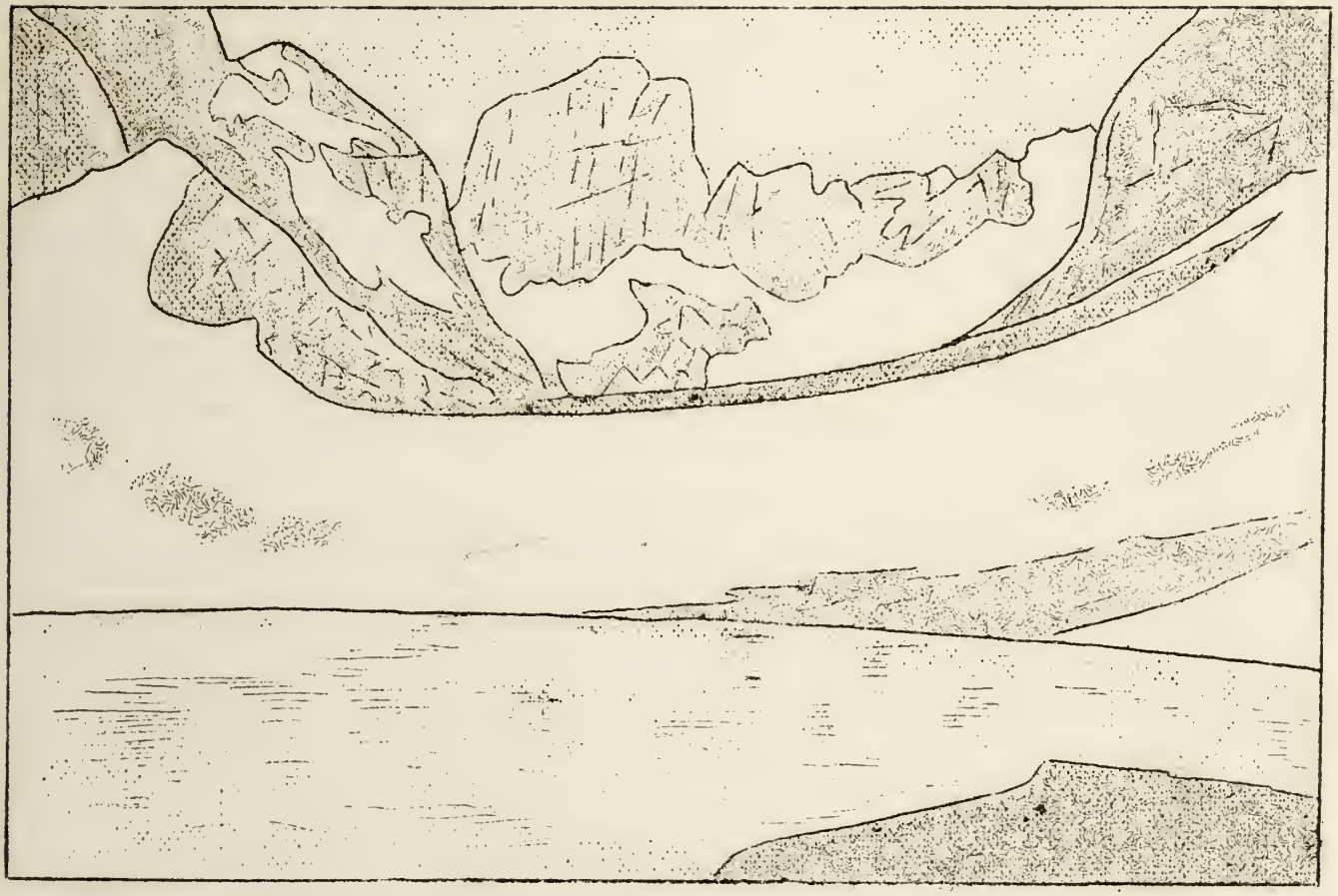
NATURE NOTES



RAMSHEAD LAKE AND ROCK OF AGES from a photo by Harrison R. Crandall

Grand Teton National Park

Vol. II No. 4 Autumn 1936

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
GRAND TETON NATIONAL PARK
MOOSE, WYOMING

GRAND TETON NATURE NOTES

Vol. II | Autumn, 1936 | No. 4

Grand Teton Nature Notes is issued quarterly to supply information about the history and natural features of this park. The bulletin is distributed free of charge to educational institutions and organizations and to interested individuals. The material contained in Nature Notes may be freely used by newspapers and other publications provided acknowledgement is made to Nature Notes, Grand Teton National Park, and to the writer of the article.

Thomas E. Whitcraft
Superintendent

Howard R. Stagner
Junior Park Naturalist

With this issue of Nature Notes, Grand Teton National Park welcomes Thomas E. Whitcraft as Superintendent. Mr. Whitcraft comes to Grand Teton National Park from Glacier National Park where, for the past three years, he has held the responsible position of Chief Ranger. Mr. and Mrs. Whitcraft and daughter are now established in their new home, and the park personnel anticipates with much pleasure future associations with the new arrivals.

Mr. Guy B. Edwards, former Superintendent of Grand Teton National Park, has accepted a transfer to Boulder City, Nevada where he will become Supervisor of the newly established Boulder Dam National Recreational Area. Under the National Park Service this area will be developed for wildlife conservation, educational activities and recreational use.

To the Whitcrafts we extend a cordial welcome to Grand Teton National Park, and to Mr. Whitcraft and Mr. Edwards go our heartiest congratulations and best wishes in their new assignments.

THE GEOLOGICAL HISTORY OF THE TETON RANGE, A SUMMARY.

by Howard R. Stagner

How were the Tetons formed? Why does this mountain range have such an abrupt, precipitous eastern front? How were the deep, cliff-bound canons formed? What is the explanation of the conspicuous black dike that appears on the eastern slopes of Mount Moran? These are but a few of the many questions that thrust themselves before the attention of the visitor to Grand Teton National Park. An understanding and the full appreciation of these wonders of Nature demands a knowledge of the events that have occurred in this area during the geologic past.

The limited size of Nature Notes precludes the telling of the geological story in one or in a number of issues. In order to treat the story in the detail necessary to give a true conception of the geological story of the range it will be necessary to relate each phase of the story and each episodeseparately in different issues of this bulletin. An attempt shall be made to make each episode complete in itself, but each will form a part of a series that will tell the story of the geology of the Tetons as far as it is now known.

With this purpose in mind, an effort has been made in the following account to summarize and to date the major events of Teton geological history. The reader of future articles can, perhaps, by reference to the following, better understand the more detailed descriptions in their relation to the complete story.

I. An Ancient Landscape

Looking backward in geologic time, the duration of which is as impossible of human conception as is the extent of astronomic space, one can see but the most indistinct suggestions of the beginnings of the earth and of its earliest history. Many events certainly took place- volcanic eruptions, earth movements, atmospheric and climatic changes, the beginnings of life- events of which the rocks bear very little record that can be recognized and interpreted.

After assigning these vague things to the unknown geologic past, we come to a time when it is known that no mountains such as are now so prominent in the Rocky Mountain region, existed. In place of high mountains and mountain-girt basins, western United States was a low subdued land, presenting a landscape of low hills, shallow valleys and gently rolling plains. The relief was low and the average elevation was but little above sea level. The most ancient of rocks composed this land. These were chiefly the metamorphic rocks gneiss and schist into which granites, pegmatites, diorites and other igneous rocks had been intruded.

II The Ancient Sea-

At the time when our known geological story begins, this ancient land was subsiding along broad, elongated areas to permit the waters of the oceans to flood these portions of the continent. At various times such continental seas extended from Lower California northward and northeastward across western United States to connect with similar seas coming from the Arctic regions,

Other invasions of the seas began in the Gulf of Mexico area and connected across the Rocky Mountain area with the Arctic seas. Many times the seas advanced and retreated over the Rocky Mountain region, and many times the Grand Teton area and surrounding areas were alternately covered by the seas and exposed as dry land.

Rivers, flowing from neighboring highlands, brought millions of tons of sand, silt and limy ooze into the seasand millions of plants and animals of the seas, upon dying, left their calcareous hard parts to add to the material accumulating on the sea floor. All of this material was distributed in nearly horizontal layers on the floor of the sea. During the time since then, pressure and natural cements have hardened these deposits to form the sedimentary rocks sandstone, shale and limestone. The total thickness of sedimentary rocks in the Grand Teton region is in excess of 6,000 feet.

Occasionally plants and animals which inhabited the seas or the land were buried with the sediments in such a manner that they were preserved in the rocks as fossils.

III. The Building of the Mountain Highlands

Finally the continent emerged permanently from the seas, and soon "wrinkles" or upward folds began to appear in the rocks as the continent was squeezed by tremendous forces. These folds grew to form the highland areas that are now the mountain ranges of the Rocky Mountain region. In the Teton area such an upward fold, about fifty miles long north to south, and fifteen miles wide, fractured along its eastern side to form a great fault. The total upward movement of the Teton Range along this fault was at least 7,000 feet, and may have been as much as 12,000 to 14,000 feet. The displacement was not the result of a single catastrophic movement, but was doubtlessly attained as the result of innumerable small movements occurring over a long period of geologic time.

While the mountain area was rising, great volcanic outpourings and eruptions developed in the areas to the west, north and east of the Tetons. Some of the breccia and ash from the Yellowstone explosive volcanoes were without doubt carried into Jackson's Hole. Great rhyolite lava flows from Yellowstone submerged the north end of the Tetons, and the great basalt lavas of Idaho flowed against the western slopes of the range. However, very little if any evidence of actual outpourings of lava or of eruptions of breccia and ash have been found in Jackson's Hole or in the Teton Range.

IV. The Sculpturing of the Tetons

Immediately after the uplift of the mountains, or more truly, while this process was going on, running water and moving ice began to carve canons into the uplifted fault block. Running water has continued to be very active in the erosion of the mountains and in the removal of much sedimentary, igneous, and metamorphic rock material from the mountains area. Periodically glaciers formed in the mountains and moved down the steep slopes to deepen and to render more rugged the existing canons. Three times did glaciers form, enlarge, and move down the canons onto the floor of Jackson's Hole.

V. The Tetons Today

The Teton Range is now in a post-glacial period, and the great glaciers have long since melted back until they are confined to the cirques at the heads of the canons. Seven such small glaciers and numerous permanent ice fields still exist- remnants of the once great alpine glaciers.

So, streams and glaciers have combined forces to carve from an uplifted fault block the present rugged Teton Range The deep, steep-sided, "U"-shaped canons and the deep, cliff-bound amphitheatre-like cirques at their heads; the sharp, saw-toothed ridges and the "horn" peaks; the cascades, falls and numerous lakes all owe their origin to the mighty glaciers of the past.

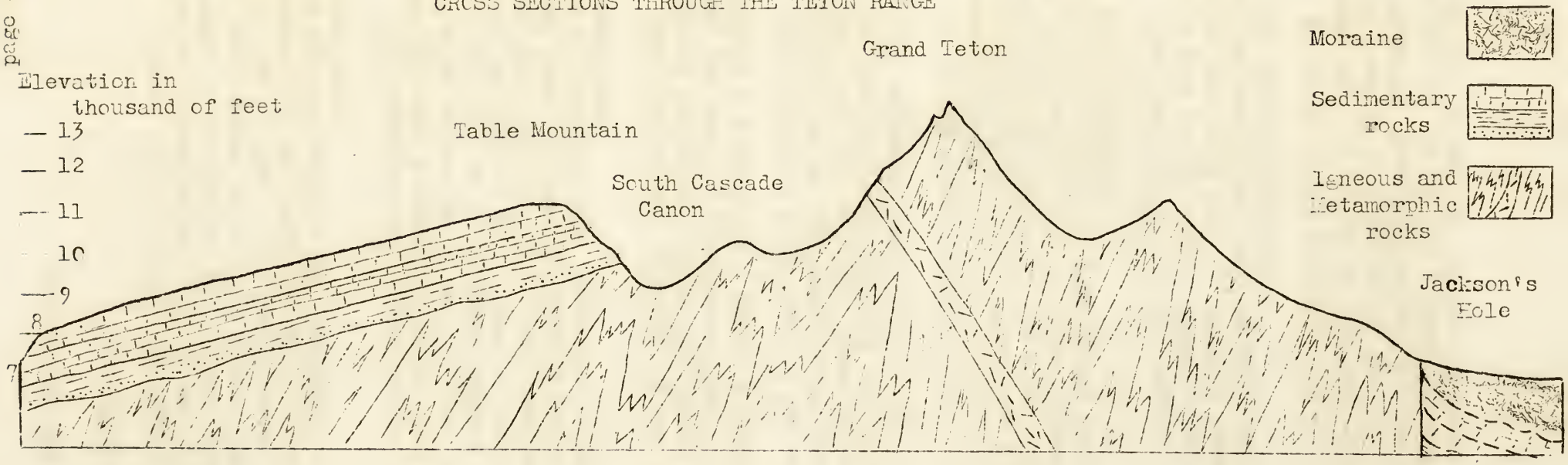
Erosion by streams and glaciers has removed from the high portion of the range its former covering of sedimentary rocks. So, again, the ancient rocks are exposed to form the high Teton peaks. Only on the western side of the range, and in its lower areas to the north and to the south of the culminating peaks do the sedimentary rocks still remain.

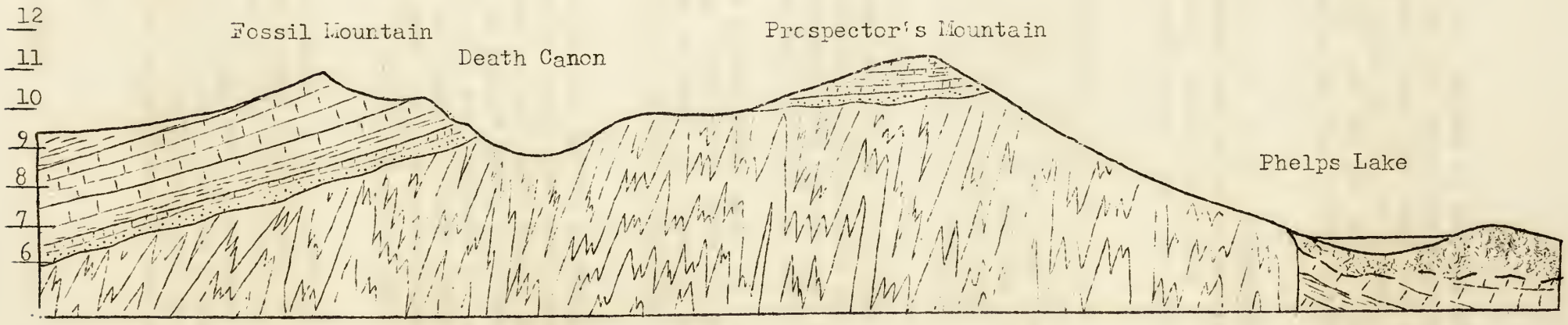
We know not what lies ahead. Erosion is still going on at a rapid rate, and in neighboring areas the tremors of earth movements are still felt. Thus, the endless war between the forces of building and the agents of destruction continues. Nature is never idle, and "time, which means everything to our idea, and is often dificient to our schemes, is to Nature endless and as nothing".

Chronology

era	period	events
Cenozoic	Quaternary	Glacial erosion predominated
	Tertiary	Erosion by streams began with the uplifting of the mountains, and has continued to the present. Volcanic activity to the west, north and east accompanied some of the earth movements. Mountain uplifting continued at intervals during this period.
Mesozoic	Cretaceous Jurassic Triassic	The emergence of the continent from the sea, and the first building of the mountains began with this period.
Paleozoic	Permian Pennsylvanian Mississippian Devonian (Silurian) Ordovician Cambrian	Paleozoic and Mesozoic were the eras of sea invasions and of the formation of the sedimentary rocks. Not all periods are represented in the Teton Range, but in surrounding areas rocks of all periods except the Silurian are represented. There were some intervals of erosion between successive advances of the sea.
Proterozoic Archeozoic	(pre-Cambrian)	During these eras the old igneous and metamorphic rocks were formed, and the surface of these rock formations was eroded to form the ancient landmass.

CROSS SECTIONS THROUGH THE TETON RANGE





Scale- horizontal, 1" - 1 mile; vertical, 1" - 4000 feet

West East

ACTIVITY AT THE LIMESTONE WALL

by Howard R. Stagner

During the past summer and fall a great column of rock became detached from the Limestone Wall, and in settling, resulted in the destruction of a portion of the Skyline Trail which passes in front of it. It is not unusual for large masses of rock to become dislodged from cliffs and steep canon walls and to fall to the depths below. In this particular case, however, the movement and the resulting destruction of the trail were accomplished in a more indirect manner, and the event is considered worthy of recording in Nature Notes.

The Limestone Wall encircles the broad head of Avalanche Canon, and forms the west boundary of Grand Teton National Park. It lies above timberline at an elevation of about 10,500 feet above sea level. A narrow ledge about half way up the eastern exposed face of the wall was followed in locating the Skyline Trail where it crosses Avalanche Canon. Below this shelf steep talus slopes form a continuous grade downward to the canon floor, interrupted here and there by exposed ledges of limestone. Above the trail massive beds of limestone rise in vertical columns and walls to a height of several hundred feet.

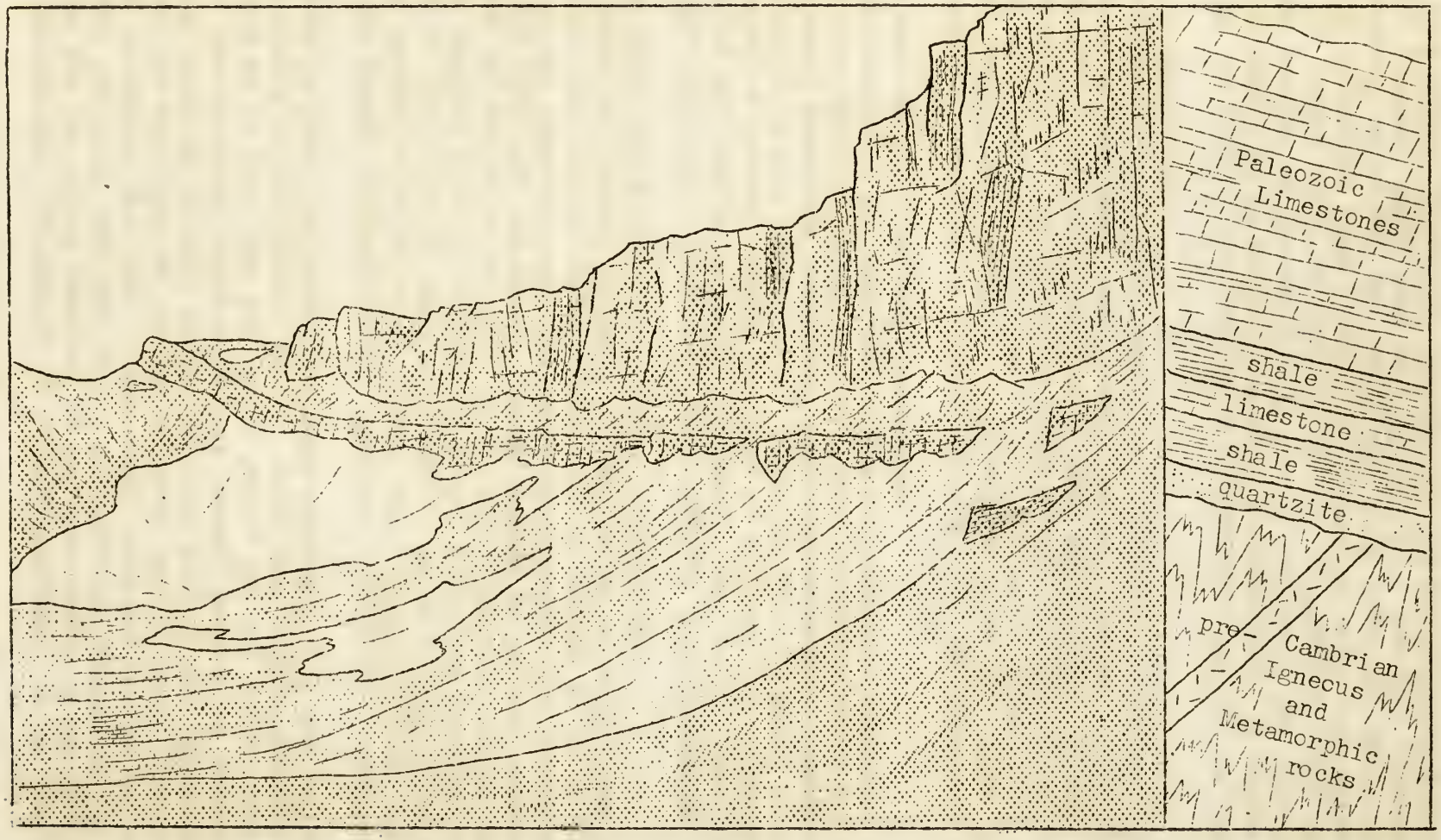
The wall itself is formed of the exposed edges of several Paleozoic limestone formations. These dip toward the west at an angle of about 10 degrees, and rest on a series of Cambrian formations consisting, from the base upward, of a quartzite, a shale, a limestone and a second shale bed.

The limestone formations of the wall are massively bedded, but as a structural feature the stratification is much less prominent on the face of the wall than are vertical cracks opened by weathering along two sets of joints. The joints run through the limestone formations in two directions at right angles to each other and to the stratification.

It is the normal thing for huge blocks of rock formed into parallelograms along the joints and bedding planes, or for great columns of rock bounded by vertical joints to become separated slowly from the wall and to plunge into the bottom of the canon. Eight such columns are now in the process of formation. One of these columns, some 150 feet high, 100 feet wide at the base, and 30-40 feet thick, provided an interesting variation to the normal process.

The first indication that something was happening along the wall came when a part of the Skyline Trail caved away and large cracks developed between the trail and the loosened cloumn. The cracks were at least ten feet deep, and much loose rock and soil disappeared into them without accomplishing any apparent filling.

At first it was believed that the base of the column was slowly swinging outward from the trail and was thus pushing directly against the trail and in this manner destroying it. That the column was actually pushing outward was apparent from observations and measurements made along its base, but that this was not the entire explanation was suggested by the large cracks between the moving column and the trail itself. How could the column be pushing the



THE LIMESTONE WALL

Structural Section

from a National Park Service photo.

trail away when not only was the column not in contact with the trail, but in fact was separated from it by a ten inch crack?

Considerable speculation by Engineer McLellan of the National Park Service and the writer resulted in the development of two possible explanations. The first required that a considerable portion of the base of the column be buried by talus. In this case, with the top of the column resting against the wall with no outward movement taking place, then the pivotal outward swing of the base would push most against the deeper portion of the talus. The overlying talus would, of course, be carried outward an equal distance as it rode upon the deeper talus, but the higher part of the column, being closer to the pivotal point, would move outward through a shorter distance to leave the observed cracks between it and the surface of the talus.

The second explanation also involved a carrying of the trail outward by the deeper moving material rather than a direct pushing action of the column on the trail. In this explanation it is believed that as the heavy column settled into the underlying shale, this soft material moved out from beneath the column in the only unconfined direction- outward away from the wall and away from the moving column, and as it "flowed" outward carried with it the talus on which the trail was located. The cracks developed as the the talus was carried outward away from the column by the deeper shale. In both cases the outward movement was sufficient to to dislodge the outer part of the trail which fell to the lower talus slopes.

The fact that a large snowfield remained on this portion of the trail and along the base of the wall throughout most of the summer,providing, as it melted, a constant supply of water to saturate and lubricate the shale, is probably of some significance. Although shale is known to flow under great earth pressure- geologists frequently encounter examples of such flowage in the limbs of folds- probably such a movement would not be possible at the surface of the earth and under such moderate pressures unless the shale were so saturated and lubricated.

There is evidence to support each of these two theories. An examination of the relative positions of the limestone, shale and talus along other parts of the wall indicated that not a large portion of the base of the column is buried by talus- not enough to alone account for the cracks as the first explanation requires. In support of this explanation, however, the outward movement of the column was several inches in excess of the downward settling. It is probable that both these processes acting together produced the effects described.

At the time of the last visit to the wall, October 17, the column had settled from 4 to 10 inches, had moved outward about 14 inches at the base, and had pivoted to the south from 4 to 6 inches. It was believed at that time that the column could not long stand, but on November 1,the wall was viewed through binoculars from a vantage point on the east side of the Snake river in Jackson's Hole, and the column was still standing. Immediately below the column, however, fresh snow that had fallen a few days earlier,was covered with rock debris apparently loosened by new movements of the column. Future developments will be followed with considerable interest.

ICEFALLS FROM FALLING ICE GLACIER, MOUNT MORAN

by Fred D. Ayres

On August 13, 1934, a tremendous mass of ice broke off the face of Falling Ice Glacier and slid far down the talus slope below, leaving a broad white trail of broken fragments nearly a quarter of a mile long. Since an ice slide of this magnitude was a rare occurrence, it was deemed worthwhile to make the long climb up to the glacier in order to get a closer view. However, other climbs prevented a start before the morning of the eighteenth, and by this time a considerable portion of the fallen ice had melted away.

From the Leigh Lake snow shoe cabin a course was followed which contoured around the base of the east buttress of Mount Moran to the long talus slopes below the glacier. From here it turned upward to the rounded brown pinnacle, a remnant of the great dike, north of the morainal slope and several hundred feet below the glacier. The view from this pinnacle is one of the finest to be had of the glacier and now, with an entirely fresh wall of glacial blue extending all the way across from one to the other of the two great rock towers from between which the glacier emerges, it was certainly at its best.As wide as the face of the glacier itself the path of broken ice extended from the ice wall down the slope to the pinnacle and on for an equal distance below.

Some photographs from a closer viewpoint were desired so the pinnacle was descended in the direction of the broken ice. Upon reaching the edge of the slide the huge size of the ice blocks, ma ny of them several feet in diameter, and the magnitude of the slide in general caused the writer to pause and reconsider the situation. To be caught out on this jumble of ice in the

MOUNT MORAN AND FALLING ICE GLACIER
from photo by Harrison R. Crandall

event of a second slide would be disastrous. Finally, rather than climb far down below around the bottom of the slide he decided to risk the dash across. It proved to be not so bad for the blocks were much smaller in the center than at the edges of the slide. From the opposite side, by following a series of ledges and slabs on the south wall below the cirque, the outcropping of the dike directly at the south end of the ice wall was reached. Here descent was made to a strip of talus slope along the rock wall of the dike not covered by the ice slide and further approach accomplished by dashing from the shelter of one overhang to the next. Fortunately there were plenty of them. Finally the advance was stopped completely by the failure of the overhangs, and the proximity of a rock bombardment which was spraying almost continuously over an area directly ahead. Several rocks whizzed overhead and struck the talus slopes below. However, these did not cause much worry because of the general overhang of the dike above. The rocks were presumably set in motion by the rush of muddy water which was pouring down along the wall of the cirque from somewhere high above.

From this close viewpoint the entire northern portion of the ice wall was seen to be leaning far outward, and seemed almost on the point of breaking off. In addition the whole leaning mass was perched on smooth, steeply sloping slabs. A number of photographs were taken from this position. Suddenly from high overhead were heard heavy, staccato reports, followed by complete silence. By this time the writer had already ducked back under a projecting ledge for all climbers well know the meaning of this warning signal. Almost immediately a huge boulder, some two feet in diameter, came hurtling into view and crashed onto the rocks fifty feet out on the talus slope. The fragments set flying by its impact clearly indicated that a hasty withdrawal from this advanced position would be discreet. A rapid descent was accordingly made back to the pinnacle (this time by the more laborious route down around the bottom of the slide).

Since another ice avalanche was clearly just on the verge of starting, the writer got his camera ready and perched on the pinnacle hopefully waiting for more than two hours. However, nothing happened other than the incessant rattling of rocks down over the dike. This rattling was punctuated frequently by bursts of large boulders which filled the canon with their echoing. By this time it was growing late, so return was made to Jenny Lake.

Sometime during the night the expected slide occurred. Frank Swenson, Reynold Holmen, Irene Ayres and the writer made the climb up to the glacier to examine the results. This second slide proved to be much less spectacular than the first. It was fully as long, but scarcely one fourth as wide as the first. The rock bombardment observed on the first trip was still in full swing. It seems to be a regular feature offered by the glacier.

JACKSON'S HOLE MUSEUM AND HISTORICAL ASSOCIATION

At a recent meeting in Jackson, Wyoming, prominent citizens of Jackson's Hole and officials of Grand Teton National Park adopted by-laws for a new organization- the Jackosn's Hole Museum and Historical Association.

The primary objects of the association are to collect scientific and

historical information relating to Jackson's Hole and the Tetons, and to provide for the preservation and display in the Jenny Lake Museum of historical relics and scientific material.

The membership will consist of those who donate objects or who contribute a membership fee of $5.00 to the Association. Dr. C.W. Huff, director of the St. John's Hospital; Thomas E. Whitcraft, Superinendent of Grand Teton National Park; Bruce Porter, Jackson businessman; Allyn F. Hanks, Chief Ranger of Grand Teton National Park; Charles Kratzer, editor of the Jackson's Hole Courier; Rev. E. Lofstrum of Jackson; and Howard R. Stagner, Junior Park Naturalist compose the board of directors.

The Association will make special effort during the next few months to obtain objects of historical interest in Jackson's Hole. These, with the many valuable historical items already on hand, will be assembled in the Jenny Lake Museum in a special display to tell the interesting and significant story of this area which for many years played an important part in the discovery, exploration and settlement of the West. - H.R.S.

TALUS

November 18- While following two bull Moose through the brush on the snow-slide scar on the lower slopes of Mount Teewinot today in an attempt to take some moving pictures, my attention was suddenly diverted to a flock of rather large gray birds diving and flying furiously through the small aspen trees, willows and mountain ash shrubs, Their sleek, smooth contour, grayish color, high crest and black mask across the face at once suggested "Waxwings". Apparently disturbed by my presence, they flew some 100 yards to a group of fir trees where they perched in close clusters. Twenty two birds were in sight at one time. They were too distant for other characteristics to be recognized, but I waited hoping they would give me opportunity for closer study. Finally, after several individuals made trial flights in my direction, the entire flock took to wing and noisily settled down near me to feed on the berries of the mountain ash. Now I noticed a brillient yellow band across the end of the tail, and two white bars which sometimes appeared to be yellow on the wings. The forehead appeared to have a rusty-brown sheen, and a narrow line extending back from the bill, divided the black mask into two parts. It was not possible to determine whether or not the under tail coverts were brown, but the wing bars and the size of the bird, about that of a robin, left no doubt that these were Bohemian Waxwings (Bombycilla garrula)

Fifteen minutes later, a disturbance up the gulch out of my sight frightened the birds away- they rose together, wheeled, rose still higher on constantly beating wings that now appeared to be tipped with white, dived and flew out of sight, all the while maneuvering as if directed by a single mind. This is the first record of this bird in Grand Teton National Park. The birds were doubtlessly in migration.- H.R.S.

November 18-19- Many new beaver cuttings and newly constructed dams have been observed during the fall along Cottonwood Creek between Jenny Lake and the Snake River. The development of these colonies will be watched with interest to see if these animals, by constructing dams, can provide a constant flow of

water in Cottonwood Creek. At the present time, because of the porous gravel, probably several hundred feet thick, over which this stream has its course, during the fall and winter the considerable flow of water from Jenny Lake is entirely lost through seepage in a distance of about four miles below Jenny Lake. - H.R.S.

December 1- To date there has been a scarcity of large game animals in the park and in Jackson's Hole. Only a few elk and deer were observed in the park during the past two months. We are undecided as to the true cause of this condition, but two explanations are suggested. First, there is a possibility that a large reduction of the number of elk and a comparable reduction in the number of deer has taken place as a result of a heavy hunting toll a year ago and as a result of death by starvation and disease last spring. We have only rumor, which must be accepted with much caution, regarding the winter kill of elk in areas adjacent to the park. This information is to the effect that large numbers of elk died last spring before the melting snown uncovered the natural forage. We are more inclined to favor a second explanation to account for the absence of the usual numbers of elk. The past fall has been unusually free of snow and bad weather. In most of the valley no snow remained on the ground at the end of November. In the area between Jackson Lake and Yellowstone Park the snow depth is only from 2 to 6 inches, and even at the higher elevations, as at the head of Granite Canon where in protected places the snow is not over 12 to 14 inches, there is an marked subnormal amount of snow. It is believed that this fine weather has induced the elk to remain on the summer range, to move unusually slowly toward the winter range in Jackson's Hole, or, after starting the migration as a result of several snow flurries in October, to have retraced their path to some extent back toward the summer range. It has not been possible to make observations in the areas where these animals summer, but the response of the elk to the snows of the next month will give more definite information.- H.R.S.

December 10- Sunday's Snowstorm, the first heavy snow of the season for some sections of the valley, started what is reported by observers to be one of the largest migrations of elk in recent years. Variously estimated to number between 2,000 and 5,000 head, the herd started crossing the Buffalo River on Wednesday afternoon. All night long and all day today, the elk, which are strung out over a considerable area, have been crossing the Buffalo in the vicinity of Turpin Meadow Lodge. What they will number by the time they reach the winter feed grounds at Jackson cannot yet be surmised. According to persons acquainted with conditions, the excellent feed in the higher hills, plus the open hunting season along Two-Gwo-Tee pass highway has tended to keep the elk back in the hills much later than usual this year. So much has this been the case that concern over the herds whereabouts was evidenced in certain quarters. Usually the animals start moving in small bunches much earlier in the fall. However, with the deep snow now prevailing and the cessation of shooting, the elk are beginning to appear. Eye witnesses to the present migration state that the elk seem to be in good condition and will probably be in no great hurry to reach their free lunch counter at Jackson.

- Jackson's Hole Courier, Dec. 10, 1936

NATURE NOTES

SNOWBOUND IN THE TETONS

from a photograph by Harrison R. Crandall

Grand Teton National Park

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Thomas E. Whitcraft, Superintendent
Howard R. Stagner, Editor

TETON GEOLOGICAL NOTES - No. 1 THE GLACIATION OF JACKSON HOLE

by Dr. F. M. Fryxell

The geological record from which one may decipher the glacial history of the Teton Range is found in part within the mountains themselves, in part outside them, especially in adjacent Jackson Hole.

To many visitors, speeding up the state highway, the flats of Jackson Hole may seem to offer little that is worth a second glance. But the geologist will recognize on the valley floor a great diversity of ridges, terraces, channels, and depressions, features that furnish the key to the glacial events which have occurred both in the valley and in the great range to the west.

To grasp the significance of these features one can do no better than visit the east tip of the main section of Burned Ridge (see map, page 3) , and from this point, with the Narrows of the Snake River directly below, survey the country to the north and south.

Here one sees that Jackson Hole is diagonally crossed by two low, wooded ridges: Burned Ridge on which we stand, and another ridge several miles to the north, that follows the south border of Jackson Lake. Around this northerly ridge the Snake River makes a circuitous eastward journey whence it turns southwestward and directly through Burned Ridge to form the Narrows at our feet. Were we to examine more closely, we would discover that both of these ridges are irregular and hummocky of surface, and composed of cobbles and boulders many of which are striated - proof that they were transported by glaciers, and that therefore the ridges themselves are typical glacial moraines.

Equally distinct from our viewpoint are two broad plains which extend outward from these ridges and slope evenly southward. Unlike the ridges from which they emerge, these plains are overgrown with sagebrush; hence the moraines and the glacial outwash plains - for such they are - are strikingly distinct. Composed of porous quartzite gravel with little or no soil they constitute barren ground indeed for anything but sage. Both of the outwash plains are deeply trenched by the Snake River, and the northerly plain is continued south of the Narrows by terraces that border the Snake River well beyond Blacktail Butte, where they widen into the swampy flats of the southern part of Jackson Hole.

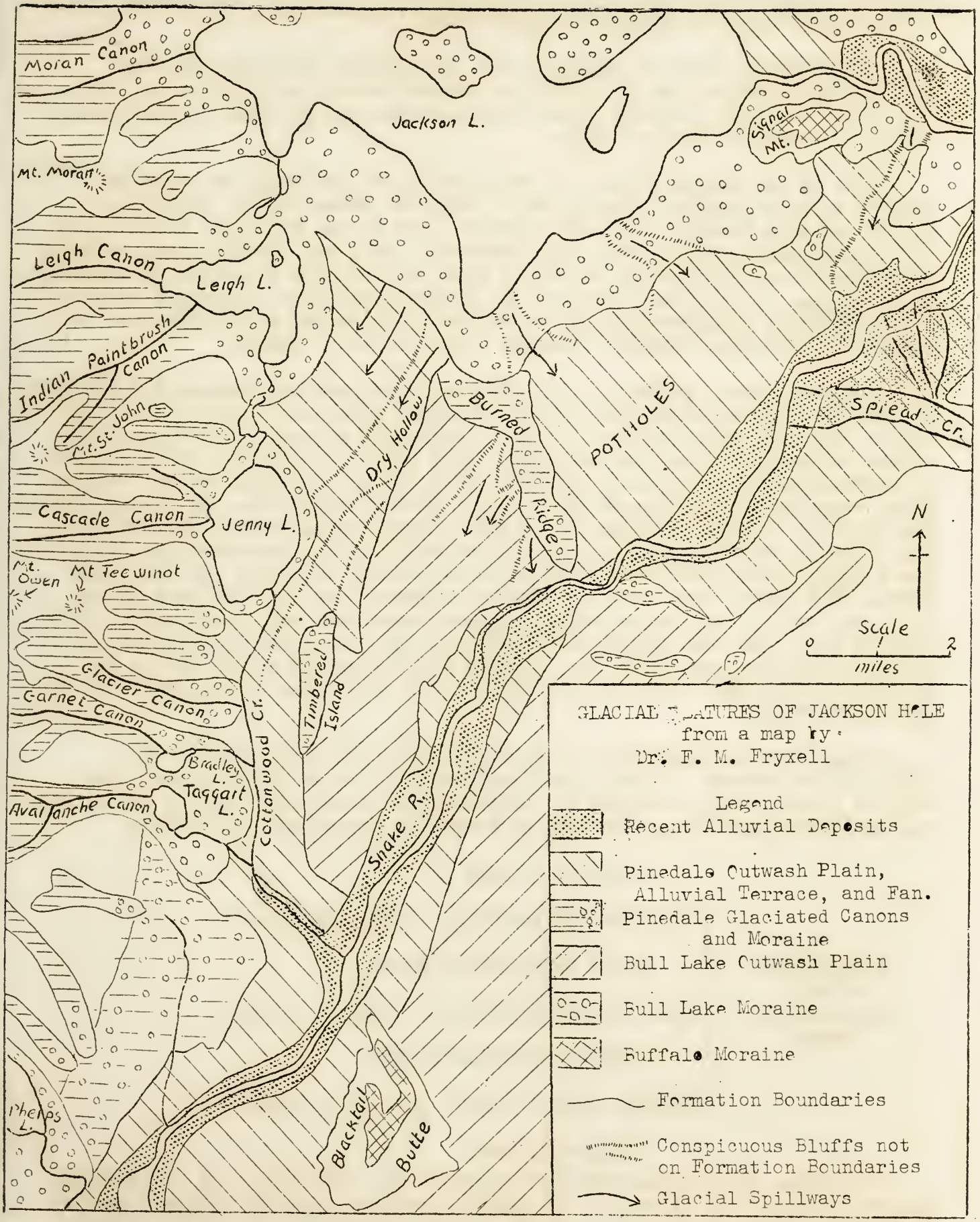
The meaning of these features now becomes evident, for they can mean only this: that northern Jackson Hole was at two distinct times invaded by a glacier. These two times of glaciation must correspond to those which geologists have reported from the Wind River Mountains and elsewhere, on the basis of similar records there found. For the earlier of these times the term "Bull Lake Stage" is generally used; for the latter, "Pinedale Stage". In terms of these stages, then, one may briefly review the glacial events of this region:

In the Bull Lake Stage a glacier (The Burned Ridge Glacier) entered the valley from the north and northwest, and advanced as far as Burned Ridge. At this position it must have stood for a time long enough to permit the ice to heap up the Burned Ridge moraine, and the glacial streams to deposit the outwash plain extending southward from it. The plain must have reached unbrokenly around and beyond Blacktail Butte, into the most southerly reaches of Jackson Hole.

In time the Burned Ridge Glacier melted back from its moraine, and eventually disappeared altogether. Did a large lake come into existence in the basin behind Burned Ridge? If so (as seems probable) it must have been drained during the interglacial stage which followed - an interval of long duration in the course of which streams greatly reduced the extent of Burned Ridge, trenched the outwash plain between the Narrows and Blacktail Butte, and in southern Jackson Hole largely eroded away similar Bull Lake deposits.

The task of the streams was arrested, unfinished, when in Pinedale time glacial conditions returned. Again a glacier (the "Jackson Lake Glacier") pushed into the north end of the valley, fed chiefly by smaller glaciers which occupied the Teton canons. In its southward growth it advanced over the same path as its predecessor of the Bull Lake Stage. The moraine of this glacier indicates that its front must have shifted back and forth. The large size of the Jackson Lake moraine is evidence of a prolonged stand in this position, but there are "islands" of moraine farther south, protruding from the outwash plain. That the ice front got farther south than even these "islands" is indicated by the pitted areas (locally called "the potholes") which lie between them and Burned Ridge. Presumably these pits mark situations where the glacier, in retreating, left behind it masses of stagnant ice which had separated from its main body. These ice masses became surrounded or buried by outwash gravels, which, when the ice later melted out, slumped in to produce depressions in the otherwise even outwash plain. Since pits of this sort extend all the way to Burned Ridge, one is led to conclude that the Jackson Lake Glacier for at least a brief time reached as far south as this ridge, that is, it practically attained the same limits as did the Burned Ridge Glacier long before.

From this shifting ice front vast quantities of outwash gravel were carried out by short-lived glacial streams. These were deposited not only on


Moran Canon
Jackson L.
Signal Mt.
Mt. Moran
Leigh Canon
Leigh L.
Indian Paintbrush Canon
Mt. St. John
Dry Hollow
Burned Ridge
POTHOLES
Spread Cr.
Cascade Canon
Jenny L.
Mt. Owen
Mt Teewinot
Timbered Island
Glacier Canon
Garnet Canon
Cottonwood Cr.
Bradley L.
Taggart L.
Avalanche Canon
Snake R.
Phelps L.
Blacktail Butte
N
Scale
0
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GLACIAL FEATURES OF JACKSON HOLE
from a map by:
Dr. F. M. Fryxell
Legend
Recent Alluvial Deposits
Pinedale Outwash Plain, Alluvial Terrace, and Fan.
Pinedale Glaciated Canons and Moraine
Bull Lake Outwash Plain
Bull Lake Moraine
Buffalo Moraine
Formation Boundaries
Conspicuous Bluffs not on Formation Boundaries
Glacial Spillways

the main outwash plain but within the river trench south of the Narrows and on the valley floor in southern Jackson Hole.

Jackson Lake came into existence as the glacier retreated from the Jackson Lake Moraine, and the water was dammed between the moraine and the ice front. With the complete disappearance of the ice the lake assumed essentially its present size and shape.

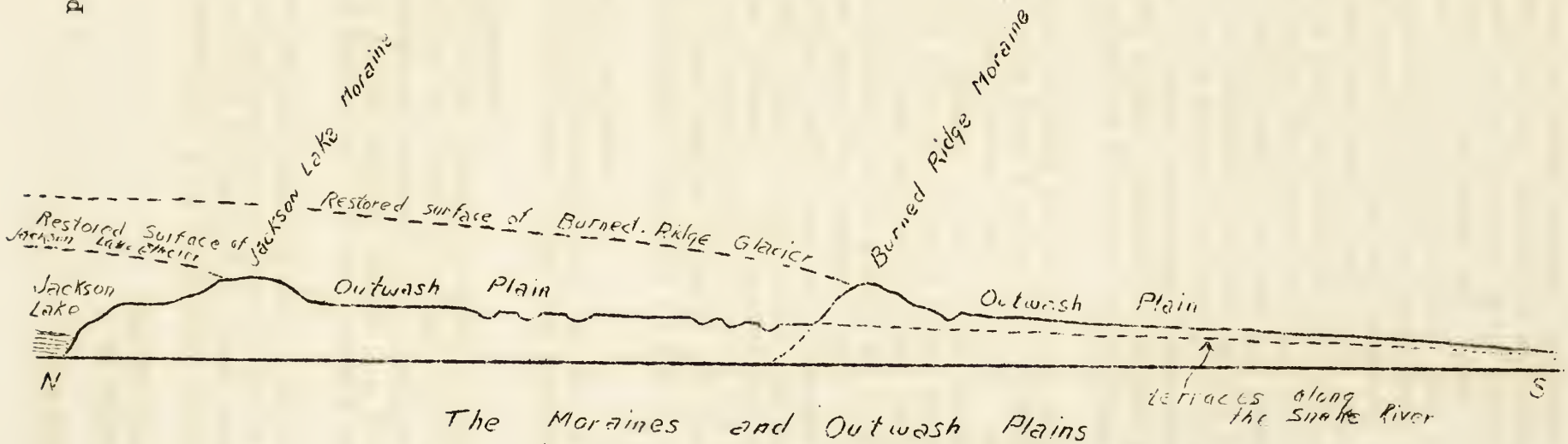
What of the Tetons during the two glacial stages? Here, as one might expect, occurred similar events. Valley glaciers descended the canons and pushed out into Jackson Hole. The moraines left by the Bull Lake glaciers are now in most places eroded away, but Timbered Island and the high bench extending along the mountain front southward from Taggart Lake appear to be extensive remnants of Bull Lake moraine. The Pinedale moraines, in marked contrast, are beautifully preserved, and form the basins which are responsible for the existence of Phelps, Taggart, Bradley, Jenny and Leigh Lakes.

But the glacial story can be pushed back yet another chapter. For evidence of this one must climb to the summits of Signal Mountain, Blacktail Butte, or one of the Gros Ventre Buttes. In these surprising situations one again discovers striated boulders and cobbles - mere patches of ancient moraine, like tattered manuscripts. Similar deposits occur on the highlands east of Jackson Hole, capping the intercanyon divides 1000 feet or more above the valley floor. The presence of morainal remnants in such situations, and their absence in the adjacent canyons, can be accounted for only by the assumption that there was a <u>third</u> glaciation which occurred much earlier than even the Bull Lake Stage, at a remote time when the floor of Jackson Hole was 1000 feet higher than now, and the present system of canyons which open into Jackson Hole had not yet been cut. This stage, which likewise has been recognized far outside Jackson Hole, has been named the "Buffalo Stage". Scanty as its record is we cannot doubt that this, the earliest of the three glaciations, was much the most widespread.

Thus, what we commonly call the "Ice Age" or "Glacial Period" (the "Pleistocene Period" in geological terminology), which lasted perhaps two million years, really involved no less than three distinct times of glaciation, and two of deglaciation. These may be tabularly represented as follows:

	Postglacial time
Subdivisions of the Pleistocene Period	Pinedale Glacial Stage (3rd glaciation)
	Later Interglacial Stage
	Bull Lake Glacial Stage (2nd glaciation)
	Earlier Interglacial Stage
	Buffalo Glacial Stage (1st glaciation)
	Preglacial time

The three glaciations were successively less extensive, and the later of the two interglacial stages was of briefer duration than the earlier. What of postglacial time, which represents the briefest interval of all? Is it truly postglacial, or are we now living in a third interglacial stage? To this question geology has as yet no positive answer, though investigation now in progress leads one to hope that a future solution is not improbable.



The Moraines and Outwash Plains of Northern Jackson Hole, Wyoming

Scale 1 mile

A SOLAR HALO

by Howard R. Stagner
Junior Park Naturalist

A beautiful and quite rare optical phenomenon was observed in the sky on the morning of January 20 near the Granite Canon Showshoe Cabin by Superintendent Whitcraft and the writer. A series of colored rings, concentric around the sun, tangent arcs, and bright spots appeared in the display.

The preceding day had brought heavy, low-hanging clouds and considerable snowfall on the higher slopes, but during the night the atmosphere cleared and the temperature dropped to 21 degrees below zero. The morning of the twentieth the sun rose in a cloudless sky and the thermometer hovered near zero throughout the day. A fine shower of tiny, light frost crystals was falling during the early forenoon.

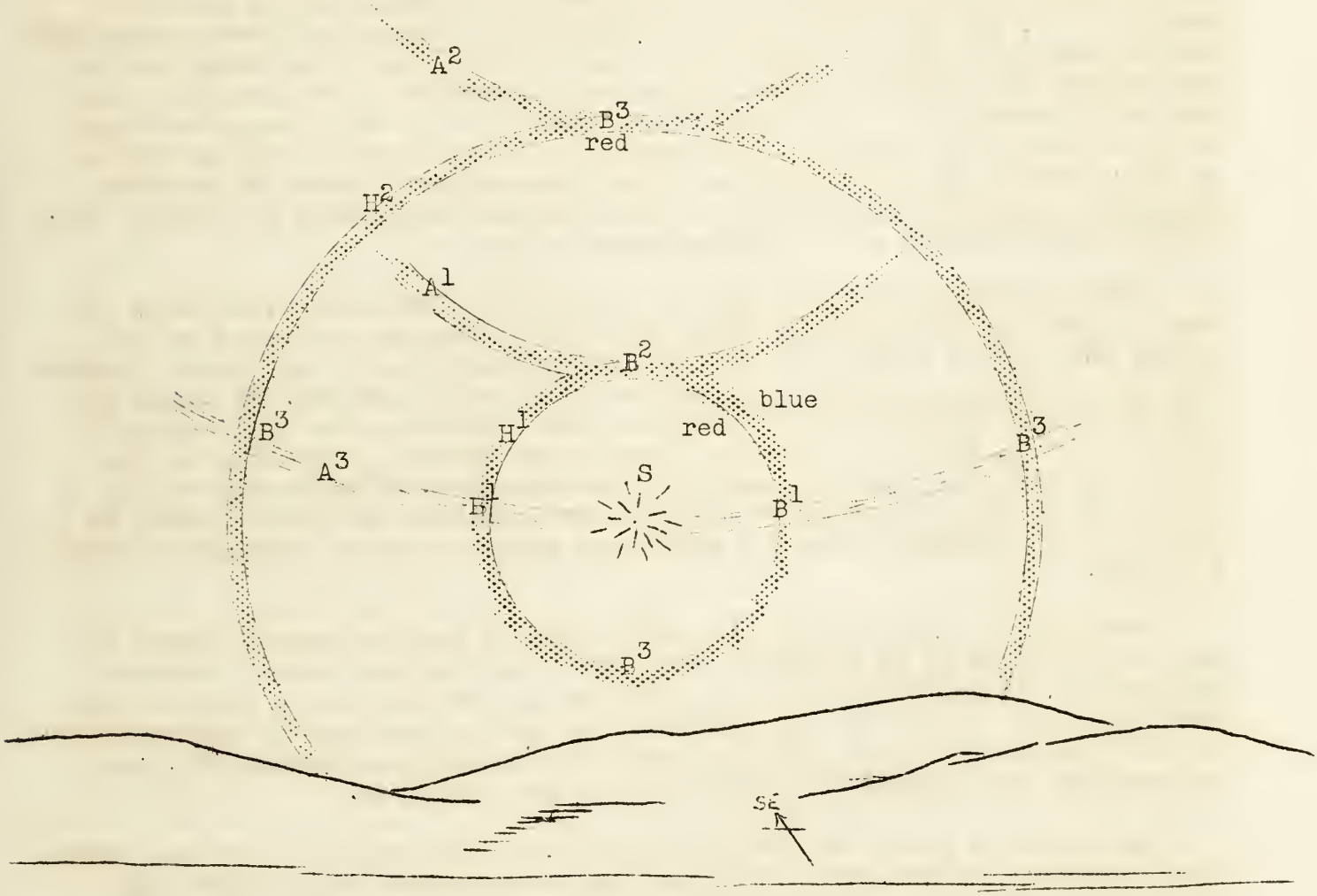
The haloes were first seen shortly before ten o'clock in the morning. They maintained their brilliance for about fifteen minutes, then gradually faded to extinction by noon.

The display consisted of two rings or haloes around the sun, horizontal band of light passing through the sun, two upward bending arcs tangent to the halos, and seven bright spots on the rings. Of the halos, the inner one was the more intensely illuminated and colored. Both were colored like the rainbow except that in both rings red appeared on the inner side. The inner halo was complete, while the outer one was visible through an arc of some 200 degrees with the lower part passing below the horizon. The band of light passing through the sun appeared to be a part of a huge arc which was faintly visible only within the rings and for a short distance beyond. Tangent to the upper side of each ring were arcs, quite short and similar to the rings in coloration. Bright spots were formed at the intersections of both the light band and the two arcs with the two rings., the brightest being on the inner ring. At the lower edge of the inner halo a bright spot appeared, possibly marking the tangent point of another colored arc below this point.

According to Moore (Descriptive Meteorology, Appleton, N.Y., 1914) and Weld and Palmer (Textbook of Modern Physics, Blackiston, Philadelphia, 1925) solar haloes are interference phenomena produced by refraction and dispersion of light in passing through tiny frost crystals. The crystals, hexagonal prisms capped by pyramids, falling slowly through a quiet atmosphere, are believed to be in rapid rotation around the longer crystal axis which in falling assumes a horizontal position. To form the inner colored halo, light rays undergo refraction both in entering and in leaving the crystals, and are thus bent toward the observer. In addition, the light rays which produce the sensations of the various colors are separated or dispersed to form the colored bands. A similar refraction and dispersion forms the outer colored ring, but in addition, at this greater angle from the sun, internal reflection occurs within the crystal. The inner ring forms at about 22 degrees away from the sun, and the outer at 46 degrees. White light reflected from the surfaces of certain crystals without refraction or dispersion is responsible for the band of white light which passes through the sun.

While such haloes are considered quite rare outside the polar regions,

several such displays of less development have been observed both in Grand Teton and in Yellowstone National Parks. In Yellowstone Nature Notes, Vol. XIV Nos. 1 and 2 for January-February, 1937, William E. Kearns, Assistant Naturalist, describes a partial solar halo, apparently almost identical with the one herein described, which was seen in Yellowstone Park on December 29, 1936.



SOLAR HALO

Explanation of the diagram:-

S - Sun
H^1 - Halo, very bright, colored
H^2 - Halo, bright, colored
A^1 - Tangent Arc, bright, colored
A^2 - Tangent arc, dim to moderately bright, colored.
A^3 - White band of light, dim.
B^1 - Bright Spots, very bright, white.
B^2 - Bright Spots, bright, white
B^3 - Bright Spots, dim to moderately bright.

THE MARTEN, A HIGH MOUNTAIN MAMMAL

by Allan D. Cameron
Ranger-Naturalist

The marten (Martes caurina origines) possesses a variety of traits which make it one of the most fascinating of all our wild animals. It is what might be termed a "medium-sized" animal similar to the better known weasel, to which it is closely related. The adults may reach a length of three feet, and may weigh from five to six pounds.

The American Sable, as it is sometimes called, is considered to have the best quality of any marketable fur. The marten is circumpolar in distribution , and in former times was extensively trapped in Siberia where the largest and best supply of that beautiful fur came from. Undoubtedly some of the travels and discoveries made by the early trappers in western North America can be attributed to the much-prized marten fur. Martens range southward down the main Rocky Mountain Cordilleran as far south as Colorado as well as to the southern part of the Sierra Nevada Range of California. It is often referred to as the Pine Marten as it is frequently associated with heavy timber-covered mountains of the northern hemisphere.

The adaptibility of the creature accounts for its being found today not only in forested mountains but at or above timberline as well. In fact one of the most recent records we have for the Tetons places it well above timberline on the sharp arete between Mount Owen and Mount Teewinot. On August 12 a party of six climbers were attracted by the disturbance set up by a small group of birds, Black Rosy Finches (Leucosticte atrata) , and soon saw the cause: a very agile animal running in our direction. It apparently failed to notice the group of climbers at first as its attention was on the birds. It was not long, however, until the animal was aware of us and proceeded to make a detour.

We could not help noticing how completely at home the marten seemed in his rocky habitat as he scrambled over the rocks with the utmost confidence and agility. It negotiated the perpendicular rock walls with no apparent difficulty- a feat that I am sure we would have put in the "humanly impossible" class in spite of our own climbing experience and equipment. We noted, too, the restless and ferocious attitude this animal possesses.

As one might expect of creatures with such a disposition, they are seldom seen together. In fact, male and female are together for only a short time during February and March, and a record of two males together is unknown. This alpine species is somewhat smaller than the timber-dwelling variety, and the one we saw on August 12, 1936, was about two feet in length and must have weighed about four pounds.

Marten are fairly common in the timbered areas of the park, and are occasionally seen during the winter. Jess Roberts reports that one has been visiting his residence at Jenny Lake in search of food, and is now so bold that no ordinary gesture will frighten him away. H.R.S.

TRAILMAKERS Part LV. ---------- ROBERT STUART- THE RETURN FROM ASTORIA

by Walcott Watson
former Temporary Ranger

A new record was established in 1812-13 by Robert Stuart and his small party of men in making the cross-continental journey from Astoria on the mouth of the Columbia to St. Louis. The prece ding year the overland expedition of the Astorians had made the westward crossing in 340 days, and on the return Stuart reduced this time to 306 days.

The hardships and dangers and obstacles to travel at this early day when no marked trails, highways, no villages except transitory Indian camps existed to give directions, are better emphasized in our minds when we reflect that by automobile, traveling this same route, the journey may be comfortably made in five or six days, and that less than a day now separates these points by airplane.

Stuart's purpose in making the hazardous trip was to carry back to John Jacob Astor despatches and reports from Astoria. Astor's sea expedition had arrived at Astoria on March 22, 1911 after a voyage around the "horn" lasting 195.days, and the overland expedition had joined them in February, 1812. But in the meantime had occurred the Indian attack on the Tonquin, the ship which had brought the sea expedition to the mouth of the Columbia. The ship itself had been destroyed by the last survivor of the crew when in desperation and to revenge himself on the Indians who had captured the ship, he set fire to the powder magazine.

An earlier attempt to send despatches had been thwarted by bands of marauding Indians that frequented the Columbia River, and only the aggressiveness of Stuart's party carried them past the Indians and to the Snake River region. Originally the party consisted of Stuart, Ben Jones, McLellan, John Day, Ramsey Crooks, Andri Vallor and Frances LeClerc. Day soon developed a mental derangement, and was sent back to Astoria in the care of friendly Indians. On the Snake River the party met John Hoback, Miller, Rezner, and Robinson who had been left near Ft. Henry the previous year to trap beaver. These men were in desperation after having lost their furs and equipment to the Indians, but upon being supplied with new traps and guns, all but Miller, who replaced Day on the return journey, remained to try their skill against the forces of nature and the Indians another season.

The return party became lost for a time near the Idaho-Wyoming boundary, and just before the Tetons came into view, McLellan, a very self-willed man, abandoned the group to push forward by himself. He probably passed through Jackson Hole about October 3, 1912. The rest of the party, delayed by the illness of Crooks, nearly exhausted from a month of aimless wandering without any forward progress, and nearly half-starved as a result of their inability to kill game that for some reason was unusually scarce, probably did not reach Jackson Hole until about October 7. The six men did not linger in Jackson Hole, but pushed onward up the Hoback, and on October 13 overtook McLellan who by this time was nearly starved and completely exhausted. The plight of the party had become so desperate that one of the men suggested that "one should die to save the rest". He desisted from this idea only when Stuart threatened to shoot <u>him</u> on the spot if he continued to insist on that procedure.

The next day brought relief to the party, however. An "old, run-down buffalo bull" was sighted, and, after considerable effort and anxiety on the part of the men, was killed.

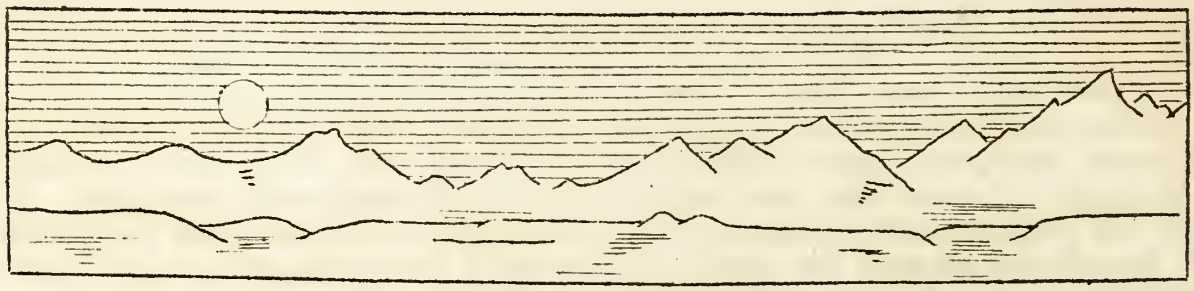
The path of the Astorians then led from the head of the Hoback River, down Lead Creek to the Green or Spanish River. This stream was followed for some distance, then the party diverged toward the southeast crossing several tributaries of the Green flowing from the Wind River Mountains. The continental divide was crossed near South Pass which was later to become the gateway to the West over the Oregon Trail, Mormon Trail, California Trail, the Overland Stage Route, and the original Pony Express Route. It is not definitely known whether or not the historic pass was actually used by the Stuart party, and most historians claim the discovery of the pass for later explorers.

The Sweetwater River, flowing southeatward from the mountains, formed the natural route to the Platt and Missouri Rivers, but Stuart, thinking that this stream nust flow southward, crossed it and entered the difficult and desolate area east of the Wind River Mountains. In passing to the south of the Rattlesnake Mountains, the party again encountered the Sweetwater River, and followed this stream through Devil's Gate, past Independence Rock, and to the North Platt River.

It was by this time late October, and the group prepared to spend the winter in a wooded area along the stream. A cabin was built in the bottomland, and a good supply of game was killed for winter use. But Arapahoe Indians soon discovered the location of the cabin, and the begging and stealing activities of these Indians soon depleted the stores. The comfortable cabin, "the first building within the limits of the present state of Wyoming"*, now no longer considered safe, was abandoned, and the party pushed on down the Platt and established a second winter camp near what is now Wellsville, Nebraska, a few miles downstream from the later location of Ft. Laramie, Wyoming.

During the winter canoes were built, and with the coming of Spring, the journey was resumed by boat. "In perfect health and in fine spirits" the group arrived at its destination on April 30, 1813.

* Chittenden, The American Fur Trade
Other quotations from Washington Irving, Astoria.



WINTER BIRD GUESTS

by Sylvia Stagner

One of the special pleasures the winter affords here is the fun of watching the birds as they flock to our feeding tables. We learn to recognize them not only as chickadees, jays, and crows, but also as engaging individuals who vary in size and temperament just as people do.

Chickadees, both the Long-tailed (Penthestes atricapillus) with their perky black caps, and the Mountain Chickadee (Penthestes gambeli) with a white stripe over each eye, are our most numerous and welcome guests. Fat an and thin, large and small, they are a gay, zestful, songful lot. Last winter, however, one poor chickadee lost his tail feathers through some mishap or other and came to Hazel Hanks' feeding board regularly when the other birds were gone. He could fly, but had difficulty in maintaining his equilibrium, particularly when "taking off". Fortunately, as time went by his feathers grew out, and he became a normal happy chickadee again.

All winter a pair of Black-headed Jays (Cyanocitta stelleri anectens) have made themselves conspicuous with their amazing variety of chatter and vivid appearance - their shiny, black-crested heads and their gorgeous blue plumage being accented by the snowy background.

Another frequent visitor of the larger birds is the Rocky Mountain Jay or "Camp Bird" (Perisoreus canadensis capitalis) whose dark grey band across the back of his light grey head is a distinguishing feature. He is a curious and friendly sort of rascal, sometimes a bit tousled looking, who is usually on hand wherever there is any food to be found.

No such welcome visitor is the Clark's Nutcracker (Nucifraga columbiana) whose heavy black bill shows him to be a member of the Crow family, and a handsome one, too, with his sleek gray body, black and white wings and tail. He is somewhat of a bully and monopolizes the feeding table.

Often we find the large, black and white striped Rocky Mountain Hairy Woodpecker (Dryobates villosus monticola) at our feeding boards. The male has a bright red bar across the nape of the neck. Occasionally a woodpecker about half as large as the Hairy and its exact duplicate in coloration comes, too, - the Batchelder's Woodpecker (Dryobates pubescens leucurus).

Jess and Ella Roberts, who are spending the winter at Jenny Lake, report in addition to the above birds, the large handsome black and white American Magpies (Pica pica hudsonia) at their feeding table, as well as the tiny Red-breasted Nuthatch (Sitta canadensis) All winter we watched for these colorful, fearless little creatures who seem equally at home upside down or right side up as they travel along the branches and trunks of trees. Finally in March a belated pair surprised and delighted us by coming regularly to the feeding boards.

Both Superintendent Whitcraft and Naturalist Stagner have been able to get some fine close-range moving pictures of these birds.

We know that Grouse (Dendragopus obscurus richardsoni) have been in the vicinity all winter, but now that Pink-sided Juncos (Junco mearnsi) are visiting our tables, we are convinced that Spring is on its way and soon our feeding tables will be deserted by our winter guests who have afforded us so much entertainment during the months of deep snow.

TALUS

January 5- Flying Squirrels (Glaucomys sabrinus bangsi) have again made an appearance at headquarters. One has made nightly forages to the bird-feeding table just outside our window during the past week or ten days. He is plainly visible by the light from the house. At first he was rather timid, and his appearances consisted of rapid jumps across the lighted area during which he secured whatever food was easily picked up. Later, becoming more accustomed to the light and the proximity of man, he could hardly be frightened away, and a fine opportunity to observe the broad skin folds extending from wrist to ankle, the rather large eyes, and its beautiful, soft, grayish-cinnamon pelage, was thus afforded. H.R.S.

January 8- Chief Ranger Hanks today discovered a tiny owl, measuring not over ten inches in length, which has taken refuge in the equipment shed at headquarters. In the somewhat dim light among the rafters, this round-headed bird's general color appeared to be a grayish with rather broad vertical bands of light and dark on the breast, white around and especially above the eyes, and radiating outward from the eye areas were finer light gray or white lines. The lines passing vertically over the head continued over the top of the head. Although identification of this bird is not positive, it most resembles the Saw Whet Owl (Cryptoglaux acadia), and is here mentioned for the information of those who may see this bird at a later date. H.R.S.

January 10- Park Ranger Winess and I were quite surprised today to find a Kingfisher (Megaceryle alcon) near the outlet of Leigh Lake. For some distance the outlet stream is broad and shallow, and seldom freezes completely over. No doubt this bird finds abundant food in this vicinity throughout the year. A.F.H.

January 19- Early sub- zero weather formed ice over Granite Creek throughout its entire length by December 1. But on today's journey up this canon, most of the stream was again open, the ice having melted beneath a cover of several feet of snow. Several Water Ousels (Cinclus mexicanus unicolor) were seen busily flitting from one spray-washed boulder to another, and diving now and then into the icy water. My desire to hear the famed winter song of this bird was not gratified. H.R.S.

January 20- A Purple Finch (probably Carpodacus cassini) was perched up under the eaves of the office building this morning. This species is well represented in the park during the summer, but it is indeed rare to find one here during the severe winter months. A.F.H.

February 2- The Jenny Lake Museum has recently received several fine colered photographs from Mr. S. N. Leek of Jackson and Moran, Wyoming. Mr. Leek, a long resident of Jackson's Hole, is famed for his large collection of photographs dating from early in his residence in this region. The pictures donated to the museum include some early views of the Tetons, and the annotations on the views give them an historic value comparable to their artistic worth. H.R.S.

February 5- Hazel Hanks reports that today she was witness to a thrilling combat between two birds for possession of the feeding board just outside her window. A Black-headed Jay (Cyanocitta stelleri anectens) was furiously attacked by a Rocky Mountain Hairy Woodpecker (Dryobates villosus monticola) The Jay occupied the top of the platform while the woodpecker hung upside down from the under side to make sudden and furious sorties upward. The Jay, in actual possession, was on the defensive, and was by no means in a happy situation, but even though the woodpecker seemed to have the advantage, after a short battle he abandoned the fight, flew away, and left the jay in full possession.

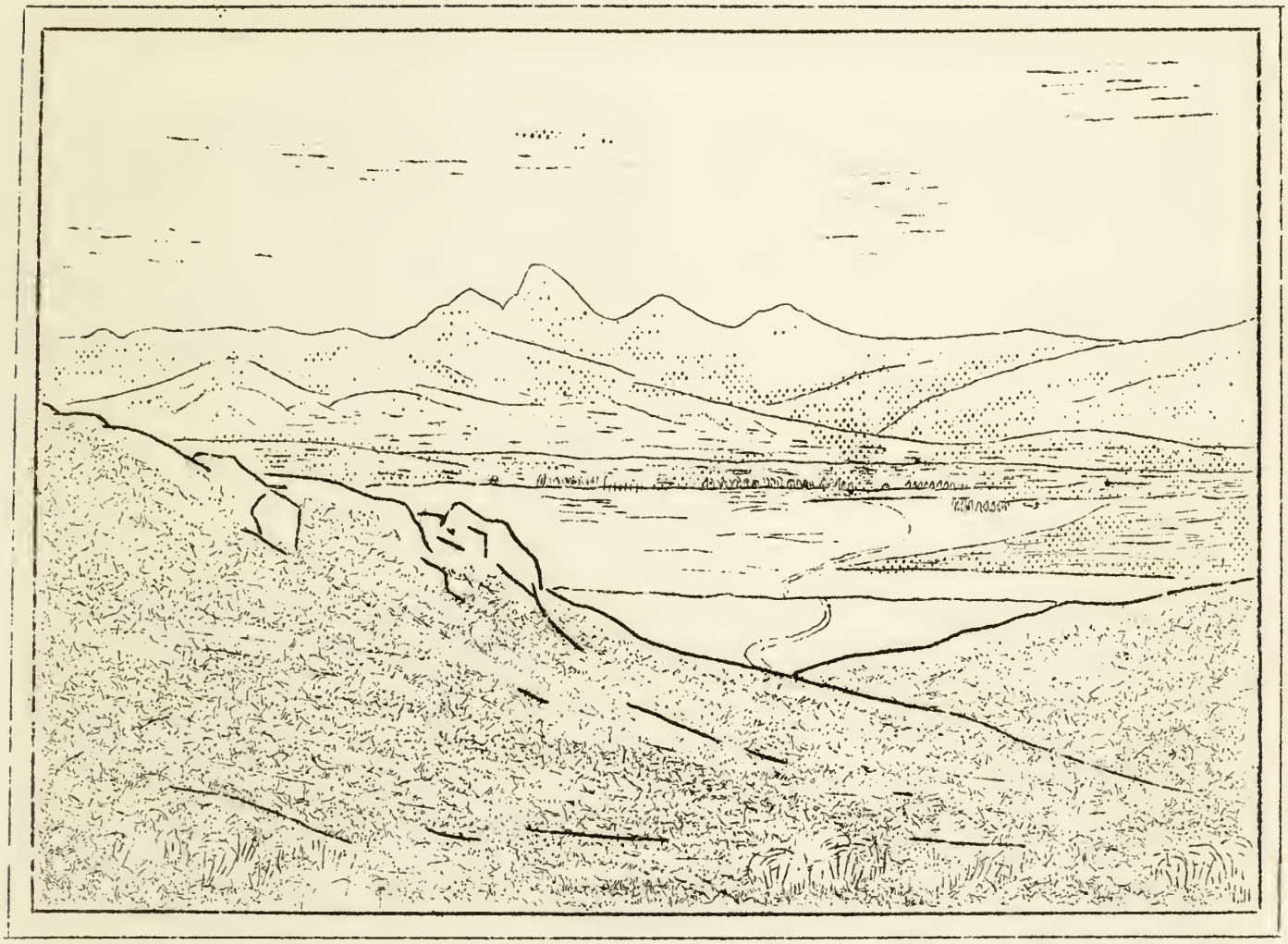
February 11- Nearly four-thousand elk (Cervus canadensis) are now on the feeding grounds of the United States Biological Survey ranch near Jackson, Wyoming, and a good supply of natural forage is still available making unneccessary any artificial feeding as yet. A small herd was also seen today in the Gros Ventre River bottoms about six miles north of Jackson, and it is reported that a few are spending the winter on Blacktail Butte. Aviators report considerable elk in the upper Gros Ventre country, and a few still remain in the lowlands south of park headquarters as well as in the Berry Creek area just north of the park. H.R.S.

February 20- Moose (Alces americani shirasi) lingered late in most of the areas along the base of the Teton Range. During January they were present in considerable numbers along Cottonwood Creek, near Jenny Lake and in the area south of park headquarters. During February most of the moose departed, presumably making their way toward the Snake River where many of them winter. Chief Ranger Hanks reports that only along the lower slopes of Mount Moran, where willow patches on rather exposed slopes provide food, were these animals seen on recent patrols. H.R.S.

March 4- Recent warm weather has made travel into the mountains extremely hazardous. In venturing about six miles up one of the Teton canons on snowshoes today, Park Ranger Winess and I crossed five large slides of recent origin. One of these filled the entire bottom of the canon for a distance of some 250 yards. These great masses of snow sliding and falling down the steep slopes completely cover the stream and the vegetation in the bottoms of the canons, and in their great velocity frequently push far up on the opposite side of the canon. Fortucately, no slides occurred while we were in the canon today. A.F.H.


GRAND TETON
NATIONAL PARK

NATURE NOTES



THE THREE TETONS AND TETON BASIN FROM THE WEST

Grand Teton National Park

Vol. III, No. 2

Thomas Moran Number

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
GRAND TETON NATIONAL PARK
MOOSE, WYOMING

GRAND TETON NATURE NOTES

Vol. III No. 2

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Thomas E. Whitcraft, Superintendent
Howard R. Stagner, Editor

THOMAS MORAN

by Willis Smith
ranger-naturalist

Nineteen thirty seven marks the one hundredth anniversary of the birth of one of America's greatest landscape artists. Western America, and especially the National Parks owe to Thomas Moran a debt of gratitude for it was he who first caught the gorgeous colors of the Grand Canyon of the Yellowstone and placed them on canvas for future generations to enjoy. It was this painting, made while a guest of the Hayden Survey party of 1871, along with the photography of his friend and colleague William H, Jackson, that were so instrumental in the setting aside of the Yellowstone wonderland as a public pleasuring ground "for the benefit and enjoyment of the people". During the next three years Thomas Moran painted in Yosemite Valley, Canyons of southern Utah and Arizona, and in Colorado. Each of these areas in turn has taken its place in our National Park System. In the building of this distinctly American institution, Thomas Moran holds an honorable place.

William H. Jackson gives us an intimate sketch of his character as he knew him as a member of the Hayden Survey party in 1871. "He was 34 years old at this time, of slight and frail physique, and did not seem to be of the kind to endure the strenuous life of the wilderness. But he was wiry and active in getting about, and keenly enthusiastic about his participation in work of the expedition. He had never camped out before except for a single night's bivouac on the shore of Lake Superior ten years previous. This was his first experience in the Rocky Mountain regions, coming out entirely unacquainted with his associates or with the country itself and all that related to it. But he made the adventure with

fine courage and quickly adapted himself to the new and unfamiliar conditions, and as it turned out later, none was more untiring on the trail or less mindful of unaccustomed food or hard bed under a little shelter tent than he was. At home, fastidious and careful of his diet, with a strong aversion to fats, he wrote in one of his letters about camp life "you should see me bolt the bacon".

"His personal equipment was simple, like that of everyone else, little attention being given to special outing costumes for the occasion. Flannel shirts and heavy boots, into which the trousers were tucked, were the main stay, with overcoat and blanket roll as a necessary adjunct. Moran had never ridden a hores before, and while getting acustomed to the experience, he was quite unabashed in using his camp pillow to protect his rather spare anatomy from the hard lines of a McClellan saddle. But, despite his lack of horsemanship, he made a picturesque appearance when mounted. The jaunty tilt of his sombrero, long yellowish beard and portfolio under his arm marked the artistic type, with something of local color imparted by a rifle hung from the saddle horn."

In September, 1872, the Stevenson division of the Hayden party came down into Jackson Hole after leaving the Yellowstone country. It was they who named one of the most imposing peaks of the Teton Range after Moran. This peak rises majestically more than a mile above beautiful Jackson Lake and it is fitting that it should carry the name of this great artist.

The Grand Teton National Park Museum has among its exhibits two original paintings, one charcoal drawing, and three pencil sketches of Thomas Moran's. These paintings and sketches were made in 1879 when Moran,with a military escort commanded by his friend Captain A.H. Bainbridge, visited the Teton Range from the west. The following incident of this trip, taken from Moran's diary that is owned by the Grand Teton National Park Museum well shows that Moran had a keen sense of humor that is also reflected in the above character sketch by W. H. Jackson.

"August 25. After camp had been finally disposed of, three men and the Indian were sent out to hunt. They had not been gone more than an hour before we heard several shots and concluded they had found something. Soon after they returned and the Indian had shot three out of five deer they had come upon. One was lost in packing as the mule objected strongly to carry dead animals so but two were brought into camp. They were mule deer which may have had something to do with the objections of the mules to carrying them."

On the same day Moran makes an entry as follows: "We were out of bed this morning at 5:30. It was cold and ice had formed on the tin cups. In an hour we were under way over what appeared to be a smooth rolling country, but as we advanced we found our mistake. Every mile we found a gulch bordered with aspen and in depth from 100 to 200 feet, but we had no difficulty in crossing the divide between Teton Basin and our last camp. The Tetons loomed up grandly against the sky, and from this point it is perhaps the finest pictorial range in the United States if not in North America."

From near this point he made the painting "The Three Tetons" that now hangs in the museum at Jenny Lake.

Thomas Moran had a photographic eye which made it possible to create in his tent at night and even in the studio after leaving the region, pictures of marvelous beauty and accuracy. He delighted in drawing and painting the rocks of his foreground with such accuracy of texture and color that the geologists of the party could identify them. His critics have accused him of being at times too idealistic and pictorial with his mountain canvases, but Moran loved these western scenes, and put into them the beauties that were in his heart.

AN EARLY TRIP TO THE TETONS THE DIARY OF THOMAS MORAN, 1879

The Grand Teton National Park Museum, through the courtesy of Dr. F. M. Fryxell, has recently acquired Thomas Moran's diary of his journey to the Tetons in 1879. It is contained in a small, 3 inch by 6 inch, cardboard-covered, pocket notebook. Written in pencil, it is still easily read except for a few words which time has blurred. The following is a complete transcription of this interesting account of the journey on which he made the paintings and sketches now in the museum at Jenny Lake. Words in parentheses have been somewhat doubtfully interpreted. - Ed.

"1879, August 21. Left Fort Hall with Cap. A. H. Bainbridge and 20 men, two wagons, on way to Taylor's Bridge. * Very hot, mirage, dogs exhausted, Pete ** sick. Reached Taylor's Bridge late in afternoon. 27 miles. Desolation, abandoned town, R.R. bridge over Snake, Anderson's store. Discharged soldier in morning came into camp and made (disturbance). Hughes, highway robber. Dismal camp. Furious wind all night, driving sand everywhere almost blinding. Gray dismal morning. Black basalt abomination. .Rushing river like Niagara Rapids.

"August 22. Left camp at Taylor's Bridge at 7 o'clock. Cold and windy with dust following and blinding all the way. At noon passed Black Jack's on Willow Creek. All sage plain, proposed irrigation. Arrived at 12 at Buck('s) from Connecticut. 7 miles to south fork of Snake. Arrived there at ½ past three. Two hours to get across on the opposite side. Had terrible time to get heavy wagons up embankment and through willows 40 feet. 12 mules, soldiers yelling and beating the mules. Got up all right and went into camp in a beautiful spot on the north bank of the river. Soldiers bathing and watering the stock. Near Taylor's Bridge had our first sight of the peak Teton some 70 miles away. Indian herder

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*Taylor Toll Bridge was near the present city of Idaho Falls, Idaho. The bridge, of which only the stone abutments remain today, was built across the Snake River in 1866-67. The timbers were hauled from Beaver Canyon 80 miles to the north, and the iron was obtained from old freight wagons and a wrecked steamboat on the Missouri River. - from Tours in Eastern Idaho, publication of the American Guide Project, Works Progress Administration.

**Pete- Peter Moran, brother of Thomas Moran, was also a member of the party. -Ed.

seldom speak(s) and keep(s) studiously apart from the other men. The (stagey) Sargent.

Amusing to see the mules inquisitively surrounding the teamster who was handling the rations. Fires all over the country.

"August 23. An early breakfast and cool. Following foothills surmounted by basalt over a plain covered with fine bunch grass, fine grazing and farming country with means of easy irrigation from the south fork of the Snake which is a splendid current and clear as crystal. We are directly opposite Crater Buttes * across the Snake 15 miles distant. The Salmon River Range, close in the distance enveloped in a delicate blue haze. To the east lies the Snake River Range a low line of mountains separating us from the Teton Basin. ½ past seven. Five miles. A halt for ten minutes, a good road for the wagons. At 11:20, reached a fine cold stream probably Moody Creek where we rested ½ hour to water the animals. The Tetons are plainly visible but not well defined owing to the mistiness of the atmosphere. They loom grandly above all the other mountains. An intervening ridge dividing us from the Teton Basin stretches for miles to the north of a beautiful (pinkish) yellow with delicate(shadows) of pale cobalt while the distant range is an exquisite blue with but little definition of forms on their surfaces.

Our Indian Jack has just caught a fine trout of about 3 pounds weight and he says the stream is full of them.

"August 24th. Teton River camp. Trout this morning for breakfast. Is a wind blowing nearly as bad as at Taylor's Bridge driving the dust everywhere and covering our breakfast. Cold but bright overhead. The Tetons from the camp are very well defined in an easterly direction before the sun rose, but soon disappeared when the atmosphere lighted up. Bogua whose ranch we stopped at for information yesterday drove over this morning before we left camp and partly under guidance reached Canon Creek at 11 o'clock after a fifteen mile ride over rolling country covered with excellent grass and free from sage. We struck the canyon at a point where it is about 800 feet in depth with very precipitous banks covered with debris from the basaltic columns with which the upper edge is fringed. A large porcupine was killed by Cap. Bainbridge a mile or two from the canyon which has a beautiful stream flowing through it fringed with water elm, pine, cottonwood, etc. The captain and two men (have gone) up the canyon either to find (A). About a mile above we found a depression in the side of the canyon down which we could make our way to a flat space containing a few acres covered with sage and grass. Here the wagons were unloaded and after packing the (material) on the pack mules, the wagons with a(portion)of the mules and 6 or 8 men were sent back to Bogua's to there camp until our return from Teton Basin. We made our

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*Crater Buttes, probably Menan Buttes or Big Buttes, near the confluence of the north and south forks of Snake River. Here a broad alluvial deposit has formed, beyond which the Buttes, broad of base and with gently sloping sides and broad tops, rise to a height of abour 600 feet. Each has a well-defined extinct crater in its top about a mile in diameter and 200 feet in depth. - from Tours in Eastern Idaho, American Guide Project, W.P.A.

camp on the flat in the canyon, Caught a few mountain trout and ascended the canyon again to get a glimpse of the Tetons but from this point only the top of Mount Moran* is visible owing to the slope of the hills beyond the canyon.

"August 25. We were out of bed this morning at 5:30. It was very cold, and ice had formed on the tin cups. In another hour we were under way over what appeared to be a rolling but smooth country, but as we advanced we found our mistake. Every mile we found a gulch bordered with aspens in depth 100 to 200 feet but we found no difficulty in crossing any of them. After crossing the divide be between Teton Basin and our last camp we found a (gentle) country to the basin. The Tetons have loomed up grandly against the sky and from this point is perhaps the finest pictorial range in the United States or even in North America. After descending the slopes about three miles we came upon a small ice cold stream and determined to camp. Leaving the main body the Cap., Pete and myself and one man proceeded a mile or two toward the Teton valley but saw no sign of water within five miles. On our return to camp we saw a deer within a quarter of a mile, but failed to get close enough to get a shot at it. After camp had been finally disposed of three men and the Indian were sent out to hunt. They had not been gone more than an hour before we heard several shots and concluded that they had found something. Soon after they returned and the Indian had shot three out of five deer they had came upon. One was lost in the packing as the mules objected strongly to carry dead animals so but two were brought into camp. They were the mule deer which may have had something to do with the objections of the mules carrying they. Later in the afternoon 4 men were sent out to search for the lost deer and they soon after brought it back to camp. Of course we (enjoyed) our venison heartily at dinner. This afternoon we made sketches of the Teton Range but the distance 20 miles is rather too far to distinguish the details especially as it is very smoky from the fires on each side of the peaks. This evening it is quite cold but we have a fine campfire and the Cap. and Peter are broiling venison ribs on willow sticks.

"26th. From camp this morning our way lay over a smooth rolling country descending gently to the bottom of Teton Basin a valley through which the Teton River flows its banks deeply fringed with the willows common to this region with here and there cottonwoods in small (groves). The Teton River can be forded at almost any point. Soon after crossing the stream we saw a teepe in the willows a short distance away and some horses grazing. Going over there we found it to be Beaver Dick** his Indian squaw and a companion whom he called Tom. He was evidently trapping beaver as he had several skins stretched with pins on the ground. Leaving Beaver Dick's camp we headed directly for the canyon of the Teton River which heads at the base of the Tetons. Dick said it was 17 miles to the camping ground, but we found that it was not more than 10 or 12. At the mouth of the

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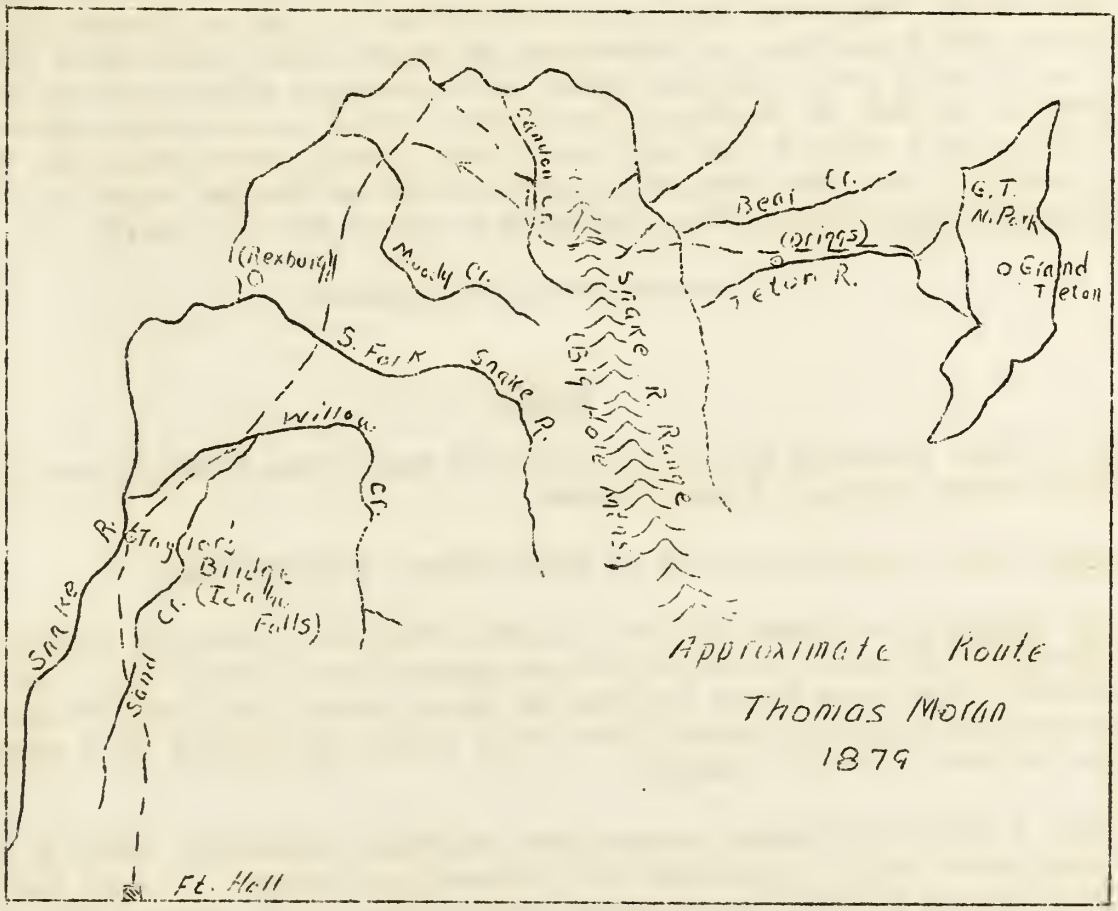
*Mount Moran had been named in 1872 by the Stevenson Division of the Hayden Survey in honor of the great landscape painter who had accompanied the Hayden party to Yellowstone Park the year before as guest artist. -Ed.

**Beaver Dick, Richard Leigh, trapper and one of the guides of the Hayden expeditions into Jackson Hole. Leigh Lake and Jenny Lake in Grand Teton National Park were named for Beaver Dick and for his Indian wife by the Hayden party of 1872. - Ed.

canyon we found a pretty good camping spot on the edge of the banks of the river which are here about 14 feet high. A fine growth of pine fills the river bottom and good grazing for the animals covers the space between ourselves and the hills. It is very hot this afternoon and so very smoky that the peaks can scarcely be seen and at times are entirely obscured so that sketching is out of the question and we spend our time working up some of our sketches made previously. As the sun goes down it gets quite cold but a roaring campfire gives warmth and cheerfulness to our camp and we all feel in the best of spirits. After a good night's rest we got up on the morning of the 27th at an early hour and after a substantial breakfast of venison we are about to start on our trip up the canyon when one of the men discovered a black bear coming down the hills toward our camp and not more than 250 yards distant. The bear showed much curiosity in regard to our camp and was deliberating whether to come nearer when the Cap. sent Indian Jack and several men out to interview him. Jack got the first shot and hit him in the right foot which seemed to surprise him very much as he threw up his foot and stood still for a few seconds but he was not long in making up his mind to retreat. The men fired a number of shots after him as he ran into the aspen grove at the foot of the hill but failed to hit him. In a few minutes he had disappeared over the top of the hill much to the disgust of the hunters. After this little event the Cap., Pete, myself and two men started on a trip up the canyon. We proceeded over a not difficult way about 6 miles and ascended to the top of a granite cliff about 500 feet to get a good view of the canyon that leads up to the right of the Tetons. The peaks of the Tetons are from this point hidden from view but a number of other fine peaks present themselves in view. The view is very magnificent. The opposite mountain rises 5000 feet above the river with a granite base surmounted by sandstone and capped by tremendous precipices of limestone. The slopes are covered in places with a growth of large pines but the summit is nearly bare of vegetation. We remained on the shelf for some three hours sketching and afterwards amused ourselves by rolling down great granite boulders over the precipice upon which we stood and watched their descent as they went bounding from rock to rock and crashing through the branches and dead timber at the base with a noise like the report of musketry and reverberating through the canyon. Descending to the valley we found red raspberries and black currants plentiful with which we regaled. A large beaver dam stretches across the the canyon at this point and the animals' industry is here exhibited on a large scale, the trees having been cut by them hundreds of feet above the water and brought down to the dam. Game of all sorts is very abundant in the canyon. Elk and deer tracks are seen everywhere. We returned to camp early in the afternoon the fires in the surrounding mountains had become so dense as to almost obscure the peaks of the Tetons and the sun went down in fiery redness. A strong and cold wind began to blow soon after and during the night a violent thunderstorm continued until nearly daybreak accompanied by rain in the canyon and snow on the peaks. Heavy storm clouds hung over the range dropping snow or rain occasionally and a cold wind blew from the southwest.

"August 28. We broke camp and left the canyon at 6:30 after an uncomfortable breakfast prepared under difficulties of rain and cold wind. As we left the canyon and came into the open plain the sun broke through the dense clouds that overhung the mountains for a time and showed his face (fitfully) all day. On our way back we called at the wickiup of Beaver Dick and after a little talk we proceeded to the Teton River near its junction with

Bear Creek where we intended to camp but after a rest of a couple of hours during which a number of fine salmon trout were taken, we concluded to go some 8 miles to our old camp on the other side of the Teton valley where we arrived about 4 o'clock. Beaver Dick and his companion Tom (showing) us part of the way. It was cold and windy part of the evening and considerable snow fell on the mountains during the day. Indian Jack as usual was the (lucky) hunter and brought in a young antelope many of which we saw between Beaver Dick and our camping ground. A roaring campfire dispelled the cold and our camp being in a sheltered spot we slept comfortably and next morning August 28* we followed our old trail toward Canyon Creek for some time when we



were again joined by Beaver Dick who guided over a new route to Bogua's but not an improvement over our own as we came over to the basin. The Cap. was very desirous of bringing into Fort Hall a hostile Bannock Indian named Pam-Pigemena who was, by the way, father-in-law to Beaver Dick and Dick said he knew where he was and would bring him to our camp in the morning. We journeyed along and reached Bogua's ranch early in the afternoon and found that the party we had left in charge of the wagons was camped on Moody Creek near its junction with the south fork of Teton River some four miles farther on. We proceeded on the way and reached

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* August 29

there about 3 o'clock after dinner. Beaver Dick started out for the Indian (promises) to bring him in in the morning. It was very cold during the night, heavy ice forming on the water in our buckets. On the morning of the

"29th* as we were at breakfast Beaver Dick came into camp with the information that his father-in-law and his mother-in-law also would be in very soon. The Cap, ordered the start but left three men in the camp to wait for the Indian and his wife. We proceeded on our way toward the south fork of the Snake River and when about 8 miles on our way we (descried) the men with the Indian coming along, We halted for half an hour until they came up. They had all their worldly goods with them packed on three horses consisting of beaver, otter, deer, bear and other skins. They were about 60 and 50 years of age and seemed entirely indiferent to their position as prisoners, We bought some otter skins from them, but a coveted gray bear skin the squaw would not part with as she said Beaver Dick gave it to her. We recrossed the Snake without accident and arrived at Willow Creek at 3 o'clock and went into camp. Cedars, cottonwoods in the bottoms and a beautiful day. The ever present Crater Buttes (occur) right all day backed by the Salmon River Range. Poor camp with no grass for animals."

*30th

TALUS

March 9 - First Mountain Bluebird arrived at the S.T.S. Ranch on the Snake River near Moose today. - Buster Estes.

March 12- First Bluebird arrived at Jenny Lake.- Jess Roberts.

March 25- April 10 - Flocks of Horned Larks (Otocoris alpestris leucolema) are commonly seen along roadsides and on exposed fence rails near park headquarters. They were first observed by Hazel Hanks and Sylvia Stagner along the snow-banked road near Moose. Snow still covers the ground to a depth of some two to three feet. - H.R.S.

April 14 - A solitary Western Meadowlark (Sturnella neglecta) perched on a rail fence near Moose today could well have become discouraged at the prospects for a good summer by what he saw about him- fields still covered with snow, with but here and there only a few shrubs and a little sagebrush showing. Warm days and rapidly melting snow as well as a fair number of small insects, however, must have lent a balancing, encouraging note to the forecast, for this first seasonal pioneer remained until joined by others of his species a week or so later. - H. R. S.

April 15 - Counted 20 American Goldeneys (Glaucionetta clangula americana) on the Snake River near Moose today. In the same area Mountain Bluebirds (Sialia currucoides) were especially numerous. On Flat Creek near Jackson two pairs of American Mergansers (Mergus merganser americanus), a pair of Bufflehead ducks (Charitonetta albeola) and a few Barrow's Goldeneye (Glaucionetta islandica) were also observed. - H. R. S.

May 3 - Al Austin and James Budge today reported that large numbers of White Pelicans (Pelecanus erythrorhynchos) have been present on the Snake River for the past two weeks. As many as seventy-five to a hundred have been counted from the highway bridge at one time. They apparently like to sun themselves, for,as the sun rises higher and higher in the sky during the mornings, they congregate on the exposed gravel bars and small islands in sufficient numbers to completely cover these areas. From a distance it appears that these islands and bars are covered with snow as some of these areas and the stream banks actually are. According to various residents of the area Pelicans commonly arrive on the Snake during the latter part of april, and remain until about the middle or latter part of May. Occasionally a few are seen in the northern part of Jackson Hole later in the summer as well. - H. R. S.

May 5 - A pair of Mountain Chickadees (Penthestes gambeli) are building a nest in a deserted woodpecker hole in an aspen tree near the Snake River beaver ponds. - H. R. R.

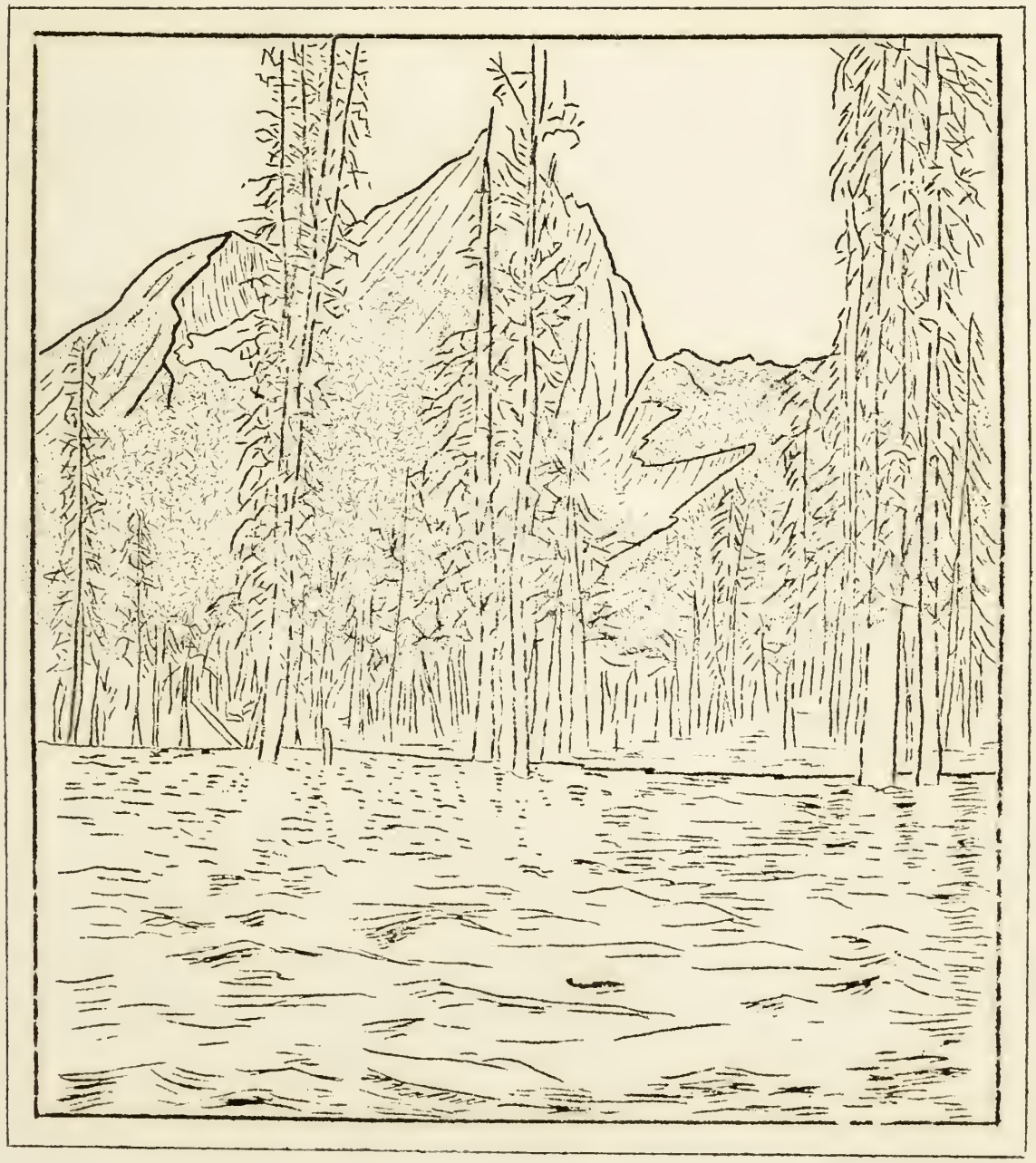
May 12 - Jack Dorman reports that a duck is nesting in a hole in a cottonwood tree on the bank of the Snake River at his ranch at Moose. Only the female has been seen at the nest and the identification is not positive although it is believed to be Barrow's Goldeneye (Glaucionetta islandica), sometimes locally called the Wood Duck. - H.R.S.

May 17 - Numerous Cassin's Purple Finches (Carpodacus cassini) and Audubon's Warblers (Dendroica auduboni auduboni) shared possession of the Jenny Lake area with Chipping Sparrows (Spizella passerina arizonae) and a few Rocky Mountain Grosbeaks (Hedymeles melanocephalus papago). - H. R. S.

June 14 - About 5 o'clock this evening while I was working on some papers in the office, a strange interrupted buzzing sound kept intruding itself on my consciousness until finally became aware of a visitor. Through the open door had entered a tiny, colorful humming bird. As it attempted an exit through the unyielding panes of the window, it repeatedly crashed into the invisible wall that separated it from freedom. After each crash it fell to the sill and remained momentarily stunned, so I had no difficulty catching it for examination after which I assisted it back to the out-of-doors. It fit the descriptions of the female Broad-tailed Hummingbird (Selasphorus platycercus). - H.R.S.

June 17 - The Catbird (Dumetella carolinensis) does not appear on the check list of birds of Grand Teton National Park. Jess Roberts reported one last Spring (1936) along Cottonwood Creek about half a mile below Jenny Lake. This morning I was at the old sawmill site near the Snake River south of Moose when I heard a rather long, varied song ending in a raucous, cat-like meow. The singer, quite unafraid, sat on an aspen branch close by. Its general body contour, long tail, gray color with brownish under-tail coverts left no doubt as to its identity. - H. R. S.

NATURE NOTES



Grand Teton National Park

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GRAND TETON NATURE NOTES

Vol. III No. 3

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Thomas E. Whitcraft, Superintendent

Howard R. Stagner, Editor

TREES OF THE GRAND TETON NATIONAL PARK

by Willis Smith
Ranger-Naturalist

The Grand Teton National Park embraces the most spectacular portion of the Teton mountains. The northern border of this park is just eleven miles south of Yellowstone National Park. To the east lies the valley of the Snake River (Jackson Hole) at an elevation of about 7,000 feet. The peaks rise with precipitous east faces to elevations of from ten to fourteen thousand feet.

The lower slopes of the range and the glacial moraines that encircle the shores of some six or more beautiful lakes of the park, are densely populated with the trees that are characteristic of any other similar area of the Rocky Mountains.

The Lodgepole Pine (Pinus contorta) forms dense black stands in the more arid and lower areas of the park. This friendly tree grows under soil and water conditions that no other tree would tolerate and in doing so serves as a protection to the water sheds of the arid plateaus of the region. In Grand Teton National Park this forest gives way to the Engelmann Spruce (Picea engelmanni),Alpine Fir (Abies lasiocarpa), Whitebark Pine (Pinus albicaulis) association as one travels up the more moist, shaded canyons or up the slopes of the range.

The Douglas Fir (Pseudotsuga taxifolia) is found on the east face of Mount Teewinot up to about 8,000 feet. This tree with its fir-like leaves,

its pendent cones that suggest the Spruce, its thick furrowed bark like that of the Western Yellow Pine (Pinus scopulorum) and a name that refers one to the Hemlock (Tsuga) leaves the amateur naturalist somewhat confused, but the common name Douglas or Oregon Fir identifies it as the most valuable lumber tree in America. It reaches its highest development in the rain-soaked forest of Western Oregon.

Two-needle Bundle and Cone of Lodgepole Pine

At timberline, about 10,500 feet, the matted, decumbent, Alpine Fir sprawls across the rocky slopes appearing in the distance like closely-cropped blue grass lawn. The Whitebark Pine, broken and gnarled from countless battles with the elements, stands guard on the wind swept ridges. In the upper reaches of south fork of Cascade Canyon stands one of these veterans of the ages. It is seven feet in diameter and is as far as is now known, the largest diameter in the park. Hundreds of hikers who have walked up the switchbacks to the top of Hidden Falls have marveled at a dwarfed and contorted specimen of Whitebark Pine growing from a crevice in an immense granite boulder. No doubt but that this tree is hundreds of years old.

A few Limber Pine (Pinus flexilis) are found in arid and exposed places at lower elevations. The flexible whip-like branches act as a special adaptation to wind-swept slopes.

For sheer beauty of form and color the Alpine Fir stands supreme, although the Engelmann Spruce is a worthy rival to it. The Alpine Fir is tall and tapers to an extremely narrow spire-like top. The silvery gray bark vividly contrasts with the dark blue-green of the leaves. The cones, always borne at the top, are erect and of velvety texture. They are dark purple in color, and with the sunlight reflecting from the pitch that has beaded itself on the cone, one can compare them with nothing other than lighted Christmas candles. However, this beautiful cone seldom comes to one's hand. On ripening, which takes place in the fall of the year following its origin in the spring, the cone disintegrates, scattering seeds and scales to the wind. The fact that a large fir is oftimes surrounded by a cluster of small ones, much as a mother hen with her chicks, tends to indicate that the seeds mostly fall to the foot of the parent tree.

Needles are Five in a Bundle and Cones Large in the Limber Pine

Another interesting characteristic of this tree is the rooting, much as a strawberry does, of the lower branches as they touch the ground due to squirrels making caches under them or the snow pressing them down. This rooting results in the tip of the rooted branch turning up and becoming a tree. As time goes on this process is successively repeated. It is not uncommon to see mature snow

mats, as these are called, with the old parent tree dead and disintegrated with the live mat forming a truncated cone a quarter of an acre or more in extent.

In the short glacial canyons that extend to the east face of the range and along the west shores of the lakes the Engelmann Spruce is found at its best. Mature specimens four to five feet in diameter, 100 feet high are found. The tree is pyramidal but not as spire-like as the Alpine Fir. The lower branches droop as do all the branchlets. This gives the tree a dense, black aspect. The foliage is dark blue-green, and contrasts vividly with the reddish brown flakey bark that is found on the young as well as on the mature trees. The pendant cones are narrowly cylindrical and borne on the ends of the branchlets, mostly near the top of the tree. This tree never produces a snow mat.

Engelmann and Colorado Blue Spruce Cones are Pendent, the Needles Sharp, Stiff, and Square in Cross-section.

Cones of the Alpine Fir Disintegrate on the Tree

The Colorado Blue Spruce (Picea pungens) is found only along the Snake River bottoms. Here the tree is typical of the species, and no confusion between it and the Engelmann Spruce could arise in the mind of an observer. The tree is wider in proportion to its height than the Engelmann. The bark is tough and furrowed, being of gray color. The cones are large, oftimes five inches in length. The pungent, four-angled leaves are usually covered with a light blue bloom from which it takes its common name.

The Three-forked Bract on Each Scale Gives the Pendent cone of the Douglas Fir a Fringed Appearance.

LEPIDOPTERA COLLECTION - A fine addition to the museum exhibit, as well as a valuable addition to the scientific collection of the park was made this summer in the way of a collection of butterflies native to the region. The collection includes about 130 mounted specimens, and makes an exhibit second only to the fresh flower display in color and attractiveness. The work was done by John W. McSwain. The following genera are represented: Papilio (3 species), Parnassius (2 species), Danaus, Pieris (2 species) Anthocharis, Eurymus (3 species), Oeneis, Cercyonis, Coenympha, Epibea, Vanessa (2 species), Argynnis (9 species), Phyciodes (2 species) Brenthis, Euphydryas (3 species), Basilarchia, Miletea, Euptieta, Plebius (6 species), Glaucophyscho, Heodes (8 species), and Thecla (2 species) . - Allan D. Cameron.

TREES	ORIGIN OF COMMON NAME	MEANING OF LATIN NAME	GENERAL APPEARANCE
Lodgepole Pine (Pinus contorta)	Used as tepee or lodgepoles by the Indians.	Cones contorted and unsymmetrical.	Tall narrow stems, devoid of limbs except at summit in dense stands.
Whitebark Pine (Pinus albicaulis)	Light gray color of the bark.	Same as common name.	Low-spreading, freely branched crown ragged, unsymmetrical.
Limber Pine (Pinus flexilis)	Flexible branches.	Same as common name.	Similar to the above species.
Engelmann Spruce (Picea engelmanni)	Engelmann, distinguished botanist.	Same as common name.	Tall, pyramidal, deep blue-green color drooping branches and branchlets giving a dense appearance.
Colorado Blue Spruce (Picea pungens)	Light blue color of the leaf.	Pungens refers to the sharpness of the leaf points.	Beautifully symmetrical, cone-shape, with spreading branches, not as tall as the Engelmann Spruce.
Alpine Fir (Abies lasiocarpa)	High mountain species species.		Tall tree with extremely narrow, spire-like top. Frequently with snow mat.
Douglas Fir (Pseudotsuga taxifolia)	Douglas, distinguished botanist.	False Hemlock.	Stately with spreading, rugged branches.

BARK	LEAF	CONES	HABITAT
Thin, flaky, brown to black in color.	Clusters of 2, about 2 inches long.	Small, woody, persistant, armed with prickles.	Arid plateaus of mid-elevations.
Smooth, gray on twigs, furrowed gray on bark.	Clusters of 5 grouped on ends of branches, about 2 to 3 inches long.	Three to four inches long, oval, dark purple, does not open at maturity.	Wind-swept ridges at high elevations.
As above	As above	Five to seven inches long, tapering, greenish when young, open at maturity, seeds edible.	As above at lower elevations.
Flaky, reddish brown in young tree as well as mature tree.	Single, short, four-angled, not as stiff or sharp as Colo. Blue Spruce, well distributed around twig.	Oval or oblong, about 2-3 inches long, pendent, brown when mature.	Mid-elevations to timberline in moist situations.
Thick and gray, in old trees furrowed and ridged.	Single, short, four-angled, very sharp.	Cylindrical, drooping, light brown, about 3-5 inches long.	Mid-elevations in moist situations.
This, smooth, and ashy gray. Cracked in very old trees, many pustules of balsam or pitch.	Flat in cross-section and blunt on end, flexible	Erect, near top of tree, velvety texture, purplish brown, disintegrate at maturity.	Mid-elevations to timberline in moist situations.
Thick and furrowed, gray in color.	Similar to above species.	Ovate and pendent, each scale subtended by a three-forked bract, giving the cone a fringed appearance.	Mid elevations throughout the range. (Reaches greatest development in Oregon)

PLANT SUCCESSIONS IN THE GRAND TETON NATIONAL PARK

by Willis Smith
Ranger-Naturalist

A view of Jackson Hole from one of the Teton peaks or from an airplane discloses a striking distribution of the forested areas. The forests are limited to a narrow fringe around the shores of the glacial lakes and a few isolated areas such as Timbered Island and protrusions into the valley floor such as Burnt Ridge. Without exception these forests are growing on glacial moraines. To the east and extending across the floor of the valley a complete absence of forest is the conspicuous feature of the landscape. This is a desert plain populated with a typical sagebrush association of plants.

To the casual observer, particularly from a moving automobile, the moraine along the east side of Jenny Lake and Leigh Lake is populated with a dense and pure stand of Lodgepole Pine. One would expect the floor of the forest to be covered with the young of that same tree, but with the exception of the open places, where the sun reaches the ground, and along road clearings, this is not the case. Rather than lodgepole seedlings, a beautiful stand of Alpine Fir and Engelmann Spruce is found. Some explanation of this limited forest distribution and the young fir and spruce replacing the young lodgepole is needed.

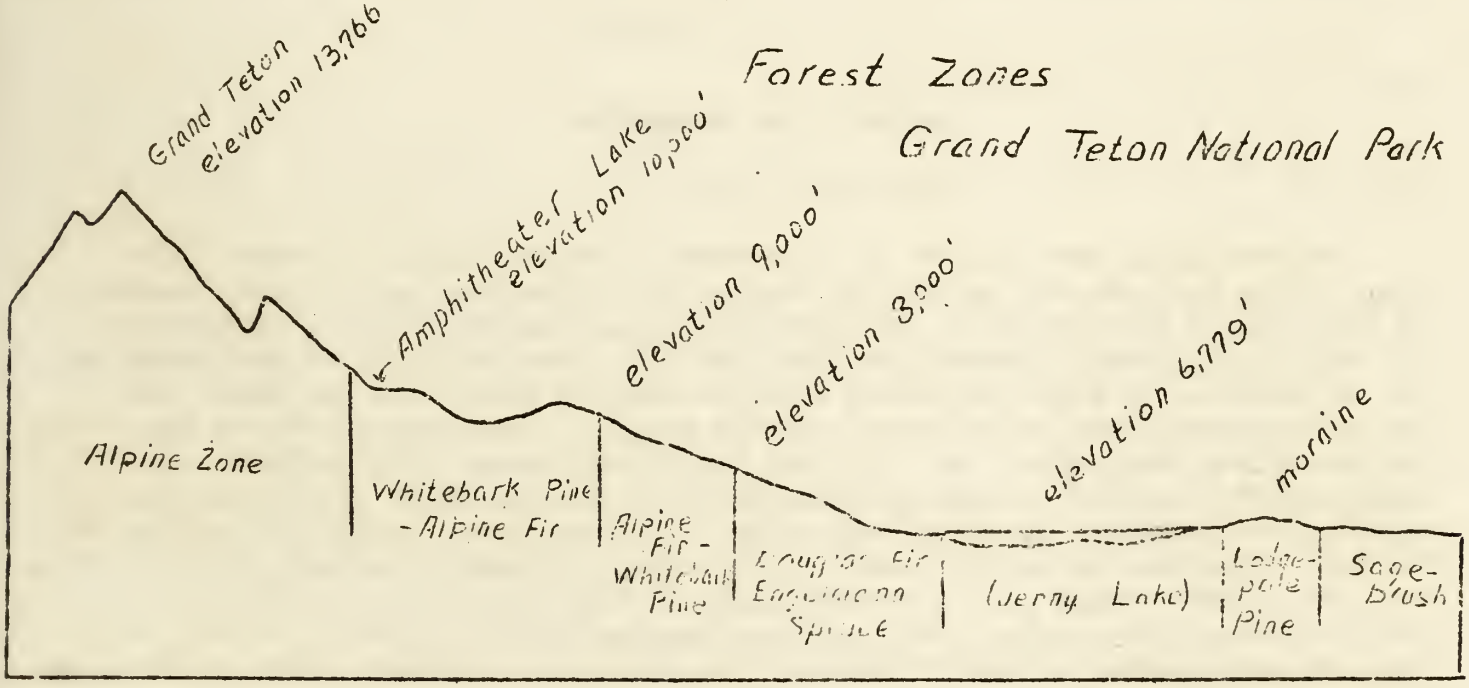
Available water is a prime factor in plant distribution, and the size of the particles that make up a given soil is a prime factor in the availability of water. Clay soil holds more water than sandy soil because clay particles are very small. Although glacial moraines that have given rise to the forests are characterized by large boulders, great quantities of finely pulverized rock - fine sand, silt and clay are also present. These fine soil particles retained the water from melting snow and summer rains in the past as well as at the present time thus permitting the lodgepole forest to populate the moraines.

On examination of the soil in the floor of the valley where grows the sagebrush and its associates, a very different condition is revealed. The soil here consists of coarse sand and quartzite gravel. This extends to hundreds of feet in depth. The water from the melting snow and spring rains disappears from it as though it were a sieve, leaving the surface a dry and inhospitable place even for the hardy, drouth resisting Lodgepole Pine. In fact it is so arid here that no Lodgepoles grow.

A few desert plants that have come down to us through countless generations of adjustment to extreme arid conditions thrive there. The cactus and sedums that store water in their stems and leaves, the buckwheat whose matted leaves shade the soil and accumulate humus, the lupine with its deep tap-root, and the sagebrush with a pubescence on the leaf that prevents excessive loss of moisture find in the floor of Jackson Hole a suitable habitat. Thus in the soil condition of the region is found an explanation for the limited distribution of forests.

Why are Alpine Fir seedlings found on the floor of a Lodgepole Pine forest? The answer is clear to the student of plant life. It is easy to assume that the plants of Grand Teton National Park were always as they are now, but this is

a mistake. As the glaciers retreated back from the areas that are now the shores of the lakes and into the heads of the canyons, the granite boulders of the moraines and the canyon walls were naked and devoid of plant life. In time these bare surfaces were populated with an interesting plant which is a combination of a algae and fungi. This plant is called a lichen. The lichens are commonly seen making brilliant as well as subdued patches of orange, red, yellow, brown and gray color on the rocks. These plants grow very slowly but in time bring about a slight disintegration of the rock. This film of dust along with the dead body of the lichen sifts into crevices where enough of this soil collects to permit other more complicated forms of plants such as mosses, certain grasses, and eventually the larger flowering plants to grow. This soil building process is very slow at first, but becomes more rapid as plants come. Thus the time comes when what was a bare, hard granite surface is a beautiful flower garden populated with the characteristic plants of the region. The Lodgepole Pine is a hardy shallow-rooted



tree and is among the first of the higher plants to take its place in the succession. It will be noted, that in such a process as described that a given plant group will prepare the habitat for another type and thus be crowded out of the picture. Certainly when the rock surface was changed to loose soil the lichen no longer lived there.

Now in a similar manner the many generations of lodgepoles that have grown on the moraines along the lake shores have prepared the way for this new growth of fir and spruce. These two trees are usually found in moist shaded canyons or well up on the slope where more moisture is available. This extra demand for moisture is successfully met on the moraines today due to the presence of great quantities of humus or rotted plant bodies, mostly Lodgepole Pine. Even a greater factor in water holding capacity of soil than the size of the soil particles, is the presence of this humus. It acts much as a sponge, regulating and retarding the run-off of melting snow and summer rains. In this way the Lodgepoles on the moraines have prepared the habitat for a new type of tree.

Why do not Lodgepole seedlings also help to repopulate the forest floor? Largely because this tree, unlike the Spruces and Firs, is not tolerant of shade, and the young will not survive in the deep shade cast by the larger parents. Thus , while preparing the soil for other tree types, the Lodgepole does not permit the seedlings of its own species to develop. The Pine, then, must perpetuate itself in the open places and on the borders of the deep forest.

In turn, then, it is encroaching on the domain of the sagebrush association and in a similar manner will replace it. It does not take too great a stretch of the imagination to see in the future the floor of Jackson Hole densely populated with a beautiful Alpine Fir - Engelmann Spruce forest. Thus, down through the ages there has been a series of shifting of types of plants that have populated the Grand Teton National Park.

JACKSON LAKE SHORELINE

by Howard R. Stagner

Jackson Lake, the largest of the several piedmont lakes of Jackson Hole, lies in the northern end of this mountain-girt valley just east of the boundary of Grand Teton National Park. Bordered with dense forests of pine, spruce and fir with Mount Moran, Bivouac, Eagle's Rest and other meuntains of the north end of the Teton Range rising abruptly from its western shore, and the Grand Teton and other sharp peaks of the range clearly visible across the waters to the south, it presents a view, which for its quiet beauty and spectacular character is not excelled. From such a vantage point as Signal Mountain, where the Forest Service maintains a lookout a thousand feet above the water level, nearly the entire irregular shoreline can be followed with the eye, the several islands distinguished, and the majestic peaks of the entire length of the Teton Range identified. In the bordering forests elk, deer, bear and smaller animals abound, and many moose find the wide-spread willow thickets of the north and northeast sides of the lake to their desire.

Especially attractive is this lake in the spring when the water is at its highest level. As summer advances, however, the water rapidly recedes as much as 39 feet leaving a conspicuous white beach , and on the north, great expanses of mud flats to mark the shoreline.

So great a change in water level does not characterize other similarly situated lakes of the area, nor is this fluctuation a natural one for it is controlled by a dam across the lake's outlet. Completed in 1916, this dam makes possible the storage of water to be released into the Snake River during the summer for irrigation in south-central Idaho,

Two very obvious results followed the erection of the dam and the resulting artificial control of the water level. First, the lake area has been greatly increased. The original area of the lake was some 25,650 acres, and now, at high water level an additional 8,000 acres of low-lying, flat lands to the north and

northeast sides of the lake are flooded. Then, by fall, when the impounded waters have been released, these flats are exposed as mud flats, and along the steeper banks a gravel and boulder-littered beach develops.

A third quite undesirable effect has been largely rectified within recent years. When this lake was artifically enlarged, it was not the policy, as it now is to clear the trees from the area to be flooded. As a result, some 7,500 acres of forest were flooded by the rising waters, and the trees drowned. Consequently, for many years the entire lake was fringed with a forest of stark, naked, dead trees. Not only did this detract from the mountain and lake view and in places actually create a picture of dismal, depressing desolation, but from a practical viewpoint was becoming a factor of great danger. As dead trees became loosened, they floated into the open lake, frequently nearly or completely submerged, and constituted a real menace to boating.

Finally the tremendous task of removing the dead trees was undertaken. The first work was done under the direction of the Bureau of Reclamation, but in 1933 the task was assumed by the National Park Service and the actual work done by boys of the Civilian Conservation Corps. By this time many of the trees had fallen, and in some places the beach was covered six to ten feet deep in a thick, tangled mass of dead trees. The last of the shore was cleaned up and the last piles of brush and dead, half-rotted trees burned in the fall of 1936. The shoreline now presents, as nearly as possible, the appearance of any normal mountain lake. Only the dam itself, the mud flats and high white beaches exposed in the fall belie this natural appearance.

Not all of the trees were removed, hewever. In several hidden bays the dead forest was left undisturbed for the advantage of any wildlife that may have been attracted by the original creation of an abnormal abundance of dead trees.

The sketch on the cover of this issue of Nature Notes attempts to picture the forest of dead trees along the shoreline before the clean-up. The lake in thi this view is considerable below high water mark, the level of which is indicated by the height of the bleached portion of the tree trunks. Mount Moran and Skillet Glacier are seen in the background.

BIRD CLOWNS

The ever cheerful little clown of the forest birds, the Chickadees, that lived around our quarters at Jenny Lake gave us many minutes of pleasure this summer. We were able to overcome the shyness of several to the extent of having them alight on our hands for food. The cheerful song that was constantly issuing from their throats was an inspiration. Has anyone ever seen a downhearted Chickadee?

An iron dipper was hanging near the stove at such an angle as to hold a few spoonfuls of water. The stove poker hung next to it. We usually kept fresh pans of water out for the birds,and the Tanagers and Chipping Sparrows drank and bathed regularly in these, but the Chickadees never did. These little clowns perched on the poker and hung upside down to enjoy a drink from the dipper.

-Willis Smith

TALUS

July 10 - Twenty persons were on the all-day hike to Death Canyon today, and reached the beginning of the upper canyon below the limestone wall. A female Richardson's Grouse (Dendragopus obscurus richardsoni) appeared especially concerned over our presence, and a brief search disclosed the reason. In the middle of an open slope deep in the shade of a rank growth of columbine, balsam root, phacelia and lupine, all in full flower, we found the grass nest, resting on the ground and containing six light buff, brown-spotted eggs. - H.R.S.

July 11 - Going up to Death Canyon on a geology trip, Howard Stagner and I stopped on the top of the Phelps Lake moraine to catch our breath and to look at the view. We happened to look down the side of the moraine and our attention was attracted by something on a large rock. We at first thought it to be a skunk, but on closer observation we found it to be a coal-black marmot (Marmota flaviventris nosophora) with a white face. Although black marmots, or woodchucks, as they are sometimes called, have been seen in the park, this is the first one with a white face that has been reported. - J.G. Simvoulakis, Student Technician

July 12,- Under a limestone ledge in upper Death Canon today, Howard Stagner and I found a nest of the American Pipit (Anthus spinoletta rubescens) containing five brown and white spotted eggs. - J.S.

July 24 - All previous records for large hiking parties were broken today when 73 persons started on the Teton Glacier Trail with the naturalist. By noon 66 of the party reached Amphitheater Lake near timberline. After lunch 50 of the party made the additional trip to the glacier, returned to the lake, and, joined by the rest of the group, were ack in camp by 6 P.M.

All-day hikes, three of which are usually conducted each week, have increased rapidly in popularity since their introduction in Grand Teton National Park a year ago. Of the several, the glacier trip has most appeal. The round trip of 13 miles, two of which are over the tremendous jumble of broken rocks that constitute the morain and talus below the glacier, is made by hiking parties in an average time of 9 hours. In the climb of some 3,500 feet, there is brought into view a constantly changing panorama of Jackson Hole with its several large lakes and the Snake River, its timbered areas and sagebrush flats, and of the Gros Ventre and Wind River Mountains far to the east. At the head of the trail near timberline are beautiful Surprise and Amphitheater Lakes; and a short distance beyond the trail, cliff-bound Glacier Canyon with the glacier nestled in a huge cirque offers on of the most spectacular views of the range. The glacier itself, quite small as glaciers are measured, but a perfect one, lies in the shadow of the Grand Teton whose summit rises nearly 3,500 feet almost vertically above the ice. When to this great variety of scenery are added an opportunity to see and to know at first hand all of the features developed by large and small alpine glaciers, and the factor of comparative easy accessibility, the increasing popularity of this trip is readily understood. - H.R.S.

July - White-crowned Sparrows (Zonotrichia leucophrys) have been especially numerous in the park this summer. They appear to be the most abundant bird at elevations of about 8,500 feet, and two nests have been observed on the lower slopes of Mt. Teewinot early in the month. - H.R.S.

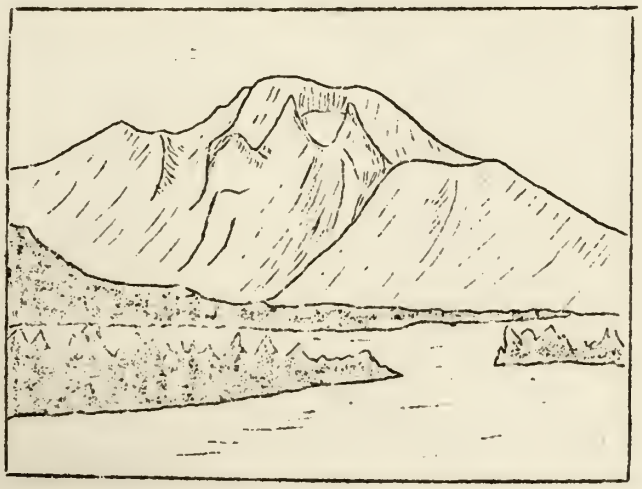
July - Many nesting pairs of Western Warbling Vireos (Vireo gilvus swainsoni) have been observed in the Jenny Lake area during the early part of the month.
- A.D.C.

August 10 - The all-day hiking party located the nest of the Black Rosy Finch (Leucosticte atrata) near Teton Glacier. These high altitude birds are seen especially during the early part of the summer in the glacier and snowbank areas. - A.D.C.

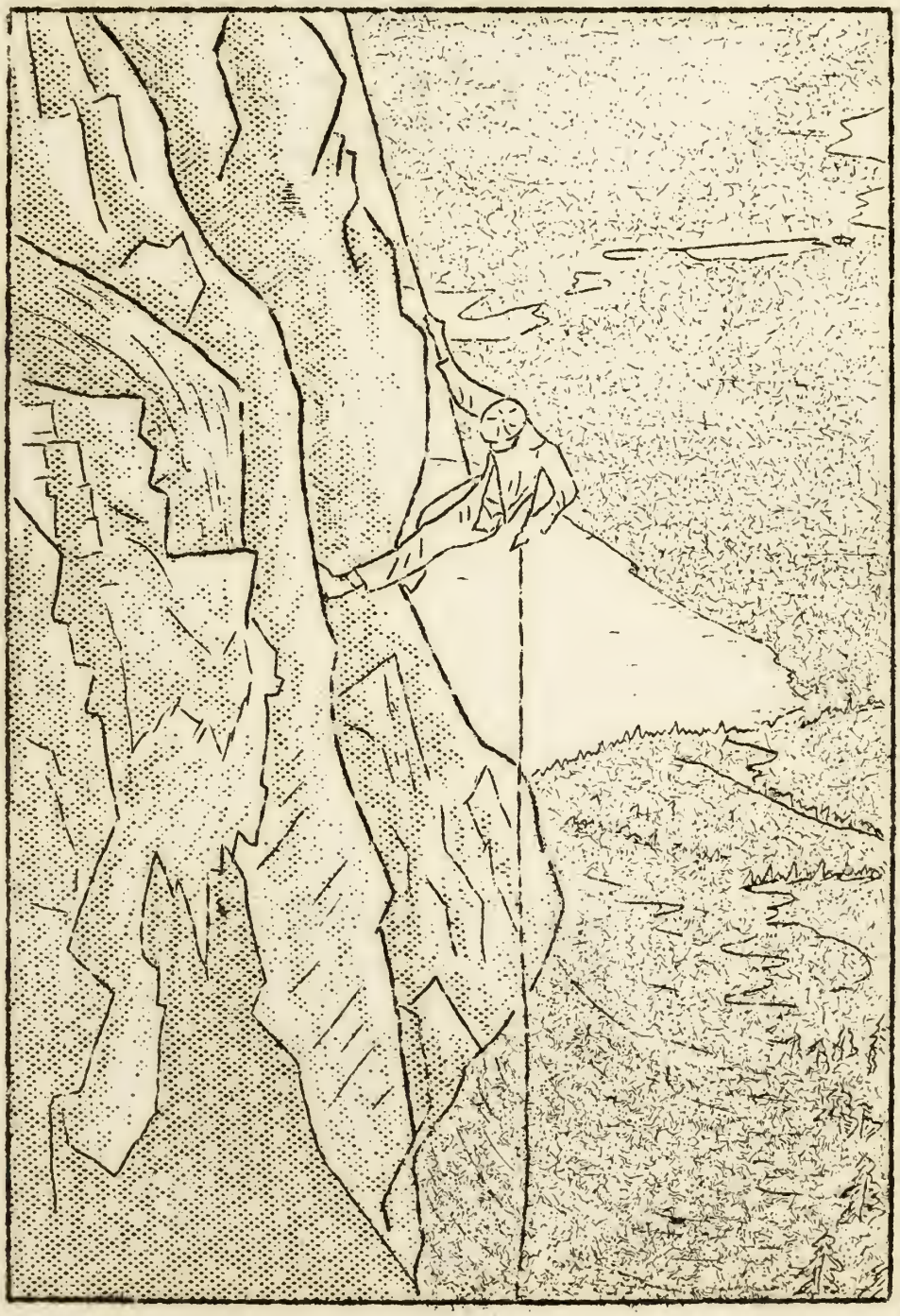
August - Green-tailed Towhee (Oberholseria chlorura) previously observed but once in the park, have been seen on two occasions on the lower slopes of Mt. Teewinot at elevations of about 7,500 feet. - H.R.S.

August - Two C.C.C. spike camps have been visited by bears this month. A small black bear carried off several pounds of meat from the Granite Camp. This particular bear showed up at a later date and was chased up a tree by a group of enrollees. One of the boys, bolder than the rest, followed the bear up the tree with a cross-cut saw. The bear perched out on a limb as far as he could go. The enrollee sawed off the limb letting Mr. bear take a good fall. He scampered off through the woods and has not molested the food supply of this camp since.
- Allyn F. Hanks

August - Moose have spent the entire month near the heads of the Teton canyons and were often seen by those taking the back trails. More deer have been observed in the park this summer than last, and at various times have been seen crossing the main highway between Timbered Island and the Park. Several have been sighted near Beaver Dick Campground, at the head of Leigh Lake, in Wister Draw, and near the mouth of Granite Creek. Some Mountain Sheep have been sighted by pack trips and trail crews. John Ray counted one ram, two ewes and one lamb on the top of Table Mountain. In all about 15 sheep have been seen by different people, and from signs observed there are possible twice this number in the park. All ground squirrels had disappeared by the end of the month although their larger relatives the marmots remained active. Beaver activity has been very noticeable this month in all streams and lakes throughout the park. Many food caches have been observed as beaver continue to store food for the coming winter. - Allyn F. Hanks



NATURE NOTES



A RAPPEL, WEST HORN, MOUNT MORAN

Grand Teton National Park

Vol. III, No. 4 Autumn, 1937

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GRAND TETON NATIONAL PARK
MOOSE, WYOMING

GRAND TETON NATURE NOTES

Vol. III No. 4

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Thomas E. Whitcraft, Superintendent

Howard R. Stagner, Editor

MOUNTAINEERING, 1937

by Phil D. Smith, Temporary Ranger
and Howard R. Stagner, Park Naturalist

Slow to start, but gathering momentum rapidly during August, the 1937 mountaineering season in Grand Teton National Park proved to be one of the best of all years. Climbing weather remained almost perfect from July until late in September, with but a few bad days While the records kept at the museum showed somewhat of a decrease over last year it is believed that this is a "paper loss" only. Professional guides of the park report this one of their best years, and it seemed that a more than usual number of climbers made independent ascents. It is therefore believed that the records are not complete due to the failure of some of the guides and other groups to report all of their climbs, and the true statistics for the season will be revealed only by a check of the summit records at a later date. The statistics for the past two seasons, appended below, consequently are of value only as they indicate the relative popularity of the various climbs.

As usual the Grand Teton, elevation 13,766 feet, was climbed about as frequently as all the other peaks combined, with all important old routes and one new one being used. Teewinot and Mt. Owen again ranked next in popularity with the latter, on which two new routes were pioneered, displacing Teewinot as second choice. Moran was scaled by but three parties, and remains one of the most trying ascents of the range. On this peak two Mazama groups paralleled each other on the east ridge and the Skillet Glacier routes. Some fine ascents were made of

Middle Teton, Nez Perce and Symmetry Spire, with Storm Point, St. John, Woodring and unnamed peaks coming in for their share of warming-up climbs.

Of the several mountaineering clubs to visit the park, the Mazamas of Portland, Oregon, were the largest party numbering about 80. The California Alpine Club, The Wasatch Mountaineering Club of Utah, and the Dartmouth Mountaineering Club, Hanover, New Hampshire, had representatives in the park during the summer as well.

Following are brief accounts of a few of the more interesting and more significant events of the season.

July 6 - Dr. Fred Ayres of Evanston, Illinois, Keith Anderson of Rexburg, Idaho, Floyd Wilson and Will Tompson of Jackson, Wyoming ascended the Grand Teton by way of the southwest ridge and returned to their timberline camp by the Owen route of 1898 thus opening the 1937 climbing season. To reach the southwest ridge first developed by Glen Exum of Pocatello, Idaho in 1931, it is necessary to follow along the exposed ledge on the face of a 2000 foot buttress, and then to cross an intervening gash in the mountain by throwing a rope over a projecting rock on the far side. After crossing safely, the climber works up the ridge and follows the steep, broken skyline to the summit. Ayres reports that the party encountered no exceptional difficulties on the trip, and the weather and seasonal conditions on the peak were found to be excellent.

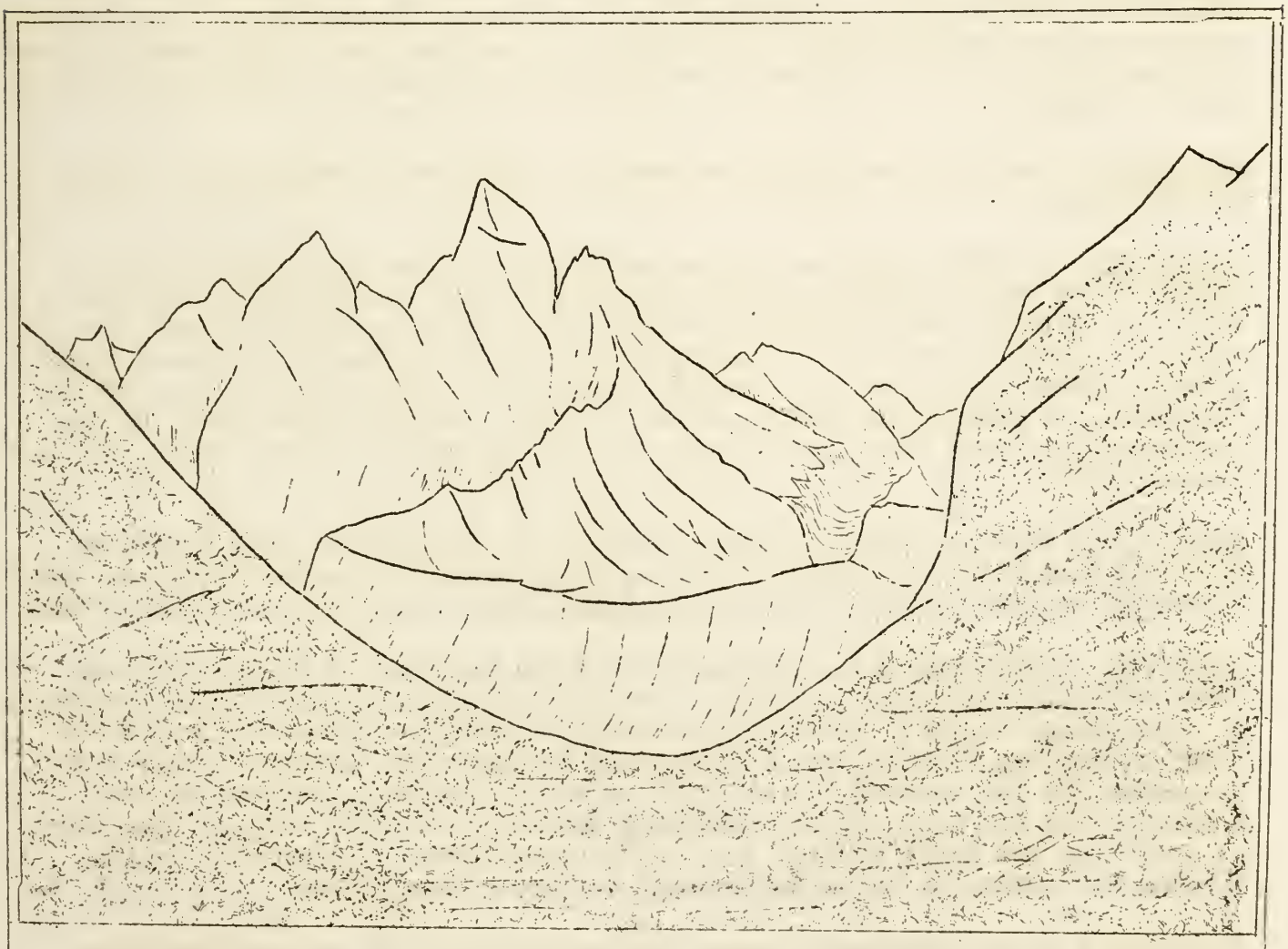
July 12 - The Mazama Mountain Club party of about 80 mountaineers arrived today for a ten day outing among the peaks and glaciers. A tentative schedule of activities announced by the club president, Edward J. Hughes, and the outing chairman, Marvin Woolfalk, includes ascents of Mount Moran, Owen, the Grand Teton and Mount Teewinot, besides a number of trail trips to points of special interest.

July 20 - The severe wind and hail storm, which proved general throughout northwestern Wyoming, swept the Teton-Jackson Hole area today and caused much discomfort among hikers and mountaineers caught out at higher elevations. A party of five members of the Mazamas were overtaken by the storm on the extreme summit of Mount Moran. Six inches of hail fell on the summit in half an hour. As the descent is especially dangerous in bad weather, the party remained on top until a terrific barrage of lightening finally forced them to seek lower elevations. The party consisted of E.J. Hughes and James Sterba of Portland, A.W. Hand of Tacoma, Washington, C.A. Fisher, Bellingham, Washington, and Don Woods of San Jose, California. On the Grand Teton, seven miles to the south, Miss Ruth Walker and Mrs. Sydney Weber of Worcester, Massachusetts, with Glen Exum, guide, also encountered bad weather, but were well down off the more dangerous slopes when the storm reached its greatest intensity.

August 10 - One climbing record was approached, and a second broken today when the Grand Teton was climbed by John Ziebarth, Star Scout of Pocatello, Idaho, John Hibler of St. Joseph, Missouri, and Glen Exum, guide. First of all, one of the boys was only 14 years old, and one of the youngest to set foot on the summit of the Grand. Further, what is probably record time was made on the 4000 foot ascent from timberline to the summit. Only three hours and 18 minutes were required for what is ordinarily a five to six hour trip.

The record for being the youngest person to climb the Grand Teton was first claimed in 1933 by Burell Bandel, age 15. This record was held for only one and one half hours when Jay Bartlett of Ogden, Utah, age 13, and his brother Frank, age 11, reached the summit. This record stood for two years, and in 1935 was shared with W. E. Reisendorph, age 11, of Arnett, Oklahoma. The latter ascent was made in company with members of the West State Teachers College Educational Tour. Other noteworthy ascents have been made by Frank McClintock, Minneapolis, Minnesota, age 11, of St. John, 1933; Donald Grant, Marion, Illinois, age 13, Grand Teton, 1933; Richard Furney, age 13, Jenny Lake, Grand Teton, 1933; Raymond Haery, age 13, East Greenwich, Rhode Island, Grand Teton, 1935; Jack Kelley, age 13, Jackson, Wyoming, Grand Teton, 1935.

Professor D. S. Hartline, Bloombery, Pennsylvania, probably holds the old age record for the Grand Teton. He was 68 years 11½ months old when he climbed the peak in 1935 having at that time broken the record claimed earlier that same year by Gustave A. Gambs, age 67½, of Washington, D. C.



Skyline Sketches - From the North Fork of Cascade Canyon, looking toward the southwest, one has, perhaps, the finest view of the high Teton peaks. Grand Teton looms high above its companions across the main Cascade Canyon. To the right is the lower summit, or West Spur, while the Middle and South Teton Peaks appear as rounded summits beyond to the south. Owen is immediately to the left, and Teewinot at the extreme left of the Grand.

August 10 - Thirty-six members of the California Alpine Club arrived by special bus from San Francisco for a week of climbing and hiking.

August 10 - Mount Owen, elevation 12,920 feet, second highest peak of the range, was completely traversed from east to west today by James C. Cooley of New York City and Macauly Smith of Louisville Kentucky, guided by Paul Petzoldt. The three left their camp at Amphitheater Lake early in the morning and ascended to the mile long ridge connecting Mt. Teewinot and Mt. Owen, From here it was necessary to cut steps up steep, hard snowfields to the final ridge which joins the summit dome on the east flank of the mountain. The dome afforded the most spectacular part of the climb. As there are but three or four hand holds for fully fifty feet, its ascent necessitated very slow and cautious work. After an hour on the summit, the trio descended to Cascade Canyon by the precipitous west face of the peak and arrived at Jenny Lake about dark.

August 14 - Emma Rumian of Mill Valley, Leroy Wilkie of San Rafael, and George Plummer of San Francisco, California, all members of the California Alpine Club, encountered bad weather today on the Grand Teton. The final cliffs were rendered difficult by ice, and all view of the surrounding peaks and valleys was blotted out by clouds.

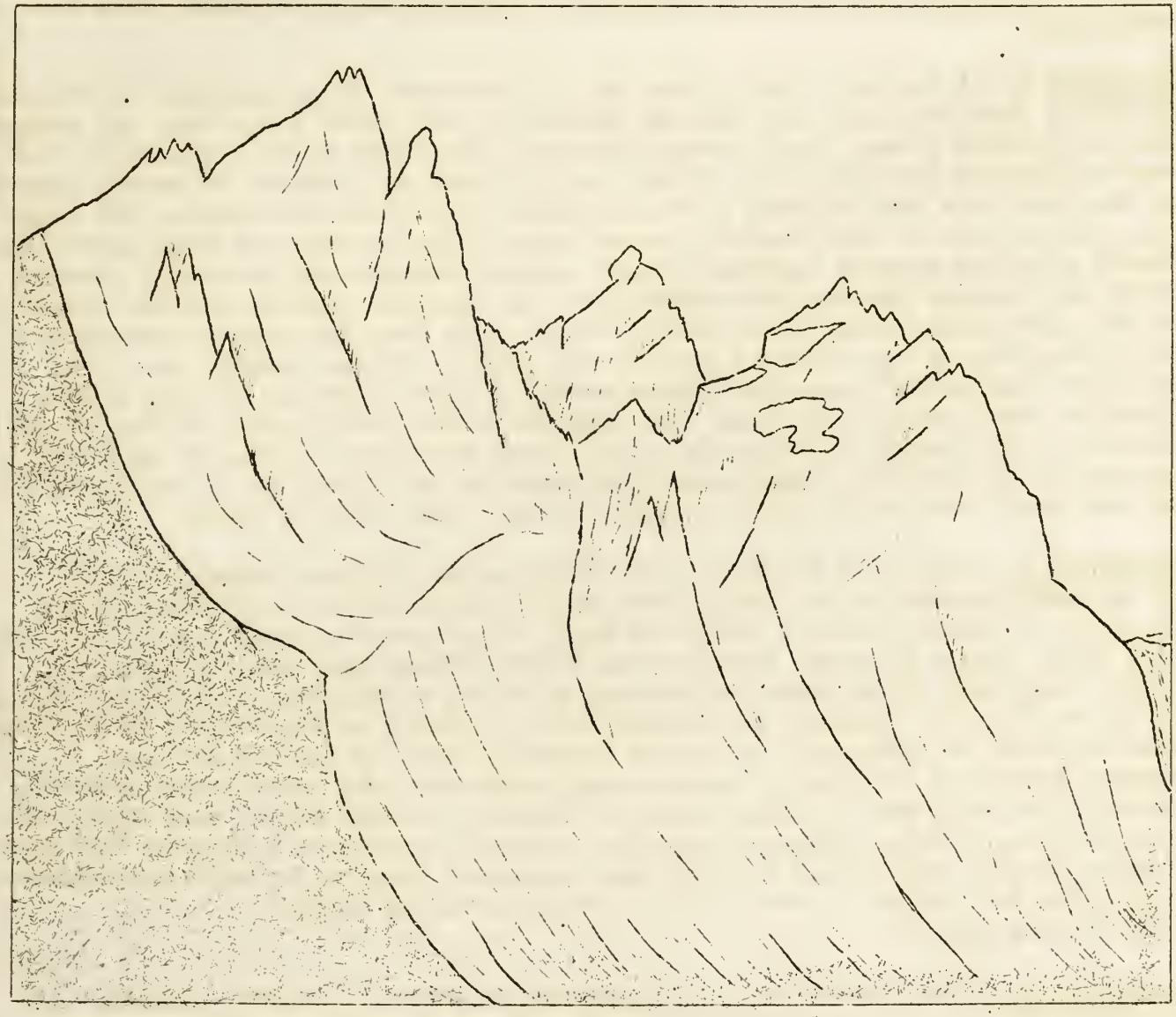
August 21 - Don Grant and Keith Anderson made the first ascent of the season of Nez Perce.

August 21 - A third ascent of the Grand Teton by way of the nearly vertical north corner was made today by Adams Carter and Paul Petzoldt. The start was made from Amphitheater Lake. Both men report the climb a difficult one, and several attempts were needed to surmount the giant overhang that almost completely blocks the route at one point. This route, pioneered six years ago by Underhill and Fryxell, ranks as one of the most exacting climbs found on the continent. A strong party of four made the second ascent by this route late last season (1936)

August 23 - Fifteen explorer scouts of the Salt Lake Council, Boy Scouts of America, guided by Ranger Phil D. Smith, today completed and ascent of the Grand Teton and equaled the record for the largest single party to make this climb.

August 20 - September 10 - Jack Durrance, Percy Rideout and George Sheldon, Dartmouth Mountaineering Club, have been"playing around"on the peaks. Members of of this group, together with their sometimes climbing companions Maria Volkhardt of Munich, Germany, and Ann Sharples of Cambridge, Massachusetts, have accounted for two ascents of the Grand by way of the Owen and Exum routes, Teewinot from the east and from Amphitheater Lake, the east ridge of Mt. Owen, as well as a new route up this peak by the south ridge (see below), and an ascent, the first, of the south face of the jaw of Nez Perce.

September 3 - Jack Durrance, George Sheldon and Percy Rideout traversed Mt. Owen by way of the south ridge. The approach was made over Teton Glacier and across the difficult gun-sight notch separating Mt. Owen from the Grand Teton. The party is the first to reach this notch, as far as is known, although several have made unsuccessful attempts. The climbers suggest that this new route be referred to as the D.M.C. (Dartmouth Mountaineering Club) route.



Skyline Sketches - Hikers along the Cascade Canyon Trail find the ever-changing skyline an interesting feature of the trail. The first fine view is from near Hidden Falls, just a mile along the trail from Jenny Lake. At the very base of Mount Teewinot, this peak appears to top Mount Owen, farther up the canyon to the west, with its permanent snow fields. Even the Grand Teton, seen through the notch between these two peaks, appears dwarfed.

September 7 - Paul and James Stettner of Chicago climbed Owen today following the usual route from Teton Glacier, between the snow fields to the east ridge. From here the route deviated from the regular one, and the climbers went "straight up over knob to summit". The descent, by way of the south face close to the east ridge to the lower snow fields, brought the climbers to Amphitheater Lake after eleven hours of climbing from this base. They report "a nice climb".

September 7 - After breaking in on Storm Point and SymmetrySpire, and an ascent of the Grand T ton, Clare and John Mallory of Godalming, England, and Dr. Glenn Millikan of Pasadena, California wound up their climbing season in the Tetons with an east ridge climb of the Jaw of Nez Perce. Descent was made down the north face.

September 8 - A new and direct route up the Grand was today followed by William P. House, Paul Petzoldt, and Phil D. Smith. The new route leads over the southeast wall. From a base camp in Garnet Canyon, the party first ascended to the head of Teepe's Glacier. Their route then followed up a series of smooth ledges to the base of a high chimney fifteen hundred feet below the summit. The chimney, free of ice in late season, proved less difficult than was anticipated but forced slow and careful climbing around several dangerously suspended stones. Above the chimney the way led directly to the top. The descent was made by way of the east south ridge, Successfully roping down over two long overhangs to a small platform on the vertical face of the steep southwest gully, the party followed a series of connected ledges around a giant buttress to easy slopes directly above their base camp. The climbers report their route of ascent not especially difficult, but that in early season or in bad weather it might be uncertain and extremely hazardous. This route is the eighth to be established on this peak since it was first climbed by the Owen party in 1898.

September 10 - Paul and James Stettner followed the Underhill-Fryxell route up the north corner of the Grand. They report their climb as follows: "Teton Glacier, up couloir between Grand and Owen, under two big rocks out to left and over steep ledges to north shoulder and north corner. From here to right and upward over very steep ledges to chimney with big chockstone. Found three pitons in place. Vertical chimneys and exposed wall climbing to shoulder on north ridge then somewhat to northeast and upward following deep cracks and chimneys to summit. Summit at 7:10 P.M. Descent along southeast ridge over loose rocks to beginning of very steep wall. Forced to bivouac at about 13,000 feet altitude. Next morning, 6 A.M., rappeled down the remaining southeast wall then traversed between Teepe's Pillar and Grand Teton. Descended Teepe's Glacier* to Amphitheater Lake. Ice and deep snow made it a very difficult climb."
* To Glacier Canyon

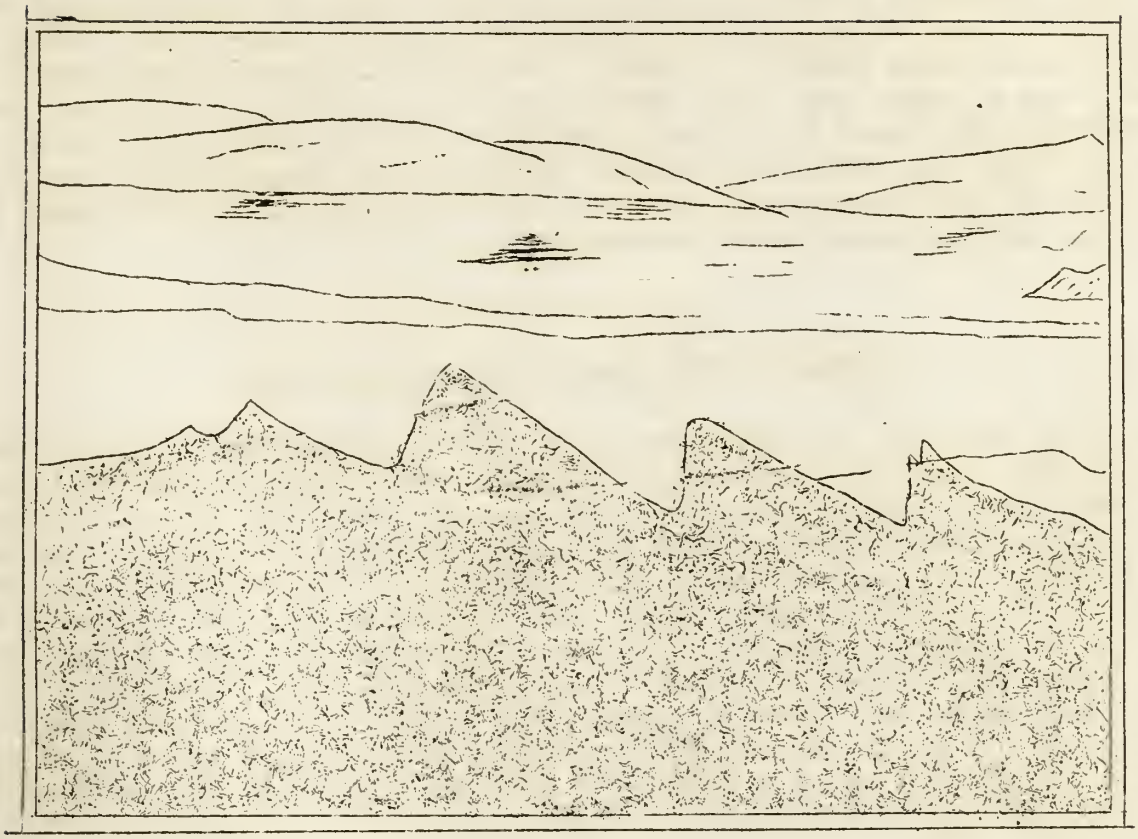
September 13 - The Stettners, again spurning traditional routes, made an interesting climb of the Middle Teton. Starting in south Garnet Canyon, their route began by following steep ledges and a couloir to the notch in the east ridge. The east ridge was then followed over all needles to the summit.

Summary of Climbing Records

	1936	1937		1936	1937
Grand Teton	178	123	Wister	6	0
Middle Teton	18	13	Buck	2	3
South Teton	20	3	Prospectors	0	3
Owen	43	28	Hunt	2	0
Moran	10	7	Disappointment	7	0
Teewinot	54	25	E. Horn	1	0
Nez Perce	5	2	S. Horn	4	0
St. John	9	9	Others	9	11
Rockchuck	2	2			
Symmetry Spire	11	6	known not reported	0	33
Storm Point	17	13	Totals	404	290
Woodring	8	9			

THE SHADOW RANGE

by Dr. F. M. Fryxell



Late in the afternoon as the sun sinks behind the Teton Range a great shadow moves eastward across the floor of Jackson Hole. Probably few of the thousands who pass through the valley or spend their lives there give thought to this episode, other than to note, perhaps, how the rampart range to the west shortens the length of day in the valley; yet in the perspective one may gain from the Teton heights this afternoon shadow is seen to be a marvelous feature, reproducing in silhouetts the profile of the range itself. Unseen, this spectacle has been reenacted daily through the ages; even now few witness it because it takes place at an hour when most hikers and climbers are well on their homeward trek, and already have descended too low. Also, in its swift and soundless course across the valley it may pass unnoticed. Some day the Teton Shadow Range will be celebrated, and many will gladly climb to the heights to see it, as now they seek them for the sunrise.

I first saw this spectacle in 1929 from near Ramshead Lake, after a late descent of Symmetry Spire. Chancing to glance downward my attention was rivetted by the scene on the valley floor. The shadow peaks of St. John, Rockchuck and Symmetry Spire were already formed, and from a point a little lower down and less obstructed, those of Teewinot, the Grand Teton, and Nez Perce came into view (The shadows of Mount Owen and South Teton merging with those of their forepeaks). At first low and blunt, the shadow peaks lengthened until each had attained its proper relative height, and the full profile was recog-

nizable as that of the familiar Teton skyline. Only for a moment was this so : to have held this picture one would, like Joshua, have had to bid the sun stand still. With increased distortion and accelerated speed as cast more and more obliquely, the shadow peaks pushed onward, crossed the Snake, and, grown to slender, needle-sharp points, grotesque exaggerations even of peaks slender as these, raced across the final stretch of Antelope Flats to the far edge of the sagebrush. The Grand Teton shadow was the first to reach it. With all the valley in shade, the peak shadows could still be seen mounting the wooded slopes beyond, but at last these, too, were all obscured, and the phantom range was gone, to be created anew on the morrow.

DARTMOUTH SKI TEAM VISITS JACKSON HOLE

En route to a ski meet with the west coast championship University of Washington ski team, the Dartmouth team, east coast champions, stopped in Jackson Hole for a week of practice. The group, consisting of Dick Durrance, Steve Bradley, Howard Chivers, Warren Chivers, John Litchfield, and the coach Walter Prager, were guests of Fred Brown of Wilson Christmas week, and were properly acquainted with choice skiing localities by Fred. An exhibition on Teton Pass the Sunday following Christmas was largely attended by residents of Jackson Hole. All the men were very enthusiastic regarding skiing possibilities in the Teton Range, and commented frequently on the excellent snow conditions and the unlimited possibilities for long ski courses on all types of slopes, free from hindering trees and brush. We believe this visit is significant in anticipating the development of a popular interest in this region as a winter sports center. - Ed.

PHOTOGRAPHS OF THE FIRST ASCENT OF THE GRAND TETON

Enlargements of photographs taken on the first ascent of the Grand Teton in 1898 were recently donated to the Grand Teton National Park Museum by Miss Elizabeth Spalding. It was the party of 1898, consisting of William O. Owen, Franklin S. Spalding, Frank L. Peterson, and John Shive, who discovered the now famous "crawl" or "cooning place". This narrow ledge forms the route of traverse across the face of a 2500 foot cliff, and is the connecting link between the lower saddle and a series of chimneys and ledges on the west and northwest sides of the peak by which the summit is gained. One of the photographs, taken by Owen when the party repeated the climb the day following the first ascent, shows Spalding, Peterson and Shive on the summit. A second picture is of the "cooning place" with Spalding and one other elbowing their way, fully prone, across this narrow ledge. - Ed.

Acknowledgement - The cover of this issue is from a photograph by Fred Ayres.
