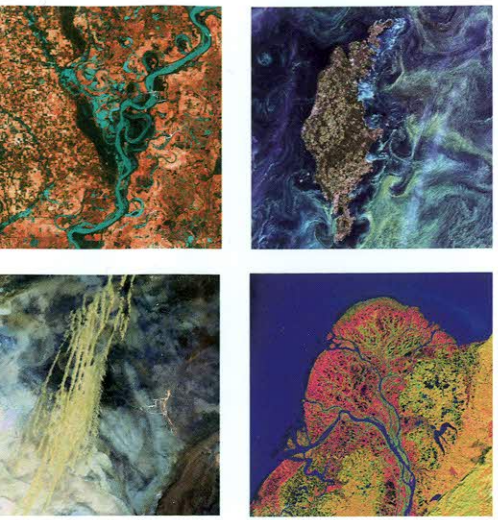

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science for a changing world

NASA

Landsat @ 40

The Long View of Earth from Space

The Longest Continuous View of Earth from Space Hits 40

Monday July 23, 2012, marked the 40th anniversary of the Landsat program, the world's longest-running Earth-observing satellite program. The first Landsat satellite was launched July 23, 1972, from Vandenberg Air Force Base in California.

The 40-year Landsat record provides global coverage that shows large-scale human activities such as building cities and farming. The program is a sustained effort by the United States to provide direct societal benefits across a wide range of human endeavors, including human and environmental health, energy and water management, urban planning, disaster recovery and agriculture.

Landsat images from space are not merely pictures. They contain many layers of data collected at different points along the visible and invisible light spectrum. A single Landsat scene taken from 400 miles above Earth can accurately detail the condition of hundreds of thousands of acres of grassland, agricultural crops or forests.

"Landsat have given us a critical perspective on our planet over the long term and will continue to help us understand the big picture of Earth and its changes from space," said NASA Administrator Charles Bolden. "With this view we are better prepared to take action on the ground and be better stewards of our home."

In cooperation with the U.S. Geological Survey (USGS), a science agency of the Interior Department, NASA launched six of the seven Landsat satellites. The resulting archive of Earth observations forms a comprehensive record of human and natural land changes.

"Over four decades, data from the Landsat series of satellites has become a vital reference worldwide for advancing our understanding of the science of the land," said Interior Department Secretary Ken Salazar. "The 40-year Landsat archive forms an indelible and objective register of America's natural heritage and thus it has become part of this department's legacy to the American people."

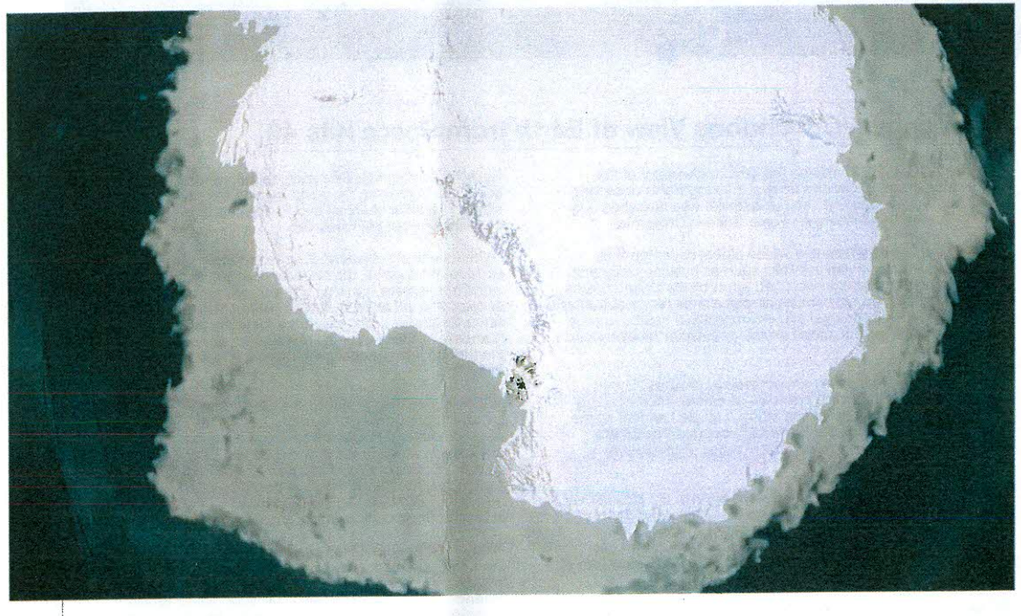
Remote-sensing satellites such as the Landsat series help scientists to observe the world beyond the power of human sight, to monitor changes and to detect critical trends in the conditions of natural resources.

"With its entirely objective, long term records for the entire surface of the globe, the Landsat archive serves as the world's free press, allowing any person, anywhere, to access vital information without charge," said Interior's Anne Castle, assistant secretary for water and wcience. "Landsat has been a game changer for agricultural monitoring, climate change research, and water management."

NASA is preparing to launch the next Landsat satellite, the Landsat Data Continuity Mission (LDCM), in February 2013 from Vandeberg. LDCM will be the most technologically advanced satellite in the Landsat series. LDCM sensors take advantage of evolutionary advances in detector and sensor technologies to improve performance and increase reliability. LDCM will join Landsat 5 and Landsat 7 satellites in Earth orbit to continue the Landsat data record.

"The first 40 years of the Landsat program have delivered the most consistent and reliable record of Earth's changing landscape," said Michael Freilich, director of NASA's Earth Science Division in the Science Mission Directorate in Washington. "We look forward to continuing this tradition of excellence with the even greater capacity and enhanced technologies of LDCM".

Landsat@40 Top 10 Images



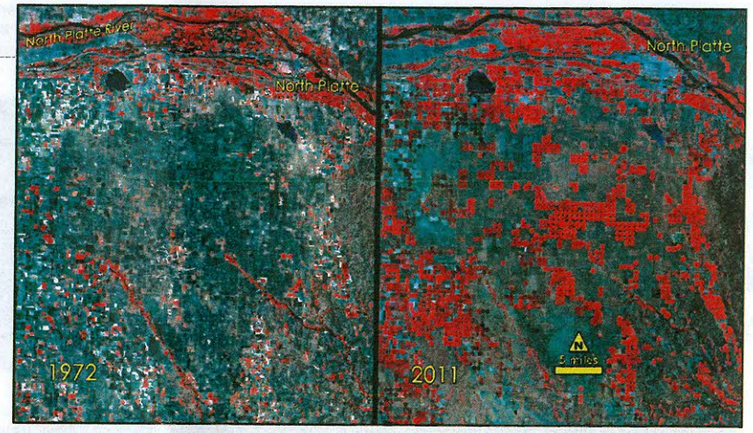
Antarctica

In 2007, more than 1100 Landsat 7 images were used to create the first ever, high-resolution, true color map of Antarctica. The Landsat Image Mosaic of Antarctica is a virtually cloud-free, 3-D view of Antarctica's frozen landscape

Credit: NASA's Goddard Space Flight Center

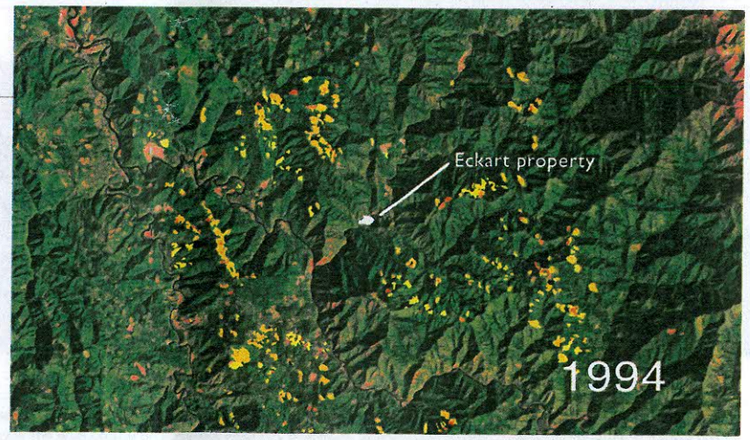
Sandhills, Nebraska

Sandhills region is one of the largest areas of mostly intact grassland ecosystems in the country and has the largest grass-stabilized sand dunes in the world. Ms. Mary Ann Vinton from Omaha is interested in how these hills have changed since the 1970s. The spread of center-pivot irrigation that taps directly into the vast underground Ogallala Aquifer has meant that agriculture has slowly taken over the landscape.



Trinity County, California

Forest fires and logging are the two main drivers of change in this area within Trinity National Forest in northern California. Mr. Roger Eckart and his siblings bought a grandfathered-in piece of private land within the forest in 1972 and so together the Eckart family and the Landsat program have observed changes in the forest for over 40 years.



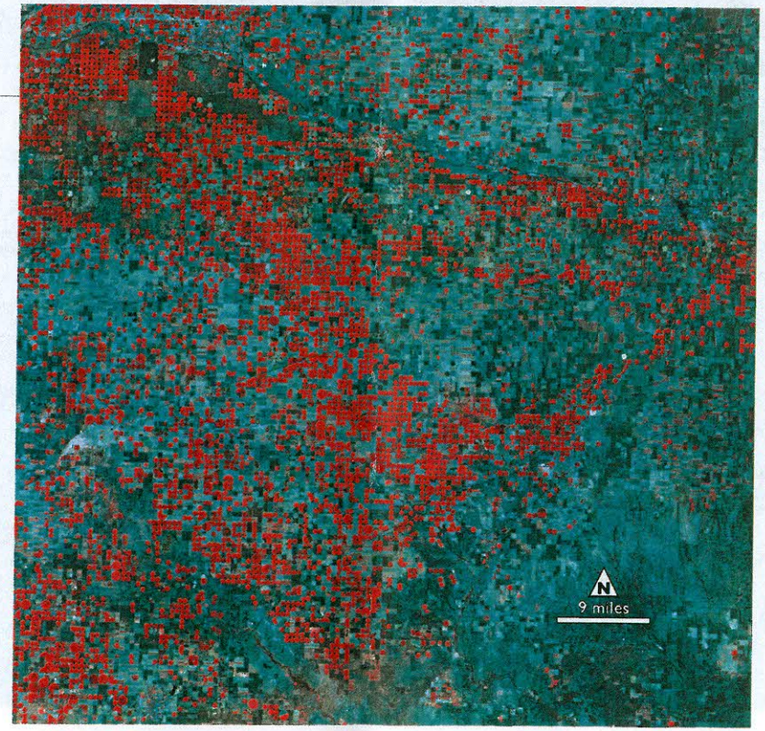

1972


1988

Kansas

These images from 1972, 1988, and 2011 show the transformation of Kansas farmland from dryland, rectangular fields to circular irrigated fields from center-pivot irrigation systems. The mining of ground water for agriculture has been a significant trend globally over the last half-century, and these images of a region in Kansas highlight the trend within the United States.

Credit: NASA's Goddard Space Flight Center

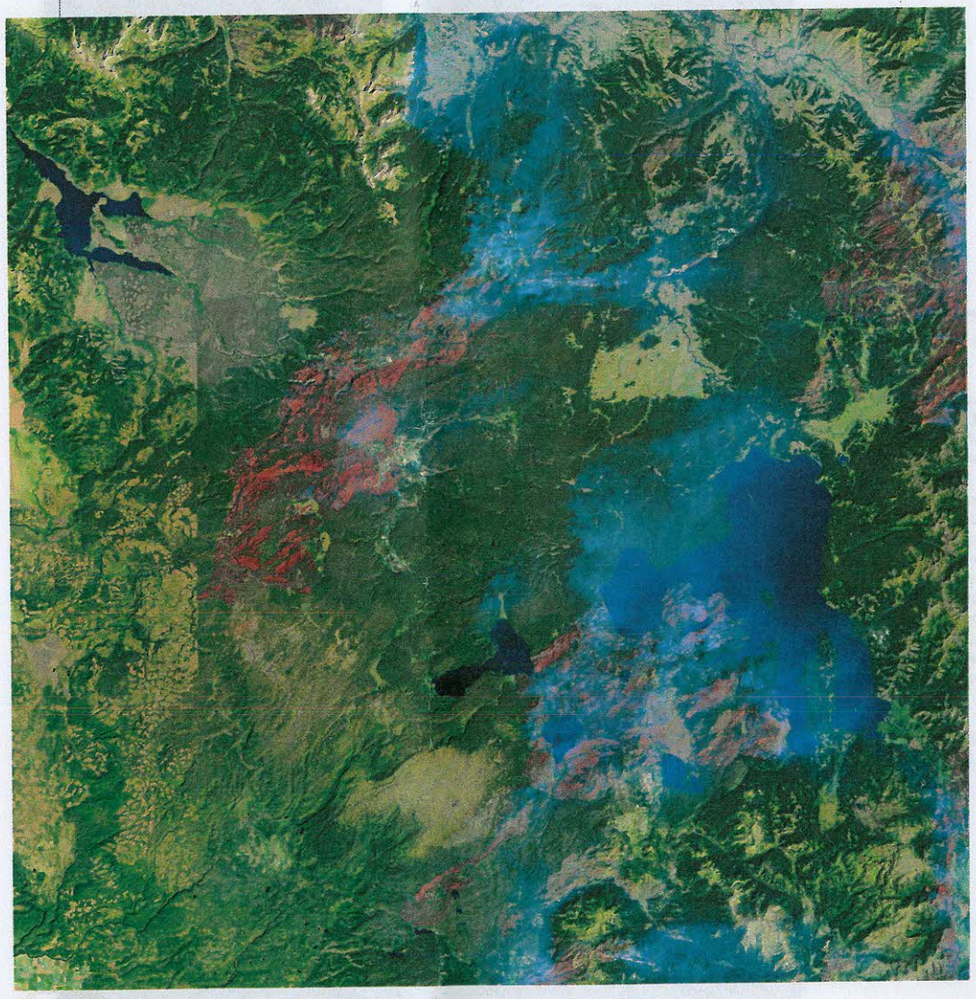


2011

Yellowstone

In 1988, fire transformed Yellowstone National Park into an apparent wasteland. Landsat captured the burn scars from the fires and watched the progress of the forest's recovery.

Credit: NASA's Goddard Space Flight Center



Lafayette Parish, Louisiana

The landforms of southern Louisiana have been shaped by the wanderings of the lower Mississippi River but with modern engineering of where the river flows, the salt marshes of the Chénier Plain are in a losing battle against the open ocean eroding the coastline. Mr. Brent Yantis and Dr. Whitney Broussard are interested in telling the story of the changing coastline.

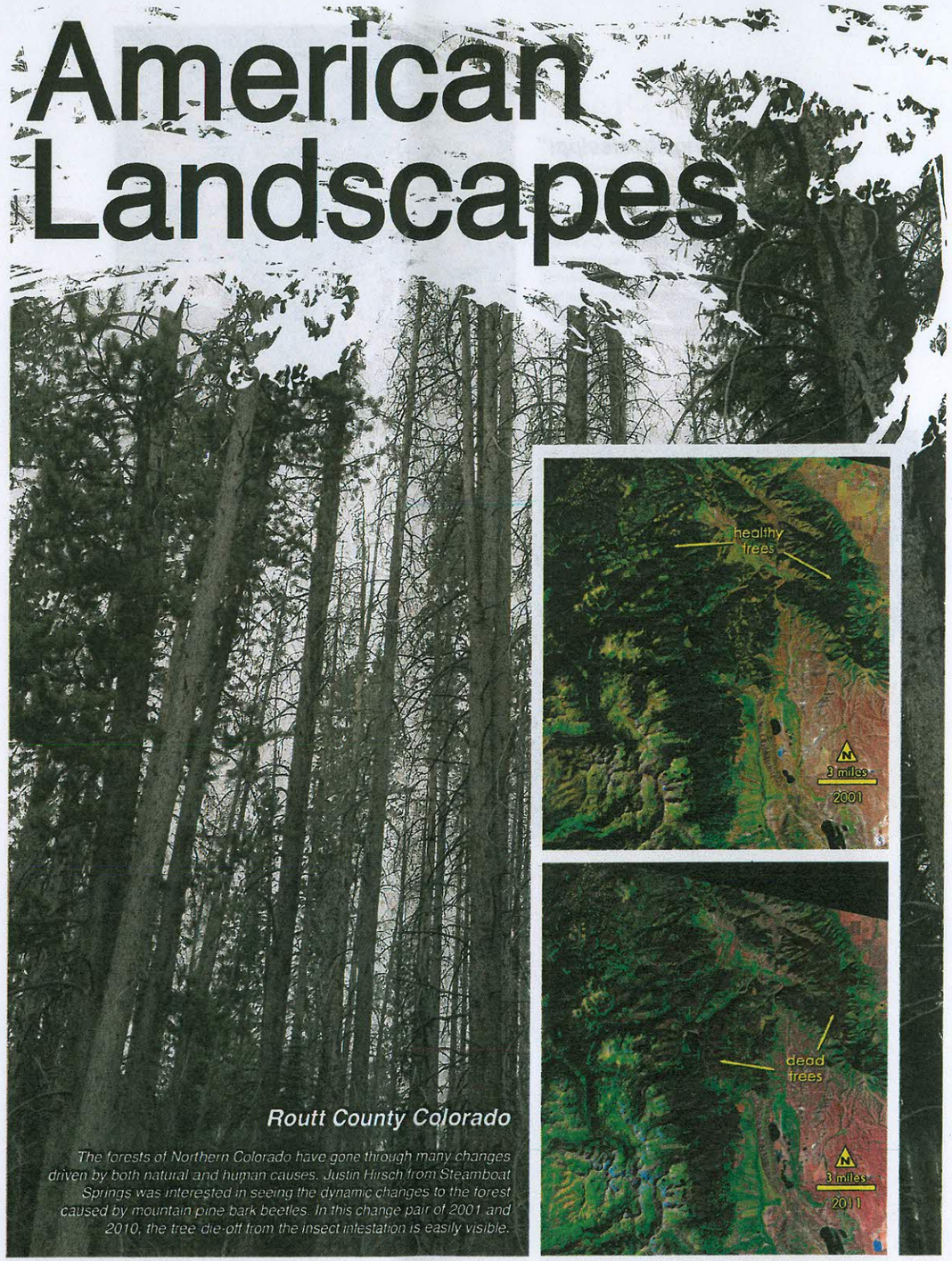
Maricopa County, Arizona

Arizona's capital of Phoenix and its neighboring towns in Maricopa County have undergone a major population boom in the last 40 years and its effects are seen in everything from the expansion of town and cities to an increased demand for fresh water. Ms. Michelle Fuller from Gilbert wrote asking to see these changes to the landscape; most visible in this series of images is how city streets and development are now covering the land that previously was used for agriculture.

Lee County Florida

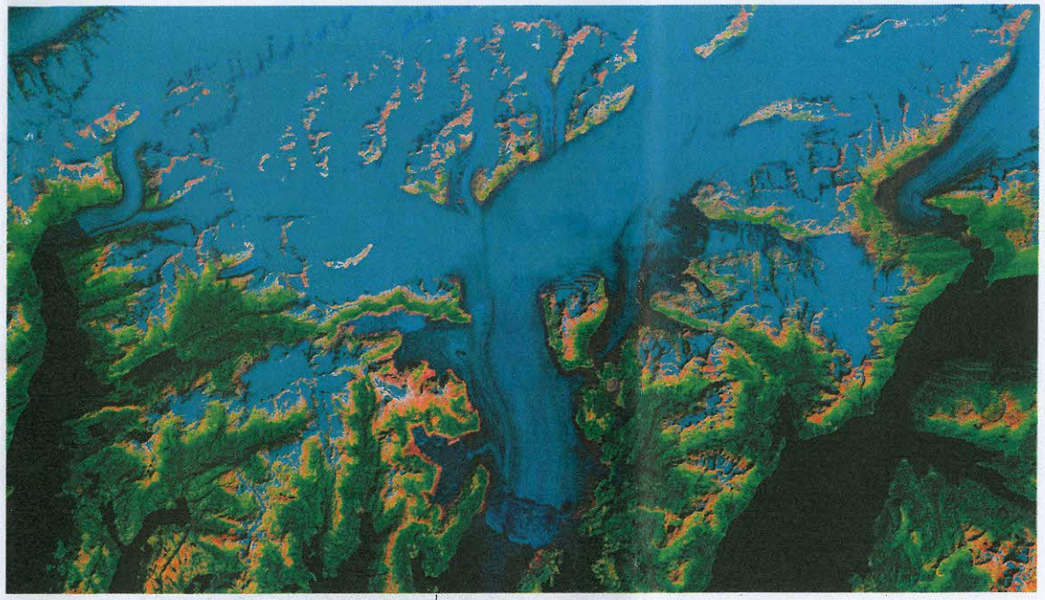
The landscape of Lee County, Florida has changed dramatically as its population greatly expanded in the last 40 years. Much of the area's unique landscape of coastal mangroves, marshes, cypress forests, and upland pine flat woods and prairies have been replaced by homes, roads and new bodies of water that are being used by industry.

American Landscapes



Routt County Colorado

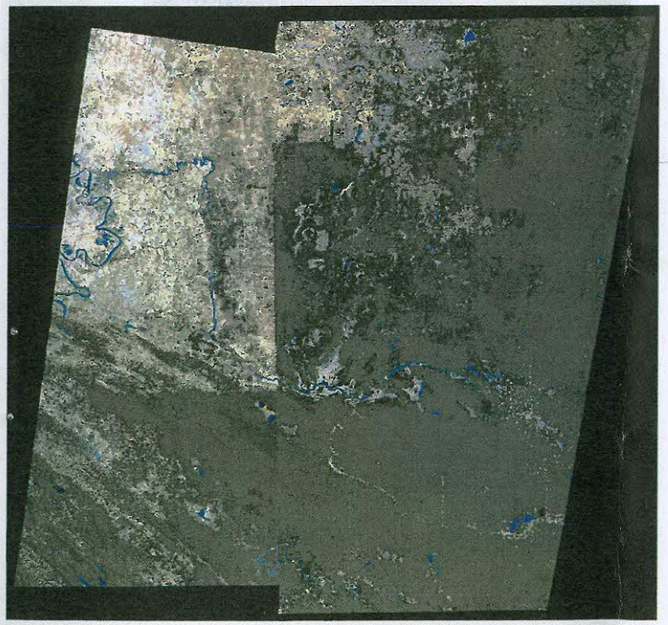
The forests of Northern Colorado have gone through many changes driven by both natural and human causes. Justin Hirsch from Steamboat Springs was interested in seeing the dynamic changes to the forest caused by mountain pine bark beetles. In this change pair of 2001 and 2010, the tree die-off from the insect infestation is easily visible.



Columbia Glaciers

The Columbia Glacier in Alaska is one of many vanishing around the world. Glacier retreat is one of the most direct and understandable effects of climate change.

Credit: NASA's Goddard Space Flight Center



Mexico/ Guatemala Border

In 1988, the first publicized Landsat image of the Mexico-Guatemala border showed clear-cut forest in Mexico and untouched trees in Guatemala. This image had a profound impact on the leaders of the two nations and influenced the establishment in 1990 of Guatemala's Maya Biosphere Reserve and other management and conservation efforts in Central America.

Credit: NASA's Goddard Space Flight Center

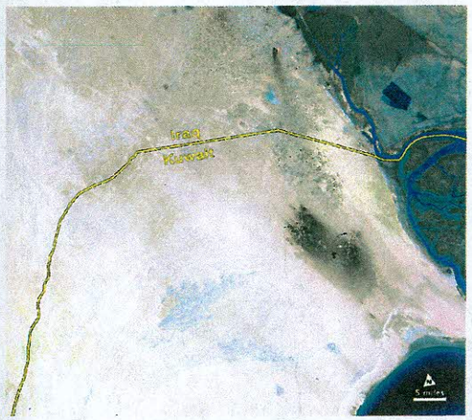
Kuwait Oil Fires

As Iraqi troops withdrew from Kuwait at the end of the first Gulf War, they set fire to over 650 oil wells and damaged many more. These Landsat images show before, during and after the release of 1.5 billion barrels of oil into the environment, the largest oil spill in human history.

Credit: NASA's Goddard Space Flight Center

1990

1991



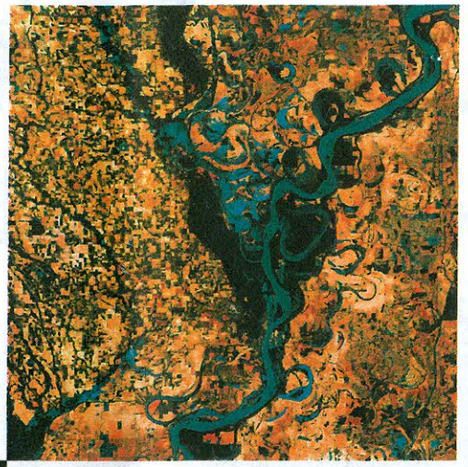
1992

3rd Place

"Meandering Mississippi"

Landsat 7, Acquired 5/28/2003

Small, blocky shapes of towns, fields, and pastures surround the graceful swirls and whorls of the Mississippi River. Countless oxbow lakes and cutoffs accompany the meandering river south of Memphis, Tennessee, on the border between Arkansas and Mississippi, USA. The "mighty Mississippi" is the largest river system in North America.



4th Place

"Algerian Abstract"

Landsat 5, Acquired 4/8/1985

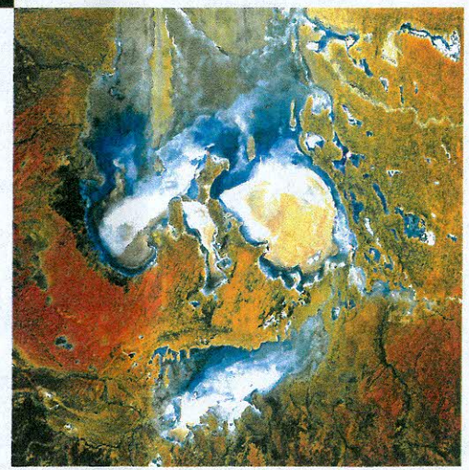
What look like pale yellow paint streaks slashing through a mosaic of mottled colors are ridges of wind-blown sand that make up Erg Iguidi, an area of ever-shifting sand dunes extending from Algeria into Mauritania in northwestern Africa. Erg Iguidi is one of several Saharan ergs, or sand seas, where individual dunes often surpass 500 meters-nearly a third of a mile-in both width and height.

5th Place

"Lake Eyre"

Landsat 5, Acquired 8/5/2006

The scary face in this image is actually inundated patches of shallow Lake Eyre (pronounced "air") in the desert country of northern South Australia. An ephemeral feature of this flat, parched landscape, Lake Eyre is Australia's largest lake when it's full; however in the last 150 years, it has filled completely only three times.



Earth As Art

1st Place

"Van Gogh from Space"

Landsat 7, Acquired 7/13/2005

In the style of Van Gogh's painting "Starry Night," massive congregations of greenish phytoplankton swirl in the dark water around Gotland, a Swedish island in the Baltic Sea. Phytoplankton are microscopic marine plants that form the first link in nearly all ocean food chains. Population explosions, or blooms, of phytoplankton, like the one shown here, occur when deep currents bring nutrients up to sunlit surface waters, fueling the growth and reproduction of these tiny plants.

2nd Place

"Yukon Delta"

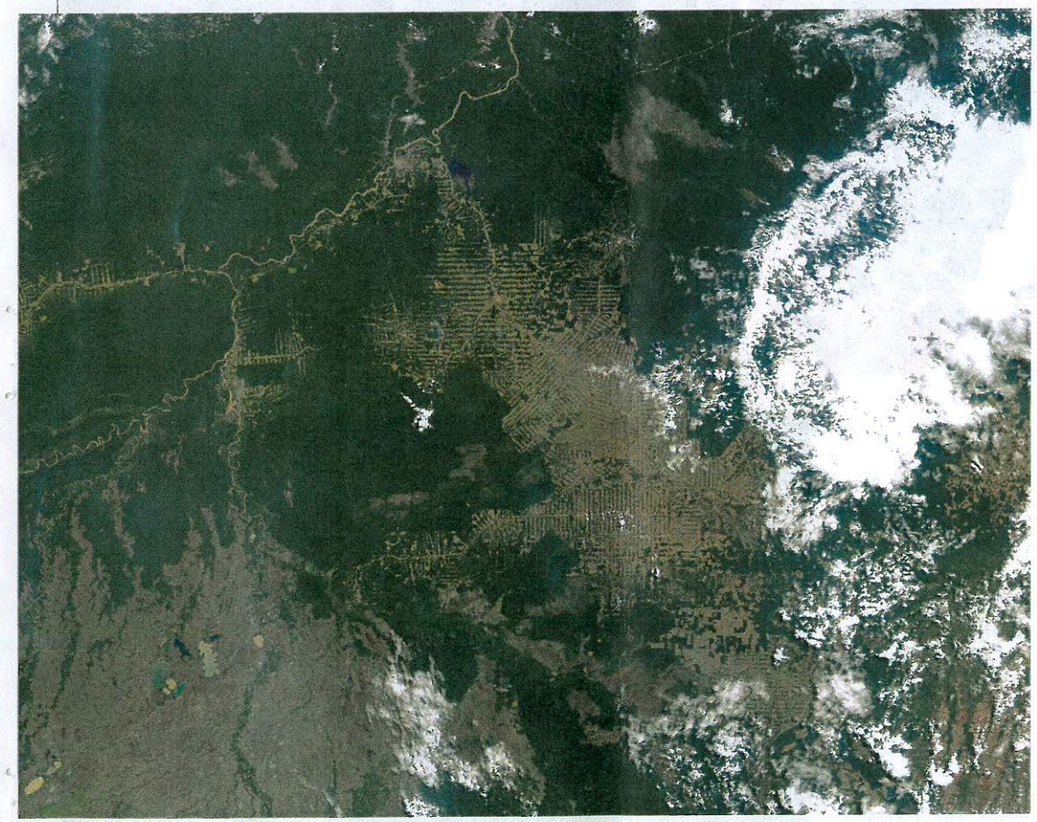
Landsat 7, Acquired 9/22/2002

After beginning in northern British Columbia and flowing through Yukon in Canada, the Yukon River crosses Alaska, USA, before emptying into the Bering Sea. Countless lakes, sloughs, and ponds are scattered throughout this scene of the Yukon Delta. The river's sinuous, branching waterways seem like blood vessels branching out to enclose an organ. It is one of the largest river deltas in the world, and currently (2010) protected as part of the Yukon Delta National Wildlife Refuge.

Rondônia Brazil

These Landsat images of Amazonian deforestation in Rondônia, a state in Western Brazil, provided conclusive, impartial evidence of the increasing loss of global tropical rainforests.

Credit: NASA's Goddard Space Flight Center



Aral Sea

The Aral Sea in Central Asia began disappearing in the 1960s because of the diversion of its two feeder rivers for agriculture. This series of images illustrates unintended consequences of water management decisions.

Credit: NASA's Goddard Space Flight Center

1977 1998 2010

Beijing

Images from 1978 to 2011 show the massive growth of Beijing, from 7.89 million to more than 12 million people. Beijing's expansion is representative of the dramatic urbanization and industrialization of Asia during the Landsat era.

Credit: NASA's Goddard Space Flight Center

Mount St. Helens

The 1980 Mount Saint Helens eruption was one of the most significant natural disasters in the US in the past half-century. Landsat captured the extent of and recovery from the destruction.

Credit: NASA's Goddard Space Flight Center

1979

1980

2011