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SPECIAL REPORT

of

SENIOR NATURALIST TECHNICIAN

ADOLPH MURIE

on

Wildlife of the Olympics

March 29, 1935

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WILDLIFE OF THE OLYMPICS

This report on some of the Olympic wildlife is necessarily of a preliminary nature, due to the small amount of time spent in the field. The annotated lists of elk food plants, mammals, and birds are quite incomplete. Most of the time was devoted to the elk because of its importance in the fauna. Although the cougar requires more protection and study than practically any other form, relatively little space is devoted to it because of the difficulty in learning much about it in a short time.

I wish to express my sincere appreciation to Superintendent Tomlinson and Assistant Chief Ranger Macy, of Mount Rainier, for their complete cooperation in this reconnaissance study. I am also grateful to officials of the Forest Service for the use of their cabins and to residents for their help at various times.

Itinerary

Three rather brief trips were made to the peninsula. On the first trip, September 15 - 26, 1934, I spent four days in the Elwha Valley, two days up the east fork of the Quinault River Valley, one day in the Queets Valley, and three days up the Hoh River, coming out on the Soleduck. Part of the time I was accompanied by Lawrence Cook of the Branch of Forestry and P. P. Macy, Assistant Chief Ranger at Mount Rainier.

On the second trip I was on the peninsula December 22 - 27, 1934. The weather was stormy and the roads were impassable in many places as a result of a November flood. At this time trips were made up the Quinault and Hoh rivers.

The third trip, February 20 - March 12, 1935, was made with C. J. Marie of the U. S. Biological Survey. January floods resulting from over thirty inches of rainfall in three days, together with the sudden disappearance of the snow, had washed out many bridges and played havoc with trails, thus making it a little difficult to reach some of the places which we had planned to visit. Most of our time was spent in the Hoh Valley, but trips were also made up the Quinault and Bogachiel rivers.

Topography

From the crowning heights of Mount Olympus, which reaches up almost 8,000 feet, the interior rough mountainous country spreads out on all sides to where the lower ridges on the periphery flatten out into the coastal plain, which is quite extensive, to the west and north. The ridge slopes are steep and the river valleys narrow. The bottom lands along the Hoh River, which are unusually broad for the region, are in general about one-half mile wide above the forks. There are many waterfalls and side streams tumbling down the rocks. Rivers flow out from the mountain mass in practically all directions. Floods are frequent, washing away banks and undermining trees.

Vegetation

Hemlock is probably the most abundant tree in the forest; other species which characterize the deep wooded sections are Douglas fir, cedar, spruce, and fir. Some of these trees are more than ten feet in diameter. Along the rivers, on the bars and other gravelly places, stands of red alder occur, the trees ranging in size from twelve inches in diameter to small shrubs. Broadleaf maple, which is scattered in distribution, is also found near the rivers or on gravelled places in the bottom lands. Thick stands of lodgepole pine have grown up in some burns on the ridges; white pine is found sparingly at higher altitudes. Vine maple occurs uniformly over the bottom lands along the streams and less abundantly up the slopes for some little distance. Red huckleberry is abundant on the bottoms and lower slopes; it is replaced by blue huckleberry on the higher slopes. Elderberry, salmonberry, and thimbleberry are abundant in places, especially on the lower reaches of the rivers. Salal forms a heavy ground cover in many areas; Oregon grape occurs sparingly. Sword fern, deer fern, and a few other species are generally distributed throughout the forest. Grasses, sedge, and rush occur very sparingly in the dense forest, but form thick stands in burns and on some of the open high ridges.

On the coastal plains there are solid stands of cedar in places. Along the lower Bogachiel River, below the Pacific Highway, is found the last pure stand of Douglas fir timber on the peninsula. In places there are small treeless spots known locally as "prairies",

in which Labrador tea occurs. The town of Forks is said to be built on a prairie.

The drier east side of the peninsula differs in several respects from the moist west side. Conspicuous forms occurring primarily on the east side are the madrona and Rhododendron.

The dense forests are tropical in appearance. Mosses hang from the trees in long pendants, and cover the logs, vegetation, and ground; ferns grow up in the trees.

Illustrative of the changing character of the vegetation with the change in altitude, I will give some notes made on a climb to the top of Dodger Mountain, beginning two miles above Elkhorn Station on the Elwha. Generally the zonation of plants is not as clear-cut as observed on this climb, but the example given here is rather typical of altitudinal zonation. Along the creek grows a little salmonberry, "tall" Spiraea, rose, large alders, and thickets of vine maple. The ground cover in the hemlock-Douglas fir forest back from the stream is largely moss and Oxalis. The large trees persist far up the ridge, but the ground cover changes to dense patches of salal, a few scattered red huckleberry, and a small amount of Arctostaphylos. Above the salal zone there is an area quite barren, but soon bear grass begins, forming almost a continuous cover over wide sections; scattered red huckleberries persist. Above the bear grass zone the red huckleberry drops out and is replaced by blue huckleberry which grows in thick patches. There is a small amount of mountain ash, willow, Arctostaphylos, lupine, cow parsnip, bracken; in the wet places there is some

grass and sedge. There are a few scattered white pines, and some fir; hemlock and Douglas fir are still the dominant trees. The next zone consists of small firs, "low" blueberry, blue huckleberry; heather appears, and there is some bear grass and lupine. On top of the ridge there are extensive open spaces. Sedge and rush form a sod over large areas. New species noted are Ribes, yarrow, serviceberry, "short" Spiraea, and Pedicularis (sp. racemosa ?).

On the forest floor there are many down logs -- many too large to crawl over. Some of these, if fallen in the right direction, form good highways, or, if lying across a stream, bridges. Most of the reproduction in the heavy forest takes root in the logs and stumps. Huge trees can be seen growing in a straight row along an old mouldering log which many years before furnished a nursery for them. The spreading tentacles at the base of some old trees indicate that they had their beginning as a little sprig on the top of a huge stump. The stump has disintegrated, leaving open archways between the stout roots which formerly passed down through it.

At the present time many of the forests outside of the monument and national forest have been logged and burned, leaving charred stumps to show where the forest had been.

Climate

The west side of the Olympic Peninsula has an exceedingly high rainfall, as much as one hundred and fifty inches having been recorded in a year. Most of the rain falls over a long winter period, but there is considerable rain in the summer some years. The north and east sides are drier; precipitation at Sol Duc Hot Springs averages about sixty inches, on the Elwha River about forty inches. At Sequim, I am told, irrigation is practiced during the summer dry period, which here generally occurs between June 20 and September 20.

At the higher altitudes much snow falls during the winter, diminishing toward the lower altitudes, where little falls or remains on the ground. In February, 1935, on the Hoh the permanent snow reached about four miles below Olympus Station; this was unusual, caused by a chinook in January. Usually it extends a few miles below Jackson Station.

Wapiti
Cervus canadensis occidentalis

Description.

The Roosevelt elk found on the Olympic Peninsula at one time had a range along the coast as far south as San Francisco, according to early reports. In northern California a herd still exists, but elsewhere along the coast south of the Olympics, this elk has now disappeared. The Roosevelt elk is somewhat darker than the Rocky Mountain form (Cervus canadensis canadensis), al-

though in the field the difference is hardly noticeable. It is said to be heavier, but so far as I can find there is little data to support this statement. There is an average difference in the antlers of mature bulls between occidentalis and canadensis. In occidentalis the brow tines are exceptionally well developed; the beam is unusually thick and heavy and is less curved than in canadensis. Of course there is some overlapping in the antler types, but usually the difference between the two subspecies is quite obvious. The Roosevelt elk seem to have a tendency toward supernumerary points and bumps.

Distribution.

The elk are most plentiful along the higher reaches of the rivers, although some do occur even down as far as the ocean. There are a few on the Hoh River below the Pacific Highway, and there are said to be some on the lower Queets River on its tributary, the Salmon River. On the Humptulips River there is a herd near the highway in a small stretch of low rolling country. The largest numbers are found on the Elwha, Bogachiel, Hoh, Clearwater, Queets, and Quinsult watersheds. A few are found on the Humptulips, Wynoochee, Skokomish, Duckabush, and Dosewallips rivers.

From what we know of elk in other areas, the present distribution, with the main herds in the higher country, is probably a typical primitive condition. If the elk were exceptionally numerous at any time in the past they may have spread out into the

surrounding coastal plain, just as they have done at the present time to some extent. When elk were scarce in the Hoh Valley some thirty years ago, settlers living at Spruce hunted their meat twenty miles up the river near the Olympus Station, the elk being more plentiful higher up the valley. Possibly poaching had decimated their numbers farther down the valley.

We know very little about the factors determining the present distribution of the elk. On the Humptulips River in the lowlands, a band is flourishing, yet there are many other suitable lowland areas with no elk. We do not know what effect hunting, predators, roads, etc., have had on the elk on the lowlands, or up the valleys, for that matter.

The Hoh Valley has a surplus of elk, and the vegetation is much overbrowsed. In the Bogachiel Valley, separated from the Hoh only by a low ridge, elk are less abundant, and the vegetation in better condition. One would expect that some of the Hoh animals would drift into the Bogachiel. It appears that animals born in a valley tend to remain there through force of habit. There are many distributional problems here which can only be solved by study over a period of years.

Numbers.

We do not know how many elk there are on the peninsula. Because of the dense vegetation it would be difficult to count them. C. Morgenroth, who has spent many years covering the area, has made the following estimates for the various watersheds:

Soleduck	30
Bogachiel	700
Hoh	2,300
Clearwater	700
Queets	900
Quinault	900
Elwha	900
Watersheds on the east side	15-90
	6520

There are at least 250 on the Humptulips near the road, living in a "burn". Morgenroth's figures give a rough indication of the number of elk on the peninsula. It is said by some that there were more elk ten years ago than there are today. Thirty years ago they were apparently scarcer than they are today.

Rut.

During the fall visit, from September 15 to September 26, 1934, the rut was in full swing. The bulls were bugling, and the various bands of cows were being herded by the veteran in charge.

Behavior and composition of bands.

Near Olympus Station on September 24, Macy and I came upon six cows and three calves which were feeding along the trail. On the river bar they were joined by a large bull which had been off challenging a lone bull also of good size. The herd moved up the gravel bar, the bull behind. The second bull was moving parallel to them, but hidden by the dense vine maple. At intervals both bulls bugled, sounding like braying donkeys. The bull on the bars herded his cows by running around them or coming up from behind. Once a cow broke away from the band and ran across the bars directly toward the second bull. At once the bull in charge circled and brought her back to the others. Presently the second bull appeared just inside the edge of the alders

and thrashed the brush vigorously for several minutes. His bugling was answered by the first bull. Presently the whole herd ran toward the second bull, which was still thrashing the brush. The bull on the bar circled in front of his band and ran toward the intruder, who quickly retreated.

On the following day we saw another band of elk moving through the woods. It was impossible to get a complete count of the animals or to determine the sex and age of all of them. There were at least three spikes in velvet and one fair-sized bull on the outskirts, eleven cows and calves, and a large bull. The velvet on one of the spikes was hanging in shreds. The composition of this herd was rather typical for the rut period. Usually there are yearlings and two-year-olds in the train and a large bull or two off to one side.

Men building a Lookout Station on Bogachiel Peak reported having seen a herd of forty in one band, mostly cows, with several lone bulls on the outskirts. They saw four lone bulls of fair size on September 26, near this peak.

On the Elwha I saw eight cows and four calves with a bull, followed by a second large bull.

The composition of the few bands seen was similar to that observed in the Jackson Hole elk.

Wallows.

Near the Elkhorn ranger station on September 18, in the heavy forest not far from the stream there were six wallows in the soft

mud within an area one hundred and fifty yards across. Some showed where the belly of the elk had come in contact with the mud. On September 19, in a seepage area, there were two large wallows, one six feet by ten feet, the other — on firmer ground — was twelve feet by twenty feet. The sod had been torn up in chunks and pieces of mud scattered out a dozen feet.

Stained antlers.

There has been some question as to what gives to an antler its color. Ignar Olson, who formerly raised elk, says that the antlers, which are white when the velvet is first shed, become stained when they are rubbed on the brush and saplings. He states that elk in low country, which are apt to rub on alders, have dark antlers, whereas those in high country, which rub on conifers, have lighter colored antlers. This will be an interesting point for future observation.

Calf crop.

It is extremely difficult to get an accurate count of the cows and calves in the deep woods. Sometimes one does not know what proportion of the band has been seen, in which case, even though the animals seen are identified, the figures are unreliable. The animals not seen may be mostly calves, or perhaps all cows; calves tend to segregate in groups at times. Of the many bands seen only the following counts are sufficiently accurate to be worth recording:

Dodger Mountain	September 18, 1934	8 cows,	4 calves
Graves Creek	September 21, 1934	3 cows	1 calf
Jackson Station	September 24, 1934	7 cows	4 calves
Jackson Station	March 4, 1935	7 cows	10 calves
Below Jackson Sta.	March 5, 1935	32 cows	5 calves
Above Jackson Sta.	March 7, 1935	13 cows	6 calves
		70	30

The ratio of cows to calves seems to be about normal. A number of the cows, the yearlings and the two-year-old animals, are too young to be followed by calves. These must be lumped with the cows of breeding age, for they cannot be differentiated from them in the field. Then, too, a certain proportion of the old cows fail to bear calves, which also decreases the calf ratio.

Ignar Olson states that the cow elk has but a single calf each year; he has never found twins. A count (a very accurate one), which we made March 4, 1935, indicates twinning, but no doubt the calves got mixed at some time when a large band broke up into smaller bands, for, as stated above, the calves tend to keep company.

Ignar Olson had some interesting information on the old debated subject of whether or not calf elk and deer fawns have scent. His information bears out the results O. J. Murie and I found in some experiments performed in Jackson Hole. Olson said he had trained dogs to hunt calves by seeking the body scent. An untrained dog would often pass by a calf and follow the mother, but a trained dog would not do this. Some of his dogs became quite expert at finding the calves.

On one occasion three hounds passed close to a deer fawn in plain sight. None of the dogs noticed the animal, although they were good trailers. On the way home the trail led past a trap which had been set for a bobcat. A cat was in the trap under a log. The first two dogs passed the bobcat without seeing it. As the third dog came opposite, the cat suddenly pounced upon him. Ignar explained the incidents by stating that the dogs were "thinking about something else".

Dogs, as well as persons, no doubt get lost in thoughts of juicy eats while on the trail. The incident serves to show how careful one must be in weighing facts before coming to a conclusion one way or the other.

I asked Olson if cow elk hid their calves. He stated that he had seen calves slink off to lie beside a log or tree when the cow showed alarm by barking or raising the hair on her shoulder. Often the calves follow the cows for a time and then lie down beside a log while the cow feeds away from the area. I have found the same behavior in deer fawns.

Migration.

The movements of the elk seem to vary somewhat in the different watersheds. In general the elk tend to go up in the high country in summer and down into the river valleys in winter. In some cases there seems to be but little movement down the valley. I shall discuss separately conditions in some of the valleys.

Hoh Valley.— In winter the elk are somewhat evenly distributed along the valley floor from a point about eight miles below the Jackson Station to a point two miles above Olympus Station, where the valley begins to narrow. During our visit early in March, 1935, from the head of the valley to a point four miles below Olympus Station, there was on the average two feet or more of snow on the valley floor where the elk were often seen foraging on vine maple. The lower slopes with south exposure were free of snow. Possibly some elk remain in the valley the entire year. During the rut in September elk were found both up high and down low.

In February and March we saw no old bulls but only spikes and two-year-old bulls, which were with the cows and calves. Twice we saw tracks in the valley, apparently made by large bulls. Local hunters stated that the bulls were up high but were rather vague about it. We climbed up the ridges into the deep snow, but saw no sign of elk. Possibly the bulls winter high on treeless wind-swept ridges. We found a shed antler above the Olympus Station and a skull with antlers attached near the Jackson Station, so apparently some of the bulls do winter in the valley.

The main migration movement of elk on the Hoh River is from the ridges into the valley in the fall and up again in spring, with very little movement down the valley except at its head, where there are no bottom lands.

Bogachiel Valley.—On the Bogachiel a few tracks were seen about six miles from the highway. Below Indian Pass there is very little evidence of browsing. We were told that the elk winter farther up the valley. It appears there is very little movement of elk down the valley.

Queets Valley.—In summer the elk are found from the high ridges all the way down to the road. At the Kelly Ranch a band is said to remain all year. At least some of these elk appear to be rather stationary from one season to the next. I do not know the exact areas occupied by elk in winter on the upper reaches of the Queets. I found heavy browse utilization as far up as Harlow Creek and it was reported that the browsing was heavier beyond Harlow Creek. This would indicate that elk wintered well above the creek. The movement

seems to be mainly vertical rather than horizontal.

Quinault Valley.—On the East Fork of the Quinault, Ignar Olson states that most of the elk winter above Graves Creek, and on the North Fork the elk are most plentiful on the Rustler River. In December I found signs plentiful on the ridges at the head of Howe Creek. During hard winters the elk come down as far as Lake Quinault in large numbers. However, a few range down to this lake each year. There appears to be some migration down the valley, especially during severe winters, and down from the head waters to the part of the river bordered by bottom lands. I was told that many of the cows have calves below Graves Creek and later move up the valley.

A tame elk cow which Ignar Olson had raised strayed over into the Queets where it remained for two years. The bell it carried served to identify the animal. During a hard winter it returned to the ranch on the Quinault where it was raised. It had roamed at least fifteen miles from the ranch.

Elwha Valley.—On the Elwha there seems to be a definite drift down the valley. During hard winters many of the elk come down into the settlements where they cause much damage. A fire guard stated that many elk are to be seen on the top of Hurricane Hill during June and July. They then migrate to the head of Lillian Creek, returning to the vicinity of Hurricane Hill in late November or early December. The narrow valley of the Elwha River furnishes but little food in the valley floor, so that the elk must move far down to secure food during hard winters. The presence of Douglas fir needles in droppings

high up on the slopes of Dodger Mountain indicates that some elk winter on its slopes.

Humptulips Valley.--There is a herd of two hundred and fifty or more elk living in a "burn" on the Humptulips River near the main highway. These elk live in the same area the entire year, feeding in the same places at all seasons.

There is opportunity to secure some valuable information on migration habits in the Olympic region because of the varied conditions in the different watersheds.

Food habits.

The elk on the Olympics are primarily browsers, at least in winter when little else than browse is available for food. During the winter vine maple, huckleberry, salal, cedar, Douglas fir, fir, hemlock, broadleaf maple, willow, sword fern, deer fern, salmonberry, and blackberry are important food species. Certain hanging mosses are also eaten when present.

In winter much food becomes available to the elk when branches and limbs of cedar, hemlock, Douglas fir, broadleaf maple, etc., are broken off by the snow and fall to the ground; windfalls also furnish a large amount of food.

In February, 1935, the elk were feeding some on the new grass shoots which were sparingly distributed through the forest around the Jackson Station.

In summer the elk no doubt include in their diet many species of herbaceous plants.

Annotated list of food plants.—

Western Red Cedar (Thuia plicata)

Cedar occurs sparingly throughout the forest. Not much cedar browse is within reach of the elk, but wherever a tree or limb has fallen to the ground it is always closely browsed. Cedar leaves were several times found in elk droppings. Cedar is a highly palatable winter food, probably ranking first among the conifers in palatability.

Western Yew (Taxus brevifolia)

Very little yew was noted. On the Quinault some yew was observed heavily browsed. It is no doubt highly relished by the elk.

Douglas Fir (Pseudotsuga taxifolia)

The thorough utilization of any branches within reach indicates that this species is much relished by elk. Windfalls and down limbs make a considerable amount available in winter.

Western Hemlock (Tsuga heterophylla)

Apparently not quite as palatable as cedar and Douglas fir. On the Hoh we found that available, heavily browsed. On Dodger Mountain needles were found in some of the winter droppings. On the slope above Elkhorn there is much hemlock of sapling size, but browsing is not very evident, probably because of the large amount of hemlock growing here. Salal, which probably has about the same palatability as hemlock, was also very abundant. Much browsing would be necessary to make it very noticeable on these forms. Hem-

lock needles and twigs were found in the paunches of elk examined on February 26 and March 12, 1935.

Vine Maple (Acer circinatum)

Vine maple is found in dense stands in most of the river bottoms. It is especially abundant on the broad bottoms of the Hoh River. Vine maple is a favorite food, eaten at all times of the year. In winter the twigs are sought and in spring the leaves are eaten as soon as they appear. In February and March the elk in the Hoh Valley were feeding extensively on this maple. On March 6, 1935, I watched a cow reaching high for its twigs, continuing to feed thus for about ten minutes. Some new grass was available at this time which some of the other elk near by were feeding on. In the Bogachiel Valley where browsing sign was scarce and salmonberry and other foods were plentiful, we found where several vine maples had been browsed. Twigs are generally not much more than two millimeters in diameter where bitten off; some are as much as four, however.

Broadleaf Maple (Acer macrophyllum)

Broadleaf maple is highly relished but little of it is available except in the fall when it is said many of the fallen leaves are consumed. Trees, limbs, and branches which fall to the ground in winter are usually almost completely barked. Tips of twigs often are chewed down to where the stem is over ten millimeters in diameter.

Alder (Alnus sp.)

Alder is barely tasted in winter; only occasionally are any twigs found browsed. The leaves, in summer, are much relished. On September 24, 1934, several cows were seen eating alder leaves.

Willow (Salix sp.)

Willow occurs but sparingly in all the regions visited. On the bars near Olympus Station some low-growing willows had been heavily browsed. The few seen on the Queets River were eaten down so that only thick stubby branches remained. Near the Jackson Station a willow limb had been barked and the twigs eaten down to where they were six or seven millimeters in diameter. Willows must be considered a highly palatable food.

Mountain Ash (Sorbus sp.)

Mountain ash was noted on the top of Dodger Mountain and near Bogachiel Peak. The few occurring at these places were browsed until only some thick stubs remained. Overbrowsing might well eliminate mountain ash from certain areas, for it is a highly palatable species.

Elderberry (Sambucus sp.)

Elderberry is very palatable. It is said to have been abundant near the Jackson Station some years ago, but is now extremely rare. A large fallen elderberry which had been growing from the roots of a windfall was trimmed and almost completely barked by elk.

Cascara (Rhamnus sp.)

Found browsed on the upper Hoh River.

Salal (Gaultheria)

Salal forms a dense ground cover on many of the slopes. Browsing on it is not very evident because it is usually so plentiful where it occurs that great quantities of it would have to be

eaten before browsing signs would be evident. It is probably eaten extensively along with other foods. The stomach contents of elk examined March 12 contained liberal quantities of salal leaves. The stomach of an elk examined by O. J. Murie April 5, 1934, on the Bogachiel where food was abundant contained salal leaves.

Oregon Grape (Berberis)

I do not know to what extent Oregon grape is eaten. O. J. Murie found quite a little eaten in April, 1934.

Red Huckleberry (Vaccinium parvifolium)

Red huckleberry is widely distributed through the forest, being especially abundant on the lower slopes. Higher up the slopes it is replaced by blue huckleberry. It is uniformly heavily browsed, and composes an important part of the elk diet.

Blue Huckleberry (Vaccinium)

This is abundant on the slopes above the red huckleberry. It occurs in dense patches, not in the scattered stands so characteristic of the red huckleberry. It is much browsed and appears to be highly palatable.

"Low-bush" Blueberry

On the tops of the ridges there is a short bush which seems to be a blueberry of some kind. It has been slightly browsed in places.

Salmonberry (Rubus sp.)

The few bushes observed in the Hoh Valley were heavily browsed. This species is said to have been abundant formerly on

the upper Hoh bottoms, but is now very scarce. On the East Fork of the Quinault it was heavily browsed. Where eaten it averaged from two to three feet tall; where protected by rocks or logs it grows to a height of seven or eight feet. It was not very abundant along the Queets River between the Kelly Ranch and Harlow Creek; it was heavily browsed. Salmonberry is highly palatable.

Blackberry (Rubus)

Found in several places. Ignar Olson said that the elk eat large quantities of it.

Rose (Rosa)

A few rose bushes on the river bottoms at Elkhorn were heavily browsed.

Currant (Ribes)

Some was found on a ridge above Olympus Station; it was moderately browsed.

"Tall" Spiraea

On the river bottom at Elkhorn it was heavily browsed; at other places it was moderately browsed.

"Short" Spiraea

Some near the top of Dodger Peak was moderately browsed.

Laurel

Above the Elkhorn ranger station there is a small amount of laurel. Some was moderately browsed, some not touched.

Devil's Club

This species is eaten, but to what extent I do not know. On

March 8, 1935, a stem was noted recently barked by elk on the Bogachiel.

Bear Grass (Xerophyllum)

On Dodger Mountain, bear grass had been heavily utilized, but I was unable to determine whether by elk or deer -- probably both. On a ridge above Olympus Station I found where a deer had grazed this species.

Pedicularis (sp. racemosa ?)

Occurred sparingly on Dodger Mountain and was heavily browsed.

Oxalis

An elk food in summer. Found eaten as early as April 10, by O. J. Murie.

Bracken Fern (Pteris aquilina)

Scarce in the forests. New shoots noted eaten, by O. J. Murie, on April 7, 1934.

Deer Fern (Lomaria spicant)

Eaten by elk; never found heavily utilized.

Sword Fern (Polystichum)

This is a very abundant fern. Browsed in winter but never found excessively utilized. On March 4 I noted where elk had recently eaten this fern at Jackson Station.

Rush (Juncus)

Rush was found moderately browsed in several places along the Hoh River.

Sedge (Carex)

Many new shoots found browsed March 7.

Grass

Elk are very fond of a number of grasses. On Dodger Mountain several elk were found in an old "burn" grown up in grass. In early March the elk were feeding extensively on the new shoots of a broad-bladed grass.

Fungus, slime (?)

A number of hemlock logs were found with the decaying wood impregnated with a slimy white substance. A large number of these logs were found which had been fed upon by elk. Specimens were sent to the University of Michigan Herbarium for identification and to the University of Wyoming for chemical analysis.

Horsetail (Equisetum)

A few noted eaten.

Bearded Moss (Usnea)

Said to be a favorite elk and deer food.

Disease and parasites.

During hard winters, large numbers of dying elk have been reported to occur on the Elwha, Hoh, and Quinault valleys. Ignar Olson states that he thinks about one thousand elk died on the Quinault during the winter of 1932-1933, when the snowfall was exceptionally heavy. Charley Lewis on the Hoh reported many dead elk for that area and several settlers from the Elwha have reported heavy losses there. There are many theories locally to account for the losses; some say ticks, some lice, others starvation.

The information secured from various sources indicates that

some elk are dying from necrotic stomatitis, a disease prevalent in the elk herds of Jackson Hole and Yellowstone Park. Most of the deaths occur in April and large numbers of calves succumb, a condition typical in the case of necrotic stomatitis. Charley Lewis stated that an elk which he had been feeding hay died, and upon examination it was found to have a greatly enlarged liver, a condition sometimes resulting from necrotic stomatitis. A settler on the Kluha said he had examined several dead elk, but that all he could see wrong with the animals was "some open sores in the mouth", which of course is very diagnostic of necrotic stomatitis.

On March 12, 1935, we examined a cow which had been dead about four or five days. The animal was emaciated, with much worn teeth. There were several small lesions around the molars filled with food, and some of the molars were loose. There was a heavy piece of twig lodged between two of the molars. It had all the marks of necrotic stomatitis.

Although we do not know conclusively that the animals here are dying of necrotic stomatitis, there is enough evidence to merit a brief discussion of the disease. Calves are more susceptible than older animals, probably because their mouths are more tender and the skin, therefore, more likely to be pierced by coarse food material. It seems to be largely chance as to which individual animal gets the disease, for all types fall victim to it, both the large and small, the fat and thin. During severe winters, food becomes scarce, and heavier twigs are consumed; thus chances for abrasions in the mouth become greater. It seems to be one of Nature's methods of approach-

ing a balance between the elk and the food supply.

On February 26, 1935, we found a spike along the trail two miles below Olympus Station, which had been dead a long time. A small wad of food was lodged between a cheek and the molars on that side, an indication of a sore mouth. The small lung passages were lined with finely chewed food, so that it seemed the animal had choked at the last. The proliferations at the base of the spikes and a malformation near the tip of one spike indicated that the animal had been sick before his antlers had developed.

Ticks.--Ticks are reported to be numerous on elk at times. A guide on the Elwha had seen many dead elk heavily infested with them.

Lice.--The cow we examined on March 12 was very heavily infested with lice. Specimens were saved for identification.

Ranch depredations.

On the Queets River a band of elk harassed the pastures, potato fields, etc., on the Kelly Ranch. Other ranchers near the main highway also complained bitterly because of elk visits during the night. The game protector killed two or three elk which were found bothering one of the ranchers. On the Elwha as many as five hundred elk are said to come down among the ranches and cause extensive damage to hay. A few ranches on the Hoh River have also suffered elk depredations. Whatever agency handles the elk in these areas may find it desirable to purchase these ranches. The problem is not as complicated as it might be, for in many cases

depredations are caused by year-round local elk which could easily be controlled.

Cattle competition.

Cattle on the elk range are in rather direct competition with elk for food. On the Queets River I watched several cows feeding along the trail as I walked past them. They fed on vine maple, salmonberry, devil's club, and the fallen leaves of broad-leaf maple -- favorite elk foods. At the present time eighty head of cattle are ranging for several miles up the Queets Valley above the Kelly Ranch. There are very few elsewhere.

Predators.

The cougar probably preys more on elk and also deer than any of the other large carnivores. It is not known how many elk a cougar will utilize in a year, or whether calves, cows, or the weak and feeble are most often secured. The wolf, probably now extinct, when present no doubt preyed on elk and deer. The bob-cat is said to account for some calves and deer. It is known that bear in other localities get some calves in the spring, and they probably operate in the same way here. Some of the natives state that a bear will follow an elk herd until all the calves have become his victims. This, of course, is probably far from the case.

The local prejudice against predators, especially cougar, is intense. The Forks Isaac Walton League, I was told, pays a fifteen dollar bounty on cougar. The last Washington legislature passed a bounty bill, paying a twenty-five dollar bounty for cougar

and lesser amounts for some of the other forms. The people on the peninsula were largely instrumental in getting the bill passed. In view of the probable predatory persecution following the passage of this bounty law, it is to be hoped that a large extension can be made to the monument to effect better protection for the cougar.

The organization of an Olympic Predatory Shooters Club is further indication of the sentiment prevalent on the peninsula in regard to non-game animals. In a hardware store (and this is significant) a copy of rules for a contest which is now being held gave the following information. Hunters would gain points when proof of having slain a "predator" was presented to the proper authorities. The proof consisted of the right ear of the house cat, upper bill of sea hawk, both feet of all other birds, carcass of cougar or bobcat. Points were alloted to the species as follows: cougar; 500; bobcat, 300; house cat, 20; hawk, 25; kingfisher, 25; crow, 20; bluejay, 10; sea hawk (osprey?), 20. This further emphasizes need for park protection to the "predators" on the Olympic Peninsula.

Range.

In the Olympics, browse composes the bulk of the food supply for both elk and deer. Elk account for most of the browsing, deer being less abundant in all watersheds, with the exception perhaps of the Elwha watershed. Vine maple and huckleberry are the most abundant food species available over the bottom lands which elk occupy principally in winter. Other important food plants utilized in winter are salmonberry, elderberry, salal, and fern.

In many places the browse on the winter range is heavily utilized and might be termed overbrowsed. On the Elwha there are many such areas; red huckleberry, in particular, was adversely affected, some bushes having died apparently from overbrowsing, and the others were stubby and productive of very little new growth.

The vegetation in the Hoh Valley is heavily utilized from a point about one mile above Olympus Station to a point seven miles below Jackson Station, a stretch of approximately seventeen miles. Although red huckleberry and vine maple are heavily utilized, the plants continue to flourish. Many of them which have been closely cropped for a number of years and have become brushy on the tips, put out many stems but too short to furnish much browse. Much of the mature vine maple is out of reach of the elk, so that the heavy browsing on the lower branches does not greatly injure the tree. The huckleberries are able to survive close browsing for a number of years without dying, but after a time furnish little food unless given a rest. Salmonberry apparently is killed off by too heavy utilization. It is now scarce on the browsed areas, and it is said to have flourished at one time up as far as the Olympus Station. Elderberry also seems to have suffered; it is now scarce over this area and is reported as having been plentiful at one time. Probably the main effects of overbrowsing as observed on the Hoh are the diminution of salmonberry and elderberry. Salal and fern are little affected. No particular damage was noted on

hemlock seedlings. The damage to the range causes no erosion, so far as I can tell.

Along the Queets River, between the Kelly Ranch and Harlow Creek, I found conditions similar to that along the Hoh River. Overbrowsing between Harlow Creek and Pelton Creek is reported to be even worse.

On the Quinault River overbrowsing is most severe on the East Fork between a point about two miles above Graves Creek and Lunata Creek. The range on the North Fork is reported to be in fair condition.

Some heavy browsing is reported for the upper Bogachiel Valley, but over most of this watershed the browsing is light.

Except for the Elwha, Quinault, Queets, and Hoh watersheds, the browsing has not been excessive, according to reports and observations I have made.

Management.

If the proposed boundaries for the monument are finally accepted there will be several elk problems entirely within the park which must be considered. As mentioned elsewhere, there is overbrowsing on the Hoh, Queets, and Quinault watersheds. Until we learn more about the elk, the possibility of normal cycles, the effect of a normal predator population (if it can be approached) on them, etc., I would suggest that no management be undertaken. Later if it is found necessary to remove elk, I feel confident that they can be expeditiously trapped and removed either as meat

or for stocking other areas on the peninsula or along the Pacific Coast.

It may be possible on the Olympics to permit nature to take its course in regard to the elk population. During hard winters in the past, hundreds of elk have died as a result of food shortage, directly or indirectly through some disease sequent to food shortage. I believe that overbrowsing can take place here without any serious damage to the vegetation or soil, to such an extent that the elk will be automatically controlled by food supply. (It may seem inhumane to have epidemics control the population, but human beings are in this same predicament, so we need not feel too badly on this point. The elk individual knows nothing about it.) The major reductions will take place during severe winters. My feeling now is that such a process is normal, a primitive course of events, and therefore to be permitted. The Olympus elk picture differs from that of the Yellowstone in being a more normal one.

It is possible that the cougar will flourish when given greater protection, and that it, together with the bear, bobcat, and wolf (if reintroduced), will prevent the elk population from becoming so unduly large as to overbrowse the range severely.

As stated above, this entire situation will require thorough study over a period of years for a complete understanding of it.

In conclusion it may be stated that the elk are in no danger whatever of being exterminated in the Olympics.

Annotated List of Other Mammals

Black-tailed Deer (Odocoileus columbianus columbianus)

Deer are most plentiful in the Elwha watershed. A few were seen on Dodger Mountain and on the ridge east of Elkhorn Station. In the Hoh Valley, deer are also quite plentiful. Many tracks were noted during February and March, 1935, between Jackson Station and Olympus Station. On the slopes above Mount Olympus, four miles up the Hoh Lake trail, many deer tracks were seen on March 2, 1935. The deer were abundant just below the deep snow, but there were also some tracks in the snow. Here there was much huckleberry, some bear grass, salal, fern, and small hemlocks.

Ignar Olson declares that deer have decreased in the Quinault watershed during the last few years. A few deer tracks were noted on the Bogachiel trail.

At least on the Hoh and Elwha watersheds the deer seem to be competing successfully with elk; the exact status at other localities is uncertain.

A peculiar deer malady was described by Ignar Olson. Some fawns which they were keeping died during the winter after a prolonged illness. Two of the fawns which died thus were examined. The intestines were punctured by numerous blackberry spines which caused pus pockets. These spines apparently never injured the elk, which were also fond of blackberry.

Northwestern Cougar (Felis oregonensis oregonensis)

The following cougar signs were noted:

September 19, 1934. Near the bones of an elk near Elkhorn ranger station there were two cougar scats containing elk hair and bone fragments.

September 24, 1934. Saw a fresh track seven miles above Jackson Station on the Hoh River.

March 2, 1935. Two scats were found under a huge log near Olympus Station on the Hoh River.

March 7, 1935. A fresh track was noted across the river from Jackson Station in the flats.

March 8, 1935. A track was seen in the Calawah Valley at Indian Pass.

There is said to be cougar ranging in the lowland areas on the Humptulips watershed.

Mr. Brandenberry and son secured three cougar during March up the Bogachiel River. They know there was still another, but he had escaped them thus far. Once he had gone to the head of the valley and eluded them by going up the ridge in the deep snow.

The exact status of the cougar is uncertain, but it seems to be getting scarce. It has been much hunted in most of the watersheds. Many of the settlers have hounds and are ready to take after a cougar whenever it comes into their valleys. Last winter thirty-five or more cougars were taken by the settlers and U. S. Biological Survey hunters.

1933-34

The individual range of a cougar seems to be extensive. Al Lundgren, game protector, states that near Quinault a cougar

with one toe missing is occupying a range at least twenty-five miles across. This was determined from the track with the missing toe mark. Charley Lewis on the Hoh River believes a cougar may range a distance of fifty miles. Lewis stated that a cougar above his ranch used to appear in the valley about every fourteen days. It seems probable that the cougar has a large home range. For that reason it will be necessary to provide a large territory to preserve the cougar and prevent it from being drained by outside hunting.

There seems to be little question but that cougars feed extensively on deer and elk. In the spring of 1934, O. J. Murie examined a yearling which had been killed by a cougar; the cougar was shot a short distance from it. The stomach of one of the cougars killed on the Bogachiel River contained remains of deer and mountain beaver.

Ignar Olson states that cougar are born during February and March; he believes a female will give birth to its three or four young every three years and that the young follow the female two or sometimes three years. The kittens are often carried by the mother even at the age of eight or nine months.

The cougar is a very necessary and desirable form to retain in the Olympic area from the standpoint of biological balance. The wolf has disappeared, so that the cougar is by far the most important check on the deer and elk populations. It is to be hoped that the extensions contemplated for the Olympic Monument will be

sufficiently large to harbor this very interesting species which has disappeared over so much of its range.

Bobcat (Lynx fasciatus fasciatus)

The bobcat is still common on the Olympic Peninsula. Lundgren states that it is plentiful in the burned-over areas on the Humptulips River. During February and March, 1935, tracks were frequently seen between Jackson Station and Olympus Station. Several scats were picked up on the trails and on some of the big fallen logs which they had used for highways. The bobcat is probably an important check on the mountain beaver which at times tend to become very abundant. It is said to prey some on elk calves and deer. Surely it forms an interesting part of the fauna.

Black Bear (Euarctos altifrontalis)

From all reports the bear is quite abundant. One seen near the top of Dodger Mountain, September 18, 1934, rose up on his hind legs to hug a fifteen-foot fir vigorously; later he straddled a three-foot tree. Apparently his belly itched. Two bear droppings near by consisted of blueberry remains.

On September 19, 1934, a bear was seen at timber line east of Elkhorn Station. A number of droppings were examined, seven made up of blueberries, one of grass, and three of pine cones. During December, tracks were noted along small streams and remains of salmon were found near by, which the bear had been feeding on.

During calving time the bear probably feeds some upon calf elk. Settlers think bears follow the elk herds in the spring, prey-

ing upon the calves. I am inclined to think these statements grossly exaggerated.

It is hoped that bear in this park will never become tame as they are so wont to do.

Wolf (Canis gimas)

The wolf is apparently extinct on the peninsula. It was scarce in 1916; however, tracks of at least two animals were seen on the Elwha about this time. If liberal boundaries are given the park, wolves might possible be reintroduced to the region.

Coyote (Canis lestes)

A few are reported to occur in the burned areas on the Humptulips. The invasion of this species is rather recent.

Raccoon (Procyon lotor pacifica)

Tracks were frequently seen on mud banks in the Hoh and Bogachiel valleys. On February 26, 1935, tracks were seen on the snow about four and a half miles above Jackson Station.

Otter (Lutra canadensis pacifica)

The otter is still reported for the peninsula. It apparently is not plentiful; no sign of any was seen.

Mink (Mustela vison energumenos)

Tracks were frequently noted in the Hoh and Bogachiel valleys.

Pacific Fisher (Martes pennanti pacifica)

Now rare. In 1934, O. J. Murie saw a track along the Bogachiel River. With protection this interesting animal should become safely established in the park.

Pacific Marten (Martes caurina)

The marten is said to be scarce. No sign of it was noted. Protection over a large area should bring it back in normal numbers. The marten is easily trapped and so quickly becomes rare when much sought.

Skunk (Spilogale phenax olympica)

Tracks noted in the Hoh and Bogachiel valleys. At least five skunks were living under the Jackson Station. Early each evening one of them would open an unlatched door, at which they were very adept, and enter. The stomping of feet was usually loud enough to awaken us if we happened to be asleep. On one occasion one of them remained inside for the day; my sweeping the floor near him -- unaware of his presence -- over-excited him.

Their tracks resemble those of a squirrel but are sometimes much like weasel tracks.

Marmot (Marmota olympus)

On September 19, 1934, several were seen above timber on the ridge east of Elkhorn Station on the Elwha.

Douglas Chickaree (Sciurus douglasii douglasii)

Common throughout the woods.

Flying Squirrel (Glaucomys sabrinus olympicus)

Several reported.

Chipmunk (Eutamias sp.)

Several seen near top of Dodger Mountain in September, 1934.

White-footed Mouse (Peromyscus maniculatus)

This mouse was found to be abundant in the cabins and under logs. Very interesting in itself and an important food supply for other forms.

Meadow Mouse (Microtus townsendii?)

Abundant in a grassy bank at Jackson Station.

Mountain Beaver (Aplodontia rufa olympica)

Mountain beaver signs were quite plentiful on the ridges in the Hoh Valley and along the Bogachiel trail. In one place some salal leaves were noted in a burrow. In several places huckleberry had been cut; some cut twigs were ten millimeters in diameter. Possibly if the numbers of this species were not held in check it might affect the vegetation considerably.

Varying Hare (Lepus washingtoni washingtoni)

In none of the areas visited was it abundant. About ten tracks were noted between Olympus Station and a point four miles below it, on February 26, 1935. In the deep snow on the ridge above Olympus Station several tracks were seen among dense hemlock thickets. A few tracks were seen along the Bogachiel River and along the Indian Pass trail between the Bogachiel and Calawah rivers.

Townsend Mole (Scapanus townsendi)

Abundant on the bottom lands in the Hoh Valley.

Shrew (Sorex sp.)

The water shrew and two other species were found at the Jackson Station.

Annotated List of Birds

(Subspecific names are based on ranges given in A. O. U. check list.)

Great Blue Heron (Ardea)

On September 24, 1934, one was seen near the Olympus Station, and another was noted near Jackson Station on March 7, 1935.

Western Goshawk (Astur atricapillus striatulus)

On March 8, 1935, one was seen along the Bogachiel River about a mile from the highway.

Western Red-tailed Hawk (Buteo borealis calurus)

On September 17, 1934, one was seen up the Elwha River; another was seen February 22, 1935, above Graves Creek, in the Quinault Valley.

Northern Bald Eagle (Haliaeetus leucocephalus alascanus)

On March 7, 1935, one was seen near the Jackson Station, and on March 9, 1935, one was seen flying over the Bogachiel River about six miles from the highway.

Eastern Sparrow Hawk (Falco sparverius)

On September 16, 1934, two were seen near the top of Hurricane Hill.

Sooty Grouse (Dendragapus fuliginosus fuliginosus)

Two seen near the top of Dodger Mountain on September 18, 1934.

Oregon Ruffed Grouse (Bonasa umbellus sabini)

On February 26, 1935, two were seen at Olympus Station and

one about four miles below. One was seen on the lower Bogachiel River on March 9, 1935.

Screech Owl (Otus asio kennicotti ?)

During my stay at Jackson Station in February and March, 1935, these owls were frequently heard calling in the evenings.

Pacific Great Horned Owl (Bubo virginianus saturatus)

This owl was often heard hooting near the Jackson Station during February and March.

Western Belted Kingfisher (Megaceryle alcyon caurina)

Seen on the Hoh River, September 24, 1934, and March 4 and 9, 1935.

Red-shafted Flicker (Colaptes)

Noted September 25, 1934, on upper Hoh River.

Harris's Woodpecker (Dryobates villosus harrisi)

One noted on March 1, 1935.

Steller's Jay (Cyanocitta stelleri stelleri)

One seen on February 28 and several on March 10, 1935, on the Hoh River.

Northern Raven (Corvus corax principalis)

Heard occasionally during February and March, 1935.

Chestnut-backed Chickadee (Parus rufescens)

Often seen in loose flocks.

Dipper (Cinclus mexicanus unicolor)

Frequently seen along the streams.

Winter Wren (Nannus hiemalis pacificus)

The winter wren is plentiful throughout the heavy woods.

In March it was frequently heard singing. It is one of the characteristic birds of this forest.

Robin. (Turdus migratorius)

Noted September 25, 1934.

Pacific Varied Thrush (Ixoreus naevius naevius)

Frequently noted on each trip. On March 10, 1935, about fifty birds were in the alder bottoms near Jackson Station.

Western Evening Grosbeak (Hesperiphona vespertina brooksi)

These birds were heard March 1 and 4, 1935.

Northern Pine Siskin (Spinus pinus pinus)

Between February 26 and March 10, 1935, large flocks, numbering from one to two hundred, were frequently seen. Generally they fed among the alders which carried long hanging catkins.

Crossbill (Loxia)

Large flocks seen on upper Hoh River, September 25, 1934.

Junco (Junco sp.)

Two seen February 26 and one heard March 8, 1935.

Boundaries

The proposed extension to the Mount Olympus National Monument assures the preservation for the American people and posterity of several important features. In general the boundaries include the culminating snow-capped mountains in the interior, extensive stretches of the radiating rivers and ridges, the excessively moist western slope with its superlative Pacific Coast forests, and the

drier eastern slopes. The extension to the north includes the beautiful Lake Crescent and in the SolDuc Hot Springs region pure stands of hemlock, a foresttype extremely rare.

The Bogachiel River extension includes a representative stretch of river and ridge which extends from the high interior to the coastal plains.

The extension in the Hoh River region preserves one of the last stands in the United States of large Sitka spruce trees.

From the standpoint of wildlife it seems that the preservation of a representative community is assured.

The monument was originally set aside to preserve the Roosevelt elk, and the proposed boundaries will provide for this objective. The principal elk populations are included within the proposed boundaries. In the Bogachiel, Hoh, Queets, and Quinault watersheds an all-year range is provided, both the summer and winter ranges being within the boundaries. On the Elwha watershed perhaps most of the elk will remain within the park the entire year, but, especially during severe winters, a number of them will move outside and at times harass the few scattered ranches in the region. I think that from the standpoint of administration it is desirable to have complete control of the herds at all times. If this is the set-up, which is ideal, then there is only one main objective to be sought in a management program.

Perhaps the most important animal for consideration in boundary delineation is the cougar. It is hard to provide for be-

cause of its large individual home range (probably thirty to fifty miles across) and consequent likelihood of its being drained from an area if not sufficiently large. We cannot predict positively what the future status of the cougar will be, even with the proposed boundaries, but to me it seems likely that it will survive in the monument. If a more wholesome feeling toward the cougar and other predators could be established outside the boundaries it would help matters much. The presence of most of the large game within the boundaries should be a factor in preventing cougar from straying outside the protected zone.

Another mammal which has become extremely rare over much of its former range and which can probably be brought back to normal numbers is the fisher. There are large numbers of black-tailed deer within the proposed boundaries. Other interesting forms, some of which are now persecuted on the peninsula and elsewhere, which can be saved here are bobcat, marten, mountain beaver, local hawks and owls, and the kingfisher.

Most important, the proposed boundaries have provided for a fast disappearing heritage of the American people -- wilderness. Although the boundaries are quite generous it is my feeling that they are the minimum for the accomplishment of worthy Park Service objectives.

Administration

The proposed Mount Olympus National Park should be administered in such a way that its primitive wilderness character will be maintained in its entirety. That means that there must be no highways into the park. One cannot get a wilderness feeling alongside a road, or five miles from a road, no matter how far the trees reach into the sky above. One of the intangibles which a true wilderness requires is space, and the more space, the deeper the wilderness spirit. The proposed park is not a large wilderness area as our American predecessors knew wilderness; there is no space to spare — in fact there is no room for a highway in Mount Olympus.

Mount Olympus should not be advertised. Peopling a wilderness destroys it; it must be enjoyed by the few, those preferably who are able to inhale deepest what it has to offer, or who require it for their growth and understanding. The best use of a wilderness is a limited one. It is worth while to let wilderness lie fallow for the great good which will come of it from time to time. Only the high purpose to which it is hoped Mount Olympus will be dedicated should be told.

Importance of travel figures should be minimized. If large figures are necessary, one man off the road should equal ten thousand on the road.

Whom does a wilderness benefit? Only him who enters it? I think probably his neighbor benefits, probably gets a little inspiration second-hand. How many people have not been served

by some great musician who drew his inspiration from esthetics. Ernest Thompson Seton created a tremendous sympathy for wild animals, feelings which every mother would wish in her child, and Seton drew his material and inspiration from the wilderness. Many draw that which a wilderness supplies to a people from the literature, which must be fed. Let us not betray the American people in the present or future by a misapplication of that worthy principle, "the greatest good to the greatest number".

Let us preserve a wilderness sufficient in size to afford opportunity for real expeditions rather than excursions in the picnic category. The greater part of the Olympic Peninsula could well be dedicated to park purposes, for the people if we could get concentrated thought on the matter. Have we not in the past had small conceptions of wilderness requirements?

It would seem to be the special privilege and function of the National Park Service, whose stock in trade is high ideals, to look out for the interests of those who appreciate the inspiration of wilderness. Few government agencies have the opportunity to serve the people in this way. I hope that the Service can in increasing amount foster the intangible values which are, after all, most important for us.

In dealing with primitive areas the National Park Service has an opportunity to better the thought of a nation. Let its policies not be influenced by the demands of the average or the selfish seekers. The ideals with which we should deal are so worthy

that if we truly believed in them ourselves we could brush aside the puny individual who needed a road for his business, put him to shame, and be commended for the action.

I wish to emphasize again that a wilderness benefits not only those few who enter it but benefits the thought and ways of the entire nation.

Recommendations

The following recommendations are made:

1. That the proposed boundaries shown on the enclosed map (prepared in the Washington office) be adopted.

2. That the Mount Olympus National Park be preserved in a wilderness condition.

3. That no new highways be built within the boundaries. (A road up the Quinsult River to Hood Canal has already been proposed by local people.)

4. That all developments be confined to the Crescent Lake and Quinsult Lake areas, where already there is considerable resort activity. These areas could serve as a base for extended trips into the interior.

5. That the elk population be permitted to go unmanaged until observations over a period of years have been made showing the trend of events and the necessity, if any, of management.

6. That the cougar be given very special protection.

7. That it be kept in mind that to preserve the primitive, the less management done the better the results.

8. That consideration be given to introduction of the wolf, which was a part of the fauna but is probably now extinct.

9. That a complete ecological and life history study be made of the elk, cougar, deer, and other forms over a period of two or three years, or longer, as soon as funds and personnel are available. If such a long-time field study is undertaken, I believe that several forms could be studied simultaneously to good advantage. By collecting scats, following trails in winter on the snow or using slow trailing dogs, etc., a most important study could be made of the cougar as well as of the bobcat. A thorough study of the cougar is much needed and such a detailed study would fit in well with a study of elk and other forms.



Figure 1. The down log supports the future forest. The Douglas fir shown in the foreground is associated with the hemlock; it is less abundant than the latter. Photograph taken March 2, 1935. Hoh River Valley.



Figure 2. Festoons of mosses hang from the trees, giving a tropical tone of luxuriance to the forest. Ferns also grow up in the trees. Photograph taken February 26, 1935. Near Jackson Station.



Figure 3. A scene in the woods. There are many down logs over which humans and elk alike must clamber in wending along any of the numerous elk trails in the forest. Photograph taken March 3, 1935. Above Olympus Station.



Figure 4. A grove of alders growing in the rocks along a tumbling side stream. Photograph taken March 3, 1935. Above Olympus Station.



Figure 5. High water cuts into the banks and here are some elders doomed to fall. The river has meandered over close to the steep ridge slope leaving gravel bars behind it. Photograph taken March 7, 1935. Near Jackson Station.



Figure 6. The landscape along the bars is mild, in lovely contrast with the deep woods. Photograph taken March 7, 1935. Near Jackson Station.



Figure 7. Alders near the river. Pine siskins in large flocks frequented those trees to feed on the catkins. Photograph taken March 7, 1935. Near Jackson Station.

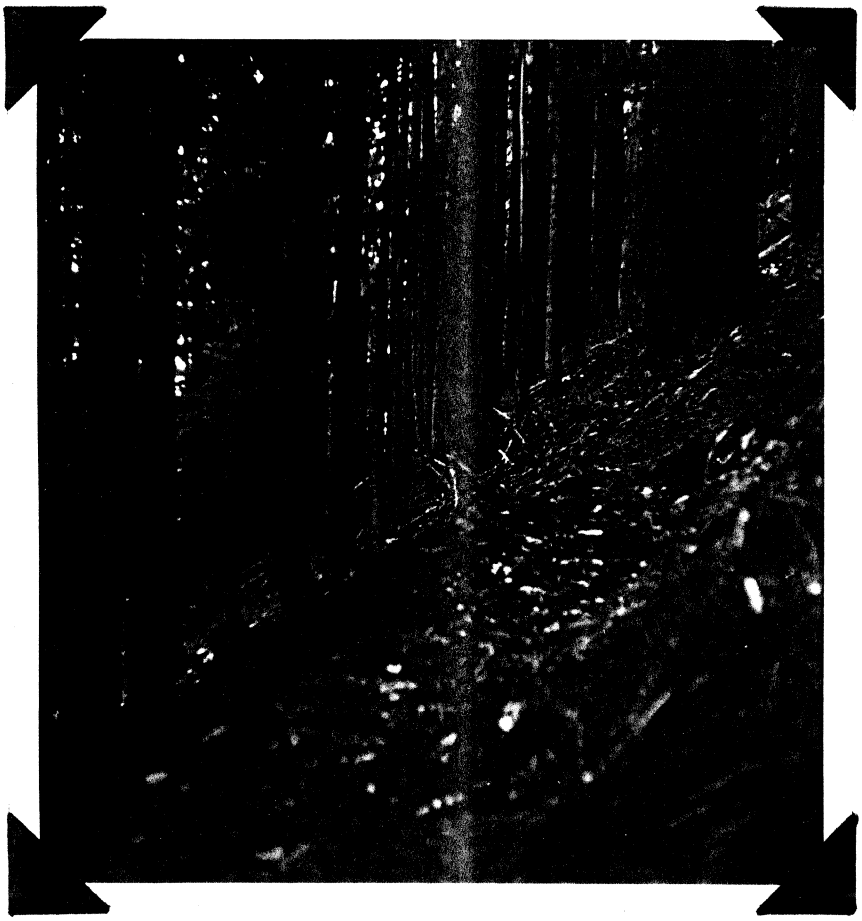


Figure 8. A characteristic steep hemlock slope. There is but little underbrush or ground cover; a few red huckleberries, salal, bear grass occur sparingly. Photograph taken March 2, 1935. Hoh Lake trail, Hoh River.



Figure 9. Devil's club, in the center of the picture, is abundant in moist places. Photograph taken March 9, 1935. Bogachiel River.



Figure 10. A tall (ten-foot) growth of salmonberry along a creek which has not been browsed. Photograph taken March 9, 1935. Bogachiel River.



Figure 11. Vine maple laden with snow. The weight of the snow forces many boughs down to within reach of elk and deer which otherwise are not available to these animals. Photograph taken March 3, 1935. Above Olympus Station on the Hoh River.



Figure 12. A heavy stand of vine maple on a flat near the river. Photograph taken March 1, 1935. Near Olympus Station on the Hoh River.



Figure 13. A view looking up the valley from the old Olympus Station. This grassy area was much frequented by elk in the late fall. Photograph taken March 3, 1935. Hoh River.



Figure 14. Suspension bridge crossing the Bogachiel River near the highway. High waters are hard on the ordinary type of bridge. Photograph taken March 9, 1935. Bogachiel River.



Figure 15. The bridge is gone, and the road flooded -- a "wet crossing". Photograph taken March 12, 1935. Hoh River.



Figure 16. Logs are usually obstructions but sometimes furnish an excellent way across tangles. Bobcats often walk the logs, and even deer occasionally. Photograph taken March 3, 1935. Near Olympus Station.



Figure 17. A yearling elk dead along the trail. The proliferations at the base of each spike indicate that the animal was antler-ing before they had formed. Photograph taken February 26, 1935. Near Olympus Station.



Figure 18. Elderberry barked by elk. Photograph taken February 26, 1935. Above Jackson Station.



Figure 19. The broom-like appearance of this red huckleberry is due to annual browsing by elk and deer. Photograph taken March 2, 1935. Ridge above Olympus Station, Hoh River.



Figure 20. A broadleaf maple is thoroughly barked. This does not necessarily indicate a general food shortage but a scarcity of available broadleaf maple of which the elk are very fond. Photograph taken March 7, 1935. Near Jackson Station.



Figure 21. Here an avalanche of water coming down a steep stream swept all before it. Photograph taken March 9, 1935. Bogachiel River.



Figure 22. These roots were bared by rushing waters during high water. The trail often came to a stop at such places, the remainder of it completely washed away by the floods which occurred in January. Photograph taken March 7, 1935. Near Jackson Station.

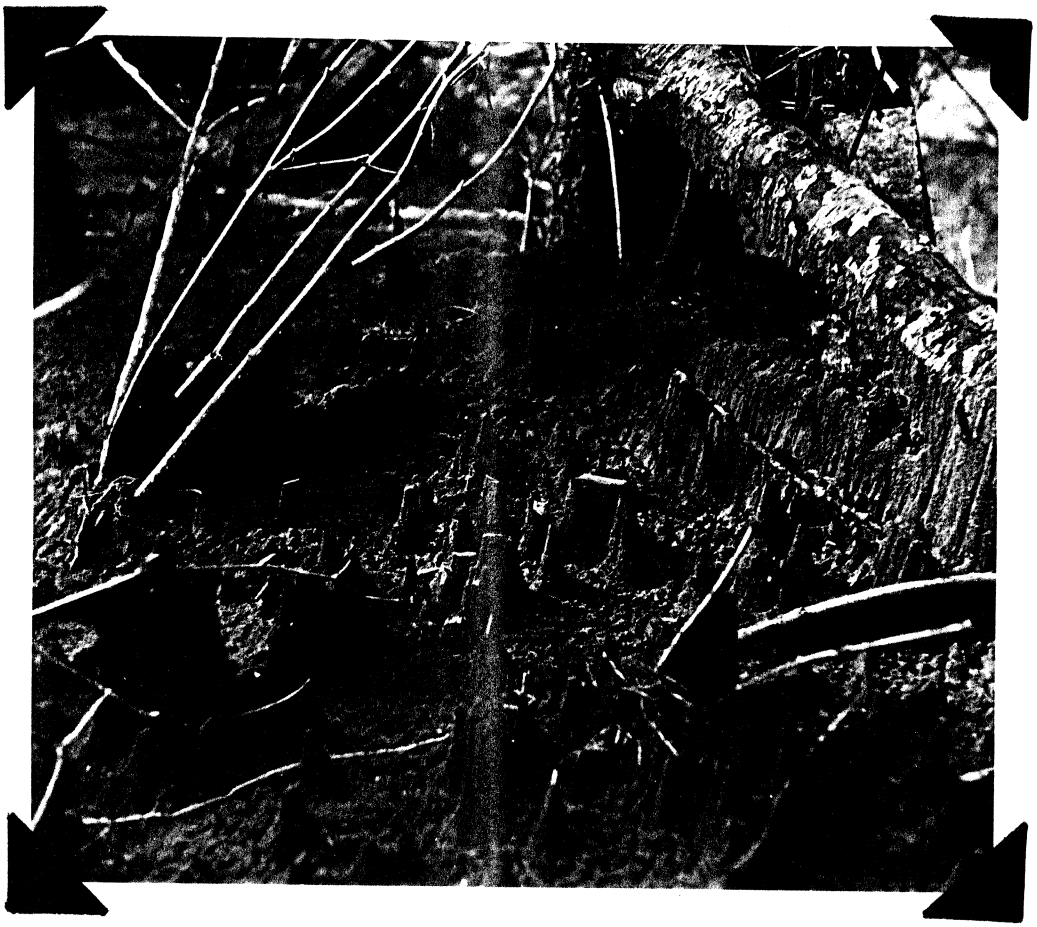


Figure 23. This picture shows the value of a ground cover, a cupping, in preventing erosion. This is in miniature, some of the spires supporting nothing larger than a dry fir needle. Photograph taken March 9, 1935. Bogachiel River.