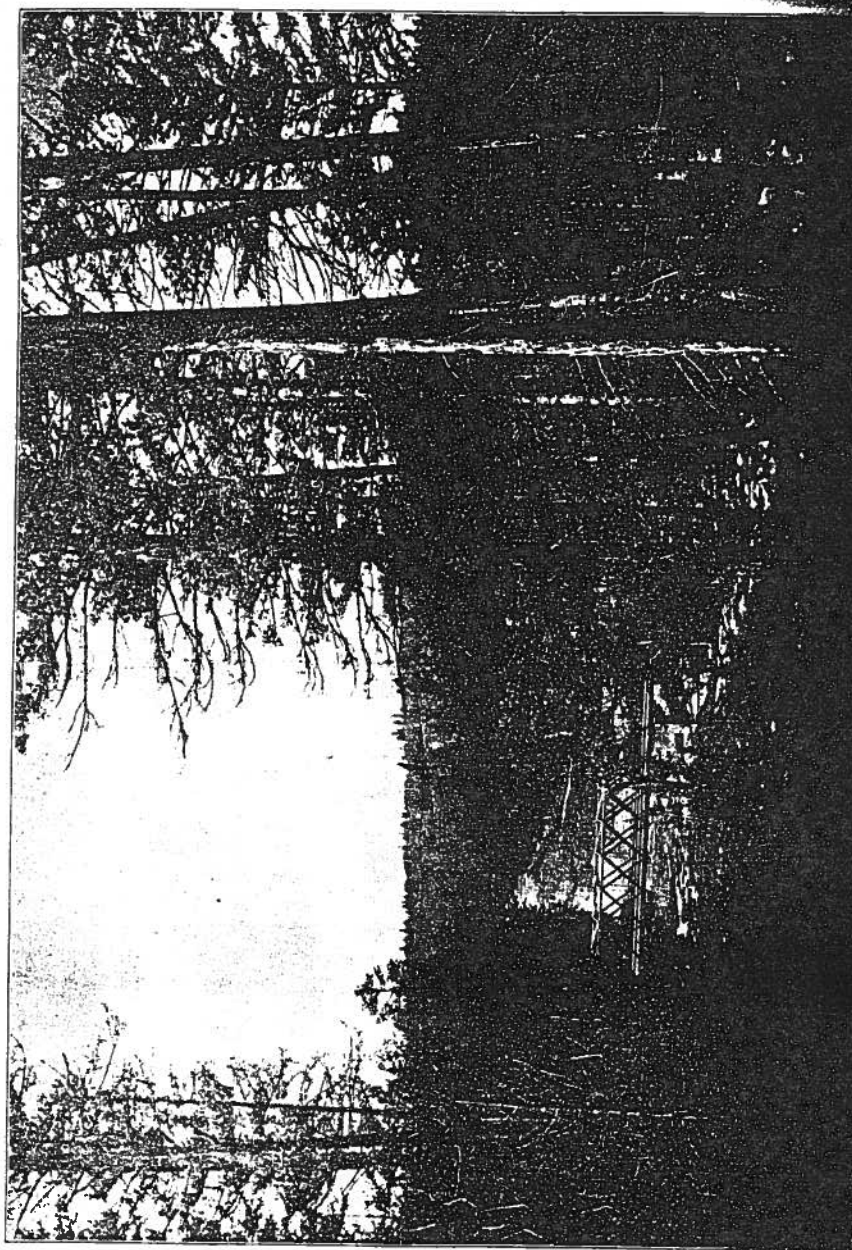

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...ological Reconnoissance

IN THE VICINITY OF

...ATHEAD LAKE

BY

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parently a part of the same range, are the well known Jocko peaks, sho
in the illustration from the mountain summit, Plate XXI.

The range extends almost due north and south, the meridian 37 p
ing along the western base of the range. The 46th and 47 para
degrees approximately mark the southern and northern ends, thoug
large bend extends toward the east in the southern end of the range.

The drainage from the western side is across the Flathead Rese
tion, through several creeks, into the Pend d'Oreille river, and i
Clarke's Fork of the Columbia. The drainage from the eastern side
into the Swan river, north around the range into Flathead lake, and
through the Pend d'Oreille river as before. From the southern end
waters are carried by the Jocko river into the Pend d'Oreille river.
portion of the eastern slope of Sinyaleamin mountain, as also the
ern slopes of the Jocko peaks, drains into the Clearwater river, th
into the Big Blackfoot; from this into the Missoula, and finally
Clarke's Fork of the Columbia. It is thus seen that the entire drain
of the range is into the same stream, though by very different rou
and over distances of varying lengths.

SINYALEAMIN LAKE.

The first place in the range at which work of consequence was
dertaken was at Sinyaleamin lake. See plates XXII and XXIII. As
been stated, this little alpine lake is at the southern base of Sinyalea
mountain. From the nature of the location of the lake the name is v
appropriate. Locally the lake is called St. Mary lake. As there is
other larger and more widely known St. Mary lake in the northern
of the state in the Blackfeet reservation, the name Sinyaleamin lak
most appropriate for this beautiful little sheet of water, and should be
tained.

St. Ignatius is about six miles from Selish, on the Northern Pac
railroad. From St. Ignatius to Sinyaleamin lake the distance is gi
as nine miles. The distance to the mouth of the canyon is nearly
miles and the road up the winding canyon is about three miles. The r
across the valley is excellent. A mountain road has been constructed
the canyon to the lake. This is passable in summer, is no do
good in winter, and with a little work could be made very good ind
save for a couple of steep hills. The road follows up the canyon carry
the waters from Sinyaleamin lake. This stream joins the main str
before it reaches the Mission. The waters from the branch stream
derived almost wholly from Sinyaleamin lake. The waters from
main stream of the Mission creek come from the mountain peaks to
north of Sinyaleamin mountain, tumbling over a high fall which may
seen miles away on the plain.

The lake is hemmed in on all sides by mountains, only a small
near the water affording a camping site. This camping site is on the
of an old moraine which is well covered with small timber. If the t
ber was cleared away there would be a good-sized camping site in
admirable location for scenery. Campers are continually widening
small space by cutting down small trees for fuel and it is now a
lightful place for a camp for either outing or study.

Our camp at this lake was from July 7 to July 18, 1900. The party
ered 15 most of the time, and for a couple of days there were 23,
ding a number of distinguished visitors. The weather was perfect,
thing to stop work for the entire time.

A second visit was made in June, 1901, a month earlier than in the
ding year. A large collection of plants was made and further notes
collections of shells were taken. Dredgings were made for Ento-
traca in the lake and in the ponds to the south of the lake. As the
son was early there was much moisture. This made the material
ections more abundant but made the work more laborious.

On the north side of the lake the mountain rises abruptly to a height
ded by our aneroid as 9,200 feet, probably 200 in excess of the true
ht. On the summit abundance of snow could be seen. The lower
are moderately wooded with small red fir, while the upper heights
are jagged rocks. On these a few white-bark pine have a foothold.
Plate XXIV. On the east and south of the lake the summits are lower,
ing gradually to the south and then to the west where the ridge des-
ds almost to the level of the waters of the lake. The mountain sides
this direction are densely wooded with small trees. The western end
the lake is the only part with what might be termed open country.
the lake is dammed by a moraine which is now covered with small
e and other vegetation. This moraine extends across the ravine, which
here about a quarter of a mile in width, and down stream for nearly a
as nearly as could be determined. The present outlet is at the south-
end of the moraine. There are indications that the outlet was formerly
the other end of the moraine, next the mountain side proper. From in-
tions it would appear that the lake was formerly larger than at pres-
when the waters were dammed up, overflowing what is now the
camping place, and for some distance beyond. On the moraine the
etation is different from that at other places, indicating that the period
n the waters covered this part of the moraine is not so very far back
time. The time that has elapsed since the outbreak at the present
let has not been great. When the lake occupied this addition it was
ger, and perhaps forty or fifty feet deeper. When the water first
ted at the present outlet the cutting was rapid, as shown by the
pt and narrow declivity at the outlet, and resulted in the present
level.

By damming up the present outlet the level of the lake could be raised
t fifty feet without overflowing the moraine.

The lake is about 7,500 feet long and 2,500 feet wide. The shape
outline are readily seen from the accompanying sketch. See Fig 1.
length lies east and west. The lake is clear, cold, and deep. At 8
M., July 9, 1900, the temperature was 15 degrees Centrigrade. By
ials it was found that the white net used for collecting entomostraca
uld just be seen at a depth of 30 feet. The dark rocks on the bottom
uld be seen only at much less depth than this.

The banks of the lake are precipitous, no shoals or rocks being found.
largest shallow place is on the western end of the southern side
re a small shallow place some 300 feet long by 50 feet wide slopes

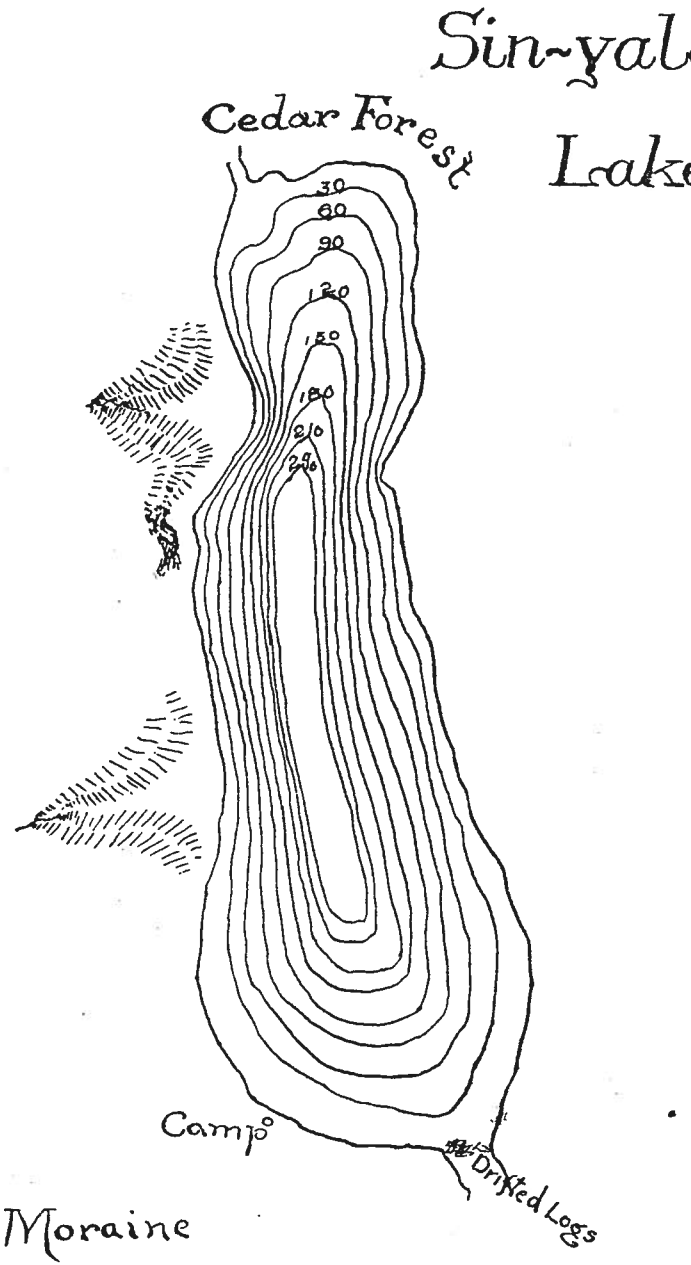

Fig. 1. Diagram, showing shape of Sinyaleamin Lake.

rom shore. At the upper end, around the inlet, there has been ding, but it has been slow. The depth a few hundred feet from was 30 feet, but it shot down rapidly to 115 feet, and finally to the deepest recorded. This depth was taken opposite the rocky ard the upper end, but a glance at the map of the lake will show ywhere deep. But a few feet off shore near camp at the southern depth taken was 165 feet.

re is but one inlet, at the upper end, draining the eastern slopes naleamin mountain and the Jocko peaks where there is abund- snow the year through. There are no small inlets save when w is melting off the hills in the spring, but there must be a underground seepage, as there is considerable water on the in sides high up that disappears before the stream reaches the

stream forming the inlet comes through a canyon from the north, amin mountain forming the western wall, one of the Jocko peaks rn. Along this creek for a quarter of a mile or so there is a owth of beautiful arbor-vitae trees, as shown in the illustration. te XXV. These continue until the canyon becomes so narrow there only for the stream, which tumbles over a cascade several hun- t high, a portion of which is shown in Plate XXVI. This cascade owed for some distance and as far as could be seen or heard the continued. Later, from the summit of the mountain, the direc- source of the stream was determined.

account of the land locked position of the lake it is seldom disturb- torms, although some strong gusts blow in from the west. The is usually calm and smooth, timber growing to the water's edge, a beautiful reflection. It appeared from indications along re that the surface of the water in the lake varied some three or , at the time of our visit being at its lowest. There is very little the lake. At the outlet there is quite a pile of old logs that have wn, but they show evidences of long submergence in the water, not in great quantity considering the timber around the lake. res are free from drift.

ridges lead up from the base to the summit of the mountain, comparatively easy ascent. The ascent of the mountain from whose altitude is 3,800 feet, was made in a day, returning very ight. We almost failed making it though within sight and hearing mp. This summit is really a long ridge, extending southeast and t, culminating in two peaks, and joined to the remainder of the the north by a low spur at the easternmost of the two peaks. north the drainage is into the main branch of Mission creek. The peak drains into the stream below Sinyaleamin lake. The s from the country to the eastward and southward, as shown in the ion, see Plate XXIII, is into Sinyaleamin lake.

the 12th of July, 1900, the ascent of Sinyaleamin mountain was The start was made before seven in the morning, three of us pre- ur loads for the ascent. The outfit consisted of a camera with loaded, a rifle, a shotgun, a botany can, provisions for a day, and

was common around the shores of the lake, and in the woods might seen woodpeckers of several species. Cabanis's woodpecker was uncommon, Batchelder's woodpecker was occasionally seen and h one pair of red-naped sapsuckers was seen for a day, the lordly pile woodpecker made announcement of his presence by his loud call and and slow pounding on the trees, while the red-shafted flicker was and heard daily. At dusk the western night hawk occasionally was in the air, while during the day, strange as it may seem, an occasi humming bird was seeking food from the various flowers about the The sharp and far-away sounding call of the western wood pewee frequently heard on the hillside. Wright's flycatcher was common timber south of the lake. The black-headed jay was not uncommon, a single curious Rocky Mountain jay was one day seen lurking ar camp. Higher up on the mountain, above 4,700 feet, Clarke's nutcr was found. In the woods adjacent to the lake the American cro was common, and pine siskins were frequently noted in the air over or occasionally were seen in camp having come for crumbs. Everyw on the reservation where observations were made the western chip sparrow was found. Around the lake Shufeldt's junco is abundant. B headed grosbeaks were not seen about the lake, but at the ponds a mil the south they were abundant. The brilliant Louisiana tanager was e where to be seen, while the handsome cedar waxwing was frequently ticed at the pond with the grosbeaks. The red-eyed vireo, warbling vi Audubon's warbler, Townsend's warbler, and Macgillivray's warbler the insect feeders noted in the trees. The Rocky Mountain creeper only occasionally seen, though the slender-billed nuthatch is comm Every walk brought to view the long-tailed chickadee. The notes of olive-backed thrush were regular features of the woods. A single of western robins were feeding the young on the nest during the sta the lake.

The region seems to be a place of resort for birds, where they c for a time and disappear, as is the case with the region as far as m concerned. Later investigations may reveal more.

CONCHOLOGY OF SINYALEAMIN LAKE.

One would expect to find an abundance of shells in and around a body of water as this lake. In this, as in many other points, the disappointment. These clear cold lakes do not offer a large supply food for such dainty feeders as shells and the supply is not abund The small alpine form, Pyramidula strigosa, var. alpina, has previously referred to as having been found near the summit of mountain. In the woods along the borders of the lake the larger P midula strigosa Gld., var. cooperi W. G. B., was taken rather abunda With the preceding P. solitaria was found in less abundance.. On few Polygyra townsendiana Lea, var. ptychophora A. D. Br., were ta These two have so far been found together, the former most abunda the latter much less so. These four land species were all that could found. In the water three more species were taken, all sparin Physa heterostropha Say was not abundant, but several large and fine specimens were taken. Now and then Planorbis trivolis was

an entire afternoon was spent at the outlet attempting to secure of these two species, and the result was not very flattering. An Illi- would produce a thousand for one. The most noticeable snail, most difficult to secure, was Limnaea emarginata, a small variety. ame species was found very abundantly in McDonald lake fifteen further to the north, and is also in Swan lake across the range east. yaleamin lake the shells are for the most part singly on stones in ttom where the water is shallow, or along the bank. They are ight in color and very conspicuous. To secure them it is neces- take a boat, row slowly where the water is shallow, and when one seen wait until the water becomes smooth and either pick it off d if not too deep, or by some other method. As there is much to determine the depth of the water on such occasions the task be- quite difficult, and the result is often a wetting. Our best suc- to take an insect net, and with this gently pull the shell off the inserting the net under the snail, thus letting the animal fall into Even this is slow work. The snails have the peculiar habit ng all holds go when anything touches them, falling to the bottom the pebbles, where it is very difficult to see them. An entire on was spent fishing for these specimens, a couple of dozen being mber secured, and many getting away. It is readily seen from this small bottle may hold the entire catch of an afternoon. Notwith- g the difficulties, the snails present many interesting points, and worth the effort. No bivalves were seen anywhere omparing these notes with the record of McDonald lake it will be hat the snail life of the two regions is very similar.

butterflies noticed were not numerous. Those seen were Colias me, Basilarchia lorquina, Vanessa milberti, and a species of Ly- These latter were collected in small places where the butterflies as close together as they could get, as many as 75 or 100 being col- in one small space. No effort was made to make a collection s or butterflies, attention being diverted in other directions, but unt of the cold water and the limited vegetation it is not likely place to seek such insects in quantity.

ENTOMOSTRACA.

dgings and surface catches were made during each day of the ten the lake. Altogether 39 vials were filled, each representing a Usually the catch represented fifty strokes of the pump. It custom to take a surface pumping, then attach ten or fifteen hose, afterwards 25 feet, then 50 or 75, then 100, afterwards could be put together, 140 feet. It was soon discovered that dur- day very few entomostraca were at or near the surface, though re always to be found late at night or early in the morning near face. To seek a solution of the problem pumpings were made ight, before daylight in the morning, and during the day. It was d that light was not suited to these animals, and that as soon as rned they sank to a depth of 25 or 30 feet, remaining until dusk, they again returned. These observations were verified later in ald lake, in Flathead lake, and Swan lake. It was found that to

McDONALD LAKE IN THE MISSION RANGE.

The road to McDonald lake from St. Ignatius Mission is good. distance is about 11 miles. Most of the distance is across the valley, the last two miles being a very stiff up grade, causing a hard when there is a load.

Camping sites at the lake are scarce, owing to the nature of the There is but one portion of the lake, the western end, free from or rocks. Most of this is densely wooded with timber and heavy brush. By fording the outlet, possible in summer when the water is a camping site sufficient for the party was found, on the bank of the in plain view of the peak, free from underbrush, and above all, in a where the cool breeze from the mountains after sundown drove awa mosquitoes, which are much of an annoyance in the region in summer. The camping site was a delightful place, and a stay of ten in 1900 was made in order to make collections, and search for species of the shell Pyramidula elrodi Pils., as well as to study the mostraca of the lake. A camp of a week in June, 1901, was made fo same general purposes. Plate XXIX gives a good view of the lake the outlet.

McDonald lake of the Mission mountains lies at the foot of McDo peak on the northwest. Like Sinyaleamin lake, it is hemmed in o sides except the west by mountains, save that they are much hi more picturesque, and steeper. The lake was named McDonald bac the sixties, and according to priority the name should easily displace given to Terry lake, also called McDonald, which lies northeast of K pell.

The valley enclosed by the peaks, in which the lake now is, has carved out by a glacier, or more properly by glaciers, as there were doubtedly several uniting to form the main glacier which flowed dow valley. Remnants of these glaciers are yet seen on the mountains, t being three on McDonald peak, one in plain sight from almost any on the lake. The rocks along the lake have been ground smooth, show plainly the marks of the ice. At the outlet of the canyon a moraine has been made, though not so advantageously situated for ming the water as at Sinyaleamin lake. But the water ha time past evidently been much deeper that it now is. The rock o north is fast disintegrating, and is filling up the lake with red mud ooze. At the upper end is a wooded valley which formerly must been a part of the lake. The filling in has drained this part of the the remainder of the lake not yet being filled up. The present la therefore but a part of what it was formerly.

The lake is smaller than Sinyaleamin lake and not nearly so d It is a mile to a mile and a quarter long, the average width being than a quarter of a mile. On either side the mountains come abr to the water, as may be seen in the illustration given, Plate XXIX. has been stated, there is a valley at the upper end, so far unexplo and densely wooded with arbor-vitae, several species of fir, white red birch, and other smaller shrubs. The inlet divides above the l one branch receiving water from the glacier visible, the other bri

ter from the amphitheater toward the east, which has for drainage the peaks visible, but also the eastern slopes of McDonald peak. eral view of the upper end is shown in Plate XXX.

bottom of the lake is comparatively level and from the mud bottom the impression is gained that the lake is either older than leamin or has filled up much faster. The depth from end to end uniform, the deepest being eighty-four feet. The lower end is , the outlet being crossed by a ford, hub deep in July. There is erable shallow water. The mud at the bottom is of a reddish apparently from the decomposition of the rock on the north shore. point near the middle a ledge of rocks projects from either side, the lake at this point quite narrow. The ledge is precipitous, the water a few feet from the rocks is deep. These stones are worn by glaciation, and show deep and numerous glacial scratches.

the north, to the left in the illustration, Plate XXIX, the rocks ry steep for about 2,000 feet. Shale and cliffs alternate. By hard work one can reach the top of the talus. Above is a mass of itous rock, not to be ascended from this side. Four waterfalls, small streams, tumble over the rocks. The waters disappears in oose talus at the base long before it reaches the lake. The south pe is not so abrupt. Large masses of loose talus, with large boul- line the water's edge, making a loose and spongy surface for the tion of moisture.

life in and around the lake is not abundant. There are few frogs, probably no snakes, as but one of the former was seen during the ten and none of the latter. On the rocks at the water's edge, altitude feet, several pika, Lagomys princeps, were killed. This is the lowest known to the writer at which these peculiar animals have been They are abundant on the peak at 8,000 feet and over, but none taken, owing to the difficulties in getting them when killed among the at these high altitudes. The banks of the lake are so steep and that it is all but impossible to climb along. Almost an entire after- was spent in going the length of the lake a few hundred feet from ater's edge. An exploration will probably show great possibility creasing the size of the lake by overflowing the valley at the upper if it shall ever become a necessity to use this lake as a reservoir site. On the northern side the timber is not so dense, owing to the nature rocks. The banks are steep, and the cliffs afford poor hold for the of trees which have not gained much headway. On the mountain the precipitous rocks the timber is quite heavy, being largely of yel- ine and fir. The southern bank is well wooded. The canyon at the of the lake is densely wooded, through which there does not appear an entrance made by road or trail. At the outlet and along the ine near the lake there is fine timber, some of which has been cut ails and lumber. Everywhere there is much underbrush, making ess difficult.

The road to the lake is good, considering it is a mountain road. is some travel over it. The lake is a great resort for the and those who visit the reservation, on account of the excellent

fishing and beautiful scenery. There is no drift around the shores, of the drift having lodged in the outlet. Here there is a quite a jam.

CONCHOLOGY OF McDONALD LAKE.

Search was made daily for shells. In the waters there were in numbers of a new variety of Limnaea emarginata Say, described in tilus, Vol. XV,* as var. montana. This is the same shell that was viously taken in Sinyaleamin lake with so much labor, and was more aboundant in McDonald like than in Sinyaleamin. Along rocks in the middle of the lake they were taken in considerable numb and at the outlet others were taken among the grass and weeds in shallow water. This species seems to relate emarginata to stagn some of the shells showing the malleations of stagnalis q plainly. Placed side by side they have many points in comm but are very much smaller than the variety appressa of stagnalis ta in western Montana.

Physa ampullacea Gld. was found sparingly, not so abundant as Sinyaleamin lake. Strange to say, not a single specimen of Planor was seen. Planorbis seems to be a warm water species, and while a f were taken at Sinyaleamin lake, they were very scarce, and the taken were small and badly broken. In the small ponds and lakes in valley to the west of the Mission range Planorbis trivolvis is exceedi abundant, and in the small lakes or ponds of glacial origin along F head lake these shells are found in great numbers.

Among the underbrush at the lower end of the lake Pyramidula gosa var. Cooperi was found in large numbers, as also P. solitaria These two species have been considered distinct heretofore. A la series of several hundred was assorted with the attempt to make t species. The most widely different were easily separated, but by t process of elimination those remaining were more and more diffic to place in one species or the other, and the last remaining could ap ently go as easily in one pile as the other. From external appearan it seems difficult to distinguish some of those found at this lake as longing to either the one or the other species. The two were found the same locality, were picked up together, and were placed in the sa receptacle. It was impossible to do anything toward working out histories, and internal anatomy may reveal differences that exter anatomy does not disclose. But as descriptions of shells are larg based on external anatomy it is doubtful if these two species are distin It may be well to note here that all the shells taken so far at the up end of Flathead lake are var. cooperi, none having been taken that co be called solitaria.

Having found a very small variety of the shell Pyramidula striga called alpina, at high altitude on Sinyaleamin mountain. it was thoug the same shell might be found on the heights of McDonald peak. A sh description of the trip in search for this shell is given in the succeedi pages. Sinyaleamin mountain is almost due south of McDonald p in the same range, the distance between the two peaks in air line bei

* Nautilus, Vol. XV., p. 111.

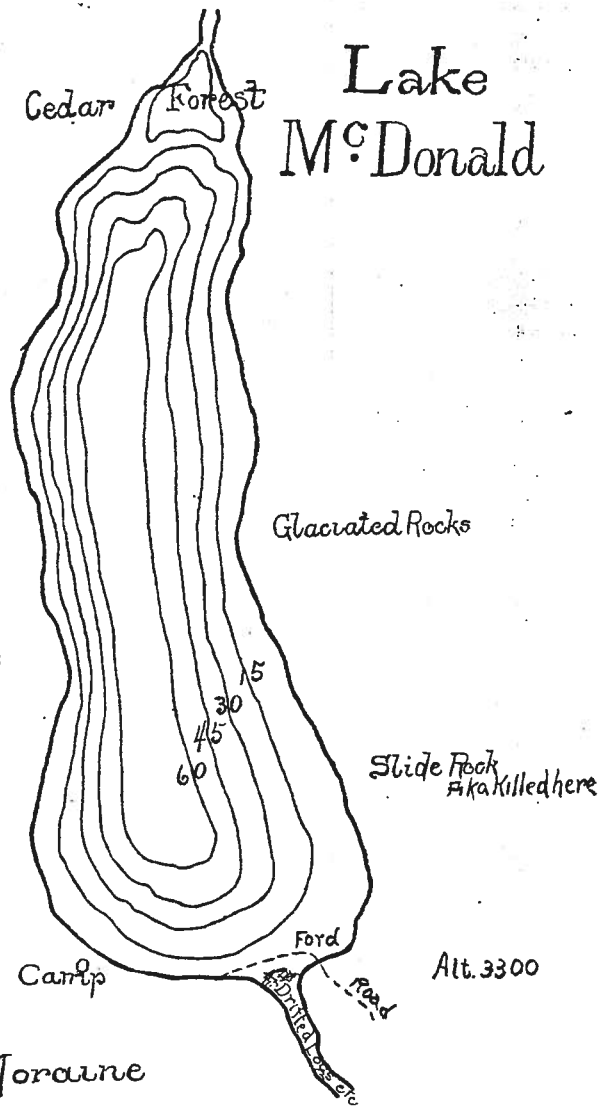

Fig. 2. Diagram of McDonald Lake, showing contour, depth and shore characteristics.

The snow mass behind the spur to the left in Plate XXXV. flows into small and beautiful lake, Leash lake. This lake is said by those who have seen it to be of surpassing beauty, usually full of snow, and visible only when almost upon it, so well is it hidden in the cliffs. The water entering the lake flows down the side of McDonald northward. After leaving Leash lake the water flows west, coming down and joining the stream from Teton on the north and the stream from the west glacier of McDonald.

Post creek, the outlet of McDonald lake, on the 30th of June, 1[illegible] carried 473 second feet of water. The place at which the water was measured was some miles down creek from the lake, at a lower elevation than the lake by a thousand feet, and with considerable loss between place of measurement and lake through irrigation.

The Mission Valley.

This beautiful valley is bordered by the Mission mountains on the [illegible] the Jocko river on the south, the Pend d'Oreille river on the west, [illegible]head lake on the north. The extreme length is about 35 miles, the [illegible]eme width about 15 miles. A terminal moraine separates the lake [illegible] the valley, bordering the lake on the southern end. The country [illegible]diately south of the moraine for a distance of ten miles is beautiful. [illegible] level land, rich, capable of making good farms, easily irrigated. A [illegible] sand dune stretches across the valley about 15 miles from the lake, [illegible]ding east and west. The eastern end is free sand, is not yet held [illegible]ce by vegetation, and is slowly creeping eastward. The free and [illegible]able sand is 12 to 15 feet high, clean looking and white. Some eight [illegible] miles from this free sand westward one comes to the Pend d'Oreille [illegible]. The country abounds with depressions and coulees, with several [illegible] buttes from 100 to 200 feet high. It is in this region that the [illegible]alo herd ranges.

The valley is crossed by four large creeks, as follows: Mission creek [illegible]e most southern. It takes its source in two canons, one the outlet of [illegible]yaleamin lake, the other Mission creek proper, with its high [illegible], visible for miles on the plain. Sinyaleamin lake receives [illegible]ater from the eastern slopes of the mountains, principally from Snow [illegible], which is full of slush snow even in July. The stream leaving Snow [illegible] tumbles over a beautiful cascade just before it enters the lake. The [illegible] is described elsewhere. The stream from this lake joins Mission [illegible]k proper a short distance from St. Ignatius Mission. A third and [illegible]aller branch emerges from the canon between Mission canon and Mc-[illegible]ald lake. This branch takes its rise in two small and beautiful alpine [illegible], Twin lakes, lying high up in the mountains, fed by melting snows. [illegible]cept in early spring this water is consumed in irrigation. Mission creek [illegible]rs a little to the north of west, receiving Post creek a few miles west [illegible]he Mission, finally flowing into the Pend d'Oreille river, Mission [illegible]k may be located by examination of Plate XIX. Post creek is the [illegible]let of McDonald lake, which receives most of its waters from the [illegible]pes of McDonald peak. The creek forming the inlet of the lake has [illegible] forks, one taking the waters from McDonald peak, the other from the [illegible]ks immediately to the north. This northern branch flows through [illegible] small lakes, and has some beautiful cascades, seen plainly from Mc-[illegible]ald peak. Neither of these branches is known save for a very short [illegible]tance from the lake. Post creek flows southwest into Mission creek [illegible] previously mentioned. Crow creek takes its rise in the mountains [illegible] farther to the north, in the canon through which runs the Crow creek [illegible]l. This trail is the Indian route across the range to the Swan river [illegible] Big Blackfoot river country. As it crosses the range at a high altitude [illegible]s passable only in summer, and is the only passageway between the [illegible]ko river and the northern end of the Mission range. The creek flows [illegible]ttle south of west, receiving Mud creek near the sand dune previously [illegible]tioned, and flowing into the Pend d'Oreille river. It is a large creek,

clear of brush, a famous fishing resort. Mud creek rises in the c... near the southern arm of the lake, flows south of west, receives the w... from Ronan Springs, passes the edge of the sand dune, and enters ... creek a couple of miles from the dune. It is not a large creek, but ... gates several farms. A fair sized stream reaches Crow creek. From ... sand dune to the lake is 15 miles. The land is level, and no streams ... it.

ORNITHOLOGY OF MISSION VALLEY.

The country between Crow creek and Post creek is full of pot h... of varying sizes and depths, containing water all summer. Hund... of these small ponds may be seen from elevation on ... mountains, the larger ones lying near the mountains. T... pot holes abound in entomostracan and insect life, prolific in ... tity rather than species. Thousands of frogs line the banks all sum... and garter snakes, feeding on the frogs, are numerous, large and ... In the grass and reed bordered ponds water fowls breed and rear th... young. In the fall large numbers of migrant water birds stop at t... ponds, making an ideal field for the hunter and sportsman. In July ... most abundant water fowl found with young was the American Gold... Eye, Glaucionetta clangula, var. Americana, taken at several places. ... camp of several days was made at Crow creek in July, 1900. Th... years previously a camp of several days was made near the same pl... In the creek three species of case worms were found. A quar... bivalve shells, Margaritana margaritifera were taken in the sandy sh... Several other species of shells were found, Planorbis trivolvis, Lim... palustris, a Physa, Polygyra townsendiana, var. Ptycophora, Pyram... solitaria, and P. strigosa, var. Cooperi. Dragonflies were not nu... ous. Aeschna contsricta was seen everywhere. Sympetrum obtr... was abundant; indeed, it is the most common dragonfly in west... Montana, and is easily captured. Around one of the ponds near ... creek Sympetrum (Diplax) madida was common. They were wary, ... and hard to catch. Two hours of hard work resulted in only about ... dozen. Lestes unquiculata was the most abundant. Hundreds c... easily have been captured had they been wanted. A few Amphiag... saucium and Ischnura were taken, making a total list of Odonata ... tured on the plain. In the stagnant water many Ostracoda were ... cured. Butterflies were not abundant. One catch of nearly a hund... Brenthids was very satisfactory. These were nearly always taken o... blue aster. Colias eurytheme, brilliant orange, were found in the gr... flats. Pieris protodice was not uncommon. A Grapta was occasion... seen. Among the shrubbery Satyrus alope, var. olympus was often seen. ... single male Argynnis leto was captured. Several Argynnis aphro... were among the captured. A single Lycaena, a few skippers, a Th... and a Chrysophanus, made the remainder of the list. Except along ... creek and around the ponds there is no collecting.

Birds in the valley are interesting, and around the water are abu... ant. The list of the ornithologist shows 43 species. Many of these ... quite abundant. The few days spent here were fully occupied by ... ornithologists, and over 60 skins was the result of their earnest ...

...ere all prepared in rolled zinc holders to keep their shape until ...uld dry. In the few wheat fields several flocks of sharp-tailed ... were flushed. Western meadow larks were everywhere abund... A few mourning doves, Zenaida macroura, were found around the ...fields. Solitary sandpipers, Totanus solitarius, were along the ... In the bushes catbirds, Galeoscoptes carolinensis, blackbirds, ...ophagus cyanocephalus, yellow warblers, Dendroica aestiva, Audu... warbler D. auduboni, flycatchers and others were always to be seen. ...trees were black-headed grosbeaks, Habia melanocephala, and ...peckers, Lewis', Melanerpes torquatus, and Harris', Dryobates villo...sarisi. It was a pleasure to sit in camp and listen to the notes of the ...ous species of birds. Over twenty were counted the first fore... camp, either by sight or by note. The total number seen during ... days at Crow creek is 43. Remembering that the creek forms ...narrow belt of vegetation in the valley, with dry plain and little ...tation on either side, this number is quite large.

GLACIAL ACTION.

...Mission valley is undoubtedly glaciated. Between Crow creek and ...creek, the valley contains many potholes, depressions in the surface ...catch and hold water during the rainy season. At the lower end ... valley, near St. Ignatius Mission, large boulders lie high on the ...while there are ridges and valleys plainly morainal. The valley and ...ain range are worthy of careful study, and will repay the person ...makes the study.

...The southern end of Mission valley has a much larger moraine than ...at the foot of Flathead lake, mentioned in succeeding pages. It ...ds from the mountains on the east westward as far as Plains on the ...ern Pacific. It may extend farther as the writer has not been ... the ground. The morainal matter in the vicinity of St. Ignatius ...hills several hundred feet high.* The height of these above this ... has not been determined, but it is certainly more than 500 feet. ... up on these hills large boulders have been left stranded. The ...nal matter here is badly broken and cut. The hills show plainly ...esence of water in former times, beach marks being plainly visible ... a long distance.

...The entire Mission valley is made from glacial material, with high ...nal deposit at both the northern and southern ends. The glacial ...extends many miles westward. It has not been followed, and the ...ster of the soil cannot be given. The Pend d'Oreille river has cut ... channel through this valley, removing the glacial drift to bed ... Whether this river drained the lake formerly covering Mission ... is for geologists to determine.

...No doubt some of this material came from the Mission range. The ...of it could not have done so. The Mission range extends north and ... The canyons opening into the valley open westward. In front ...h of the larger canyons is a small morainal dam, extending generally ...north to south, or parallel with the range. The large moraines pre-

*It is possible the morainal deposit may be on a foothill, covering ...ock.

500. Now, there are large tracts of land leased annually for small ... to large cattle dealers. There are large tracts in Indian reserv... which can be utilized for some such purpose more legitimately t... lease to cattle men for stock. If a tract of land containing from 50 ... square miles were set apart for this particular use, with an appr... tion at the beginning of $15,000, and an annual appropriation of ... there certainly should be no difficulty whatever in developing a her... a small beginning to one that would be a credit to the nation.

The government and care of the herd should be placed unde... jurisdiction of the Biological Survey of the Department of Agricu... The men in the Survey are keenly alive to the importance of an ac... to save the buffalo from extinctin, and may be relied on to look aft... animals as carefuily as they are looked after in any zoological park...

It is hardly to be expected that the animals will thrive in the Y... stone Park, where the winters are long and severe, the summers shor... concentrated, and where protection is likewise afforded to the wild ... mals which prey upon the calves. The buffalo, unlike the deer and ... seems to remain in a limited territory. If they are to thrive and ... tiply, they must be looked after and cared for. With a range in M... tana, Idaho, Arizona or New Mexico as mentioned above, with a ... herd under care of the Biological Survey of the Gvernment, a small ... propriation will, with proper handling, produce a large herd in ... or twenty years.

It is to be hoped that the recent small appropriation made by con... for the preservation of the buffalo will be sufficient to protect it ... extinction. It is doubtful, however, whether they will ever thrive in ... Yellowstone Park without much care in the winter. A lower alti... with less snow and longer summer, similar to that of the Flathead In... Reservation, will insure the safety of the herd with small amount o... tention and expense.

Flathead Lake.

...following report of the lake was prepared by Fred. D. Smith, ... Professor of Chemistry and Geology at the University of Mon... mining engineer at Sumpter, Oregon. The paper was prepared ... was connected with the University, after he had made an ex... trip around the lake and over a large portion of the country ad...

... lake occupies the lower portions of an immense valley that ... from a low range of hills along the Jocko river northward across ...tish Columbia line, and which has a total length of over 100 miles. ... Plains on the north are a part of this valley though separated ...ission valley by a low range of hills. This larger valley may be con... made up of three smaller ones, viz: Mission, south of Flathead ... Flathead, north of the lake, and Tobacco Plains still farther north. ...ion valley has a general elevation of from 100 to 250 feet above the ...el and a length of about 35 miles north and south with a width of ... to 10 miles. Flathead valley has a slight elevation of from 20 to ... above the lake and is much more regular in its surface contour ... width. Its length is about 40 miles and the width 8 to 10 miles. ...wo valleys are the more important in this discussion as each illus... geological process bearing on the history of the lake. (The lower ... of Flathead valley may be studied from Plate XXXVII.)

... present lake is the remnant of the much larger lake that occu... valleys in Tertiary times, as shown by the lake beds in both ... as well as in the valley through which the Jocko river flows. As ...le, if any, investigating for vertebrate fossils has been done in ...eds though it is probable that they are of the same age as those ... creek and Madison valley studied by E. Douglass.

...ssion valley and the lake are bordered on the eastern side by the ... mountains, a range which rises abruptly from the plains to great ... These mountains, with a very steep western slope, have their ... within relatively short distances from the valley and consequently ...eams therefrom are neither large nor of great volume in discharge. ...other hand the eastern slopes of the mountains are long and grad... furnishing a larger drainage area to the Swan river and Black... butaries which receive the waters. This range, as such, appears to ...ate at a point near the upper end of the lake where the Swan river, ...ing its course from northward to west and south westward, flows ...Flathead lake. Another range, the Swan range of the Kootenais, ... 13 miles to the N. E. continues to be the border of Flathead valley ...manner similar to that of Mission range just explained.

...The history of these valleys or of the one larger valley, when all are ...dered as one, is very interesting. The Mission mountain range was ...d by a fault, having a general direction of north and south, with a

Pass it would be to a stream leading into Clarke's Fork through Miss
where it has not been seen.

It is hoped soon to make an expedition to the headwaters of the
Blackfoot and Swan rivers, when the question may be settled.

Few water birds were seen on the lake. It does not seem to h
favorite resort for them. Although there are several species of
they do not seem to thrive in the warm waters of the lake. It is
sible later investigations may show this to be a good breeding place
Entomostraca are quite abundant. Other forms of animal life, such
larval Diptera and Odonata, leeches and worms have not been determi
except in case of adult dragonflies.

Plate XLIV is a good view of this very interesting lake. The
tograph was made from the bridge at the outlet. The
is northeast, up the lake. In the foreground is a bed of pond
Rushes almost choke the stream. The dense vegetation along the
line is plainly discernible. The wooded valley is a great shelter
white-tailed deer. During ten days stay in the region not a day pa
without some one of the party either seeing or hearing an animal.
are abundant in the hills.

In the hills east of the lake mountain goats are reported. In fo
years an occasional moose is said to have reached this region, though
are now seen. Their spoor is found in the mountains shown in the
ground. Elk and black-tailed or mule deer were also formerly take
this region. The former are no longer seen, and the latter only
sionally. But the white-tailed or Virginia deer roams the forests
summer from the settlements to the summits of the range, altitude
feet. They have been seen on the snow banks almost at the sum
They are fond of lying in the open places on the high ridges in sum
Here they escape in part from their worst enemies, the flies. Fo
abundant. They bask in the sun, rarely disturbed by man.

It was stated that the borders of Rost lake contained many spha
bogs, mud holes and swamps. In July we traveled miles of meadow
bogs with scarcely a dry knoll during the entire distance. In
marshes, which are no doubt deep in early spring, there must be an
ance of smaller life.

Among the interesting features presented by a brief stay at this
was the information that all the deer were badly infested by a liver
Numerous reports came regarding the "bloodsuckers" that were
liver of every deer, etc. Coming from reliable sources these
could not be denied. The first specimen examined after hearing
reports had two large flukes encysted in the liver. Old residents
the statement that "when you kill a big old buck in the fall, take
liver and shake it, it is so rotten with blooksuckers it falls to
The life hisory of this fluke will be an interesting study for some
From the shells thus far found the early stages are likely to be
Physa, although Planorbis trivolvis should be present in the region.

Next to Daphnia pond Rost lake has greatest interest for stude
the Biological Station.

Echo Lake.

interesting lake lies close to the Swan range of the Kootenai
ains, between the Swan range and Flathead river. It is but eight
miles from the Biological Station.

outline of the lake is very irregular. From the mountain tops
tline very much resembles the letter H, with small projections in
directions. This may be studied from examination of Plate
. The total shore line of the lake, including all the arms, is said
from 12 to 14 miles. The width varies from a half mile to a narrow

depth is said to be great at the eastern arm, the head of the lake,
soundings showed less than 20 feet.

lake has no surface outlet. The waters are held in by glacial
evidently a portion of a moraine. The waters escape through
derground outlet, finally reaching Flathead river, though just where
tlet is or how far it extends underground is not yet known.
ry recent, or present connection with some large body of water is
ed by the presence of at least four species of fish, the squawfish,
chellus oregonensis, Rich., whitefish, Corregonus williamsoni,
minnow, Leuciscus, probably gilli, and trout. Salmo mykiss. It is
have suckers, Catostomus, also. A very large spring is reported
distance from the lake on the west, but it has not yet been ex-

lake has an annual rise of from five to seven feet, the waters fill-
with the melting of snow in the spring and summer, reaching the
e again late in the fall or early in the winter. The drainage is
small portion of the west slope of the Swan range, and a small
of the timbered valley adjacent to the waters of the lake.

lake lies in a trough or depression in the wooded valley. Its
are steep slopes, leading up to the valley plain, densely wooded
tamarack, lodgepole pine, yellow pine, and an occasional white
Maple, alder, cottonwood and birch are present, but less numerous.
the year 1894 the surface of the lake rose during the freshet to a
me ten or twelve feet above its usual height, and has remained
since. This elevation of water surface, and consequent sub-
ce of land, appears to be due not to the submergence by sinking
surface, but to filling up the underground outlet, preventing the
from escaping. This additional depth of water has drowned con-
le vegetation, and in one case has submerged a meadow of sev-
es, including house, barn, and fences, the lake water covering
pth of several feet what was formerly a meadow and garden. The
se at present has the water half way up the door, whereas pre-
to the rise it was on the bank of a creek emptying into the lake.
was formerly the mouth of the creek, and for a quarter of a mile
is now a part of the lake. This is plainly shown in Plate XLII.
idge in the illustration formerly spanned the creek. The water
lake.

photograph was taken during the summer of 1901. In 1902 a

Swan Lake.

From Swan lake to the Mission mountains westward the di
tance is perhaps not more than six miles. It lies in a direction north a
south, parallel with Flathead lake. It was evidently formed by the sa
geological method, faulting, the western half of the uplift of the Sw
range falling after the upheaval, thus making the valley between th
Swan and mission ranges, in which Swan lake lies.

From the laboratory at the outlet of Swan river to Swan lake is p
haps eight miles. The road winds through the forests and along t
river, mostly through unfenced country, scarcely touched by the hand
man. There are a few houses along the road, several more between t
road and the mountains to the west. The timber close to the road
mostly lodge pole pine, Pinus Murrayana, Engl., and Douglas spru
Pseudotsuga mucronata, Raf. Occasionally in the smaller timber the
rises the tall trunk of a monster tamarack or yellow pine, showing th
in days gone by a different forest growth covered the country. Toward
the Mission range there is considerable low and swampy land, apparent
the remains of a portion of the old lake before mentioned, where is to
found an abundant growth of arbor-vitae, or white cedar, Thuja plica
Don. Some of the mountain spurs have a dense growth of young timb
of this species, so thick that the sun scarcely strikes the ground thro
the foliage, and where underbrush and other vegetation are entirely wa
ing. In passing through such timber one is continually squeezing b
tween small trunks, often no thicker than one's arm, breaking limbs
make a passage, with nothing but dead leaves underfoot. It is impossi
to see out in any direction. One must follow the compass, not know
whether before there is a lake, a swamp, a steep slope, or open woo

While exploring a portion of this region we came upon some blazed
the trees. At first these were supposed to be the marks of the surv
ors. The compass showed them to be out of line with the direct
which surveyors would take, and the question then was as to what t
blazes would mean. It was decided to follow them up the mountain s
through the dense timber. The way wandered much through the woo
apparently taking an uncertain direction. They were certainly made
some one who was undecided as to his bearings. They fianally led up
mountain side to a tree well cut, barked almost around the trunk. Fr
indications it was decided that some hunter a few years before had kil
an animal at this spot, and had blazed his way out in order to be abl
return for his game.

On this same trip, leaving the blazed trail before mentioned, we to
the direction of the compass southeast, wishing to come out at a h
reported to lie between the river and the Mission mountains, a h
north of Swan lake. The timber was very thick, and a view impossib
Following down a ridge which we had been ascending for some time, w
came in sight of a small lake, covering but a few acres, lying in a poc
between two steep slopes. As we descended to the lake shore a pa

en-eye ducks started in affright. A kingfisher noisily resented our
sion, perhaps the first for a long time. A flicker called from a near-
ree, and drummed loudly. Otherwise the woods seemed to be silent.
lake was almost choked by hydrophytic vegetation. The waters
of a beautiful blue color, causing exclamations of surprise and de-
. We were not prepared to make examination of the water.

The ridge proved to be morainal, as shown by the rounded pebbles
stranded boulders on the surface. It continues to the lake, as we
rwards discovered, cutting the lake in twain, really making the lake
ke. This body of water is perhaps a mile or more across, some-
elliptical in outline, timbered to the edge, and unexplored. The
cutting the lake in two meets the waters of the lake approximatly
middle, extending from side to side of the lake. The morainal
extends almost due east and west, The ridge is sharp and steep,
at the same time narrow. On the summit the distance across is but
w feet. In height it is perhaps a hundred feet above the water. It
ell wooded with small timber. On the north the trees are arbor-vitae,
the south Douglas spruce. It is a place where the sharpest line yet
served is drawn between forest growth of two different species, show-
plainly how slight differences in location may make sufficient differ-
to give one species an advantage over the other. The southern
of the sharp ridge faces the sun, is dry, and supports Douglas spruce.
north slope holds more moisture, gets much less sun, better suited to
growth of cedar.

A portion of this lake to the north has receded so as to uncover the
nd, leaving a marshy meadow on which native hay grows in abund-
. This is cut by thrifty ranchers for winter use. The lake is not
ed, is little known, and biologically is unexplored. As our trip on
occasion was hasty and merely for preliminary purposes no attempt
made to collect material. Indeed, it was late when we returned home
this hasty reconoissance, much as we desired to make more care-
examination. That must be left for future years.

On the ridge between the two portions of the lake a place was noticed
re the grass and other vegetation was apparently trampled and
ed down as though a conflict had taken place. At first it was taken
the bed of a deer, but there was a marked difference in appearance
een this and the ordinary deer bed. Examination disclosd the
ed skeleton of a porcupine, yet covered by portions of skin, and
dantly protected by long quills. The fight had taken place at the
of a fir tree. Evidently the porcupine had just descended from the
when he was seized by an enemy, probably a wolf.

long the bank of the old lake referred to as meadow was found
partly decayed skeleton of a fine white-tailed buck. He had a large
of antlers, which were still covered with velvet. His death can
be conjectured, but must no doubt be referred to the hunter. Un-
unately his antlers were badly eaten by rodents, hence they were
ess. On the border of the meadow a fine buck was rousd from his
day slumbers. The timber was dense, and the first bound put him
ind such a mass of tree trunks as to make a shot impossible. Up in

and cool. Fishing is good. Mountain climbing may be indulged in almost any extent. The lower peaks near the lake may be scaled the mountaineer may go south a few miles and find summits reaching 10.000 feet. The region is a bontanist's paradise. In the swamp entomologist will find a rich field. No doubt many new species a the collector. Artists may find ample scope for the brush, and the w brain may find a haven of almost complete rest if such is desired.

The Swan Range of the Kootenai Mountains.

Several excursions have been made into the Swan range in different In 1901, Dr. MacDougal, Mr. Harris, Mr. Ricker, Mr. Silloway and writer shouldered packs and started over the trail to Haystack. We ed along the south face of this about third way up, and northeast to way mountain. The second day Mr. Ricker and Mr. Silloway return- camp. The remaining three passed entirely around the head of creek, ascended Craig mountain, followed its long ridge to the north- nd, and descended through the woods to camp the third day without p.

The trail thinned out and disappeared early in the day. The slope steep. The blazing July sun on the south side of the mountain was ering hot. The way was almost barred by dense growth of rock e, alder, mountain ash, New Jersey tea and Menziesii scrub. This th was bent downward by many heavy and sliding snows. In its to straighten the shrubby vegetation had become a tangled mass, dingly difficult to penetrate.

From nine in the morning, when this scrub growth was first en- tered, until six in the evening we worried through this dense and ed shrubbery. Excessive thirst drove us to a descent to the creek this time, as our canteens were long since empty. After a cool and shing draught the brush was again entered. It was worse than ever. s impossible to see more than a few feet ahead, and it was often sary to crawl on hands and knees to get through. Most of the the head man was poking his gun between bent bushes with one hand with the other trying to force the stems apart so as to slip through. ourse the others followed. The lead man was soon tired out with threshing round he received and was relieved by another, and so on. s the most trying, soul stirring, temper distracting and abominable the writer has ever had the bad fortune to be in. Guns, packs, other paraphernalia made progress so slow as to be very dishearten- Some of the boys wanted to stop and sleep on the brush. But pushed on. About nine in the evening we stopped on a large flat fifty feet above the stream, and 1,600 feet below the ridge we d to reach by night. So tired were we that we threw ourselves to rest without removing the packs. After a meal remembered by the abundance or variety of food, but by the fact that it was very we crawled into our sleeping bags around the campfire for a 's rest.

The next morning we were off before half past six. The slope was , and smoothed annually by spring avalanches. We reached the summit at 9, prospected the three ridges to the mountain, as also lake. As stated, two of the party returned from here to camp. The three followed the ridge southward, skirted Actomys on the west, ed over some rocky cliffs into the pass of faulted rock between Arc- and Craig, spending the night between huge snowbanks. Our

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