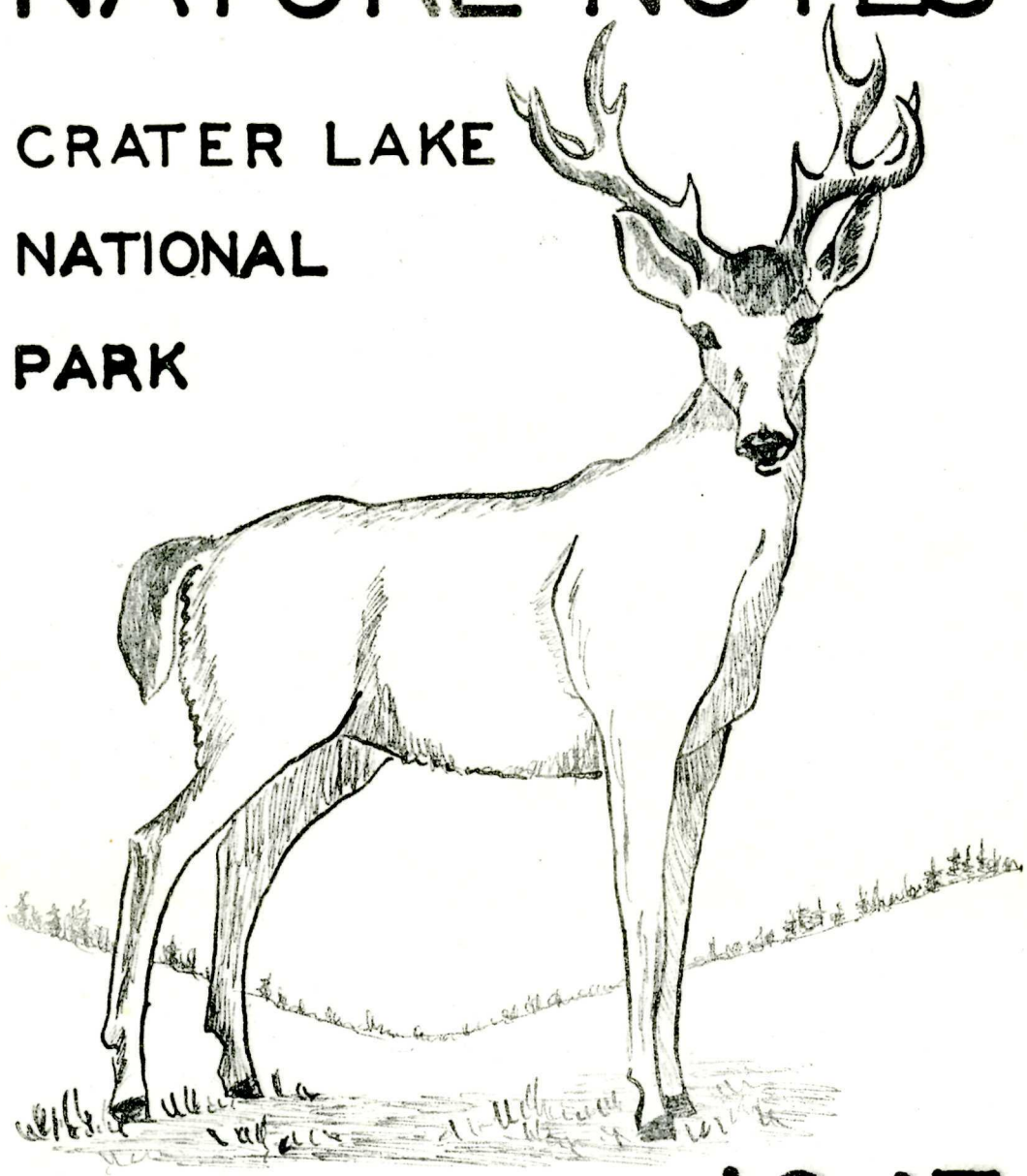


NATURE NOTES

CRATER LAKE
NATIONAL
PARK



=1947

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

CRATER LAKE NATIONAL PARK

NATURE NOTES

Volume XIII

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NATURE NOTES from Crater Lake National Park are issued from time to time by the Crater Lake Natural History Association to foster an appreciation and interest in the natural history of the park. It is distributed free to members of the association. Reprinting of articles appearing in NATURE NOTES is encouraged. It is requested that acknowledgement of the source be made by giving the name of the author and of this publication.

E. P. Leavitt
Superintendent

Dr. G. C. Ruhle
Editor

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COVER SKETCH AND ILLUSTRATIONS by Nancy P. Wallis

- 0 -

The philosophy that progress is proportional to the amount of alteration imposed upon nature never seemed to have occurred to the Indians. Robert Marshall--U. S. Forest Service

- 0 -



BOOBY CROWS

Dr. R. R. Huestis,
Ranger-Naturalist.

During three different summer seasons a mother Clark's Crow, Nucifraga columbiana, has arrived on Crater Lake rim with a full grown but dependent young one. The 1942 pair, on which notes were taken, kept close to the parking area, the mother availing herself of the food offered by visitors and the young one calling incessantly to share in it. This perpetual clamor during the first part of July interested many people, most of whom appreciated the fact that they were observing a somewhat uncommon episode in family relations although few realized how unseasonal it was for a nutcracker to be feeding young that late in the year. In the morning, the mother usually exhibited considerable patience with her nagging offspring and fed it diligently. By afternoon, however, she appeared distinctly weary of well-doing, fed only at long intervals, and flew rapidly from one perch to another followed interminably by the squawking young one. At times she would administer a weaning peck or two which appeared to have little effect, and sometimes, when the youngster's mouth was open, she would "feed him her bill clear down to his gizzard," as one onlooker phrased it. This produced a sort of choking gurgle in the young one and greatly pleased visitors who were very tired of his clamor.

On July 13, 1947, the writer observed four Clark's Crows on a table in the picnic area. One adult flew away leaving an adult with two full grown and "harmless" offspring. The mother gleaned under the table for awhile, both young hopping after her with hunger cries. She then fed one young by regurgitation, ate again herself, and fed the second young crow in a similar manner. Occasionally, the mother fed both young in succession without a break between feedings. Both young accepted food with the typical feeding reaction of throaty noises and quivering wings. On July 18, 1947, three crows presumably the same trio, were in the camp grounds and going through the same maneuvers. The young made no effort to feed themselves when food was available.

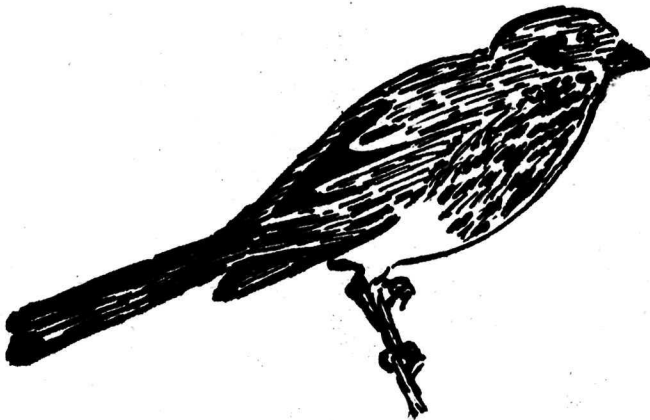
To observe birds that nest, as a rule, in March, feeding young in the latter part of July is sufficiently unseasonal to be mentioned as a matter of record. In all three previous seasons in which it has been observed, the phenomenon was confined to one family. Data upon marked birds have

shown that Clark's Crows return to Crater Lake Rim for several years in succession so the observed adult may have been the same bird. She may nest much later than modally or she may rear an atypical second brood and bring one or more of them to the lake. Another possibility is that in a related group of birds the mother-young relationship is continued in time to a pathological degree and we are observing the distasteful antics of the crow problem child. In this connection, it may be recalled that problem children are an excrescence of the higher classes, a group, amongst avians, in which the crows belong. The idea should interest the philosopher who believes that the larger social groups are merely extensions of family relationships which were not, in themselves, particularly salutary. Other observations of mother-young interactions similar to those described above would be of interest in this connection.

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FOX SPARROWS BREEDING ON THE RIM

Dr. R. R. Huestis,
Ranger-Naturalist.



On June 30, Park Naturalist George C. Ruhle identified a fox sparrow, Passerella iliaca, sub. sp., on the rim walk just east of Crater Lake Lodge. The writer, who was a member of the field party being led by Mr. Ruhle, went back to the area on the morning of July 1 to see if the bird was still there. This special trip was prompted by knowledge of the fact that fox sparrows had not been reported even as transients in the rim area during the seven summers in

which the writer has been a seasonally employed ranger-naturalist at Crater Lake National Park.

On July 1 at 8:30 A. M. a singing male, presumably the one identified by Mr. Ruhle, was seen on a small mountain hemlock close to the rim walk; near him was a female, presumably the second bird that was heard but not observed the previous day. This female was carrying food and while the writer watched she signaled out of cover and fed a young bird apparently in juvenal plumage. After an interval of about two minutes the female reappeared with food, made contact with, and fed a young bird this time in the cover of a clump of small mountain hemlocks and herbaceous shrubs close to the rim walk. The observer was within twenty feet of the birds involved in these two important episodes in the lives of avian young.

A prior report upon Passerella within Crater Lake National Park was made by Joseph Dixon who collected a fall migrant Valdez Fox Sparrow in 1936. The present family group was not broken to provide a bird in hand. The probability is that this report concerns P. i. fulva, Warner Mountains Fox Sparrow.

- 0 -

ROSY FINCHES

Dr. R. R. Huestis,
Ranger-Naturalist.



On July 8, the members of a guided trip up the Garfield Peak trail were able to closely observe a pair of Hepburn's rosy finches. The birds were feeding along a receding snowbank at 7800 feet, about twenty feet from the trail and paid no attention to the fifteen observers although these latter were no quieter than any group of people unaccustomed to the conventions of successful bird observation. It is this tendency to continue with the business of feeding, as though observers did not exist, that brings the leucostictes particularly to the notice of individuals who have taken advantage of self-guiding trails and are fortunate enough to come in contact with these handsome and by no means well-known birds.

This notice is very often followed, when opportunity comes, by a question directed to a member of the park personnel. Even when visitors have heard of rosy finches they do not realize that, at last, they have seen one. This is because the vernacular name is inappropriate and, at least in Crater Lake National Park, these birds are not restricted to high altitudes. Visitors notice particularly the grey head and the large size for a finch. The usual comment is that the rest of the bird looked brown.

Actually, under field observation leucostictes do not look rosy. According to Webster rosy means blooming; blushing; resembling a rose, and none of these connotations fits a hard working brown and grey finch busily working the snow banks. These finches are not large birds but they are bigger than the more commonly seen junco, vireos, crossbills, and purple finches, and perhaps look bigger than they are because they are clearly seen against the snow.

No part of Crater Lake National Park is above 9000 feet but because snow commonly lies late in the angle which the rim makes with the lake shore and in sheltered points on the rim walls, leucostictes may be seen along the lake shore at 6200 feet, along the center wall trail which joins the rim at 7000 feet, and even just within the rim in the parking area. Their visits to these latter points are transitory but to step from one's car and only have to walk a few feet to see rosy finches is quite an event even if it doesn't happen very often. - 0 -



Steller's Jay

BIRDS OF THE PARK IN WINTER

Dr. G. C. Ruhle,
Park Naturalist.

It has long been held that the waxing and waning of food supply has been the chief cause of the migration of birds, but soon after the task of rearing a brood has been completed, scarcely after the last migrants have arrived in the park for the

short summer season, and at a time when available food is most abundant with some species, the parent birds have grown restive and have started their long journey to climes with happier winters. By the time snow blankets the ground with a durable mantle, a dozen of the more than a hundred species of park birds remain to endure the icy winds, long snow storms, and drab days of the high mountain fastness. And of these, few individuals are seen by the ranger or skier who visits the park and enters the forest solitudes. Not one winter visitant species has been reported in the park.

Best known of all park birds is the Clark nutcracker of intimate association with timberline forests of our West and with visitors to the lake rim in the summertime. He fares well at all times, since he eats a great variety of food, tho the seeds of conifers are his particular fare. In winter, he loiters around the park mess house, watchful for scraps of food and a possible handout. Most interesting is the fact that this gray crow, who spends his whole life in high mountains, nests in the dead of winter. The young are active and on the wing long before the flow of visitor traffic is underway in June.

Closely related to the nutcracker is the Oregon or gray jay, the local representative camp robber or whiskey jack. This bird is bold and friendly, so most campers make its acquaintance. Its general appearance is unkempt, quite in contrast to the natty nutcracker, but this fluffiness helps to protect it from wintry cold. Like the other crows and jays, it nests early, in weather seemingly cold enough to freeze. On a trip by Sno-cat westward from the Watchman, we discovered its nest high under a protective canopy of green hemlock boughs. It was of twigs, moss, and lichen, snugly lined with grass and feathers, and deep enough so that only the head and tail of the brooding bird protruded.

Crows and jays are the most intelligent of birds, and many provide for lean months by hiding provender in times of abundance. In summertime, it is entertaining to watch nutcrackers thriftily cache peanuts and tidbits supplied by kind people on the rim, only to have the Steller jay lurk in the shadows to steal them from under his nose. For this handsome character of dark blue suit, black cowl, and jaunty crest, like many other jays, is an ungracious rogue always ready to cry an indignant, "Thief, thief!", at the other fellow, is a self-righteous termagant skilled in vituperation that bristles with vilest of epithets and curses. He mixes freely with the blameless nutcrackers and camp robbers that come to our camp in winter squawking, "We're hungry; how about some grub?" For the smoke hardly starts curling above a lonely snowshoe cabin, before these forms appear in the trees or on the snow, where no life had been visible upon the arrival of the occupant.

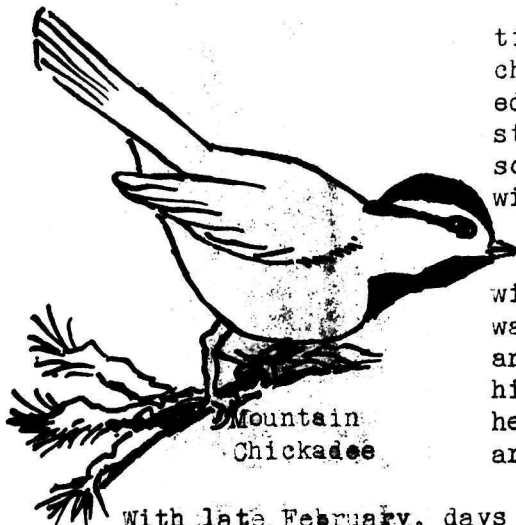
Holding aloof from his three cousins above, as well as from members of his own kind, the big, solitary raven may sometimes be seen flying inside of the crater wall in any month of the year. He loiters, scolding around the garbage disposal area, or lurks at a distance from the mess hall. In the park, as elsewhere, he undoubtedly finds carcasses of victims of the storm, and he carries out his beneficial role of scavenger. Ravens nest early. The crags inside the rim furnish them with an abundance of nesting sites.

The biggest park bird is the bald eagle. Formerly very abundant in Oregon, this, our national emblem, has become uncommon. He is to be seen, winter and summer, soaring over the lake; perhaps his favorite item of food is fish, either fresh or carrion. Eagles nest on Wizard Island; building a huge home of sticks and twigs, with a lining of moss and plant materials.

The great horned owl is so-called from the prominent tufts of feathers that project above his eyes. He is an aggressive night hunter that lives on rabbits, squirrels, grouse, and other prey. A hardy bird, he nests early, sometimes taking over the empty home of a raven or hawk. His penetrating hoot, an unforgettable nocturnal sound of western timberland, is heard, also, in winter months blended with the wail of winds and the creaking of trees.

Occasionally on ski trips in the park, one is startled by a sudden whirr of laboring wings, as one flushes a sooty grouse. These birds perform interesting tho limited seasonal migrations. They spend summer and fall on open ridges to feed on ripe berries and insects. In spring, they move downward to the edges of meadows to nest. In winter, they keep to heavy timber, mostly unseen and high in the conifers, in which they feed on buds and needles. In March, males utter a low-pitched hoot which comes from a throat inflated until large brilliant yellow sacs show on either side of the neck. The birds are ventriloquists, and one scrutinizes with care, only to find, if lucky, that the performer perches at the very elbow of the searcher.

Among woodpeckers, only the Modoc hairy has been reported within the park in mid-winter. He has appeared outside the mess hall looking for crumbs. His relative, the red-shafted flicker, does not remain all year, but returns early to the park, his lusty call resounding in the early months of the year.



Mountain
Chickadee

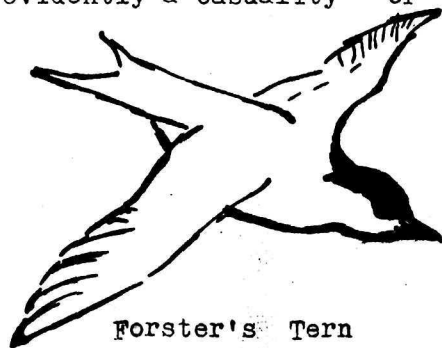
Cheeriest of all winter birds is the tiny mountain chickadee, whose rollicky chick-a-dee-dee-dee seems to be stimulated rather than stilled by the gruffest storms. Sometimes their gay company is sought by a nuthatch, but in the park in winter, such an observation is rare.

The water ouzel should spend winter within the park, since there is open water here, but there do not seem to be any reports of his presence. February is his month of brilliant song, which is heard over the gurgling of the complementary half-frozen stream that is his home.

With late February, days of sunshine become more frequent, and summer residents may soon put in appearance. Thus a blackbird has been reported at Annie Spring in February, and a meadowlark ten days later. As early as March, robins, mountain bluebirds, and varied thrushes may come in the vanguard of migrants and summer residents. Juncos arrive from the lowlands, the siskins chirp as they fly from tree to tree, the woodland rings with the nasal "vank! vank!" of nuthatches. Not until snow has all but disappeared, with the song of the axe ringing in camp grounds, do the last of the host, among them the olive sided flycatcher and the nighthawk, complete the cycle of the year.

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FORSTER'S TERN. On June 7, a female Forster's tern, Sterna forsteri, was found dead near the Lost Creek Ranger Station at the East Entrance to the park. It was evidently a casualty of the storms of the first week of June. Forster's terns have not previously been reported within Crater Lake National Park; this specimen can only be regarded as accidental.



Forster's Tern

Post mortem examination revealed that she had not eaten for some time as no sign of undigested food was found in the digestive tract. Since these birds are known to nest in the marshes of Upper Klamath Lake, it is probable that this bird was lost in the storm and was unable to find suitable food in the unsuitable habitats afforded by the rugged southern Cascades of which Crater Lake National Park is a part. This tern is a marsh loving bird which is not conditioned to timbered areas. - Dr. Ruth E. Hopson.

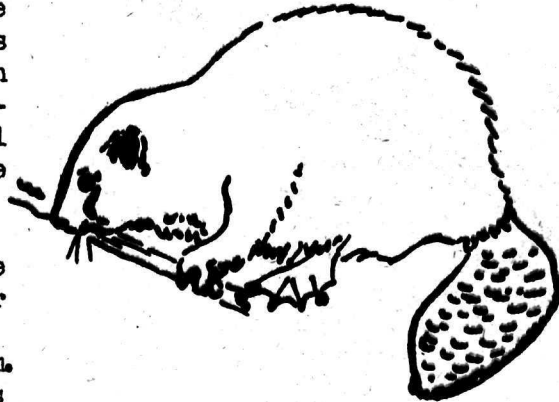
RENEWAL OF BEAVER ACTIVITY
IN COPELAND CREEK

W. S. Vincent,
Ranger-Naturalist.

Early this season the crew clearing out the Castle Creek Firetrail observed that beaver were damming the culvert at Copeland Creek. Other park employees reported additional signs of renewed activity to the naturalist's office. On July 2 and July 16 I visited the area with Ranger-Naturalist O. L. Wallis.

Beaver had been very active in the Copeland Creek region for several years after 1931, when they first appeared in this section of the park. They soon exhausted the willows, their principal food here, and were forced to migrate to a more favorable habitat.

On July 16, it was noted that the willows have recovered. With their food supply replenished, the beavers have renewed activity along this stream. Nearly every one of the old dam sites had been or was in the process of being repaired. A considerable amount of water is being stored behind these dams in the area which extends about 250 yards below the firetrail. The restored dams range from five to fifty feet in width and from one to four feet in height. Behind one dam, the impounded water is backed up approximately one hundred feet. The total number of dams is about 15.



As my attention was drawn by a sudden disturbance on the bottom of one of the pools I saw a beaver departing from the immediate vicinity. A full view of the animal was obtained as it climbed over the dam and disappeared into the willows below the site. The beaver appeared to be full grown and in good condition.

From the amount of activity in the area, it is estimated that only one pair of beaver are working along the stream. The cuttings are somewhat scattered throughout the entire area with occasional cut branchlets submerged in open areas apparently used as food depots. No indication of lodge-building was noted.

In the 1946 issue of Nature Notes, Ranger-Naturalist Wallis reported no sign of fresh beaver activity in the Copeland creek area, but some fresh workings along lower Annie Creek. Observations this year indicate that no new activity has taken place along Annie creek.

Other indications of beaver activity in the park have been seen only in lower Bybee Creek, where a considerable number of fresh cuttings were observed and one quite large dam had been constructed. This particular dam was novel in that it was constructed in very fast water, and was five feet high and twenty feet across, backing up a pool forty feet long. Freshly peeled twigs of willow were noted in the dam but no other sign of the beaver was noted.

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DEER OBSERVATIONS

O. L. Wallis, Ranger-Naturalist

Although three species of deer are reported from the park area, the occasion is noteworthy that specimens of each form are seen within the course of one day's travel within the park. On July 27, while driving down the Wineglass motorway with Ranger-Naturalist Don Findlay, I observed an Idaho whitetail doe, Odocoileus virginianus ochrourus Bailey, cross the road and dash off into the timber with its "flag" highly raised.

Later in the morning three Rocky Mountain mule deer bucks, Odocoileus hemionus hemionus (Rafinesque), were seen by the roadway near Bear Creek. Their white rump patches and black-tipped creamy tails showed distinctly against the dark background of the lodgepole timberland. This sector of the park is typical of the preferred arid habitat of this species.

On the way back to the Park Headquarters, three Columbia blacktail deer, Odocoileus hemionus columbianus (Richardson), were feeding in the meadow between Kerr Notch and Lost Creek Ranger Station.

Members of the guided trip afield had an opportunity to observe a mule deer buck near the summit of Garfield Peak on August 4. This buck had one of its antlers broken and the other was still in the velvet. The tail, although typically cylindrical in shape and creamy in color, had a black strip extending down its entire length; the white rump patch was greatly reduced. These characteristics would seem to indicate that this individual was an intergrade with the Columbia blacktail deer.

While conducting a stream survey on upper Bybee Creek, I observed a large six point whitetail buck along the stream, one mile below Lightning spring.

Blacktail were seen on various occasions along the streams and the highway in the western portions of the park through the summer. These, the most abundant of park deer, appear to be present in their usual numbers. There was a good fawn crop, so numerous fawns were to be seen during the season.

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BAT RECORDED
FROM WIZARD ISLAND

O. L. Wallis,
Ranger-Naturalist.



A small bat was observed dipping down to take a drink from the waters of Emerald Pool on the west side of Wizard Island at midday on August 23. Later it was seen zig-zagging after flying insects. On August 17, this bat presumably was

also observed in the early afternoon resting on one of the angular pieces of lava in the bright sunlight.

Later the specimen was collected for identification. It was a small bat with brownish body and black wings, and probably belongs to the genus *Myotis* although positive identification will be made by a specialist in the near future.

This is the first known record of a bat on Wizard Island and increases the number of reported species occurring on the island. Conies, golden mantled ground squirrels, deer mice, and mazama red-backed mice were collected by Ranger-Naturalist R. R. Huestis in 1937. The Klamath or Allen's chipmunk was listed prior to this date.

- 0 -

PACIFIC MARTEN

O. L. Wallis, Ranger-Naturalist.

A Pacific Marten or American Sable, *Martes caurina caurina* (Merriam), was discovered killed by an auto on the North Entrance highway, one mile south of the Pumice Desert, on July 31 by Seasonal Ranger George Swan. Because of its agility and swiftness it is seldom that one of this beautiful species is reported to be killed by a motor vehicle.

The specimen was made into a study skin. It is dark yellowish brown in color with darker tail and feet and with a yellow-orange throat and chest patch. Although it was a female, the marten was not pregnant nor was it lactating. The measurements of this female were:

Total length:	443 mm.
Tail length:	182 mm.
Hind Foot:	80 mm.
Ear Pinna:	37 mm.

Pacific martens range in distribution from southern British Columbia to northern California. They are primarily forest dwellers and are expert tree climbers. The high value of its fur makes the marten one of the most valuable furbearers of Oregon, where it is now being protected. Within the Crater Lake National Park, the marten is protected along with all other forms of wildlife. Park Naturalist George C. Ruhle, who has worked or made studies in many National Parks, avers that he believes that this is the best park of all for study and observation of these attractive members of the Weasel Family.

- 0 -

WOLF! WOLF!

Dr. G. C. Ruhle,
Park Naturalist.

Reports frequently come to the office about wolves being seen within the boundaries of Crater Lake National Park. These are always subject to skepticism and questioning, so no effort is spared if there is opportunity to authenticate, confirm, or disprove the observation.



On Friday, January 10, Assistant Superintendent Parker reported that he had seen a huge timber wolf along the road near the old south boundary. The description passed on to me averred that his estimate of the size of the animal included: 125 pounds of weight and 18 inches high at the shoulder. On Saturday, January 11, I went down to the site of the observation to investigate. There were tracts of a canine animal which measured $3\frac{1}{2}$ inches long, exclusive of the claw marks; the distance between tracks was $10\frac{1}{2}$ inches. A very light snow had fallen, so they could not be described as "fresh" tracks.

It is worthy to mention that I assisted in making a survey for a park waterline near this site last October. At that time the caretaker of Crater Lake Lodge, William E. Armstrong, told the naturalist that he and George Hopper, surveyor and former park engineer, had seen a large police dog within the park which apparently had gone wild. The location of this observation was not far to the south from the old boundary. It is possible that the animals in the two instances are identical.

- 0 -

FISH AND STREAM SURVEY

O. L. Wallis, Ranger-Naturalist.

A preliminary fish and stream survey has been conducted within Crater Lake National Park during this summer in an effort to gain a basis for scientific fish management of the streams within the area. From this work some interesting and enlightening information has been gleaned.

From the slopes of Mount Mazama arise nearly a score major streams and creeks. On the west the creeks drain into the Rogue watershed. Largest of these westward flowing streams are: the Rogue River, itself, which arises from Boundary Springs in the northern portion of the park: National, Crater, Copeland, Bybee, Castle, and Redblanket Creeks. The Klamath watershed eventually claims the waters flowing from the eastern slopes of the Cascade summit. Annie, Sun, and Sand Creeks and their tributaries form the largest streams of this drainage arising within the Park. Minor streams are Bear and Lost Creeks.

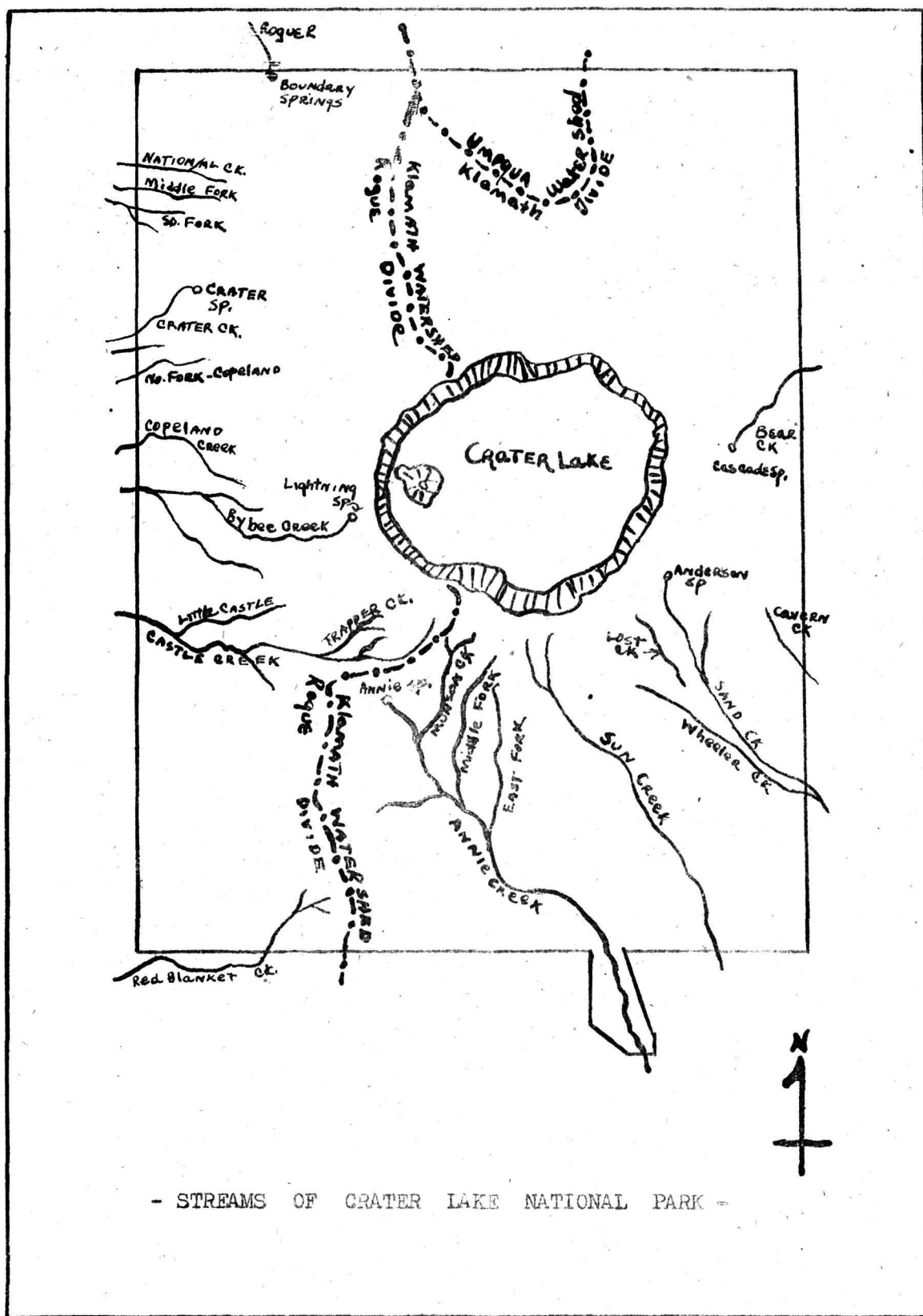
Most of the creeks arise from large, clear springs, the waters of which maintain a constant temperature of 36 to 38°. From the springs, the streams run rapidly through deeply cut canyons carved out of the soft volcanic materials, and cascade over numerous lava flows in series of falls. In some of these creeks the rapids are interspersed with numerous pools while in others the riffle area is nearly continuous throughout the course of the creek. The desirable ratio of riffles to pools, which is 50:50 or better, is lacking in most of the streams. Aquatic vegetation of moss and algae is common in most of the waters.

Aquatic insect life, the mainstay for food of the trout, is generally common although not in the great abundance which could be desired for an optimum condition. Bottom samples taken in each of the streams to determine the quantity and composition of the available food matter revealed that mayfly, stonefly, and caddis fly larvae, helegramites, mud worms, and flat worms constitute most of this aquatic life.

The streams, for the most part, are well shaded with conifers, alders, or willow bushes. Submerged logs, large boulders, and overhanging banks furnish much shelter for the fish. The unstable bottoms, consisting as they do in some streams of pumice and cinders, is generally regarded as detrimental to fish life, especially to the eggs and fry.

Natural reproduction, a highly desirable factor in fish management, is generally lacking; but in Copeland, Bybee, Trapper, Munson, and Lost Creeks, the observation of fry and fingerlings indicate that some natural reproduction is taking place. In Copeland, Bybee, Trapper, and Lost Creeks, this is sufficient to produce enough to replenish the trout under only nominal fishing pressure. In all other streams, if fishing is to be maintained, a limited amount of planting varying according to the qualities of food and other factors of each stream is necessary.

Continued on page 14.



Since 1931, 743,949 fingerlings (275,564 rainbow and 467,385 eastern brook trout) have been planted in the streams. The last plantings were made in 1940 when 66,350 eastern brook and 30,914 rainbow fingerlings were stocked. Fish planting is an expensive operation. The abundance of fish in a stream at present is not in direct proportion to the numbers planted in that creek. Into Annie creek, one of the most accessible, were dumped 20,758 eastern brook fingerlings, 31% of all eastern brook planted in 1940, and yet this stream still maintains the reputation of being one of the poorest fishing streams within the area.

Four species of trout were collected; these were, in order of greatest numbers: eastern brook trout, Salvelinus fontinalis (Mitchell) Dolly Varden, Salvelinus malma spectabilis, rainbow trout, Salmo gairdnerii gairdnerii (Richardson), and German Brown or Loch Leven trout, Salmo trutta Linnaeus. It was interesting to find a large Loch Leven in Sand Creek, Dolly Vardens and rainbows in Sun Creek, for in these streams only eastern brook have been planted according to park records. Fifteen hundred rainbows were planted in Munson Creek in 1937; only one rainbow has been reported caught from this stream in the past two seasons. More rainbow than eastern brook trout have been planted in the streams of the Rogue drainage, but only three rainbows were collected. It would seem from this that the eastern brook trout is better adapted to the cold, clear, high-montane streams than the rainbow. The temperatures of these waters vary from 38 to 49 degrees.

Of the 179 trout collected, forty-three whole fish, 145 stomachs, and 179 scales were preserved for future study during the winter to determine parasites, food habits, age groups, and condition-factors of these trout from the streams of Crater Lake National Park.

The table on the next page tabulates some of the pertinent information about the trout collected during the summer.

- 0 -

VISIBILITY DISC REPLACED. The white cement disc has been replaced in 25 feet of water in the lake below the Sinnott Memorial to aid the visitors to appreciate and grasp the extreme clarity and deep blue color of the water. One of the binoculars at Sinnott Memorial is trained upon the 24 inch object. Paul Herron, boatman for the Park Company, lifted the disc from its old location, repainted it, and then reinstated it. Metal legs were attached to one edge so that the disc tilts toward the observation center.

- 0 -

Information about some trout collected from the streams of Crater Lake National Park during the summer of 1947. Assisting the writer with the collecting were the following persons: Seasonal Ranger John Myers, Ranger-Naturalists W. S. Vincent and Tom Matthews.

Species	No. of Fish	Sex			Average			Largest			Smallest		
		Male	Female	Undet.*	Wgt.	SL	TL	Wgt	SL	TL	Wgt.	SL	TL
Eastern Brook	128	60	41	27	74.35	16.23	18.21	-	25.4	27.3	12.37	9.4	10.7
Dolly Varden	15	5	4	6	61.67	16.02	17.78	143.44	20.0	22.2	20.96	11.7	12.9
Rainbow	10	5	2	3	99.87	18.14	20.15	281.73	26.4	28.9	32.88	12.1	13.6
German Brown	1	1	0	0	-----			218.09	25.5	28.7	-----		

* Undet. - Sex undetermined at present as specimens are being preserved whole for further investigation.

Wgt. - Weight in grams.

SL - Standard Length measured in centimeters from the tip of the snout to the point where the caudal rays articulate with the vertebra.

TL - Total length in centimeters measured from the tip of the snout to the fork in the caudal fin.

RAINBOWS IN POOLS ON WIZARD ISLAND

O. L. Wallis, Ranger-Naturalist.

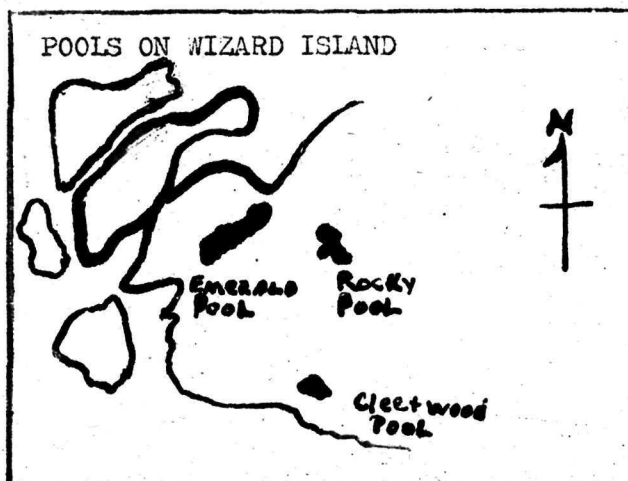
Located in the blocky lava on the west side of Wizard Island are situated three pools caused by the unequal flow of volcanic material. Their bottoms are below the surface of Grater Lake so that they are kept filled to the lake level by infiltration. During earlier times when the level of the lake was higher two of the pools were mere inlets.

The temperature of the pools varies 5 to 6 degrees warmer than that of the lake water. Green algae and diatoms cover the pool bottoms, and tend to give them a blue-green color when viewed from the Watchman.

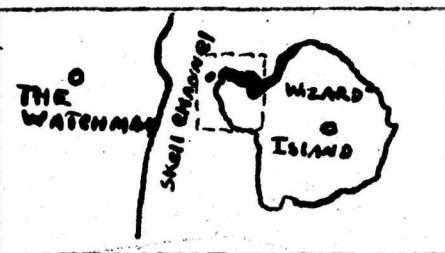
The smaller of the pools is Cleetwood Pool, in which lies the remains of the Cleetwood, the boat used for the initial soundings of the lake in 1886. According to Ranger-Naturalist Wayne E. Kartchner in an unpublished report, there were two small rainbow trout located in this pool in 1936. They were again observed in 1937; only one was seen in 1938, and none in 1939. On August 2, 1939, six more fingerlings were planted. Observations this year revealed several fish were still to be found in this pool. They varied from eight to eleven inches.

Emerald Pool, the largest of the small lakes, contains so much aquatic vegetation that it has a definite emerald color. This pool is 150 feet long, 15 feet deep, and 35 feet wide. On visits August 17 and 23, many mayflies, stoneflies, water striders, salamanders, and tadpoles were observed; giving evidence of an abundance of fish food. Three large rainbows, one "as large as one's arm" were seen. Twelve trout were placed in this pool in 1939. At least three of them were taken by anglers in 1946.

The third pool, Rocky Pool, is located on the east side of a high ridge of blocky lava behind Emerald Pool. It is separated from the Lake by higher lava barriers than the other pools, and is about 60 feet across. From the 1939 planting, it received six fish but on visits this year no trout were observed.



Two specimens were collected from Cleetwood Pool on August 11 by Ranger-Naturalist Walter S. Vincent.



Both were male rainbows. The stomach contents of these fish revealed that this pool contains a scarcity of fish food for conifer needles and vegetative matter, mainly diatoms, which have little nutritional value, made up the bulk of the contents.

Measurement of these fish and stomach contents are:

Specimen No. 470811-1 WI, rainbow, male, standard length: 21.3 cm. total length: 24.1 cm., weight: 158.3 grams. Stomach contents: 28 insect larvae, 12 shrimp, 750 Daphnia (water fleas which are almost microscopic), 1 fragment of crayfish, and 50% vegetative matter(diatoms)

Specimen No. 470811-2 WI, rainbow, male, standard length: 20.2 cm. total length: 22.9 cm., weight: 126 grams. Stomach contents: 6 insect larvae, 1 terrestrial insect, 22 conifer needles (made up bulk of contents), 275 Daphnia, 10 shrimps, and 25% vegetative material.

This investigation shows that conditions within these pools are suitable for survival of trout.

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THE 1947 CATCH IN CRATER LAKE

O. L. Wallis, Ranger-Naturalist.

To the angler, the fishing in Crater Lake this season proved to be disappointing, for a total of only 23 fish were taken by boat fishermen during July and August. This total constitutes the lowest catch reported since the creel census began in 1937. To the investigator, the results provided interesting and instructive information about the fish condition in the lake. Fishing boats have been available daily from 7:30 A.M. until 5:30 P.M., from July 15 through September 1, few people availed themselves of the full day. Most of the fishing was confined to the area around Wizard Island and Skell Channel; few venturing far from this locale.

Information in this report is gleaned from data of boat fishing and a limited amount of shore fishing. Boat operator Paul Herren and his two assistants, Tommy Price and Dick McConkey, gave material help in gathering necessary data.

1. The catch in 1947. Of the 23 fish caught from boats, 14 were silver side salmon and 9 were rainbow trout. This amounts to .21 fish per boat hour, as compared with .11 for 1946. (See Nature Notes, 1946) The silver-side averaged 12 inches in length and 8.6 ounces in weight; the rainbows 17.5 inches and 2 pounds 4 ounces respectively. Boats were used for fishing a total of 110.5 hours, only 6.8% of the use made in 1946.

2. Natural Reproduction. Although persistent observations were made during the summer, no sign of fry or fingerlings were seen. Mr. Herron in his 30 trips around the lake never saw any small fish. On July 13, two fishermen from Klamath Falls reported that there were some "six inch rainbows off the Wineglass shore." The size of the silversides would indicate that they had been spawned in the lake.

3. Shore Fishing. As in past seasons, shore fishing is attempted by considerable numbers of improperly equipped with a general lack of success. Three rainbows, 9, 14, and 15 inches, were taken from the south shore at the boat landing and at the Wineglass; no other catches were reported.

4. Food. Only nine stomach samples were obtained throughout the summer; midge larvae, and midge pupae made up the bulk of the silverside stomach contents examined, while three of the rainbow stomachs contained whole salamanders.

5. Age and Growth Determination. Ten scale samples were taken and will be studied during the winter to determine the age groups and growth record.

6. Remarks. Although there is definite evidence that there is some natural reproduction taking place among the silversides, the size of this season's catch would seem to indicate that this natural reproduction is not sufficient to provide satisfactory sport for the visitor. Only by supplementing this reproduction by stocking can fishing be brought back to its former reputation. Stocking the lake is expensive and difficult with relatively small return for the effort of the fisherman.

The 1947 Boat Fishing Record for Crater Lake

Fish taken:	July	August	1947
Silverside salmon	7	7	14
Rainbow trout	3	6	9
Total	10	13	23
No. of boat reports:	10	11	21
No. of anglers	20	23	43
Total boat fishing hours	51.5	59	110.5
No. of fish per boat per hour	.19	.22	.21
No. of fish per hour per angler	.10	.12	.11

Comparison with 1946 season: only 6.5% as many fishermen took 13.4% as many fish as taken in 1946 with the result that nearly two times as many fish were taken per boat hour this year.

A CHECK LIST OF AMPHIBIANS AND REPTILES OF

CRATER LAKE NATIONAL PARK

W. S. Vincent, Ranger-Naturalist

During the summer season an attempt has been made to prepare a check list of recorded amphibians and reptiles from the park. This attempt has been only partially successful, due to lack of adequate time and facilities to make a thorough search of some of the less frequented areas of the park, particularly those areas of the north and east sections of the park. An adequate search in these areas should reveal some of the hitherto unrecorded desert forms.

The list is a revision of the section included in "An Annotated List of the Vertebrates" by Barry Campbell in the Naturalist Manual for Crater Lake National Park (1934). This list seems to be the only one available, and since its completion considerable changes in nomenclature have been made. Furthermore, some of the varieties and species given are no longer valid, so an attempt has been made particularly to clarify and complete some of the more obscure points.

AMPHIBIANS

Salamanders

1. Triturus granulosus mazamae (Rathke) Twitty. Crater Lake Newt.

This form was listed as T. torosus by Campbell. In more recent work, on forms found on the Pacific Coast, Twitty included all in the species granulosus, and described the form found in the lake as the subspecies mazamae. This subspecies is highly pigmented, and reaches a maximum length of about eight inches. During the summer several adults and larvae in various stages of development were found in Emerald Pool on Wizard Island. No others were observed except four adults found in the stomachs of three rainbow trout caught in the lake proper.

Description: Adult, 5"-8"; back quite roughly pebbled, rich chocolate brown, belly reddish-orange; juvenile (just transformed), 2½"-4"; color as adult.

2. Ambystoma macrodactylum (Baird). Long-toed Salamander.

Common along the lake shore and in certain pools in Munson valley. Larvae from 1" to 4", collected in Munson valley. Larvae kept in Laboratory transformed into adults which were about 4" in length. No evidences of reproduction of this form observed in other parts of the park.

Description: Adult, 3½"-5"; back smooth with yellowish mottlings on dark green, sides with 11 costal grooves.

Frogs1. Rana cascadii (Baird and Girard) Cascade Frog.

This is one of the most common animals of the park; it is found in abundance along all streams and water courses of the region. This form is reported by Campbell as being R. pretiosa, but Dr. Kenneth Gordon, in personal communication, places it in the above classification.

Description: Adult, 3"-4 $\frac{1}{2}$ " body and head length; hind legs longer than body-head length; ground color pale to dark green with numerous black spots on back; underside yellow to pinkish on legs. larvae, very darkly pigmented, extremely numerous in spring fed pools.

2. Rana boylei boylei (Baird) California Yellow-legged frog.

This form was first recorded from the park during the present season (see page 22) when one specimen was collected in Red Blanket Creek at the extreme southern border of the park. Further search should reveal this form in all canyons of the Rogue River drainage and possibly in Annie Creek.

Description: See page 22.

3. Hyla regilla (Baird and Girard) Pacific Tree Frog.

This form seems to be fairly common in the park. It has been heard in the Headquarters area, Boundary Springs, Red Cone, and on Wizard Island during the present season.

This frog has a voice all out of proportion to his size and is often heard in chorus in the spring breeding season. An interesting feature is the adhesive disc which is present on the tip of each of the toes, enabling the frog to cling to a vertical glass plate.

Description: Adult, small (2" or less), color variable with the habitat, usually tan to gray-green with dark mottlings.

Toads1. Ascaphis truii Steuneger Bell's Toad.

This form was reported by Campbell as being common in the Bybee Creek area, but none have been collected during the present season. This toad is the only North American representative of an Asiatic species. It resembles closely the genus Rana but has several modifying features.

Description: Adults, 2" to 3" head body length, body greenish with darker mottlings, male with tail like protuberance which is actually a modified cloaca. Larvae characterized by an enlarged upper jaw and minute lower jaw that acts as a sucker to assist in clinging to rocks in fast mountain streams.

2. Bufo boreas boreas (Baird and Girard) Northwestern Toad.

A quite common large toad in all areas of the park. Has been found in such unusual places as the crater of Wizard Island and atop Munson ridge.

Description: 4"-5" head body length, back gray to greenish with large warts and darker mottlings.

REPTILES

Snakes1. Thamnophis sirtalis ssp. (Blainville). Garter Snake.

This is the only snake as yet observed within the park and is quite rare. Seven specimens have been reported during the present season from two localities, the lake shore and the beaver dam area of Copeland creek. One specimen collected by Ranger S. Sprecker on the lake shore was unusual due to its lack of coloration. The stripes of dark gray were only faintly visible on the basic black coloration. This specimen was about 10" in length. One of those collected in the Copeland Creek area was about 36". This form was reported by Campbell as T. s. infernalis, the Pacific garter snake, but as the status of this particular subspecies is somewhat uncertain, no attempt has been made to allocate the form observed to a particular subdivision.

Lizards1. Gerrhonotus coeruleus principis (Baird and Girard)
Gerrhonotus principis (Baird and Girard) Northern Alligator Lizard.

This rather large lizard is quite common on the talus slope just west of Headquarters and is quite probably the same form which has been observed on the lake shore. This is a rather retiring form, and because of its shy habits is probably more widely distributed than was formerly supposed.

Description: 7"-9", back brownish with black markings; quite long fragile tail and large gaping jaws.

2. Gerrhonotus coeruleus shastensis (Fitch). Shasta Alligator Lizard.

A single specimen observed in the field on upper Bybee Creek was tentatively identified as this form. Further collection is desirable.

Description: Similar to above but larger, 10" and longer; body brown with dark markings with lighter colored head.

3. Phrynosoma douglassi douglassii (Bell) Pigmy horned toad.

Reported by Campbell as being collected on the Wineglass motorway. This form is probably fairly common in the desert-like eastern sections of the park.

Description: 2"-3", back with spiny scales; short horns behind the eyes; two rows of blackish dots down back bordered with yellow or white; underside white.

The above list of reptiles is undoubtedly far from complete. A list of a few of the forms which might be expected to be found within the park boundaries is given below:

<u>Scelopores occidentalis</u>	Blue-bellied lizard
<u>Scelopores fraciosus</u>	Mountain swift
<u>Eumeces skiltonianus</u>	Blue-tailed skink
<u>Coluber constrictor</u>	Yellow-bellied racer
<u>Pituophis catenifer</u>	Gopher snake
<u>Lampropeltis</u> sp.	King snakes
<u>Crotalus viridis oreganus</u>	Pacific rattlesnake

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FIRST RECORD OF THE CALIFORNIA YELLOW-LEGGED FROG IN PARK

W. S. Vincent, Ranger-Naturalist..

A small frog which proved to be Rana boylei boylei was collected by the writer in the pond of a small spring on Red Blanket Creek on July 2 while on a field trip with the Park Naturalist George C. Ruhle.

This frog has not been reported previously in any literature as having been collected within the park boundaries. Its range has been reported as being the middle Rogue River valley (vicinity of Medford) and in the area around Lake-of-the-Woods. It has further been reported to the north in Marion, Lane, and Linn counties. This specimen would appear to consolidate these ranges. No further collecting in the area was possible to extend the range within the park.

A brief description of the frog is as follows*: "Light grayish, greenish or brownish back, indistinctly mottled; under parts white to pale yellow on posterior parts and underside of legs; throat and sides of body mottled with dark color; three inches or less in head-body length." (*Gordon, Kenneth, Amphibians of Oregon, Oregon State Monographs, Studies in Zoology No. 1, 1939.)

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EARLY SPRING FLOWERS AT CRATER LAKE NATIONAL PARK

Dr. Ruth E. Hopson, Instructor,
Field School of Nature Appreciation.



Steer's Head

As the weather grows steadily warmer in early June and the days of sunshine begin to out-number those of storm, the snow banks slowly dwindle in the park. In the damp, brown, bare spots that appear under the outer branches of the mountain hemlock trees and in the open spaces beyond, the pale yellow-green spears of smooth woodrush (*Iuzula glabrata*) replace the snow. The leaves, even before they have obtained their full quota of chlorophyll, separate to expose a flat-topped cluster of tiny flower buds. Sometimes several of these grass-like plants may be found about the thinning edges of the snowbanks, each plant in a circular pit of its own making. A typical display contains all stages of development from spears appearing above the ground that is still wet from the recent snowmelt to fully developed plants with their green ribbon-like leaves and their feathery brown inflorescences. To one familiar with the forests of mountain hemlock of the Hudsonian Zone and with the succession of

plants that is found there during the short growing season, the smooth woodrush is the herald of coming summer, the promise of the gorgeous display of mountain flowers that is to follow in the meadows close by.

Where the heavy snows of winter have recently lain, such plants as creeping Crater Lake current (*Ribes erythrocarpum*) and trailing raspberry (*Rubus lasiococcus*) are pressed into the soil. Soon the warmth of the sun is reflected in the growing energy that enables the twigs and leaves to lift themselves from the ground to their summer position. Inconspicuous racemes of small saucer-shaped bronze flowers are present almost by the time the leaves are freely exposed to the air. The white strawberry-like flowers of the trailing raspberry require more time to develop.

The yellow faces of the smooth woodland violet (*Viola glabella*) reflect the bright light upon the mountain hemlock trees. This violet is one of the earliest flowers to bloom. In the forests along the coast and in the valleys of Oregon, the smooth woodland violet blooms in February or March, at Crater Lake in June or July.

Edging groves of hemlocks, especially on the back slopes of Applegate and in Sun valley, the lamb's tongue, or glacier lily,

Erythronium grandiflorum var. pallidum) nod their yellow heads as snow banks dwindle beside them. Steep rocky hillsides that have south or southwestern exposures are among the earliest places to be free of snow. Here rock-loving perennial plants are waiting to take advantage of the early moisture to enable them to display their flowers and mature their fruits. The western wind flower (Anemone occidentalis) is one of these plants. While the leaves are still tightly folded along the midrib of each linear segment the translucent white sepals, purple tinged without, form a cup of delicate beauty on top of each thickened stem. Later in the summer after the stems have grown tall, heads of plumose achenes (one-seeded fruits) will have replaced the white cup-like flowers. Back-lighted by the sun, each head then appears with its own halo. One of the most beautiful sights of the high mountains may be had by looking toward the sun across a hillside or meadow of western wind flowers when their pale green fluffy heads are fully matured. Near the summit of Garfield Peak, a smaller anemone with pale blue flowers, Drummond's windflower (A. Drummondii), is found. The achenes of this species are densely covered with cotton. Heads of the achenes of Drummond's windflower are therefore much less showy than those of the western windflower.

Exposed rocky cliffs such as those of the Garfield Trail are clear of snow early. Here crevices afford footing for several species of rock-loving plants. Three species of plants that bloom among the first are usually found elsewhere in the Cascades only above timberline in the Arctic-Alpine Zone. The flowers of the mountain sorrel (Oxyria digyna) are inconspicuous, but the color scheme of red and green and the pattern of circles and straight lines formed by the kidney shaped leaves and the straight racemes of tiny flowers make this plant easy to recognize. The slender polemonium or Jacob's ladder (Polemonium shastense) is a delicate study in pastels. The large clusters of pale blue and yellow flowers often just balance the soft green mass that is made up of long pinnately compound leaves. A lone plant of feather-leaved fleabane (Erigeron compositus), with its finely divided leaves, grows from a soil pocket in the cliff about half way up Garfield Trail. By the time the slender polemonium is in profuse bloom, the fleabane is just lengthening the strap flowers of its single flowerhead.

Two crucifers bloom early along the trail. Members of the Cruciferae or mustard family are marked by having four petals and six stamens, two of them shorter than the other four. The dagger-pod (Parrya cheiranthoidea) is recognized by its long narrow gray basal leaves and its deep purple flowers. The pods of this species indicate clearly the reason for the name, dagger-pod. A small species of rockcress (Arabis Holboellii var. secunda) is found scattered among the rocks. Each flower and later each elongating pod is turned to one side of the extended flower stalk.

Before its leaves have unfolded, bleeding heart (Dicentra formosa) is in bloom. The flowers are typical of the species but the leaves are coarser and less finely divided than is usual for this species of lower elevations.

Bright patches of yellow and green among the rocks are apt to be fringed-leaved cinquefoil (Potentilla flabellifolia). The flowers that resemble buttercups and the leaves that look like fringed "three-leaved clovers" signify this species.

A number of shrubs bloom in the Garfield rock gardens while snow is yet deep on the slopes below. Two species of bushy currants are found side by side in some places. Both develop racemes of creamy-white tubular flowers at about the same time. The waxy currant (Ribes cereum) has small smooth leaves. The gummy currant (Ribes viscosissimum) has larger sticky leaves. Although the service berry (Amelanchier florida) is dwarfed along the Garfield trail its blossoms of white strap-shaped petals almost cover the bushes. The leaves of the service berry are easy to recognize because they are oval to almost round and notched about half the margin that is away from the twig.

Large areas of the open rocky slopes are carpeted by two creeping shrubs that produce their flowers while snowbanks remain closeby. The rigid brick-red branches, conspicuous among the glossy, leathery ever-green leaves and the racemes of dainty bell-like pale pink flowers make the pinemat manzanita (Arctostaphylos nevadensis) an attractive ground cover. The lovely pattern produced by the small, holly-like, deep green, shiny leaves and the puffs of tiny lavender flowers of the squaw carpet (Ceanothus prostratus) is equally attractive.

The damp soil of the mountain meadows at first appears almost destitute of life. Here and there the clumps of brilliant red growing tips of Newberry's knotweed (Polygonum Newberryi) push above the uniformly brown surface of the ground. This plant is least attractive during its flowering season. The tiny, papery white flowers that cluster in the axils of the leaves are so inconspicuous that a person looking directly at the plant in full bloom often asks what the flowers are like. Nevertheless, each delicate flower proves to be a delightful surprise to one who chances to examine one with the aid of a hand lens. Following the blooming period, glory returns to the knotweed as its dying leaves turn scarlet. If one chances to view these leaves against the sun they appear translucent like stained glass windows. But this is a picture of late August, not early June.

Among the patches of red tips of growing Newberry's knotweed, steer's head, (Dicentra uniflora) is an attractive surprise to anyone who discovers it. The single rose-colored flower, held at an angle barely clearing the ground, suggests a tiny steer's head even to many who do not know its name. Each flower is surrounded by two or three finely divided gray-green triangular leaves that lie flat on the ground.

Spring beauties (Claytonia lanceolata) are the most abundant flowers on the open slopes. As they push through the earth, the two lance-shaped leaves are held tightly together, like hands over their heads. Soon they separate and are lowered to their characteristic position opposite buds. As the buds open one at a time, the peduncle straightens and holds up the flower that looks like a deep saucer of delicate pink-striped china.

The rosettes formed by the deep-green spatulate leaves of pussy-paws (Spraguea umbellata) are at first small and tight against the ground. The first dense cluster of tiny flowers are greenish. As the season progresses, the clusters become more fluffy and the flowers turn white, then red, all the while the rosettes of leaves are increasing in size.

A small yellow violet (Viola venosa) with gray-green leaves is so inconspicuous that it is easily overlooked. Close examination, however shows it to be an unusual violet that often makes the most of complementary colors, since the back of the upper petals may be purple and the other petals are purple-veined.

The rainbow colors of the spider-web paintbrush (Castilleja arachnoides) blend perfectly into the pumice slopes. The paintbrush tips enlarge as the flowers bloom farther and farther down the stem. This plant is covered by a fine cobwebby pubescence that adds a delightfully soft texture to its delicate coloring.

Dense, cottony plots of alpine antennaria (Antennaria media) look like irregular sections of a patchwork quilt on these mountain meadows. Tiny stems with reduced leaves and clusters of papery white flower heads rise a few inches from each basal clump of leaves. Other plants that may be found in bloom in the mountain meadows during the early summer are: varied-leaved phacelia (Phacelia heterophylla), alpine agoseris (Agoseris alpestris), blue stickseed (Hackelia jessicae), and several species of sedges (Carex sp.).

Three shrubs that are common about the springs or along streams begin to flower while patches of snow still remain; the catkins appear on the Eastwood willow (Salix Eastwoodae), the deep rose of the flower buds make spots of color on the mountain spiraea (Spiraea densiflora), and the yellow twin-flowers blend with the yellow-green leaves of the black twinberry (Lonicera involucrata). In soggy reaches along the streams and about the springs, the ground is often covered with the tiny Gorman's buttercup (Ranunculus Gormanii). Taller plants soon extend their flowering racemes above the mat of mosses and buttercups. The elephant's heads (Pedicularis groenlandicum) make conspicuous patches of rose color, as do the alpine shooting stars (Dodecatheon alpinum). The slender stalks of the green and white bog orchids (Habenaria stricta and H. dilatata) with their sweet-scented exquisite flowers add much to the beauty of the scene. At this time a few white flowers are peeking out of the flat terminal flower clusters of the northern valerian (Valeriana sitchensis), and the white flowers in the dense, slender heads of the bistort (Polygonum bistortoides) are also in evidence.

By the time the snows are gone, most of these flowers have already produced their first fruits. Many of them have a system of flowering that enables them to keep producing flowers farther up the stem as long as the moisture and temperature conditions are favorable, thus a long season results in abundance of seed, yet a short season permits maturity of a few fruits at least. The early spring scene shifts rapidly, so a markedly different one greets the visitors during July and August. Some year come early, see the early spring flowers!

A VISITOR LEARNS ABOUT LICHENS

Gordon P. Walker,
Ranger Naturalist

"Ranger, is that sulphur on those rocks over there?"

"No, sir, the bright yellow color which you see is a lichen."

"A lichen? What in the world is that?"

"A lichen is a form of plant life which results from a combination of a fungus and an alga. Any one of a number of fungi may combine with a single alga or any one of these fungi may combine with several different algae. Each one of these combinations results in a separate species of lichen having a distinct color and form. Both of these factors are a result of the interaction of the two members of this relationship and rarely, if ever, do they resemble either the alga or the fungus as it grows alone. The color seems to be connected with special chemical compounds, each produced only by a single pair."

"Does just any old fungus and alga, as you call it, get together in this way?"

"So far only one group of fungi have been found in lichen associations of the temperate region. These are the cup fungi or Ascomycetes. In the tropics, fungi closely related to the toadstools also combine in this way. Three kinds of algae are found in lichens: brown, blue-green, and more commonly green algae. Ordinarily only the single-celled algae combine, but occasionally a filamentous form has succeeded in doing so. Scientists have been able to break them down into their two components and grow them separately in the laboratory, they have never been able to recombine the two under artificial conditions."

"Why should the two combine anyway? Wouldn't they compete with each other?"

"On the contrary, in nature they help each other out. You see, the fungus is an excellent water absorber and it also can get a grip almost anywhere, but it lacks the ability to make its own organic food. The alga, having green color just like the grass or trees, can use the energy of the sun in the manufacture of sugar. Some of this sugar goes to the fungus which in turn gives the alga a good environment in which to live. In this way the two of them together are able to live in very difficult places such as the surface of bare rock, where neither of them could singly. In fact they are the first form of life to invade any new rock formation and do the all important first work in the breaking down of rock to soil."

"Hmm, right out on bare rock, eh? Do they grow anywhere else?"

"Yes, the forms which grow on trees, you would call mosses. The yellow moss on the trunk of that hemlock over there is called the stag horn lichen. Although it grows on the tree, it is in no sense a parasite. It may get some mineral material from the dead outside bark to which it is attached, but it does not penetrate into the living tissue of the old tree and derives no organic foodstuff from the tree. It grows equally well on living and dead trees or branches. You will notice that it doesn't grow down to the ground in very many places. This is because it doesn't do well when it is buried under the long winter snows. Thus the bottom of the lichen growth indicates the level of the normal persistent snow. At lower elevations there is another lichen, the goat's beard, which grows in the same manner on the same trees. It looks somewhat the same but the color is lighter and it usually is somewhat longer. At around 5,200 feet there is a sharp line where the goat's beard suddenly gives way to the stag horn which we see up here.

"The black moss which hangs so thickly on the lower limbs of the alpine fir there to your right is known as the squaw's hair lichen. I have been told that it was used as a famine food by the Indians. Deer eat it in wintertime, but in summer it is a hazard, since it burns readily and a tree will literally explode if humidity is low and a match or other flame is touched to it. Another edible form, called rock tripe, grows on the rocks up the trail. Other forms grow on down logs and some flat on the ground."

"Golly are there many of these things?"

"Yes, although many of them have not been identified as yet, there are probably from seventy to a hundred of them in the park and the known forms throughout the world number in the thousands. Some of them are exquisitely delicate and others are brilliantly colored, such as the one which splashes the northeast side of the Phantom Ship with gaudy orange. If you are interested in them, go up the Garfield trail where you will see the rocks covered with veritable gardens of them. They are particularly showy right after a rain. The moisture seems to bring out their colors as they blossom out into renewed growth."

(Much of the information contained in this article was obtained by private communication from Dr. F. P. Sipe, Associate Professor of Botany, University of Oregon.)

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The purpose of a National Park is to protect and preserve primitive, a natural state, the most significant examples of floral and faunal types; as well as of scenery, so that scientist, nature lover, and the general public may see, enjoy, learn and benefit.

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EVOLUTION IN ACTION

Gordon P. Walker, Ranger-Naturalist

Some years ago a corn breeder in the Middle West was surprised to find plants which did not have the normal green color, but were pure white. This strain of albino corn suddenly appeared in his otherwise normal seed stocks. Since they lacked green color, they could not use the energy of the sun to manufacture their organic food from water and carbon dioxide. Since no special provisions were made for their feeding, these albino plants died as soon as the food which had been stored in the seed was exhausted. This lack of color and therefore synthetic power was deadly to them. The strain could survive only when the mutation was covered by the dominant gene for color.

In the forests of Crater Lake are several plants which have solved the problem of survival without green color in a different manner. There exist in the duff of forests certain fungi which have the ability to digest cellulose and convert it to sugar. Since the sugars, as made, are outside the body of the fungus, they are available to any plant or animal in a position to absorb them. Since they are water-soluble, the roots of certain seed plants able to absorb and utilize them as a substitute source of organic material.

These plants are true seed plants which have secondarily lost their synthetic powers. Many of them have no close relatives among the green plants of the region and therefore must either have been derived from green plants at some distance from their present habitat or have survived less successful relatives. In the case of Pyrola aphylla, however, we can see the process of conversion to the non-green habit taking place. Several green species of Pyrola are found in the same range of Pyrola aphylla. There is indication of how recently the switch to the non-green habit has occurred. The leafless stem of the flower-bearing shoot is green as it breaks thru the ground, and in some cases its color persists until the flowers are fully formed. It has not been determined whether the green substance is chlorophyll, but the small amount occurring on the portion of the plant exposed to light, and thus capable of synthetic action, could not possibly support the extensive underground stem system that is two to four feet long.

Here is a step in the story of the seed plants. Similar plants show that some such process has occurred several times before. Thus it is not accidental occurrence, but a definite trend in development. It is possible that it is a process similar to that by which the fungi were derived from a precursor of our modern green algae millions of years ago.

It is not yet known whether these new seed plants are completely dependent on the action of fungi in rotting the duff or whether they are capable of carrying out this process for themselves. Strong presumptive evidence for the necessity of a fungal association comes from the observation that they are never found except where fungi are

actively carrying on the process of decay. If, in the course of time, they do evolve the necessary mechanisms to carry out the digestion of wood, they might supplant the fungi as decomposition agents of wood. In much the same way, in many habitats, the seed plants have replaced the dominant green vegetation such as ferns, which reproduce by spores.

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THE FUTURE WIZARD PENINSULA

L. T. Grose,
Ranger Naturalist

The Watchman-Hillman talus slopes form the largest single slide area within the caldera walls. The slide is constantly in action, though no mass slumps have occurred in the last few years. The coarse, flat, detrital beach at the base grows rapidly outward into Skell Channel. It has been built up as follows: Perennial snow patches remain at the base of the talus. Most of the detritus slides over the snow and is deposited farther out on to the beach or into the water. In the early summer when the snow is deepest, the rocks are carried into the water. Already the beach extends 300 feet into Skell Channel. The Channel is now approximately 1,600 feet wide and less than 100 feet deep.

The earliest pictures of Crater Lake, about 50 years old, do not show any such wide beach. Wizard's status as an island is endangered; if the present rate of erosion continues and the lake level does not rise, our great grandchildren will view Wizard Peninsula.

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TRAVEL RECORD

The all-time record for travel in Crater Lake National Park set in the travel year 1941 was broken on the 20th of August. At the end of the travel day on the 20th, 83,319 cars and 274,592 people had visited the park. The previous record was 82,466 cars and 273,564 people.

Clyde E. Gilbert,
Chief Ranger

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REDCLOUD ROCK SLIDE

L. T. Grose, Ranger Naturalist

At 11:10 A.M., July 15, a tremendous blast, followed by a rumbling noise, resounded around the caldera walls. It sounded much like a series of thunder claps, and evidently, everyone thought it to be thunder from a lingering dark cumulus cloud overhead. Actually this "thunder" was the collapse and slide of a section of Redcloud Cliff. A study of the slide is significant because of its being typical of the larger rock slides and mass erosion within the caldera.

A slab, estimated to be 250 x 200 x 8 feet, of the older dacite flow under and immediately to the south of the V-shaped mass of Redcloud Cliff spawled off and slid 9/10 of the way down to the lake shore. One third of the largest blocks were carried farthest by their momentum, but none of them reached the lake. Slight sorting of the debris is evident on the lower portion, the heavier blocks being followed by increasingly smaller fragments. The original, underlying talus was pushed to the shore, extending the fan to the water's edge. Therefore, the total rock slide continued 1,000 feet from the base of Redcloud Cliff to the water's edge. Most of the larger fragments came to rest approximately half way down, and a smaller portion were stopped by the bottle-necking effect of big and little Castle Rock formations. In these higher portions there is little or no evidence of sorting.

The slide fragments came to an unstable rest at the maximum angle of repose, in this case of angular blocks, 43 degrees. It is believed that this angle is reached only in the upper third, and that the slide curves, as the lower portion grades down to approximately 38 degrees. This upward curving is characteristic of new, unstable, and active slides. The lower slide area is semi-safe to climb over due to frictional stabilization of detritus, but the larger rocks in the upper portion are delicately balanced. Prior to this recent slide the Redcloud talus slope was not at the maximum angle of repose, otherwise more than the total additional weight of new slide material would be carried into the lake.

Distortion and dilation transformed the dacite slab into fragments ranging from 1,000 cubic feet down to rock dust. On top of the larger blocks there was loose, fresh rock powder, a characteristic of very recent, large rock slides. Many hand-sized fragments appeared integrated and competent, but crumbled easily under fist pressure. A slickenside appearance is quite obvious on the adjacent andesite spurs, however none of this resistant rock broke loose. Amazingly enough, little Castle Rocks remain none the worse for wear, in spite of much rock battering over them. Small amounts of pumice slid with the main block, but the remains of this were crushed to dust.

The causes of the larger rock slides inside the rim are a number of interacting natural processes. Redcloud Cliff faulted downward on

a nearly vertical plane which affords maximum gravitational pull. Water, directly and indirectly, has helped disintegration and decomposition within a series of cracks, mostly from the top downward. Water seeped from Cloudcap dome into tension cracks near the rim and froze. Seasonal and diurnal temperature changes, alternate freezing and thawing, greatly accentuated frost wedging, which can be an effective cause of spawling. Most likely by the middle of July the ice within the cliff melted sufficiently to hold the rock together no longer. The rock collapsed after the cementing ice had melted away.

A clayey surface was seen on some of the larger rock fragments. This suggests the slow decomposition and decay of the rock itself, or the washing in of volcanic dust, either one being a function of water and ice. The rock face fractured quite evenly along semi-columnar joints. No oxidation of iron or water seepages can be seen. The uniformly light tan of the cliff face indicates hydration as a mode of decomposition. This process produces a swelling of rock parts, allowing moisture to penetrate until some decay is effected. In conclusion, the primary cause was the increasingly powerful action of frost wedging, and secondarily, the expansion and decay due to hydration.

The newly exposed cliff remains very unstable, as well as the talus slope beneath. Fragmental bits are still constantly falling off. It will be interesting to watch--from a distance.

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THE UNIFORMED NATURALISTS OF 1947

Dr. G. C. Ruhle,
Park Naturalist.

Ranger naturalists are scientists carefully selected not only for their intimate knowledge of nature and its ways, but also for their enthusiasm and ability in aiding others to know it as well. Curtailed and finally abolished during the war, naturalist services were resumed in a modest measure in the park last year, upon the return of the park naturalist after four years of service in the Navy. Every important naturalist service which was offered before Pearl Harbor, was restored to the program this year. The uniformed men on the staff number eight.

Dr. R. R. Heustis, dean of naturalists in the park, returned to tell in his inimitable fashion about private ways and doings of mantled ground squirrels and a host of lesser folk. He is professor of biology at the University of Oregon during its regular session. Mrs. Heustis is the obliging pianist for naturalist pow-wows in the Community House each night.

Coming to the park last year from the foxholes of Okinawa, ex-Marine Orthello L. Wallis of Oregon State College is conducting a park survey of stream fish and fishing, as well as having his share of talks,

conducted trips, and contact duties. While his fellows were fighting off boredom between annoyances by the enemy, Mr. Wallis made a collection of trap door spiders on Okinawa, and has published a scientific paper on them. To his efforts, also, is due the assembly of this issue of Nature Notes. His wife, Nancy, has prepared the originals of illustrations used.

It took considerable persuasion to bring Walter S. Vincent, Jr., from his laboratory at Oregon State College, since he boasts a brand new pair of twins, whom he hesitated exposing to the wilds and hardships of Crater Lake forests. With his choice of field in zoology, a good background in botany, and a prying interest in what goes on in ponds, pools, and puddles, Mr. Vincent has an appealing and authoritative fund of information for park visitors. When it is his night at the "Com house", Mrs. Vincent helps with the entertainment. Mr. Vincent was with the Army Medical contingent in the Pacific Theatre of war.

Fresh from Osborne Botanical Laboratory at Yale, ex-Marine Gordon F. Walker specializes in cellular botany, but while in the park has interested himself in plant parasites and saprophytes. Mr. Walker shared the brunt of the ordeal of landing operations on Iwo Jima, being attached to the Fourth Division.

Lucius T. Grose is a geologist from the University of Arizona, at which institution he was associated with Eddie McKee, popular and efficient park naturalist of Grand Canyon National Park in the thirties. A navy man, ex-aerographer's mate Grose served on fighting flattops, including the Essex, Hornet, and Hancock. He was with task force 39 during the bombardment of Japan.

Norman Doyle is an aeronautical major at San Jose State college in California and a student of ex-ranger naturalist-geologist Wayne Kartchner. He spent three years with the air arm of the Navy, being pilot of a PBM on patrol bombing duty of the Phillipines, Okinawa, China, and Japan.

Two junior ranger-naturalists complete the uniformed staff, and are giving valued help as information rangers and leaders of occasional trips. Thomas C. Matthews of Portland is a forestry student at Oregon State College. He has had previous outdoor experience in the Willows and in Alaska. Donald G. Findlay of Eugene, Oregon, is a student of ex-ranger naturalist Dr. Warren G. Smith, head of the department of geology and geography at the University of Oregon. He served as an army air cadet during the war.

THE CRATER LAKE NATURAL HISTORY ASSOCIATION

ITS PURPOSES

1. To promote and assist the ranger naturalist program in Crater Lake National park and Oregon Caves National Monument.
2. To help gather and publish accurate information on the wildlife and natural features of the two areas.
3. To further investigation of subjects of greatest popular interest and importance in the two areas.
4. To assist in the development and procurement of an adequate park museum and series of displays.
5. To sponsor the production of NATURE NOTES.
6. To aid the park library by acquisition and distribution of books.
7. To make available for purchase by park visitors at the most appropriate time and place, government and private publications on subjects pertaining to the park and its welfare.
8. To publish, when funds permit, pamphlets and bulletins on park subjects.

The Crater Lake Natural History Association was organized under the direction of the National Park Service and was approved by the secretary of the Interior on July 25, 1942. It operates under a constitution which provides for the following classes of membership:

Junior member	\$1.00 per year
Annual member	2.00 per year
Subscribing member . . .	5.00 per year
Contributing member . . .	10.00 per year
Assisting member	25.00 per year
Life member	100.00
Patron member	1000.00

Your check to the Executive Secretary will make you a member of the Association and will greatly assist its purposes. For your contribution you will receive copies of NATURE NOTES, whenever issued, as well as all notices and other information published by the Association from time to time.

MAY WE INVITE YOU TO JOIN?

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PUBLICATIONS AVAILABLE FOR PURCHASE

Crater Lake, The Story of Its	Western National Parks, Yeager	\$3.50
Origin, Howel Williams	Higher Plants of Oregon, Peck	5.00
Blue Enchantment, Dunham	Pacific Coast Ranges, Peattie	3.50
Meeting the Mammals, Cahalane	Garment of God, John Merriam	2.00
Birds of Oregon, Gabrielson and Jewett		\$5.00
Oh Ranger, Albright and Taylor		\$3.00