



Land Cover Matters

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Greenbelt, Maryland



Image by: Smith, Nelson, Heister
Laboratory for Atmospheres
Goddard Space Flight Center
http://rsl.gsfc.nasa.gov/



Hurricane Linda west of Mexico
September 9, 1997 17:45 UTC
Data from: NASA, NOAA, USGS





<http://svs.gsfc.nasa.gov/goto?30082>



<http://svs.gsfc.nasa.gov/goto?30180>

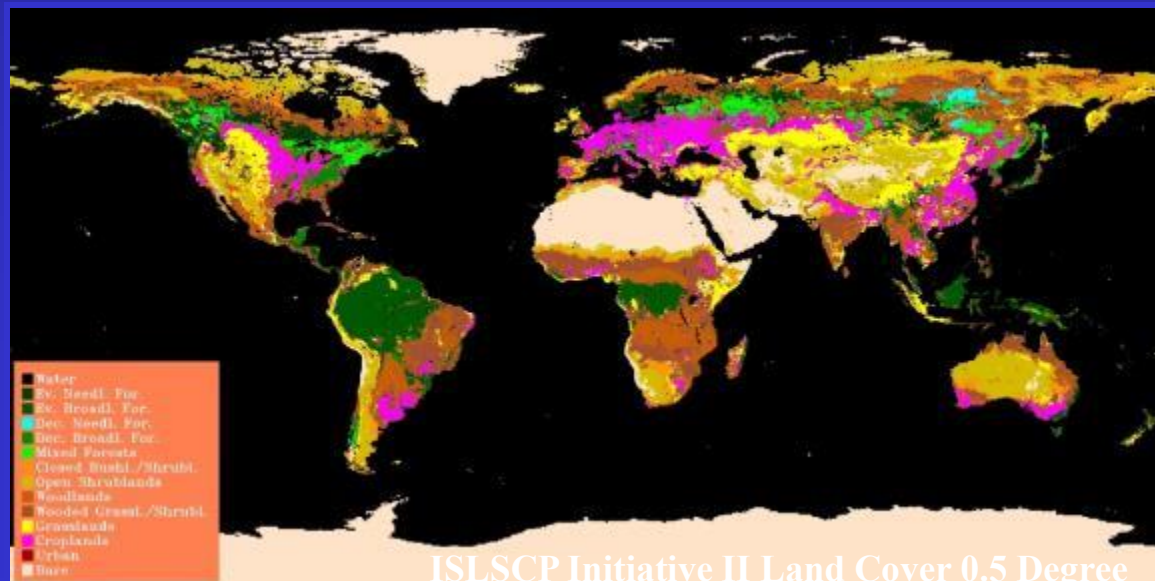
NASA Research Addresses Broad Questions



- How are global ecosystems changing?
- What changes are occurring in global land cover and land use, and what are their causes?
- How is the Earth's surface being transformed and how can such information be used to predict future changes?
- What are the consequences of land cover and land use change for the sustainability of ecosystems and economic productivity?

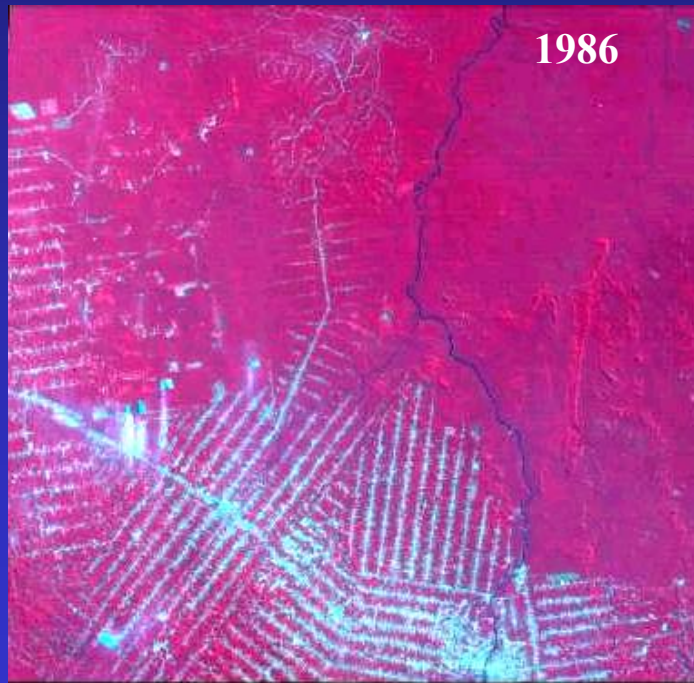
Land Cover Matters

- Land Cover is a principal factor controlling the exchange of energy, water, gases, and nutrients within and between the Earth systems.
- Important for global change modeling:
 - Boundary conditions for General Circulation Models (GCM).
 - Global biogeochemical and hydrological models.
- Land cover/use change impacts carbon, water and energy at all spatial scales...
- But also biodiversity, resource management, fire/disaster monitoring...

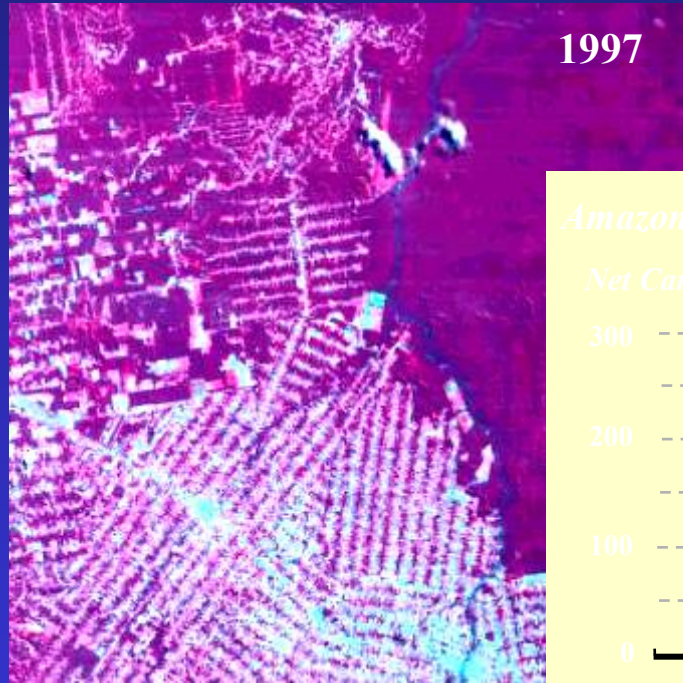


Land Cover Change

- These images show the impact of deforestation in the Amazon on the carbon cycle.



1986

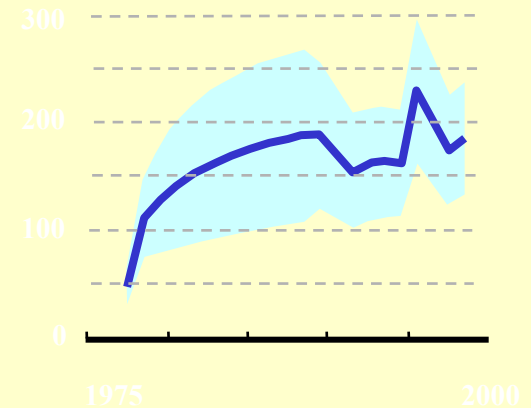


1997

100 km

Amazonian Carbon Fluxes

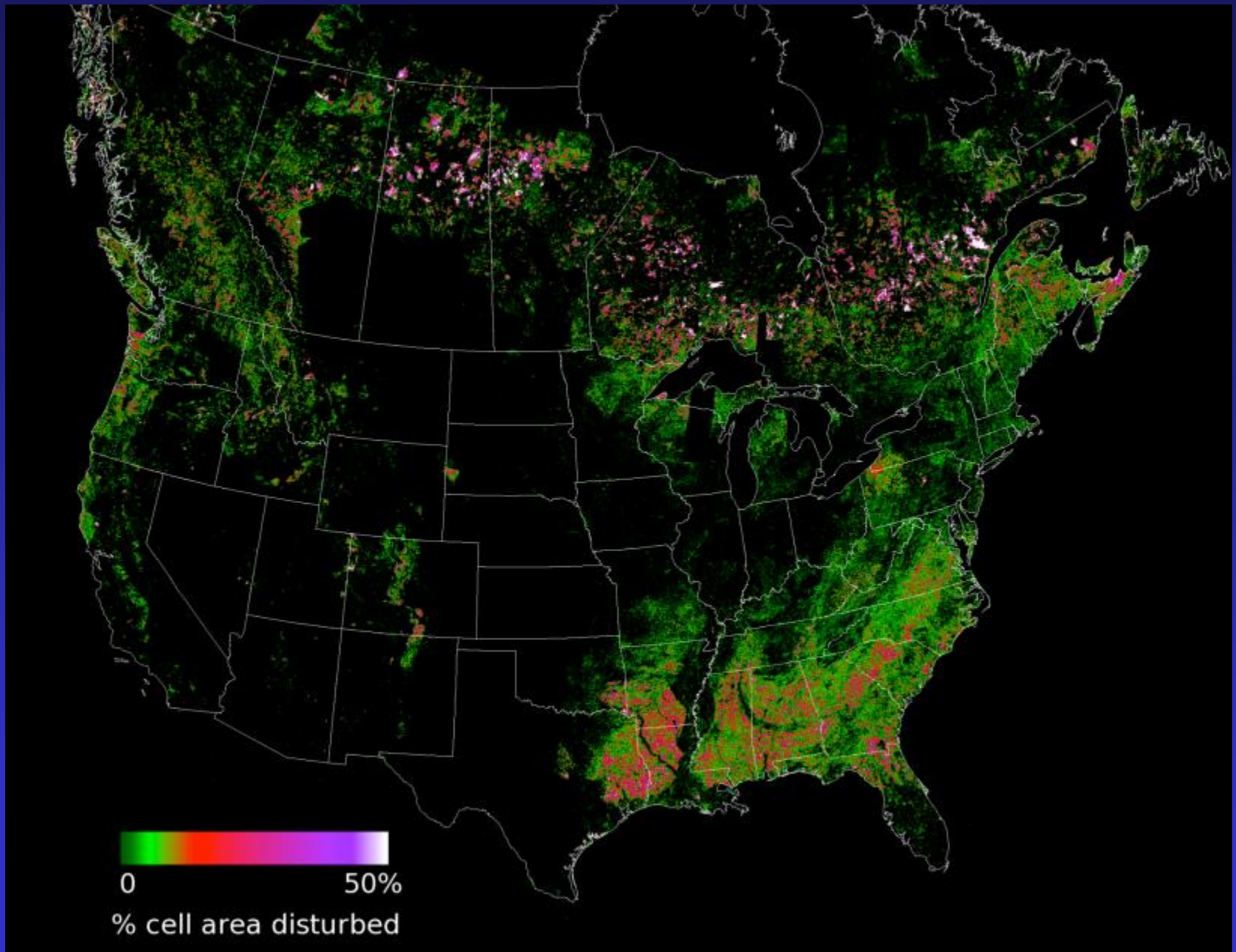
Net Carbon Flux (Tg C yr⁻¹)





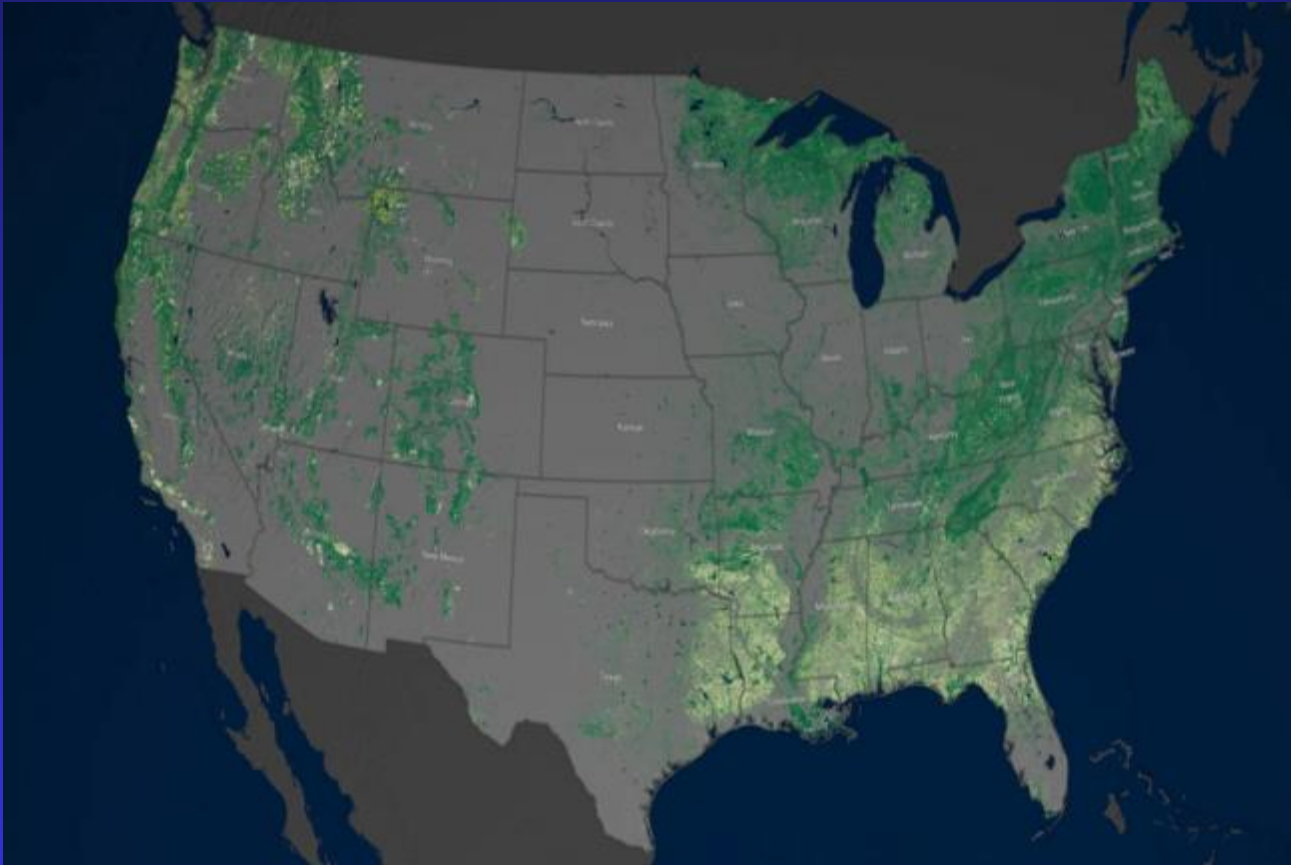
<http://ledaps.nascom.nasa.gov>

Continental Scale Forest Disturbance



<http://ledaps.nascom.nasa.gov>

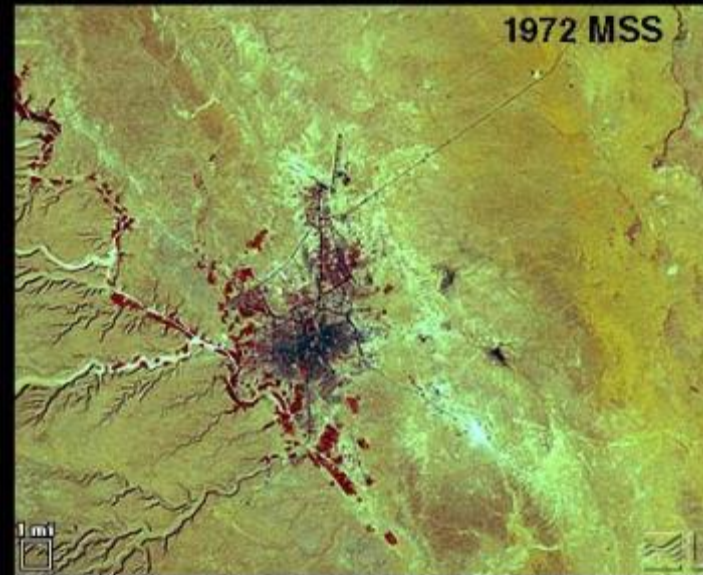
Forest Change Video



<http://svs.gsfc.nasa.gov/goto?4399>

Global Urban Growth

Riyadh, the national capital of Saudi Arabia, is shown in 1972, 1990 and 2000. Its population grew in these years from about a half million to more than two million.



*NASA/GSFC/MITI
/ERSDAC/JAROS,
and U.S./Japan
ASTER Science
Team*

Studying Urbanization from Space

Urban growth and sprawl can have significant impacts on:

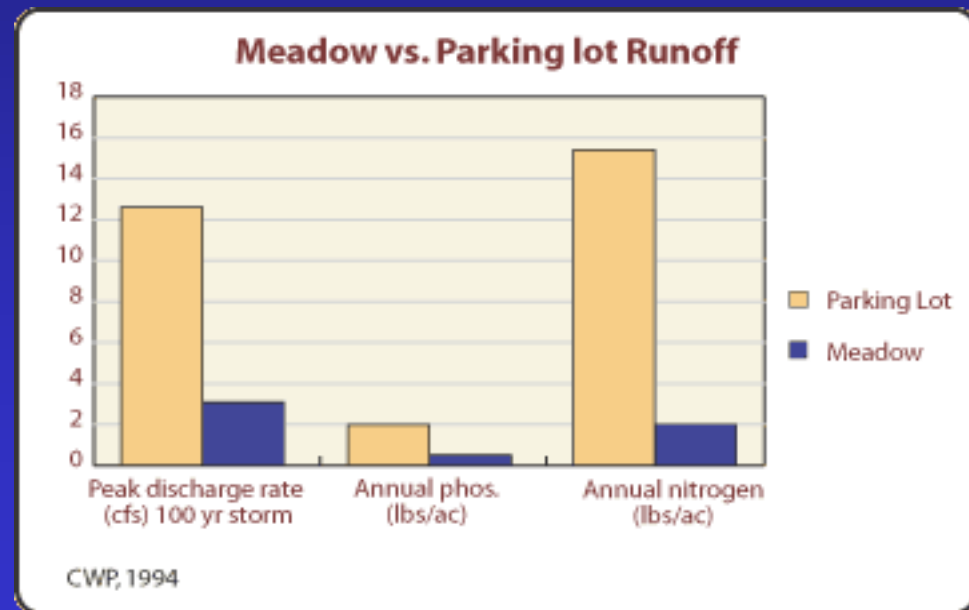
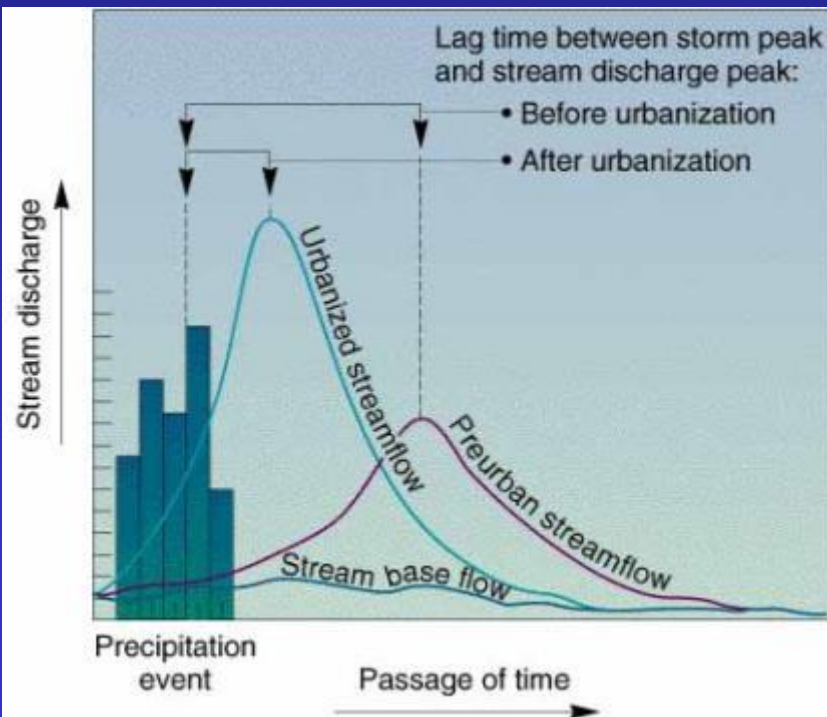
- Local meteorology (e.g. Urban “Heat Islands”).
- Hydrology through increased runoff and/or modified streamflow dynamics.
- Air pollution and water quality.

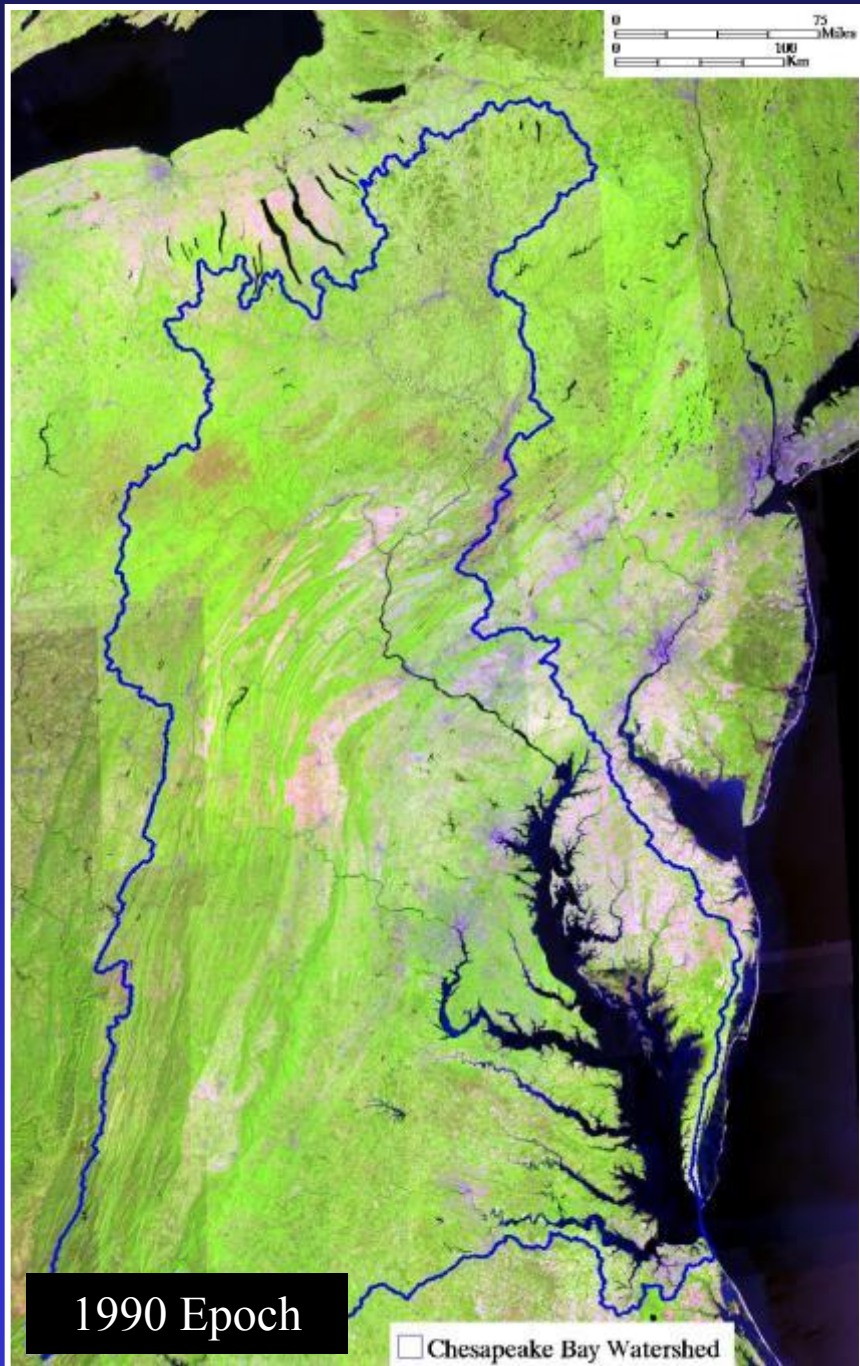
NASA Applications



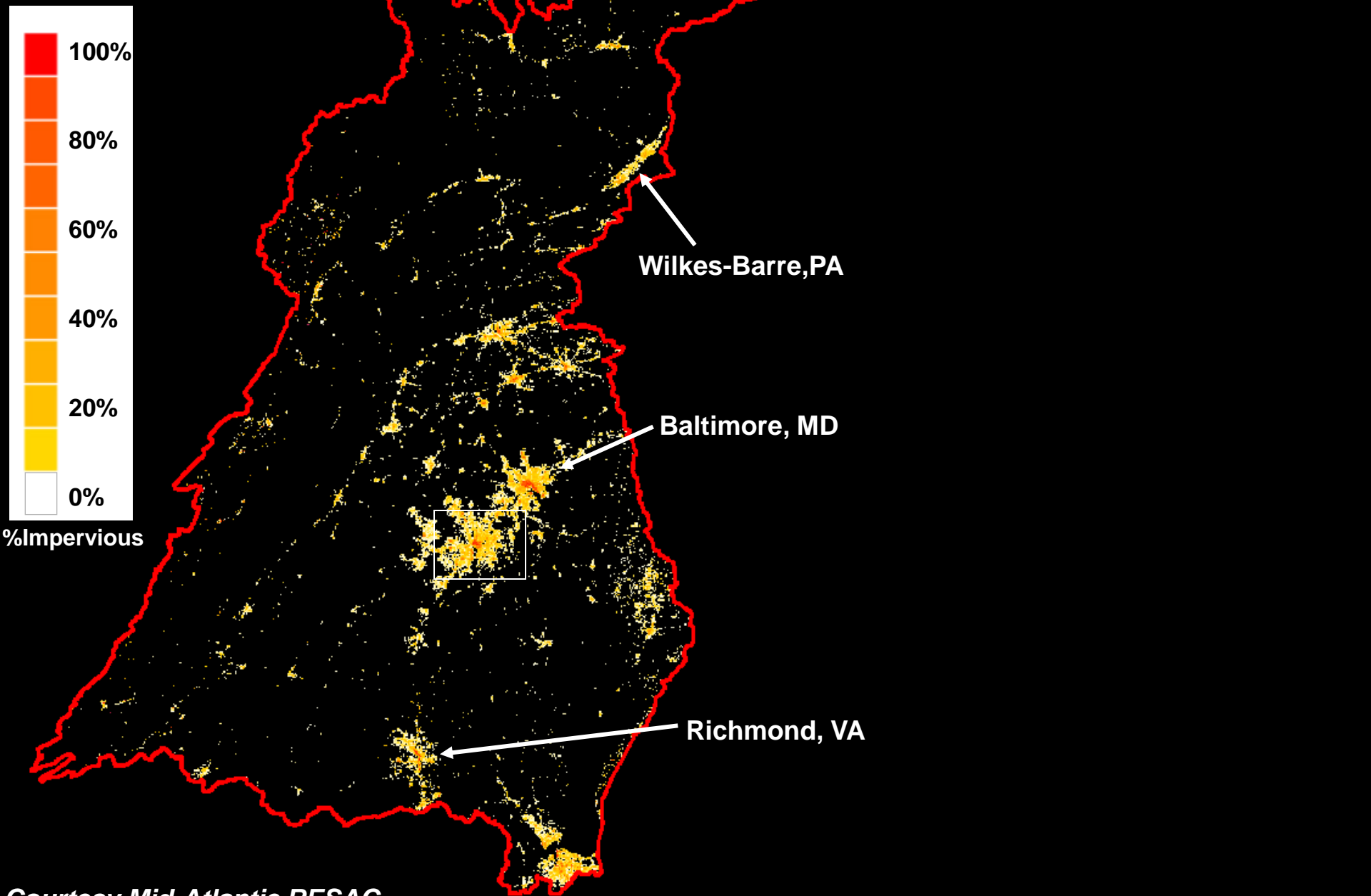
Community Growth

Scientists use Landsat data to generate accurate maps of urban extent and track the changes in impervious surfaces over time.

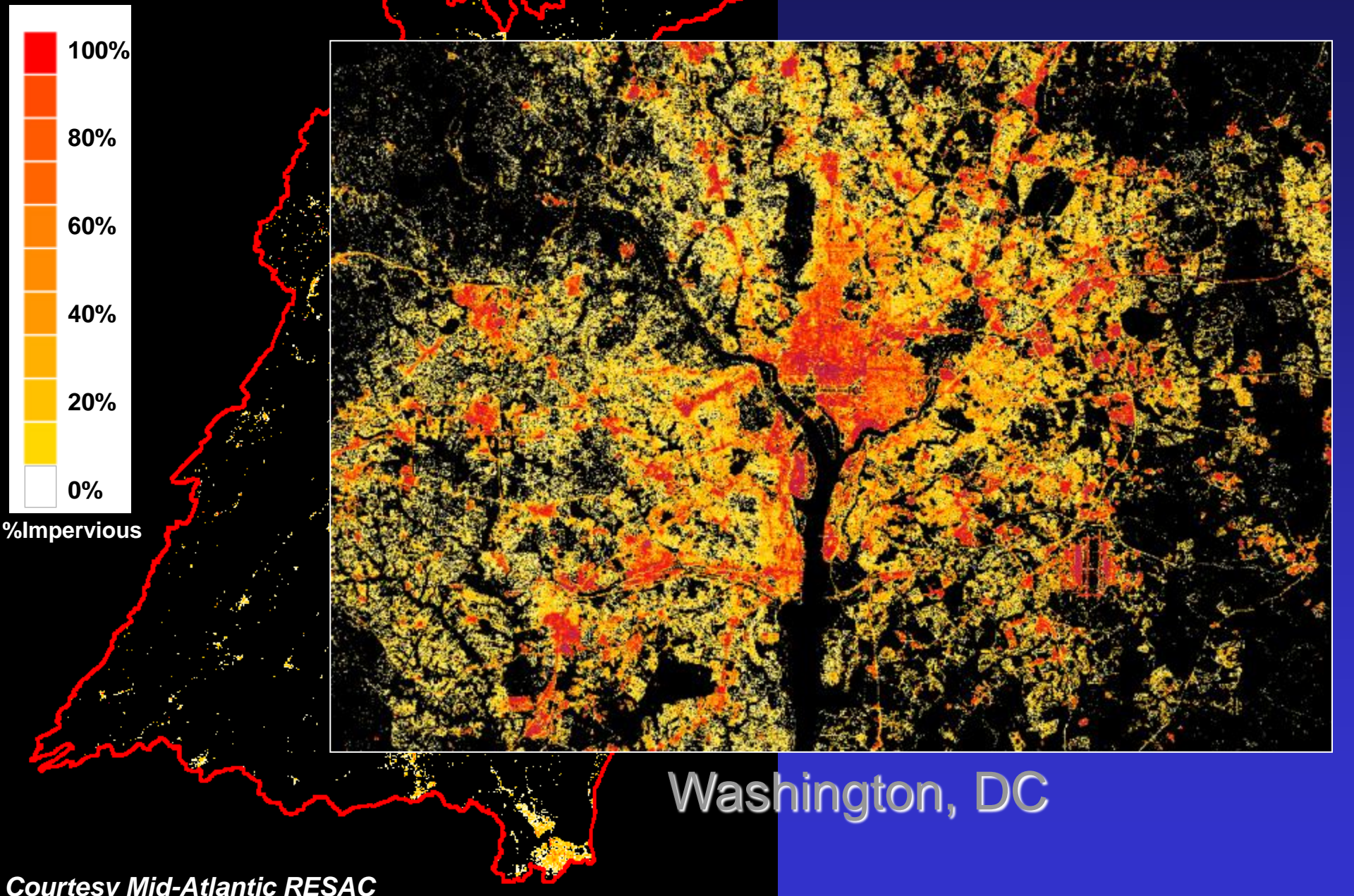




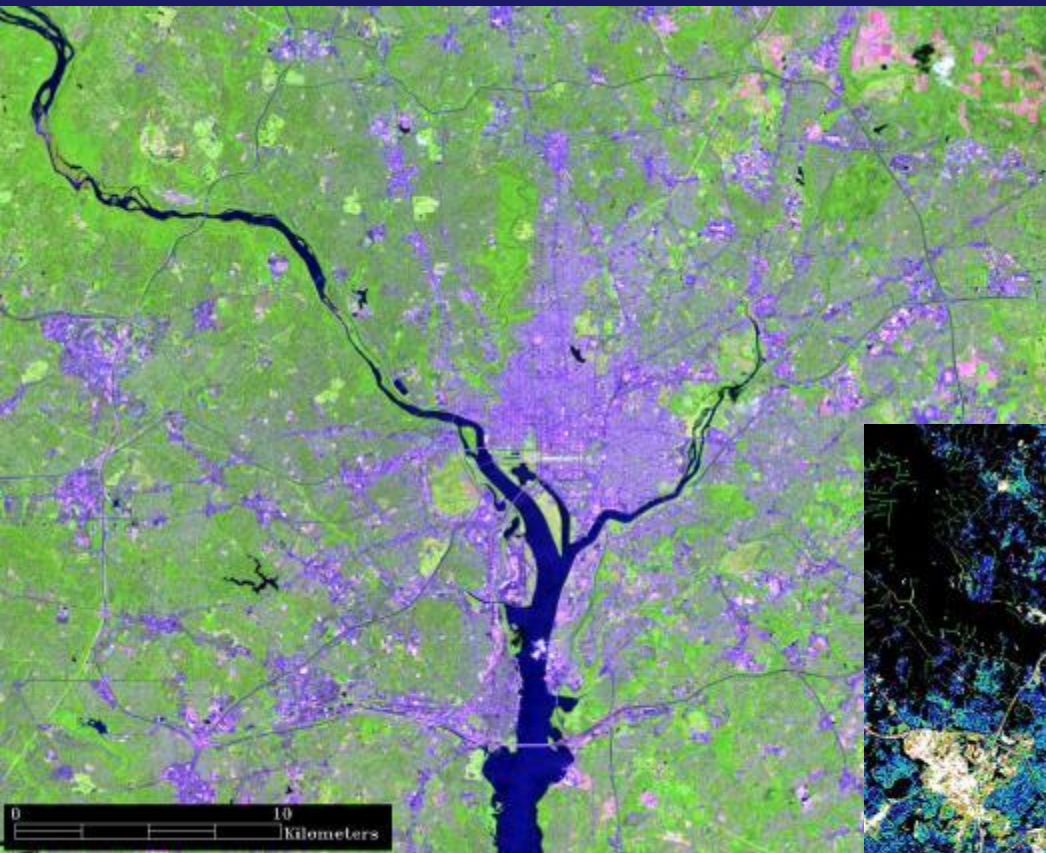
Impervious Surface Area Mapping of the Chesapeake Bay Watershed



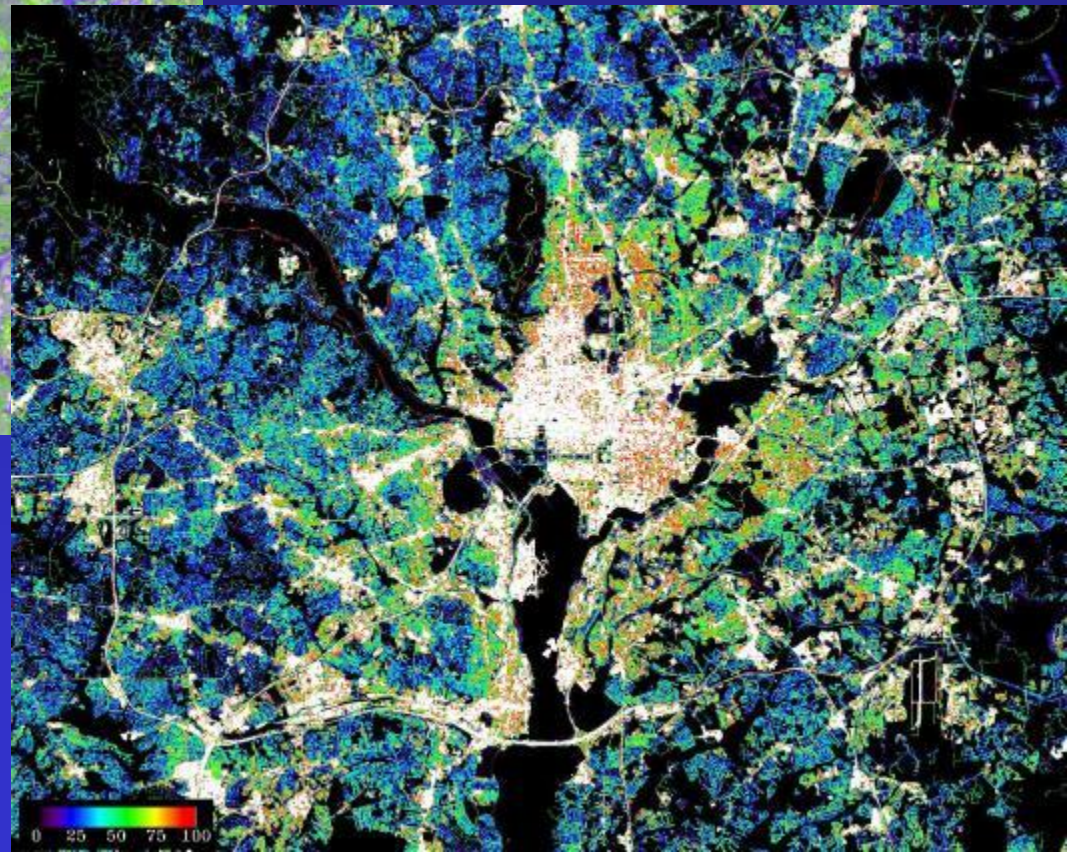
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Full Resolution Results



Washington, D.C., USA

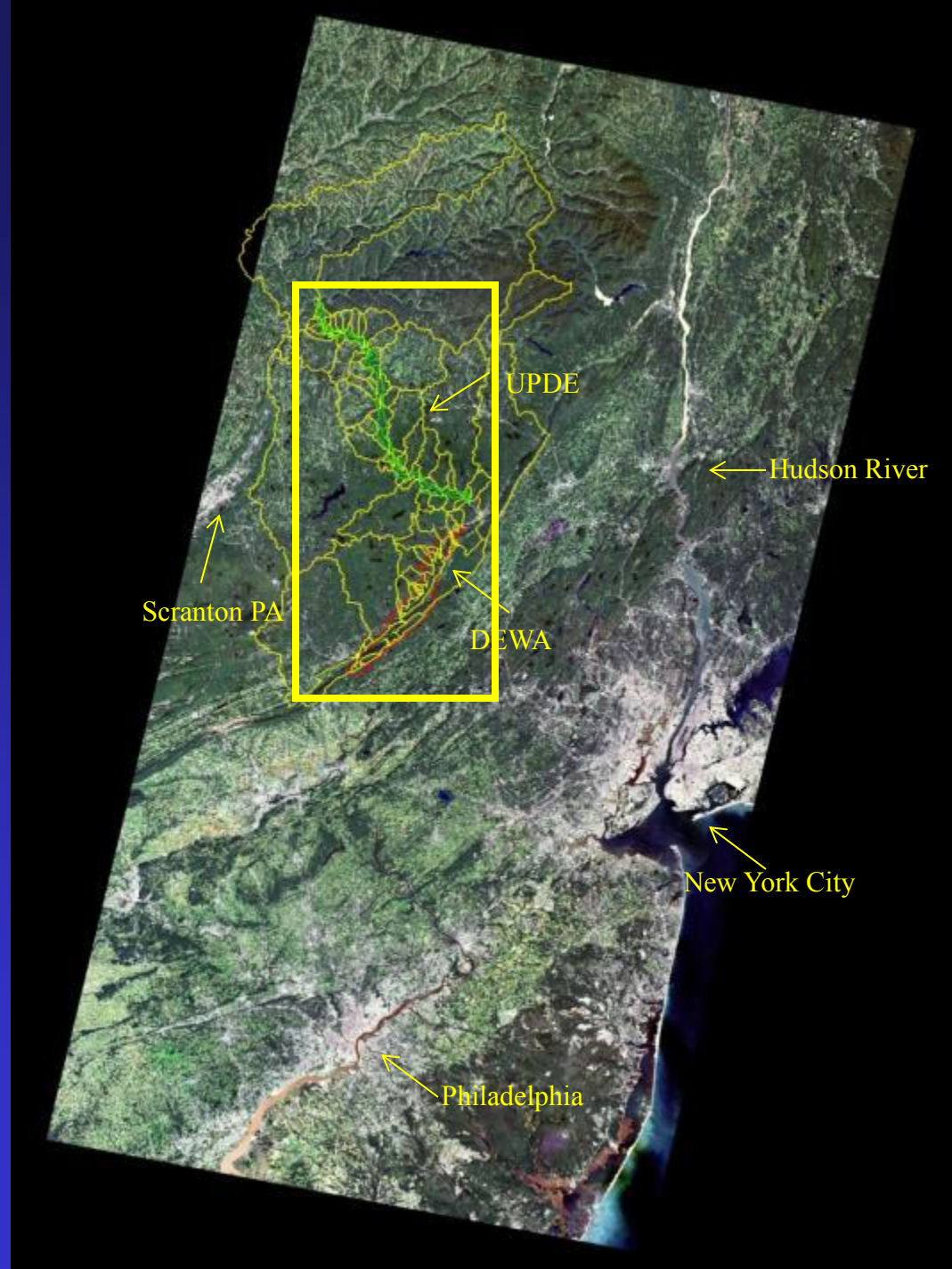


Mosaic of two Landsat ETM+ scenes

Acquired on September 23, 1999
(3,2,1)

The area of study is the Upper Delaware River Basin (Yellow) and includes several counties in PA, NY, NJ

The two parks being studied are Delaware Water Gap National Recreation Area (Red**) and Upper Delaware Scenic and Recreational River (**Green**)**

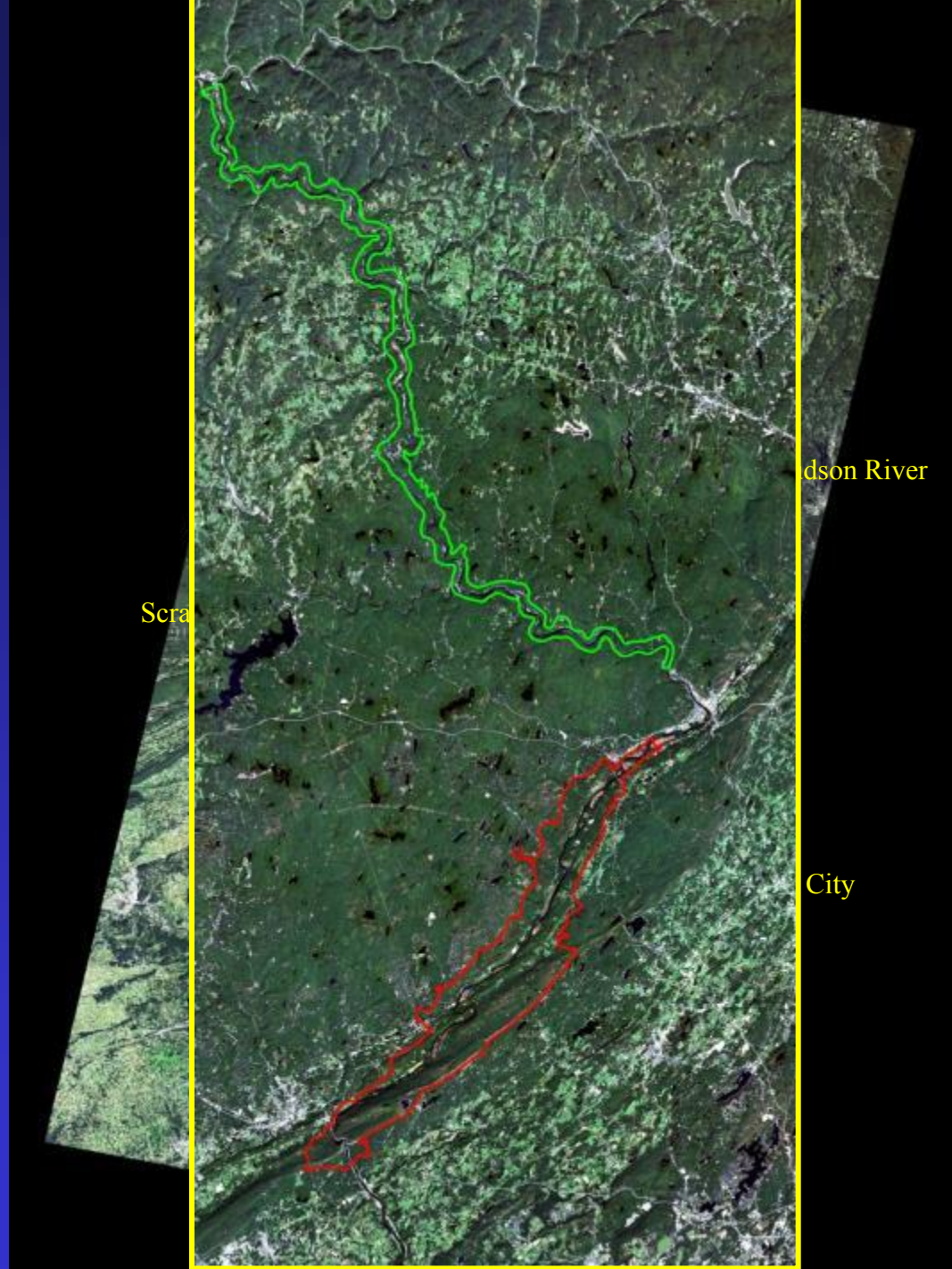


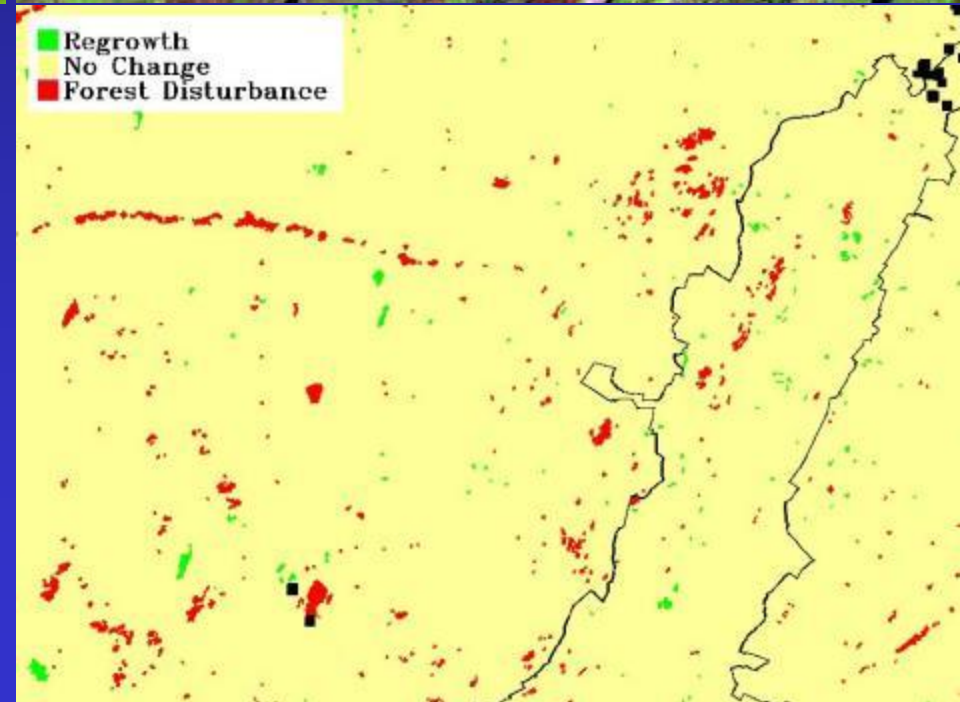
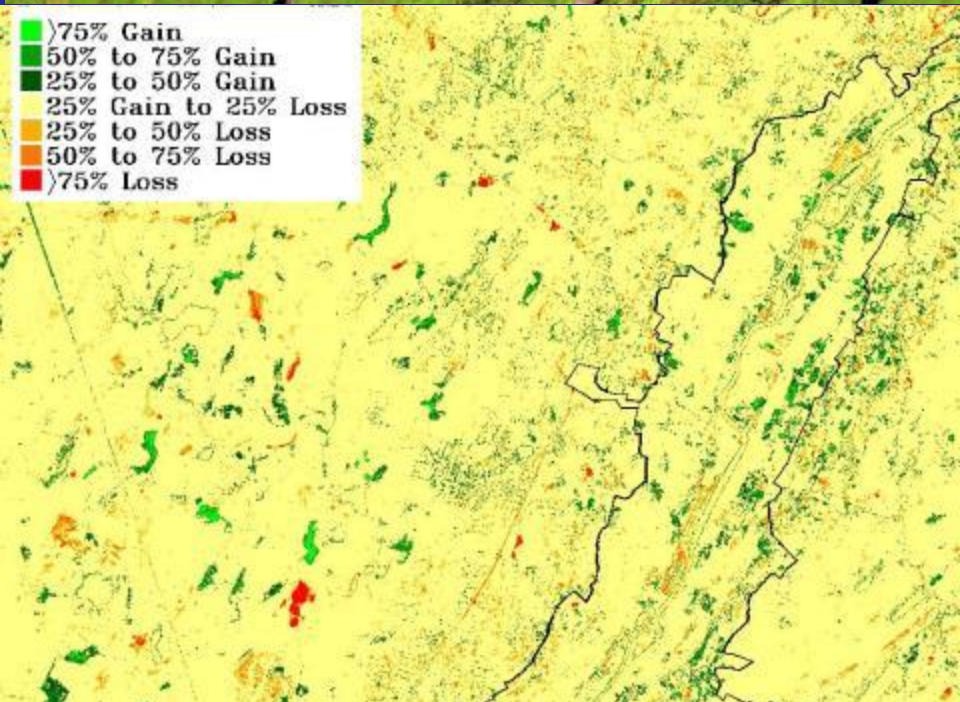
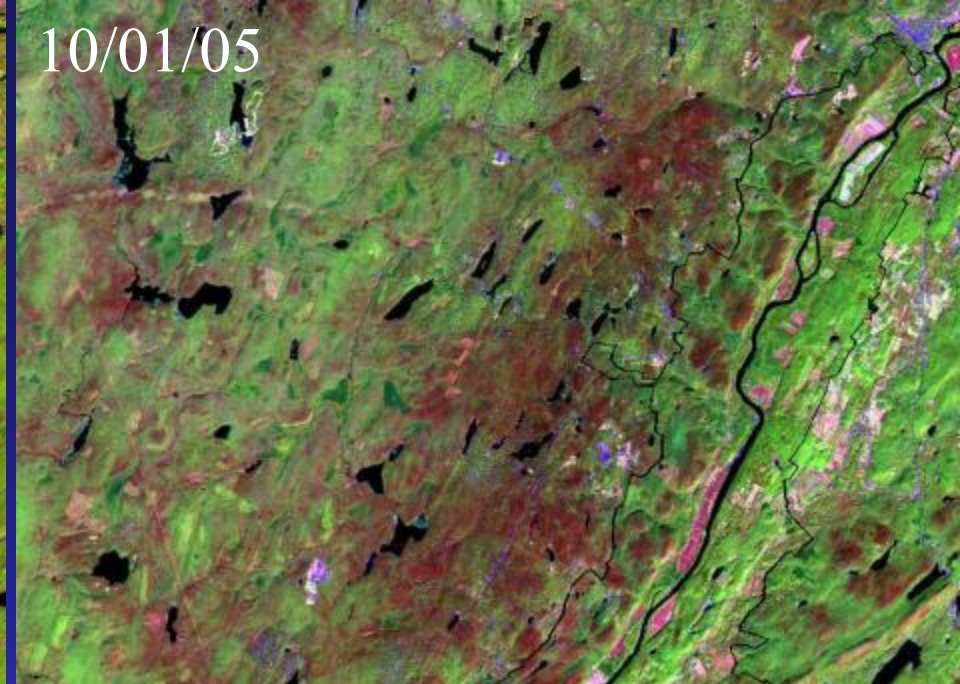
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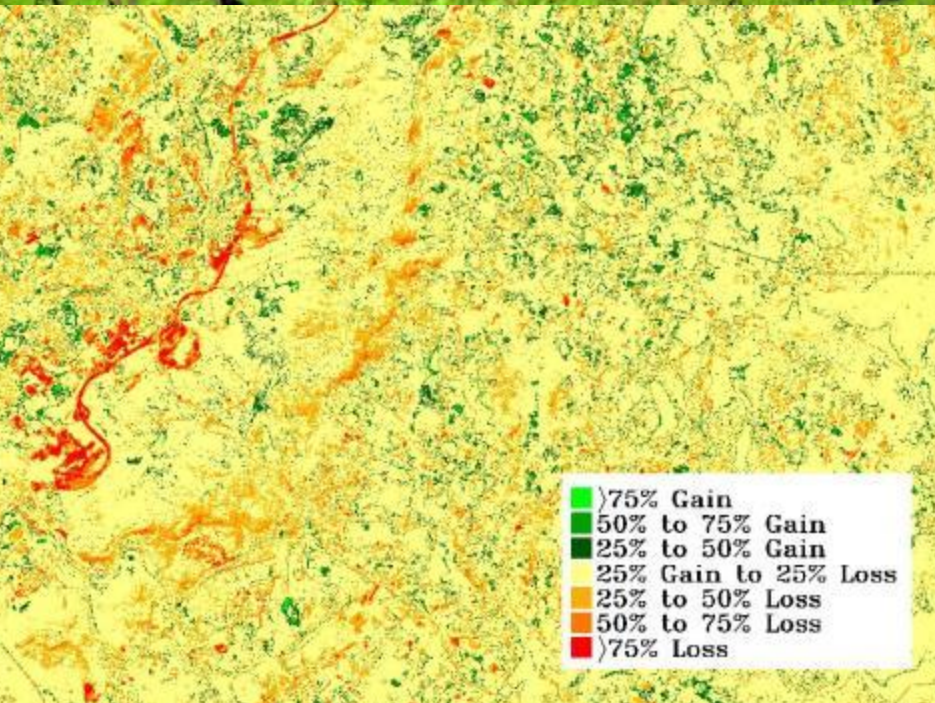
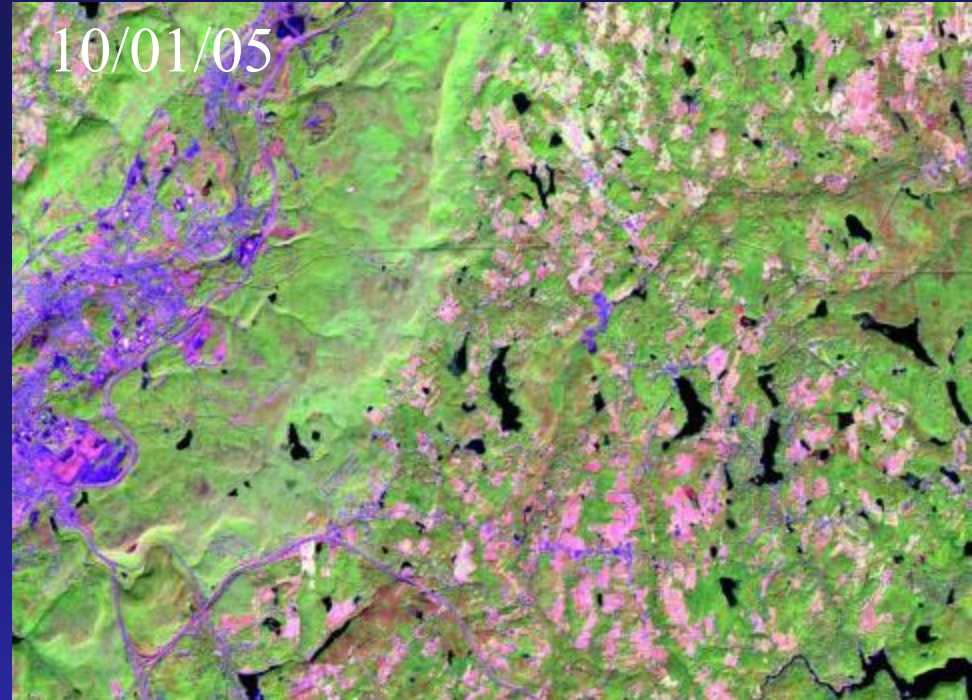
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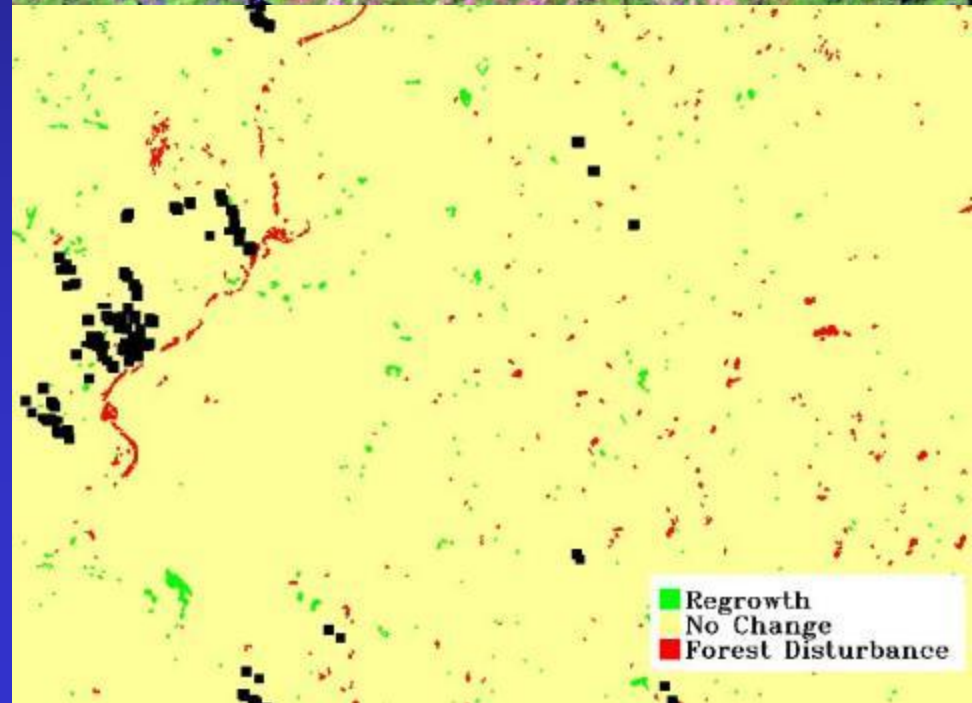


%Tree Loss 84-05

LEDAPS Forest Disturbance 88-01

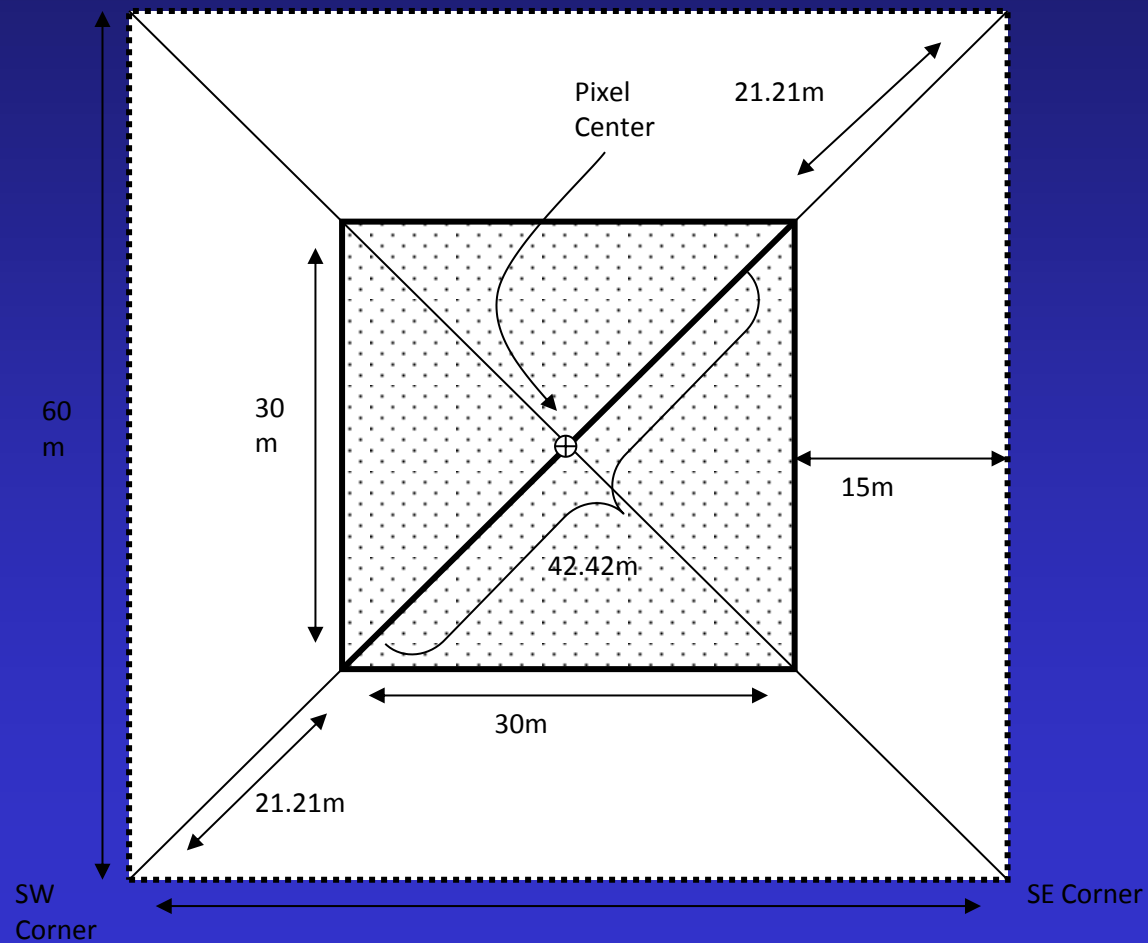


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Landsat Pixel for Validation



MUC-a-Thon!

- Two successful training/prof. development workshops:

- Pocono Environmental Education Center (October 2005).
- NEIU and Colonial IU Joint Workshop (May 2006).

- Field validation activity, September 2006.

- Weekend validation of Landsat 2005/2006 products in the field with students, parents, volunteers, NPS staff.

- Trained 58 Science, Math, Geography teachers from 33 middle/high schools. 90 student participants in field validation.

- “We helped NASA to survey the area and I had fun.”
- “I believe it is a great experience for anyone interested in Geography/Science.”

- “They did not give us any bug spray!”

Bridging the GAPS from Space:
How to Use NASA Satellite Images in
the Classroom

Day 2: Multispec and Land Cover
Change

Northeastern IU 19 & Colonial IU 20 Workshop
Archbald, PA
May 2 - 3, 2006

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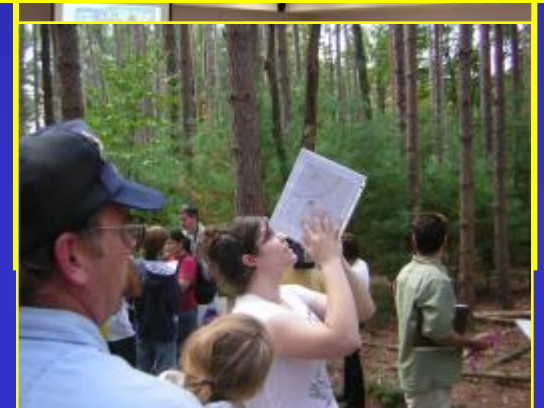
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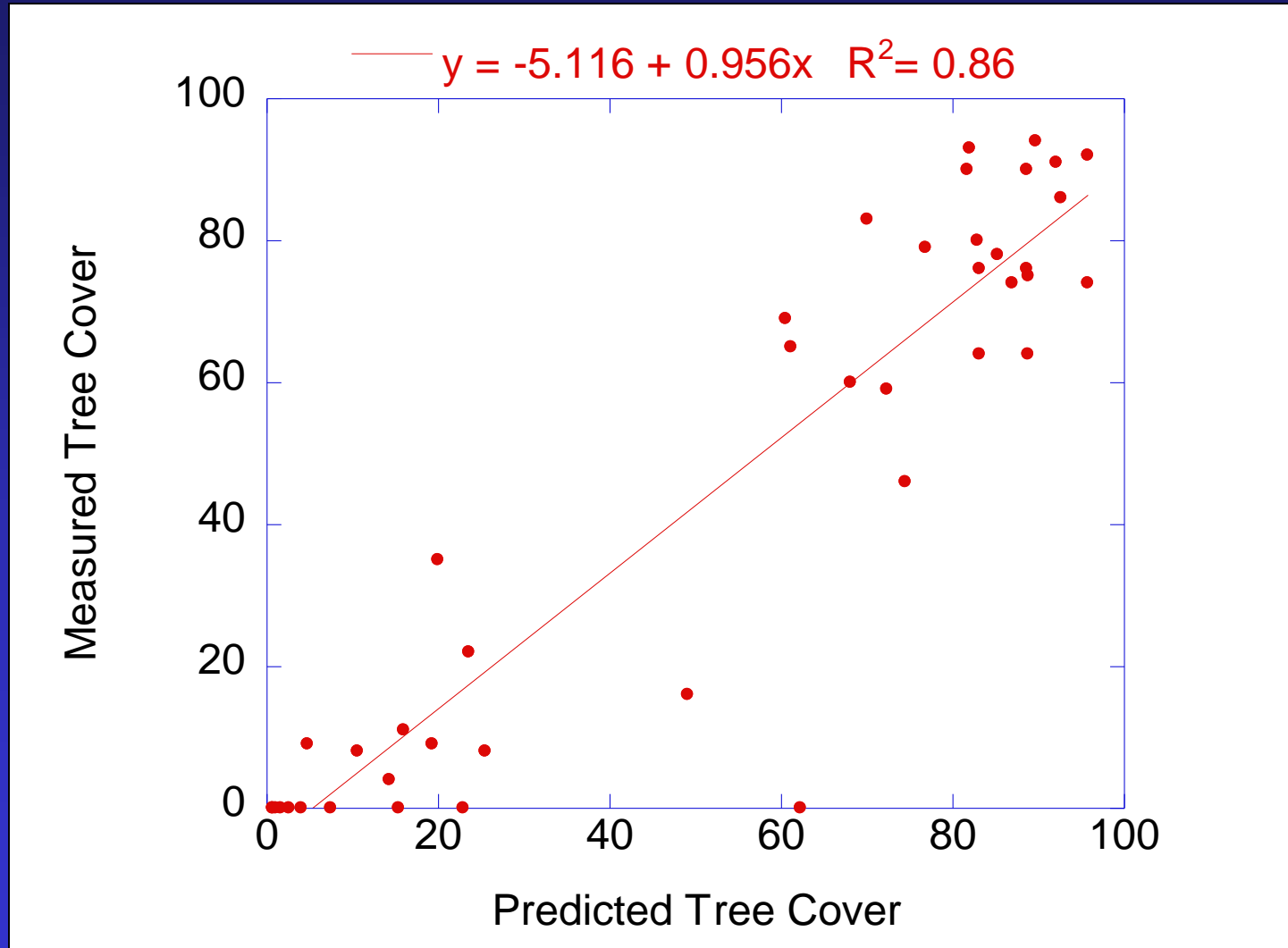
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2005 Tree Cover Validation with Student Acquired Data



Where to find Data/Images/Stories

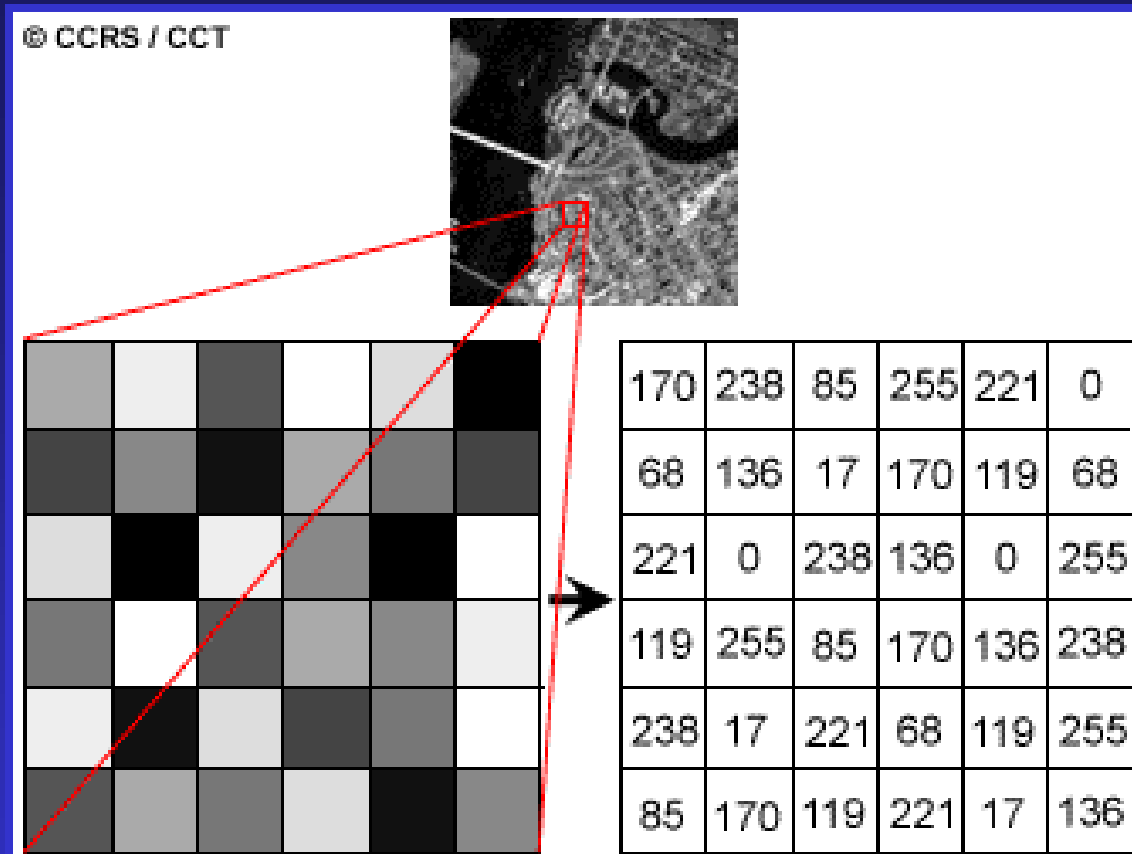
- <http://earthobservatory.nasa.gov/>
- <http://svs.gsfc.nasa.gov>
- <http://landsat.gsfc.nasa.gov/>
- <http://climate.nasa.gov>

Summary



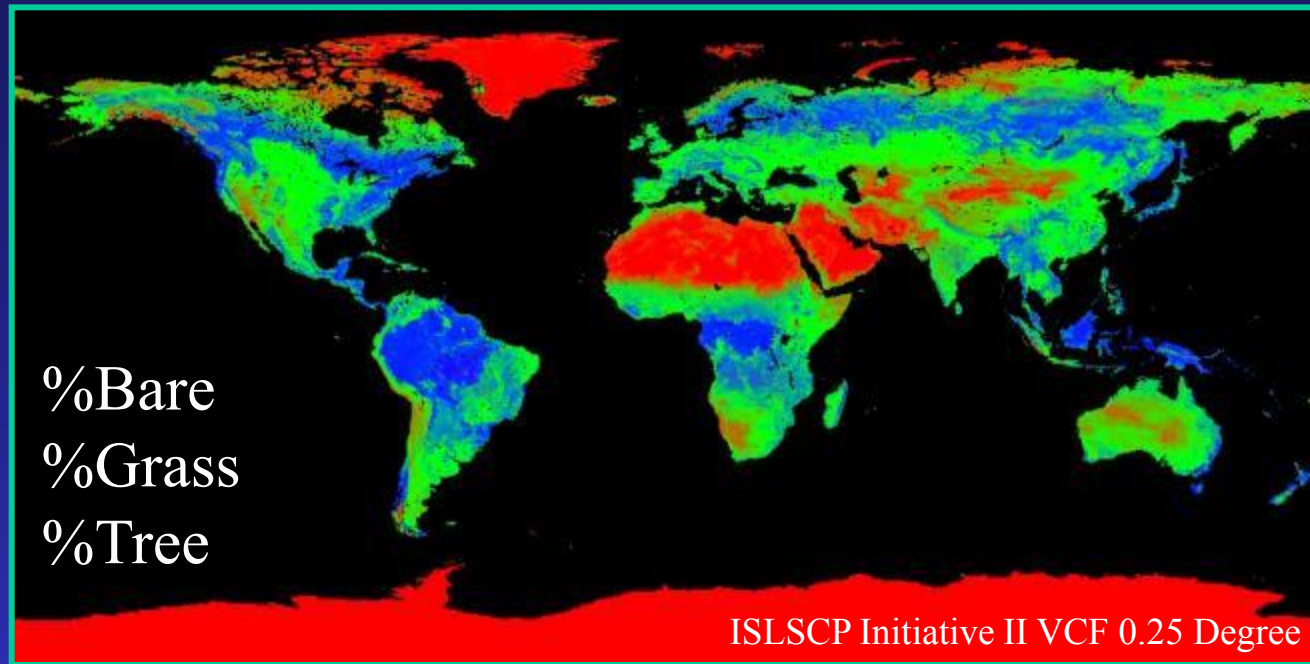
- ❖ NASA uses the view from above to monitor our changing home.
- ❖ Different satellites help us study the various systems of the Earth.
- ❖ NASA tools and science helps us to understand how the planet is changing and what the changes mean for us.
- ❖ We can ALL help!!!
- ❖ But we need YOUR help!!!

Getting to Know your Satellite Image



Satellites measure the amount of energy reflected by the Earth's surface in multiple regions of the E.M. spectrum. These data are recorded and converted into digital images composed of picture elements (pixels) arranged in columns and rows. In the case of Landsat, the pixels cover an area of 30m by 30m of the Earth's surface (How many m² is that??).

Continuous Fields of Vegetation



- Continuous fields of vegetation characteristics are thought to better describe land cover than discrete classifications (mosaics/ecotones).
- Much work done at continental/global scales with AVHRR, MODIS (DeFries, Townshend, Hansen). NLCD 2001 has impervious and canopy cover for U.S.
- If variables are continuous then land cover change is also continuous.