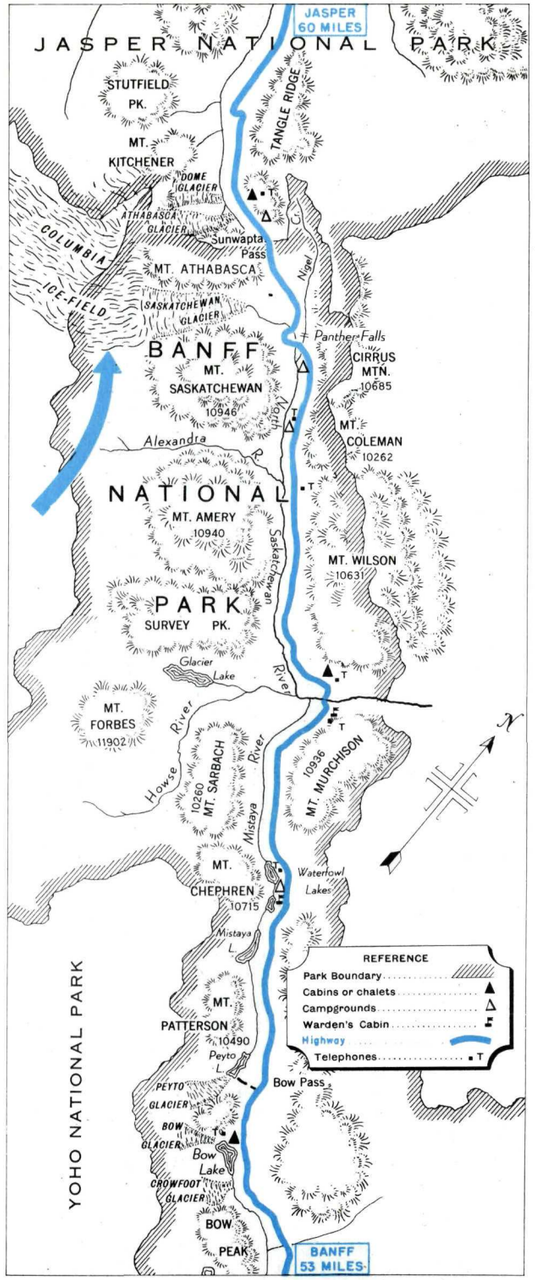
ATHABASCA GLACIER

The Athabasca Glacier has been receding rapidly in recent years. Records of the Water Resources Division of the Engineering and Water Resources Branch, Department of Resources and Development, show that the average yearly recession (1945-1949) has been 102 feet. It has well-defined and apparently recently formed terminal and marginal moraines. These moraines indicate that at one time Dome and Athabasca Glaciers were joined.

One of the first published photographs of the glacier, taken in 1908, showed that the Athabasca terminus had receded only about 400 to 500 feet from the terminal moraine. Later pictures indicated a recession of perhaps 300 to 400 feet from 1908 to 1919 and 100 to 200 feet from 1919 to 1922. From 1922 to 1948, net recession was approximately 1,750 feet. For the past five years the recessions have been approximately 100 feet each year.

Evidence of the recession of other glaciers in the national parks in British Columbia and Alberta may be observed by visitors to these parks.

This publication was compiled in co-operation with the National Parks Branch, Department of Resources and Development, Ottawa.



COLUMBIA ICE-FIELD

. . . the source of three mighty rivers flowing into three oceans.

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FOREWORD

Nature's handiwork — in all its awesomeness, in all its beauty and serenity — is revealed in lavish manner in the National Parks of Canada. Miles and miles of ageless snow and ice move in majestic splendour down the mountainsides; lakes of indescribable colouring shimmer in long-to-be-remembered settings; mighty waterfalls pour in thunderous grandeur from the very heavens, and deep and fearful canyons disclose the story of earth's creation. These are all part of the magnificent surroundings in which the visitor to the National Parks in the Canadian Rockies may enjoy a holiday, in whatever manner his heart desires and his purse permits.

Kootenay National Park in British Columbia has its Radium Hot Springs; the Paint Pots or ochre springs; the natural saltlicks where big game animals concentrate at dawn and dusk; Marble Canyon, 200 feet deep and a mile long; the Iron Gates, a natural portal formed by towering red-rock cliffs on each side of the Banff-Windermere Highway; an iceberg lake; and Sinclair Canyon, the narrow gap through which the highway passes.

Yoho National Park, also in British Columbia, is famous for its many waterfalls, some of which cascade in filmy grandeur a thousand or more feet down the precipitous mountainside; its Natural Bridge, a rock formation spanning the Kicking Horse River; and its many snow-capped mountain peaks and rainbow-tinted lakes.

Waterton Lakes National Park in Alberta has won acclaim for its mountain peaks banded with red and gold; its Red Rock Canyon, its lacey waterfalls and its glacier-bordered lakes.

Banff and Jasper National Parks, encompassing more than 6,700 square miles in the heart of the Canadian Rockies offer the greatest variety of natural phenomena. Both have hot mineral springs, glittering glaciers, deep canyons, roaring cataracts and a vast assortment of majestic mountain peaks like Mount Eisenhower in Banff Park. Banff also has its Hoodoos, weird pillars formed by erosion, and Jasper its beautiful Angel Glacier.

Along the Banff-Jasper Highway linking these two world-famous playgrounds, the Columbia Ice-field sends down one of its sparkling tongues, the Athabasca Glacier, to within a short distance of the highway. Here motorists may enjoy the delightful experience of a snowmobile trip across the glacier in mid-summer.

In the following pages will be found a more detailed description of the great Columbia Ice-field.

Published under the authority of
THE HONOURABLE ROBERT H. WINTERS
Minister of Resources and Development.

THE COLUMBIA ICE-FIELD

The Columbia Ice-field, centre of the greatest known accumulation of ice in the Rocky Mountains, is not only one of the most interesting ice-fields in North America, but certainly one of the most accessible. Near the Banff-Jasper Highway, it lies astride the British Columbia-Alberta boundary and at the dividing line between Banff and Jasper National Parks.

With its outlet glaciers, the Columbia Ice-field covers an area of nearly 130 square miles, of which fully 50 square miles are more than 8,500 feet above sea level in the area of accumulation, usually called the "névé". From the great central ice reservoir, lying between Snow Dome, Mount Castleguard, and Mount Columbia and capping the Continental Divide for a distance of about 20 miles, three valleys radiate outward. Through them flow the Athabasca Glacier to the northeast, the Saskatchewan to the east, and the Columbia to the northwest.

From other points smaller ice tongues flow into the surrounding valleys, and in a number of places ice tumbles over precipices to form reconstructed glaciers such as Dome Glacier at the head of Habel Creek, and the northward flowing glacier between Mounts Columbia and King Edward.

The Columbia Ice-field is the source of three great rivers—the 765-mile Athabasca, a sub-tributary of the Mackenzie River, which flows into the Arctic Ocean; the Saskatchewan (1,205 miles) which crosses the Prairies and empties into Lake Winnipeg and, via the Nelson River, into Hudson Bay; and the Columbia (1,210 miles) which cascades its way through scenic gorges, crossing into the U.S.A. before entering the Pacific Ocean.

HOW ARE GLACIERS FORMED?

Glaciers are formed by great depths of snow accumulating in mountain basins at high altitudes. The weight of the snow, assisted by surface melting, causes the lower layers to compact and to form solid ice. Under the pressure exerted, together with gravitational effect, the ice is slowly extruded through the valley outlets of the basin. When the slowly moving mass of ice in the valley reaches lower altitudes melting takes place during the summer months, forming glacial streams.

WHY ARE GLACIERS RECEDING?

The present glaciers are the remnants of the continental ice-cap which once covered a large part of the northern half of this continent. In earlier times glaciers were of much greater extent than at present. The recession of glaciers has been caused by a gradual, long-term cyclic change in climatic conditions, primarily a slight increase in annual mean temperature. Probably there has been also a lower rate of precipitation in the mountains and longer periods of sunshine.

MOVEMENT OF GLACIERS

Remembering that ice is a hard and brittle solid, it is surprising to find that it can flow like a plastic body under the pull of gravity, but this can easily be proved. Metal plates placed in a row at right angles across a glacier gradually get out of line, the central ones moving fastest, similar to floating debris in a river; but the motion is very slow, even in the middle being seldom more than a few inches a day.

***Crevasses*—As a glacier flows over a rock bed or reaches a space of increased incline, tension is exerted in the upper portion of the ice until it ruptures. Such cracks, but a hairbreadth wide at first, are enlarged by melting and changes of slope until they may become hundreds of feet in length and depth. These are known as crevasses.**

***Seracs* — As the glacier advances, these crevasses are bent out of shape and may be crossed by fresh crevasses, splitting up the ice into wild lumps and pinnacles called seracs.**

***Ice-falls* — Passing over an uneven bed, the body of the glacier is first bent in one direction and then in the other. When the slope increases, great openings are formed across the glacier which are known as transverse crevasses, as they usually occur almost at right angles to the direction of the flow. The ice at this point may form in great steps with crevasses between them. This is known as an ice-fall.**

CARRYING POWER

One of the most interesting characteristics of a glacier is its carrying power. Although it is in motion like a plastic substance, it is solid and strong enough to support a tremendous weight. Debris torn from the mountainside obscures its edge, so that often one may walk 50 yards out before the ice can be seen. This fringe of broken rock carried on the edge of the glacier is called a marginal moraine.

Rocks, even as large as cottages, now and then roll down upon the ice and are transported without trouble. Medium-sized rocks, a few feet across, called glacier tables, are left standing on pedestals of ice, as they protect the glacier beneath from the sun, while thawing goes on all around them.

The whole mass of debris is carried steadily onwards until a point is reached where melting is complete and no more burdens can be borne. Then a terminal moraine is built up, a steep and rugged pile of loose rocks.

The shrinkage of the glaciers is illustrated by the number of terminal moraines visible in the valleys in which glaciers descend. The nearest to the present tongue of the ice is almost bare; the next, a few hundred yards away from the tongue, may have bushes growing on it; and others a mile or two away may be covered with forest.

GLACIER OBSERVATIONS

Glacier observations under governmental auspices were undertaken by the Dominion Water and Power Bureau in 1945. Charter and succeeding members of the Alpine Club of Canada, however, made sporadic observations and studies of the variations of a number of glaciers over a long period of years.