Agassiz Glacier
Glacier National Park, MT

1943 M. V. Walker photo courtesy of GNP archives

2005 Greg Pederson photo USGS

USGS Repeat Photography Project
http://nrmisc.usgs.gov/repeatphoto/
Blackfoot and Jackson Glaciers
Glacier National Park, MT

1911
EC Stebinger photo
GNP Archives

2009
Lisa McKeon photo
USGS

USGS Repeat Photography Project
http://nrmsc.usgs.gov/repeatphoto/
Boulder Glacier
Glacier National Park, MT

1932
T. J. Hileman photo
courtesy of GNP archives

1988
Jerry DeSanto photo
K. Ross Toole Archives
Mansfield Library, UM

USGS Repeat Photography Project
http://nrmisc.usgs.gov/repeatphoto/
Boulder Glacier
Glacier National Park, MT

1932
T. J. Hileman photo
courtesy of GNP archives

2005
Greg Pederson photo
USGS

USGS Repeat Photography Project
http://nrmsc.usgs.gov/repeatphoto/
Boulder Glacier
Glacier National Park, MT

circa 1910

Morton Elrod photo
courtesy of GNP archives

2007

Fagre / Pederson photo
USGS

USGS Repeat Photography Project
http://nrmsc.usgs.gov/repeatphoto/
Chaney Glacier
Glacier National Park, MT

1911  M.R. Campbell photo
USGS Photographic Library

2005  Blase Reardon photo
USGS

USGS Repeat Photography Project
http://nrmisc.usgs.gov/repeatphoto/
Clements Glacier displayed crevasses in 1914, but in 2010 it is merely a perennial ice mass. Each summer, thousands of visitors pass by the steep moraines sculpted by this glacier as they hike from Logan Pass to Hidden Lake Overlook. The trail is visible along the left side of the 2010 photo.
Grant Glacier
Glacier National Park, MT

1902
Morton Elrod photo
courtesy of GNP Archives

1998
Karen Holzer photo
USGS

USGS Repeat Photography Project
http://nrmisc.usgs.gov/repeatphoto/
In 1900 Grinnell Glacier’s mass filled the cirque basin. This early photo shows the glacier’s height along the headwall and how it was once joined the upper ice portion, now called The Salamander.
Nearly a century after Stanton’s photograph was taken, Grinnell Glacier has receded into its cirque basin and is no longer visible from the trail above Grinnell Lake.
Among the earliest photos of Grinnell Glacier, this 1887 image shows the immense extent and depth of the glacier at the turn of the 20th century. The glacier has responded to temperature and precipitation in the past 100 years, resulting in its obvious reduction in size.
In addition to the change in the size of Grinnell Glacier, there is obvious change in the foreground streamside vegetation between these two images.
Grinnell Glacier
Glacier National Park, MT

1914
Marble photo
courtesy GNP Archives

1938
T. J. Hileman photo
courtesy GNP Archives

2008
Lisa McKeon photo
USGS

Grinnell Glacier from the shore of Lake Josephine

USGS Repeat Photography Project
http://nrmisc.usgs.gov/repeatphoto/
Grinnell Glacier
Glacier National Park, MT

Oblique view of Grinnell Glacier taken from the summit of Mount Gould, Glacier National Park. The relative sensitivity of glaciers to climate change is illustrated by the dramatic recession of Grinnell Glacier while surrounding vegetation patterns remain stable.

USGS Repeat Photography Project
http://nrmsc.usgs.gov/repeatphoto/
Grinnell Glacier
Glacier National Park, MT

Oblique view of Grinnell Glacier taken from the summit of Mount Gould, Glacier National Park. The relative sensitivity of glaciers to climate change is illustrated by the dramatic recession of Grinnell Glacier while surrounding vegetation patterns remain stable.
Grinnell Glacier taken from the Grinnell Glacier Overlook off the Highline Trail, Glacier National Park. The view of Grinnell Glacier taken circa 1940 shows the early formation of Upper Grinnell Lake, a proglacial lake visible at the terminus of the glacier. The 2006 photo shows a dramatic increase in the size of the lake as a result of melting ice.
The 1920 photo shows National Park Service Director, Steven Mather, on Piatt Path near present day Grinnell Glacier Overlook. Darren Pfeifle strikes a similar pose in the 2008 repeat photograph.
Grinnell Glacier
Glacier National Park, MT

View from north moraine of Grinnell Glacier

1922
Morton Elrod photo
K. Ross Toole Archives
Mansfield Library, UM

2008
Lisa McKeon photo
USGS

USGS Repeat Photography Project
http://nrmsc.usgs.gov/repeatphoto/
Grinnell Glacier
Glacier National Park, MT

North moraine of Grinnell Glacier
In 1924 the glacier’s ice margin was still in proximity to its lateral moraine
This pair of photographs from Grinnell Glacier’s southeast edge shows the dramatic change in the glacier’s volume and area. Note the glacier’s depth along the headwall and it’s extent at the terminal moraine in the historic photograph.
This large boulder was used by Morton Elrod and other scientists as a baseline to measure the retreat of Grinnell Glacier’s terminus. It is now referred to as “Elrod’s Rock,” and the glacier’s terminus is no longer visible from this point.
This large boulder was used by Morton Elrod and other scientists as a baseline to measure the retreat of Grinnell Glacier’s terminus. It is now referred to as “Elrod’s Rock,” and the glacier’s terminus is no longer visible from this point.
Grinnell Glacier
Glacier National Park, MT

7-16-1936
W. C. Alden photo
USGS Photographic Library

8-26-2010
Dan Fagre photo, USGS

USGS Repeat Photography Project
http://nrmisc.usgs.gov/repeatphoto/
In 1910, Morton Elrod documented how Grinnell Glacier’s mass filled the basin and how the glacier was then joined with the ice apron we now call the Salamander (right). Close inspection of Gem Glacier (top-center) reveals a loss of thickness / volume over the past 112 years as well.
While difficult to quantify, this photo pair of Harrison Glacier exemplifies the loss of glacier volume. Comparison of the ice profile in the foreground of the photos shows a marked thinning of the glacier over the years. Colorful layers of sedimentary bedrock are being exposed as the glacier recedes from the cliff bands.
Alpine regions along the shores of Hidden Lake (1943 m) show tremendous expansion of vegetation in these photos, especially at the base of Bearhat Mountain (left).
Vegetation in-growth on the peninsula and surrounding lakeshore are evident in this pair of photos.
Iceberg Glacier
Glacier National Park, MT

circa 1940
T. J. Hilemen photo
Courtesy of GNP archives

2008
Lisa McKeon photo USGS

USGS Repeat Photography Project
http://nrmisc.usgs.gov/repeatphoto/
Jackson Glacier
Glacier National Park, MT

1911
M. Elrod photo
K. Ross Toole Archives
Mansfield Library, UM

2009
Lisa McKeon photo, USGS

USGS Repeat Photography Project
http://nrmsc.usgs.gov/repeatphoto/
Establishment of new growth and expansion of existing sparse vegetation is obvious along the upper ridge line (center of photo). Persistent snowpack in these alpine regions once deterred profusion of growth, but changing climate conditions have permitted these species to expand their range.
Piegan Glacier appears visibly unchanged in this pair, but the meadow in foreground has undergone significant vegetation change.
Piegan Glacier
Glacier National Park, MT

View from Mount Siyeh
Piegan Glacier is one of the few glaciers in Glacier National Park that has not significantly changed since photographed in the 1930s.
Although the 2009 photo location does not exactly match the historic photo station, a comparison of relative glacial coverage can still be made. Logan Glacier is in the foreground, while Red Eagle Glacier sits beneath the pyramidal peak that bears the same name.
Shepard Glacier
Glacier National Park, MT

1913
W. C. Alden photo
USGS Photographic Library

2005
Blase Reardon photo
USGS

USGS Repeat Photography Project
http://nrmisc.usgs.gov/repeatphoto/
In 1913, Sperry Glacier’s mass spanned across the entire basin and the glacier’s terminus was recorded at over 150 ft. tall. Contemporary images show how the glacier has receded and separated into fragments.
The expanse of Sperry Glacier that once greeted hikers facing NE on Comeau Pass is in stark contrast to the bedrock and vegetation that has since emerged as the ice retreated. The Marble image, most likely taken in the 1920s or early 1930s, was featured on a postcard with this caption: "Sperry Glacier from the river."
Repeating Elrod’s photograph from the same photo point was impossible since he shot from the elevated perspective of the glacier’s surface. The terminus of the glacier has retreated beyond the field of view, but these images give a sense of the glacier’s extent and mass early in the 20th century.
The northwest portion of Sperry Glacier once spanned Comeau Pass to the base of Edwards Mountain.
This view of the northeast portion of Sperry Glacier shows evidence of the glacier’s recession as well as the advancement of conifer species and other vegetation on the glacial moraines.
Swiftcurrent Glacier
Glacier National Park, MT

circa 1930
Unknown photographer courtesy of GNP Archives

2002
Karen Holzer photo USGS

View from Swiftcurrent Lookout
Thunderbird Glacier
Glacier National Park, MT

1907
Morton Elrod photo
courtesy of GNP Archives

2007
Dan Fagre / Greg Pederson photo
USGS

USGS Repeat Photography Project
http://nrmisc.usgs.gov/repeatphoto/