LANDSAT Update - 25th Anniversary of Landsat 5

Exceeding expectations: Above and beyond the call of duty

Figure 1. Artist's rendition of Landsat 5 in orbit

When Landsat 5 was launched in the spring of 1984, no one imagined that we would be receiving images from the same equipment 24 years later. The endurance of the system and all of the components onboard have far exceeded expectations and have provided valuable earth data to scientists, educators, government decision makers, and technical users worldwide.

Changes in the Earth's surface are recorded the Thematic Mapper (TM) instrument onboard Landsat 5. Land surfaces flooded by water, expansion of urban areas, and forested areas cleared by fire or humans are just a few examples of what Landsat 5 can tell us about the earth.

Bolivia Deforestation

These images show the progression of deforestation in Bolivia from 1986 to 2000. This area lies northeast of Santa Cruz de la Sierra, Bolivia, in an area of tropical dry forest. Since the mid-1980s, the resettlement of people from the Altiplano (the Andean high plains) and a large agricultural development effort (the Tierras Baja project) has lead to this area's deforestation.

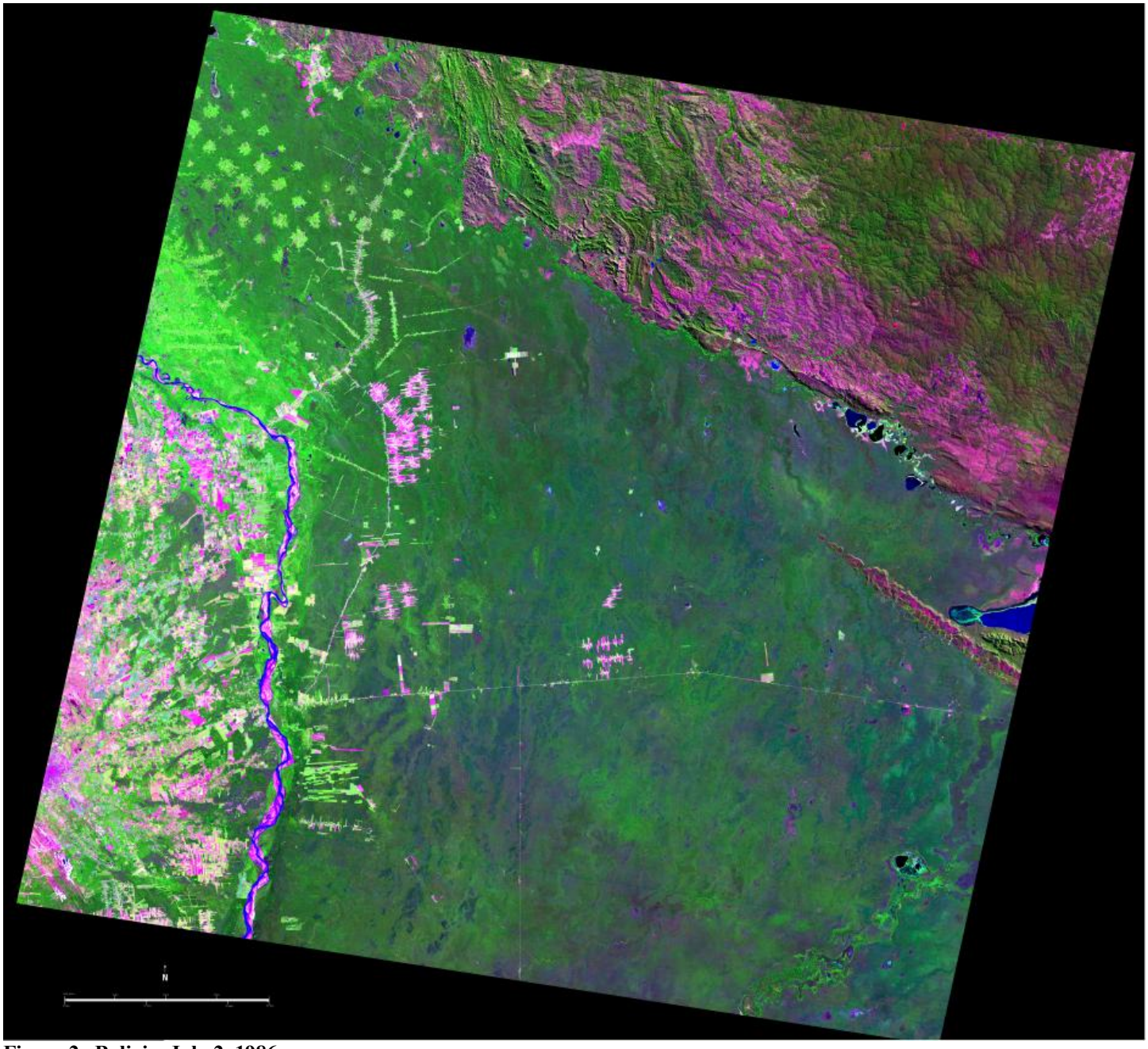

Figure 2. Bolivia, July 2, 1986

The pie or radial patterned fields (upper left) are part of the San Javier resettlement scheme. At the center of each unit is a small community.

The rectangular, light purple areas are fields of soybeans cultivated for export. The dark green strips running through the fields are windbreaks, which help prevent wind erosion of the area's fine soils.

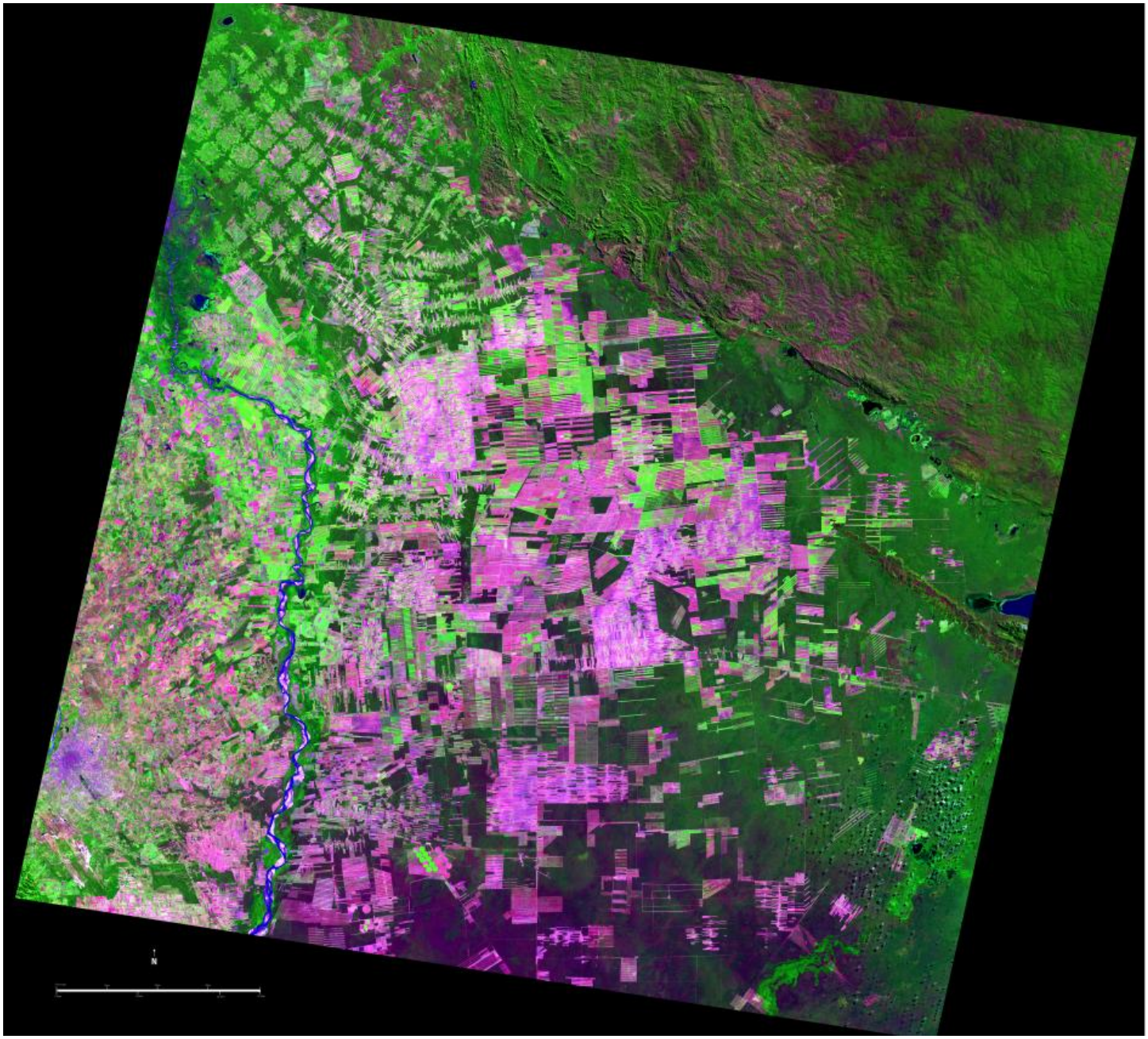

Figure 3. Bolivia June 22, 2000

Growth in the Desert – Las Vegas

These images from 1984 and 2007 show the increasing urban sprawl of Las Vegas, Nevada, and the shrinking of Lake Mead on the border of Nevada and Arizona. Rapid growth in Las Vegas has led to increased demand for water resources, while below-average rainfall has decreased the water levels in Lake Mead, as the source of 90% of southern Nevada's water.

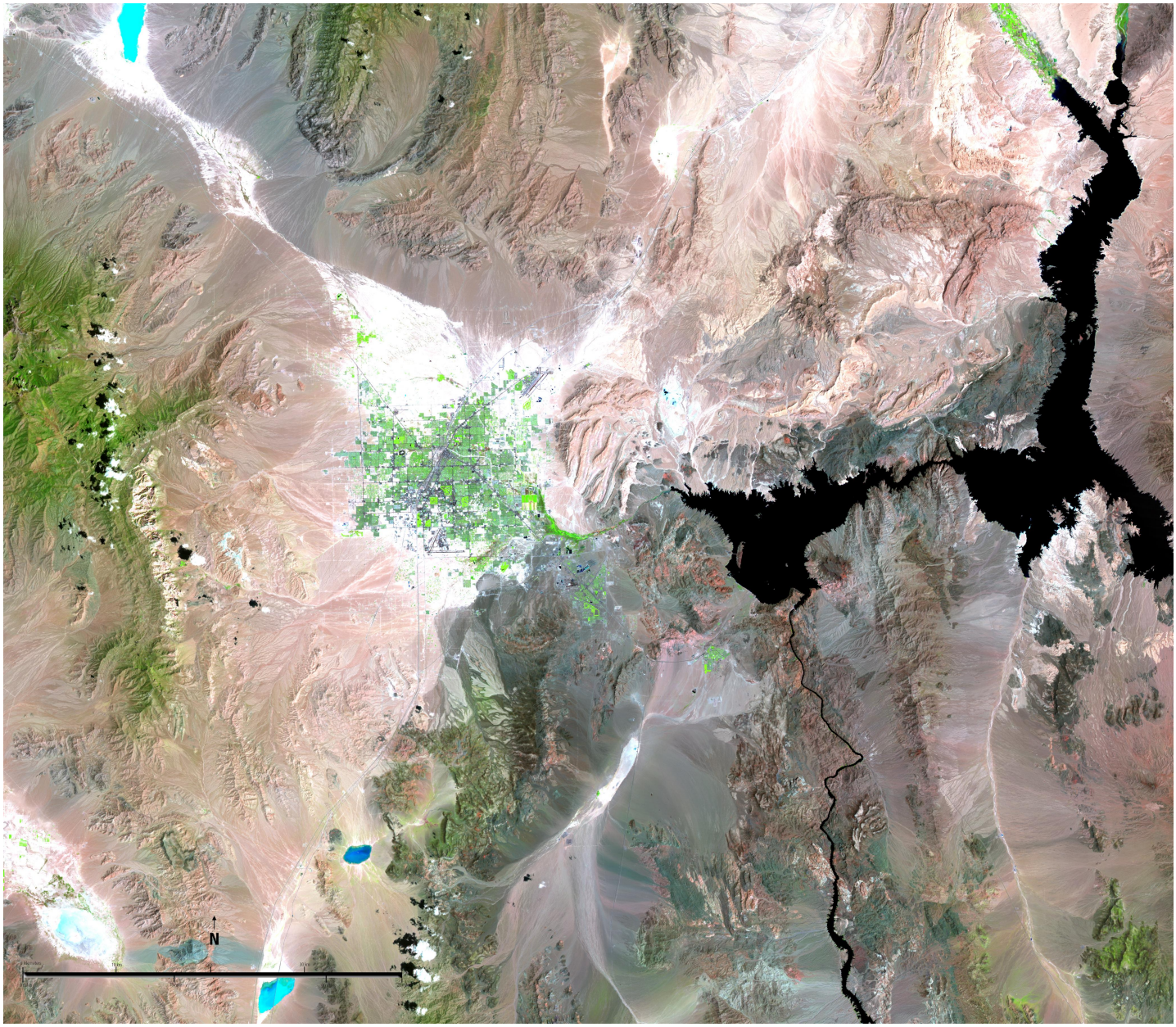

Figure 4. Urban Growth 1984 - Las Vegas, Nevada

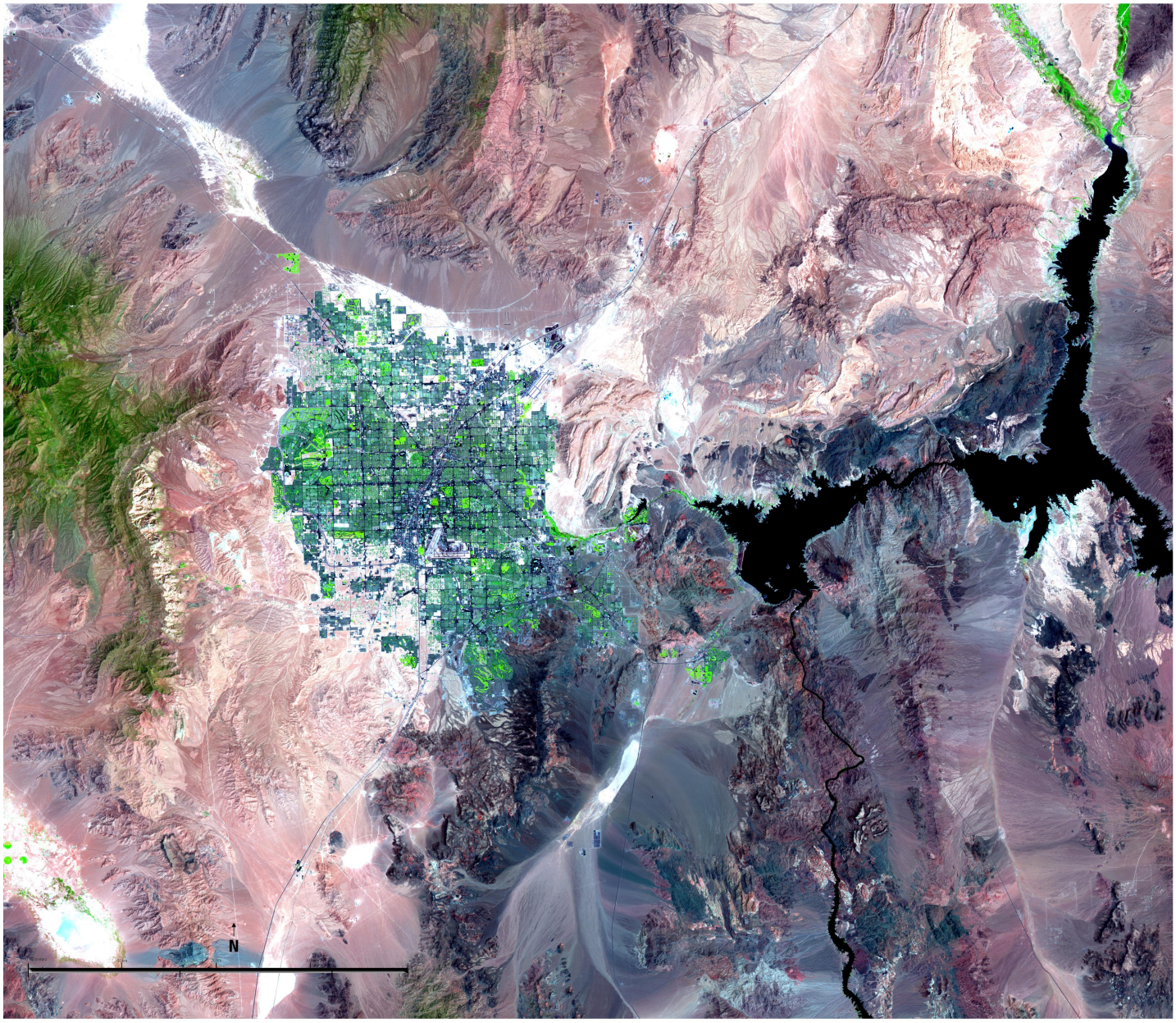

Figure 5. Urban Growth 2007 - Las Vegas, Nevada

Keeping a Satellite Functioning for 25 Years…What Could Possibly Go Wrong?

Since its launch in 1984, a number of component failures and other malfunctions have beset Landsat 5, and challenged the knowledge of the staff working to fix the 1980's-technology. Each time the system has come back to life to continue as a necessary and important asset to the USGS Landsat program.

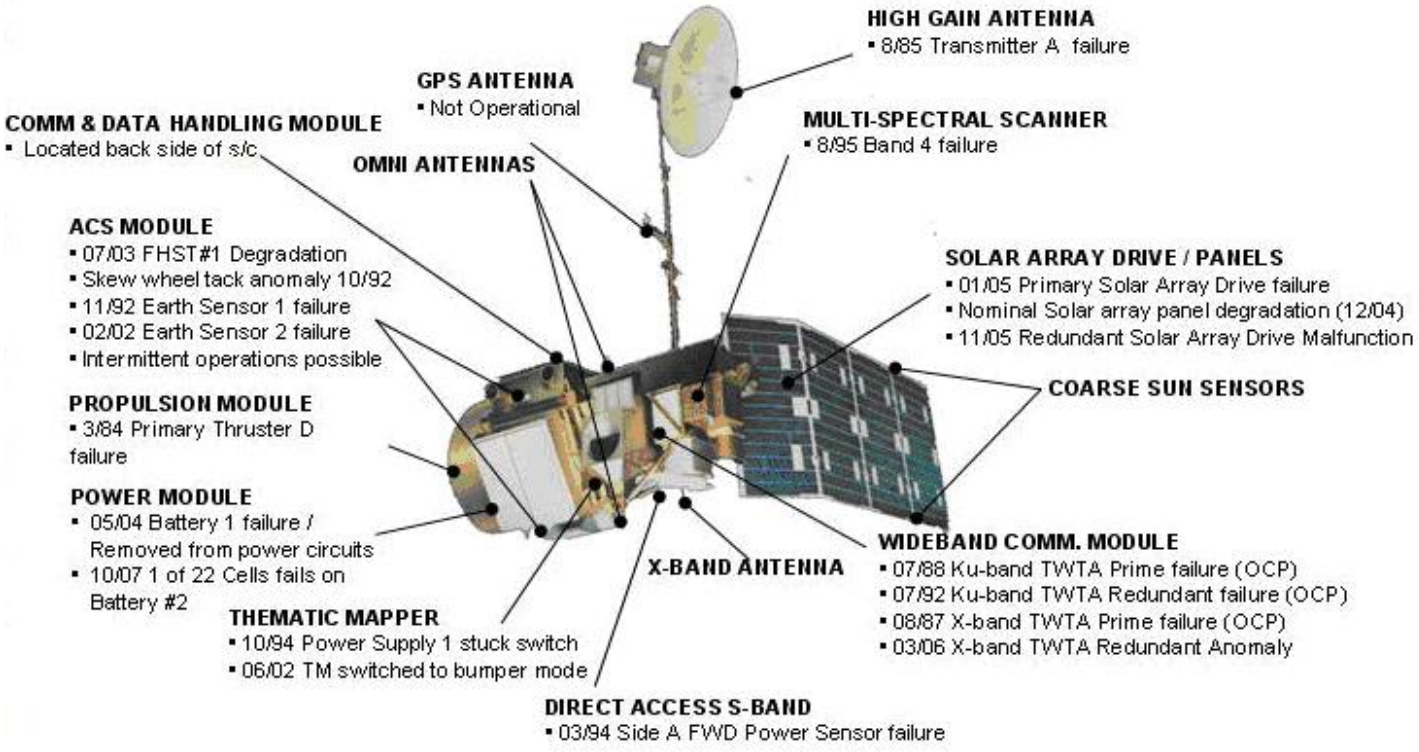

Figure 6. Component problems or failures during Landsat 5's mission, specified by month/year.

Belize, Central America

This image provides a view of the Belize Barrier Reef, the longest coral reef in the Western and Northern Hemispheres and second largest worldwide only to the Great Barrier Reef of Australia. Running the entire coastline of Belize in Central America, the Belize Barrier Reef supports a large number of patch reefs, shoals, and over 1,000 islands called "cayes." Most of these cayes, and the entire coastline of the country outside of settlements, are protected by huge forests of mangrove.

The Turneffe Atoll is shown on the right side of the image. As one of three large coral atolls outside of the reef, it stretches over 30 miles long and 10 miles wide and is surrounded by one of the most fertile marine ecosystems in the world - a natural nursery for fish, sharks, and crocodiles. A network of flats, creeks, and lagoons dotted by many mangrove islands runs throughout the shallow interior of the atoll.

Belize City is situated on the outlet of land near the center of the image. It is the largest city in Belize and is the nation's principal port and its financial and industrial hub.

Figure 7. Barrier Reef off the coast of Belize, March 1994

The Rocky Mountain Trench

The high reflectance of clouds compared to the surrounding land, coupled with the low sun elevation when this image was acquired, causes low clouds to appear red as they fill a portion of the Rocky Mountain Trench. Running parallel with the peaks of the Canadian Rockies and ranging from 2 to 10 miles wide and about 900 miles long, the Trench aligns with the Fraser River and makes its way past Mount Robson, the highest peak in the Canadian Rockies at 3,954 meters. Mount Robson is near the center of this image.

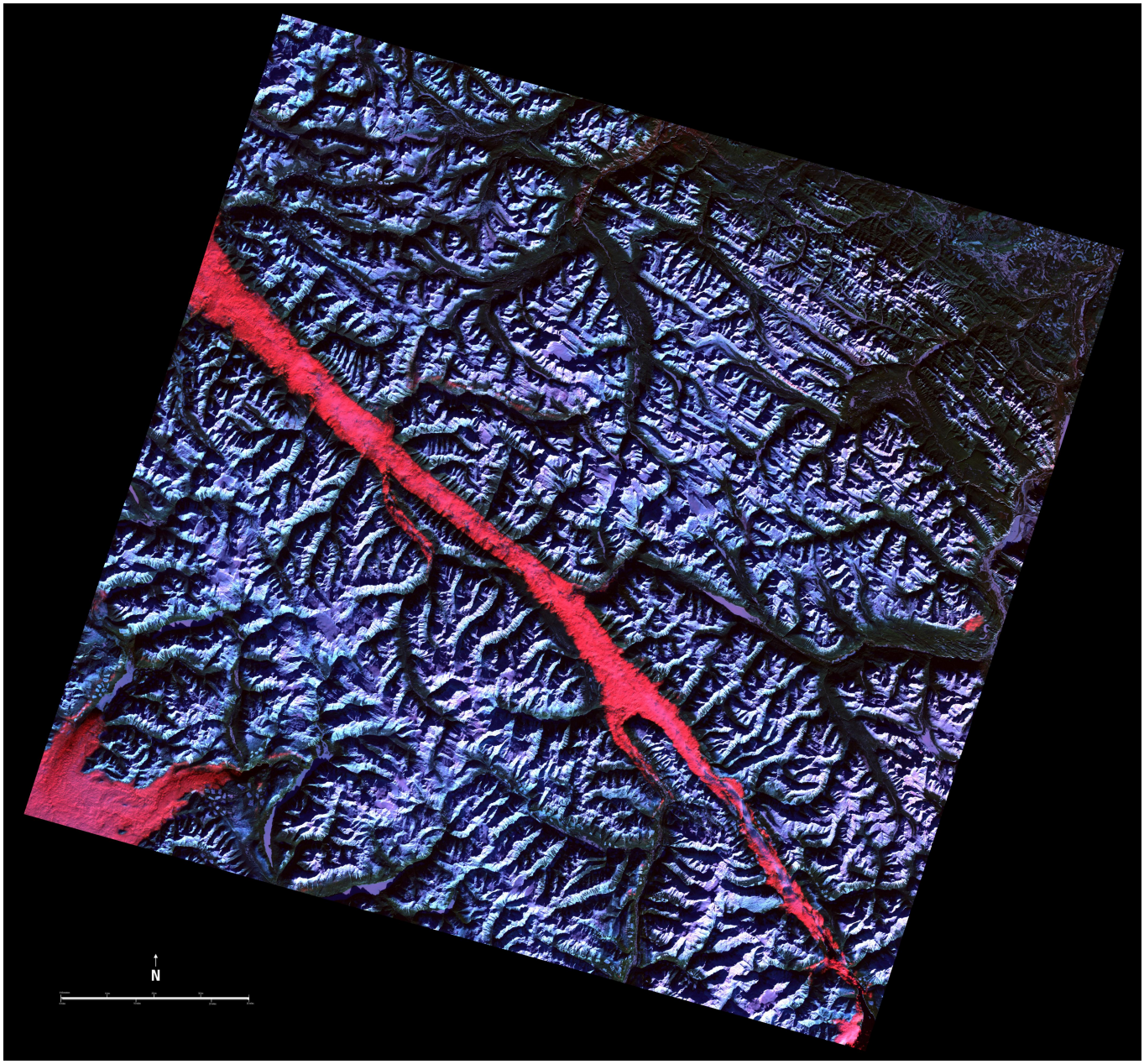

Figure 8. Rocky Mountain Trench, February 2004

Lake Eyre, Australia

Lake Eyre is part of Lake Eyre National Park within the Lake Eyre Basin. The basin is one of the world's largest drainage systems, totaling more than 1 million square kilometers. The Georgina, Diamantina, and Cooper Rivers all drain into the lake. Other rivers in the Simpson Desert would flow into the Eyre, but they are ephemeral and are dry much of the year. Lake Eyre is usually a large salt pan; however, when the seasonal rains occur, water gathers in the lake bed. In the last 150 years, the lake has filled completely only three times. When it does, many species of birds migrate to the area.

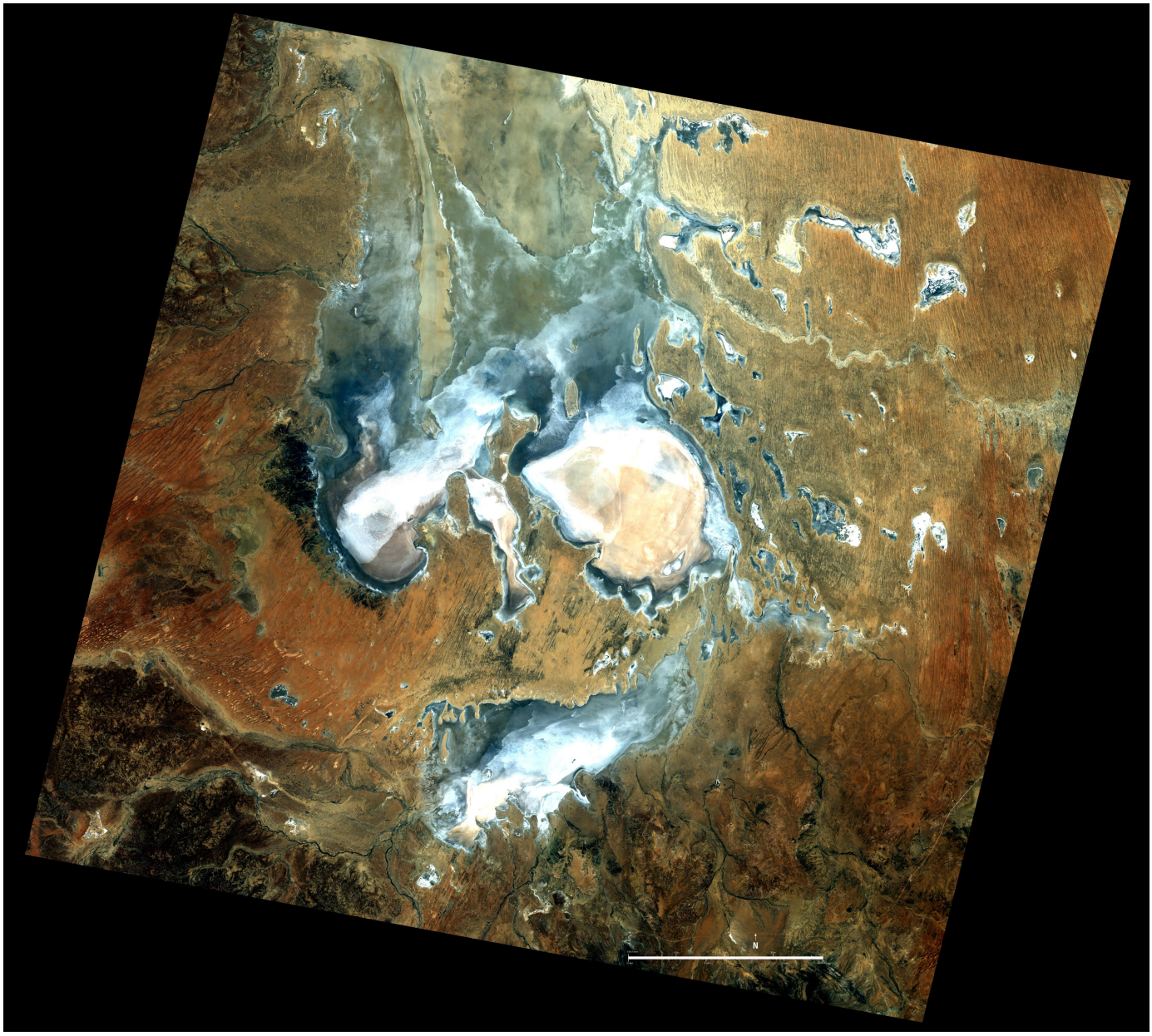

Figure 9. Lake Eyre in Australia, August 2006

Jayakwadi and Ujani Dams, India

These images show the areas of the Jayakwadi and Ujani Dams in western India.

Built across the River Godavari in the 1990s, the Jayakwadi Dam is located at the eastern side of the Nath Sagar Reservoir. The dam is famous for its vantage points for bird watching, because a wide variety of resident and migratory birds are found in the vicinity of the dam. In August 2006, the floodgates of the dam were opened because of heavy rainfall in the region, and the small town of Paithan experienced its worst flood in known history.

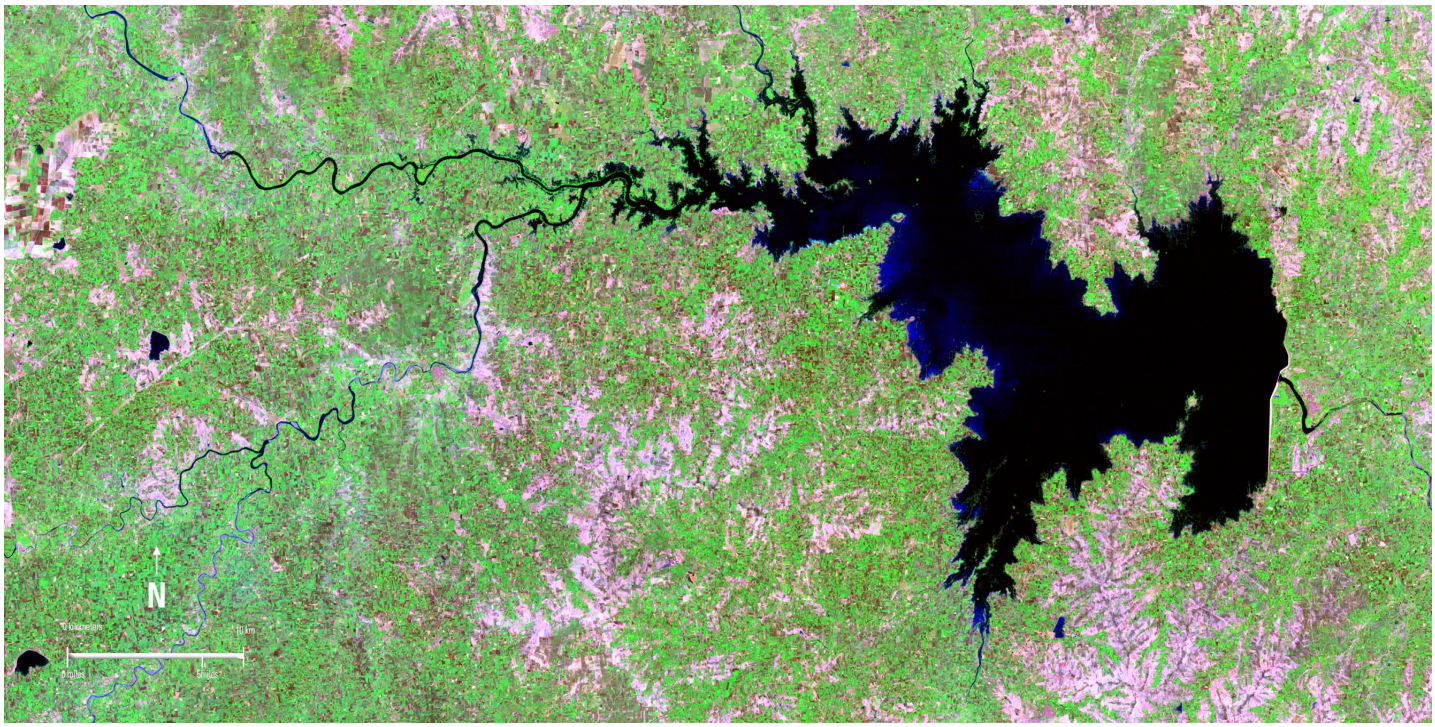

Figure 10. The Jayakwadi Dam in India

The Ujani Dam is built on the Bhima River and helps contain one of the largest reservoirs in the region supplying water for drinking, irrigation, and hydroelectricity. The dam has also lessened threats of floods to downstream settlements. The Bhima River runs in a well-entrenched valley, and its banks are heavily populated. Local irrigation helps support sugarcane, an important irrigated cash crop, as well as rice and sorghum.

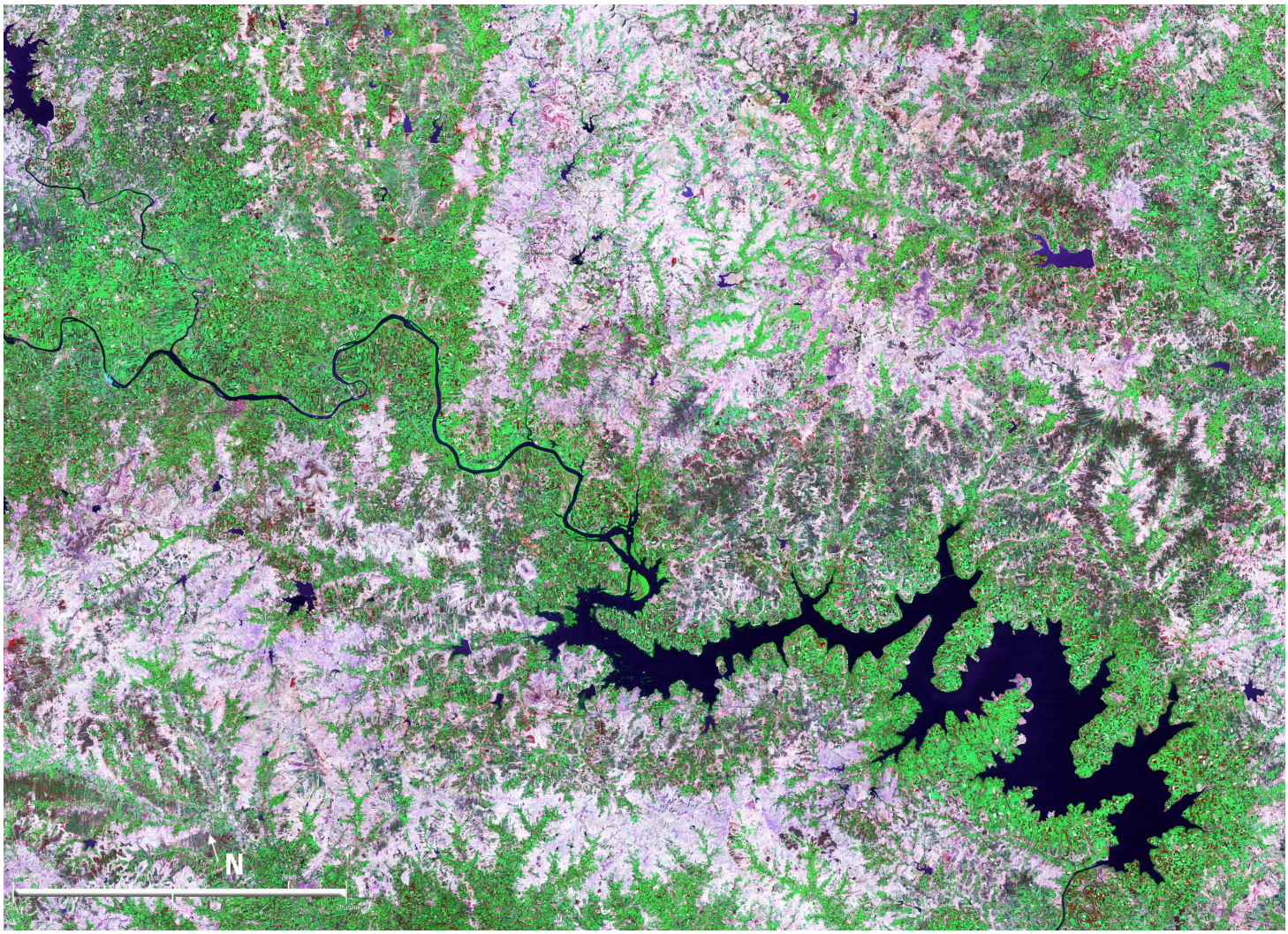

Figure 11. The Ujani Dam in India

The Fjords of Sogn og Fjordane – Norway

The fjords of Sogn og Fjordane dominate this image of the western coastline of Norway. Carved out of mountains by glaciers, the flooded u-shaped valleys are surrounded by steep cliffs, verdant slopes, and snow-capped mountain tops.

Nordfjord is home to the Jostedalsbreen National Park, which covers an area of more than 1,300 sq km and is located near the center of this image. Within the Park is the largest glacier in continental Europe, Jostedalsbreen Glacier. Also located in Nordfjord, Hornindalsvatnet is considered the deepest and clearest lake in Europe at over 500 meters deep. This is the darkest water body in the north-central part of this image.

The fjord in the southern portion of this image is Sognefjord. As the largest fjord in Norway, it stretches over 200 kilometers inland. Cliffs surrounding the fjord rise quickly to heights of 1,000 meters and more.

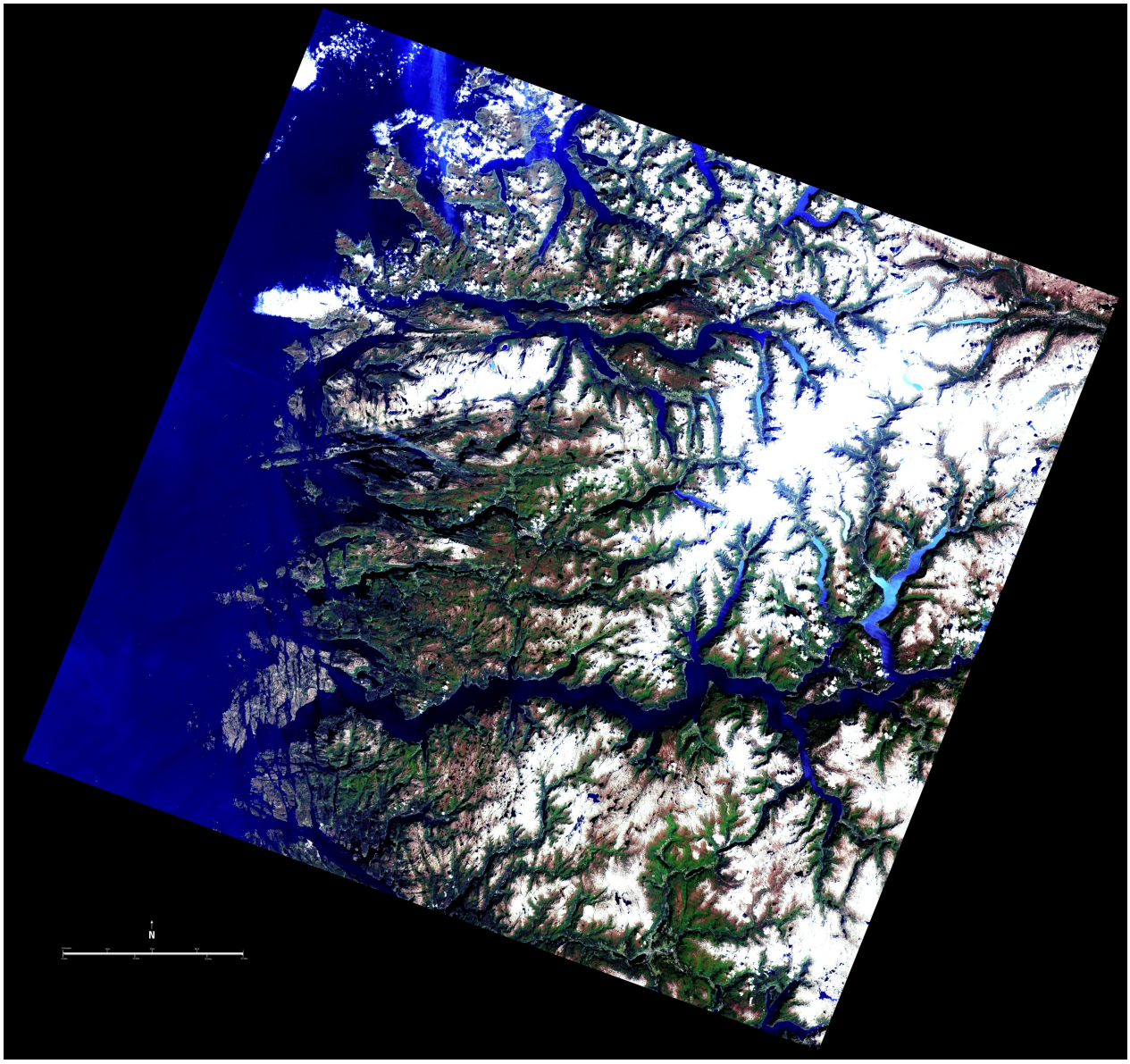

Figure 12. The Fjords of Sogn og Fjordane in Norway, July 2003

Yellowstone National Park – 1988 Fires

Lightning strikes in late June 1988 sparked a series of major wildfires that burned the already dry Yellowstone National Park. Fires continued until the snow began to fall in September, and when all of the fires were finally extinguished in November, 36 percent of Yellowstone National Park was burned to varying degrees of intensity.

Recovery started as soon as spring returned, as nutrients from the ash helped the vegetation to flouish. Wildflowers were abundant by midyear, and the grasses and shrubs were a rich green.

These images show the area during the time of active fires, and as recovery continued through the years. The fires appear as dark red and smoke billows in the August 1988 image. Deep red scars can be seen in the October 1988 image. As vegetation recovery continues, dark red fades to a mixture of red and green in the 1993 and 2007 images.

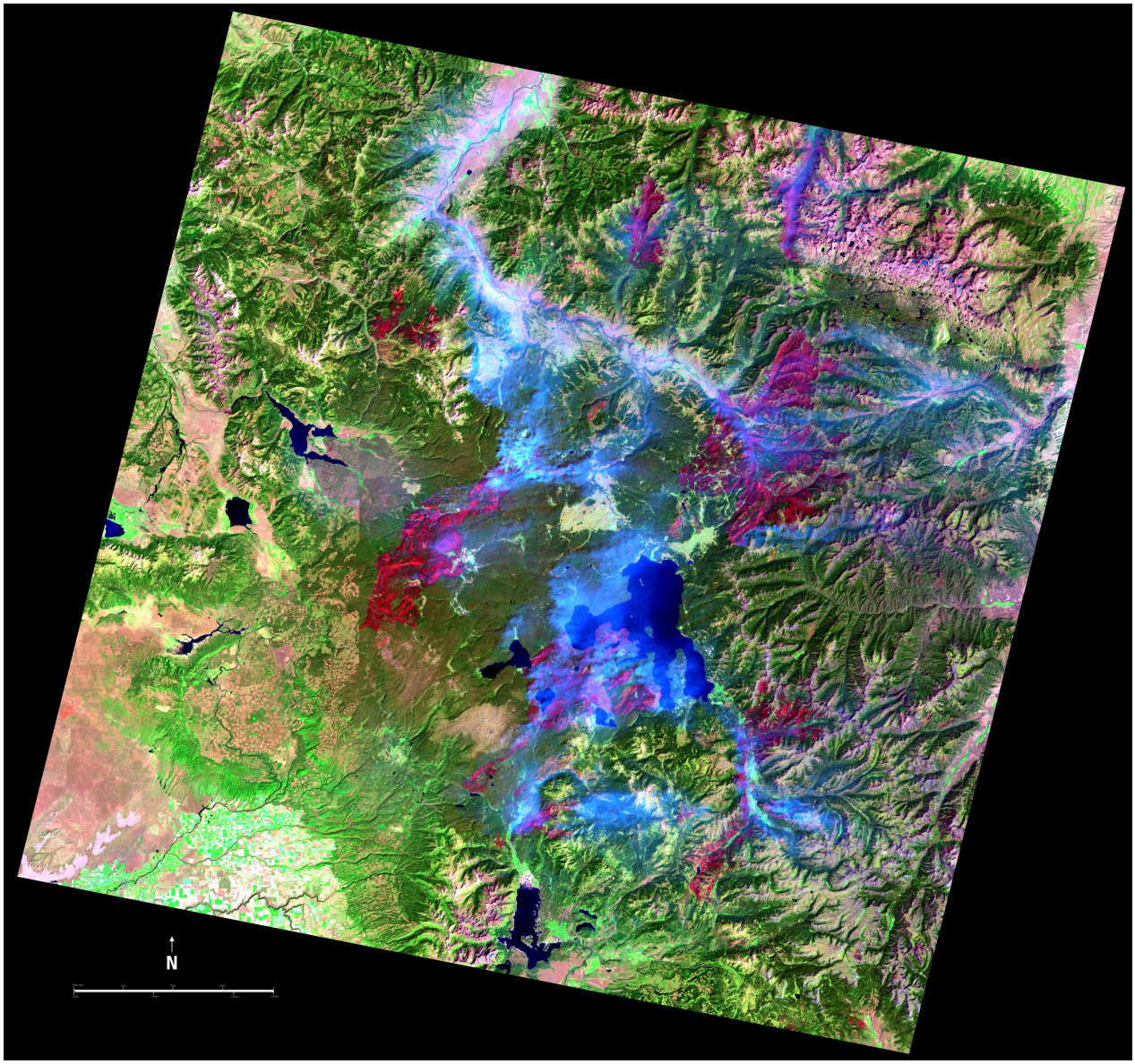

Figure 13. Yellowstone National Park, August 1988

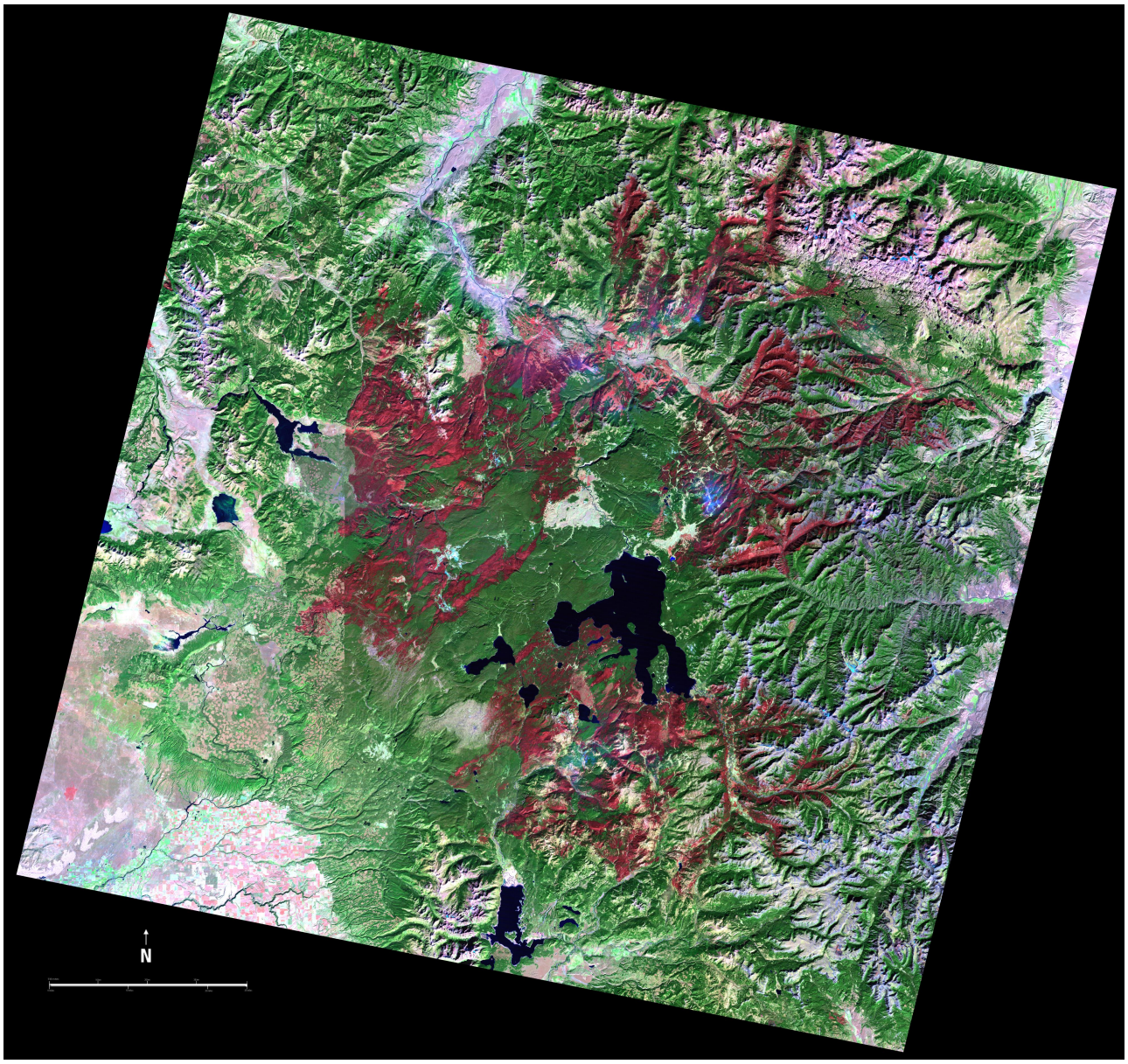

Figure 14. Yellowstone National Park, October 1988

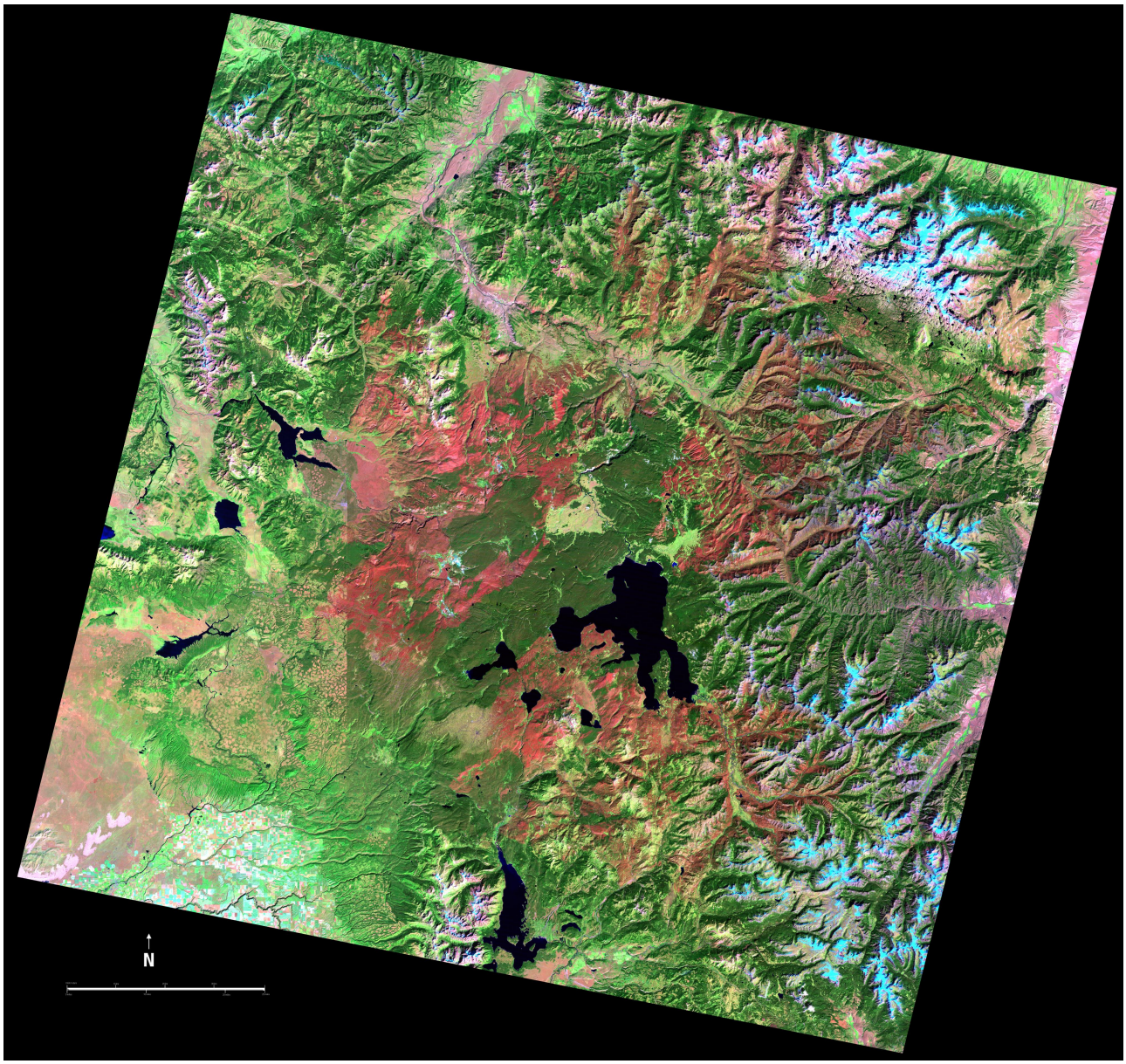

Figure 15. Yellowstone National Park, September 1993

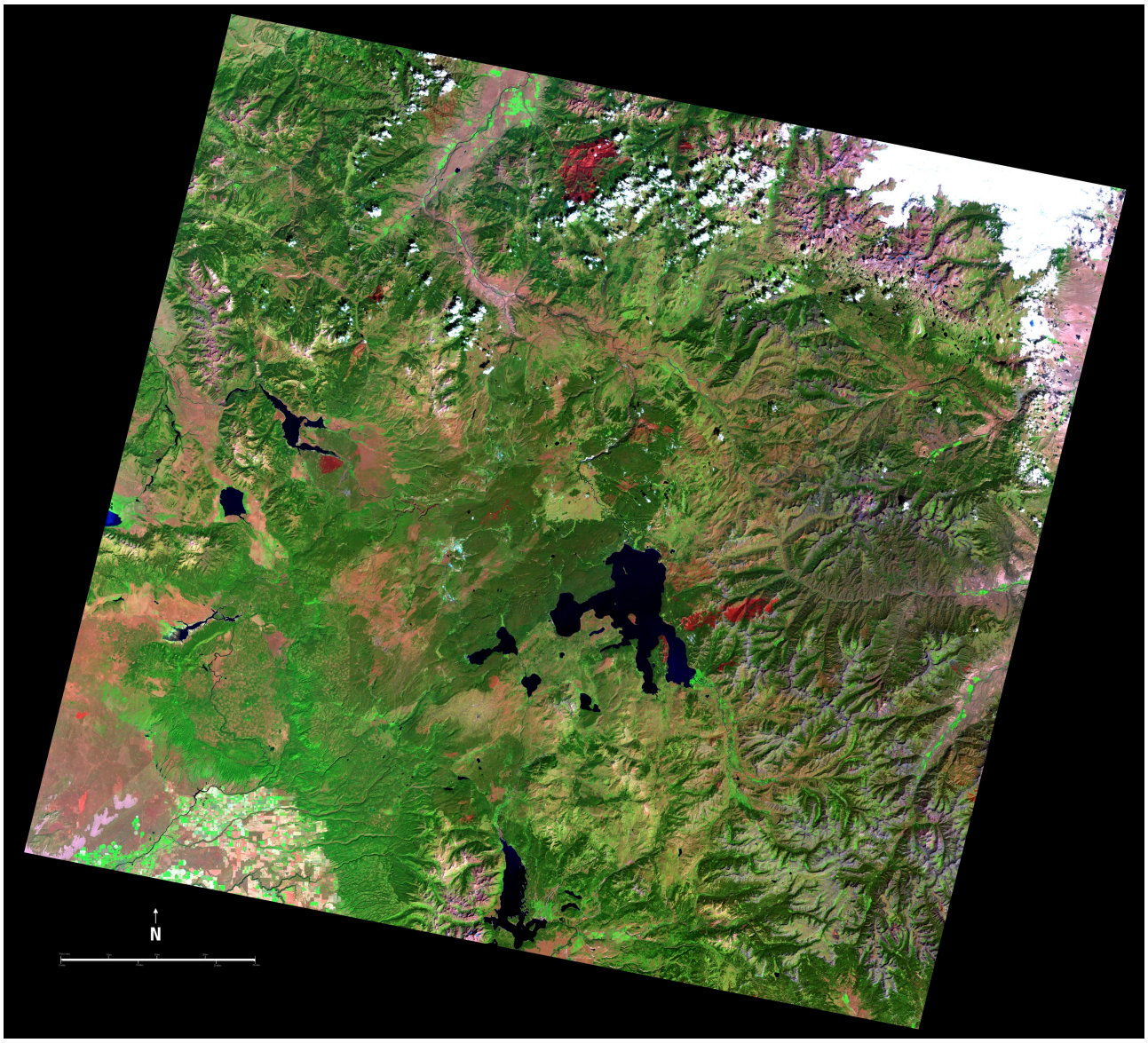

Figure 16. Yellowstone National Park, August 2007