

Using satellite imagery To detect land change

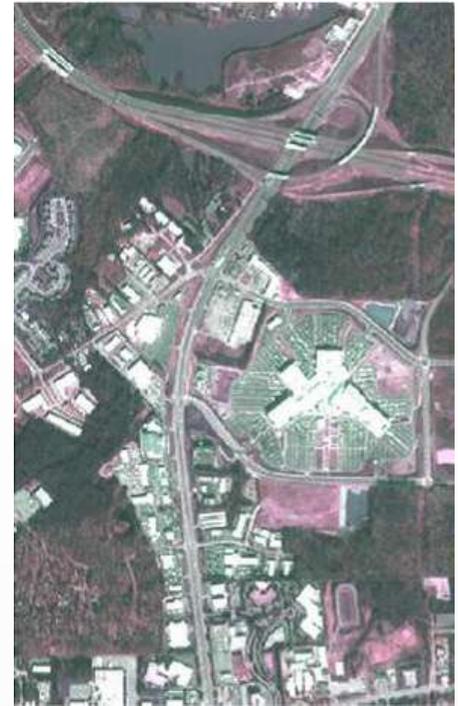
Studying urban environments using DigitalGlobe satellite imagery to understand waterway pollution

The Stormwater Utility Division in Raleigh, North Carolina has a federally mandated program requiring the city to reduce waterway pollution. The program is entirely funded by stormwater fees based on the total amount of impervious surface (e.g. buildings, driveways, sidewalks, parking lots, etc.) on properties in Raleigh. Impervious surface is the defining factor in how the Stormwater Management Division operates: the utility fee is based on the total amount of impervious surface on a property. It is also used to determine the effects of development and areas where runoff from impervious services could potentially cause the most pollution.

To begin studying waterway pollution and how to reduce it, the city digitized 1,000 land parcels, which were then used to help determine the impervious surfaces of the lots and the stormwater utility fee. The first aerial photography to be used for the utility was flown in 2002. Stormwater staff determined what features in the data were considered pervious and impervious. The mapping updates are done by the same vendor that provides the ortho-photos, using sophisticated equipment to update the impervious data. Using the 2002 photos, they updated the data for the entire city, adding the impervious/pervious designation and any construction dating back to 1993.

Each year, new photography for the entire extraterritorial jurisdiction is flown. It is used to complete a change-analysis, which the GIS department reviews to determine what will be updated each year. The goal is to update the impervious data for the entire city at least once in the five-year time span, but we also update the areas of significant growth each year. The city then implemented the Land Change Detection Using High Resolution Imagery study for Raleigh, NC to find a way to calculate the area for impervious surfaces more efficiently while maintaining accuracy. Urban changes can be detected many different ways, including high-resolution satellite imagery donated by the DigitalGlobe Foundation. High-resolution satellite sensors can scan to a resolution of one meter squared.

Through preprocessing data, running the principal component, normalizing the data and calculating the spectral distance, change-detection is possible. Areas of the greatest change mainly consisted of the areas covered with clouds and land-disturbing activities. Future projects could include manipulating the threshold and trying to determine the point in which asphalt and concrete change can be detected. The introduction of Light Detection and Ranging (LIDAR), which introduces an altitude component, could also help distinguish between surfaces.



2002 DigitalGlobe panchromatic image of the Town Center Mall, Raleigh, North Carolina



2006 DigitalGlobe image showing Town Center Mall surface change