CRATER LAKE

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E. P. Leavitt
Superintendent

Dr. G. C. Ruhle
Editor

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MY SEARCH FOR BOTRYCHIUM PUMICOLA

Roy L. Rogers
Naturalist Assistant

"... delicate relative of the ferns with tremendous root system." The dried, shrunken middle portion of the stalk in the photograph appeared just above the surface of the pumice in which the plant grew. Immediately beneath is the bud containing next year's leaf, flanked on either side by the dried remains of predecessors.

In the acute appreciation of the value and contribution of science towards modern life, the Westinghouse Electric Corporation and Science Service of Washington, D.C., have combined forces to ferret out talent of promise among graduating seniors in high schools all over the United States. This is known as the Science Talent Search that has been heralded in magazines and press. Basic requirements are: (1) a superior and versatile high school record, (2) a science aptitude test, and (3) study and performance of a significant scientific project. The reward is a scholarship in a science major in an American university of the contestant's choice.

I had been extremely interested in entering this competition. Several projects passed through my mind before I took a job to help the ranger naturalists in the park. Immediately I was thrilled by the ideals of the National Parks and the varied, exciting possibilities for a project at Crater Lake. There is intense fascination in how plants came to the mountain after the climax eruption, how they have adapted themselves to the vicissitudes of the forbidding area, how they have succeeded in the various patterns that exist today. Then came the story of Botrychium pumicola told by one of the naturalists.

Here on the bleak summits of Llao Rock and Cloudcap, both buried in pumice scores of feet deep, are plant colonies and associations that have learned to get along in the intense sunlight, dessicating winds, cold nights, and bitter exposure, plants that because of their peculiar situation have acquired characteristics more closely akin to those of desert types than to those of Alpine-Arctic members in similar high places. Here is found that delicate relative of the ferns with a tremendous root system and a single depauperate leaf that scarcely extends

two inches above the soil: one of the rare plants of the world whose natural growing area may not even be the total of one acre.

Botrychium pumicola was discovered on the high open slope of Llao Rock by Dr. Frederick V. Coville, Chief Botanist of the U.S. Department of Agriculture in August, 1896. He discovered a second small colony on Cloudcap in 1902. Both of these localities are about 8000 feet in elevation. These two tiny plant islands were the only places in which the plant was known to grow until Dr. L. R. Detling of the University of Oregon collected it in 1928 on a summit just east of Paulina Peak near Newberry Crater. This is sixty miles northeast of Crater Lake from which it is separated by a pumice-covered surface of a lower and relatively flat elevation.

"... scarcely to be discerned against the drab background: Botrychium itself!" Approximately half life-size.

In this 1951 season that was early for plant activities, it was almost August before my plans for a project fully materialized. My initial search for the obscure plant was met with frustration. It proved to be annoyingly evasive. I had expected to find it sparse, but did not think that I should have to have my nose rubbed into it to discover what it looks like in the field. My initial trips to its home resulted in failure, but I would not give up. At last, when I began to doubt its existence it yielded: there it was in an exclusive and minute colony, perhaps fifty by twenty feet and resembling a crescent in shape. Its color of glaucous-green in its prime blends well with surroundings, and in the late season it had added a yellowish tinge that further diminishes its visibility. The slope on which it grows is gentle and close to the inside of the break that follows the crest of the prominence. The colony is 300 feet west of the bench mark on the summit that bears the legend, elevation 8046 feet. I noted in particular its associates which are few in number of species. Chiefly there are silver flower (Raillardella argentea), that odoriferous buckwheat well remembered by its name, dirty socks, (Eriogonum pyrolaefolium coryphaeum), and the interesting broom-rape (Orobanche fasciculata franciscana) that is parasitic on the buckwheats and polygonums.

It was now my fascination to make the trip to Newberry Crater to see if I could retrace Detling's discovery. On September 7, I had my opportunity. On hands and knees, I scoured a likely-looking crescentic ridge southeast of East Lake. The dried remains of my friend Orobanche

".. a likely looking crescentic ridge..."

proved to be the decisive lead. Sure enough, there it was, its small and somewhat dried form scarcely to be discerned against the drab background: Botrychium itself! The lineal spread of the colony seemed great to me, being over 350 feet. In contrast, the greatest width appeared to be no more than five feet. The precise location of this colony is in T. 22 S., R. 13 E., Sec. 4. I ascended the ridge on a course due east from the car that was parked alongside a Forest Service section line marker that indicates that it is placed 350 feet south of the midpoint of the line between sections 4 and 5. To the south and practically on the level with the car is a pass over which the road winds and which is given an elevation of 7176 feet on the map. I estimated our colony to be 300 to 500 feet higher. Later I learned that Dr. Detling's collection was made on a summit west of the road.

From my high place, the summits of the Cascades looked so near and alluring. Could it be that Botrychium might find a home there, too? Little chance of such occurrence, but nevertheless, there I wandered two days later. The first locality of promise was the rounded top of Tumalo Mountain on which perches a Forest Service fire-lookout at its apex, 7772 feet. The soil, though the familiar fine pumice with a cover of coarse pumice-mulch, looked somewhat different, having a reddish hue caused by an admixture of ash of that color. The familiar indicators were there, but the most numerous member of the colony was Anemone globosa, that was absent in the other three localities in which I discovered Botrychium. Here, as elsewhere, Raillardella was the most encouraging lead. I scrutinized the whole summit area on my hands and knees, hoping against hope that the small treasure might be my reward. The entire dismal start of my search for the fern passed through my mind's eye. It was so improbable, and the efforts seemed

so futile. But no! There it was: a single specimen growing scarcely an inch above the ground 80 feet due north of the lookout whose location is in T. 18 S., R. 9 E., Sec. 10. But despite piercing search and dogged persistence, only one other plant could be found, scarcely twenty feet away from the first specimen.

In that afternoon of September 9, I made a sortie up a likely-looking ridge leading northeast from Broken Top. Higher and higher led the search, later and later grew the hour. Each patch of Raillardella was examined with tireless care. Already the highest elevation had been

"... patch of Raillardella examined with tireless care."

passed at which the plant had been found elsewhere. Prospects and light were growing dimmer, and an autumn chill gripped the darkening landscape. It was imperative that I start down the grim crags. Then in the gloom of faded light and hope, a single stem shimmered out of the bare soil, attended by a complete circle of Raillardella, a few feet in diameter. It was the capping triumph of my great day! The exact locality of my find is T. 17 S., R. 9 E., Sec. 20, at an elevation of over 8500 feet!

The collected specimens were pressed and prepared for mounting. I sent the Cascade prizes and examples from the other three localities for study and positive identification to Dr. Robert Clausen of Cornell University, the celebrated expert on OPHIOGLOSSACEAE to which Botrychium belongs. I donated other specimens to the herbarium of the University of Oregon which is under the direction of Dr. L. R. Detling. A report of their conclusions should follow in a future number of NATURE NOTES.

"The youngsters...had dainty pink noses and feet."

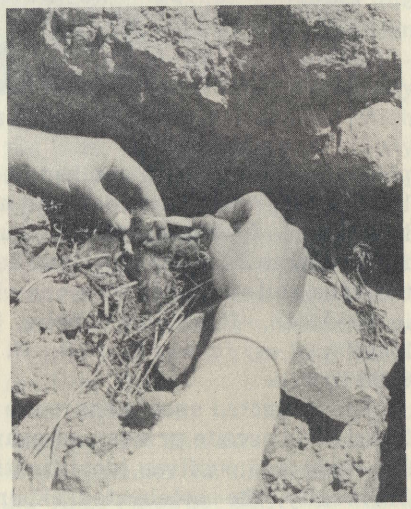
PACK RATS

Philip Ross
Ranger-Naturalist

The naturalists had been annoyed by an unknown nightly visitor to the Information Building during the month of July, that left disorder in its wake. The flowers so carefully arranged for display were chewed off and scattered in distant parts of the room. Traps in numbers were set for the villain, but they were untouched during the night. Tidbits of cheese, candy, peanut butter, even the flowers so avidly stolen from the display table would not entice the pilferer to his capture.

The end was sudden; a female pack rat was discovered in the wood pile on July 31 and was quickly dispatched. But this did not make an end of the episode. The next morning, upon opening the building, we heard hungry squeals coming from above. Upon investigation, the rat's nest was found upstairs and within it four babies. The heterogeneous components of the structure included four of the traps that had been set out, two large signs used on the self-guiding nature trails, bits of rocks, paper and wood. The interior was snugly lined with fur from the mother and small pieces of newspaper.

The youngsters, only two or three days old, with pelage still matted, had dainty pink noses and feet. The eyes had not yet opened, nor did they open during the next three days of pampered but forced residence at Park Headquarters. The young measured two inches in length with naked tails about three-quarters of an inch long. They were fed cream sweetened with syrup through a medicine dropper to which they clung with eagerness. A small feeding was required at least every half-hour, but my maternal efforts were insufficient to sustain the delicate thread of life within them. After all, they had endured a long day's hunger when mother had made her demise.



"They were fed cream sweetened with syrup through a medicine dropper to which they clung with eagerness."

The flowers now remain undisturbed on the display table during the night. No longer need the naturalists go afield each morning with vasculum under arm in search of fresh blossoms to show park visitors. The benefits of the nocturnal rearrangement and disposal have come to an end, but another yarn has been added to the many involving this character of prankish caprice.

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MUSKRAT RECORD

Dr. C. F. Yocom
Ranger-Naturalist

On August 8, 1951, I found an adult muskrat on the park highway four miles north of the South Entrance. Apparently it had been hit by a car as it was attempting to cross the road. As Annie Creek nearby has cut a deep canyon with sheer walls, it seems quite unlikely that the animal was making that creek its home. Muskrats are known to rove or migrate considerable distances in the fall. Possibly this individual was in search of a new home.

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On a sparkling winter's day

BUTTERFLIES OF CRATER LAKE NATIONAL PARK

Donald C. Lowrie
Ranger-Naturalist

An early collection of butterflies of Crater Lake National Park was made by Dr. H. A. Scullen in 1930 who served as a ranger naturalist that year. No attempt is made to give a complete list of park butterflies here, for a comprehensive collection should yield fifty to a hundred different species. A short discussion is given of the specimens collected by Scullen and those observed by me in the park during the past summer. The butterflies are to be commonly found in several general localities. Principally they are abundant on and in the vicinity of flowers. Secondly, they are likely to be found near streams and in moist places where they try to imbibe water from the wet earth.

Among more common species captured or observed are the following: Western Parsley Swallowtail, Parnassius, several whites and sulphurs, satyrs or wood-nymphs, fritillaries, checker-spots, angle-wings, California Tortoise Shell, Mourning Cloak, Painted Lady, Admiral, Nivalis Copper, several species of little blues, and several skippers.

The California Tortoise Shell was the species that most captured the attentions of park visitors this year. Beginning before August 1, this butterfly appeared in vast numbers on the slopes of Mt. Mazama. The same phenomenon had occurred in 1930 and 1931 according to park records, as well probably as in intervening years when no note was made of the irruption. California lilac or snowbush (Ceanothus) is the food plant of the larvae. 1951 must have been an exceptionally propitious season for these insects, for they developed in vast numbers. The main migration lasted about ten days, though many specimens could still be seen by the end of August. On September 5, hordes were seen migrating southward over the top of Mt. Scott. They were performing in interesting activity on the south rock slope of Mt. Thielsen where I saw them still in abundance on August 20. Many had secreted themselves beneath the rocks, from which they would pop out and fly away as I disturbed them by walking over their retreat.

Most of the time, the tortoise shells were flying in great numbers mainly in one direction, upward. The significance of such migration is not understood, though presumably the females, forced outward by population density, were in search for host plants on which they could lay their eggs. The area in which adults emerge has been shown in some cases to be almost entirely denuded of leaves. Consequently the young would have little on which to live if eggs were deposited in the same vicinity. Regardless of the cause, the fact of migration or wandering has impressed observers during years when conditions are right for its occurrence.

Many species of butterflies are found at high altitudes in the vicinity of the rim, 6000 to 8000 feet, that do not occur elsewhere. Of these, three species, Parnassius, Nivalis Copper, and Pine-white, were collected and frequently seen this year.

The larvae of Parnassius feed on stonecrop (Sedum) and saxifrage which are common plants at high altitudes. The adults are quite common, flitting around the trails and meadows from Tulare County, California into Oregon. It is a white to cream-colored insect with black spots and short black bands on its front wings and a pair of small red or orange spots bordered with black on each hind wing. The wing spread is about two and a half inches.

The pine-white, also mainly a high altitude form, is likewise white in color, but much smaller (1-3/4 inches wing spread) and having only black markings. A black band on the forward edge of the front wings extends from the body about half way out to the side where it curves inward towards the center of the wing. The tips of the fore wings are black with an enclosed white pattern. The remainder of the wings are marked only lightly with dusky scales along the wing veins. The larvae feed on pine trees. When ready to change to the adult stage, the larva lets itself down to the ground by a long thread. In the ground, it goes into the pupal stage to emerge the next spring as the adult butterfly.

The following list arranged in taxonomic order, includes the species of which specimens have been collected or definitely identified in the field.

Western Parsley Swallowtail - Papilio zelicaon Lucas
Parnassius - Parnassius clodius baldur Edw.
Pine White - Neophasia menapia F & F
Becker's White - Pieris beckeri Edw.
Common White - Pieris protodice vernalis Edw.
Boisduval's Sulphur - Eurymus eurytheme Bdv.
Wood Nymph - Cercyonis alope Fabr.
Fritillary - Argynnis sp.
Segregated Checker Spot - Melitaea hoffmanni segregata B & McD.
Angle Wing - Polygonia faunus Edw.
California Tortoise shell - Aglais californica Bdv.
Milbert's Tortoise shell - Aglais milberti Godt.
Mourning Cloak - Aglais antiopa Linn
Virginia Lady - Vanessa virginiensis Dru.
West Coast Lady or Malva Butterfly - Vanessa carye Hon.
Lorquin's Admiral - Basilarchia lorquini Bdv.
Nivalis Copper - Heodes nivalis Bdv.
Acmon Blue - Plebeius acmon West. & Hew.

BANDING CROWS AND JAYS

Dorothy C. Farner

A banding program was begun in the summer of 1950 in order to understand better the behavior and movements of park crows and jays. Besides the standard, numbered, aluminum bands supplied by the U.S. Fish and Wildlife Service, most birds were marked with additional bands of several colors, so that each individual could be distinguished by his distinctive combination. This eliminated the necessity of retrapping for identification. To compare wear among the aluminum bands, a few birds were given two bands of this kind.

CANADA JAY (Perisoreus canadensis, Linnaeus)

Thirty Canada jays have been banded at our cabin at park headquarters and at Annie Spring during the past two summers. Of the twelve taken in 1950, one was banded at Annie Spring where it shared campers' breakfasts and was most easily enticed by bread as bait. Two of the ten captured at our cabin had been banded previously by M. R. Mewalt in December, 1948. Colored bands were added to their standard bands for easy recognition. As our trap was set almost continuously, eight of the ten were taken more than once: five were retaken a second time, two were retrapped twice, and one individual was caught an additional four times. This is a different pattern from that of juvenile Steller jays that discovered the trap a very easy way to get food and were retrapped very frequently.

Of eighteen Canada jays captured in 1951, four were banded at Annie Spring Campground within an hour. Two of fourteen taken at our cabin had been banded in December, 1948 and were given the extra identifying

bands. Six of the 1951 birds were retrapped; three were recaptured a second time; one was captured two additional times; the other two entered the trap three more times. Three banded in 1950 were retrapped in 1951, but only one of these had been retrapped in 1950. Apparently these three individuals had forgotten about the trap during the winter. Once retrapped in 1951, they remembered their lesson and did not enter the trap again. As soon as all of these jays that came to our feeding platform in 1951 had been banded, the trap was no longer set. Thus it is impossible to compare retrap figures for the two years.

The behavior of the Canada jays on the feeding platform in the presence of Steller jays is very interesting. The Canada jay is the smaller and less aggressive bird and does not eat or alight on the platform while the Steller jay is feeding. However, a change took place in this behavior at the end of the 1951 banding period. A number of juvenile Steller jays moved into the area the last week in August and began using the feeding platform regularly. By this time the Canada jays apparently had come to consider the platform their personal property, for they did not show the newcomers the usual respect. In fact, while they do not actually drive their competitors away, they do come and eat at the same time, and frequently when two or three of them arrive simultaneously the Steller jay is forced to leave.

A further problem in competition was added by the ability of one golden-mantled ground squirrel to jump from the ground onto the feeding platform. Other squirrels try it with most amusing results as they fail, sometimes by as much as eight or ten inches, and land in most undignified positions. On August 30, 1951, following two days of snow and rain, the Canada jays were extremely eager for food. When I put some out and pounded the can against the metal food platform, a sound which they have learned to identify with a replenished supply of food, not only the jays appeared but also the squirrel. The latter leaped onto the platform and began eating. The jays were hungry; one after another they landed on the platform and, facing the squirrel, ate with him. Finally, with three jays on the platform, they rushed the squirrel as though a signal had been given, causing him to retreat in great haste.

STELLER JAY, Cyanocitta stelleri (Gmelin)

When the banding trap was set and baited in 1950, a family of Steller jays made use of it as one of their main sources of food a large portion of the time. There was a great deal of snow in June and even July that year. Our first two banded Steller jays were adults which we banded June 15 and which we saw frequently during the remainder of the summer. They often came to the feeding platform and tried to get food from the trap by putting in their heads, while refusing to step inside. On July 19 we banded the first of several juveniles which we eventually identified as belonging to this family group by establishing which juvenile was begging from which adult. Those young became our star boarders.

In all, we banded six adults and four juveniles at the cabin in 1950. Three of these were retrapped once, one was retrapped nine times, two were retrapped 15 times, and one was retrapped 24 times. On August 5, 1950, a juvenile which had been banded on July 19, 1950, was retrapped five times in one day. All of the juveniles became so accustomed to the trap and to the procedure for release that when they heard the back door slam, a sign that someone was coming to release them, they ate with greater speed in order to get as much food as possible. When I came within a foot of the trap they stopped eating and started clinging to the wire sides of the cage farthest from the door. When I actually had my hand in the cage they made a few feeble flaps of their wings, much as a juvenile does to attract the attention of the parent bird when it wishes to be fed. They took as a matter of course the reading of the band number before release and made not the slightest effort to escape.

In 1951 we banded two adults and nine juveniles. Only one of these was retrapped and none of the birds banded in 1950 was retrapped. However, we do have 1951 sight records for two of the birds banded in 1950.

CLARK NUTCRACKER, Nucifraga columbiana (Wilson)

For reasons not yet fully understood, 1950 was a year in which Clark nutcrackers flocked to the rim area at the head of the lake trail and from there to the lodge in very large numbers. On the first morning that banding was attempted, the trap was set up in the vicinity of the wall not far from the Information Building and to the west of the walk to Sinnott Memorial. In one hour and a quarter, ten nutcrackers were banded. But when half an hour passed without further birds, a better location was sought and found beneath some dead trees at the head of the lake trail. For the rest of the summer, all banding at the Rim was carried on at that spot and an average of one bird per five minutes was maintained.

One hundred and sixty five nutcrackers were banded in 1950; one of these was banded at Annie Spring Campground, 5 at the cabin at park headquarters, and 159 at the rim. One of these birds had been previously banded with a wire ring which gave no information except that the bird had been seen during the winter of 1948-1949.

The sight records showed some very interesting things about the birds. There were eight birds among those we had banded that regularly went to Annie Spring Campground for breakfast. We first became aware of this when we encountered an "educated" nutcracker at the campground. Foolishly, we had attempted to bait the trap with peanuts just as we did at the Rim, only to discover that the Annie Spring birds were avian "country bumpkins" who did not know how to eat peanuts. They took each peanut and after examining it several times broke it into many small pieces and spent ten minutes eating the peanut piece by piece.

They were much more interested in bread, bacon, potatoes, and butter. When we found one that was "sophisticated" enough to swallow peanuts whole, as it was done on the Rim, we had much less trouble in trapping him. He had obviously been corrupted by the birds on the Rim. Further observations showed that there were eight birds which appeared at Annie Spring for breakfast, that arrived at the Rim about 9:30 AM for their share of the peanuts to be obtained there.

Of the 159 birds banded on the Rim in 1950, 120 were seen again that year. Two not seen again in 1950 were seen in the following year. Nineteen were seen both years. Four of the five banded at our cabin were eventually seen at the Rim; three banded at the Rim were seen as far away as the Watchman and fourteen were retrapped. Two of these were retrapped a second time, but none was ever captured more than three times.

The most interesting record of all of the nutcrackers banded in 1950 came to us because a hunter read the band. This man had shot at an owl on Mount Adams, Washington, and although he missed it, had seen it drop something that it was carrying. He investigated and found out that it was one of the Clark nutcrackers that we had banded a month and a half previously (September 1, 1951) here in Crater Lake National Park.

The small baseball-minded member of our family spent part of his time during the summer pitching peanuts to the nutcrackers. When, toward the end of the summer, he reported that he had found a nutcracker that could catch peanuts, we were doubtful, but investigation proved that one of the banded birds could do just that. This nutcracker would stand about five feet away and point his bill directly at the individual holding the peanuts. A peanut tossed within several inches of his head was caught without difficulty. If the peanut were thrown so that he could not catch it he paid no further attention to it and allowed one of his less accomplished companions to scramble for it. We immediately started tossing peanuts to all the nutcrackers that were around but we never found another one which would catch them.

Banding in 1951 was a very different matter. There were days when it was impossible to see a single bird between the lodge and the head of the lake trail, although occasionally one could hear them even when they were not present along the Rim. The nutcrackers showed a considerable indifference to peanuts; very few of the birds even knew how to eat them. In all, we banded 36 nutcrackers in 1951, all of them in the Rim and Rim Campground area. We have sight records for exactly half of these. This remarkable decrease probably does not indicate a decrease in total nutcracker population in the park, but rather a wider and more even dispersal because of the abundance of natural food in terms of the excellent cone crop in several species of trees.

ORNITHOLOGICAL NOTES OF INTEREST

Donald S. Farner
Ranger-Naturalist

The summer of 1951 was somewhat unusual because of the very early disappearance of the snow and further because of the relatively high temperatures and the almost total lack of precipitation during July and August. Although it is not possible to designate these factors as causal, it is nevertheless of interest to note, in correlation, certain interesting changes which occurred with respect to the avifauna of the park.

The summer was characterized by an unusual number of turkey vultures, Cathartes aura (Linnaeus). During the course of the summer ten individual observations were recorded; this is equal to the total records accumulated for all previous years. Two of the records are from high on the slopes of Garfield and Applegate Peaks respectively. The previous high-elevation records were from park headquarters (Sparrow, 1921) and Munson Meadows (Aldrich, 1937). Red-tailed hawks, Buteo jamaicensis (Gmelin), on the other hand, were considerably less abundant. For July and August, I recorded only five; during 1950 I saw eleven during the same period, and during August, 1949, I saw 20. On July 7 and 8, at Llao Rock and the Rim Village respectively, I saw single ferruginous rough-legged hawks, Buteo regalis (Gray). To the best of my knowledge, these are the first July records for the park. As usual, the first sparrow hawks, Falco sparverius (Linnaeus), appeared in the rim area during the first week of August. My first record was from Llao Rock on August 3; they were observed commonly thereafter.

The upward migration of the blue grouse, Dendragapus obscurus (Ridgway) appeared to be somewhat earlier than normal. On July 28 I flushed two at 7700 feet on Dutton Ridge and on August 2, C. F. Yocom saw a female and seven chicks at the headwaters of the East Fork of Annie Creek at about 6500 feet. On August 11, I saw a flock of seven at the summit of Timber Crater. Thereafter there were numerous reports of this species from higher elevations.

On July 4 I found a nest and four eggs belonging to a pair of spotted sandpipers, Actitis macularia (Linnaeus), in upper Munson Meadow. The nest was unsuccessful. There are previous records of breeding spotted sandpipers in this area for the summers of 1940 and 1944. As usual the species was fairly abundant on the lakeshore. California gulls, Larus californicus Lawrence, were somewhat more numerous on the lake than usual; on August 22 I saw 58 on the launch trip. Most of them were resting along Skell Channel.

In general the summer was apparently a poor one for woodpeckers. I saw no pileated woodpeckers, Ceophloeus pileatus (Linnaeus); Williamson sapsuckers, Sphyrapicus thyroideus (Cassin); Arctic three-toed woodpeckers, Picoides arcticus (Swainson); or American three-toed woodpeckers, Picoides tridactylus (Linnaeus). Flickers, Colaptes cafer (Gmelin); and hairy woodpeckers, Dryobates villosus (Linnaeus), were substantially less abundant than usual. Of particular interest was the white-headed woodpecker, Dryobates albolarvatus (Cassin), which I saw on Sand Ridge on August 5. There are only six previous records for the Park.

Another lower-elevation species which appeared in the higher parts of the park this summer was the Western wood peewee. They were seen repeatedly in the Shasta fir forest at the headwaters of the East Fork of Annie Creek; that breeding occurred there is indicated by the two juveniles which I saw begging from an adult on August 7. There were records from park headquarters and the lakeshore below Cloudcap. Normally this species breeds only in the lowest parts of the park such as along lower Annie Creek. Previously, however, it was found at higher elevations in 1926 and 1927 (Munson Meadow, by A. H. and Loye Miller), and in 1940 (several localities, Fletcher Palmer).

During the first week in August definite evidence of the breeding of Wright's Flycatcher, Empidonax wrightii Baird, was obtained. An adult, positively identified as a specimen, was observed on the north slope of Sand Ridge feeding three young very recently from the nest.

Although the number of nutcrackers, Nucifraga columbiana (Wilson), at the Rim Village in early July approached normal levels, the characteristic increase in population which ordinarily occurs during July and August failed to materialize. Actually, they became less common after the first of August. I am inclined to regard this not necessarily as a decrease in the population of this species but rather as an indication of a more general dispersal throughout the park. In support of this my notes show considerably greater numbers than in other years at a number of localities. It is possible that this can be correlated with the substantially greater cone crops on several of the species of conifers. For example, on Dutton Ridge on July 22, I saw 18 in two hours; all were quietly feeding on white-bark pine cones.

Also among the lower-elevation species which appeared in considerable numbers was the chestnut-backed chickadee, Parus rufescens (Townsend). The two seen by C. F. Yocom at the headwaters of the East Fork of Annie Creek (6500 ft.) on August 2 constitute the highest record thus far recorded for the park.

The first dipper, Cinclus mexicanus (Swainson), noted in the Munson Creek drainage was seen near Castle Crest on July 8; the first seen on the lake was on July 10 (Duane S. Fitzgerald). The unusually early record for the lake agrees with the July 11 record for 1940 which was also characterized by early loss of snow.

Rock wrens, Salpinctes obsoletus (Say), were again commonly heard on the Garfield Peak Trail. I saw an adult carrying food repeatedly early in August but was unable to find the nest.

During the first two weeks in July, varied thrushes, Ixoreus naevius (Gmelin), could be heard in the vicinity of park headquarters and elsewhere in the mountain hemlock forests. I am convinced that there were substantially greater numbers this summer than there have been during any summer which I have spent in the park.

Although they were abundant in the lodgepole forests east of the park, there was a remarkably small number of ruby-crowned kinglets, Regulus calendula (Linnaeus), within the park. Very few could be found in the Kerr and Pinnacles valleys where they are ordinarily quite abundant.

On August 7, a juvenile specimen of a black-headed grosbeak, Pheucticus melanocephalus (Swainson), was obtained along lower Sun Creek. This is the third authentic record for the park.

Lazuli buntings, Passerina amoena (Say), were again relatively abundant. Each of the little meadows along lower Annie Creek canyon contained at least one lazuli bunting territory. However, there was also a marked upward expansion. Records were obtained of territorial males in Wheeler Creek Canyon, headwaters of the East Fork of Annie Creek, upper Castle Creek, and park headquarters. Previous summers in which this species was common at higher elevations were those of 1926 (A. H. Miller and Loye Miller) and 1940 (Fletcher Palmer and D. S. Farner). Pine siskins, Spinus pinus Wilson, were present in the last two years. During the summer of 1951, I saw siskins at the rate of about 9.0 per hour in the field; the rates for 1950 and 1949 were 2.2 and 2.6 respectively. Possibly this great abundance is to be associated with the substantially more abundant cone crops. More definitely to be associated with the abundant cone-crop is the irruption of red crossbill's, Loxia curvirostra Linnaeus.

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The Sapphire Lake becomes a cauldron of fog

THE RED CROSSBILL IRRUPTION OF 1951

Donald S. Farner
Ranger-Naturalist

Unquestionably the most spectacular ornithological phenomenon of the summer of 1951 was the prodigious numbers of red crossbills, Loxia curvirostra Linnaeus. These spectacular nomadic finches were reported continuously and in substantial numbers from all parts of the park. They were the repeated subject of questions and comments by large numbers of visitors most of whom have only the most casual interests in birds. At the Rim Village they could be observed repeatedly at distances of a very few feet as they pecked systematically, possibly for minerals, at the andesite blocks of the retaining wall. The same behavior was observed less frequently at fireplaces and at broken places on the pavement of the highways.

Crossbills were relatively abundant during the summer of 1950, but the numbers observed then were greatly eclipsed by the numbers recorded this season. My field notes yield a reasonably useful comparison in terms of the numbers of crossbills seen per hour in the field during several summers in the park.

Year	Hours in the field	Number of Crossbills Seen per Hour
1940	50	0.1
1941	50	0.1
1942-1945	no records	
1946	65	0.9
1947	no records	
1948	74	0.5
1949	42	1.0
1950	111	1.7
1951	110	5.5

Although no nests were found I am quite certain that breeding has occurred in the park during 1951. Pairs were seen repeatedly, singing was common, courtship display was observed several times, copulation was observed once, a juvenile bird was observed being fed, and the specimens obtained for the park collection were in breeding condition.

With respect to periods of abundance in the past it is interesting to note that Miller and Miller (ms. 1926) observed only a few in 1926. Superintendent E. C. Solinsky reported them as abundant in October 1930. Campbell (1934) saw none during the summer of 1934. According to Aldrich (1938, 1940) red crossbills were abundant during the summer of 1938 when there were good crops of cones on the white-bark pines and mountain hemlocks; they were less abundant again in 1939

and quite uncommon during 1940. During 1938 Aldrich (1940) observed a juvenile being fed by an adult.

The "mineral pecking" behavior which was observed so frequently this summer was also observed repeatedly during the summer of 1938 (Aldrich, 1939) and less commonly during 1939 and 1940.

The specimens obtained during 1950 and 1951 indicate that the race involved in this irruption is bendirei Ridgway.

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UNUSUAL BIRD RECORDS

Charles F. Yocom
Ranger-Naturalist

POORWILL (Phalaenoptilus nuttalli)

On September 6, 1951, Dr. Donald C. Lowrie and I found a dead poorwill on the rim road on Dutton Ridge one mile east of Sun Notch at an elevation of 7250 feet. Apparently this bird had been killed by a car sometime during the night, for it was quite fresh at 8:30 A.M. when we found it. The skin was damaged beyond salvation, but the wings and tail were saved and placed in the study-skin collection at park headquarters. The blackish area in the middle of the crown, the back of the neck extensively marked with black, and a dull blackish-gray back suggests that this bird was a dusky poorwill (Phalaenoptilus nuttalli californicus). So far as I could learn, Dr. Donald S. Farner collected the only specimen ever previously reported in the park.

LEWIS WOODPECKER (Asyndesmus lewis)

The Lewis woodpecker migrates through the park each fall. The following observations record the start of their fall migration for 1951: September 2, one juvenile at 7700 feet of elevation of Llao Rock; September 6, two adults at 7430 feet near Reflection Point, 20 within ten minutes at the same elevation near Sentinel Point, and four near 8000 feet at the base of Mt. Scott.

AMERICAN PIPIT (Anthus spinoletta rubescens)

Pipits pass through the park on their way south. I observed them at higher elevations near the rim as follows: on September 2, three at 8046 feet in a sedge meadow on Llao Rock; on September 6, one at 8938 feet on top of Mt. Scott and six on the pumice slide on the west slope of this mountain. On September 3 three individuals, perhaps the same I had seen the day before, were seen on the very summit of Llao Rock by Dr. R. Whitaker and Don Holloway of Washington State College, naturalist assistant Roy Lee Rogers, and the park naturalist.

CEDAR WAXWING (Bombycilla cedrorum)

Few cedar waxwings have been observed in the park. I saw a single bird on the rim near Sentinel Point on August 12.

BREWER BLACKBIRD (Euphagus cyanocephalus)

Records for this bird within the park are rare although they are common near Fort Klamath. On September 6, Dr. Donald C. Lowrie

and I saw two. One was seen at 8:30 A.M. hunting insects among the Newberry knotweeds one-half mile southeast of Sentinel Point. Another was seen at 1:30 P.M. on the pavement west of the Administration Building. A bird was seen at 7:00 P.M. in the same general area, but this was probably the same individual seen at noon.

SAVANNAH SPARROW (Passerculus sandwichensis)

I saw three savannah sparrows on the grassy summit of Llao Rock on September 2. This may be first record of these field-loving birds on this lofty summit, although the park naturalist informs me that he has seen them at lower elevations, namely in Copeland Meadows.

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SPECIAL NUMBERS OF NATURE NOTES

George C. Ruhle
Park Naturalist

The Crater Lake Natural History Association is planning a series of special numbers to fill the demand for information on a variety of subjects in Crater Lake National Park and Oregon Caves National Monument. At this writing, the first number, "The Golden-mantled Ground Squirrel in Crater Lake National Park," is already in the hands of the lithoprinter. It has been written by former ranger naturalist Dr. Ralph R. Huestis of the zoology staff of the University of Oregon. Dr. Huestis was famous for his lodge talks which sparkled with wit, cleverness of expression, and dependable fact. This product of his pen, a subject with which he delighted so many park audiences, will please the reader in similar ample degree.

In this issue, a pen and ink sketch of quillwort has been reproduced from an original by Dr. Charles Yocom. Dr. Yocom was assigned the task of drawing 120 different plants of the park and the Caves area this summer. These will be parts of two small portfolios on popular and common flowers of these areas. Other brochures will deal with birds, trees, Indians of the region, and mammals. At the present time, nine have been prepared or projected for the coming three years.

The Run in Winter

Winter Scene on the Run

RESEARCH ON SALAMANDERS

James Kezer
Ranger-Naturalist

(Research is a vital part of the activity of the naturalists in our National Parks. It is the source of knowledge about what is in the park and what is occurring. Its results furnish the supply of information which the park needs to interpret its treasures for the public. Only by continuous study of problems with full possession of facts can intelligent administration and operation of the park be achieved. The pursuit of research is a stimulus which keeps fresh and vigorous the enthusiasm of the naturalists in their lectures, guided trips afield and other efforts. - Ed.)

During the summer of 1951, Dr. Donald S. Farner and I carried out intensive field work on park amphibians and reptiles. We were ably assisted by our fellow ranger-naturalists as well as by Lawrence Bisbee of the fire suppression staff, Fred Larmie of the ranger staff, and Roy Strand of the trail crew. Lawrence Bisbee made the first big discovery of the summer by collecting a specimen of the Oregon red salamander, Ensatina eschscholtzii oregonensis (Girard), from beneath a pile of boards near Annie Spring on August 7, at an elevation of 6080 feet. This is the first specimen of this salamander to have been found in the park and it is apparently the highest altitude record for any member of its genus. Although the specimen has been allocated to oregonensis, it is actually intermediate between oregonensis and platensis (Espada), according to the recent revision of Dr. Stebbins of the University of California. A thorough search of the area in which this salamander had been collected, failed to reveal other individuals. It is possible that others will be found in the park, if looked for earlier in the season when the ground contains a greater amount of moisture.

A second important addition to the herptofauna of the park occurred on September 15 when Lawrence Bisbee, Fred Larmie and I found the northwestern salamander, Ambystoma gracile Baird, occupying bog ponds in the vicinity of Crater Spring at an altitude of 5300 feet. The three ponds in which this salamander was first found are in the rarely visited northwestern section of the park, about one-half mile south of the end of Crater Spur Motorway. Two of these ponds are small, not more than six feet in diameter, but the third is larger—about 25 feet long and 10 feet wide. Each pond is surrounded by a floating mat of vegetation and the sides drop off almost vertically to a depth of four to six feet. From these three small bodies of water, we collected nine large larvae which have a mean total length of 165 mm. These larvae, although unmetamorphosed, are sexually mature and were breeding in the larval condition. This curious situation, neoteny, is oftentimes found in this and certain other species of salamanders.

Along the northern side of Crater Creek, I found A. gracile occupying a bog pond that was almost filled with vegetation. Large larvae of this species were seen in this pond; however, my collection consists of two smaller individuals.

In the vicinity of the park, Norman Davidson and I collected A. gracile in a cut-off section of the Rogue River below Hamaker Meadows and Philip Ross and I discovered it making up part of an abundant salamander fauna in Spruce Lake, an isolated montane pond at 4750 feet in Jackson County, a mile and a half from the western boundary of the park. The lake is about 200 yards long, 30 yards wide and approaches a maximum depth of eight feet. It supports an abundant population of A. gracile, associated with the Oregon newt, Triturus g. granulosus, and the long-toed salamander, Ambystoma macrodactylum. The isolated and undisturbed nature of this body of water along with its large salamander population make it an ideal place for the study of this species. My several visits to this pond, during the first two weeks of September, revealed an A. gracile population made up of large neotenic larvae, smaller larvae of several size classes, metamorphosing larvae, and completely metamorphosed individuals.

In each of the four localities where this salamander has been collected, its globular egg masses have been conspicuous. On July 25, in the cut-off portion of the Rogue River, hatching had already taken place in some of the egg masses but in others the embryos were present in the gel. At Spruce Lake on August 31, at least 150 masses of gel were seen, hatching having taken place sometime prior to that date. On September 22, I was extremely pleased to find an egg mass of this species containing well-developed embryos in a small bog pond along the northern side of Crater Creek. Along with the various size-groups of small larvae that have been found in Spruce Lake and in the bog ponds near Crater Creek, this unhatched egg mass indicates a long egg-laying season for this species.

The salamander for which Crater Lake National Park is zoologically famous is the Mazama newt, Triturus granulosus mazamae Myers, a "water dog" that is found no place in the world except in the waters of Crater Lake. It is closely related to the common Oregon newt, Triturus granulosus granulosus (Skilton), but differs in having varying amounts of dark pigment mixed with the orange or yellow of the under surface. Dr. Farner and I were unable to find specimens of Triturus that had been collected in the park other than from the lake. We were interested in securing newts outside of the lake, but near it, in order to see if they would be ordinary granulosus or the much less common mazamae. Accordingly, the two of us were delighted to find a single large adult newt on August 25, in a cut-off oxbow along Munson Creek. We examined it carefully, finding no evidence of any of the characters which distinguish mazamae from typical granulosus, despite the fact that it had been collected only two and one-half miles from Crater Lake.

Two more specimens of typical granulosus were collected September 22 in the bog pond near Crater Spring which was mentioned previously in connection with Ambystoma gracile. We believe that these collections of typical T. granulosus within the park, but outside of the lake, give strong evidence toward the idea that the Mazama newt is a subspecies entirely confined to Crater Lake.

These brief notes give an idea of progress made during 1951 in our understanding of the herptofauna of the park. For those particularly interested in this group of animals, detailed information about the amphibians and reptiles of the park has been prepared for publication sometime during the coming months.

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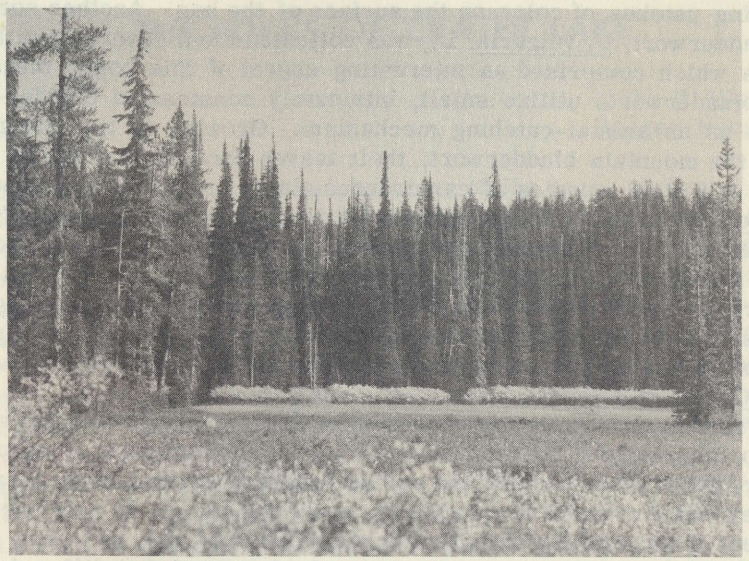
BOTRYCHIUM

George C. Ruhle
Park Naturalist

Botrychium is the generic name for a group of fern-allies called grape-ferns from the sporangia clustered like bunches of grapes. It is classified with the Adder's Tongue Family, OPHIOGLOSSACEAE, each of whose members has an underground stem reduced to a short rootstock. A single leaf appears each year that is divided into a foliage part and a sporebearing spike or panicle that faces the former. The bud for the succeeding year's frond grows within the base of the stalk or petiole of the leaf, and is circinate, that is, rolled downward from the apex.

The Crater Lake grape-fern was the object of avid search by the park's scientist of promise, my budding sixteen-year-old helper, Roy Rogers. In his narration, he tells of its provision for existence in a rugged, exposed situation. Quite larger in size, growing in moister, kindlier situations is the leathery grape-fern, B. silaifolium Presl, that frequents shaded banks and sphagnum bogs from New England to California and north to Alaska. Great variation in size occurs among individual plants that cannot be referred to character of climate and soil.

On our botanical survey of the Siskiyous near Oregon Caves, Dr. Wm. S. Baker and I found this plant growing in a mossy site at the outlet of Lower Biglow Lake. I made a half-dozen hikes to the place before securing sporebearing specimens. This year, James Kezer added it to the park flora. He collected it at Spruce Lake and in the sphagnum bogs near Crater Spring, well within the park boundaries. Kezer's specimens have been examined and classified by Dr. Robert Clausen of Cornell University as B. multifidum ssp. silaifolium (Presl) Clausen.



A bog in the vicinity of Crater Spring.

ADDITIONS TO THE FLORA

(CRATER LAKE NATIONAL PARK - 1951)

James Kezer
Ranger-Naturalist

One of the exciting experiences of the 1951 season was the discovery of a large area of sphagnum bogs in the northwestern part of the park. It is not surprising that ten plants previously unknown from the park were found in this new and distinctive kind of habitat.

On the evening of September 14, Lawrence Bisbee, Fred Larmie and I explored a remote and seldom visited region of the park south of Crater Spur Motorway in search of a pond that had been reported in 1937 by Dr. Applegate. About one-quarter mile south of the motorway spur we entered an extensive, beautiful, wet montane meadow that was characterized by boggy areas covered with sphagnum moss. Although exact measurements were not made, we estimated that the meadow extended over at least ten or fifteen acres.

To the northeast, it was bounded by a row of alpine firs below which was a hedge of willows that looked as though it had been planted and clipped. Growing abundantly in the sphagnum was a carnivorous plant, mountain bladderwort, Utricularia intermedia Hayne, its yellow flowers

forming patches of color on the surface of the bog. Another species of bladderwort, U. vulgaris, L., was collected from several small bog ponds which comprised an interesting aspect of this boggy meadow. The bladderworts utilize small, intricately constructed bladder-like traps as an animal-catching mechanism. Growing in the sphagnum with the mountain bladderwort, their leaves forming patches of red, were two other species of carnivorous plants, round-leaved sundew, Drosera rotundifolia L., (previously known in the park only from Copeland Meadow) and long-leaved sundew, D. longifolia L. The sundews have glandular hairs on their leaves which provide them with a fly-paper-like secretion in which small animals become entrapped. In the ponds with the bladderwort was a pondweed, Potamogeton pusillus L., and in the nearby wet sphagnum were a few plants of the marsh cinquefoil, Comarum palustre L.

A number of days later, I returned to Crater Spring and hiked along the northern side of the creek toward the western boundary of the park. A very short distance from the spring I entered another boggy meadow that extended at least one-half mile along the creek. In nearly every respect it was similar to the sphagnum meadow that had been previously discovered; however, it contained a bog pond that differed considerably from those present in the meadow south of Crater Spur Motorway. This was a body of water about 120 feet in diameter, surrounded by a floating mat of vegetation which extended into the pond as its bottom. The mat of vegetation was so fragile that it would not support my weight and it made collecting in the pond extremely difficult. An abundant growth of sedges and aquatic plants protruded through the water's surface, leaving only small patches of open water. Buckbean, Menyanthes trifoliata L., was growing in the sphagnum around the pond with marestail, Hippuris vulgaris L., and the floating pondweed, Potamogeton natans L., conspicuous in the water among the sedges. A small burr-reed Sparganium minimum Fries, was also growing in the pond. At the edge of the water, in the mud of the floating mat of vegetation, were a few clumps of stick-tight, Bidens cernua L.

It is highly probable that a more detailed exploration of these two areas will yield other plants that have not been reported from the park.

It should be emphasized that the areas in which these new plants were found represent a totally new habitat for the park. Sphagnum bogs were previously unreported within the boundaries of the park; furthermore, the park contains only one permanent pond (discussed elsewhere in this issue of Nature Notes) other than these Crater Creek bog ponds. There can be no doubt that these newly discovered bogs and ponds, with their distinctive plants and animals, add to the biological significance of this magnificent National Park.

THE ROCKS OF CRATER LAKE

N. H. Davidson
Ranger-Naturalist

In order to understand the character of the rocks of Crater Lake National Park, it is necessary to have a general understanding of the major classes of rocks. According to their origin, all rocks can be placed in one of three groups: sedimentary, igneous, or metamorphic.

Most sedimentary rocks are composed of small particles of other primary rocks which have been transported and deposited in water. The common sedimentary rocks of this type are shale, sandstone, and conglomerate. Sedimentary rocks may also be formed from chemical precipitates of material that was dissolved in the water. Limestone is an example of this type of sedimentary rock.

Igneous rocks are formed by the solidification of molten rock, called magma. This magma originates far below the surface of the earth where the temperature is high enough to melt the rock.

Metamorphic rocks are formed when an existing rock is changed by heat, pressure, solutions, or a combination of these forces. For example, limestone is changed to marble, shale is changed to slate.

Because the rocks in Crater Lake National Park are igneous, a more detailed description of this type of rock is in order. In considering igneous rocks, a very important concept must be understood: the relationship between the rate of cooling of the magma and the resulting grain size. If the magma is cooled slowly, the constituent minerals have time to grow to large size; if the magma is cooled rapidly, more crystal nuclei form spontaneously and none can grow to large size. Extremely rapid cooling results in a non-crystalline rock, or glass called obsidian. The mineral crystals of an igneous rock may not be all of the same size. Because of some variation in the rate of cooling, the rock may consist of large crystals, called phenocrysts, embedded in a fine grained or glassy matrix called a groundmass. This rock, containing both large and small crystals, is called a porphyry.

There are two general classes of igneous rocks: intrusive or plutonic, and extrusive or volcanic. The intrusive rocks are those formed when the magma solidifies far below the surface of the earth. Because of the insulating properties of the overlying rock, the cooling is slow and the resulting rock is coarse grained. Granite is a common example of an intrusive igneous rock. Extrusive rocks are those formed when the magma, called lava in this case, is extruded to the surface of the earth. On the relatively cool surface the rock solidifies quite quickly and the resulting material is fine grained.

The shape of the topographic feature built up around the volcanic vent depends upon the physical characteristics of the rock that is

extruded. If the extruded material consists of fragments, called pyroclastics, the resulting feature is called a pyroclastic cone. These cones are quite steep, but not very high because of the unconsolidated nature of the rocks. If the extruded material consists of lava flows, the resulting feature is called a shield volcano. The steepness of the slope depends upon the viscosity of the lava; the more viscous lavas pile up around the volcanic vent and produce a steeper slope than is produced by the more fluid lavas. A volcano composed of both pyroclastics and lava flows, roughly stratified, is called a stratovolcano.

There is a great variety of material ejected from volcanoes. The lava may flow from the crater in the summit or, more probably, from fissures in the sides. A volcano may erupt violently, throwing rock particles high into the air. This material may be fragments of solid rock torn from the sides of the vent or it may be clots of liquid rock or both. The size of these particles varies from masses weighing tons to fine dust. The largest are called blocks and the smaller particles are called, in order of decreasing size, cinders, ash, and dust. Volcanic bombs are rounded or twisted pieces of rock, formed from clots of molten rock hurled, spinning through the air.

Crater Lake exists in the caldera caused by the collapse of the upper portion of a volcano. The present cliffs above the lake reveal an excellent cross-section of this volcano which has been named Mt. Mazama. Alternate layers of various types of rocks indicate that this was a stratovolcano.

Most of the rock in the vicinity of Crater Lake is porphyritic andesite, a volcanic rock intermediate between the acidic rocks containing much silica and alumina, and the basic rocks containing the ferro-magnesian minerals. Andesite is typically light gray to dark gray in color, sometimes almost black. Less abundant than the andesite is a siliceous rock that occurs in two forms. Dacite is a hard, dense, glassy, gray rock. Its glassy appearance distinguishes it from andesite and it frequently has a definite flow structure. This dacite may be called obsidian, but the presence of phenocrysts renders it a glass porphyry instead of a true obsidian. The other siliceous rock is pumice, a light weight, porous rock formed from liquid rock with a great quantity of finely dispersed gas bubbles. Most of the pumice is so light that it will float on water. Another rock, basalt, is found only at lower elevations in the park. Basalt is a dense, hard rock which is dark colored because of the predominance of ferro-magnesian minerals. Its source in this area was a system of small volcanoes on the lower slopes of Mt. Mazama.

In Crater Lake National Park there are many excellent opportunities to observe the structure of the rocks. In the cliffs above the lake an excellent cross-section of this volcano is presented. From the lake, the rough layering in the walls is quite apparent. The strata consist of dense flows of andesite, layers of pyroclastics, pumice, and glacial

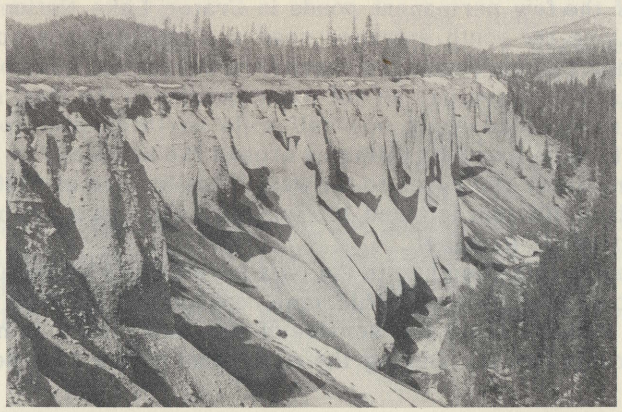
till. There are also a few flows of dacite, prominent among which are Llao Rock and Redcloud Cliff. Dikes are other features to be observed from the lake. A dike is created upon the solidification of magma squeezed into a crack in an older formation. Devil's Backbone is the best example of a dike in this area.

The characteristics of a cinder cone and a block lava flow are best studied on Wizard Island. The main portion of the island is a cinder cone, simply an unconsolidated pile of cinders and ash. The base is a lava flow that is now almost completely covered by water. The west side of the island affords an excellent example of a block lava flow, whose angular fragments represent the solidified crust broken and pushed into its present form as viscous lava persisted in emerging from fissures in the sides of this volcano.

At lower elevations of the park, there are many spectacular gorges, of which Llao's Hallway on Whitehorse Creek is particularly fascinating. It is an extremely narrow, deep gorge with steep walls that are vertical or undercut in many places. The rock is a very thick deposit of partially consolidated pumice.

A very common feature of these river gorges is an erosional structure often called "pinnacles." These structures occur in partially consolidated rock and are "fossil fumaroles," columns in the rock hardened by rising gases.

The visitor at Crater Lake is afforded an excellent opportunity to study the structure of a volcano. From the Garfield Peak trail one can observe both the interior of Mt. Mazama and the exterior including a considerable portion of the High Cascades. From the lake trail and from the motor launch the interior of this volcano may be studied in detail. On Wizard Island, the volcano that grew in the caldera quite recently, the visitor can study the well-preserved cinder cone and the block lava flow. Nature has indeed been generous in providing us with this deep caldera whose high walls, not obscured by talus or vegetation, reveal the history of a great fire mountain.



THE "LOST" POND

(CRATER LAKE NATIONAL PARK)

Lawrence Bisbee, Fred Larmie, Roy Strand and James Kezer

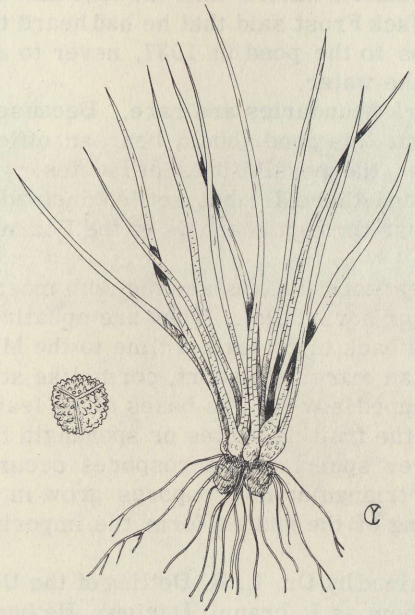
One of the few permanent ponds in Crater Lake National Park is located along the south entrance road a short distance north of the Cold Spring Campground. To reach this interesting body of water, it is necessary to drive into an old stone quarry on the west side of the south entrance road about one-half mile north of Cold Spring. The pond can then be found by climbing around the south end of the quarry and walking about 200 yards to the west. It is located at 6250 feet altitude, is about 300 feet long and 100 feet wide and has a maximum depth of approximately four feet.

Curiously, this pond has in the past periodically become "lost." It is not shown on the topographic map, consequently, when those who know its location leave the service of the park, there is no way for newcomers to find it. During the early part of the 1951 season, Dr.

Donald S. Farner told us that he had seen this little body of water during his first season in the park but had not found it since that time. He suggested that we locate it because, being permanent, it had the possibility of containing animals and plants that would not be found in the temporary ponds which exist in other parts of the park.

Our inquiries among the members of the park personnel revealed that the pond was not quite as lost as we had originally thought. Ranger Paul Turner had seen it in 1938, electrician James Kilburn had visited it as recently as 1950 and Charles True, for many years a worker at Crater Lake, had climbed around the quarry to this body of water about 18 years ago. However, the fact remained that it had been seen only infrequently and, as far as we could learn, had never been explored for plants and animals.

On the evening of September 5, 1951, we made the climb around the quarry and found this elusive pond. The accompaning photograph shows how it appeared to us at that time. We were delighted to discover that the bottom of the pond was covered with a plant that had not previously been recorded from the park. This curious species is a quillwort, Isoetes braunii Durieu, a non-flowering vascular plant in which the spores are borne in sporangia that are imbedded in the basal portions of the quill-like leaves. Dr. Charles F. Yocom has prepared a drawing of this quillwort which shows clearly both its general structures and the detailed appearance of its megaspore as seen under magnification. The quillworts were growing so abundantly over the bottom of the pond that, as one waded through the water, he left a trail of uprooted quillwort behind him.



We have recorded the position of this pond on the large map that is kept in the Ranger's office. Perhaps that record and this Nature Notes article will enable future park workers and visitors to find and enjoy this beautiful and interesting aspect of Crater Lake National Park.

QUILLWORT POND

George C. Ruhle
Park Naturalist

As might be expected from his articles in this issue, salamanders are the chief interest in the life of Ranger-Naturalist James Kezer. A good observer clad in hip-boots, he spent his free time last summer in the wet, boggy spaces of the park and Oregon Caves National Monument. The result was the addition of several aquatics to the flora of the regions. His first find was a quillwort, Isoëtes sp., in Lower Biglow Lake above Oregon Caves. Later he found his "lost" pond near Arant Point floored with it.

Tho it is not indicated upon park maps, this small pond was not unnoticed in the past. There is a current story that it was planted with fingerlings in the early thirties. Their introduction was the signal for numbers of pelicans to visit the shallow waters until the last fish was consumed. Former park ranger Jack Frost said that he had heard this story in 1936. He made two trips to the pond in 1937, never to see waterfowl of any kind on or near the water.

Permanent ponds inside the park boundaries are rare. Because of its history, the park concluded that this pond should bear an official name. For the purpose, I weighed the possibilities of Isoëtes, what with its Greek origin, euphony, and dieresis, but settled instead on simple "Quillwort Pond" to propose through channels to the Board on Geographic Names.

The plant is of interest. Its nearest relatives are the club mosses and scouring rushes (equisetums or horsetails). They are aquatic or marshloving, and have been traced back in geological time to the Miocene. They are characterized by an extremely short, corm-like stem from which grow 10 to 100 quill-shaped leaves. The bases of the leaves are spoon-shaped, in which grow the fruiting bodies or sporangia that are of two sizes and kinds. Larger spherical macrospores occur in the outer leaves while numerous, triangular microspores grow in the inner leaves. Size and sculpturing of the spores form the important differences between species.

The park specimens were examined by Dr. L. R. Detling of the University of Oregon who identified them as I. braunii Durieu. He bases his conclusion on the presence of very long papillae, almost spines, on the megaspore coat. Dr. LeRoy Abrams of Stanford gives the range of this species as far northern, coming southward only into Washington and Idaho. Further investigation will be reported in a future issue.

Phantom Ship

THE CRATER LAKE NATURAL HISTORY ASSOCIATION

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