National Aeronautics and
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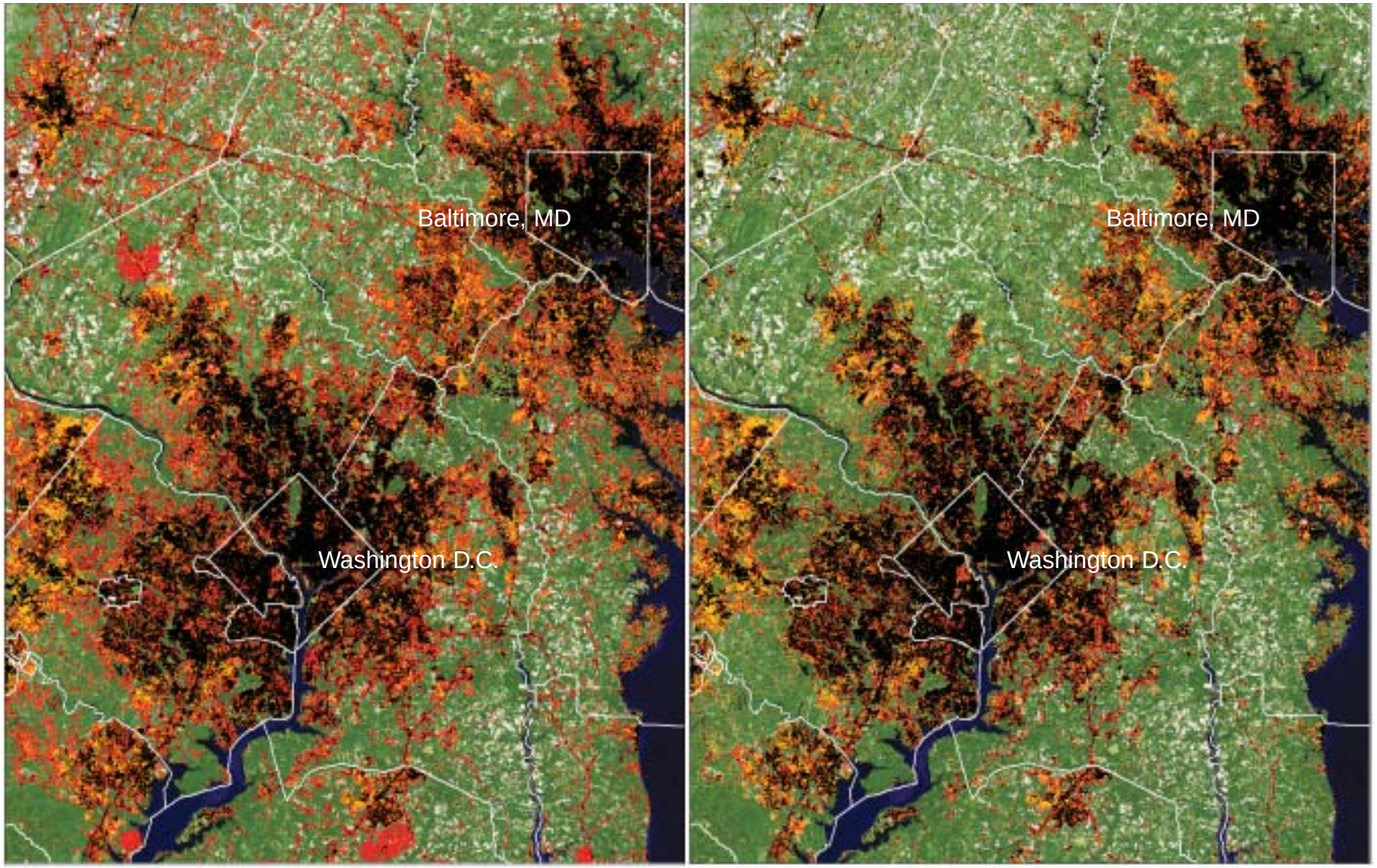
Urban Growth in the Baltimore-Washington Corridor



Current Trends

Managed Growth

Data from the Thematic Mapper and Enhanced Thematic Plus instruments on board NASA's Landsat 5 and Landsat 7 satellites, respectively.

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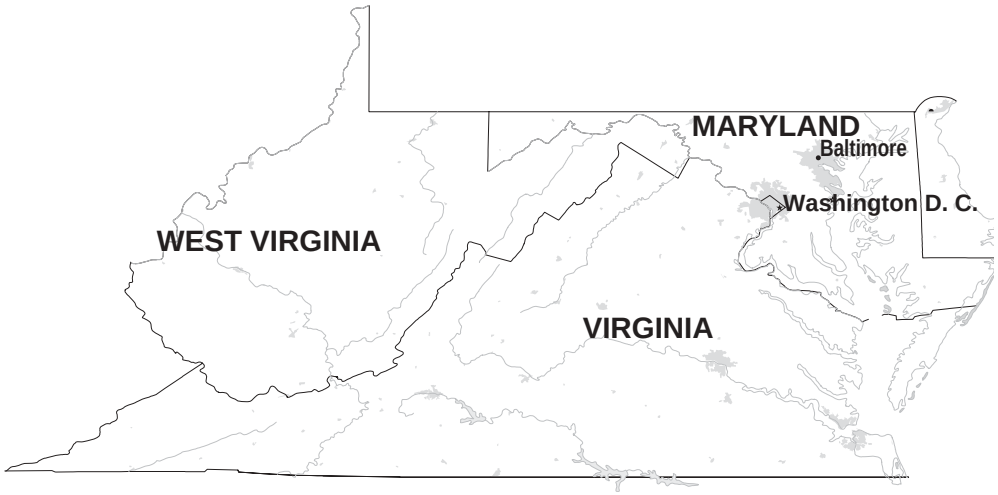
These images show the extent of land developed as urban, commercial and residential areas between 1986 and 2000, and projected development to 2030 in the Baltimore-Washington D.C. Metropolitan area. Past and current urban extent were derived using Landsat Thematic Mapper (TM) and Enhanced Thematic Mapper Plus (ETM+) satellite images, where the shades of green indicate vegetation, light-colored areas show agricultural lands, and water bodies appear in dark blue. In both images, black indicates the extent of development in 1986 and orange shows the extent in 2000. This information was derived using new techniques to map impervious surface areas. Developed areas are characterized by highly impervious surfaces, such as concrete, pavement and rooftops, which prevent precipitation from infiltrating soils and concentrate pollutants into streams and ultimately the Chesapeake Bay. Extensive paved areas also alter the hydrological regime, increasing the variance in stream flow, leading to soil erosion along stream banks and alterations in aquatic habitat. In the Chesapeake Bay watershed, which encompasses several major urban areas, including Washington, D.C., Baltimore, Maryland, and Fredericksburg, Virginia, water quality is impaired by urbanization. Extent of urbanization is important for researchers to understand and attempt to mitigate the negative impacts of urbanization on water quality.

For planners and policy makers, knowledge about how growth may occur in the future is critical. In the images, red indicates the predicted extent of urbanization for two different policy scenarios. These predictions were made using an urban growth model called SLEUTH (slope, landcover, excluded, urban extent, transportation, hillshade), which simulates four kinds of growth: spontaneous new growth, new spreading centers, edge growth, and road-influenced growth. SLEUTH was calibrated to the types of urban growth processes that have occurred in the Washington D.C. region using Landsat impervious surface maps for 1986, 1990, 1996 and 2000. Growth assuming different possible scenarios, was then predicted using the calibrated model.

The Current Trends scenario is based on a continuation of historic development patterns (1986-2000) and reflects current land development policies in the region. In Maryland, for example, some lands outside Priority Funding Areas may be protected from new development. New growth and transportation improvements are included, and protection is conveyed to natural resource lands such as wetlands and riparian corridors. In order to explore the impact of different policy solutions, the hypothetical Managed Growth scenario attempts to incorporate stronger growth management policies by protecting land outside of established urban centers in both Maryland and Virginia. Wetlands and riparian areas are more stringently protected, and conservation of some forests and agricultural lands is emphasized. If current trends are followed, the model suggests a continuation of low-density development patterns, which would result in the fragmentation or loss of important natural resource lands. On the other hand, if growth is focused around existing urban centers, large forested areas can be preserved even in areas close to urban centers.

The ability to compare potential future scenarios allows planners and policy makers to make informed decisions about effective land use and resource conservation policies. Urban modeling coupled with satellite remote sensing can help address the difficult problems associated with urban growth, and provide more effective visual planning tools to manage growth, a challenge that requires resourceful and practical solutions.
Images and data courtesy of the University of Maryland Geography Department and the Chesapeake Bay Foundation.

For the Classroom
A related educational activity can be found on the web at:
http://education.gsfc.nasa.gov/UrbanGrowth



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