

South America

At A Glance

Population: 351 million

Percent of World's Population: 5.72%

Land area: 17,819,000 sq km

Percent of Earth's Land: 12%

Key Environmental Issues:

Land degradation

Deforestation

Forest degradation

Habitat conversion and destruction

Over-exploitation of resources and illegal trade

Decreasing water available per capita

Water quality

Degradation of coastal and marine areas

Sites for South America

Brasilia, Brazil

Gulf of Guayaquil, Ecuador

Iquazú National Park, Argentina

Manaus, Brazil

Rondônia, Brazil

Santa Cruz, Bolivia

Santiago, Chile

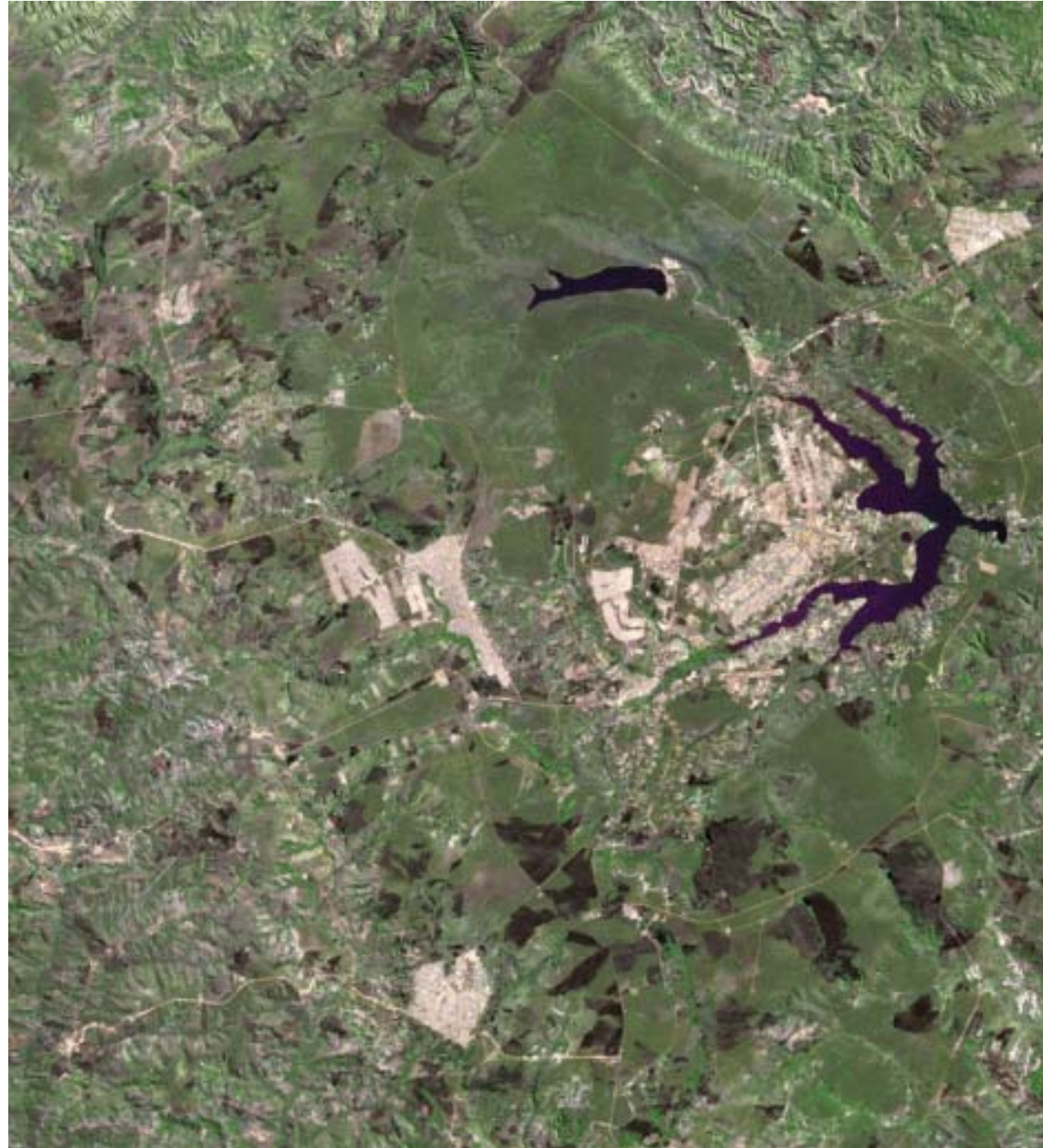


Brasilia, Brazil

Growth of a Capitol

Brasilia, Brazil's new capital, was inaugurated on April 21, 1960 with a population of 140,000 and a master plan for only 500,000 inhabitants. The city was a landmark in the history of town planning, and was recognised as a world heritage site in 1987. Urban planner Lucio Costa and architect Oscar Niemeyer intended that every element—from the layout of the residential and administrative districts to the symmetry of the buildings themselves—should be in harmony with the city's overall design. The official buildings, in particular, are innovative and imaginative. Plans were first proposed to move the capital of Brazil to the interior highlands in 1789. The new location promotes the development of the interior and unifies the country.

The satellite images show the dramatic growth and transformation of Brasilia. The dark green color in the images represents forest, agriculture appears light green, bright white spots represents planned areas for infrastructure and pink shows urban growth.





1973 (left)

The Pilot Plan of Brasilia consists solely of the bird shaped core area and residential areas between the arms of the Lake Paranoá. The urban developments away from the core are the initially unplanned satellite cities. The population of Brasilia and its satellite cities in 1970 was about 500,000.

2000 (right)

Due to population influx, currently more than 2,000,000 inhabitants now live in Brasilia and its satellite towns. The 2000 image shows fair amount of urban growth in planned areas and in the satellite cities. The National Park of Brasilia clearly stands out in 2000 as densely vegetated dark green. Several new reservoirs have also been constructed.





Gulf of Guayaquil, Ecuador

Expansion of Shrimp Culture

Guayaquil is Ecuador's main Pacific port located on the northern side of the Gulf of Guayaquil. The Gulf of Guayaquil is the largest estuarine ecosystem on the Pacific coast of South America. The low topography of the coastal region combined with high tides allows salt water to penetrate far inland, which helps to produce shrimp. Ecuador is the world's second largest producer of shrimp grown in captivity. Shrimp farming in Ecuador began in the Guayaquil region over thirty years ago. Many of the shrimp farms in this area have been abandoned with the shrimp farming activity moving to other stretches of the coast. Knowledge and awareness of the impact of shrimp farming on traditional agriculture, fisheries and wetlands is beginning to result in better regulation of shrimp farming in Ecuador. Many of the unregulated and often illegal shrimp farms were extremely destructive to the coastal ecosystem. Newer, ecologically sound shrimp farms are under development in 2000. Their design enables them to be less destructive and more sustainable. The tan color in the image shows shrimp-farming areas, where green represents natural vegetation and blue represents water.



1985 (left)

The satellite image of 1985 shows agricultural and mangrove areas in the Gulf of Guayaquil region. Farmers were converting to shrimp farming from agriculture at that time.

2000 (right)

The satellite image of 2000 shows the dramatic expansion of shrimp farms. Agricultural and mangrove areas have been converted to shrimp farms. It is estimated that in 1984 there were 893.68 sq. km. of shrimp ponds, while in 2000, with the expansion of shrimp breeding, the area increased to 1,176.31 sq. km.





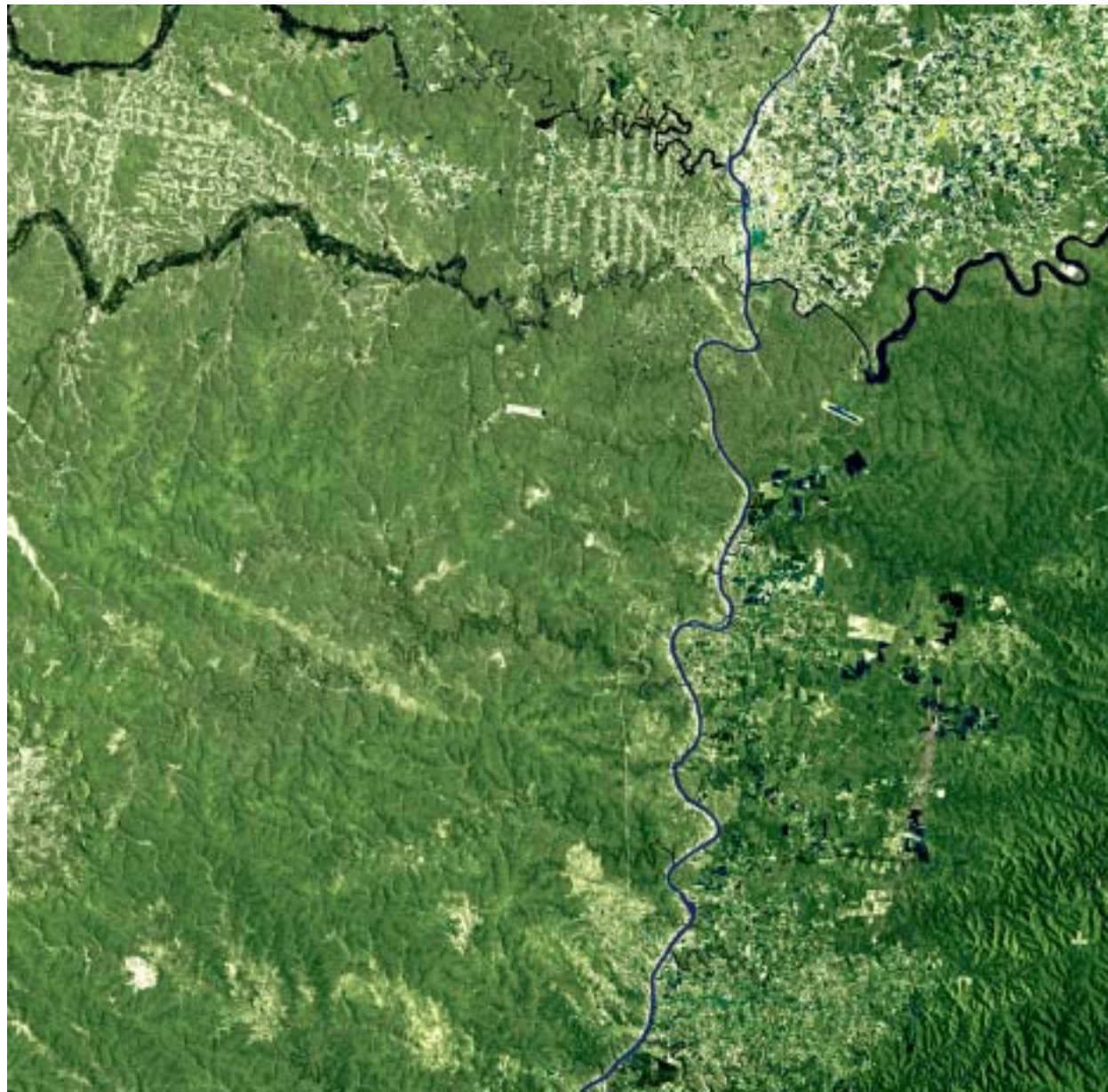
Iguazú National Park, Argentina

Vulnerable Paranaense Forest

Iguazú National Park is located in Argentina on the border with Brazil and Paraguay. This world heritage site covers a total area of 555 sq. km.: the National Park covers 492 sq. km. and the National Reserve covers 63 sq. km. Conservation of this park is critical because it harbours one of the most complete remnant patches of the highly endangered Paranaense forest. The park is rich in fauna and includes 68 species of mammals, 422 of birds, 38 of reptiles and 18 of amphibians, a large number of which are threatened or vulnerable.

The Iguazú Falls, among the most impressive in the world, are on the Iguazú River, which serves as the border between Brazil and Argentina. The Itaipu Dam is on the Paraná River north of its confluence with the Iguazú. This dam is presently the largest in the world, prior to the completion of the Three Gorges Dam. In 1995, it provided 25% and 78% of the energy supply to Brazil and Paraguay respectively.

The satellite images show how land clearing and logging have opened up a previously forested landscape.

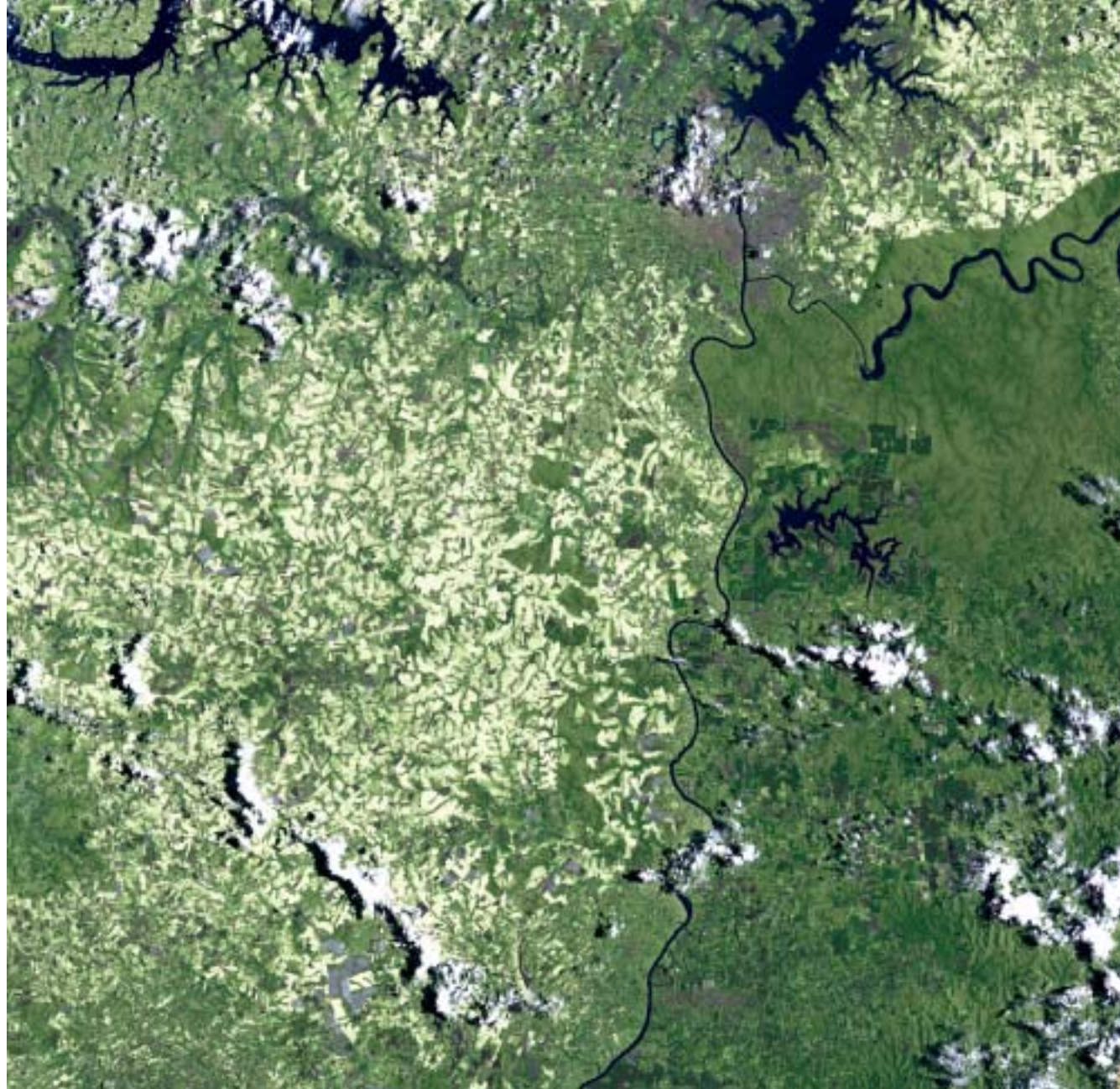


1973 (left)

The image shows extensive forest cover throughout the image.

2000 (right)

The protected area of Iguazú National Park, located in Argentina on the border with Brazil and Paraguay, is sharply defined as the dark green enclave on the right of the images and is the only remaining original forest in the region. A new reservoir is visible inside the Park. On the Brazilian side of the Iguazú River is the Iguazú National Park, which by 2000 has returned to a more vegetated condition. The Itaipu Reservoir is very visible in the top-center of the image. The three towns of Ciudad del Este in Paraguay, Foz do Iguazú in Brazil and Puerto Iguazu in Argentina have grown substantially since the construction of the dam and presently are reliant on tourism.





Manaus, Brazil

Conversion of Brazilian Rainforest

Manaus, the capital of the state of Amazonia, is located on the north bank of the River Negro and its confluence with the Solimões River, which extends eastward as the Amazon River. Manaus was settled in 1669 and was a rubber boomtown between 1890 and 1920. Commercial activity in Manaus presently is largely in forest and petroleum products. The Pan American highway meets the river here and connects Manaus to Caracas. No paved roads connect Manaus to other cities. Oceangoing shippers have access to the port of Manaus. Air and river transportation connect Manaus to the outside. The city population grew by more than 65 per cent to 1.5 million in the past decade.

These two Landsat images document the conversion of forest areas due to logging and urbanization between 1987 and 1999.



1987 (left)

Manaus appears as tan/white color at the right corner of the image. About 15 kilometers from Manaus, Rio Negro (Black River) meets Rio Solimoes to create an amazing confluence of brownish white water from the Salaomes joining black water (caused by the very high acidity from tannin) from the Rio Negro. The Rio Negro flows 2,300 km from Colombia, and is the dark current forming the north side of the river. It gets its color from the high tannin content in the water. The Rio Solimoes appears blue in this image. The black waters of the Rio Negro are not completely absorbed until many miles after the confluence.

1999 (right)

The image shows the expansion of logging and road construction north of Manaus between 1987 and 1999. Manaus has grown to meet the border of the rectangular Adolpho Ducke Forest Reserve (100 sq. km.). Mature forest appears as green. The white/purple color shows converted urban areas.





Rondônia, Brazil

Deforestation for Agriculture

Brazil is the home of approximately 30% (3,562,800 sq. km.) of the world's tropical rainforests. The southern Amazon Basin in Brazil is one of the regions of the Amazon rainforest undergoing rapid change. In a continuing effort to decentralize the Brazilian population and populate undeveloped regions, the Brazilian government constructed the Cuiabá-Pôrto Velho highway through the province of Rondônia. Completed in 1960, the road served as the spine of access for infrastructure development into tropical rainforest ecosystems, previously occupied only by the indigenous people of the region. The highway connects the north and west parts of Brazil with the more urbanized areas of the south-central and coastal areas. In-migration increased substantially after infrastructure development. This series of satellite images shows land use change and deforestation in Rondônia. The deforested land and urban areas appear in gray white and healthy vegetation appears green.





1975 (left)

The image shows healthy natural vegetation, indicating minor human interference.

1986 (upper right)

The image exhibits substantial immigration to the area between 1975-1986. The predominant “Feathered” or “Fishbone” pattern on the landscape is the result of logging operations, providing mechanized access to land resources. Primary land uses are cattle ranching and annual crop farming. More sustainable perennial crops like coffee and cocoa occupy less than 10 percent of the agricultural land areas.

2000 (lower right)

The image shows the demand for agricultural land continues to threaten the Brazilian rainforest. In the central portion of the image, a distinctive net shaped pattern of clear-cut is evident.

Despite encroachment, programs are attempting to preserve the land with multi-use functions providing a wider array of income producing products to local farmers, which might mitigate adverse impact on the tropical rainforest.



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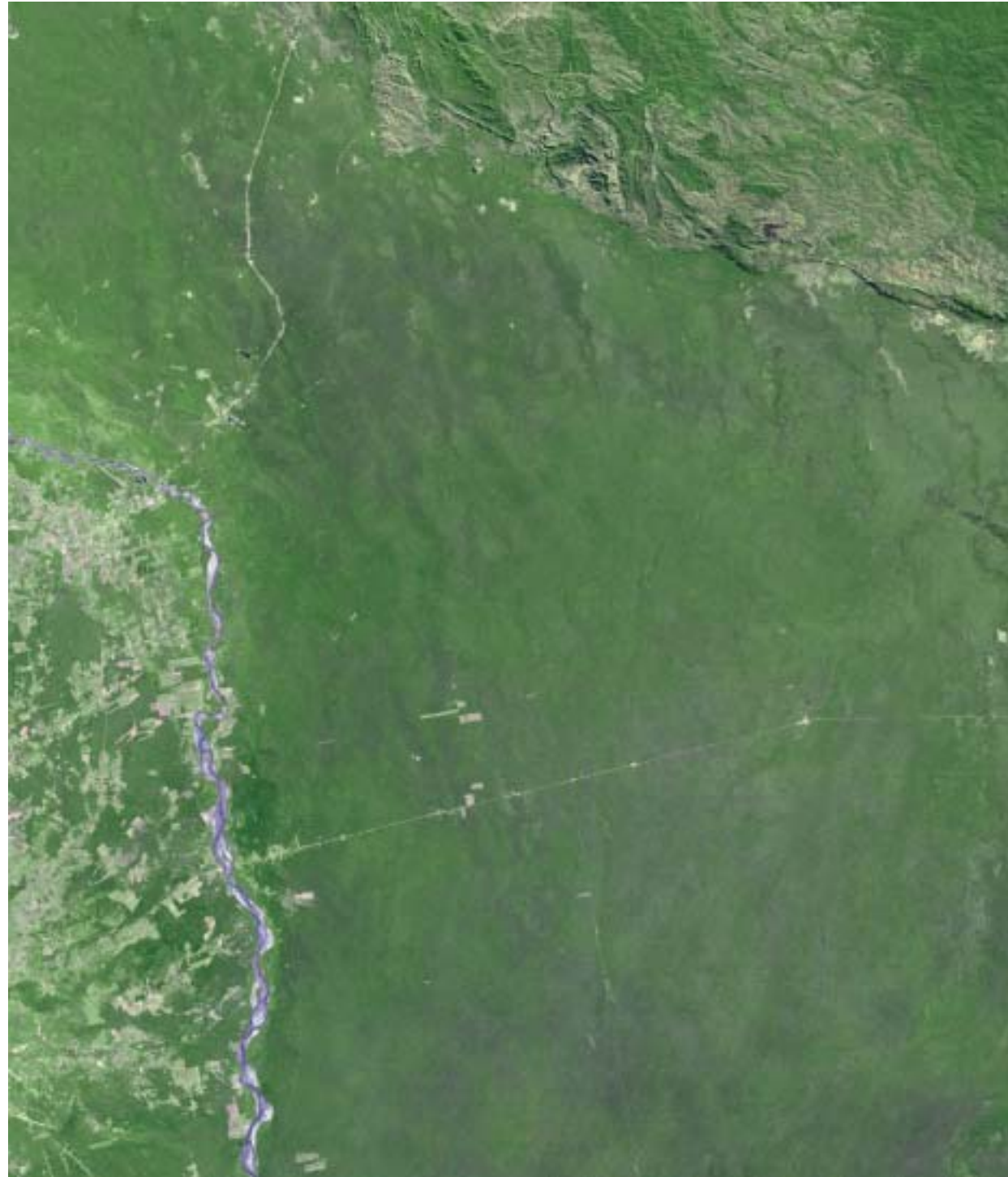
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Santa Cruz, Bolivia

Land Use Change in Bolivia

Santa Cruz is situated in the rich, fertile Bolivian lowlands, highly suitable for agriculture. The area was formerly isolated due to natural forest, mountain, and river boundaries. But the isolation was overcome by the construction of highway and railway links in the mid 1950s. The population of Santa Cruz increased from 26,000 to 1.1 million in the last 35 years. Land reform, infrastructure improvements and colonization are the three main factors that influenced the influx into Santa Cruz in the 1950s. The new highway from Cochabamba to Santa Cruz and a railroad to Sao Paulo, Brazil allowed the transportation of goods and encourages commercial farming in this region. The government also facilitated new settlers coming into the region. The series of satellite images shows land use change due to human encroachment in forested areas surrounding Santa Cruz.



1975 (left)

The satellite image shows the status of Santa Cruz in 1975.

1992 (upper right)

Resettlement of the rural people from the Antiplano (the Andean high plains) is evident in the starburst patterns in the upper left. At the center of each is a small community including a church, bar/cafe, school, and a soccer field.

2000 (lower right)

The large corporate agricultural fields in the center of the imagery are producing soybeans for export. The dark green strips are windbreaks to prevent wind erosion of the very fine soils.

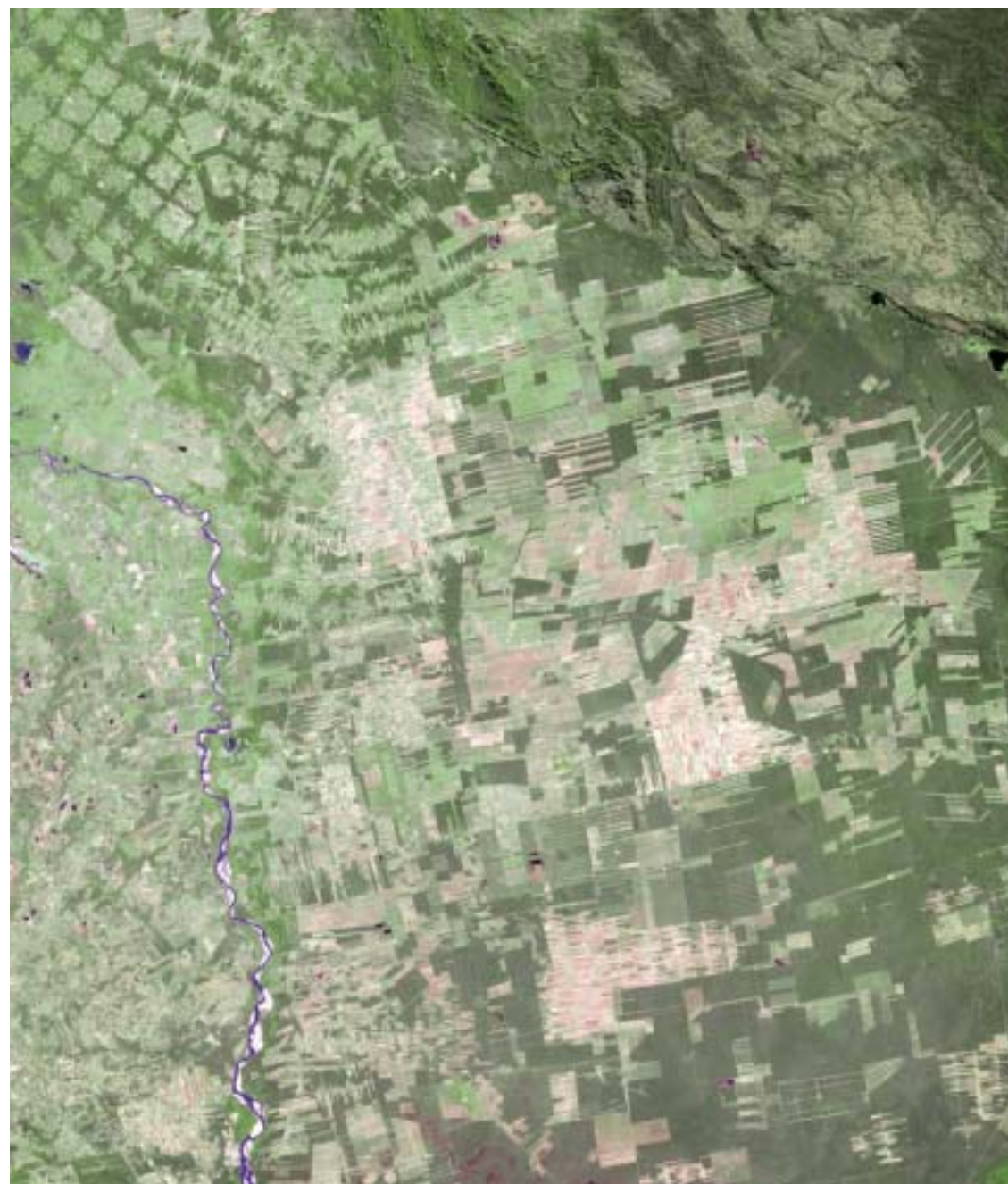


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Santiago, Chile

Urban Growth in Chile

Santiago is the capital of Chile and has more than one third (35.2%) of the country's total population of 5 million. The exponential population growth of Santiago is part of a national trend but also results from the city's ability to attract immigrants. Santiago's population growth has led to the horizontal expansion of the city. Chilean urban scholars speak of this expansion as the "urban stain" which, through a process of sub-urbanization, continually exceeds and expands the limits of the Metropolitan Region of Santiago (MRS), incorporating previously rural areas into the MRS. The salient characteristics of this urban sprawl are haphazard growth, low density housing, excessive public costs, poor transportation and air pollution.

Between 1970 and 2000, Santiago's population increased from 2.7 million to over 5.1 million. In spite of a population that has nearly doubled, these satellite images show surprisingly little growth in geographic urban area. In the image, green shows natural vegetation and dark pink shows urban areas in the center.



1975 (left)

The 1975 image shows the status of Santiago with a population of 2.9 million.

2000 (right)

The 2000 image shows expansion of urban areas in the city, now with a population of 5 million. This population growth has led to the horizontal expansion of the city principally towards the south and southeast.

