed species were found inhabiting the higher slopes about Crater Lake. Here, also, in

* The animal here referred to is the large Mountain Water Rat, *Microtus (Arvicola) arvicolooides*.

the cold streams about Fort Klamath, the two American subgenera of Water Shrews (*Neosorex* and *Atophyrax*) fish and swim in the same pools.

Several mountain mammals of wide distribution are conspicuous by their absence. Thus the Elk or Wapiti (*Cervus canadensis*), Mountain Sheep (*Ovis canadensis*), Mountain Goat (*Oreamnos montanus*), Wolverine (*Gulo luscus*), and Fisher (*Mustela canadensis*) have not been known to inhabit the region in recent years. The Raccoon (*Procyon*) and common small bat of the Pacific coast (*Vespertilio nitidus*) probably occur in the Klamath region but were not obtained by us.

Since the time spent on Mount Mazama and at Fort Klamath by the several members of the Biological Survey collectively was only about a month (Aug. 12—Sept. 15, 1896), it cannot be assumed that all the mammals of the region were secured. Sixty-one species are included in the accompanying list, most of which were obtained in good series, the total number of specimens collected and brought back to our National Museum being about 450.

My assistants who took part in this work were Vernon Bailey, Chief Field Naturalist of the Biological Survey, and Edward A. Preble and Cleveland Allen, assistants. The localities at which collections were made are: Williamson river, near the road crossing; Fort Klamath; Anna Creek Canyon and Pole Bridge Creek; Crater Lake near end of road; Glacier Peak and L'ao Rock; Diamond Lake; the upper or western Sink Creek (at the east base of the range on the road from Diamond Lake to Klamath Marsh); and Prospect, in the upper Rogue river valley, on the west slope of Mount Mazama.

In addition to the specimens above mentioned, I had many years previously (in 1883-84) received as a gift from the late Major Charles E. Bendire a small collection made by him at Fort Klamath. This collection contained several new species, of which *Spermophilus chrysodeirus* and *Atophyrax bendirei* were described by me. Subsequently Dr. J. C. Merrill presented me with a few additional specimens, including the chipmunk described as *Tamias amoenus*

by Dr. J. A. Allen, and still later I purchased others from a soldier named Samuel Parker.

Owing to the chaotic state in which a large proportion of the groups of North American mammals still remain, it has been necessary, in the preparation of the present paper, to make revisionary studies of the greater number of genera inhabiting the northwest coast region, involving the critical examination of several thousand specimens. It has been impossible to complete these studies in time to announce all the results in this list; subsequent work is sure to increase the number of recognized forms—particularly in wide ranging species.

When camped at Crater Lake, Capt. O. C. Applegate, of Klamath Falls kindly brought to my tent two of the principal Indians of the Klamath tribe, and assisted me in obtaining from them a vocabulary of their names for the native mammals; and has since sent me several additional names, thus covering all of the mammals known to these Indians. This has enabled me to give the Klamath names in the present paper. On showing the Indians specimens of the Pika, or Little Chief Hare (*Ochotona*) and Mountain Jumping Mouse (*Zapus*) I was surprised to find that these animals were unknown to them. On the other hand they discriminated between, and had special names for, the small Shrew, White-footed Mouse, and Field Mouse or Vole, as well as for the larger kinds.

LIFE ZONES OF MOUNT MAZAMA.

Mount Mazama, formerly known as Crater Lake Mountain, is in the southern part of the Cascade Range in Oregon, about 20 miles north of Fort Klamath. It is the basal part of what was once a large volcanic cone, but is now cut off at an altitude of about 2,500 meters (8,200 feet). Its summit is a large caldron, nearly 6 miles in diameter, and 1,220 meters (4,000 feet) in greatest depth. This caldron contains the far-famed Crater Lake, one of the most attractive bits of scenery on the American continent. There is no 'timber-line' on Mount Mazama, although local timber-lines exist on Glacier Peak and one or two other of the higher crags.



Photo. by J. S. Diller.

By permission of National Geographic Magazine.

RIM OF CRATER LAKE (MOUNT MAZAMA) IN THE DISTANCE,
LOOKING NORTH ACROSS ANNA CREEK CANYON.



Photo. by J. S. Diller.

By permission of National Geographic Magazine.

SOUTH SHORE OF CRATER LAKE,
LOOKING WEST FROM KERR NOTCH, SHOWING DUTTON CLIFF (LEFT),
PHANTOM SHIP (CENTER), AND CASTLE CREST (RIGHT).

The whole mountain, except a small pumice desert north of the Lake and some narrow meadows on its rim, is covered with a dense forest, notable for the size and magnificence of its trees. This forest is made up of a number of species of conifers, arranged in definite belts or zones, corresponding with the three faunal zones—the Hudsonian, Canadian, and Transition—into which the life of the mountain slopes may be divided.

The lower part of Klamath basin, including the treeless area between Klamath Lake and Tule or Modoc Lake, and a strip on the east side of Klamath Lake south of Williamson river, belongs to the Upper Sonoran Zone, and is characterized by such mammals as the Black-tailed Jack Rabbits, Kangaroo Rats, Pocket Mice, Grasshopper Mice and other interesting forms which do not occur at Fort Klamath or on the mountain, and consequently are not mentioned in the accompany list.

The life zones of Mount Mazama, beginning at the bottom, may be characterized and defined as follows:

(1) *The Transition Zone.*—The Transition Zone covers the flat between Upper Klamath Lake and the base of Mount Mazama (thus including the ground formerly occupied by Fort Klamath), and pushes up the south slope to an altitude of about 1,525 meters (5,000 feet), which point is 10 or 12 miles northwest of the old Fort. To the south, it reaches continuously to Williamson river, and covers the hills beyond to within a mile or two of the town of Klamath Falls. To the west, it is believed to extend continuously from the Klamath Lakes to the lower Rogue river valley in southwestern Oregon and Klamath valley in northwestern California.

The characteristic and dominant tree of the Transition Zone is the Yellow Pine (*Pinus ponderosa*) which grows to very large size—single trees measuring upwards of 7 feet in diameter—and covers nearly the whole of the plain north of Williamson river and the south slope of the mountain up to the altitude mentioned. Scattered through this splendid forest are trees of the Incense Cedar (*Libocedrus decurrens*) and the long-coned Sugar Pine (*Pinus lambertiana*). The White Fir (*Abies concolor*), Douglas Spruce (*Pseudotsuga mucronata*), and Aspen (*Populus tremuloides*) also occur here

and there but belong more properly to the zone above. The most conspicuous undergrowth consists of Manzanita (*Arctostaphylos patula*), Buckbrush (*Ceanothus velutinus*) and *Kunzia tridentata*. A characteristic flower is the handsome *Gilia aggregata*.

Among the characteristic birds of the Transition Zone in the Klamath region are: Lewis' Woodpecker (*Melanerpes torquatus*), the Pigmy Nuthatch (*Sitta pygmaea*), three small Flycatchers (*Contopus richardsoni*, *Empidonax trailli* and *E. obscurus*), the Warbling and Cassin's Vireos (*Vireo gilvus swainsoni* and *V. cassini*), the Magpie (*Pica hudsonica*), Chipping Sparrow (*Spizella socialis arizonae*), Green-tailed Towhee (*Oreospiza chlorura*), Lazuli Finch (*Passerina amoena*), House Wren (*Troglodytes aedon parkmani*) and Western Blue-bird (*Sialia mexicana occidentalis*).

Few mammals are anywhere distinctive of the Transition Zone, most of its species coming from the zone below (Upper Sonoran) or the zone above (Canadian). Among those which reach their upper limit here are the Gray Fox (*Urocyon*), the Little Spotted Skunk (*Spilogale*), the large gray tree Squirrel (*Sciurus fessor*), Round-tailed Woodrat (*Neotoma fuscipes*), Gray and Oregon Ground Squirrel (*Spermophilus douglasi*), Belding's Ground Squirrel (*Spermophilus beldingi*), the California Vole (*Microtus californicus*), the California Mole (*Scapanus californicus*), the Sage Plains Jackrabbit (*Lepus campestris*), and LeConte's Bat (*Antrozous pallidus*). The Klamath Flying Squirrel (*Sciuropterus klamathensis*) is known only from the pines, but may inhabit the Canadian or lower Boreal also. The black-bellied Water Shrew (*Atophyrax bendirei*) and the Long-tailed Mountain Vole (*Microtus mordax*) inhabit the borders of the cold streams which flow through the Transition plane from the Boreal mountain sides, but probably belong to the Canadian fauna rather than the Transition. The 'Red' or small Pine Squirrel (*Sciurus californicus*) is common to the Transition and Canadian belts, but does not push up into the Hudsonian. Among the species which come down into the pines from the Boreal mountain sides are the Golden-mantled Ground Squirrel (*Spermophilus chrysodeirus*), the large and small Chipmunks (*Eutamias senex* and *E. amoenus*), the Sierra Marmot (*Arctomys flaviventer*) and the Weasel (*Putorius arizonensis*).

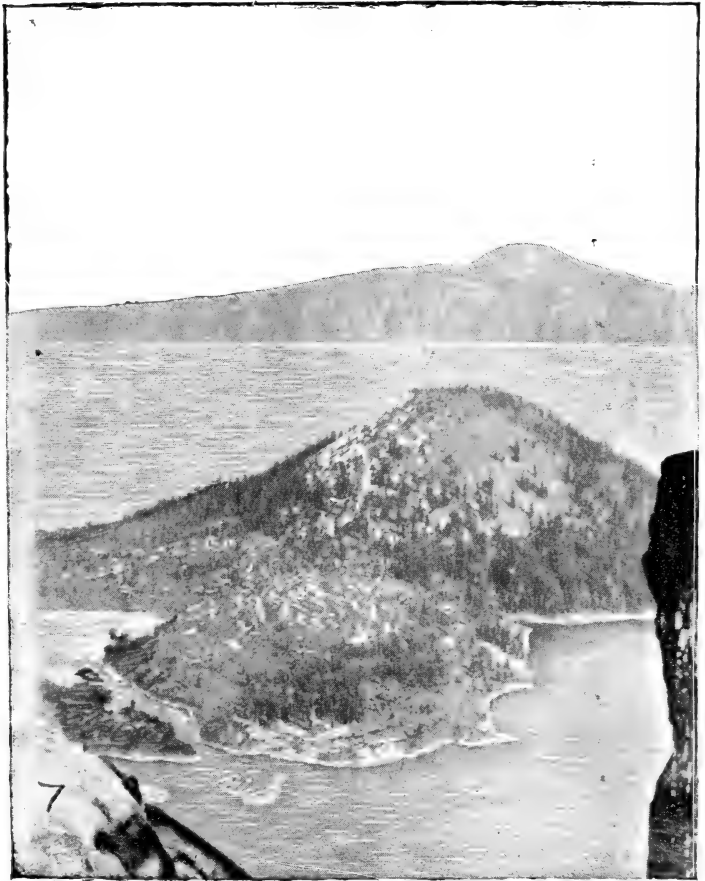


Photo. by M. M. Hazeltine.

By permission of Southern Pacific Co.

WIZARD ISLAND FROM THE WATCHMAN.

The fauna of the Transition Zone at Prospect in the upper Rogue river valley, at the west base of Mount Mazama, differs in some respects from that of the Klamath plain, which latter has a strong Boreal tinge. Thus *Bassariscus raptor*, *Zapus pacificus* and *Evotomys obscurus* were obtained at Prospect but not at Klamath.

(2) *The Canadian Zone.*—The Canadian Zone occupies the middle elevations of Mount Mazama and sends long tongues downward along the water courses that traverse the Transition Zone below. On the south slope of the mountain it begins about 10 miles northwest of Fort Klamath and covers a broad belt between the altitudes of 1,450 and 1,850 meters (4,800 to 6,100 ft.). The dominant tree is the Lodgepole or Murray Pine (*Pinus murrayana*) a relatively small tree thickly beset with cones and forming a dense continuous forest. Other characteristic species are the Mountain White Pine (*Pinus monticola*), Douglas Spruce (*Pseudotsuga mucronata*) and White Fir (*Abies concolor*), which latter pushes down into the zone below. The Canadian zone shares with the Hudsonian two of the finest trees of the mountain—the Noble Fir (*Abies nobilis*) and Alpine Hemlock (*Tsuga pattonii*). The most conspicuous and offensive underbrush is the Buckbrush (*Ceanothus velutinus*) which forms almost impenetrable thickets and reaches downward through the Transition Zone also. But the Manzanita of the Transition belt (*Arctostaphylos patula*) is replaced in the Canadian by a dwarf species (*A. nevadensis*).

So little field work was done in the Canadian fauna of Mount Mazama that its distinctive birds and mammals cannot be enumerated with certainty. The following birds, however, breed in the Canadian belt of the mountain and may be fairly regarded as belonging to it, though several of them range down well into the pines*. Steller's Jay (*Cyanocitta stelleri*), Williamson's Woodpecker (*Sphyrapicus thyroideus*), Mountain Tanager (*Pyrranga ludoviciana*) Olive-sided Flycatcher (*Contopus borealis*), Water Ouzel (*Cinclus mexicanus*), Oregon Junco (*Junco oregonus*), Western Creeper (*Certhia familiaris occidentalis*), Calaveras Warbler (*Helminthophila*

*It must not be inferred that a bird can be classed as Transition because it breeds at Fort Klamath, for the mixture of Canadian trees and conditions along the water courses invites many Boreal species to remain through the summer.

rubricapilla gutturalis), Pileolated Warbler (*Myiodiocytes pusillus pileolatus*). Other species, which are common to the Canadian and Hudsonian Zones, will be mentioned under the latter.

The Canadian Zone mammals which range down to the Klamath plain but were not found in the Hudsonian are the Weasel, Mink, large Skunk, Red or Pine Squirrel, and Snowshoe Rabbit. Those which are common to the Canadian and Hudsonian are the Oregon Puma, Lynx, West-coast Wild-cat, Black Bear, Western Marten, Columbia Black-tail Deer, Porcupine, Jumping Mouse, Long-tailed Vole, Gibbs' Mole, White-bellied Water Shrew, Sierra Shrew, and Silver-haired Bat.

(3) *The Hudsonian Zone.*—The Hudsonian Zone occupies the summit of the mountain and descends on the south side to an altitude of about 1,850 meters (6,100 ft.) which is only a short distance above Pole Bridge Creek. The dominant trees are Alpine Hemlock (*Tsuga pattonii*) and the Noble Fir (*Abies nobilis*). Mixed with these are numerous Alpine Firs (*Abies lasiocarpa*) and a few White-bark Pines (*Pinus Albicaulis*). The latter are confined mostly to the rim of Crater Lake and are therefore of no value in fixing the lower boundary of the zone. The Hudsonian belt is characterized by negative as well as positive elements, lacking the Lodgepole Pine (*Pinus murrayana*), Mountain White Pine (*Pinus monticola*) and White Fir (*Abies concolor*) of the Canadian Zone.

The following Boreal species of bird breed about Crater Lake in the Hudsonian Zone and many of them occur also in the Canadian: Oregon Jay (*Perisoreus obscurus*), Clark's Crow or Nutcracker (*Nucifraga columbiana*), Evening Grosbeak (*Coccothraustes vespertinus*), Cassin's Purple Finch (*Carpodacus cassini*), Crossbill (*Loxia curvirostra stricklandi*), Pine Siskin (*Spinus pinus*), Townsend's Solitaire (*Myadestes townsendi*), Three-toed Woodpecker (*Picoides arcticus*), Mountain Bluebird (*Sialia arctica*), Audubon's Warbler (*Dendroica auduboni*) and the Mountain Chickadee (*Parus gambeli*).

The distinctive mammals of the Hudsonian summit of Mount Mazama are the Alpine Flying Squirrel (*Sciuropterus alpinus*), the Alpine Mole (*Scapanus alpinus*), the Giant Mole or Water Rat

(*Microtus arvicoloides*), the alpine *Phenacomys orophilus*, the Mount Mazama Red-backed Mouse (*Evotomys mazama*), Baird's Alpine Vole (*Microtus bairdi*) and the Sierra Pika, or Little Chief Hare (*Ochotona schisticeps*). The Sierra Sewellel (*Aplodontia major*) occurs locally. A number of other species which are more or less common on top of the mountain, range down through the Canadian Zone, under which head they have already been enumerated.

The boundaries between the zones are marked by belts of overlapping, where the trees of the zone below mix with those of the zone above over a belt covering a vertical difference in altitude of about 125 meters. The actual breadth varies according to the slope, being less than a quarter of a mile on very steep slopes and a mile or more on gradual slopes.

The Yellow Pine forest of the Transition plain between the north end of Klamath Lake and the south base of the mountain is interrupted in a number of places by trees which come down from the Canadian belt above. These trees are chiefly Lodgepole Pines, more or less mixed with Douglas Spruces and White Firs. It will be observed that they follow the cold streams and cover the flat swampy lands where the temperature is much lower than in the pine forest. Birds and mammals of the Canadian Zone inhabit these places as will be shown later.

THE FORT KLAMATH PLAIN.—The site of Fort Klamath, now abandoned, will always be a place of special interest to naturalists, on account of the large collections in different branches of natural history made there by Captain (afterwards Major) Charles E. Bendire and Dr. J. C. Merrill.* It is moreover the type locality of a number of species, for which reason its faunal relations should be clearly understood. From the preceding description, it will be evident that while the post itself is in the Transition Zone, a day's ride to the south enables the collector to obtain Upper Sonoran species, and a day's ride to the north or west takes him into the mountains where he is surrounded by Canadian and Hudsonian species.

*A very full and valuable list of the Birds of Fort Klamath, with critical notes by William Brewster, was published in the *Auk* for 1888 by Dr. J. C. Merrill. An earlier and less complete list had been published by Dr. E. A. Mearns.

Fort Klamath itself is in the midst of a forest of magnificent Yellow Pines, which covers the greater part of an extensive area of flat ground between the tule marshes at the north end of Klamath Lake and the base of the Cascade Range. The altitude of this flat is about 1,280 meters (4,200 ft.), and it is in the upper part of the Transition Zone. The pine forest is interrupted by hot pumice meadows and cold Boreal swamps. Several gigantic springs of exceedingly cold water from the mountains break out of the ground and flow away to the lake in large streams (Fort Creek, Wood river and others), carrying lines of Boreal species through the Transition plane. Thus these streams, and the adjacent cold, swampy flats, support small forests of Lodgepole Pines, scattered clumps of Aspens, and a number of bushes and flowers belonging to the Canadian Zone above. To the same influences should be attributed the infusion of Boreal birds in the pines of the Fort Klamath plain, and the presence along the cold streams and swamps of such Boreal mammals as the small Shrew (*Sorex vagrans*), the large Water Shrews (*Atrophyrax bendirei* and *Neosorex navigator*), the Mountain Jumping Mouse (*Zapus trinotatus montanus*), and the Long-tailed Mountain Vole (*Microtus mordax*).

The road from Fort Klamath to Crater Lake follows the south slope of the mountain, and affords a direct and easy grade without the complications that usually result from canyon or gorge slopes on mountain roads. The soil is mainly pumice sand, very fine and very dusty. Anna Creek Canyon, with nearly vertical walls of volcanic tuff, lies close to the road on the east side, and carries Boreal species down considerably below the altitudes they reach on the adjacent slopes.

CRATER LAKE, OREGON. — Crater Lake is a body of clear indigo-blue water, about five miles in average diameter and 600 meters (2,000 ft.) in greatest depth. It occupies the crater of the extinct volcano of Mount Mazama, and is completely encircled by a continuous wall of cliffs varying in height from a little less than 300 to a little more than 600 meters (1,000-2,000 ft.). There is no break in this wall, which is so nearly perpendicular that climbing up or down is impossible, save in



SOUTHWESTERN SHORE OF CRATER LAKE, LOOKING FROM THE CAMP GROUND.
By permission of Southern Pacific Co.

a few places. Large masses of snow remain all summer on the north and east slopes, and small streams, turned up on end, dash down some of the gulches from the melting snowbanks above. Dark coniferous trees, chiefly Hemlocks and Noble Firs, have here and there gained a foothold on the steep slopes, and afford pleasing contrasts with the sombre gray of the crater. Wizard Island, a remarkably perfect cinder cone rising 260 meters (850 ft.) above the water on the west side of the Lake, has a perfect crater on its summit, and is fairly well covered with trees—Hemlocks, Noble Firs, White Pines and Alpine Firs. A colony of Pikas (*Ochotona*), of which I shot one, and a Ground Squirrel—probably *Spermophilus chrysodierus*—seen by Mr. Coville and others, inhabit the Island. The Island is separated from the rim on the west by a narrow and shallow channel about a quarter of a mile in breadth, over which the mammals doubtless crossed on the ice in early spring. At the Island I shot two Mallard Ducks, and saw a Golden-eye and some Grebes—apparently *Podilymbus podiceps*. A few Tip-ups (*Actitis macularia*) and a Water Ouzel (*Cinclus mexicanus*) were also seen along the rocky shore. Although there are no fish in the Lake, amphipod crustacea and caddice fly larvæ abound, and millions of black mosquitos, with black, fuzzy antennæ, swarmed along the shore; being males, these mosquitoes did not bite, which was refreshing.

On the rim of Crater Lake, cliffs and crags alternate with narrow fields of pumice, which latter are buried in snow until late in the summer.

A few mammals live on the inner or lake side of the crater. Shrews and Voles inhabit the narrow strips of vegetation bordering the springs and streams; Chipmunks enliven the scattered clumps of trees; and Pikas, Marmots, and Golden-mantled Ground Squirrels make their homes among the heaps of slide rock on the steep slopes.

The Hemlock Forest.—The whole summit of the mountain except the pumice meadows on the rim, is covered by a noble forest of Hemlocks and Firs. The dominant tree is the large black-barked Alpine Hemlock (*Tsuga pattonii*) whose trunks sometimes attain great size—the largest found by us measuring $1\frac{3}{4}$ meters (69 inches)

in diameter at the height of a man's head. These trees often grow in clusters, half a dozen or more standing side by side, sometimes in a straight line, and so close together that the trunks are in actual contact at the bottom. On sloping ground the trunks are often curved downward at the base, from the pressure of the snow which covers the ground for 9 months of the year. The Alpine Hemlock, with its irregularly drooping branches, draped in long beards of gray and black lichen, is a beautiful and picturesque tree. The widely different Noble Fir with which it is associated, is also a large and splendid tree. Owing to the relative shortness of its lower branches its usual form is cylindrical rather than conical. The branchlets, particularly the upper ones, stand out at right angles, giving an odd mathematical effect; but the crowning glory of *Abies nobilis* lies in its huge cones, with their leaf-like exserted green bracts, ivory white scales, and blood red seed-wings.

The hemlock forest is dark and open, with very little undergrowth, chiefly *Vaccinium myrtilloides*, *V. scoparium* and *Rubus lasiococcus*, with here and there scattered plants of *Pyrola picta*, *Chimaphila menziesii*, *C. umbellata*, and *Pedicularis racemosa*. It is the home of the Camp Robber or Oregon Jay, the Evening Grosbeak, Red Crossbill, Pine Siskin, Three-toed Woodpecker, and Townsend's Solitaire; of the Alpine Flying Squirrel, Allen's Chipmunk, Western Marten, Columbia Deer, Lynx, and Oregon Puma.

The Pumice Meadows.—The open pumice meadows of the rim of Crater Lake deserve a special word. Most of them are buried in snow until August and many of the snowbanks never entirely disappear. As soon as the bare ground is exposed to the warm sun it becomes dotted over with small plants which increase in abundance as the season advances, and furnish an important part of the food of certain small mammals. The most characteristic plants of these pumice meadows are *Polygonum newberryi*, *Phlox douglasii*, *Aplopappus bloomeri*, *Spraguea umbellata*, *Agoseris barbulata*, *Lupinus laxiflorus*, *Antennaria alpina*, a small *Arenaria*, and two or three species of *Eriogonum**. These places are the chosen homes of

*I am indebted to Mr. F. V. Coville for the specific determinations of these plants.

the Pocket Gophers (*Thomomys mazama*) which are constantly turning the soil and throwing up little mounds of damp earth by which their movements may be known. They are inhabited also by the White-footed Mice and Baird's Alpine Vole.

The Springs and Small Marshes.—The springs and wet places in the immediate vicinity of Crater Lake support a luxuriant growth of alders, wild currants and other bushes and small plants, among which are *Spiraea arbuscula*, *Kalmia glauca*, *Lonicera involucrata*, *Veratrum viride*, *Mimulus lewisii* and *M. luteus*, *Aquilegia formosa*, *Dicentra formosa*, *Pedicularis groenlandica*, *Pyrola secunda*, *Ranunculus eschscholtzii* and *Veronica alpina*.

These places are the homes of the Alpine Water-rat (*Microtus arvicoloides*), Red-backed Mouse (*Evotomys mazama*), Mountain Jumping Mouse (*Zapus trinotatus*), Alpine Mole (*Scapanus alpinus*), Gibbs' Mole (*Neurotrichus gibbsi*), Water Shrew (*Neosorex navigator*) and Sierra Shrew (*Sorex vagrans amoenus*).

The Cliffs.—The cliffs on the rim of Crater Lake are adorned here and there by scattered hemlocks and firs and are dotted by little clumps of flowering bushes, of which *Spiraea discolor*, *Pentstemon davidsoni* and *P. newberryi* are the most abundant. A small woody *Polygonum* (*P. shastense*) and one or two Eriogonums are also common. These cliffs are the homes or favorite resorts of the Sierra Marmot, Pika, Golden-mantled Ground Squirrel, Small Chipmunk, Badger, Yellow Fox, Bushy-tailed Wood-rat and White-footed Mouse.

CATALOGUE OF SPECIES.

COLUMBIA BLACK-TAIL DEER. *Cariacus Columbianus* (Richardson).

Klamath Indian name, *moos-mus*.

Abundant. Fresh tracks were seen every day and many deer were killed during our stay. Our party killed three, one within a few rods of camp at Crater Lake; two others in the forest below the base of Glacier Peak. As a rule the deer were quiet during the greater part of the day, and started out to feed about the middle of

the afternoon. The bucks were active and pawed many holes in the dry ground.

The Rocky Mountain Black-tail or Mule Deer (*Cariacus hemionus*) is said to find the western limit of its range along the east base of the Cascades, and the White-tail Deer is said to be found sparingly about the base of the mountain.

ANTELOPE. *Antilocapra Americana*, Ord.

Klamath Indian Name, *Cha-o*.

Antelope are still fairly common on the plains and deserts east of the Cascade Range and on Klamath Marsh, where they are said to be much hunted by the Indians. In summer small bands of Antelope push through the forest of Lodgepole Pines at the east base of the Cascades to the narrow meadows along the upper Des Chutes river. On August 27, 1896, Mr. Bailey and I saw a small herd at the crossing at East Fork of Des Chutes, in dense forest; and the next day we saw others in the small 'prairie' on Paulina Creek. During our stay at Crater Lake we were told that Antelope were seen on the pumice desert between Crater Lake and Diamond Lake.

ALPINE FLYING SQUIRREL. *Sciuropterus Alpinus* (Richardson).

Klamath Indian name, *Kok-kotch*.

A specimen of this Hudsonian species was caught at Crater Lake by Mr. Preble. It was taken in a trap set at the base of a stub in open woods about a quarter of a mile from the crater.

KLAMATH FLYING SQUIRREL. *Sciuropterus Klamathensis*, Merriam.

Klamath Indian name, *Kok-kotch*.

Two specimens of this new species of Flying Squirrel were sent me from Fort Klamath some years ago by the late Major Charles Bendire. They were caught in a hollow log May 15, 1883. Whether or not the species ranges above the Transition Zone was not determined.

PINE SQUIRREL. *Sciurus Californicus*, Allen.

Klamath Indian name, *Go-wack*.

Common in the Transition and Canadian Zones from Fort Klamath half way up the mountain. Two were seen at Pole Creek,

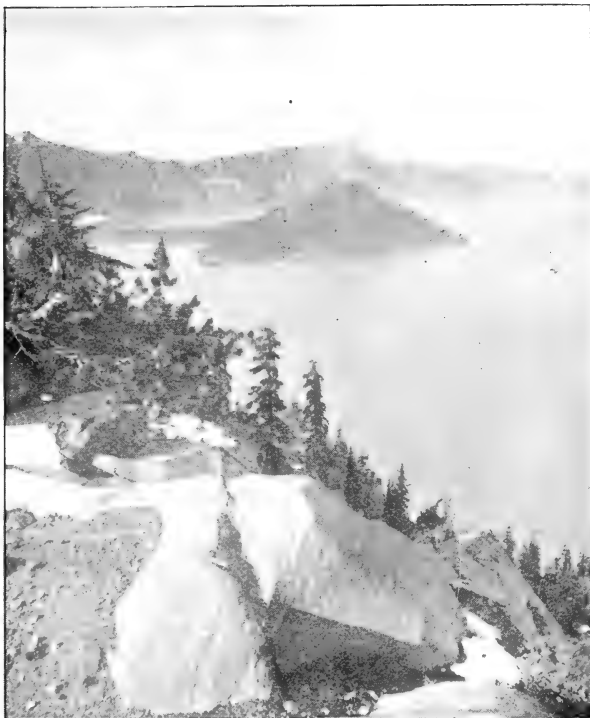


Photo. by M. M. Hazeltine. By permission of Nat'l Geographic Magazine.
GLACIATED CREST OF RIM OF CRATER LAKE.



Photo. by H. B. Patton. By permission of National Geographic Magazine.
SNOWDRIFT IN CRATER OF CINDER CONE
ON WIZARD ISLAND.

at the upper edge of the Canadian Zone (alt. 5,800 ft., or 1,760 meters) by Mr. Cleveland Allen. They were rather common at Prospect, but were not found anywhere in the Hudsonian belt and consequently were absent from the immediate vicinity of Crater Lake.

OREGON GRAY SQUIRREL. *Sciurus fossor*, Peale.

This large gray tree squirrel ascends the Rogue river valley to Prospect, where it was found by Mr. Preble. It occurs also in the Yellow Pine forest on the east side of Klamath Lake, along the road between Klamath Falls and Williamson river.

ALLEN'S CHIPMUNK. *Eutamias senex*, Bachman.

Klamath Indian name *Was-la*.

This large dark-colored chipmunk occurs on most parts of the mountain, though its distribution seems to be somewhat irregular; at all events it is decidedly rare at some points and common at others. It was found along the east base of the mountain among the firs and Lodge-pole Pines, whence it ranges northward to Farewell Bend on the Des Chutes river. It occurs also at Fort Klamath, and in the upper Rogue river valley at Prospect, where it was common. At Crater Lake it is common in the dark hemlock forest, but is rather silent and shy and consequently less often seen than its smaller relative, *E. amœnus*, who is always in evidence. Townsend's Chipmunk climbs the giant hemlocks fearlessly and feeds on the seeds of their cones, scattering the scales about its quarters. It makes a low chucking noise similar to that made by the red or pine squirrel, and also suggesting the note of the eastern Chipmunk, *Tamias striatus*.

MOUNTAIN CHIPMUNK. *Eutamias amœnus*, Allen.

Klamath Indian name *Was-la*.

This small chipmunk is common from the lower edge of the Yellow Pine forest about Klamath Lake all the way up to Crater Lake on the summit of the mountain. It is most common in open places in the woods and in bare spots among logs, stumps and rocks, but is also found in the forest, and a few were caught at Fort Klamath in traps set for shrews and meadow mice in thick grass on the river banks. Near Klamath Lake it was found outside of the

pine woods among the mountain mahogany and chaparral. Unlike the large Townsend's Chipmunk, it is always in sight and rarely if ever climbs trees. On the west or Rogue river side of the mountain, Mr. Preble did not find it below Union Creek, about 16 miles from Crater Lake, and thinks this marks its lower limit on that slope.

LARGE GRAY GROUND SQUIRREL. *Spermophilus douglasi*, Richardson.

Klamath Indian name, *Cho-chuck*.

Common in the lava rock of the Transition Zone on the east side of Klamath Lake, and at Prospect in the upper Rogue river valley. It does not enter the Canadian or Boreal Zone, and consequently is found about the base of the mountain only.

BELDING'S GROUND SQUIRREL. *Spermophilus beldingi*, Merriam.

Klamath Indian name, *Me-sas*.

This short-tailed brownish ground squirrel is very abundant at Fort Klamath, where it lives in the pumice meadows and also in the more open parts of the pine forest immediately about the post.

GOLDEN-MANTLED SPERMOPHILE. *Spermophilus chrysodeirus*, Merriam.

Klamath Indian name, *Chihl-lass*.

Abundant everywhere about Crater Lake, on the summit of the mountain, and also in the Yellow Pine belt about Fort Klamath. On the rim of Crater Lake families were found in many places living in the rock slides with the Pikas (*Ochotona*). On the west slope Mr. Preble found them in the upper Rogue river valley 15 or 20 miles below Crater Lake. Mr. Preble caught a young one on Anna Creek the first week in September, and took it down to Fort Klamath, where he left it ten days later "in contented possession of a burrow it had appropriated." This little one became quite tame, and ate oatmeal, bread and fruit.

GROUND HOG; SIERRA MARMOT. *Arctomys flaviventer*, Audubon & Bachman.

Klamath Indian name, *Mo-e*.

This large Marmot is abundant among rocks on the side of Castle Crest, and was seen at various other points along the rim of

Crater Lake, all the way round to L'ao Rock. It occurs also on the lava beds near Fort Klamath.

MOUNTAIN SEWELLEL. *Aplodontia major*, Merriam.

This curious animal, which looks like a bobtailed muskrat, occurs locally on Mount Mazama. Mr. Preble found a large colony in the canyon of Anna Creek, about half a mile from Pole Bridge Creek bridge. Their burrows and runways were mostly in low willow thickets immediately bordering the creek, but some were in thick rank grass near the edges of the willows. Many of the burrows and runways seemed to be in use, but the animals were difficult to trap, and only three specimens were taken. Considerable quantities of hay, consisting mainly of grass, lupine, and stems of willows, were piled up to dry near the mouths of the burrows and on bushes and logs in the immediate neighborhood. This hay was found in small bunches with the butt ends close together, evidently just as carried in the animal's mouth. Several other colonies were heard of, one in the upper Rogue river valley, another near the head of Sun Creek.

BEAVER. *Castor canadensis*, Kuhl.

Klamath Indian name, *Pome*.

Beaver are now scarce on Mount Mazama. Old signs are plentiful along a stream flowing into Diamond Lake, and a few trees were found there that had been recently gnawed. In the neighborhood of Fort Klamath numerous signs of former presence were seen, and along Wood river many alders and other bushes that had been cut down by them.

EUROPEAN HOUSE MOUSE. *Mus musculus*, Linn.

Some years ago a specimen of the common House Mouse was sent me from Fort Klamath by the post surgeon, Dr. J. C. Merrill. It was captured in 1886, and is of interest as showing that the species had penetrated to Fort Klamath before this date—perhaps many years before. Dr. Merrill tells me that it was common at the post during his stay.

WHITE-FOOTED MOUSE. *Peromyscus leucopus gambeli*, (Baird).

Klamath Indian name, *Me-ko-ka*.

White-footed Mice, while universally distributed over the moun-

tain, are less common than in most parts of the country. At Crater Lake a few were caught in the pumice sand along the rim, others among the cliffs, and still others among rocks in the woods. It is possible that two species exist at Crater Lake, since the specimens collected show a very large range of variation. At Fort Klamath White-footed Mice are more common and a number of specimens were collected.

PACK RAT; BRUSH-TAILED WOODRAT. *Neotoma cinerea*, Ord.

* Klamath Indian name, *Cho-cho*.

Common in places throughout the region. One was trapped by Mr. Bailey on Castle Crest, on the rim of Crater Lake, at an altitude of 8,000 ft. (2,438 meters); and others were obtained by Mr. Preble at Prospect in the upper Rogue river valley, at Fort Klamath, and in the lava ledges on the east side of Klamath Lake. Some of their nests examined by Mr. Preble contained bones and skulls. One had apparently been made near the spot where an Indian had been buried, for most of the skeleton was found in the nest. In this same nest were remains of spermophiles, skunks, dogs, coyotes, fishes, and so on. The Bushy-tailed Woodrat is evidently somewhat carnivorous, although I am not aware that this fact has been previously recorded. A nest found by me in a hollow juniper between Goose Lake and the Modoc lava beds, contained two young rats and a dead pocket gopher. The latter had been recently killed and was partly eaten. It had evidently been captured and taken to the nest by the parent rat.

ROUND-TAILED WOODRAT. *Neotoma tuscipes*, Baird.

This Round-tailed Woodrat is common in in Rogue river valley and is said to occur also at Pelican Bay on Upper Klamath Lake.

ALPINE PHENACOMYS. *Phenacomys orophilus*, Merriam.

During our stay at Crater Lake a special effort was made to secure specimen of this genus, and hundreds of traps were kept set in likely places. All our efforts proved fruitless however until the morning of August 22, when Mr. Preble found a specimen in one of his traps on the steep west slope of Castle Crest. It was in a dry place among low huckleberry bushes near a rock cliff, at an altitude

of about 7,800 ft. (2,375 meters). A few days latter, when we had moved camp to the northwest part of the rim, Mr. Bailey caught one at the north base of Glacier Peak. At Diamond Lake Mr. Preble secured another specimen in a trap set in thick grass at the south end of the lake.

Since the type specimen of *Phenacomys orophilus* was obtained by Mr. Bailey and myself in the Salmon River Mountains of Idaho, in 1890, additional specimens have been secured in the Saw Tooth Mountains, Idaho; Bear Tooth Mountains and Mary's Lake region, Montana; Yellowstone National Park, Wyoming; the Blue Mountains and Cascade Range, Oregon. In the Cascades we obtained specimens, during the past season, at Mount Hood, Diamond Lake and Crater Lake, showing that the animal inhabits suitable spots at high altitudes all along the range.

MOUNT MAZAMA RED-BACKED MOUSE. *Evotomys mazama*,
Merriam.

This new species is common in the Hudsonian Zone at Crater Lake, where a number were caught in traps set among logs, both in the dark hemlock forest and in the thick growth of plants near the small cold streams. The species seems to be partly arboreal and somewhat diurnal, as usual in this genus. I saw one crawl along on the loosened bark of a log in broad daylight, and saw another jump down from a dead tree, but could not be certain whether it was outside of the bark or had come out from beneath a large scale of loose bark. Mr. Preble saw one in the spruce woods near the head of Anna Creek, where several were secured.

SHORT-NOSED RED-BACKED MOUSE. *Evotomys obscurus*,
Merriam.

This is another new species. It is based on specimens collected at Prospect by Mr. Preble. One was caught in a damp mossy place near Rogue river Falls, the others in grassy places near the river. A single specimen was secured by Mr. Bailey on the west slope of Mount Mazama below Glacier Peak. The animal is considerably darker than *E. mazama*.

LONG-TAILED VOLE. *Microtus mordax*, Merriam.

This long-tailed vole is a mountain or Boreal animal and is rather common on the steep west slope of Castle Crest on the rim of Crater Lake, where it occurs both in springy places and in drier situations. Like the large vole it makes runways and holes, and cuts much grass and other small plants. It was obtained by Mr. Preble at Diamond and Paulina Lakes, and by Mr. Bailey and myself on West Sink Creek and the upper Des Chutes river. On Mount Mazama it follows the cold streams down to Fort Klamath where it is common in the thick grass and bushes bordering Wood river and Fort Creek.

COMMON VOLE. *Microtus californicus*, Peale.

Klamath Indian name, *Gli-wa*.

The California Vole seems to be restricted to the Transition Zone and consequently does not occur on the mountain. It is common at Fort Klamath where it was found chiefly in the hay fields.

GIANT VOLE. *Microtus (Arvicola) arvicolooides*, (Rhoads).

Klamath Indian name, *Gli wa*.

This, the largest of the Voles of Mount Mazama, is common in a variety of places within the Hudsonian Zone, but always in damp or moist situations. Numerous specimens were obtained at Crater Lake and along the upper part of Anna Creek, near Pole Creek. At the latter locality two were caught in steel traps set in runways of the Sewellel (*Aplodontia*). This species is partly aquatic and is abundant along little spring streams where it makes large runways of its own in very wet places, and cuts much grass and many succulent water plants, leaving the cuttings scattered about its runways. It has large side glands which secrete a musky odor. Many young were caught ranging from a quarter to three-quarters grown. One of the old females contained 7 embryos.

BAIRD'S VOLE. *Microtus (Chilotus) bairdi*, Merriam.

This new species was caught by Mr. Bailey at the north base of Glacier Peak, on the rim of Crater Lake, where it was living in burrows in open grassy places on the pumice sand. It is interesting as being the second species described of the subgenus *Chilotus*—a



Photo. by G. M. Weister.

By permission of Southern Pacific Co.

ANNA CREEK CANYON.

subgenus established by Professor Baird, for whom the present species is named.

POCKET GOPHER. *Thomomys mazama*, Merriam.

Klamath Indian name, *Mo-nana-tam-has*.

Abundant throughout the region. Common in the pumice meadows on L'ao Rock and at numerous other places on the rim of Crater Lake where its little hills were thrown up every day; also common at Fort Klamath.

MOUNTAIN JUMPING MOUSE. *Zapus trinotatus montanus*, Merriam.

Abundant in moist places grown over with grass or weeds. Specimens were secured at Crater Lake, Anna Creek Canyon, and Fort Klamath.

PACIFIC JUMPING MOUSE. *Zapus pacificus*, Merriam.

This new species, which is smaller and yellower than the mountain animal, was collected by Mr. Preble in the upper Rogue river valley at Prospect.

PORCUPINE. *Erethizon epixanthus*, Brandt.

Rather common. Mr. Bailey saw fresh tracks several times near the spring at the head of Anna Creek, about $\frac{1}{4}$ mile from the rim of Crater Lake. In the forest of Lodge-pole Pines (*Pinus murrayana*) between Crater Lake and Mt. Thielsen, 'barked' trees abound.

PIKA; MOUNTAIN CONEY; LITTLE CHIEF HARE. *Ochotona schisticeps*, Merriam.

Abundant at Crater Lake, where numerous specimens were collected. The Pika makes its home in the precipitous rocky slopes of the lake rim, both on the outer and inner side, living among the loose slide rock and laying up little stores of plants for winter use. A small colony was found on Wizard Island in the Lake, where I shot and secured a specimen. Small colonies follow the canyon of Anna Creek down to an altitude of about 1,830 meters (6,000 ft.).

SNOWSHOE RABBIT. *Lepus washingtoni*, Baird.

Klamath Indian name, *Chi*.

Tolerably common, but exceedingly difficult to procure in summer. Tracks were seen among the thick clumps of young evergreens about Crater Lake. Some years ago a number of specimens, killed near Fort Klamath, were sent me by Major Bendire.

NORTHERN JACK RABBIT. *Lepus campestris*, Bachman.

Klamath Indian name, *Chi*.

Moderately common in the openings and plains about the base of the mountain. A specimen sent me by Major Bendire, killed near Fort Klamath, November 15, 1882, is in the change from the grayish-brown coat of summer to the white coat of winter.

PUMA; MOUNTAIN LION; PANTHER. *Felis hipolestes olympus*, Merriam.

Klamath Indian name, *Dos-lotch*.

Pumas or Mountain Lions are still plentiful in Oregon. In going from our first camp on the southwest side of the rim of Crater Lake to Glacier Peak, Mr. Bailey and I observed the tracks of two Pumas, which we crossed several times in the dense hemlock forest. They were traveling together and were evidently hunting deer.

CANADA LYNX. *Lynx canadensis*, (Geoff.)

The Lynx, which is a more Boreal animal than the Wild Cat, inhabits the higher mountains, and sometimes ranges down into the foothills. It was not obtained by us, but Mr. Elmer J. Applegate of Swan Valley, near Klamath Falls, writes me that his father and brother have both killed Lynxes as well as Wild Cats in this region. It seems safe to assume that the species is the same as that of Mount Adams in the Cascade Range just north of the Columbia.

WILD CAT. *Lynx fasciatus*, Raf.

Klamath Indian name, *Wol-kot-ska*.

Tracks were seen by Mr. Bailey near Crater Lake, but no specimens were obtained.

GRAY WOLF; TIMBER WOLF. *Canis griseus*, Sabine.

Klamath Indian name, *Kow-a-chis*.

Formerly common, but now extremely rare in the southern Cascade region and not met with by our parties.

COYOTE. *Canis lestes*, Merriam.Klamath Indian name, *Quatox*, *Ko-la-a*, *Was*.

Coyotes occur on the mountain, but are not common. A few tracks were seen about the brink of Crater Lake. Mr. Preble secured a handsome specimen on Lost river late in September.

BAIRD'S YELLOW FOX. *Vulpes macrourus*, Baird.Klamath Indian name, *Wan-na*.

Tolerably common. At the time of our visit a family of these foxes had its den on Castle Crest, and another family on the rim of the Lake near the peak known as the Watchman. In fall and winter they doubtless come down to lower altitudes. About the middle of September Mr. Preble saw one near Fort Klamath.

GRAY FOX. *Urocyon californicus*, Mearns?Klamath Indian name, *Sketch-loo-is*.

No specimens of the Gray Fox were seen by us, but Mr. Burton L. Cunningham told me that the species occurs at Fort Klamath.

GRIZZLY BEAR. *Ursus horribilis*, Ord.Klamath Indian name, *Lok*.

The Grizzly is now exceedingly rare in the southern Cascades, where it was formerly common and destructive to stock. The last one seen in the Klamath region was killed in the upper part of Wood river valley, near Fort Klamath, in 1894 or 1895. It had killed a number of cattle and calves belonging to a Mr. Vaughn, who has a ranch near Anna Creek, and who shot it with a set gun. For this information I am indebted to Capt. O. C. Applegate and Mr. Burton L. Cunningham.

Respecting the former range of the Grizzly in western Oregon, Capt. Applegate writes me: "On the west side of the Cascades very few Grizzlies have been known to stray north beyond the Umpqua Mountains, and none beyond the Calapooia Mountains. East of the Cascades they ranged as far north as Crooked river not many years ago."

BLACK BEAR. *Ursus americanus*, Pallas.Klamath Indian name, *We-tam*.

Apparently not common. On August 25, Mr. Bailey and I

saw fresh tracks among the Lodge-pole Pines between Crater Lake and Mount Thielsen. Some years ago a Black Bear was killed in a tree close by the spring at the head of Anna Creek, less than a quarter of a mile from the rim of Crater Lake, by Captain O. C. Applegate.

RACCOON. *Procyon lotor*, Linn.

The Raccoon was not secured by us, but Mr. Burton L. Cunningham informs me that it occurs in the neighborhood of Fort Klamath, where it is not common.

OREGON BASSARISK. *Bassariscus astutus raptor*, Baird.

One of the unexpected captures was a specimen of this handsome species which Mr. Preble secured at Prospect. It was caught in a steel trap at the foot of a tree near a ledge on Rogue river. On account of its long, ringed tail the Bassarisk is locally called "Ring-tailed Cat" and "Coon-tailed Fox." It is also known as the "American Civet," but is not related to the true Civets, none of which occurs in America.

OTTER. *Lutra hudsonica*, Lacepede.

Klamath Indian name, *Kolta*.

Otters are said to occur along Lost river and the streams about Fort Klamath, and Mr. Preble found evidences of their presence at Diamond Lake.

BADGER. *Taxidea americana*, (Boddært).

Klamath Indian name, *Koltz*.

Apparently common throughout the region. Their signs were seen on Castle Crest, near Anna Creek, and also near Diamond Lake.

LARGE SKUNK. *Mephitis occidentalis*, Baird.

Klamath Indian name, *Chaw-sis*.

Tolerably common in the pine forest at Fort Klamath, Prospect, and other points about the mountain, though no signs were observed at the summit. Mr. Preble saw the remains of a dead one at Diamond Lake.

LITTLE SPOTTED SKUNK. *Spilogale phenax latifrons*, Merriam.

At Prospect, in the upper Rogue river valley, Mr. Preble was

told that a little spotted skunk was killed there sometime previously. Prospect is probably at the upper limit of the species' range.

PACIFIC MINK. *Lutreola vison energumenos*, Bangs.

Klamath Indian name, *Kla-pa*.

Common along the larger streams. We found Mink sign plentiful on the Upper or West Sink Creek, near the northeast base of Mount Mazama; and Mr. Preble secured a specimen at Paulina Lake, some distance farther north.

MOUNTAIN WEASEL. *Putorius arizonensis*, Mearns.

Klamath Indian name, *Ketch-ketch*.

We did not succeed in finding Weasels immediately at Crater Lake, but Mr. Preble caught a pair in runways of the Sewellel (*Aplodontia*) near Anna Creek, about $4\frac{1}{2}$ miles below the rim of the Lake, and at altitude of about 1,830 meters (6,000 ft.). Some years ago Major Charles E. Bendire sent me a pair from Fort Klamath.

PUGET SOUND WEASEL. *Putorius streatori*, Merriam.

This Weasel was not obtained by us, but a rough skin in white winter pelage has been sent me by Mr. Burton L. Cunningham of Fort Klamath, who states that it was killed there by a dog.

PACIFIC MARTEN. *Mustela caurina*, Merriam.

Klamath Indian name, *Pap*.

Common in the hemlock forest immediately about Crater Lake, where three were caught by Mr. Bailey. The stomachs of these specimens were full of large brown crickets.

CALIFORNIA MOLE. *Scapanus californicus*, (Ayres).

Klamath Indian Name, *To-ma-lok*.

This Mole is tolerably common in the Transition Zone flat about Fort Klamath, from which locality Major Bendire sent me four specimens some years ago. It is considerably smaller than *S. alpina*, the new species from Crater Lake.

ALPINE MOLE. *Scapanus alpinus*, Merriam.

Klamath Indian name, *To-ma-lok*.

This fine large Mole is common about the rim of Crater Lake,

where Mr. Bailey caught the type specimen. Pocket Gophers abound in the same locality and one was caught in the same runway with the Mole.

At Union Creek, about 15 miles west of Crater Lake and at a considerably lower altitude, Mr. Preble found where a Mole had burrowed into a decayed log from below, and had penetrated the log back and forth in search of insects, pushing out the chips on one side.

GIBBS' MOLE. *Neurotrichus gibbsi*, (Baird).

Tolerably common, but difficult to trap. Specimens were obtained at Crater Lake near the head of Anna Creek, on Anna Creek, near Pole Bridge Creek, and at Fort Klamath. They were secured in a variety of situations. At Crater Lake one was caught in a runway in a damp grassy place among small bushes on a steep hillside. At Anna Creek one was caught under a log in a dry place, in a trap baited with meat. At Fort Klamath four were caught in a patch of willows and alders on the bank of Wood river, in traps baited with bacon.

SMALL SHREW; SIERRA SHREW. *Sorex vagrans amœnus*, Merriam.

Klamath Indian name, *Show-sy*.

The common Shrew of the mountain belongs to the *vagrans* group and is so closely related to the Sierra form, described under the name *amœnus*, that it is placed under this head. It is abundant over most parts of the mountain, chiefly in wet springy places. A few were caught under logs in the woods. Specimens were obtained at Crater Lake, Anna Creek, and Diamond Lake. Specimens from Fort Klamath seem to be intermediate between *vagrans* (the coast form) and *amœnus* (the mountain form). They were very abundant along Wood river near Fort Klamath, where about 20 were caught in traps baited with bacon.

BENDIRE'S WATER SHREW. *Sorex (Atophyrax) bendirei*, Merriam.

The type specimen of this species was obtained by the late Major Charles E. Bendire on Williamson river a few miles south of Fort Klamath. Mr. Bailey secured a second specimen on Fort Creek, close to the old post. It is probably common in the streams of the



Photo. by C. C. Lewis.

By permission of Southern Pacific Co.

THE PHANTOM SHIP,

region and may be easily distinguished from the Water Shrew by its black belly.

ALPINE WATER SHREW. *Sorex (Neosorex) navigator*, Baird.

Common about the little springs and rapid mountain streams. Several were secured at Crater Lake, and along the upper part of Anna Creek, from its source down to Pole Creek. One was taken as low down as Fort Creek, near Fort Klamath, by Mr. Preble. All were caught at the very edge of the water, some in woods, others in marshes. One Mr. Bailey caught alive did not attempt to bite. The species may be distinguished from Bendire's Water Shrew at a glance by its white belly.

BIG-FOOTED BAT. *Vespertilio yumanensis*, H. Allen.

Klamath Indian name, *En-che-cha*.

A small bat of the genus *Vespertilio* sent me from Fort Klamath in 1883 by Major Bendire has been identified by Mr. Gerrit S. Miller, Jr. as a dark form of *V. yumanensis*.

SMALL BROWN BAT. *Vespertilio lucifugus longicrus*, True.

On the evening of August 25 Mr. Bailey shot one of these bats at Upper Sink Creek, near the east base of the range.

Several small bats were seen at the rim of Crater Lake, but unfortunately we were not able to secure a specimen.

SILVER-HAIRED BAT. *Lasionycteris noctivagans*, (Le Conte).

When camped on Upper Sink Creek, the night of August 25, I shot a silver-haired bat as it was flying overhead in the short twilight. It is odd that the three bats killed at this place the same evening belong to three different genera (*Lasionycteris noctivagans*, *Vespertilio lucifugus longicrus*, and *Eptesicus fuscus*.)

LARGE BROWN BAT. *Eptesicus fuscus*, (Palisot de Beauvois).

Common about the base of the mountain and ranging up the canyon of Anna Creek nearly as far as Pole Creek, where several were shot by Mr. Preble. The species is common at Fort Klamath and one was killed on Upper Sink Creek.

LARGE PALE BAT. *Antrozous pallidus*, (Le Conte).

Three specimens of this large, handsome long-eared bat were sent me from Fort Klamath some years ago by Major Charles E. Bendire, who collected them there in 1883. They belong to the large California form which ranges northward on the east side of the Cascades to the Dalles.

Department of Agriculture, Washington, D. C.

U. S. Fish Commission Investigations at Crater Lake.

BARTON WARREN EVERMANN, PH. D.
Ichthyologist of the United States Fish Commission.

In the spring of 1896 the U. S. Commissioner of Fish and Fisheries received a request from the Mazamas and also from public spirited citizens of south-western Oregon that a plant of fish be made in Crater Lake.

No one seemed to know whether the physical and biologic conditions existing at Crater Lake were such as would permit fish to thrive in it. Before acting upon the request it was, therefore, thought advisable to learn something of the character of the Lake. I was therefore directed by the Commissioner to make such an examination of the Lake as would determine its fitness for fish life.

The investigation was conducted chiefly along four lines, viz: the character of the water as to purity, temperature, etc., the nature and amount of fish-food found in the Lake, the presence of other animal and vegetable life in and about the Lake, and the existence of bottom suitable for spawning beds.

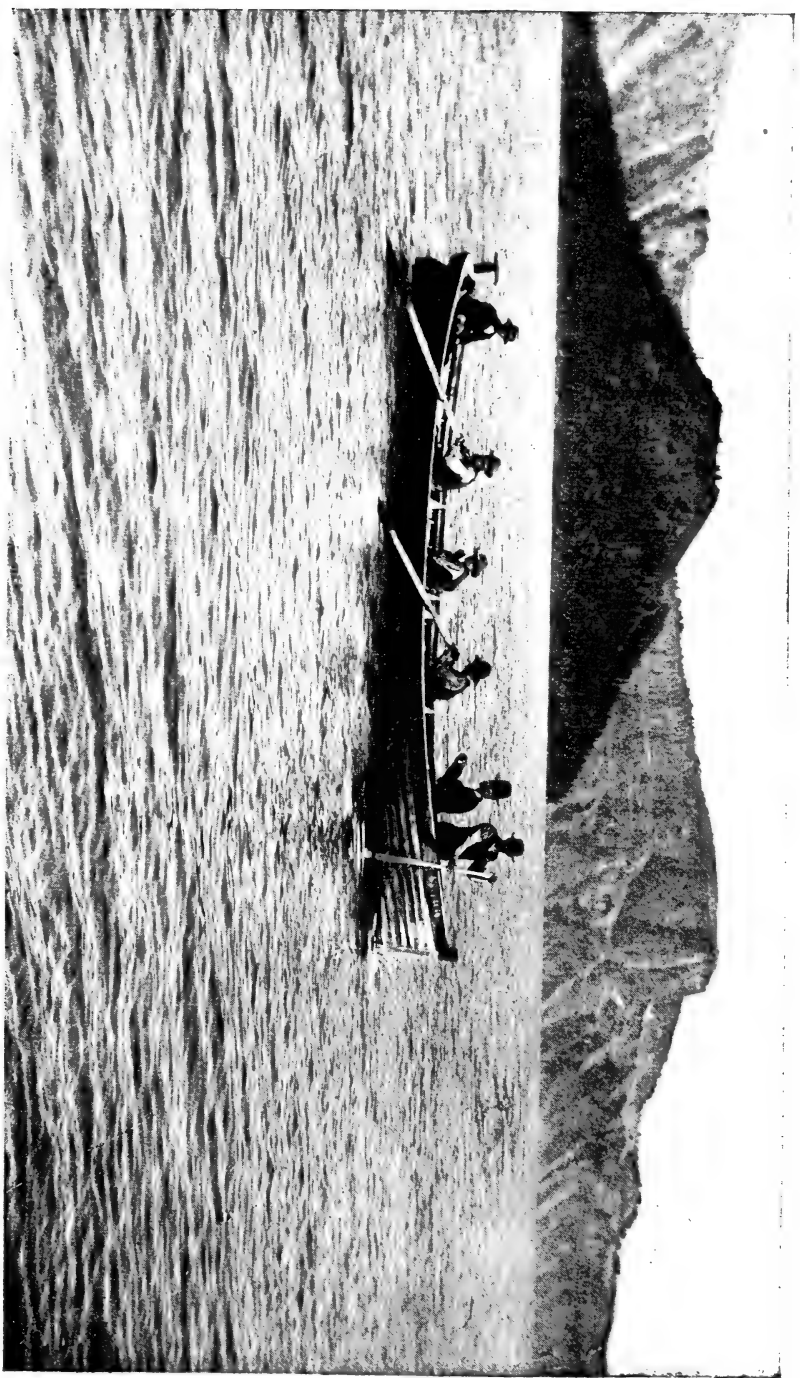
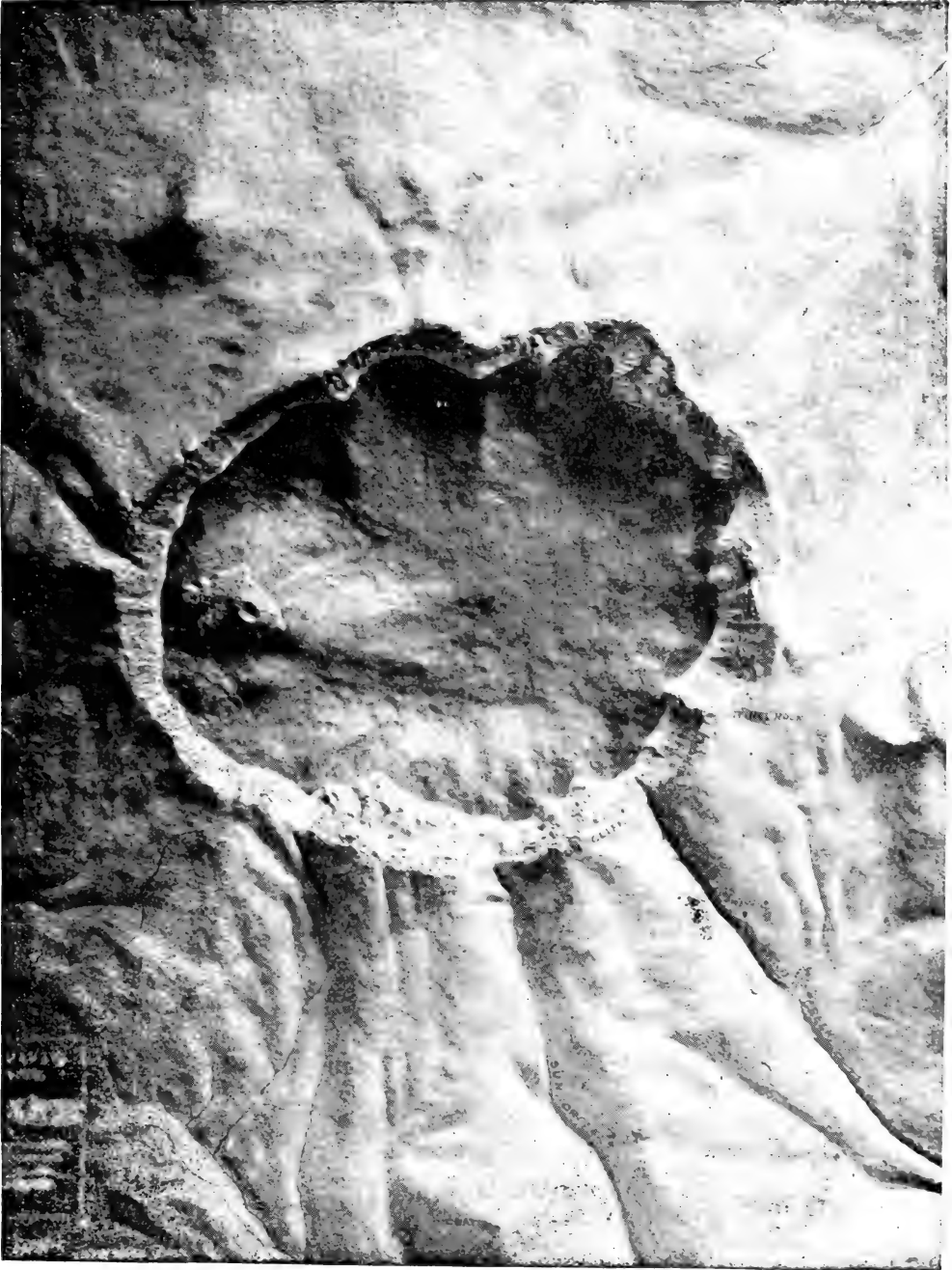


Photo. by E. D. Dewert

THE "CLERTWOOD" ON CRATER LAKE.

By permission of Southern Pacific Co.



By permission of Director U. S. Geological Survey.

CRATER LAKE, AS IT WOULD APPEAR FROM A HEIGHT OF 20 MILES ABOVE IT. (FROM A RELIEF MODEL.)



Photo. by G. M. Weister.

By permission of Oregon Immigration Board.

MOUNT PITT, FROM NORTH.

ON THE MAZAMAS' EXPEDITION OF 1896.

Morning Oregonian, August 12, 15, 22, 23, 25.

September 10. "Trip of a Lifetime." W. G. Steel. Illustrated.

Klamath Republican. August 27, 1897. "Crater Lake — Mazamas."

San Francisco Chronicle, October 11, 1896. "An Ascent of Mount Pit (*sic*) and a Visit to Crater Lake by the Mazamas." W. G. Steel. Illustrated.

New York Journal, September 20, 1896. "A Woman Mountain Climber's Exploits." Fay Fuller. Illustrated.

Tacoma Ledger, September 6, 1896. "Christened Mount Mazama." May Fuller.

Science, September 25, 1896. "Meeting of the Mazamas at Crater Lake, Oregon." C. H. Merriam.

Pacific Unitarian, October, 1896. "A Trip to Crater Lake." Earl Morse Wilbur.

Good Roads and Cyclist (Portland), October, 1896. "A wheel to Crater Lake." Earl Morse Wilbur. Illustrated.

Scientific American, December 5, 1896. "Crater Lake, Oregon." Earl Morse Wilbur. Illustrated.

Traveler (San Francisco), November, 1896. "The Mazamas at Crater Lake." W[inifred] W[atson]. Illustrated.

