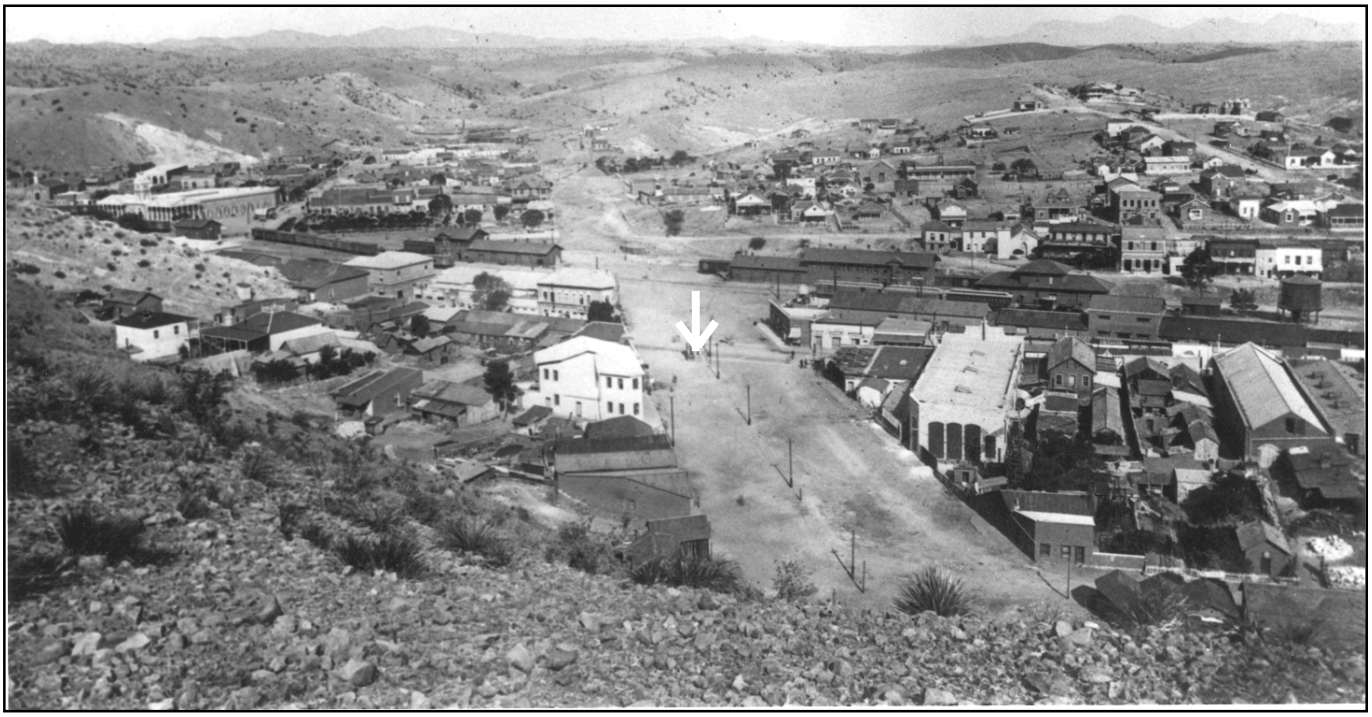
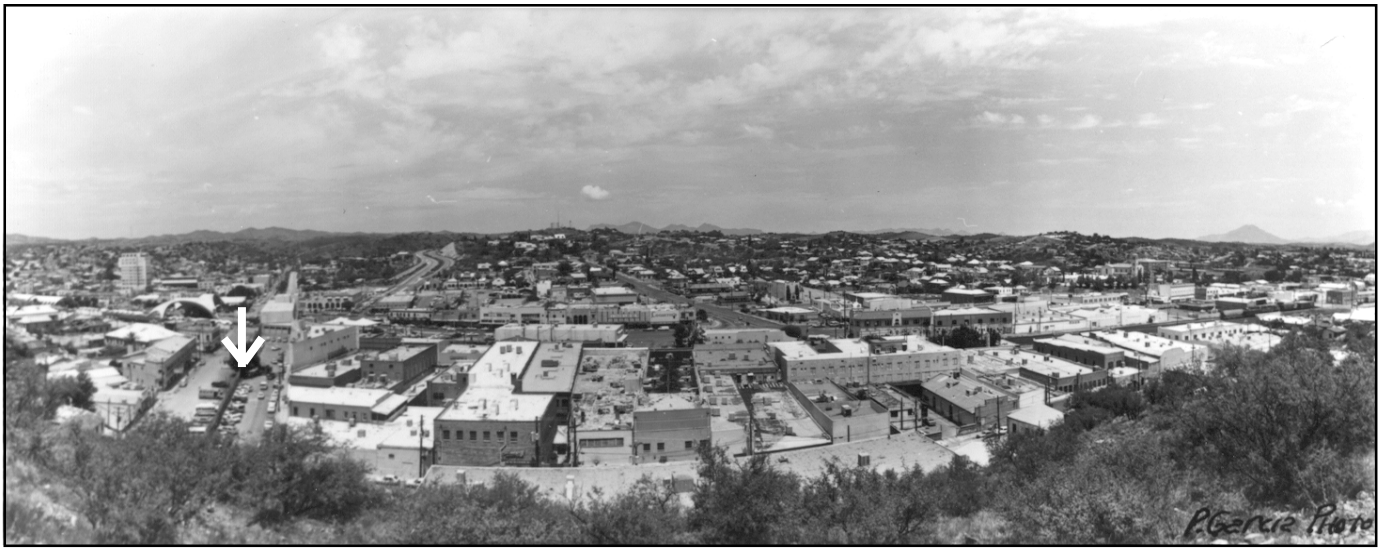
These images are from Ambos Nogales (Nogales, Sonora and Nogales, Arizona) at the U.S. – Mexico border. The photo is looking west (the U.S. is on the right). For reference, find the arrow that depicts the same location in each picture. Note the changes in vegetation as well as increased urban development.



U.S. – Mexico Border looking west. Ambos Nogales. 1897.



U.S. – Mexico Border looking west. Ambos Nogales. 1974

Photo courtesy of the Arizona Historical Society, Tucson.

Image Set #2

These images depict the Santa Cruz River looking downstream (northeast) from the lower slope of Sentinel Peak. The location is the confluence of the west and main branches of the Santa Cruz River in Tucson, Arizona. Deterioration of the riparian vegetation is evident due to groundwater depletion, urbanization, and arroyo cutting. Many other southwestern floodplains have undergone similar changes, including reaches of the Rio Grande, the Salt River, and the Gila River.

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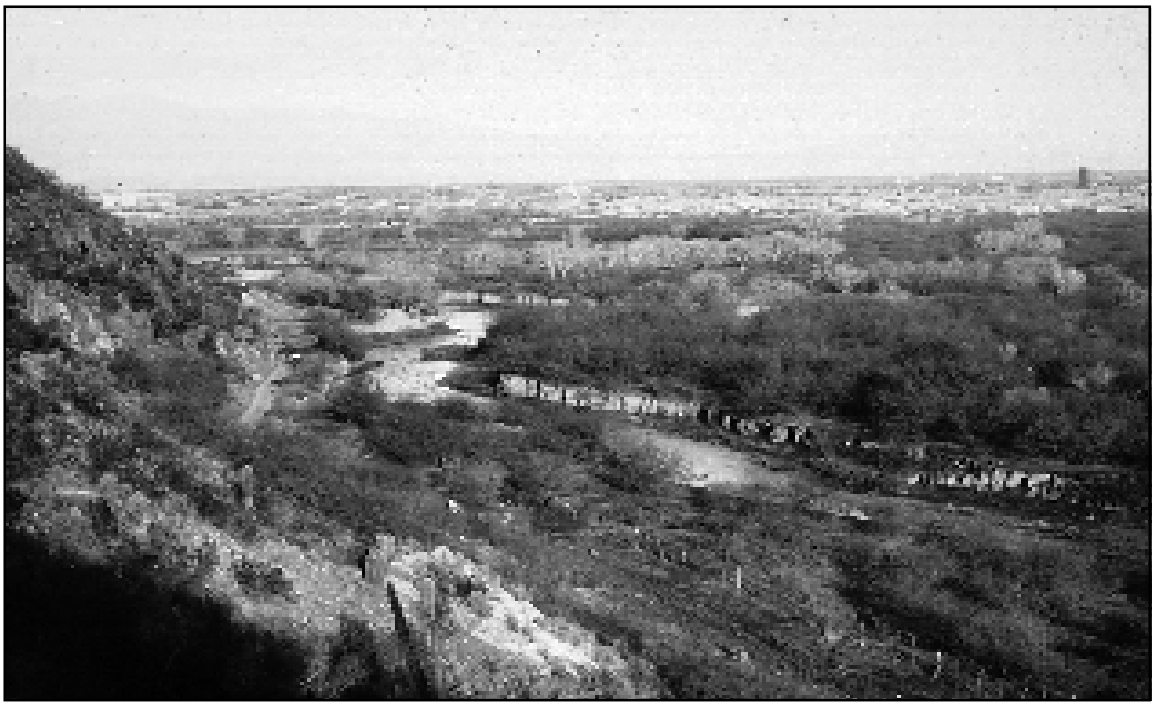
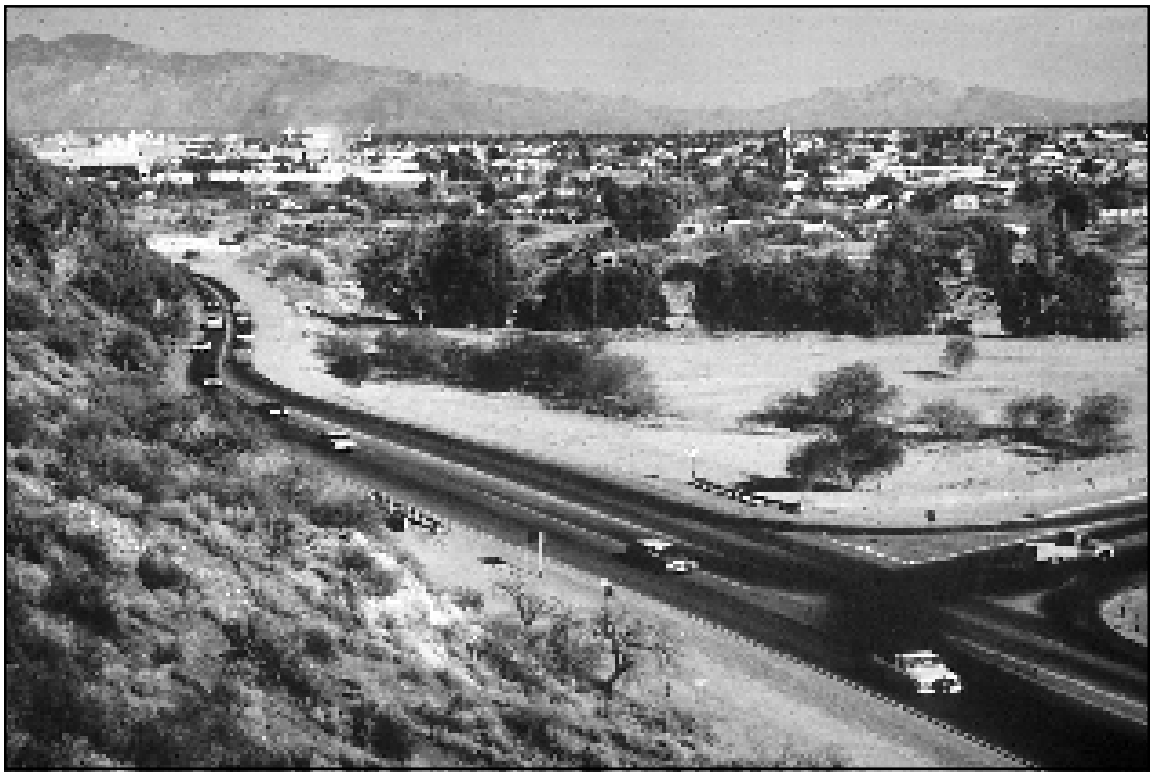


Santa Cruz River looking northeast from Sentinel Peak. Tucson, Arizona. 1904.

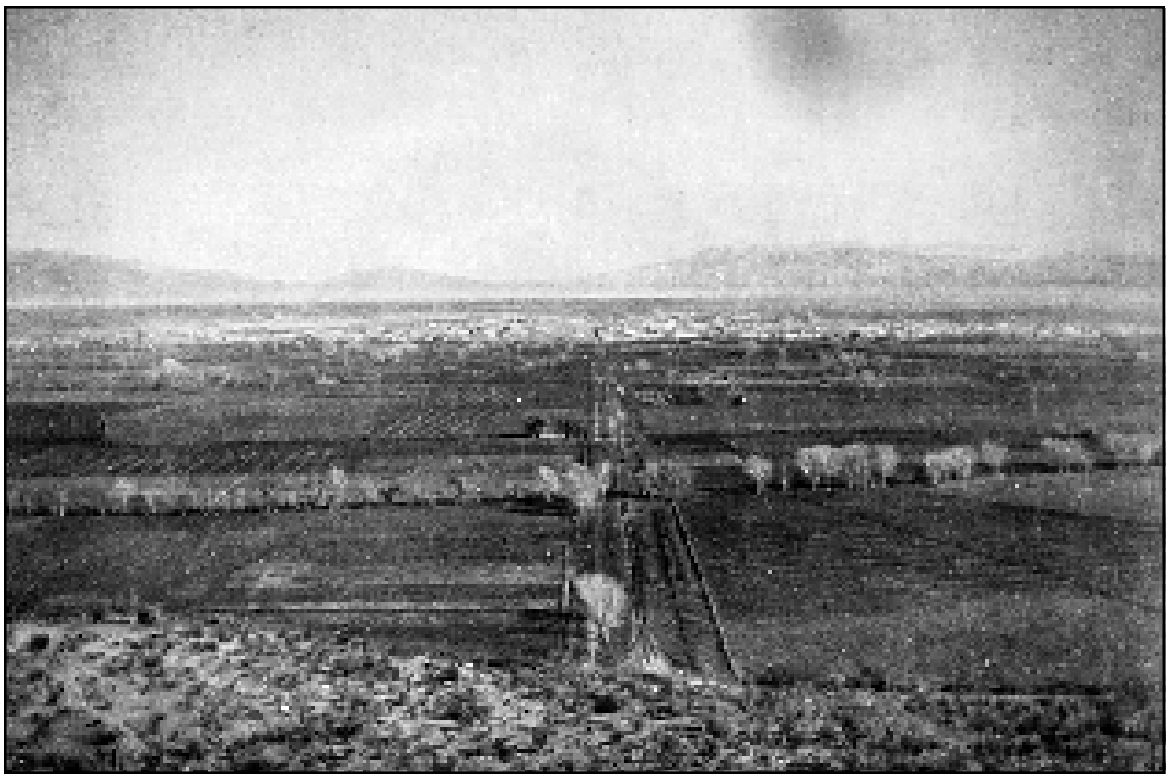


Santa Cruz River looking northeast from Sentinel Peak. Tucson, Arizona. 1981.

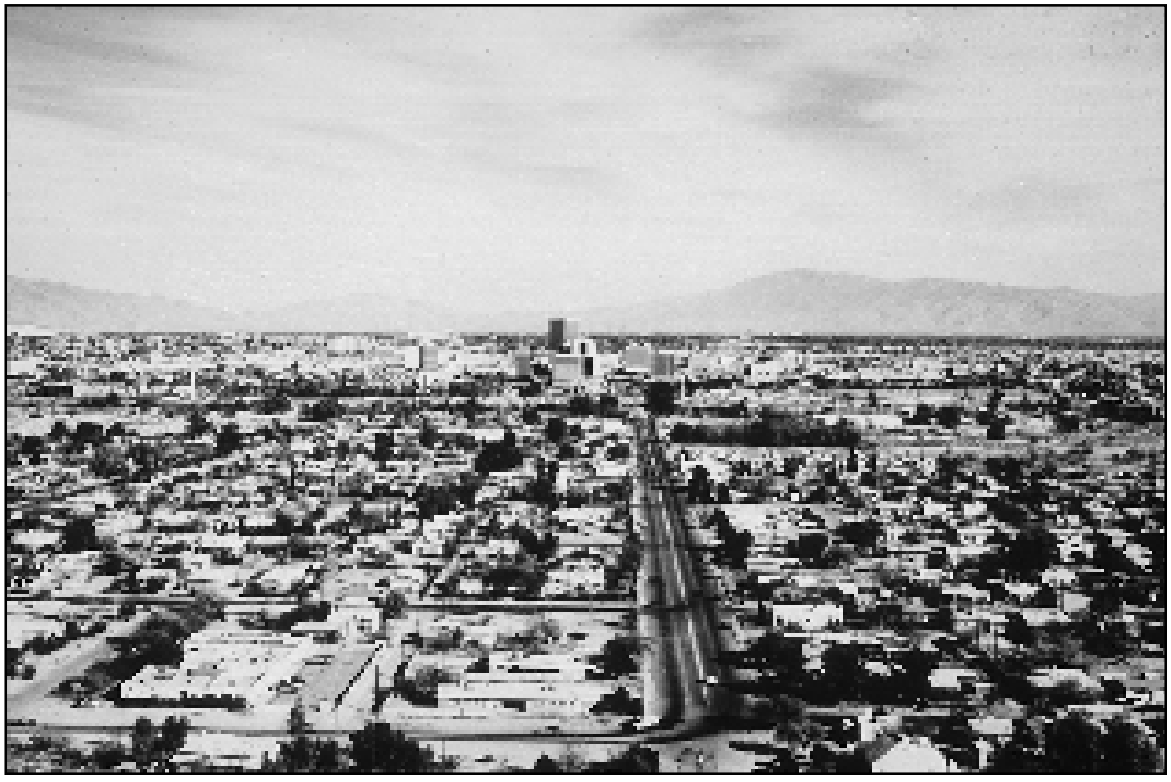
Photos: 1904, unknown; 1981, R.M. Turner y J.L. Betancourt .

Image Set #3

These images are of the Santa Cruz River floodplain in Tucson, Arizona. The images are looking from west to east across what is now downtown Tucson. The floodplain (like so many southwestern floodplains) has been heavily urbanized; restoration of the floodplain is clearly no longer possible.



Santa Cruz River Floodplain. Tucson, Arizona. 1890s.

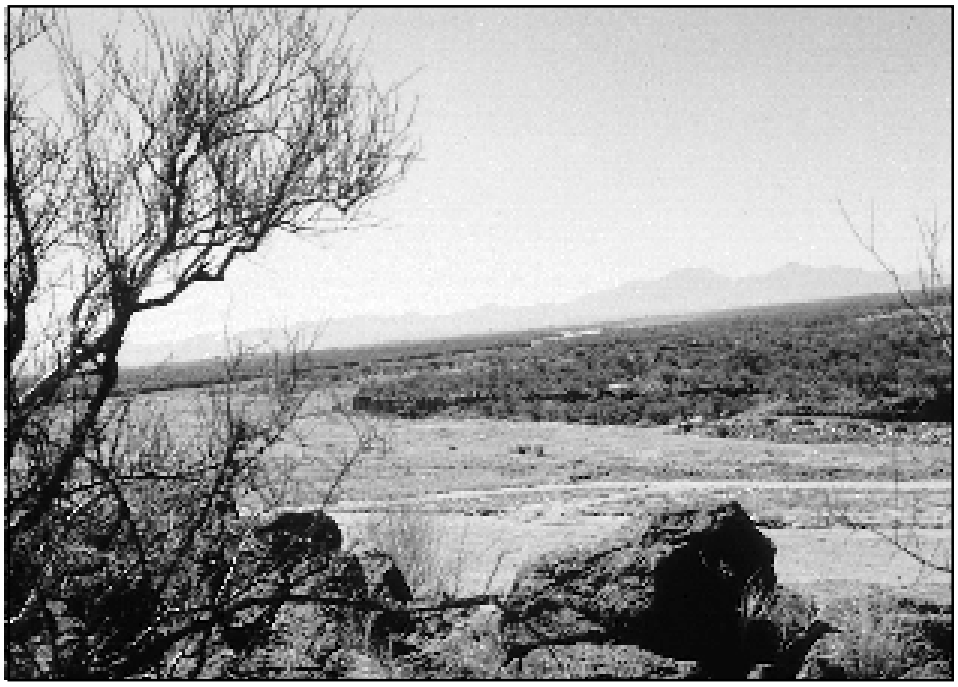


Santa Cruz River Floodplain. Tucson, Arizona. 1980.

Image Set #4

These images depict the Santa Cruz River within the San Xavier District of the Tohono O'odham Nation. Since World War II, ground-water withdrawals have reduced wetlands and riparian vegetation in many southwestern valleys including the Santa Cruz. Mining of ground water in the Tucson Basin, for example, destroyed these mesquite forests in the bottomlands of the San Xavier District. Deep arroyo-cutting follows the loss of the trees. When floodplains are so radically changed, recovery is nearly impossible.

Santa Cruz River within the San Xavier District of the Tohono O'odham Nation. 1940.



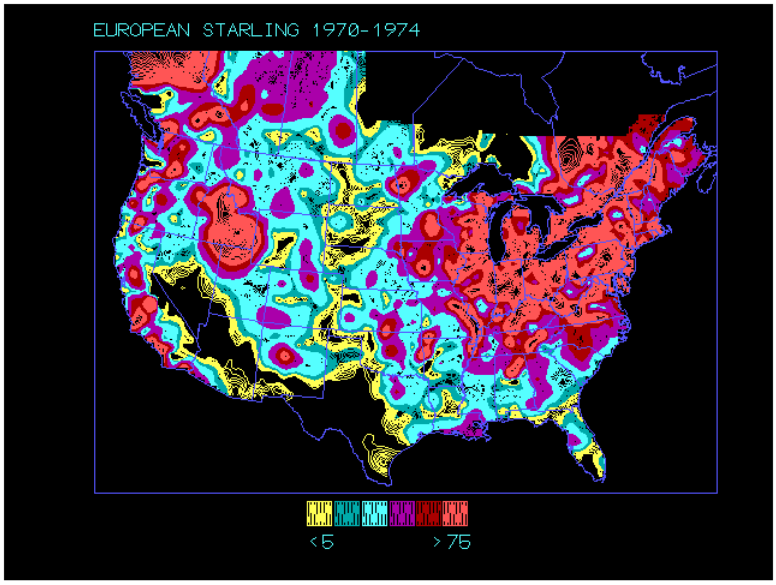
Santa Cruz River within the San Xavier District of the Tohono O'odham Nation. 1982.

Photos: 1940, unknown; 1982, C.D. Allen, J.L. Betancourt and T.W. Swetnam.

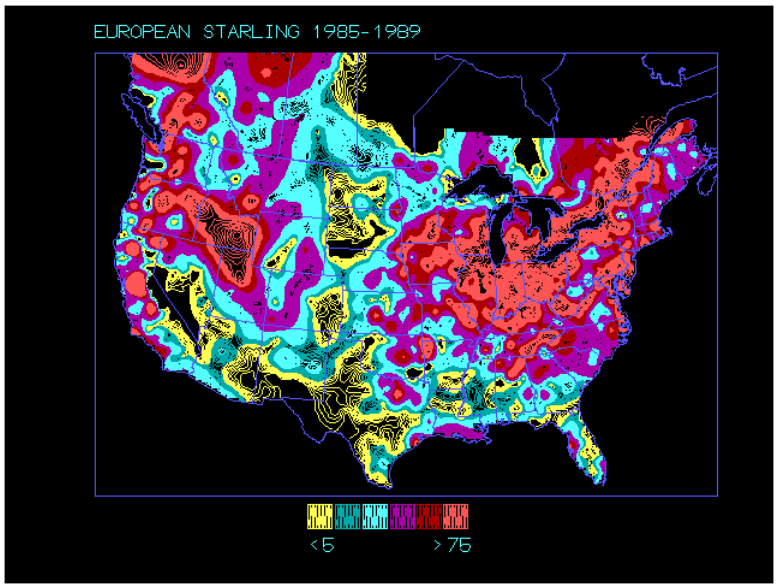
STUDENT ACTIVITY
Image Set #5

EUROPEAN STARLING

The following maps depict the distribution of the European Starling in the United States from 1970 through 1989. The starling, a bird originally from Europe, was introduced into New York City in 1890. It has since spread across the continent including into Canada and Mexico. These maps were generated from data gathered every year during breeding bird counts. The numbers in the key refers to the numbers of individual birds counted. Note the increases as well as the decreases. Remember, before 1890 the entire map would have been black as no starlings existed anywhere in North America.



Eurpoean starling numbers 1970 - 1974.



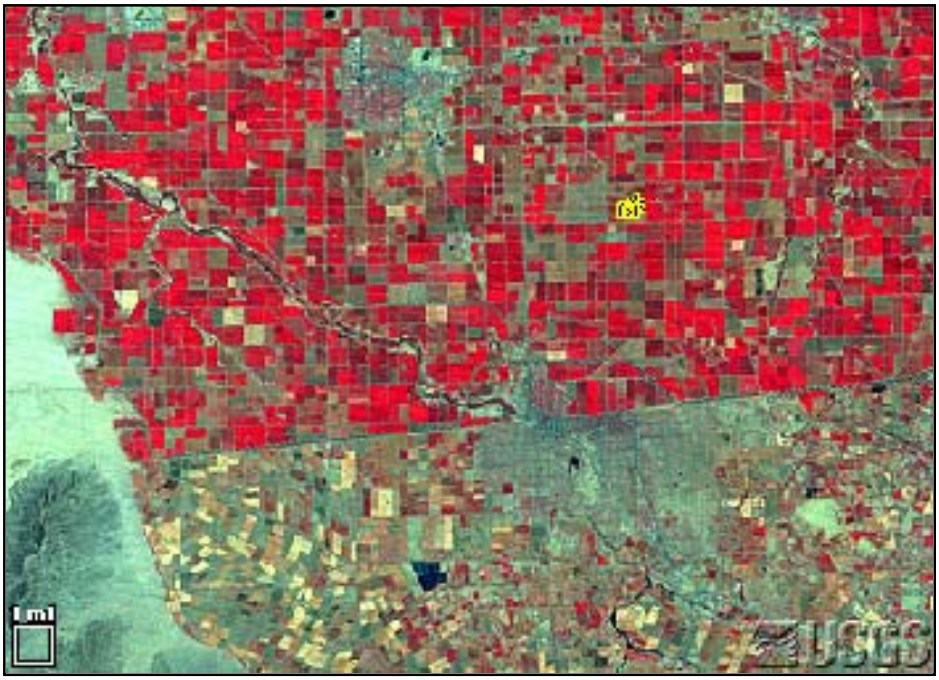
European starling numbers 1984 - 1989.

Photos by Jeff Price. 1995.

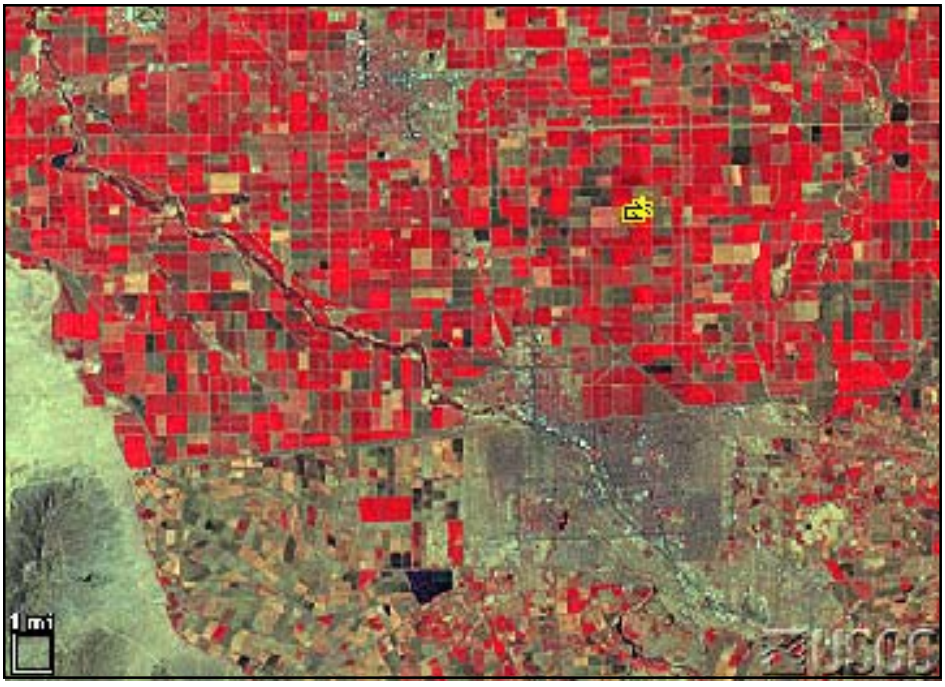
STUDENT ACTIVITY
Image Set #6 (part one)

MEXICALI - CALEXICO

1973. The image below shows El Centro, California, and the urban area of Mexicali/Calexico on the border. The population of these cities in 1970 were as follows: El Centro - 19,272; Calexico - 10,625; Mexicali - 459,900.



1992. The image below shows El Centro, California, and the urban area of Mexicali/Calexico on the border. The population of these cities grew from 1970 to 1990 as follows: El Centro - 19,272 to 31,384 (63%); Calexico - 10,625 to 18,633 (76%); Mexicali - 459,900 to 712,400 (55%).



STUDENT ACTIVITY
Image Set #6 (part two)

MEXICALI - CALEXICO

Landsat Remote Sensing

These sattelite images were taken by the Landsat remote sensing system. Scientists use Landsat satellites to gather remotely sensed images of the land surface and surrounding coastal regions for global change research, regional environmental change studies and other civil and commercial purposes. Landsat images have a spatial resolution of 30 meters (98 feet) and include spectral spectral bands in the visible, near-infrared, short-wave, and thermal infrared regions of the electromagnetic spectrum. Landsat imagery provides critically important information for monitoring agricultural productivity, water resources, urban growth, deforestation, and natural change due to fires and insect infestations. The data have also been used successfully for mineral exploration, to measure forest cover at the state level, and to monitor strip mining and strip mine reclamation.
The Landsat system offers the unique capability to seasonally monitor important small-scale processes on a global scale, such as the inter- and intra-annual cycles of vegetation growth; deforestation; agricultural land use; erosion and other forms of land degradation; snow accumulation and melt and the associated fresh-water reservoir replenishment; and urbanization. Both man-made (deforestation) and natural changes (glacial recession) are often initiated at scales requiring high resolution for early detection. Landsat images are able to provide the resolution needed to monitor global environmental change.

What the Colors Mean

Landsat images show how much energy from the sun (electromagnetic radiation) was being reflected or emitted off the Earth's surface when the image was taken. Clear water reflects little radiation, so it looks black. Pavement and bare ground reflect a lot of radiation, so they look bright. Urban areas usually look light blue-gray. Vegetation absorbs visible light but reflects infrared, so it looks red. This is a customary way to show satellite images.

Images from: http://www.usgs.gov/Earthshots

Sells, Arizona 1914. Looking east from “High Store” hill.

Sells, Arizona 2000. Looking east from “High Store” hill.

Photo: 1914, unknown; 2000 Peter Ruiz