Targeting Low Impact Development Restoration and Retrofit Areas in Impaired Urban Watersheds Using Remote Sensing Analysis

This flier demonstrates some specific project analyses generated for an area south of the Anacostia River in the District of Columbia and Maryland. Consultation with the DC Office of Planning, the DC Department of Health, and the Army Corps of Engineers was used to pick this area for an initial exploration of remote sensing techniques.

A remote sensing primer and a number of educational images addressing such issues as urban forests and the urban heat island can be found on the project's website at

http://www.lid-anacostia.net.

Links to information on project partners are also available on this site.

Project Goals

- ✓ Explore the use of multi-spectral satellite imagery, such as Landsat, in identifying and targeting ecologically impacted areas for potential LID retrofit or restoration.
- ✓ Derive maps that indicate ecological conditions from the satellite imagery. Provide examples of this technique for watershed analysis, including vegetation coverage, surface temperature, soil moisture, and imperviousness.
- ✓ Demonstrate the use of remote imagery for visualizing and analyzing the interaction between soils, climate, hydrology and vegetation for the protection and restoration of aquatic resources, riparian buffers and upland areas. Allow users to develop a broad perspective of a watershed in a cost-effective and timely manner.

Potential Focus Areas That Can Be Defined Using Remote Sensing

- Compacted soils
- Degraded vegetation
- Extensive imperviousness
- Exposed sediment
- Thermal pollution
- Disconnected riparian buffers

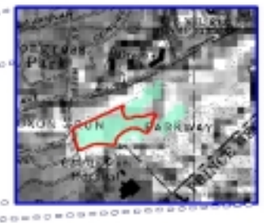
Effective Outcomes

Some examples include the rapid identification of dry, compacted soils along riparian corridors. These areas could then receive LID restoration techniques, such as soil amendments, which increase infiltration of rainfall, reduce thermal pollution, and enhance stream buffering. Other target areas, such as multi-family and commercial buildings, could receive microscale vegetation treatment, such as rain gardens, which filter polluted runoff, protect local soils, reduce runoff volume, and cool local climates.

Future Objectives

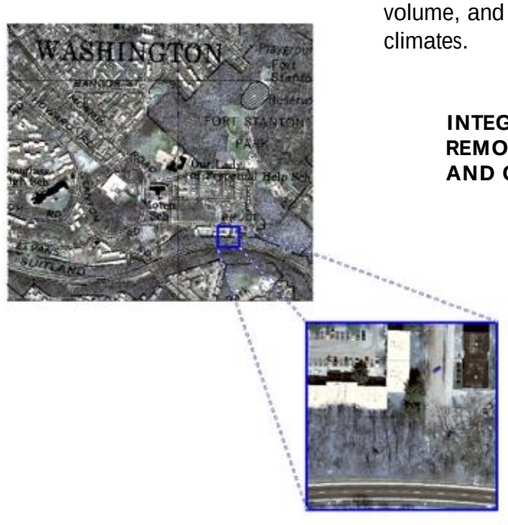
Development and refinement of protocols and a model planning process for the use of this technology as a broad and comprehensive watershed management screening tool. This will allow watershed planners to focus resources on more detailed analyses of identified target areas.

Soil moisture maps can be generated using vegetation and surface temperature data derived from the Landsat image in conjunction with a surface climate model. The gray-scale image is dark for surfaces with a dried out top layer and bright or white for surfaces that are wet. This information can be used to identify dry, compacted soils that no longer function in the capacity of their original Soil Survey classification or to locate areas with very moist surface layers near identified wetlands that can be easily converted to wetlands themselves.



woody wetlands classified by the National Land Cover Dataset (NLCD)

forested, non-tidal wetland classified by the Army Corps of Engineers (floodplain of Oxon Run, diversity = fair, quality = good, soil type = frequently flooded fluvaquents-udifluvents)



INTEGRATING SATELLITE REMOTE SENSING, GIS DATA, AND ORTHOPHOTO IMAGERY

Winter 1999, **0.2-meter orthophotographic image** from the Washington GIS Consortium. Such higher resolution images can be used as "ground-truth" in developing algorithms to classify land use, imperviousness, vegetation type, etc. in Landsat scenes like the one to the right, which covers the same area. These algorithms can then be quickly and easily applied to an entire watershed, reducing the data requirements and costs of a regionally based project. GIS overlays can also be used to identify landowners, homeowners associations, and stakeholders that could be potential partners in the restoration or retrofit of problem areas identified within the watershed.

Landsat 30-meter near-infrared image. Healthy green vegetation appears red, with subtleties in the shade indicating differences in condition, density or type of vegetation. Bare and developed areas appear bluish or white.

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An **index of vegetation coverage** derived from the satellite image. The gray-scale image ranges from black for areas devoid of vegetation to white for areas with complete coverage by vegetation.

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The Center is a non-profit 501(c)(3) water resources research organization aimed at balancing growth and environmental integrity through the advancement of Low Impact Development (LID) technology.