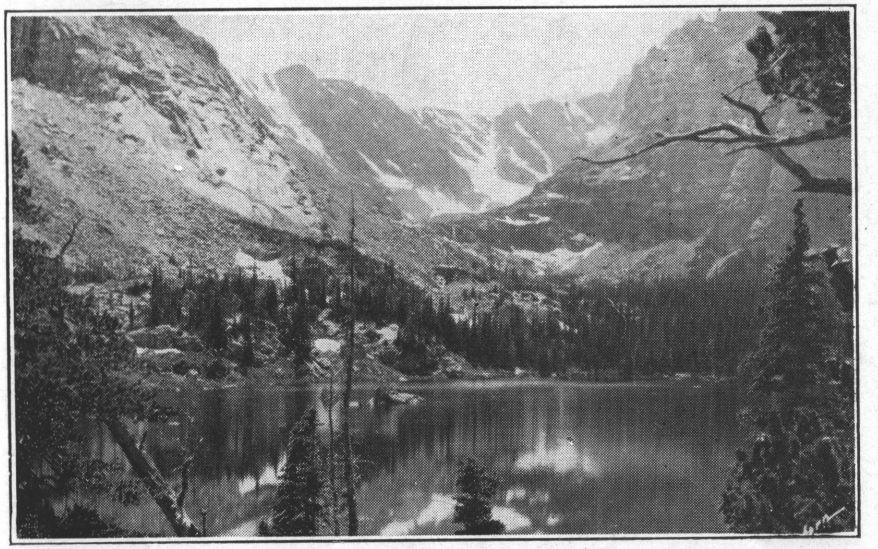
The Story of Our Glaciers



Price 10c

ROCKY MOUNTAIN NATURE ASSOCIATION

Estes Park, Colorado

Some Glacier Terminology

Some terms, in common usage in glaciated regions, are often unfamiliar to our visitors. They are listed, with explanations, below.

Cirque—(pronounced s-e-r-k). Great natural amphitheatres at the head of each glaciated mountain, where our glaciers got their start. Chasm Lake, at the foot of the East Face of Longs Peak, is in our biggest cirque, but Iceberg Lake on Trail Ridge occupies a typical, although much smaller, cirque.

Crevasses—fractures in the ice of a glacier, usually caused by movement over an irregularity by the glacier. Dangerous to an alpine climber because they may open up for a hundred feet or more.

Cyclopean Staircase — Intermittently flat and steep canyon gradient, due to differential glacial erosion. Hikers to Sky Pond, for example, traverse such a "staircase"—first a flat meadow or lakeshore is traversed, then a cliff must be climbed in order to reach the next meadow or lake basin.

Glacier—a mass of ice which moves, or shows evidence of having been moving in the recent past. The movement is due to gravity and weight of the ice. Usually an ice field must be about 100 feet thick before its weight prompts movement.

Hanging Valley—A tributary valley to a main canyon, but perched above it. Normally, streams join on a level, but scooping out of the main canyon bottom by a glacier left the tributary river "hanging" above the main canyon bed. Roaring River is our best local example of this landscape form.

Horn Peaks — Glaciers sculpture rounded mountains into steep-sided ones by taking great "bites" out of each slope. When this has occurred all around the peak, a "matterhorn" peak develops. Many such needle-like peaks can be seen in Rocky Mountain National Park.

Ice Field—A mass of ice or **neve'** which is of insufficient thickness to move. If it should move, it becomes a glacier by definition. Most of the white "flecks" on our mountains are ice-fields.

Moraines—These are heaps, piles or ridges of unsorted rock debris, which were originally piled up by glaciers as they ground their way down our valleys during the Ice Age. Moraines are common everywhere in the Park above 9,000' altitude. They often have lakes behind them (as Bear Lake) or are long embankments, covered by forests (as in Moraine Park).

Neve' — (Pronounced n-e-v-a-y). When snow piles up to some depth, the snowflakes change into more resistant globular grains of ice. This material is **neve'** and under pressure it becomes ice. This is how glaciers begin—snow to neve' to ice.

Paternoster Lakes — A string of glacial lakes, occupying basins scooped out by now-vanished glaciers. They (on a map, at least) resemble beads on a string, hence the name. The Gorge Lakes, in a sense, are in this category.

Peneplain—Not restricted to glaciated regions, but to be found in mountains everywhere. These are remnants of an early "plain" surface, the uplift of which has produced "fresh" mountains. In a sense, a fossil landscape, such remnants are well preserved atop Trail Ridge, on Flattop Mountain and elsewhere, where glaciers have "bitten" into them making the sheer cliffs which "top out" on a flattish, rolling surface.

Tarn Lakes—Lake which occupy a glacial cirque (not those merely dammed up by moraines). Chasm Lake and Iceberg Lake are good examples.

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lar studies by Enos Mills showed movement of only 6/100's inches per day. No modern studies have been made, but it is considered likely that movement has almost entirely ceased.

How to Reach it: Not recommended as a hike unless with local guides or after inquiry of route and conditions has been made of a park ranger or other authoritative source. Two routes are in use. The usual one is to follow the marked trail to Lawn Lake—an excellent horseback trip—and then to cross up and over the divide near the top of Hague's Peak, to the glacier. Some primitive stone markers—cairns—help guide the hiker. This is always an exhausting hike, over rough country, although horses can be ridden to within a mile of the glacier. Another approach is from Lost Lake, reached by trail up the North Fork. From there a rather grueling hike can be made to the glacier. Horses have been ridden to within a mile or so of the glacier by this route, as well.

SPRAGUE GLACIER

Located at an altitude of about 12,700 feet, this glacier faces northeast, at the head of Spruce Canyon. It drains through Spruce Canyon into the Thompson River. It is about 4/10 mile long, and possibly 3/10 mile in width. Enos Mills conducted studies here in 1906 which indicated that the ice was moving at the rate of about 2½ feet per year. A characteristic feature is the "calving" off of ice, at the glacier's base, into the lake at its foot. It was named for Abner Sprague, who with his parents, settled in Moraine Park in 1875. Sprague called attention to the curious features of this glacier before 1900, and his name became applied to it by local residents.

How to Reach it: Not recommended except with guides. One of the more isolated features of the Park, no trails lead anywhere near Sprague's Glacier, but seasoned hikers have had close views by ascending the slopes up Spruce Canyon to Rainbow Lake. This is a rugged trip, about six miles through the timber, across the creek dozens of times, and up hill all the way. The regular Fern Lake trail is followed from Moraine Park, but is left near the Pool. It is also possible to reach an overlook point, from which the glacier is well seen, by hiking up a rather poor trail above Tonahutu Creek, from the Grand Lake side. An occasional ranger - naturalist horseback trip is scheduled to this point during the summer months.

MOVEMENT OF GLACIERS

Much curiosity has been expressed about the "movement" of a glacier. Many jokes—almost of Ice-Age antiquity—are told about glaciers' "going back for more rocks". The movement of a glacier is roughly comparable to the slow spreading out of a mass of warm tar, or of wax. The moving takes place within the glacier itself, and is necessarily very slow—so slow that it is scarcely ever perceptible to the viewer. As ice temperatures approach the melting point, the rate of movement increases—hence, movement is at a maximum during the summer and early autumn. Friction along bottom and sides of a glacier holds back the edges; most rapid movement of a glacier is, therefore, largely in the center. Some glaciers in Switzerland show movement of two feet per day; some in Greenland have been "clocked" at over fifty feet per day. Usually the rate is more nearly fifty feet per year. Our local glaciers have had scarcely any such studies made of them. Early work indicates an average movement of about three feet per year. It is quite possible that they are almost stagnant in these modern days. One way to test the movement of a glacier is to drive a series of stakes across the glacier —in a perfectly straight line. Then you return, a couple of years later, and if there is movement, the "stake fence" will have moved out of its straight line, usually with the stakes in mid-glacier having shifted downhill a few feet. It is hard to conceive of such slow motion accomplishing the amount of work for which we credit it; however, one need only consider that even these slow movements, taking place over a period of perhaps a hundred thousand years, can do almost anything!

The Story of Our Glaciers

By Edwin C. Alberts, Park Naturalist

Few landscape features of the Rocky Mountain National Park attract as much visitor interest as the glaciers. This is odd, really, for our modern glaciers are about as poor examples of their type as one could find anywhere. Glaciers are products of cold climates and although Colorado is justly famous for being cool and green, it is too far south, and with too sub-humid a climate for glaciers to be well developed today.

Few Glaciers Remain Today

You must visit Mount Rainier or Glacier National Parks to see the few sizable glaciers remaining within our country's continental borders, and go to Alaska or Greenland to see North America's best. We are speaking of today, of course, for a few thousand years ago the situation was quite different and in, say, 12,000 BC, we had some big glaciers in what is now the National Park, and their evidences are certainly excellent examples of past glacial work, if the modern glaciers themselves are not.

The story begins, perhaps, about a million years ago, or so. Although this seems remote by human standards, it was only yesterday when the vast sweep of geological time is considered. By that time the present Front Range had attained its present general development—after experiencing many vicissitudes which would make a good story, too —and the present pattern of river valleys and drainage systems was established. For a variety of reasons (still rather obscure) North America underwent an Ice-Age, and thousands of square miles of Canada and the northeastern United States were completely buried beneath a great ice-cap. Modern Greenland presents a comparable situation today.

These great ice caps never extended into Colorado. Our Ice-Age experience was not one of complete burial beneath ice; instead each mountain valley above 9,000 feet altitude, in what is now the National Park, filled up with thick, slowly moving rivers of ice. The glaciers began in the highest slopes — up near the present Divide—and extended down the river-cut valleys to altitudes of modern Horseshoe Park—about 9,000 feet. They didn't reach as far as Estes Park (as is presently believed at any rate) nor into the present Thompson Canyon. They definitely never reached the plains. They were, even then, restricted to the higher mountain regions, and almost always were contained within an already existing river-cut valley or canyon.

Deluxe Excavations

Grinding their way down these originally twisting canyons, the glaciers scooped the bottoms out deeper, removed most of the many shoulders and other obstructions responsible for their original twisting pattern and, after melting away, left them characteristically broad, steep-walled but straight and open. If you compare the broad valley above Fall River Lodge to the tortuously twisting river-cut Big Thompson Canyon, you get the idea.

In the high country the glaciers did a lot of landscape changing. They quarried out originally broad valley-heads into great pit-like cirques. They cut into the sides of rounded mountains and produced great cliffs instead—like the cliffs of Hallett's Peak and the famous East Face of Longs. They scooped out depressions in the hard crystalline bedrock, which today are filled by lakes, such as Sky Pond and the Gorge Lakes. Altogether, then, most of the rugged beauty of our high country is due to the work of these now-vanished glaciers. The view south from the Rock Cut on Trail Ridge Highway is a view of the intricate sculpture accomplished by several mountain glaciers on what was originally a group of broad, rolling upland hills.

The rock which was quarried out in the high country wasn't crushed to dust up there; most of it was carried into the lower country by the glaciers. Some was borne atop the ice—like a conveyor belt. Some was enclosed within the ice. Some was actually pushed along in front of the advancing glacier front. It was all eventually dumped, either along the glacier's sides, underneath the ice on the bottom, or at the glacier's terminus. Such deposits, seen today, are called moraines—usually noticeable as long, symmetrical forested ridges. Often the moraines served as natural dams, producing lakes. Most of our mountain meadows were once such lakes, now silted up. Bear Lake, Haiyaha and Grand Lake are examples of such processes, but are still bodies of water. Bierstadt Lake has an interesting history—it occupies the sag formed by the piling up of two huge moraines which paralleled each other and more or less merged. Nearly all our lakes, then, owe their existence to the Ice Age glaciers.

Informative Talks Hourly

Much information on the Ice Age and its glaciers is given on the field trips provided summer visitors to Rocky Mountain National Park by the ranger-naturalists. A talk is given at Moraine Museum every hour through the day on this subject; exhibits there also help tell the story. It is hoped that the reader may take advantage of these services.

Our modern glaciers are sometimes called pathetic remnants of the king-size glaciers of the past. Although admittedly small, they are interesting destinations for hikers. Only two — Andrews and Tyndall — can be seen, at close hand, without an exhausting hike, and none of them are approached closely by a developed trail. It is recommended that anyone planning to visit them get current advice on conditions and the routes before undertaking such excursions. The notes on each glacier, which follow, give general approach directions but are not to be considered guides to them. A "Glacier Hike" is conducted monthly by the ranger-naturalists during the summer, which includes Tyndall and Andrews Glaciers. This is one excellent way to glimpse and understand two of our glaciers.

ANDREWS GLACIER

Located at an altitude of about 12,500 feet, at the head of Andrews Gorge, draining easterly through Loch Vale into Glacier Creek. About ¼ mile in length, and perhaps 1/10 mile wide, it has a northeast exposure. It was named by Abner Sprague, an early settler and mountaineer, for Ed B. Andrews, husband of his wife's sister, and a well-known local amateur naturalist. This is one of the two glaciers "measured" annually by the ranger-naturalists. Their work indicates that the ice has become greatly reduced in volume since the mid-1930's when this work was started.

How to Reach it: Rather easily reached by the seasoned hiker, by following dim "fisherman tracks" up Andrews Gorge from the Loch, to which a well developed trail leads, about six miles from the Glacier Gorge Parking Area on the Bear Lake Road. It is a fairly short "all-day" hike. Many hikers take the Andrews Glacier in stride, descending it on the return from a hike to near the Tyndall Glacier, via Flattop Mountain. This is the route of the ranger-naturalist glacier hikes.

TYNDALL GLACIER

Tyndall, located at an altitude of about 12,300 feet, at the head of Tyndall Gorge, draining easterly through Emerald and Dream Lakes into Glacier Creek. About ½ mile long, and possibly of 1/3 mile width. It was named for Dr. John Tyndall, a noted nineteenth century scientist who visited the West in the 1870's, and after whom a 14,000-foot peak in California's Sierra Nevada is also named. It has a northeast exposure and is quite steep in gradient. It and Andrews Glacier are "measured" annually by the ranger-naturalists in an attempt to detect movement and relative advance or retreat of the ice front. It presents great difficulties to these men because of the likelihood that the actual terminus is buried beneath talus and morainal debris at its foot, and our studies are relatively inconclusive. The bergschrund—"split" area at its head, between rock cliff and ice cliff—is an impressive sight.

How to Reach it: The most accessible glacier in the Park, one needs merely to ascend the Flattop Mountain trail, which begins at Bear Lake, and hike across Flattop Mountain toward the western slope, some five miles from Bear Lake. From the rim of Tyndall Gorge, the glacier appears before the visitor in great majesty. It clings to the cliff face as though reluctant to finally melt away, as appears to be its ultimate fate. Everyone who drives to Bear Lake sees Tyndall Glacier—in the distance—on the skyline, between Hallett's Peak and Flattop Mountain. It is probably the most often photographed of our present day glaciers. A word of caution to hikers on Flattop who might care to examine the glacier more closely—descent into Tyndall Gorge can be very hazardous, and the trip should only be made by one of the known routes, preferably in the company of an experienced guide.

TAYLOR GLACIER

Located at an altitude of about 12,700 feet, at the head of Loch Vale Gorge, facing north, a mile or so west of Taylor Peak. About 6/10 mile long and 3/10 mile in width, it is an extremely steep mass of ice—a true cliff glacier. It is visible for many miles—as from Moraine Park—as a hook-shaped mass of white ice and snow. Often great gashes appear on its face—the marks left by avalanches and rock falls of the previous spring. It was named by Abner Sprague, a famous local settler, for A. A. Taylor, who was head of a Normal School in Kansas and who spent a summer in Estes Park during the early 1890's.

How to Reach it: A familiar, well-marked trail leads from Glacier Gorge Parking Area on the Bear Lake Road to the Loch, about three miles. From the Loch one must locate the dim fisherman's tracks which lead south to Lake of Glass and Sky Pond. A rather difficult passage through the brush and over innumerable boulders can be made to the base of this glacier, another three miles from the Loch. This trip is very awkward if not made with a guide or someone who has found his way there before. A quite satisfactory distant view can be had from the Loch itself. Most newcomers should find this view adequate, and if they feel impelled to get right next to a glacier, they should continue on to Andrews Glacier instead of trying Taylor.

ROWE GLACIER

Located at an altitude of about 13,200 feet, on the north slope of Hague's Peak, the Rowe Glacier drains into the North Fork of the Thompson River. It is about ¼ mile long, and possibly 4/10 mile in width,. "Its surface rises steeply from the water's edge . . . appears to slope steeply down from the south, west, and north, like tiers of seats in an amphitheatre"—so wrote Willis Lee in 1917. It was originally called Mummy Glacier, but was renamed Hallett's Glacier by Chapin in 1887, after the same climbing companion for whom he named Hallett's Peak. The National Park Service, in order to avoid confusion with the same name for the peak, distant some 15 miles, re-named the glacier in 1932 in honor of Israel Rowe, who discovered the glacier, while bear hunting, in 1880. It is pronounced to rhyme with "how", by the way. Studies made here in 1896 suggested that the glacier showed movements of 1.01 inches per day; in 1907 simi-