North and Central America

At A Glance

Population: 493 million
Percent of World's Population: 8.03%
Land Area: 24,474,000 sq km
Percent of Earth's Land: 16.5%
Key Environmental Issues:

- *Land degradation*
- *Habitat loss*
- *Conversion of fragile ecosystems*
- *Greenhouse gas emissions and climate change*
- *Exploitation of groundwater*
- *Degradation of coastal and marine areas*
- *Urban sprawl*

Sites for North and Central America

Everglades, United States
Gulf of Fonesca, Honduras
Hayman Wildfires, United States
Las Vegas, United States
Mexico City, Mexico
Mount St. Helens, United States
Tensas River Basin, United States
Vancouver and Seattle, Canada/United States

Everglades, United States

Urban Encroachment into the Wetlands

Everglades National Park is situated on the southern tip of the Florida Peninsula, 16km from Florida City. The Everglades is the largest subtropical wetland in the United States with 6,100 sq. km. of area. Everglades National park was included on the list of World Heritage sites in 1993. The sawgrass marshes are the largest in the world and serve as a protected refuge for over 400 species of birds and some 800 species of land and water vertebrates. The threats to the region are evident, as urban growth, overpopulation, agricultural pollution from fertilizers, mercury poisoning of fish and wildlife and drought severely stress the system.

Escalating population is the single biggest threat to the Florida Everglades. Four-fifths of the historic boundaries of the Everglades lie outside the protected region of the park and are threatened by agricultural and urban conversion. The satellite images show that urban population growth has been particularly intense in the counties in the lower east coast rim of the Everglades, straining the natural buffer zone of mangrove forests and sawgrass marshes.

1973 (left)

In 1973, the population of Florida was 8,317,034 and had rather limited impact on Everglades.

2000 (right)

By 2000, the population had almost doubled to 15,774,603. The image shows encroachment along the edge of the everglades.

Photo Credits:
South Florida Water Managment District

Gulf of Fonesca, Honduras

Hondurian Shrimp Farming

Honduras is second only to Ecuador in the production and export of cultured shrimp from Latin America. Shrimp aquaculture in Honduras began in the early 1970s and continued in the 1980s with the support of international financial organizations and the Honduran government. The private national and international enterprises converted vast areas of humid coastline into farms for the cultivation of shrimp. This industry boomed to become one of the top grossing industries of the country by the 1990s.

The increase in the production of shrimp is directly proportional to the requirement for land. This land is obtained through the conversion of highly productive coastal wetlands to shrimp farms. The rapid growth of aquaculture in Honduras has caused both environmental and social problems. Shrimp farmers are depriving fishermen, farmers and others access to mangroves, estuaries and seasonal lagoons. The destruction of mangrove ecosystems; alteration of the hydrology of the region; degradation of water quality; destruction of the habitats of other flora and fauna, which precipitates a decline in biodiversity, and the decline in Gulf fisheries through the indiscriminate capture of other species caught with the shrimp post larvae used to stock ponds degrade the overall well-being of local populations.

1987 (left)

This image shows the Gulf of Fonesca before the beginning of intensive shrimp cultivation.

2000 (right)

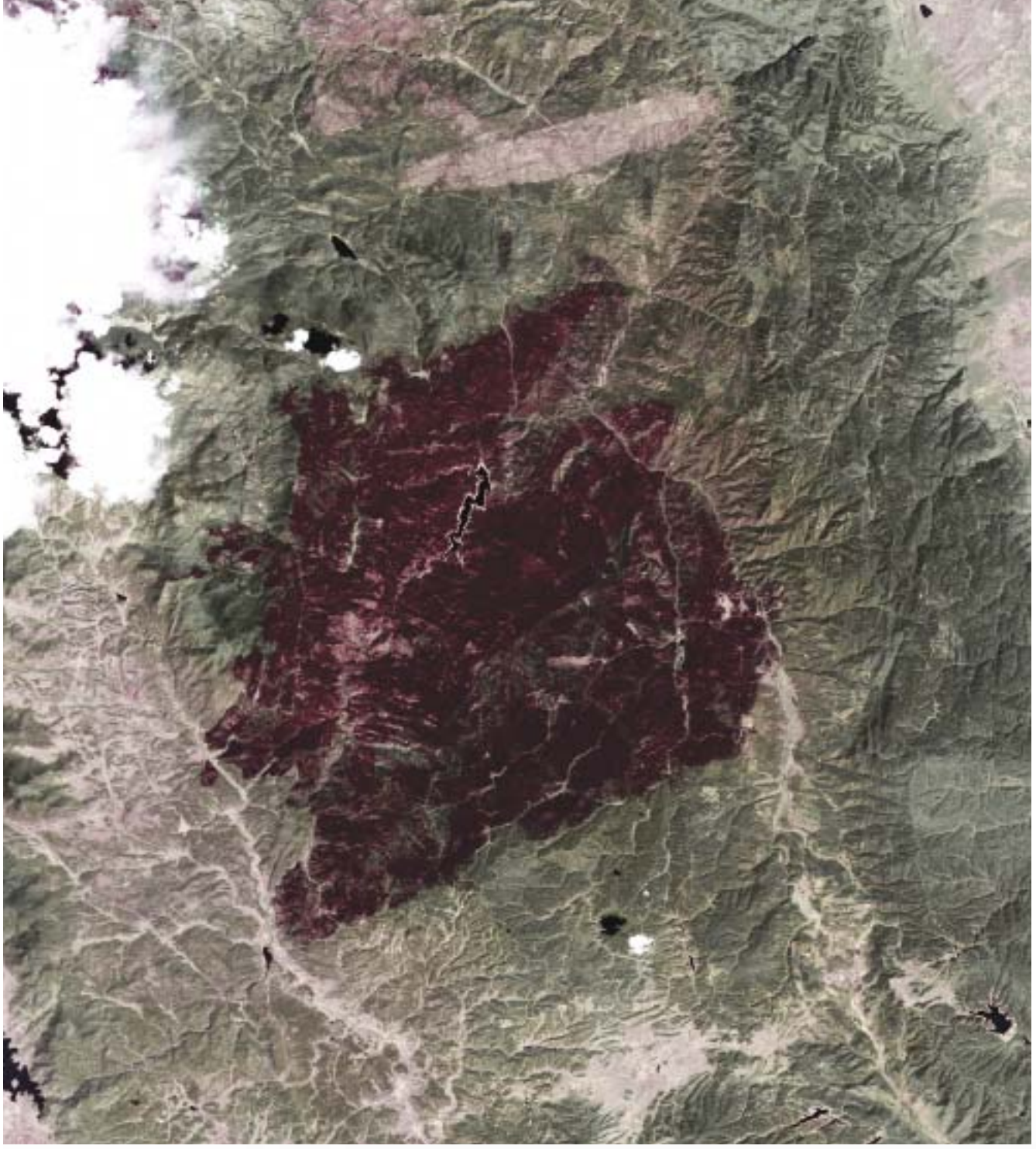
Over 250 sq. km. in the Gulf of Fonesca has been leased through concessions. The 2000 image documents the resulting conversion of wetlands. Estimates of mangrove loss due directly to the construction of shrimp farms range from about 20 to 40 sq. km. If conservation policies are not put in place, estimates suggest that all the mangroves will disappear within 20 years.

Photo Credits:
UVic Shrimp Aquaculture Research Group
NOAA / NERR

Hayman Wild Fires, United States

Wild Fires in the Western United States

The Hayman wild fire near Denver, Colorado caused the destruction of nearly 60,750 ha of forest. The fire forced about 6,000 people in the communities south and west of Denver to evacuate, and destroyed at least 115 homes and 10 commercial buildings. The cost of fighting the wildfire was $3 million a day. Wildfire activity in 2002 was much higher than normal across the country with over 567,000 ha burned by June, nearly twice the 10-year average.



May 12, 2001 (left)

The satellite image shows healthy vegetation in various shades of green. In the pre-Hayman fire image, evergreen forests are generally dark green, while deciduous trees leafy plants are a lighter green color. Water and cloud shadows are black, and urban areas are gray.

July 2, 2001 (right)

The satellite image provides a view of the Hayman fire after it burned an estimated4,600 ha. Recently burned areas appear black, some smoke plumes appear light blue or gray and clouds are white. The Hayman fire scar is clearly visible where older fires show shades of gray immediately north of the Hayman fire.

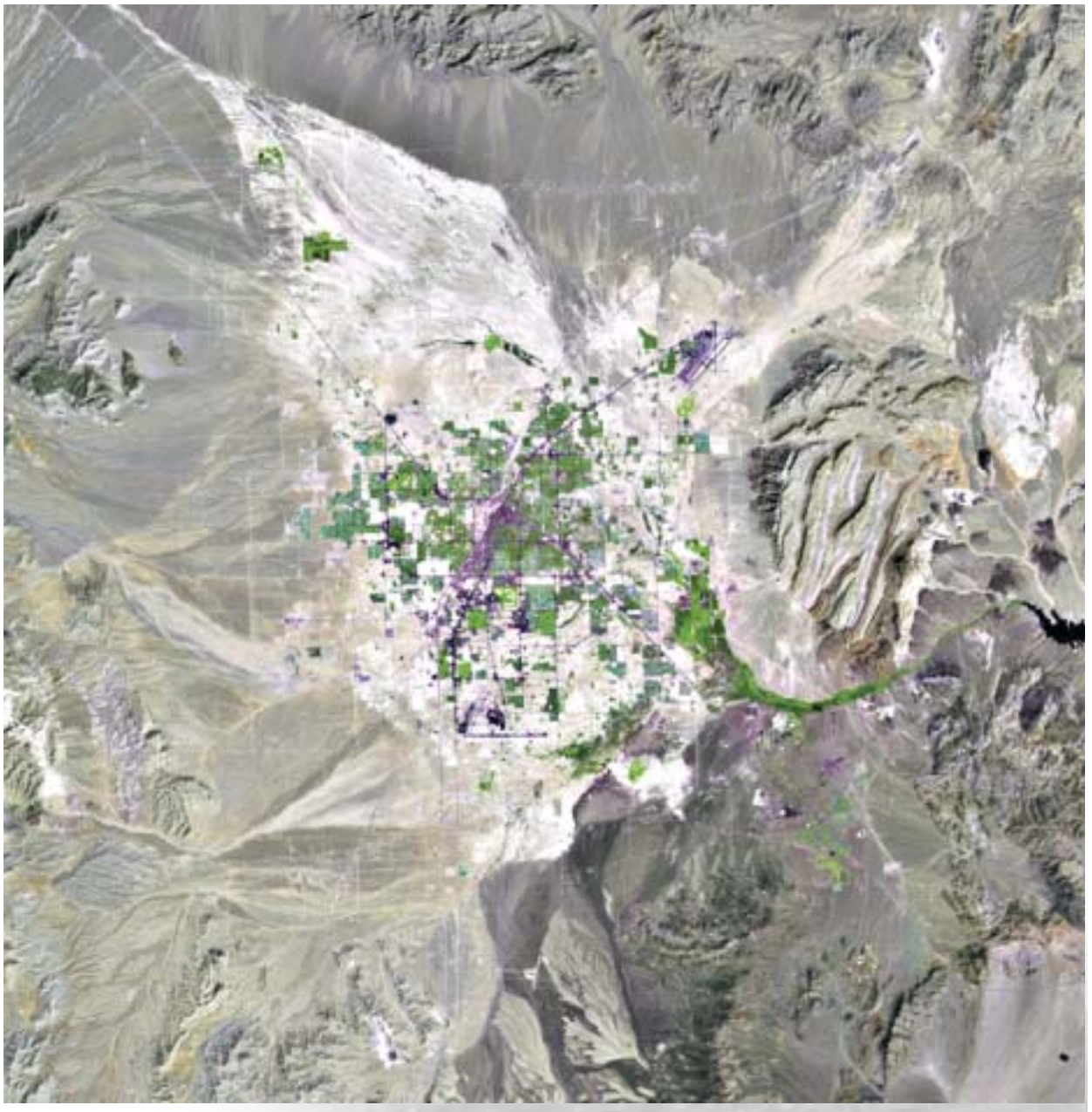
Photo Credits:
USDA / NRCS—Gene Alexandra
USDA—Bob Nichols

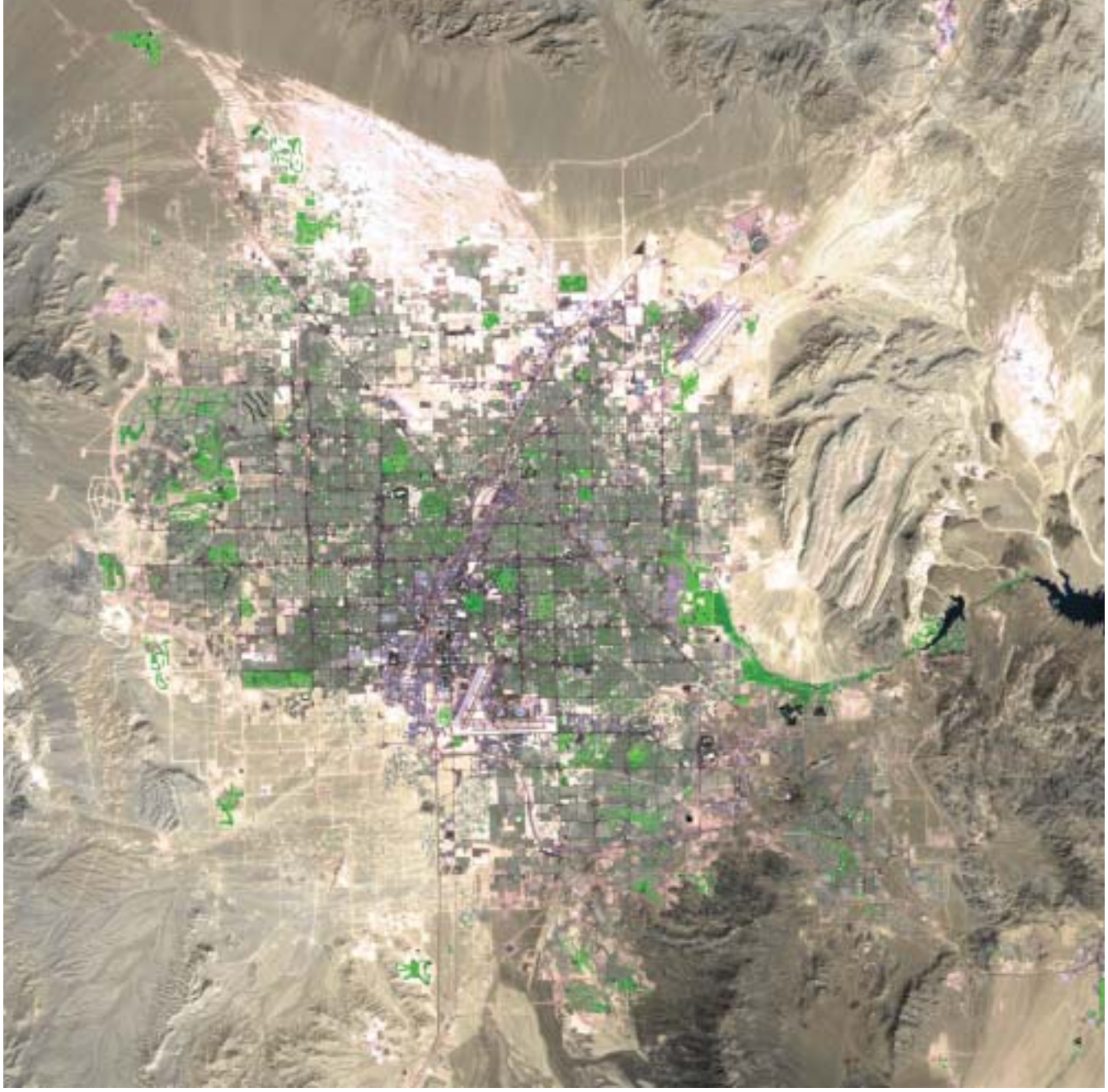
Las Vegas, United States

Urban Land Use Change

The built-up area data for Las Vegas provide a dramatic illustration of the spatial patterns and rates of change resulting from urban sprawl. Population growth in the Las Vegas Valley was fairly slow during the first half of this century, but as the gaming and tourism industry blossomed, population began to increase rapidly. For example, the population of Las Vegas in 1950 was 24,624 and in 1960, it increased to 64,405. By 1980, Las Vegas had a population of 164,674. Today, the Las Vegas Valley's population tops one million, and this does not include the tourist population. Las Vegas is the fastest growing metropolitan area in the USA. One estimate is that the population will double by 2015, causing the rate of conversion of the arable and forestlands to urban use to grow in the same proportion as the population.

The city of Las Vegas is shown in the central portion of the satellite images of 1973 and 1999. These show that modern urbanization in arid environments result in profound modifications to the landscape, specifically the proliferation of asphalt and concrete along with the displacement of the few vegetated lands, such as agricultural and forest lands.





1972 (left)

This 1972 satellite image shows the status of Las Vegas in 1972. Las Vegas was just a stop along the railroad that passes through the town.

2000 (right)

By 2000, the town had grown and sprawled in almost all directions with emphases on the northwest and southeast directions. Several transportation networks emerged to serve the city.

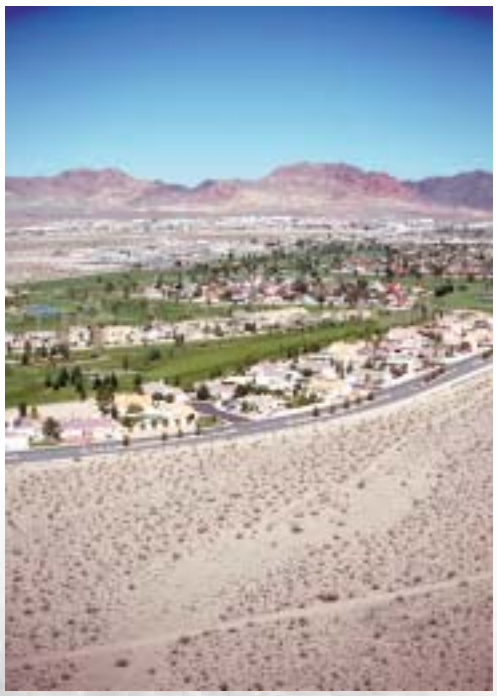
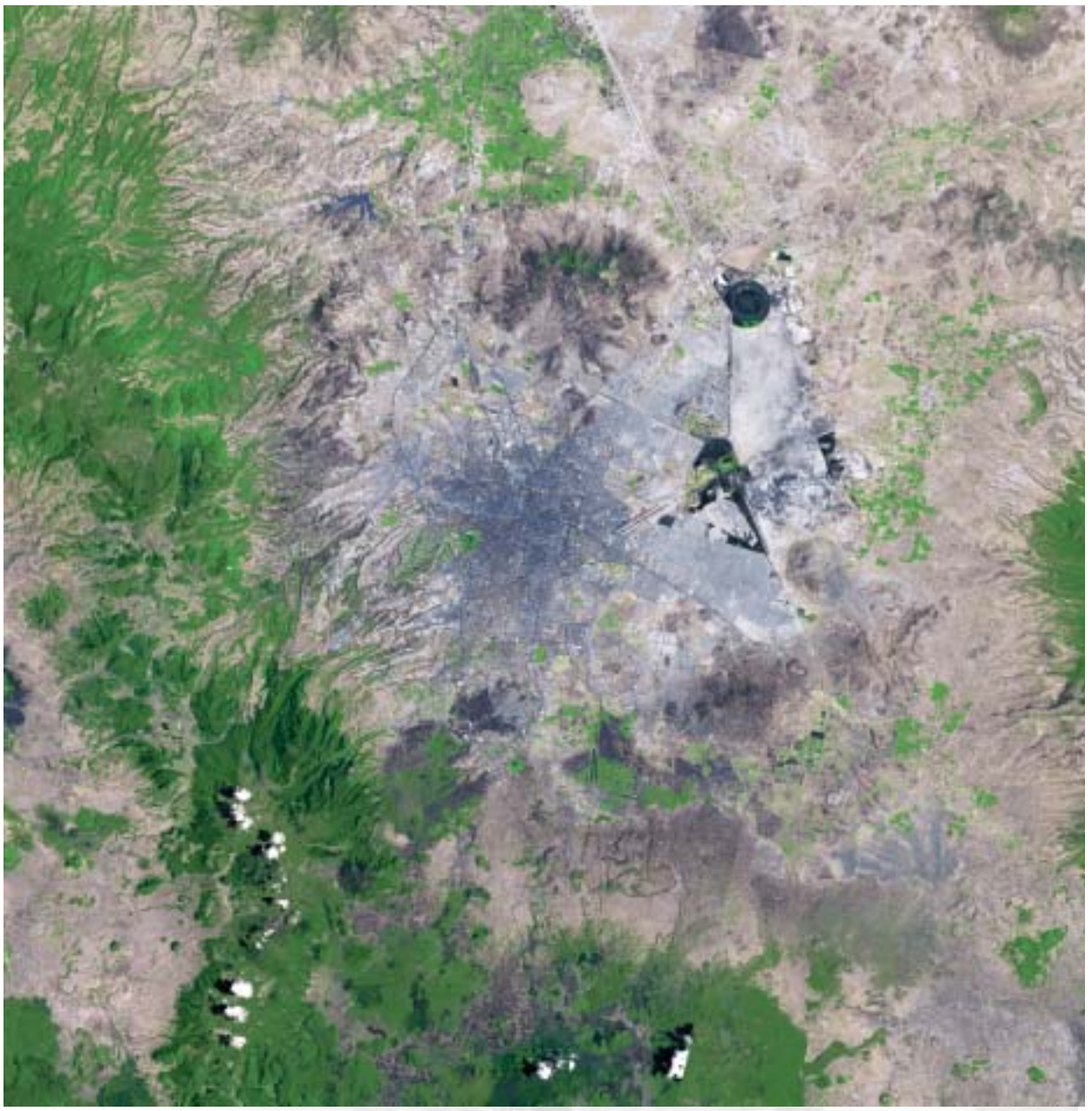


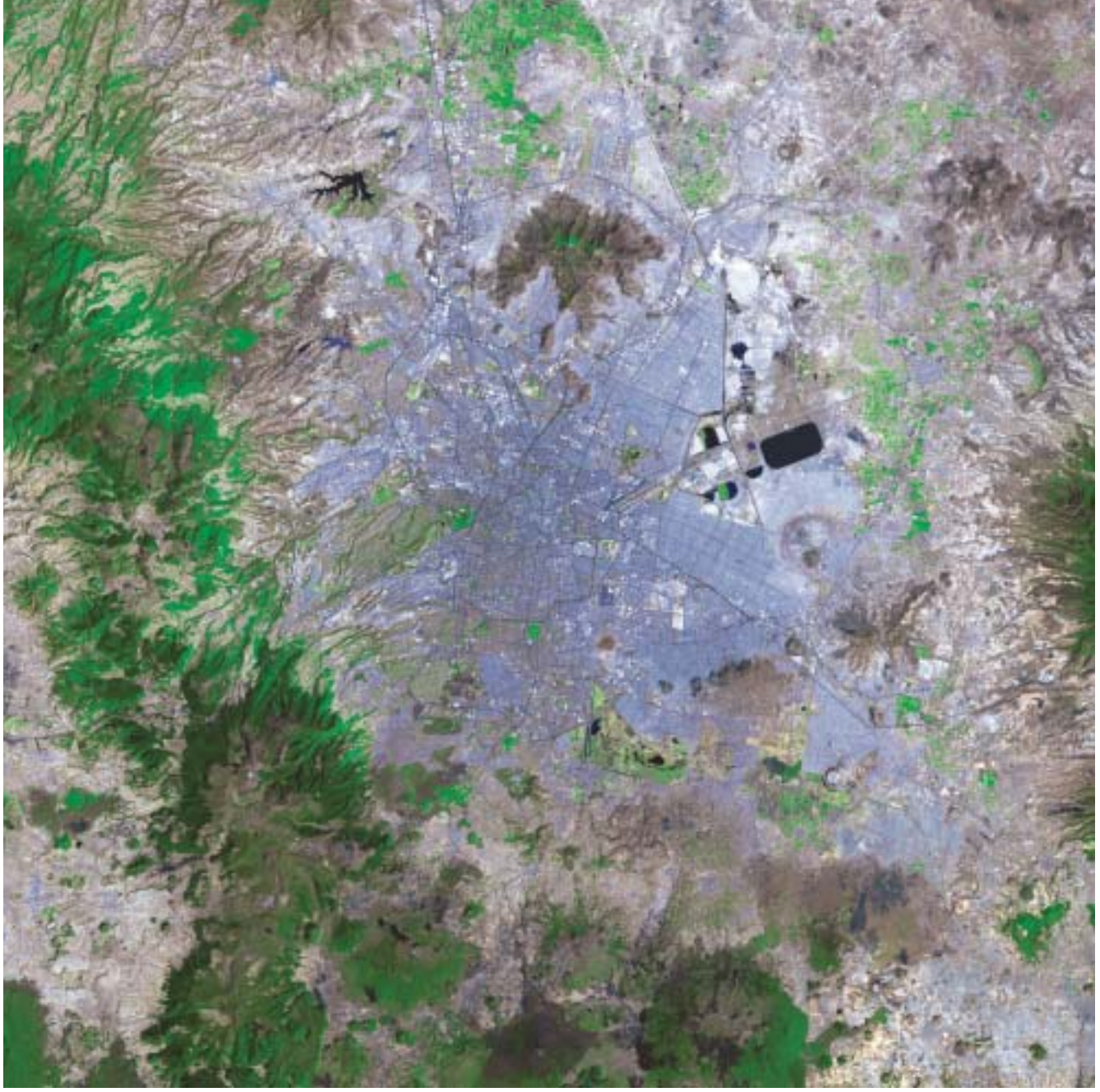
Photo Credits:
USDA / NRCS—Lynn Betts

Mexico City, Mexico

Growth of a Megacity

Mexico City, Mexico had a population of 17.9 million in 1999 which makes it the second largest metropolitan area in the world behind Tokyo, Japan. The satellite images show dramatic urban growth in Mexico City between 1973 and 2000. The purple color shows urban infrastructure and green shows natural vegetation. The forests in the mountains west and south of the city have suffered significant deforestation.





1973 (left)

The satellite image of 1973 shows urban growth concentrated in the center of Mexico City, when the population was 9 million.

2000 (right)

The satellite image of 2000 shows dramatic urban expansion of the city into its surrounding areas. The mega city had a population of 14 million in 1986 and is heading for a population of 20 million within the next few years.

1910

1929

1941

1959

1970

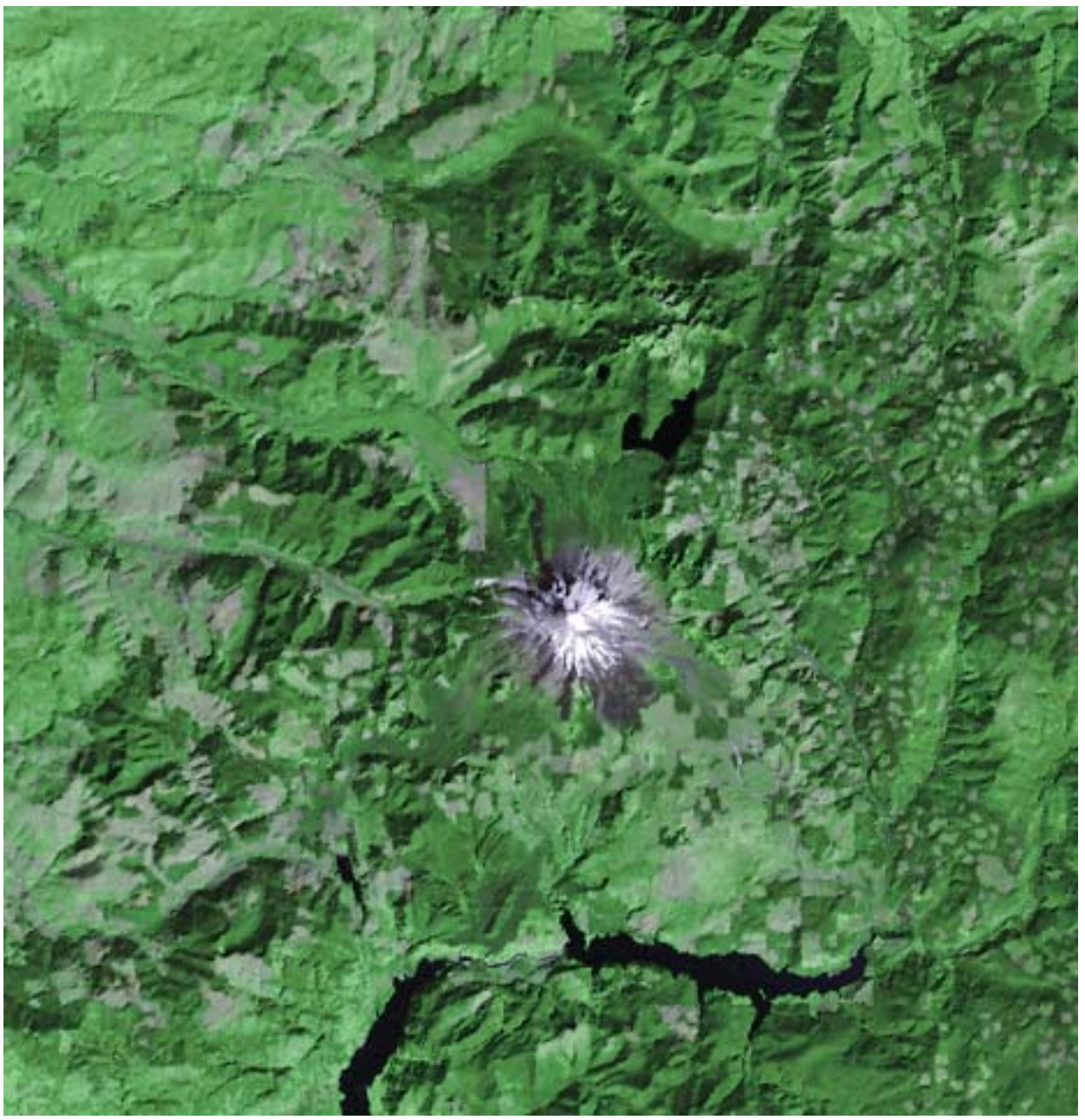
Photo Credits:
CentroGeo—José de Jesús Campos Enríquez

Mount St. Helens, United States

Change At Mount St. Helens

Before 1980, Mount St. Helens was a quiet mountain retreat and a popular location for skiing, hiking, camping, and fishing. However, in a matter of minutes on May 18, 1980, the landscape changed from dense forest to devastated moonscape. Following two months of unrest the volcano erupted catastrophically, resulting in a massive landslide into the Toutle River valley and devastating mudflows down several drainages. The eruption killed 57 people, flattened over 600 sq. km. of trees, and left the area barren and nearly devoid of life for some years. A vertical eruption column persisted for 9 hours, sending a stream of ash and pumice 15 miles into the atmosphere.

While the 1980 eruption of Mount St. Helens destroyed the landscape, it granted biologists an unprecedented view into the colonization and recovery of natural systems. Future eruptions of other volcanoes in the Cascade Range are inevitable, and lessons from Mount St. Helens will be invaluable to geologists and biologists for predicting such activity and anticipating their ecological impacts.



1973 (left)

In 1973 before the volcanic eruption in 1980, Mount St. Helens was a quiet mountain retreat and a popular location for skiing, hiking, camping, and fishing.

1983 (upper right)

This image shows Mount St. Helens after it erupted in May 1980 with the entire north flank of the mountain collapsed into the Toutle River. This reduced the height of its peak by 400 metres, and in the years that followed, a dome of viscous lava formed on the crater floor, eventually reaching a height of 300 metres when it stopped growing in 1986. In addition, two new lakes, Castle and Coldwater, formed where the landslide debris dammed tributaries of the Toutle River.

2000 (lower right)

By the year 2000, life had returned in areas affected by the eruption including the devastated blast zone. Seeds that were blown in by the wind took root in the avalanche deposit and soon shrubs and grasses began to grow. Elk, rodents, insects, and other animals followed the plants, and today, 22 years after the eruption, a thriving ecosystem is evolving.

Photo Credits:
USGS/Cascades Volcano Observatory—Austin Post
USGS/Cascades Volcano Observatory— Lyn Topinka
USGS/Cascades Volcano Observatory— Harry Glicken

Tensas River Basin, United States

Conversion of Forest to Agriculture

The Tensas River Basin encompasses approximately 375,000 ha. of Mississippi River alluvial flood plain in Northeast Louisiana. Historically, most of the Basin was covered with bottomland hardwood forested wetlands. The bottomland hardwood wetlands of the Tensas River Basin have been described as some of the richest ecosystems in the United States in terms of diversity and productivity of plant and animal species. At the same time, the cleared lands are recognized as some of the country's most productive farmland for grain and fiber.

In past years, the freshwater marshes, stream banks, and bottomland swamps of the Tensas River Basin were under strong development pressures. Large portions of the forest near streams and in backwater swamps were converted to agriculture. In 1972 the amount of forest land in the Tensas River Basin was 126,298 hectares compared to 244,522 hectares for human use. These represent 33.6% and 65.1% of the total Tensas River Basin area. In 1991-1992 the amount of forest area was 80,807 hectares and human use was 290,336 hectares. These represent 21.5% and 77.3% of the total Tensas River Basin. The satellite images show the land use change in the basin.

1975 (left)

The image shows the distribution of forest and agricultural lands in the complex riparian ecosystem along the Tensas River in 1975.

2000 (right)

The images show a tremendous forest loss over the 28-year time period. Forests have been replaced by agricultural and urban land uses as can be seen by comparing the images to observe the forest loss over 20 years. The net forest loss for this period is 45,491 hectares, 12.3% of the land area. The river is more channelized and many of the oxbow lakes and their associated wetlands are reduced in size.

Photo Credits:
USDA / NRCS—Bob Nichols
USDA / NRCS—Bob Nichols
USDA / NRCS—n / a

Vancouver and Seattle, Canada/US

Urban Growth In The Pacific Northwest

The Pacific Northwest's two major metropolitan areas, Seattle and Vancouver, each grew by about the same number of people in the 1990s, but satellite images reveal that more previously undeveloped land was paved over in greater Seattle than in Vancouver. On average, ten 4 ha. were developed per day in greater Seattle, but only 1.6 ha per day in greater Vancouver.

During the 1990s, the two main Pacific Northwest metro areas (Vancouver and Seattle) have experienced a very similar growth in population (approx 450,000 to 500,000 people). However, the patterns of growth are very different as can be seen in the satellite images.

Vancouver, 1976 (upper left)

The Vancouver, B.C., urban area grew denser since the 1980s. Compact, pedestrian-friendly neighborhoods contained 80 percent of the city's growth between 1986 and 1996. The Vancouver, B.C., metro area lost about 1.6 ha. a day for development.

Vancouver, 2000 (lower left)

The population is nearly 2 million in 2001 compared to 1.3 million in 1976. The 2000 satellite image shows the increased urban area in the Vancouver region.

Seattle, 1985 (upper right)

Seattle has sprawled since 1980's. Low-density residential areas made up three-fifths of the Seattle-Tacoma urban area's growth during the 1990s. During the decade, the Seattle-Tacoma metro area lost an average of 4 ha. of open space per day to suburban development, as measured by satellite imagery. There was an overall increase of 500,000 people from 1990-2000.

Seattle, 2000 (lower right)

The current population is 3.2 million and of that, 2.5 million were living in "car-dependent" low-density neighborhoods.

Photo Credits:
USDA / NRCS—Gary Wilson
Courtesy of Louise Krohn, www.krohn.org