

FOR YOUR SAFETY
Those portions of the text
highlighted by large dots con-
tain essential safety information
and should be read closely.

GLACIER BAY

Glacier Bay National Monument
The park is located in south-
eastern Alaska. A superinten-
dent, whose address is Box
1089, Juneau, AK 99802, is in
charge. Personnel are stationed
at park headquarters at Bartlett
Cove on a year-around basis.
As the Nation's principal con-
servation agency, the Depart-
ment of the Interior has re-
sponsibility for most of our
nationally owned public lands
and natural resources. This
includes fostering the wisest
use of our land and water
resources, protecting our fish

and wildlife, preserving the
environmental and cultural
values of our national parks
and historical places, and pro-
viding for the enjoyment of
life through outdoor recreation.
The Department assesses our
energy and mineral resources
and works to assure that their
development is in the best
interests of all our people.
The Department also has a
major responsibility for Ameri-
can Indian reservation com-
munities and for people who
live in Island Territories under
U.S. administration.

National Park Service
U.S. DEPARTMENT OF THE INTERIOR

GLACIER BAY'S PONDER-
OUSLY ADVANCING AND
RETREATING GLACIERS
RECORD A HISTORY OF
RHYTHMIC CHANGES IN THE
CLIMATE OF THE PLANET.
OVER AND OVER, CENTURIES
OF MILD CLIMATE IN THE
FAR NORTH HAVE ALTER-
NATED WITH THE LONG,
COLD PERIODS OF SUCCE-
SSIVE ICE AGES.
SINCE LIFE EVERYWHERE
PRESSES AGAINST ITS FRON-

TIERS, HERE TOO IS RE-
CORDED AN EXTENSION OF
MOSS-CARPETED PRIMEVAL
FORESTS AND THEIR INHABI-
TANTS IN THE WAKE OF
RETREATING ICE . . . THEN
EXTINCTION OR WITHDRAW-
AL WHEN OVERWHELMED BY
ADVANCING GLACIERS . . .
AND AGAIN THE FORESTS'
RECOVERY, AS IN OUR TIME.

GLACIER FORMATION

Glaciers form (right) because
the snow that falls each year in
the high mountains does not
all melt but accumulates and
is transformed into ice. New-
fallen snow changes first into
granular snow consisting of
round grains of ice. As the
depth increases, these ice
grains become more closely
packed and in time fuse into
solid ice. When such ice is of
sufficient thickness, volume,
and weight, it flows downslope
into lower regions to a point
where the rate of melting
equals the rate of accumula-
tion. That point is the terminus,
or snout, of the glacier.

The advance or retreat of a
glacier terminus is a reflec-
tion of many things: rate of
snowfall, topography, and
trends in climate. Scientists
are seeking means to accu-
rately correlate glacial move-
ments with changes in climate.

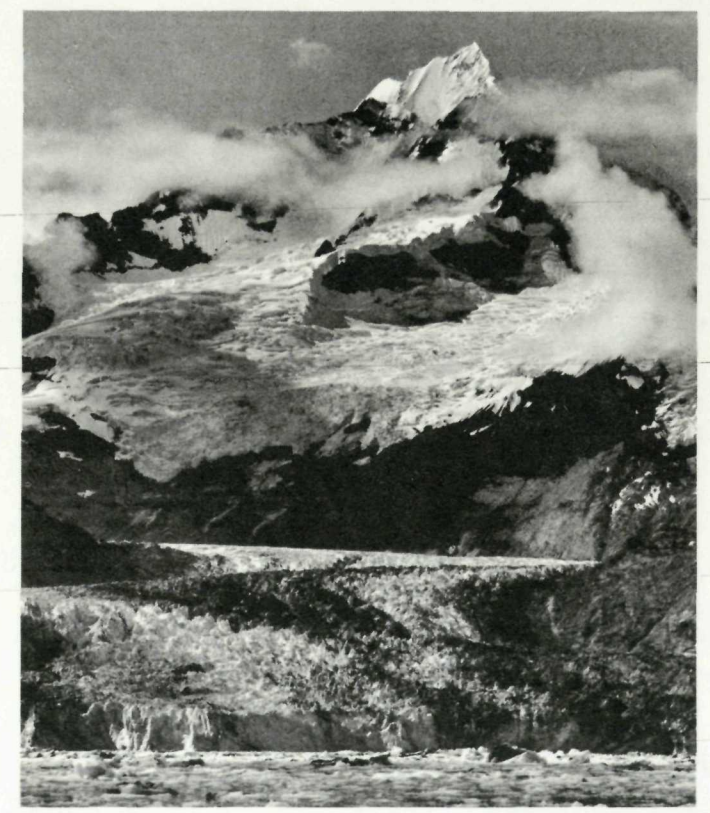
THE GLACIERS RECEDE

When Capt. George Vancouver
sailed through the ice-choked
waters of Icy Strait in 1794,
Glacier Bay was little more
than a dent in the shoreline.
Across the head of this ap-
parently minor inlet stood a
towering wall of ice—a wall
that marked the seaward outlet
of an immense glacier that
completely filled the broad,
deep basin of what is now
Glacier Bay. To the north, ice
extended more than 160 kilo-
meters (100 miles) to the St.
Elias Range, covering the basin
to widths of 30 kilometers
(20 miles) and more. In many
places the mantle of ice was
more than 1,200 meters (4,000
feet) deep.

John Muir, the noted naturalist
and explorer, found that by the
time of his canoe trek into the



Bay in 1879 the ice front had
retreated 77 kilometers (48
miles) and a tall spruce-hem-
lock forest had begun to take
its place. Tidewaters had in-
vaded the basin and filled the
deep, narrow fiords. The
glaciers kept receding. By
1916, Tarr Inlet was free of ice,
and the terminus of Grand

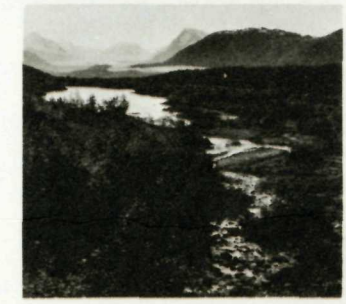


Pacific Glacier stood 105 kilo-
meters (65 miles) from the
mouth of Glacier Bay. Nowhere
else have glaciers receded at
such a rapid pace.

The speed at which Glacier
Bay's ice sheet shrank has
created much scientific in-
terest; consequently, the his-
tory of the recession is well
documented. The retreat con-
tinues today on the bay's east
and southwest sides; Muir
Glacier receded about 8 kilo-
meters (5 miles) in 7 years. In
contrast glacial termini on
the west side were stabilized
by 1929. Most have slowly
fluctuated ever since, but
several, including the snouts
of Grand Pacific and Johns
Hopkins, have moved gradually
forward. Glaciers outside the
Glacier Bay drainage show yet

other patterns of activity.
Some may be as far forward
as in any previous time. Local
climate and topography are
presumably involved, but the
full explanation for this be-
wildering diversity of glacial
activity has yet to be found.

FOREST GROWTH QUICKLY INVADES
AREAS FORMERLY COVERED BY
GLACIAL ICE.



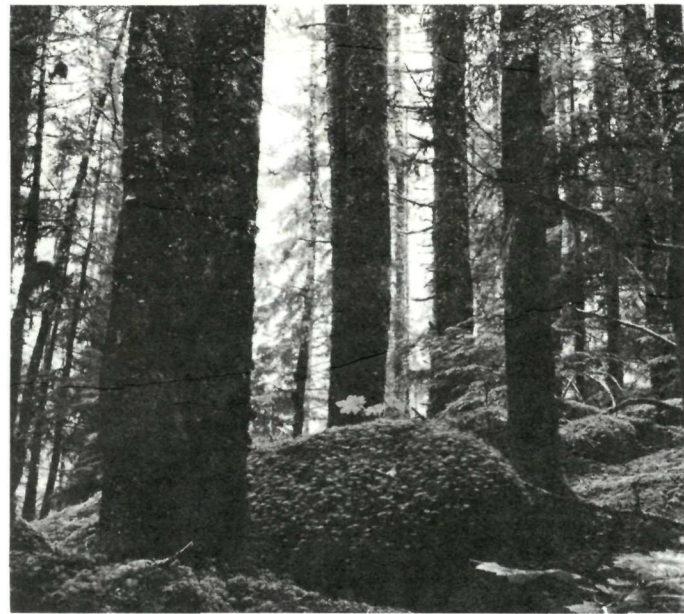
THE GLACIERS TODAY

The glaciers seen in the park
today are remnants of a gen-
eral ice advance which began
about 4,000 years ago. This
period, sometimes called the
"little ice age," in no way ap-
proached in extent the con-
tinental glaciation of earlier
Pleistocene time. Ice fronts
reached their maximum limits
about 1750, after which the
slowly warming climate brought
about general melting.

Few of the many tributary
glaciers that once supplied the
huge ice sheet still extend to
the sea. Yet the 11,400 square
kilometers (4,400 square miles)
of Glacier Bay National Mon-
ument enclose 16 active tide-
water glaciers. Icebergs,
cracked off from near-vertical
ice cliffs, dot the waters of
the bay. Glaciers, deep fiords,
and snow-capped mountains

combine with lush forests and
abundant wildlife to create a
unique wilderness.

Several tidewater glaciers offer
a spectacular show of geo-
logic forces in action. As water
undermines the ice fronts,
great blocks of ice up to 60
meters (200 feet) high break
loose and crash into the sea,
creating huge waves and fill-
ing the narrow inlets with
massive icebergs. Muir and
Johns Hopkins Glaciers dis-
charge such great volumes of
ice that it is seldom possible
to approach their cliffs closer
than 3 kilometers (about 2
miles). Margerie Glacier, while
also very active, is more ac-
cessible. From a safe distance
of 0.8 kilometer (0.5 mile),
boaters can observe ice fall-
ing from the glacier faces.



FLORA IN TRANSITION

Before the last glacial advance, much of the land in the upper bay was covered by forests of spruce and hemlock (left). With the forward movement of the glaciers came great quantities of meltwater and debris. The shifting streams flooded and then buried the trees under many meters of sand and gravel. Glaciers then advanced over the sediments and for perhaps 3,000 years the forests lay buried. As glaciers melted, their outwash streams cut through the deep deposits and exposed the ancient stumps, many still in upright position. Well-preserved specimens may be observed in the areas of Morse and Forest

Creeks and along the shore just north of Fingers Bay.

Life quickly reinvades land recently covered with ice. The glacial barrens are dotted with scattered dwarf fireweed, horsetail, mosses, and other plants that seldom prosper in the poor soil. A pioneer plant, *Dryas*, forms dense mats on the sands and gravels, building soil for the willow and alder thickets that soon follow. Much later, spruce crowds out the thick brush. Hemlock slowly replaces the spruce, and much of the undergrowth gives way to a deep carpet of moss. The last stage of succession occurs as moist locations become open muskegs.



RIVERS OF FLOWING ICE ACTIVELY GRIND THEIR WAY TO THE SEA AT 16 LOCATIONS WITHIN GLACIER BAY NATIONAL MONUMENT. THE DARK CENTER LINE IN MC BRIDE GLACIER INDICATES THAT THE MAIN GLACIER IS COMPOSED OF TWO TRIBUTARY GLACIERS. DEBRIS THAT ACCUMULATED ALONG THEIR SIDES FORMS A DARK CENTER RIBBON IN THE MAIN GLACIER.

ABUNDANT BIRDLIFE

More than 200 species of birds have been recorded within Glacier Bay National Monument. Many of these are best seen in or near marine environments, which supply bountiful and varied food. In Sitakaday Narrows, Adams and Hugh Miller Inlets, and the mouth of Glacier Bay, tidal flow is concentrated in narrow and/or shallow portions of the bay, and the resulting water turbulence stirs plankton, shrimp, and fish to the surface. In such locales "feeding frenzies" occur, and large flocks of marbled and Kittlitz's murrelets, blacklegged kittiwakes, Bonaparte's gulls, and northern phalaropes gather.

Remote islands, free from predation by land mammals, are favored for nesting sites by tufted and horned puffins, pigeon guillemots, pelagic cormorants, glaucous-winged and herring gulls, and black oystercatchers. Many of these sites are easily viewed from a boat.

Some land birds are highly adaptable and nest in most plant communities in the park. These include the bald eagle, common raven, and barn swal-

FISH

Numerous streams are filled with spawning salmon in late summer and early autumn. Dolly Varden and cutthroat trout live in many of the crystal-clear lakes and streams. Halibut, a salt water species popular to sport fishermen, are common in Glacier Bay and Icy Strait.

low. Other species are more selective. Thus the treeless areas near the retreating glaciers attract ptarmigan, snow buntings, and common redpolls. Grey-cheeked thrushes and yellow warblers summer in alder-cottonwood thickets.

THE NESTS OF MANY BIRDS AND THEIR YOUNG—INCLUDING THESE HUNGRY CORMORANTS—ARE EASILY VIEWED BY BOATERS IN THE PARK.



U.S. Fish & Wildlife Service photo

The spruce-hemlock forest is the haunt of blue grouse, northern three-toed woodpeckers, varied thrushes, and golden-crowned kinglets.

MOUNTAINS, FIORDS, AND THE TROUBLED EARTH

The snow- and ice-clad mountains of the Fairweather Range are as impressive as the glaciers. The highest peak in the range is 4,670-meter (15,320-foot) Mount Fairweather. Several other summits, including Mounts Crillon, Quincy Adams, LaPerouse, Lituya, and Salisbury, exceed 3,000 meters (about 10,000 feet). The steepness of their slopes is dramatically visible throughout the upper bay. In Johns Hopkins Inlet, several peaks rise from sea level to 2,000 meters (6,500 feet) within 6.5 kilometers (4 miles) of the shore. The peaks supply moisture to all glaciers on the peninsula separating Glacier Bay from the Gulf of Alaska.

The deep fiords are a direct result of glacial erosion by quarrying and abrasion. Quarrying is caused by an ice mass plucking soil and rock from the sides and floor of the valleys. This material acts as a powerful abrasive on the underlying bedrock as the glacier moves forward, widening and

deepening the trough. Landslides contribute to this widening. Great slides occur when the glacier removes bedrock support from under masses of soil and rock on the upper slopes of an inlet.

During a severe earthquake in 1958, an estimated 82 million metric tons of rock, weakened by glacial erosion, broke loose from the cliffs above the terminus of Lituya Glacier. Thundering down the mountain, the slide tore 300 meters (1,000 feet) of ice from the terminus and crashed into the water. On the ridge opposite the slide, a wave surged to a height of 524 meters (1,720 feet). Still several hundred meters high, the wave moved seaward down the 13 kilometers (8 miles) of Lituya Bay, completely stripping nearly 10 square kilometers (4 square miles) of forest from the shores. Evidence of this giant wave's destructive power will be visible for many years.

PIONEERING MAMMALS

The recent recession of glaciers that once covered Glacier Bay and nearby lowlands has opened a new landscape for pioneering animals as well as plants. Many mammals have shown special means to speed recolonization. Black and brown bears, river otters, and mink are able to swim around ice barricades that prevent access by other land animals. Mountain goats and hoary marmots live in alpine meadows, where vegetation received a head start on ridges exposed first by the waning ice. Several types of shrews and mice experience years of burgeoning populations when surplus individuals are forced to new territories for food and living space. Humpback and killer whales and Dall and Harbor porpoises have found open marine corridors to the front of retreating tidewater glaciers. Harbor seals select densely packed icebergs at the face of Muir and Johns Hopkins Glaciers for pupping grounds. Each of the preced-

ing species is widely spread over the park in suitable habitats.

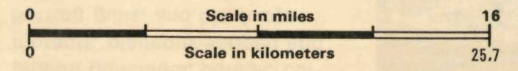
HAIR SEALS AND THEIR YOUNG (SHOWN HERE) ARE SEEN FREQUENTLY IN THE WATERS OF GLACIER BAY.



Other animals have not been so successful in colonizing Glacier Bay. Moose and coyotes are common in some sections, but not in others. Animal species that are generally scarce or absent but which may become established in the area include the Sitka black-tailed deer, beaver, lynx, and snowshoe hare.

WE'RE JOINING THE METRIC WORLD

The National Park Service is introducing metric measurements in its publications to help Americans become acquainted with the metric system and to make interpretation more meaningful for park visitors from other nations.



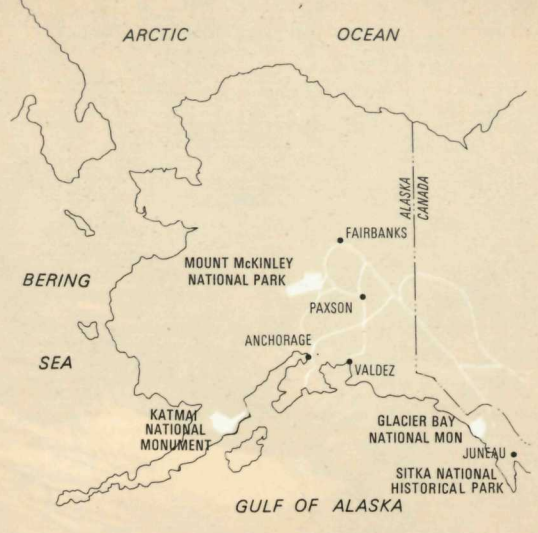
VISITOR SERVICES NATIONAL PARK SERVICE CONDUCTED
 Park naturalists conduct daily hikes, evening programs, and other activities at Glacier Bay Lodge. Hiking trails of various lengths are maintained at the Bartlett Cove area (see insert). The Forest Trail is a 1.6 kilometer (1-mile) loop near the lodge that traverses both beach and forest settings. A 6.5 kilometer (4-mile) trail round trip to the Bartlett River

provides access to an estuary where wildlife and migrating waterbirds frequently are seen. Publications, maps, and marine charts relating to Glacier Bay may be purchased at Bartlett Cove, or by writing to Alaska National Parks and Monuments Association, Glacier Bay National Monument, Gustavus, AK 99826.

CONCESSIONER OPERATED
 Glacier Bay Lodge at Bartlett Cove is operated from about mid-May to mid-September. Rooms and meals are available. For reservations, write to Glacier Bay Lodge, Glacier

Bay National Monument, Gustavus, AK 99826 during the operating season, and Glacier Bay Lodge, Inc., 312 Park Place Bldg., Seattle, WA 98101, the remainder of the year. A tour boat makes daily cruises from the lodge to the glaciers.

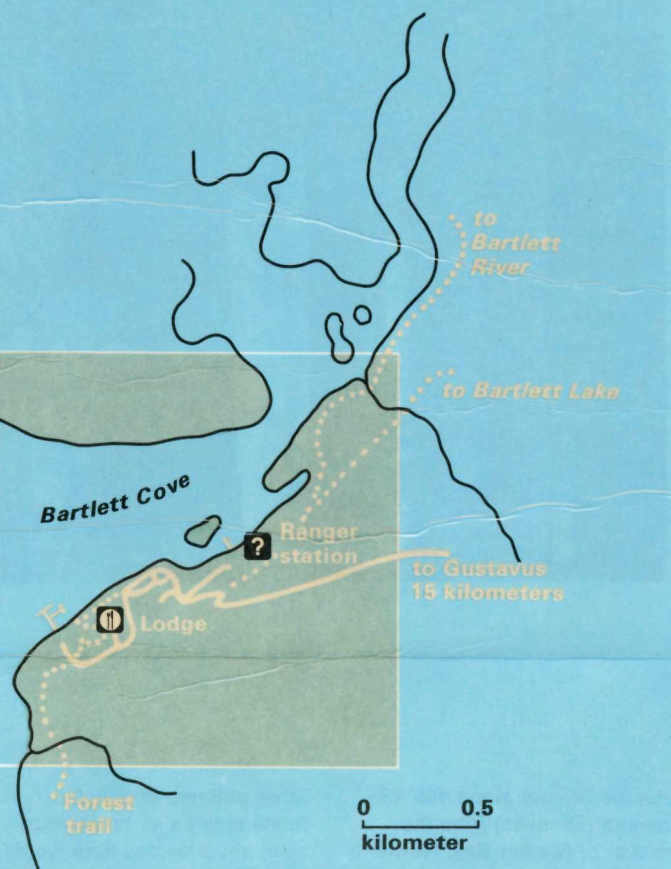
Boaters may obtain gasoline, diesel fuel, water, and limited moorage space at Bartlett Cove. No other public facilities for boats are within the park.



GETTING TO GLACIER BAY

Glacier Bay is situated at the northwest end of the Alexander Archipelago in southeastern Alaska. There are no roads to the park, and access is by various types of commercial transport, including regularly scheduled and charter air services, cruise ships and charter boats, private boats, and tours via kayak.

By boat, the distance from Juneau is about 160 kilometers (100 miles). Flying time from Juneau is about 30 minutes. An airfield is at Gustavus, just outside the park. Otherwise, landing is restricted to salt water. Adams Inlet is closed to aircraft landing.



VISITOR ACTIVITIES SEEING THE GLACIERS

A trip to the face of one of many local tidewater glaciers is a highlight of a visit to Glacier Bay National Monument. Bartlett Cove is 72 kilometers (45 miles) from the nearest tidewater glacier, and arrangements should be made for trips by boat or plane to see them. Concession-operated

and commercial transportation are available. Warm clothing and rain gear are essential when visiting the park. Summer temperatures seldom exceed 24°C (72°F) and extended periods of wet weather are to be expected. The ground is usually moist and foot wear should be selected accordingly.

BOATING

Most of the areas of major scenic and biological interest are easily reached by boat through the natural marine-way of Glacier Bay. Private boaters should be aware of certain information and procedures.

- Remember that water temperatures are only a few degrees above freezing and that prolonged immersion is usually fatal.
- Navigation of Glacier Bay should not be attempted without nautical charts, tide tables, and local knowledge. All are available at Bartlett Cove, along with the booklet, *Boating Guide to Glacier Bay*.
- Park rangers are stationed at Bartlett Cove to assist you. Field ranger crews are

also based at Goose Cove in Muir Inlet and at Dundas Bay during the summer months. Several radio frequencies are monitored daily at park headquarters, and you are encouraged to use them if needed.

- Floating ice is a special hazard in Glacier Bay. While boats can slowly push through smaller pieces safely, icebergs are often unstable and roll easily. It is extremely dangerous to lie next to larger bergs.
- Boats should not approach closer than three-quarters of a kilometer (about one-half-mile) to the face of a tidewater glacier. Both ice-falls and large ice masses boiling to the water's surface some distance from the terminus often create substantial waves. Boats should not be beached on shorelines subject to these waves.

CAMPING AND HIKING

Although only one campground, at Bartlett Cove, is maintained, the park's several hundred kilometers of shoreline, numerous islands, and alpine meadows offer nearly unlimited camping and hiking opportunities. Lightly vegetated regions of the upper bay are especially attractive to hikers.

Access to more isolated areas is usually by the daily tour boat from Bartlett Cove, which will drop campers at selected points en route, or via charter air services. Reservations may be required, and it is advisable to obtain local information prior to a camping trip. Inquiries may be addressed to the superintendent. In addition, a hiker's guide with many suggestions for back-country users and topographical maps covering the park can be obtained at Bartlett Cove.

Be sure to buy your own food and camping supplies before you come to Glacier Bay. There are no stores or camping services locally. Juneau is the closest city offering a complete selection. Wet weather and terrain with numerous streams, lakes, and moist surfaces are the rule in Glacier Bay. Rain gear, a tent fly, and water-resistant boots are often essential items for a successful trip.

Cooking stoves are recommended because no wood is available in many portions of upper Glacier Bay for camp-

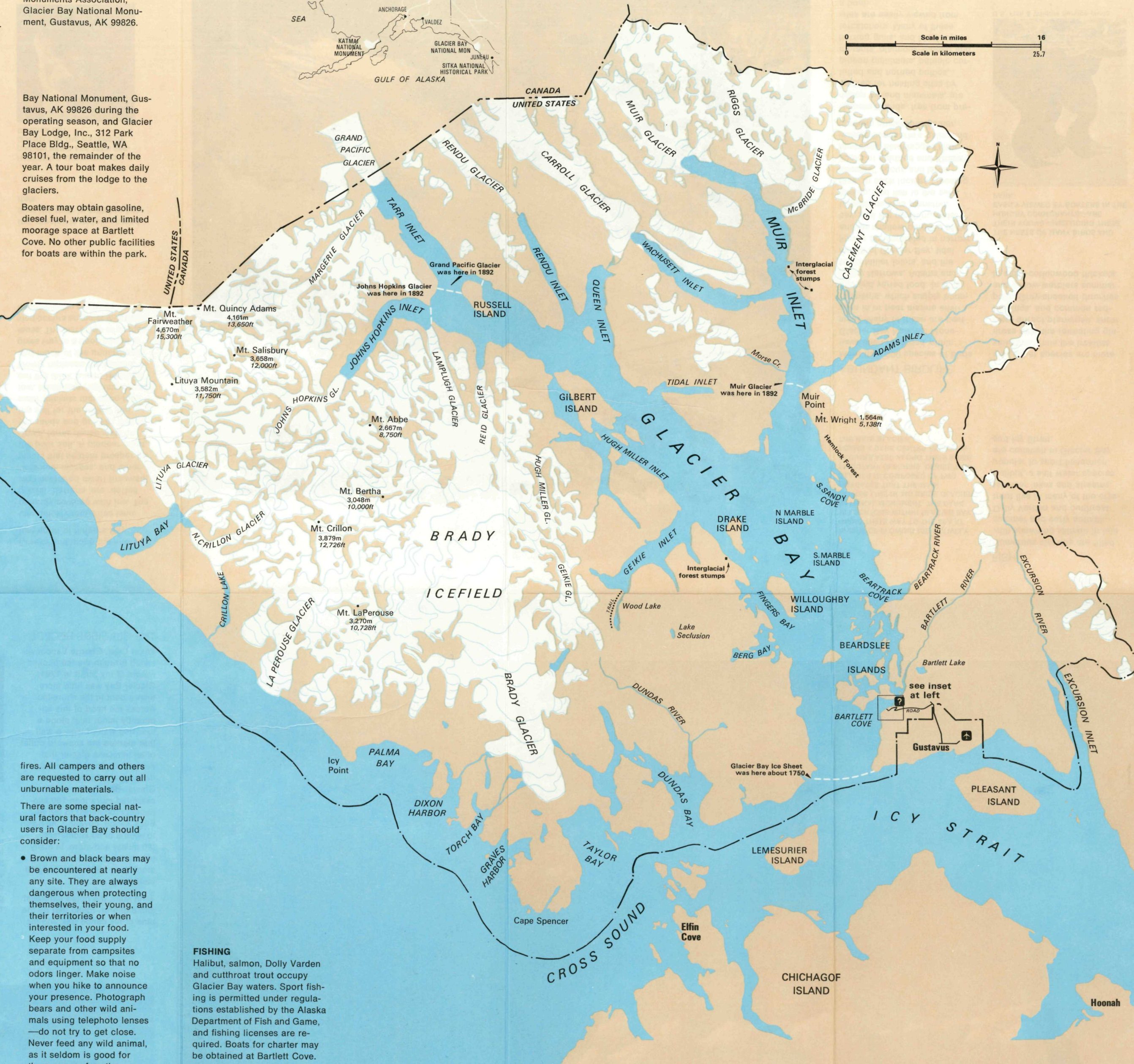
fires. All campers and others are requested to carry out all unburnable materials.

There are some special natural factors that back-country users in Glacier Bay should consider:

- Brown and black bears may be encountered at nearly any site. They are always dangerous when protecting themselves, their young, and their territories or when interested in your food. Keep your food supply separate from campsites and equipment so that no odors linger. Make noise when you hike to announce your presence. Photograph bears and other wild animals using telephoto lenses—do not try to get close. Never feed any wild animal, as it seldom is good for them, you or for other campers who follow.
- Glacial streams may be small in the morning and uncrossable torrents in the afternoon after a warm or rainy day. Tides may fluctuate 7 meters (25 feet) daily and beach meadows that are enticing as campsites may be flooded.
- Avoid crossing or approaching steep glacial interfaces. Though some stagnant bodies of ice may be crossed safely, extreme caution should be taken when hiking on glacial surfaces.

FISHING

Halibut, salmon, Dolly Varden and cutthroat trout occupy Glacier Bay waters. Sport fishing is permitted under regulations established by the Alaska Department of Fish and Game, and fishing licenses are required. Boats for charter may be obtained at Bartlett Cove.



PRESERVING THE PARK

To retain Glacier Bay's natural values for your enjoyment in coming years and for future generations, please observe established regulations.

Natural Features Destroying, defacing, or collecting plants, rocks, shells or other features is prohibited. Feeding, capturing, molesting, or killing any animal is not allowed.

No Hunting All firearms must be surrendered, or sealed, or unloaded and cased, or otherwise packed in such a way as to prevent their use while in park areas. The hunting closure is strictly enforced.

Pets You must keep your pets leashed and under physi-

cal restraint at all times. They are not permitted with you on trails or in the back country. Pets and wildlife don't mix.

Wildlife Protection Zone North and South Marble Islands are the sites of the largest bird nesting colony in Glacier Bay. As nesting birds are sensitive to disturbance, these islands are closed to foot traffic between May 15 and August 15.

Hoonah