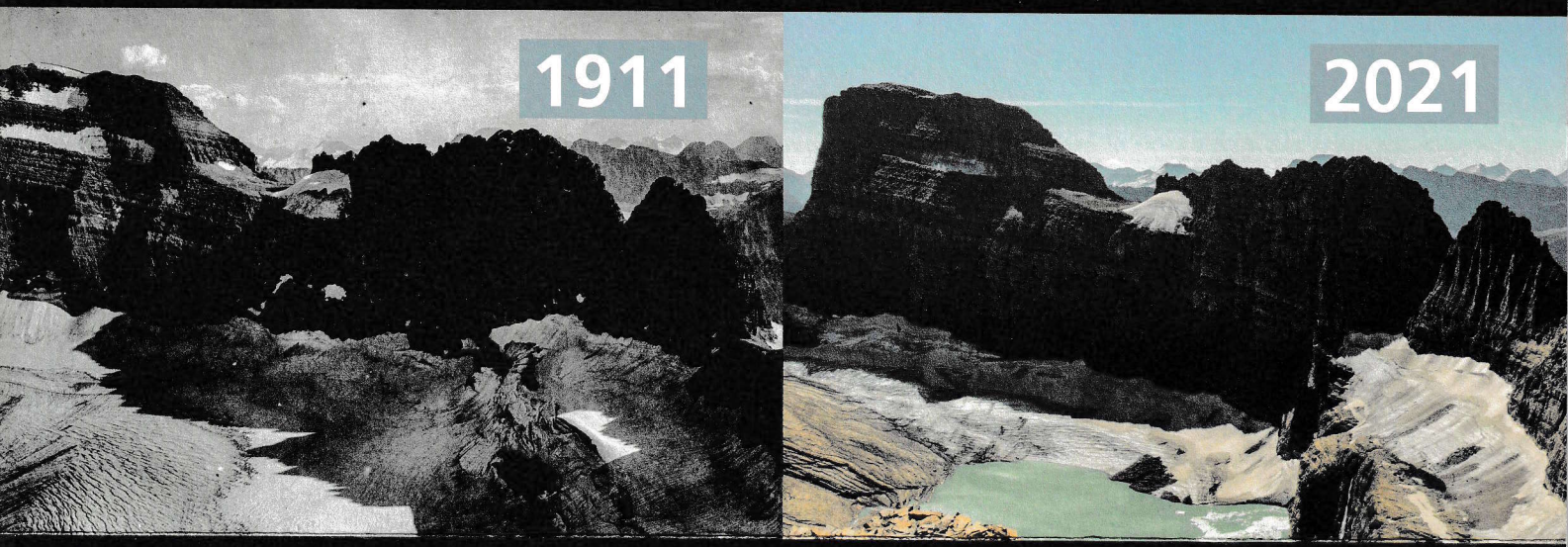
Losing a Namesake

Glacier National Park
Montana

National Park Service
U. S. Department of the Interior

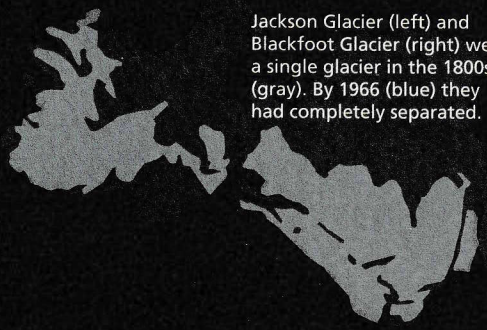


Though the park's glaciers are all getting smaller, variations in avalanches, ice flow dynamics, wind exposure, and ice thickness cause some to shrink faster than others. Left, Grinnell Glacier in 1911 by Morton J. Elrod from the K. Ross Toole Archives. Right, Grinnell Glacier in 2021 by the National Park Service.

Why do glaciers matter?

Glacier National Park's glaciers support the American way of life by contributing meltwater to irrigation for agriculture, to cold streams for wildlife, and to lakes and reservoirs for recreation. The melting of the park's glaciers does have consequences, but for many people glacier retreat itself has become enough reason for concern. Losing the park's glaciers could be a lesson about the significance of global warming. Though other effects of climate change may be felt closer to home–more frequent heat waves, rising seas, larger wildfires–the loss of the park's namesake grabs our attention and challenges us to imagine what the future could look like.

Paradoxically, glacier retreat sometimes leads to *more* glaciers when they melt into separate ice patches.



Jackson Glacier (left) and Blackfoot Glacier (right) were a single glacier in the 1800s (gray). By 1966 (blue) they had completely separated.

What is a glacier?

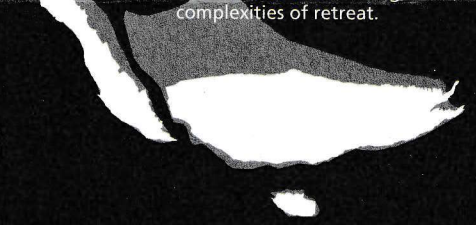
A glacier is a mass of ice so big that it flows under its own weight. A commonly used threshold for determining if a body of ice is big enough to flow under its own weight is an area of 0.1 km^2, which is about 25 acres. Below this size the ice is less likely to move and is not considered a glacier. This general definition works most of the time, but there are exceptions. Some glaciers may be smaller

Between 1966 (blue) and 2015 (white), Grinnell Glacier lost 45% of its area. The smaller bodies of ice nearby

than 0.1 km² and yet remain active. Others may stop moving under their own weight and still remain larger than 0.1 km².

How many glaciers are in the park?

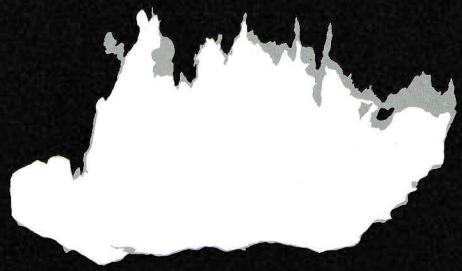
At the end of the Little Ice Age around 1850, there were about 80 glaciers in what would eventually become Glacier National Park. Aerial imagery from 2015 showed 26 named glaciers that met the size criteria of 0.1 km², nine fewer than in 1966. Of the 26 remaining in 2015, some may now already be too small to be considered glaciers. In addition to the roughly two dozen named glaciers that are monitored by the U.S. Geological Survey, the park also hosts several unnamed glaciers and many snow fields.



Are the glaciers shrinking?

Between 1966 and 2015, every named glacier in the park got smaller, some by more than 80%. In late summer when the glaciers are most visible, satellites can capture images to measure the areas of glaciers. These images have generally shown a trend of shrinking area. For some of the more accessible glaciers, scientists collect data in the field. Photographs of the glaciers taken repeatedly from the same vantage points on the ground confirm a reduction in area and also illustrate a reduction in thickness and overall mass. GPS measurements track the glaciers' surface areas, and stakes embedded into the ice help to illustrate overall changes in mass.

The shape of Sperry Glacier below shows how its area was reduced between 2005 (light blue) and 2015 (white) by about 10%.

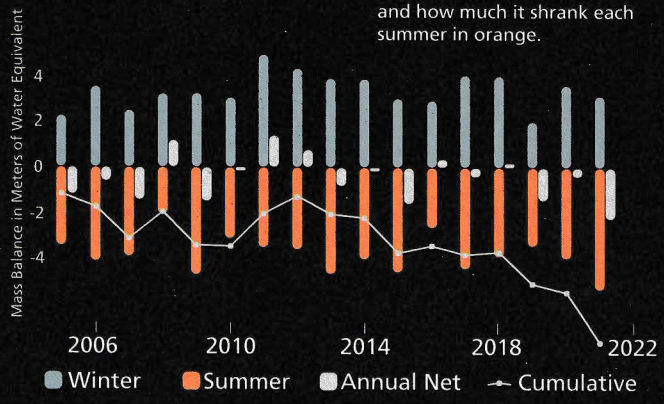


When will they be gone?

Predicting exactly when the glaciers will be gone requires answers to a series of questions. For example, is "gone" defined as inactive or disappeared? How much more will the glaciers melt from warming that has already occurred? How much more will the planet warm from greenhouse gases already emitted and how much longer will emissions continue to rise?

Glaciers shrink when summer melting outpaces winter snowfall. If over time more snow falls in the winters than melts in the summers, a glacier will grow. The chart on the right shows this pattern of gain and loss, known as the "mass balance," for Sperry Glacier between 2005 and 2021. Despite periods of growth, Sperry's mass still declined.

Sperry is the one glacier in the park for which data about mass, as well as area, is available. The graph below, adapted from a USGS study, shows how Sperry Glacier grew each winter in blue and how much it shrank each summer in orange.

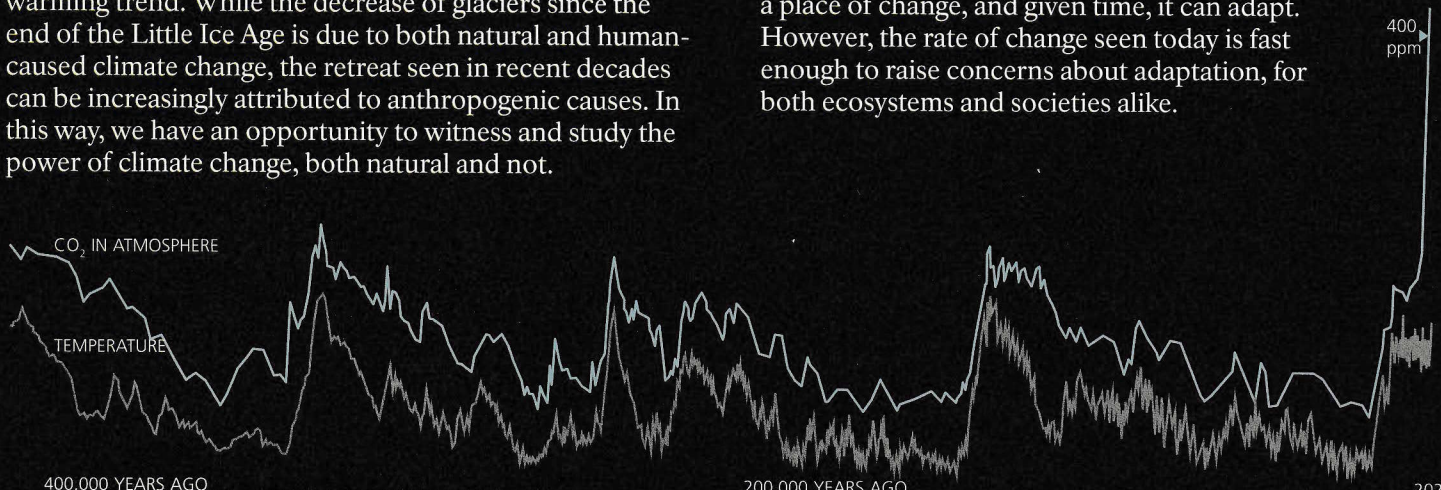


Around 1850 Grinnell Glacier (the lower ice mass bordering the lake) reached a peak size of 488 acres. In 2015, it was measured at 139 acres.
Photo credit from left to right: USGS Carl Key, USGS Dan Fagre, USGS Lisa McKeon, and NPS.

Why are the glaciers shrinking?

For thousands of years, the glaciers naturally cycled through periods of advance and retreat. The park's current glaciers were at their largest at the end of the Little Ice Age (around 1850) then started to retreat with the onset of a warming trend. While the decrease of glaciers since the end of the Little Ice Age is due to both natural and human-caused climate change, the retreat seen in recent decades can be increasingly attributed to anthropogenic causes. In this way, we have an opportunity to witness and study the power of climate change, both natural and not.

When you view Jackson Glacier from Going-to-the-Sun Road you stand in a valley carved by a Pleistocene glacier and see distant bedrock exposed as ice formed in the Little Ice Age retreats. Glacier National Park has always been a place of change, and given time, it can adapt. However, the rate of change seen today is fast enough to raise concerns about adaptation, for both ecosystems and societies alike.



CO_2 and temperature have changed in tandem for millenia. This graph illustrates how today's climate change, with more CO_2 in the atmosphere than any other time in the past 400,000 years, differs from past changes. Graph adapted from ice core data by Petit et al. Nature 1999.

What can be done?

The climate is hotter, the glaciers are melting, and some have disappeared. Global warming has already happened and continues to happen now. Greenhouse gas emissions can continue to go up and it can always get even hotter. Although the effort to reduce emissions may be too late to preserve Glacier National Park's glaciers, it remains a worthy cause for many reasons, including the possible preservation of glaciers elsewhere.

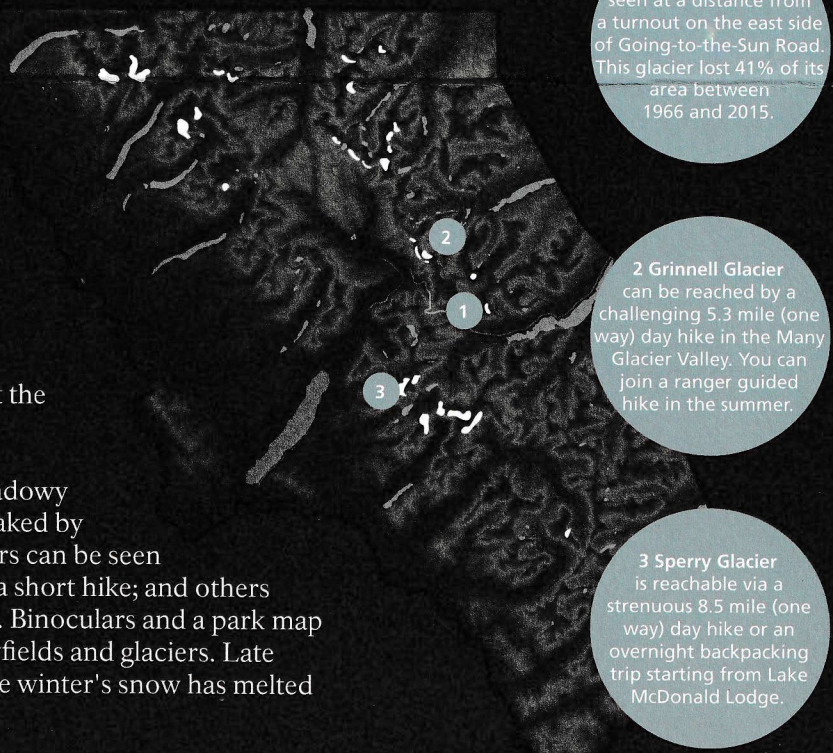
Glacier National Park has already begun an effort to reduce its contribution to a warming climate. Solar arrays and hydropower help provide electricity throughout the park. Improvements to the recycling program are being made. More efficient LEDs are replacing energy-wasting light bulbs. Glacier's employees can reduce their own carbon emissions by riding the employee shuttle or biking to work. You can join Glacier's effort by taking steps to reduce your own individual emissions, and by encouraging wider, more collective efforts.

How can I see a glacier?

Massive glaciers can be viewed with relative ease in Alaska's national parks. In the contiguous United States, glaciers can be seen in Mount Rainier, Olympic, North Cascades, and Grand Teton National Parks. It is actually North Cascades that boasts the highest number of glaciers of any National Park in the lower 48 states, but Glacier National Park comes in second with about two dozen named glaciers.

Many visitors come to the park hoping to see glaciers. Ironically, Glacier National Park isn't the easiest place to see an active glacier.

Most of the park's glaciers are tucked into shadowy niches high along the Continental Divide, cloaked by semi-permanent snowfields. Still, a few glaciers can be seen from the road; a few others can be seen from a short hike; and others can be studied up close after a strenuous hike. Binoculars and a park map can help you tell the difference between snowfields and glaciers. Late August and early September, when most of the winter's snow has melted away, is the best time to see the glaciers.



1 Jackson Glacier is seen at a distance from a turnout on the east side of Going-to-the-Sun Road. This glacier lost 41% of its area between 1966 and 2015.

2 Grinnell Glacier can be reached by a challenging 5.3 mile (one way) day hike in the Many Glacier Valley. You can join a ranger guided hike in the summer.

3 Sperry Glacier is reachable via a strenuous 8.5 mile (one way) day hike or an overnight backpacking trip starting from Lake McDonald Lodge.