National Aeronautics and Space Administration

Landsat's Critical Role in Protecting Human Health

People have long recognized the connection between the environment and human health. Various animal and insect species from mice to mosquitoes serve as vectors that can transmit disease pathogens to people. Malaria is among the most deadly, preventable vector-borne diseases. About half of the world's population (3.3 billion people) is at risk of contracting malaria from mosquitoes, according to the World Health Organization. Other human health problems such as cancer arise from exposure to pollutants in the environment. Finally, malnutrition can follow crop-destroying natural disasters such as drought or floods in poor regions.

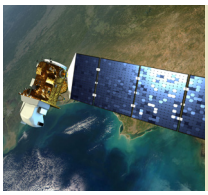
Landsat measurements can help decision makers pinpoint and minimize environmental health risks. With a spatial resolution of 30 meters, Landsat is well suited to mapping various components of changing landscapes, including agriculture and urbanization, that might pollute waterways. This level of detail can also show where water has accumulated in depressions to become breeding grounds for disease-carrying insect vectors.

Landsat measures reflected light in both visible wavelengths and infrared wavelengths. This combination of measurements helps scientists gauge how healthy vegetation is, since growing plants generally absorb red light and reflect infrared light. Knowing the health of plants informs decision makers about cropland productivity and habitat conditions for disease-carrying insects and animals.

Image courtesy of IFRC/Maggie Hallahan/Olyset Nets

Landsat Data for Decision Making

- Mapping and Predicting Vector-Borne Diseases
- Protecting Food Sources
- Cancer Research



ABOUT LANDSAT

Landsat satellites provide an unparalleled record of Earth's varying landscapes. Landsat's 30-meter resolution is ideal for measuring human impacts on the land. The consistency of Landsat's digital image data from sensor to sensor and year to year makes it possible to trace land cover changes from 1972 to the present.

Landsat and Human Health

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Remote Sensing to Help Map Disease

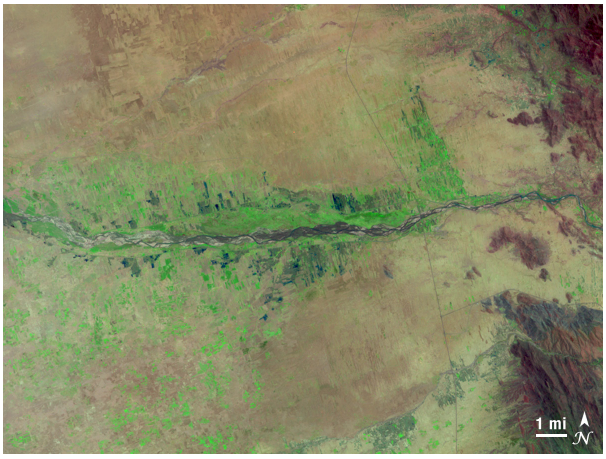
From the vantage point of space, scientists can identify key habitats for disease-carrying animals and insects. Landsat's 30-meter resolution reveals aquatic mosquito habitats in malaria-stricken areas and pockets of moist vegetation in arid areas where hantavirus-carrying rodents may live. This information allows health officials to take preventative measures such as spraying pesticide to control larval populations. Scientists combine 30-meter Landsat data with less detailed daily satellite data of weather and vegetation to identify conditions conducive to disease outbreaks before an outbreak occurs. Other vector-borne diseases whose habitats can be monitored by Landsat include Rift Valley Fever, Lyme disease, and dengue fever.

Protecting Food Sources

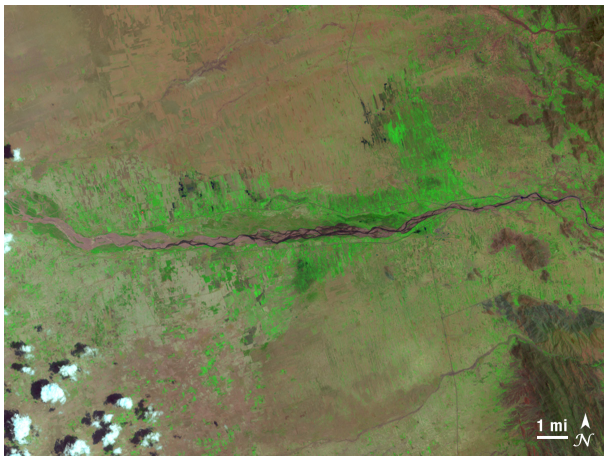
For many decades, agricultural agencies have estimated global crop production to stabilize agricultural commodity prices and guarantee food security. Landsat's measurements of reflected light and emitted energy help crop analysts and farmers identify crops that are infested with disease or pests, which in turn has helped farmers manage crops and provide safe food to consumers. Landsat data has also been used to estimate mercury loading in rivers and lakes, and protect anglers from consuming harmful levels of mercury in fish.

Landsat Data Collaborates For Cancer Research

Scientists have associated certain cancers, reproduction complications and some neurological disorders with chemicals used in agriculture. In 2006, human health scientists started using Landsat imagery to identify land cover features of agriculture areas. By observing specific crop types, irrigation practices and large animal feeding operations, scientists are hoping to curb exposure to agriculture chemicals and improve water quality by reducing feedlot runoff. The landscape-scale view of these hazards provided by Landsat is valuable because human health and water quality effects may be spread across large geographical areas. Landsat's continuous data record can also help scientists track exposure and impacts over several decades by reconstructing historical land use and land cover information.



May 2000



September 2000

Healthy plants are bright green against the tan desert landscape in these images of western Yemen taken by Landsat 7 in 2000. Green areas and standing water (dark blue and black) provide possible habitats for mosquitoes carrying Rift Valley Fever.

Further Reading

Collaboration for cancer research
http://1.usa.gov/SywgpU

Mapping Rift Valley Fever outbreak risk areas
http://1.usa.gov/TIu9kC

Monitoring lake inventories and health
http://1.usa.gov/Uom9Ua

U.S. uses Landsat satellite data to fight hunger, poverty
http://1.usa.gov/TD0GWK

NASA Landsat http://www.nasa.gov/landsat

Landsat Science http://landsat.gsfc.nasa.gov

USGS Landsat http://landsat.usgs.gov/

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