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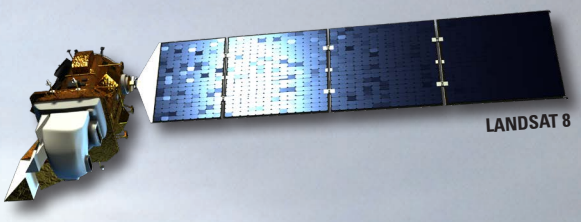


SOUTH DAKOTA and Landsat

Few States derive as much of their social and economic well-being from the land as South Dakota. Agriculture is the State's primary industry, likely because the fertile soil of eastern South Dakota consistently produces some of the largest corn and soybean yields in the United States. The State is also a top producer of spring wheat, flaxseed, hay, oats, rye, and sunflower seeds.

South Dakota is also famed for its hunting and fishing. Tens of thousands of visitors each year descend upon its rolling fields and grasslands to hunt the State bird, the *Phasianus colchicus* (Linnaeus, 1758) (ring-necked pheasant), or the waterfowl of northeastern South Dakota's prairie pothole region. Visitors to western South Dakota marvel at the beauty of the Black Hills, Mount Rushmore, and Badlands National Park.

Mining and energy are also important to South Dakota. Much of the corn not used in food production or fed to livestock is used to make ethanol at one of several plants in the State, and hydroelectric power from the Missouri River provides the bulk of the energy used by its 800,000 residents. All but one of South Dakota's gold mines have ceased operations, but mining continues for mica, construction sand and gravel, crushed stone, and more. Data from the USGS Landsat program, archived at the USGS EROS Center just outside Sioux Falls, South Dakota, has long been a boon to the monitoring, mapping, and management of the State's land resources.

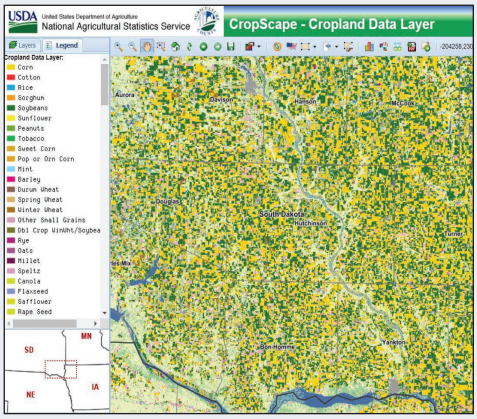
Here are just a few examples of how Landsat benefits South Dakota.

Mapping South Dakota Croplands

Landsat imagery is a key input for the U.S. Department of Agriculture (USDA) Cropland Data Layer, an interactive mapping tool used since 2009 to track crop types across the Lower 48 States year by year. The program leverages survey data and Landsat imagery to monitor the food supply and offers State agricultural leaders a way to track trends across time and space. Landsat imagery also feeds into models of evapotranspiration (ET), a measure of transpiration from plant leaves and evaporation from the land surface that doubles as a metric for water-use efficiency (Savoca and others, 2013). ET models can evaluate South Dakota water use, inform soil health studies, and serve as an indicator of drought stress. Finally, Landsat imagery can measure the effect of hostile weather to crop production in bad years, such as 2019, when an abundance of precipitation saturated South Dakota's rich soil and caused the State to lead the Nation in prevented planting crop insurance payments (Farm Service Agency, 2020).

National Land Imaging Program Benefits—South Dakota

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



The USDA's Cropland Data Layer uses Landsat and other data sources to define the crops grown in the United States.

The Landsat series is a joint effort of the USGS and NASA. NASA develops and launches the spacecraft; the 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 the USGS.

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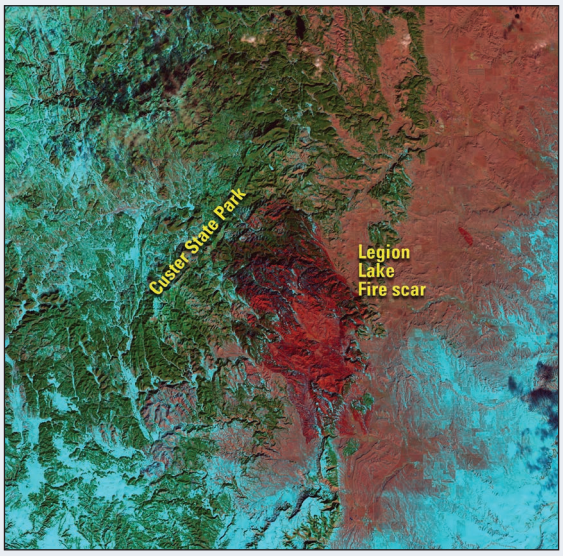
Watching South Dakota's Wetlands

The prairie pothole region in South Dakota is one of the most important stops for migrating waterfowl in North America. The region is a draw for anglers and hunters as well. Many seasonal wetlands have been drained for crop production, but surface water has expanded in other areas. Landsat's long historical record allows researchers to study lake dynamics across 50 years, bolstering the knowledge base for this critical habitat and enabling more extensive studies on the long-term effect of conservation programs and agriculture (Rover and others, 2011). The recent production of high-level Landsat data products like Dynamic Surface Water Extent simplifies the examination of water resources and supports broad area studies across longer periods.

Protecting South Dakota Forests

The Black Hills are a top tourist draw for South Dakota. Visitors take in wildlife like *Bison bison* (Linnaeus, 1758) (bison) or *Ovis canadensis* (Shaw, 1804) (bighorn sheep) along slow, scenic drives through Custer State Park or Black Hills National Forest; however, those forests face consistent threats from fires and invasive species. For example, the Legion Lake Fire scorched 54,000 acres in 2017, and the *Dendroctonus ponderosae* (Hopkins, 1902) (mountain pine beetle) has affected some 430,000 acres of forest in recent decades (Forest Service, 2020). Because Landsat captures imagery in spectral bands beyond what the human eye can see, it can be used to track wide-scale damage and to monitor recovery efforts. Mapping data derived from Landsat also informs tools that can help local leaders safely manage the wildland urban interface in areas like the Black Hills. For example, datasets from the Landsat-based LANDFIRE geospatial product suite were used as a baseline input for the USDA Forest Service's Wildfire Risk to Communities resource portal—the first nationwide risk assessment tool ever built to focus on fire risk to communities, homes, and businesses (Scott and others, 2020).



This Landsat 8 false color image shows a burn scar from the Legion Lake Fire in western South Dakota. The bright red scar is visible through Landsat's shortwave infrared and near-infrared bands.

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Landsat—Critical Information Infrastructure for the Nation

Landsat is the most widely used land remote sensing data source within Federal civilian agencies. Local, State, Tribal, 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; support climate change resiliency; 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 determined the total annual economic benefit of Landsat data in the United States to be $2.06 billion, far surpassing its development and operating costs (Straub and others, 2019).

Landsat 8 and Landsat 9 provide 8-day repeat coverage of the Earth's land surfaces. The National Aeronautics and Space Administration (NASA) and the 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 are planned to provide a sustainable, space-based system to extend the 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 to 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 global positioning system and weather data, Landsat data are used every day to help us better understand our dynamic planet.

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