

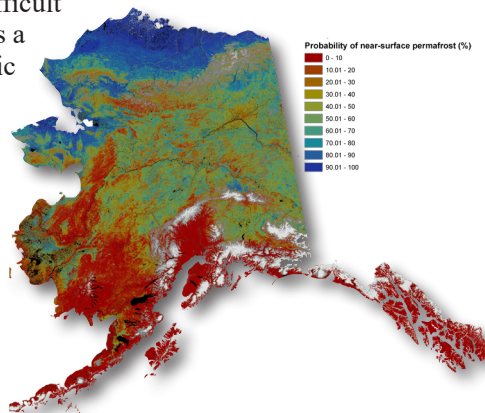
# ALASKA and Landsat

Alaska is the “Last Frontier,” a stunning and dynamic landscape whose rugged beauty has fascinated and thrilled Americans since its acquisition from Russia in 1867 by Secretary of State William Seward. The Arctic lands of the 49th State remain wildly popular tourist destinations, but the State also contributes to the Nation’s energy security through its mineral and energy resources, and is the dominant player in the U.S. seafood industry.

Yet Alaska’s landscapes are changing at a more rapid rate than those of the Lower 48. Its large size makes the collection of aerial surveys—a biannual occurrence for the conterminous United States—cost prohibitive. That means the Landsat series of land-imaging satellites offer the only publicly available, up-to-date imagery of land conditions for Alaska. Landsat satellites underpin public and private sector decisions in the State and across the Nation for effective adaptation to changing landscapes. Those decisions often lead to enhanced agricultural productivity, smart urban development, sustainable forest management, inland lake water quality monitoring, increased disaster resilience and risk assessment, effective water use, climate research, and other applications.

## Land Change and Permafrost Accounting

At 663,268 square miles, Alaska is the largest U.S. State by area. Much of that land is remote, sparsely-populated and difficult to access for field research. Landsat offers a powerful tool for monitoring remote Arctic ecosystems. One USGS-led study found that 13 percent of the State’s land area—an area larger than the State of Wisconsin—has changed over the past 32 years due to glacial retreat, shrub and treeline expansion, wildfires, erosion, pollution disturbances, and more. Landsat was used in 2015 to create a baseline assessment of Alaska’s near-surface permafrost and to project permafrost degradation.



## National Land Imaging Program Benefits: Alaska

*The U.S. Geological Survey (USGS) National Land Imaging Program provides to government, commercial, academic, and public users a wide range of satellite imagery and other remotely sensed and geospatial data. These activities include worldwide access to Landsat satellite data through the NLI-funded USGS Earth Resources Observation and Science (EROS) Center.*



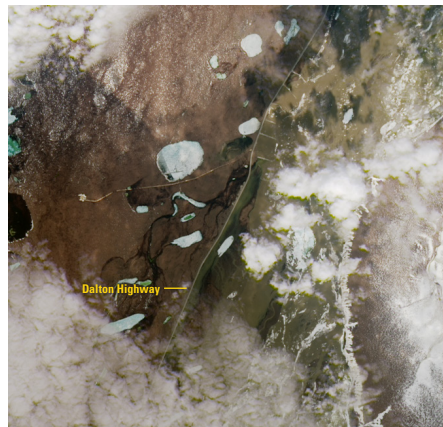
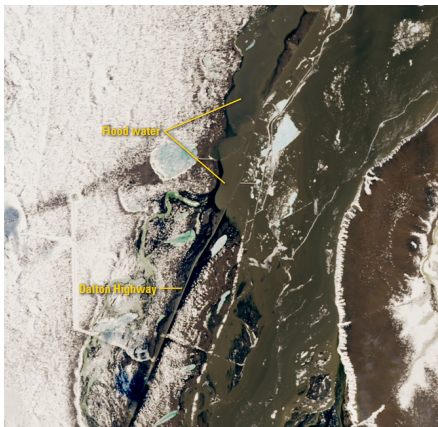
*Erosion along Alaska’s Arctic coastline near the village of Kaktovik. Permafrost-dominated coasts of Alaska have drastically changed as the result of coastal transgression and storm-surge flooding which can result in the loss of cultural sites and damage to infrastructure.*

## Coastlines and Fisheries

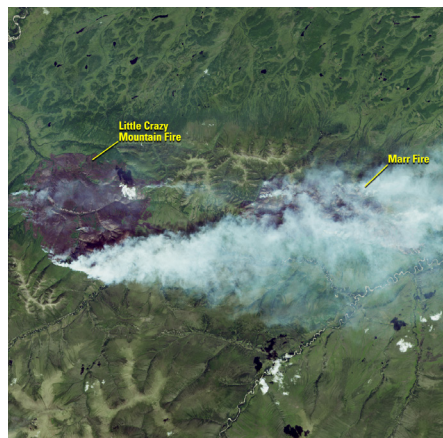
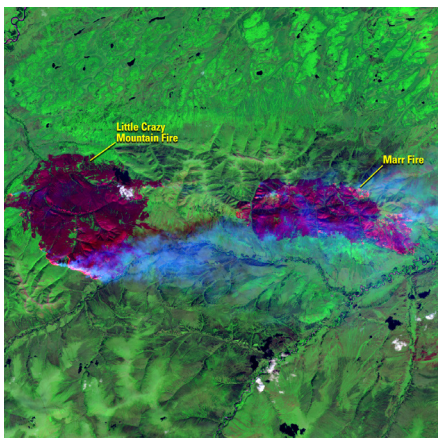
More 56,000 Alaskans work in the seafood industry, and many thousands more rely on fisheries for food. Understanding changes to coastlines, inland rivers and lakes, and surrounding ecosystems is critical to managing fisheries for both commercial industry and Alaska's Native population. Landsat's unparalleled historical archive has helped researchers study water clarity in Lake Clark and stream temperatures in the Anchor River, track the vulnerability of coastlines and subsistence resources in the Kotzebue Sound region, model coastal inundation for Cook Inlet, and map thermal erosion across thousands of lakes in the Noatak National Preserve—just to name a few.

## Wildfire and Disaster Response

When the Castle Rocks Fire ignited in Denali National Park in July 2013, the Alaska Fire Service turned to Landsat 8 to help build fire perimeter maps. The agency did the same for the Funny River Fire on the Kenai Peninsula the following year, and for countless fires since then. When flooding closed the Dalton Highway in 2015—the only access road to the Prudhoe Bay oil field—Landsat was used to assess the damage. Landsat's public imagery database offers emergency managers a cost-effective tool for monitoring and responding to disasters in Alaska.



Landsat 8 imagery showing the Dalton Highway in northern Alaska during major flooding, which closed off the road in May of 2015. The image on the right comes from May 16, 2019, and shows the highway during a more typical spring.



Landsat satellites have infrared and near infrared bands that can be used to more accurately view the extent of fire damage and active burning during wildfires. These images from July 5, 2019 show the Marr and Little Crazy Mountain Fires, in both natural color (right) and false color (left). The fires were two of several blazes that burned north of Fairbanks through the summer of 2019.

*The Landsat series is a joint effort of USGS and NASA. NASA develops and launches the spacecraft; USGS manages satellite operations, ground reception, data archiving, product generation, and data distribution. Funding for the National Land Imaging Program's Landsat operations and data management is provided through USGS.*

## Landsat: Critical Information Infrastructure for the Nation

Landsat is the most widely used land remote sensing data source within Federal civilian agencies. Local, State, and Federal agencies use Landsat to monitor and forecast a wide range of land surface phenomena. Information from Landsat contributes to day-to-day decisions on land, water, and resource use that protect life and property, safeguard the environment, advance science, technology and education, and grow the U.S. economy. Landsat's imagery provides a landscape-level view of land surface, inland lake, and coastal processes, both natural and human-induced. Landsat enables us to better understand the scope, nature, and speed of change to the natural and built environment.

Businesses draw upon Landsat data to provide customer-specific applications to improve logistics, resource allocation, and investment decisions. Commercial space imaging firms leverage Landsat data to refine product offerings and support new information services. A 2017 USGS study found ***the total annual economic benefit of Landsat data in the U.S. to be \$2.06 billion***, far surpassing its development and operating costs.

Landsat 7 and Landsat 8 provide eight-day repeat coverage of the Earth's land surfaces. Landsat 9, which will replace the aging Landsat 7, is under development for launch in 2021. NASA and USGS are currently reviewing the findings from a joint Architecture Study Team, which will inform the design and implementation approach for Landsat Next, the follow-on mission to Landsat 9. Landsat 9 and its successors will provide a sustainable, space-based system to extend the nearly 50-year Landsat series of high-quality global land imaging measurements—the world's longest time series of the Earth's land surface.

The long-term availability of consistent and accurate Landsat data, combined with a no-cost data policy, allows users to analyze extensive geographic areas and better understand and manage long-term trends in land surface change. New cloud computing and data analytics technologies use Landsat data in a wide range of decision-support tools for government and industry. Much like GPS and weather data, Landsat data are used every day to help us better understand our dynamic planet.

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