PARKS CANADA
WESTERN REGION
DEPARTMENT OF THE ENVIRONMENT
I.W.D. 1011

CANADA

INLAND WATERS DIRECTORATE
NATIONAL HYDROLOGY RESEARCH INSTITUTE
DEPARTMENT OF THE ENVIRONMENT
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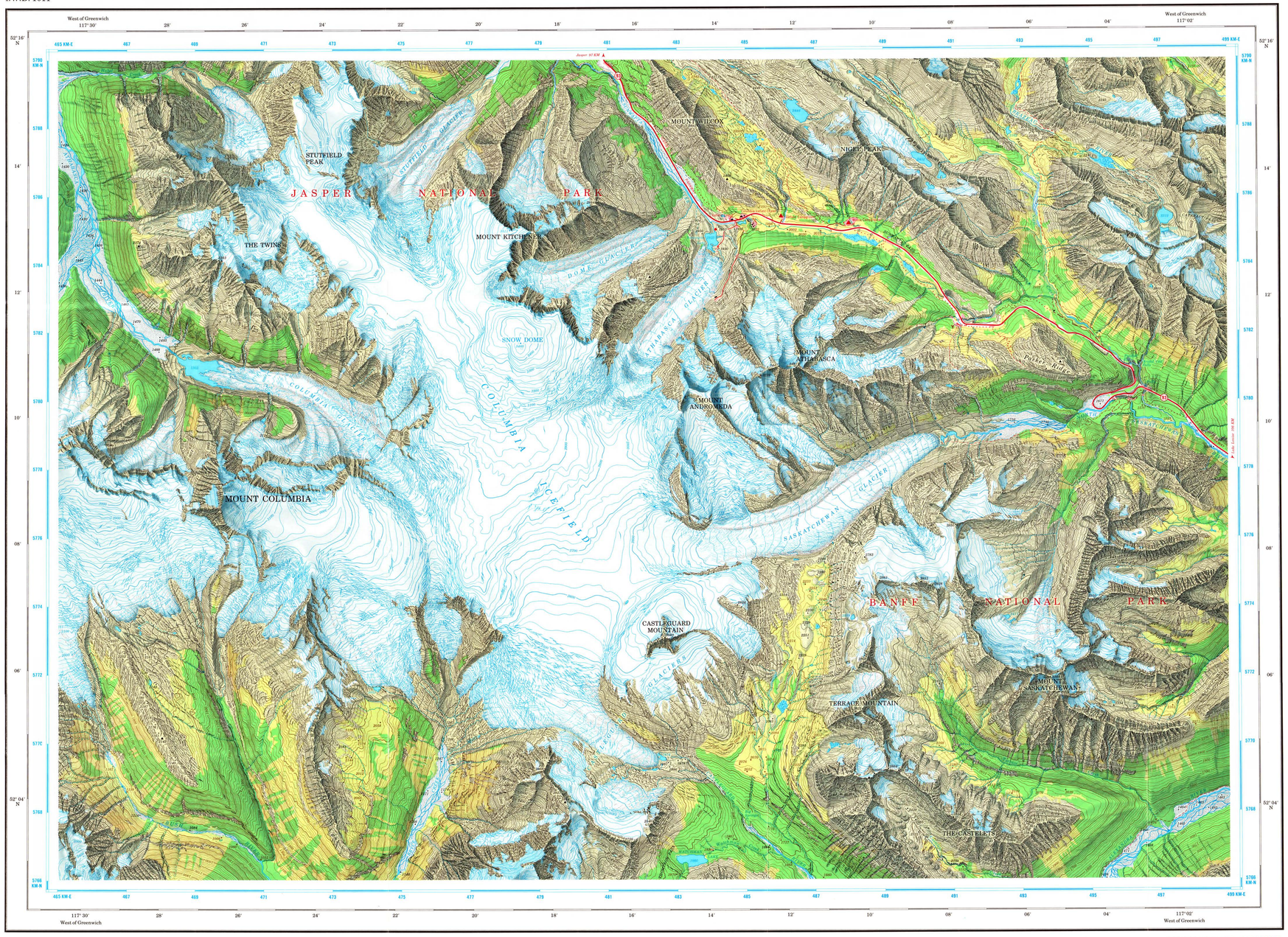

PRODUCED 1981, BY PARKS CANADA, WESTERN REGION AND SNOW AND ICE DIVISION, NATIONAL HYDROLOGY RESEARCH INSTITUTE, DEPARTMENT OF THE ENVIRONMENT, FROM AERIAL PHOTOGRAPHS TAKEN IN 1977 AND FIELD SURVEYS IN 1979.

COLUMBIA ICEFIELD

BRITISH COLUMBIA - ALBERTA

BANFF - JASPER NATIONAL PARKS

ELEVATIONS IN METRES ABOVE MEAN SEA LEVEL
NORTH AMERICAN DATUM 1927
TRANSVERSE MERCATOR PROJECTION

SCALE 1: 50 000

Kilometres 1 0 1 2 3 4 Kilometres

Miles 1 0 1 2 3 Miles

2 cm = 1 kilometre
3.22 cm (1.27 inches) = 1 mile

CONTOUR INTERVAL 20 METRES
CONTOUR INTERVAL ON BEDROCK 100 METRES

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LEGEND

Contours - Bedrock
Contours - Vegetation
Contours - Snow and ice
Depression contours
Bedrock
Scree, Talus slope
Moraines
Kames
Till
Rock glacier
Ice cored moraines
Debris covered ice
Landslide
Perennial snow
Visible ice
Bergschrunds
Crevasses
Ice cliffs
Ice falls
Ice avalanches
Reconstricted glacier
Ogives
Springs (seasonal)
Streams - Perennial
Streams - Indefinite
Braided stream
Dry river bed with channel
Disappearing drainage
Lakes - Perennial
Lakes - Intermittent
Marsh
Falls, Rapids
Delta, Outwash
Forest
Alpine meadows
Highway
Gravel road
Gravel road, service only
Trails, Hiking routes
Bridges, Culverts
Buildings
Quarry
Parking lot
Campground, Youth Hostel
Picnic site
Triangulation station, elevation in metres
Spot elevation in metres
Hydrometric gauging station

CONVERSION SCALE FOR ELEVATIONS
Metres / Feet

INDEX MAP

83 C/3

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PARK FEATURES INTERPRETATION
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MAP PRINTING
Surveys and Mapping Branch (Department of Energy, Mines and Resources)

Glaciological information from aerial photographs

1) A-40 065 (1 to 73, Altitude 10 000 m (33 000') A.S.L.
Focal length = 153.12 mm (6"), taken August 16, 1977.

2) A-40 066 (1 to 118), Altitude 10 000 m (33 000') A.S.L.
Focal length = 153.12 mm (6"), taken August 17, 1977.

Two Kilometre Universal Transverse Mercator Grid Zone 11

The cover of this map is part of a thermal image of the Columbia Icefield area acquired in mid-August. Each successive colour represents a surface temperature difference of 1°C with the 2°C point depicted by the boundary between the lightest blue and the darkest green. Snow and ice covered areas are shown in shades of blue representing freezing temperatures. Temperatures below -4°C are white. Most land areas are warmer and shown in shades of green, yellow and red. Black areas are warmer than 10°C.

APPROXIMATE MEAN DECLINATION 1980
FOR CENTRE OF MAP
ANNUAL CHANGE DECREASING 10.7'
APRIL 1, 1980

Canada

THE ATHABASCA GLACIER

Well Kept Secrets

This is the most studied and visited glacier in Canada, seen by hundreds of thousands of national park visitors each year. Yet the glacier is barely touched by man — it responds to climatic cycles older than life on earth and keeps secret the sources of its power.

The Columbia Icefield feeds nearly a dozen large glaciers of which the Athabasca is the second largest. (the largest is the Saskatchewan, see map on reverse). The icefield is a natural snow trap. Moist winds from the Pacific Ocean rise to the frigid 3000-metre elevations of the mountains surrounding the icefield and each year the cooling air drops a layer of snow two or more times the height of a man.

The Ice Press

The snow forms ice. Over time, snowflakes turn into ice crystals and, as the depth of snow grows, the crystals are squeezed into a solid mass. It takes the weight of 30 m of snow (the height of a 10-storey building) to create a thin bottom layer of ice.

As the ice grows thicker, the deep layers become slightly plastic and begin to flow like water in very, very slow motion. Ice in the Athabasca Glacier takes 150 years to flow from the icefield to the glacier's toe.

River of Ice

The Athabasca Glacier flows through a gap in the mountains at the edge of the icefield then spills over three giant bedrock steps forming an ice fall at each step. From the base of the ice falls to the glacier's toe, the slope is gentle, rising slightly just before the toe.

Where glacial ice bends or stretches, brittle surface ice or thin ice fractures and forms crevasses as deep as 35 or 45 metres in places. Most crevasses in the Athabasca occur near the toe, at the ice falls and at the glacier's margins (see photo below).

Balancing the Glacial Budget

Long-range weather patterns cause the icefield and its glaciers to grow or shrink.

A glacier's budget is like a bank balance. Each year, snowfall adds to the amount of ice in the field and its glaciers. Each summer, melting subtracts from that amount. If more ice and snow is deposited in a year than is withdrawn, the balance and the glacier grow. If withdrawals exceed deposits, the balance and the glacier shrink.

Auditing the results is difficult. The effects of a year of heavy snows may not show in the glacier's movements for 20 years or more. A year of heavy snow can be offset by a summer of rapid melt and the glacier's movement may reflect neither.

For more than 100 years, though, the Athabasca has been spending more than it earns — it has lost more ice through melting than it has gained through snowfall. Dotted lines on the photo below show past locations of the glacier's toe. Between 1870 and today, the Athabasca has lost more than two-thirds of its volume and more than one-half of its surface area. And it is still in retreat.

Mountain Wreckers

As glacial ice flows, it erodes the bedrock it flows over. It plucks at weakened rock and uses rock fragments as files and chisels to wear away stronger formations. As the glacier groans and grinds down its valley, it gradually deepens and widens its bed.

Flanking the glacier are huge lateral moraines towering the 100 m above the ice surface in places and composed of rock debris covering cores of ice. The debris falls from cliffs above or is dumped from hanging glaciers in small side valleys (hanging glaciers appear in the photo below). The glacier also pushes and drags masses of crushed rock in front of and beneath it, depositing the load at its toe when the debris melts free of the ice.

The crescent-shaped ridges of debris in front of the glacier are end moraines. Each marks a spot where the glacier paused for a year or more, giving debris a chance to pile up. Some large end moraines mark places where the glacier advanced, pushing the mound before it, then retreated. The rest of the debris scattered over the valley floor was dropped in the midst of a steady retreat. It forms a carpet of ground moraine laced by meltwater streams and is tufted here and there with pioneering colonies of plants.

To The Sea

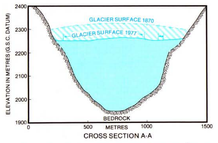
Glaciers and moraines are shaped also by running water. In summer, snow and ice melt off the icefield and the whole surface of the glacier. The rushing water cuts zig-zag raceways in the glacier's surface, disappears into the glacier's margins, or plunges deep into crevasses, millwells and hidden channels beneath the ice. Most meltwater splashes off the glacier's toe in sparkling cascades or gushes out of grottos at its sides and base.

At the toe, the meltwater cuts down through old moraines and wears canyons in bedrock. In front of the Athabasca, meltwater has pooled in a bedrock depression to form Sunwapta Lake. Where the glacial streams enter the lake, sediment carried by the water creates fans and deltas. Leaving the lake, the water makes its way north out of Jasper National Park and eventually reaches the Arctic Ocean. The 3540-kilometre trip is made via the Sunwapta, Athabasca, Slave and Mackenzie rivers.

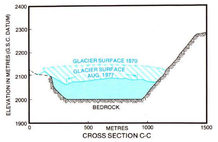
What Next?

We can only guess what the glacier will do in the distant future. It may continue to retreat until it is only a bulge at the rim of the Columbia Icefield. Or, it may readvance to its previous maximum or beyond, destroying the Icefields Parkway and all the developments now in Sunwapta Pass.

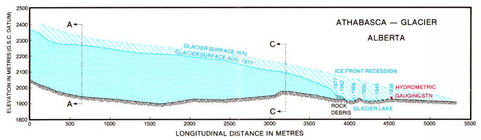
Or, it may simply remain where it is, defying our attempts to learn all of its secrets.



In contrast to the cross-section taken near the toe, this view shows the massive volume of ice that flows through the glacier at the base of the lowest ice fall. Because so much ice must pass through this narrow valley, it flows faster here than at the toe.



This head-on view shows how the Athabasca looks in cross-section about 600 m behind the toe. The valley bottom is much flatter here than it is at the base of the lowest ice fall (see cross-section A–A). Note how shallow the glacier is at its toe and how much deeper it was in 1870.



COLD FACTS ABOUT THE ATHABASCA GLACIER

Elevations: 2710 m at icefield rim
1925 m at toe

Lengths: 6.5 km icefield to toe
3.8 km ice falls to toe

Widths: 1100 m at ice falls
900 m at toe

Depths of Ice: 300 m just below ice falls
60 m near toe

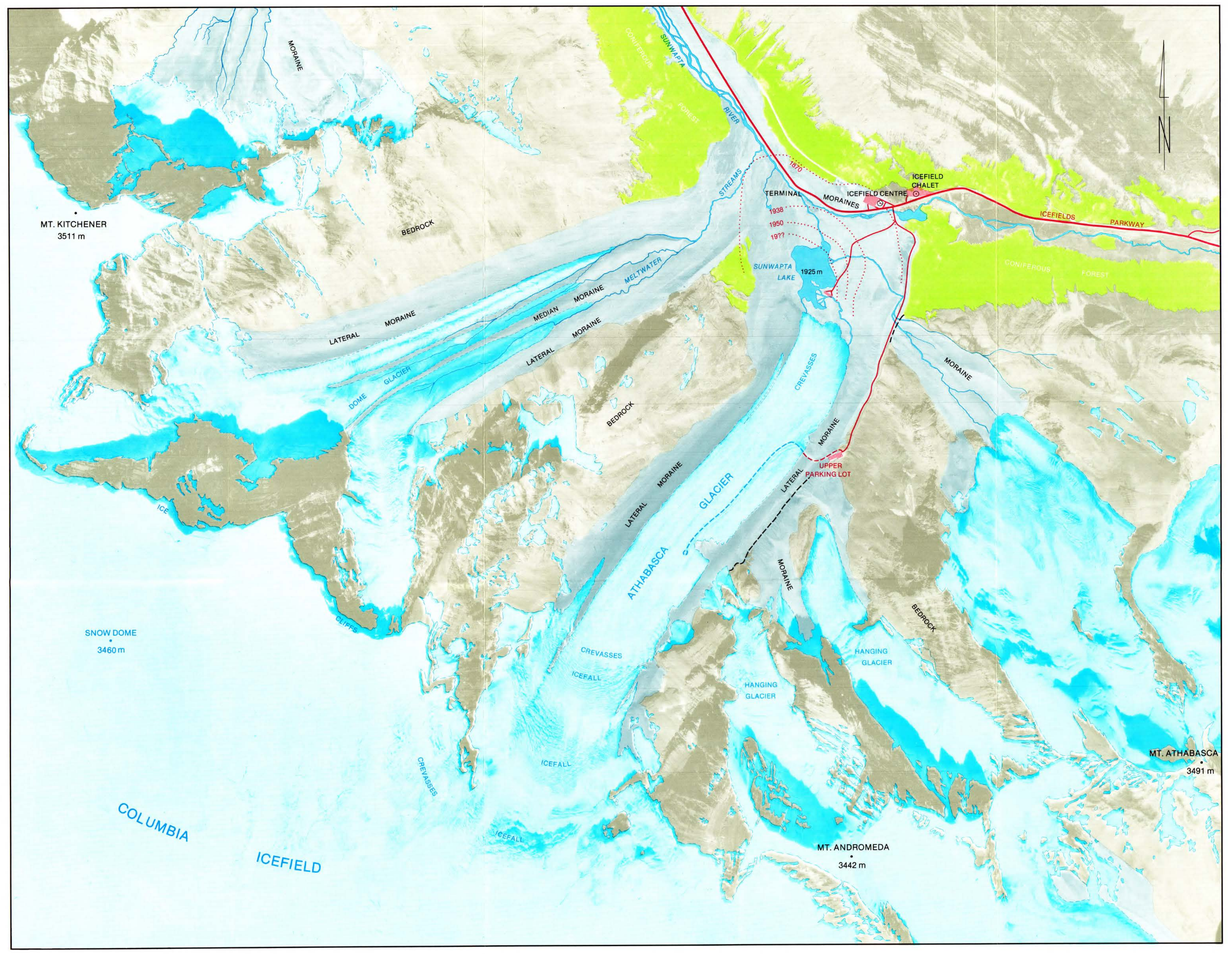
Ice Velocity: 80 m/yr at ice falls
15 m/yr near toe

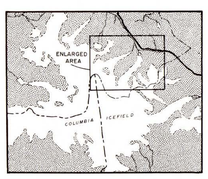
Average Annual Snowfall on Icefield: 7 m +

Estimated Volume of Ice: 640 million cubic metres

Below is a cross-section of the Athabasca Glacier taken along a line running up the middle of the glacier from the toe to the foot of the lowest ice fall. Note that the glacier grows thinner gradually toward the toe and that the land beneath the glacier is lower a kilometre back from the toe than it is right at the toe.

The estimated height of the 1870 ice surface is also shown on this cross-section along with the approximate locations of the toe over the last 110 years. The other two cross-sections also show the approximate ice height in 1870 and the lines where the other two cross-sections were taken are marked by the vertical lines through the glacier on this cross-section.



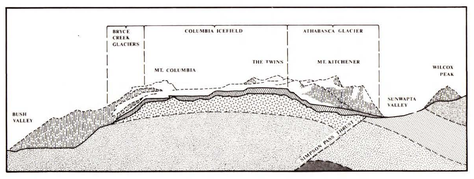


Bird's-Eye View

Above is an aerial photo of the part of the Columbia Icefield closest to the Icefields Parkway. The key on the left outlines the photo's coverage. Although the scale varies, the average on this photo is 1:20,000.

Rock Bottom

Stress in and under the earth's crust compressed and lifted layers of sedimentary rock to form the Rocky Mountains. Pushed eastward over younger rock, the layers under the icefield lie nearly flat as do layers in most mountains of the Continental Divide. Under the icefield, the rock forms a high plateau, carved on all sides by rivers and glaciers and ringed by some of the loftiest peaks in the Canadian Rockies. This distinctive plateau is the foundation of the Columbia Icefield.



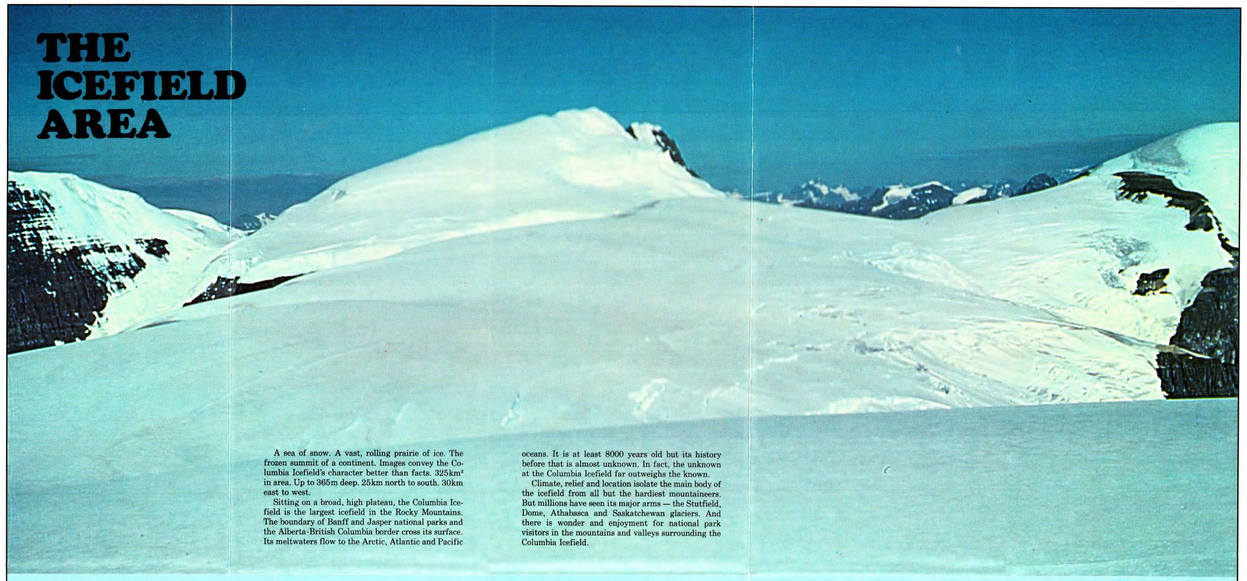
Snow-Catcher

Climate alone did not make the Columbia Icefield. An area's ability to catch and keep snow year after year to form an icefield depends on geography as well.

The cross-section diagram on the left shows how the icefield plateau is level enough to collect snow in winter without sloughing or avalanching, and high enough to be chilly in summer, cutting down on the amount of snow that melts away. The Bush and Sunwapta valleys, pictured on either side of the plateau, are at least 1000m lower than the icefield and lose all their snow to melting every summer.

The Columbia Icefield, then, is the largest in the Rockies because climate and geography combine here in a unique mix.

THE ICEFIELD AREA



A sea of snow. A vast, rolling prairie of ice. The frozen summit of a continent. Images convey the Columbia Icefield's character better than facts. 325km² in area. Up to 365m deep. 25km north to south. 30km east to west.

Sitting on a broad, high plateau, the Columbia Icefield is the largest icefield in the Rocky Mountains. The boundary of Banff and Jasper national parks and the Alberta-British Columbia border cross its surface. Its meltwaters flow to the Arctic, Atlantic and Pacific oceans. It is at least 8000 years old but its history before that is almost unknown. In fact, the unknown at the Columbia Icefield far outweighs the known.

Climate, relief and location isolate the main body of the icefield from all but the hardiest mountaineers. But millions have seen its major arms — the Stutfield, Dome, Athabasca and Saskatchewan glaciers. And there is wonder and enjoyment for national park visitors in the mountains and valleys surrounding the Columbia Icefield.

Photo by L.A. Bilodeau, Parks Canada

DRIVING AROUND

Visitors reach the icefield area on the Icefields Parkway, a scenic highroad linking Lake Louise and Jasper through the Main Ranges of the Rockies. The parkway provides viewpoints, campgrounds and other facilities along its 230km length. A free brochure describing these facilities can be picked up at information centres in Banff, Lake Louise and Jasper.

Your first stop in the icefield area should be the Icefield Centre, 104km south of Jasper and 126km north of Lake Louise on the parkway. There, Parks Canada staff will give you information and advice to help you make the most of your visit.

A scenic drive in the area is the road to the upper and lower parking lots at the Athabasca Glacier. A trail to the glacier's toe begins at the lower lot and the upper lot offers an excellent view of the glacier's surface. The road to the upper lot is steep, and is a difficult climb for large recreational vehicles. Visitors may park at the Columbia Icefield Chalet and ride a shuttle bus to the upper lot, and trailers may be dropped off in the lower lot before the drive up.

There are two picnic sites in the area. The one outside the Icefield Centre gives a fine view of the Athabasca Glacier (see panorama, bottom right). The other is north of the Icefield Centre on the shoulder of the parkway at Tangle Falls Viewpoint.

Photo by L.A. Taylor, Parks Canada

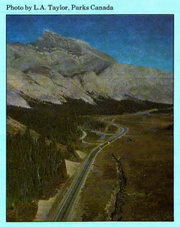
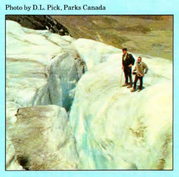


Photo by D.L. Pick, Parks Canada



CLIMBING AROUND

A party of mountaineers discovered the Columbia Icefield in 1898, and the icefield's historic peaks and glaciers have challenged climbers ever since. Mountaineering and glacier travel require stamina, special skills and equipment. The deeply crevassed glaciers around the icefield and the ice-carved cliffs are dangerous, even for experienced climbers. Route information, topographic maps and travel advice are available at the Icefield Centre where travel plans may be registered. Information about hiring a licensed mountain guide can be obtained by writing the Association of Canadian Mountain Guides, Box 1537, Banff, Alberta T0L 0C0 or by enquiring at park information centres or warden offices.

SNOCOACH TOURS

Commercial snowmobile tours leave from the upper parking lot at the Athabasca Glacier and travel 1.5km up the glacier on a specially graded ice road. They operate from early May to mid-October, weather permitting, and their busiest period each day is from 11:30 am to 2:30 pm. Tickets are sold at a kiosk in the upper lot.

The grade to the upper lot is quite steep, and visitors should park large recreational vehicles at the Columbia Icefield Chalet and ride the shuttle bus to the upper lot. Trailers may be dropped off at the lower lot at the Athabasca Glacier while visitors drive to the upper lot.

GETTING AROUND

Leaving your vehicle and experiencing this glaciated landscape first-hand is the best way to know and appreciate the icefield area. Reaching the icefield itself demands stamina and good climbing and glacier travel skills, but there are many easy walks and hikes in the valleys surrounding the icefield.

Overnight Hikes

If you would like to strike out on an overnight hike, go to the Icefield Centre and obtain personal advice, topographic maps, trail guides and the back-country use permit you must have for your trip.

There are two main routes for overnight hiking in the area: Nigel Pass and Castleguard Meadows. The most popular is Nigel Pass which begins at a gravel road near Camp Parker, 15km south of the Icefield Centre and leads to several extended backcountry routes west of the icefield. Many primitive campgrounds are located along Nigel Pass Trail and trails branching from it. A Parks Canada trail guide describing Nigel Pass Trail and the trails it leads to in Jasper National Park is available at the Icefield Centre.

The Castleguard Meadows are breathtaking in summer, covered in a mat of alpine wild flowers. But the route to the meadows is strenuous and often obscure. The overland route begins at a bridge on the North Saskatchewan River, below and west of the Icefields Parkway, 27km south of the Icefield Centre. Mountaineers may reach the meadows by travelling over the Saskatchewan Glacier. Routes are described in the *Canadian Rockies Trail Guide* on sale at the Icefield Centre.

Day Hikes

The following trails range from short, easy strolls to fairly strenuous hikes. All can be made in a day or less. Trail lengths are shown one-way — return trips are double the lengths shown. More trail information is available at the Icefield Centre.

WILCOX PASS TRAIL

Length: 6.5km Elevation Gain: 390m

The trail begins at Wilcox Creek Campground, 2.5km south of the Icefield Centre. The trailhead is on the left side of the campground entrance, just beyond the fire gate. You can park just off the campground road.

Wildlife ranging from bighorn sheep, moose and coyote to ptarmigan and eagle frequent the pass and wild flowers abound. The Athabasca and Dome glaciers and a cirque on Mount Athabasca can be seen clearly from the pass.

PARKER RIDGE TRAIL

Length: 2.5km Elevation Gain: 240m

The trailhead is 8.8km south of the Icefield Centre on the west side of the Icefields Parkway. The trail sign is at a parking lot 300m south of the Hilda Creek Hostel.

The summit of Parker Ridge offers an excellent view of the Saskatchewan Glacier (see panorama below right). In the alpine meadows on the ridge, mountain goats and wild flowers can be seen. Also visible is an outcrop of an ancient coral reef, evidence that the Rockies were lifted out of a prehistoric sea.

Please help prevent erosion of the slopes by not short-cutting the switchbacks on the trail.

NIGEL PASS TRAIL

Length: 7.2km Elevation Gain: 300m

The trailhead is 12km south of the Icefield Centre on the east side of the Icefields Parkway. A gravel road leads 1.6km to Camp Parker which is to the left of the trailhead sign. Parking space is available at Camp Parker or at the start of the road if the gate is closed.

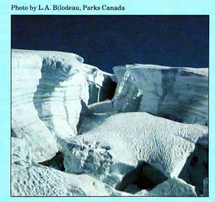
While hiking in the alpine and subalpine meadows of Nigel Pass, you will have a clear view of Parker Ridge and Mount Saskatchewan.

PANTHER FALLS TRAIL

Length: 800m Elevation Loss: 150m

This trail begins at a parking lot on the east side of the Icefields Parkway, 12.9km south of the Icefield Centre. The path to the falls and mist-screened Nigel Creek canyon leads down from the south end of the parking lot.

Photo by L.A. Bilodeau, Parks Canada



STAYING AROUND

Campground, hostel and hotel accommodation are available in the icefield area.

Camping

All campgrounds in the area are operated by Parks Canada and are open in summer. Camping space is allotted on a first-come, first-served basis, a daily fee is charged and the maximum stay allowed is two weeks.

Wilcox Creek and Columbia Icefield campgrounds are both close to the Icefield Centre. Wilcox Creek Campground has 46 drive-in sites, kitchen shelters, dry toilets and trailer sewage disposal. Columbia Icefield Campground has 22 tenting sites, kitchen shelters and dry toilets.

Within a half-hour drive of the icefield area are Jonas Creek and Cirrus Mountain campgrounds. Jonas Creek Campground is 27km north of the Icefield Centre and has 13 drive-in sites, 12 walk-in tenting sites, a kitchen shelter and dry toilets. Cirrus Mountain Campground is 24km south of the Icefield Centre and has 16 drive-in sites, a kitchen shelter and dry toilets.

Hostels

Hilda Creek and Beauty Creek hostels are on the Icefields Parkway, close to the icefield area. The accommodation is dormitory-style and is open to all age groups, members and non-members alike. Pets are not allowed.

Hilda Creek Hostel is 8km south of the Icefield Centre. It is open year-round and reservations can be made by phoning or writing the Canadian Hostelling Association, Mountain Region, ffl203, 1114 Kensington Rd. N.W., Calgary, Alberta T2N 3P3; telephone: (403) 283-5551.

Beauty Creek Hostel is 17.5km north of the Icefield Centre and is staffed in the summer. Arrangements can be made to stay there in winter but keys must be picked up at the Edmonton office. For reservations and winter arrangements, phone or write the Canadian Hostelling Association, Northwest Region, 10926 - 88 Ave., Edmonton, Alberta T6G 0Z1; telephone: (403) 439-3089.

Hotel

The Columbia Icefield Chalet is open from mid-May to the end of September and offers hotel accommodation. Reserve space by writing: Columbia Icefield Chalet, Brewster Transportation Company, Box 1140, Banff, Alberta T0L 0C0.

UNDERSTANDING THE ICE

You can learn more about the story of the mountains and the ice through Parks Canada's facilities and programs in the area.

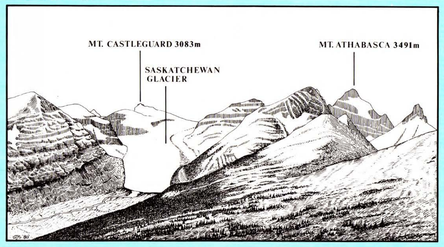
Conducted walks, campfire gatherings and evening presentations are all part of a personal service program given free of charge. A schedule of events is distributed at the Icefield Centre and at information centres in Jasper, Lake Louise and Banff.

The Icefield Centre contains models, displays and an audiovisual presentation about the Columbia Icefield. Several publications about the environment of the icefield and Jasper National Park are available free to visitors there.

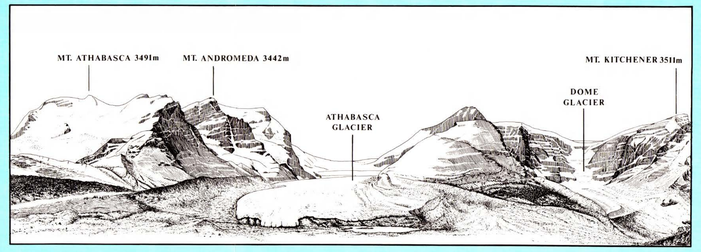
More information about Jasper or Banff national parks is available by writing: Banff National Park, Box 900, Banff, Alberta T0L 0C0; or, Jasper National Park, Box 10, Jasper, Alberta T0E 1E0.

Information about other national parks and national historic parks in western Canada is available from Parks Canada, Western Regional Office, Box 2989, Station M, Calgary, Alberta T2P 3H8.

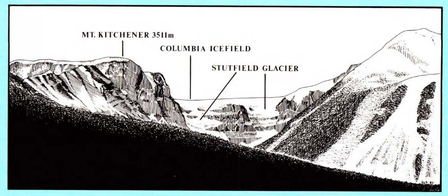
Panorama from: Parker Ridge



Panorama from Icefield Centre



Panorama from Stutfield Viewpoint, 9 km north of Icefield Centre



NORTH SASKATCHEWAN HEADWATERS TRAIL

Length: 1.2km Elevation Gain: 60m

The trail begins at the bottom of the Big Bend, 16km south of the Icefield Centre on the west side of the Icefields Parkway. Cross the gravel flats to the trees where a small trail follows the canyon through the forest for 300m. Unusual rock formations created by the pounding water are visible in the 12m depths of the canyon. The canyon lip is unprotected; use caution.

SASKATCHEWAN GLACIER TRAIL

Length: 8.0 km Elevation gain: 120m

The trailhead is 16.8 km south of the Icefield Centre at an old concrete bridge on the southeast side of the Icefields Parkway past the Big Bend. The trail begins in the trees to the immediate right on the southeast side of the bridge. After 1.6 km the trail joins a fire road, continuing over a small ridge and out onto low terraces along the south side of the outwash plain of the Saskatchewan glacier. From this point the route becomes indistinct, but continues to follow the terraces and level outwash plain on the south side of the valley to the gently sloping Saskatchewan glacier toe.

BEAUTY CREEK — STANLEY FALLS TRAIL

Length: 3.2km Elevation Gain: 150m

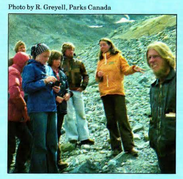
The trail begins 15.2km north of the Icefield Centre. Park on the east side of the Icefields Parkway at a dike and culvert just beyond the Stutfield Glacier Viewpoint. Walk along the dike and through the trees to the old highway and the creek. Continue along the deeply gouged canyon in the forest, past seven waterfalls to Stanley Falls, the eighth in the series.

ATHABASCA GLACIER NATURE TRAIL

Length: 1.0km Elevation Gain: slight

The trail begins at the lower parking lot at the Athabasca Glacier, across the Icefields Parkway from the Icefield Centre. A short walk across eroded moraine leads past Sunwapta Lake to the toe of the glacier. Signs along the way describe aspects of the glacier.

Photo by R. Greyell, Parks Canada



EMERGENCIES

Emergency help and telephones are at the Icefield Centre and the Columbia Icefield Chalet. When these facilities are closed, help is at the Tangle Creek maintenance compound, down a gravel road off the west side of the parkway, 12km north of the Icefield Centre.