Factsheet # 18

Seattle Hyperspatial Land use/land cover (LULC) from LiDAR & Near Infrared Imagery Using Object-based Image Analysis (OBIA)
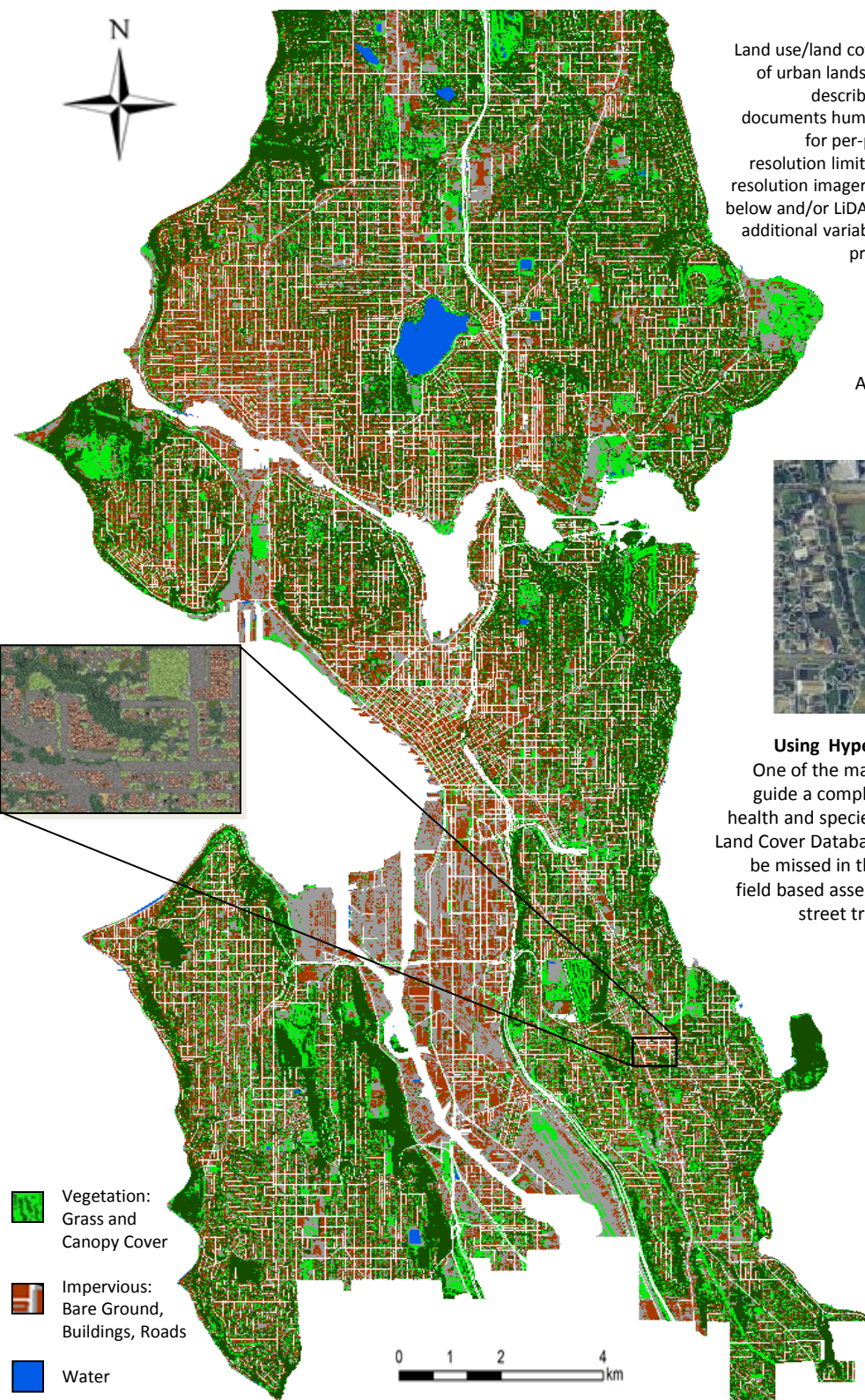
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Understanding multiscale dynamics of landscape change through the application of remote sensing & GIS

Using Hyperspatial Data for LULC Mapping with OBIA

Land use/land cover (LULC) classifications are often created to assess the composition of urban landscapes and quantify different aspects of the environment. Land cover describes natural and built objects covering the land surface, while land use documents human uses of the landscape. Landsat imagery has historically been used for per-pixel driven land use/land cover (LULC) classifications, but the spatial resolution limits our ability to map small urban features. In such cases, hyperspatial resolution imagery, including aerial or satellite imagery with a resolution of 1 meter or below and/or LiDAR, is preferred. Object-based image analysis (OBIA) allows for use of additional variables, such as texture, shape, context, and other cognitive information provided by the image analyst, to segment and classify image features. The map to the left was created using a classification with an OBIA approach in **eCognition** software with, 1 m near infrared imagery and LiDAR.

Accuracy Assessment of Hyperspatial Maps

Accuracy assessment is a critical component of all remote sensing projects. As part of the OBIA approach auxiliary data, such as oblique imagery and field data, are used for assessing accuracy.

Using Hyperspatial LULC for Designing Canopy Assessment Field Sampling

One of the main purposes of a remotely sensed canopy cover assessment is to guide a complimentary field data acquisition, including information on canopy health and species. When using coarse resolution data, such as the 2001 National Land Cover Database (NLCD), close to 70% of the heterogeneous urban canopy can be missed in the sampling design (see figures below). This effectively focuses a field based assessment on large forested tracks of land, such as parks and ignors street trees and trees in residential canopy cover. Thus, classifications of hyperspatial data using OBIA provide a better data layer for designing canopy cover field assessments.

- ● Field Sampling based on OBIA
- ● Field Sampling based NLCD
- ■ 2001 NLCD Canopy Cover
- ■ 2009 OBIA Canopy Cover
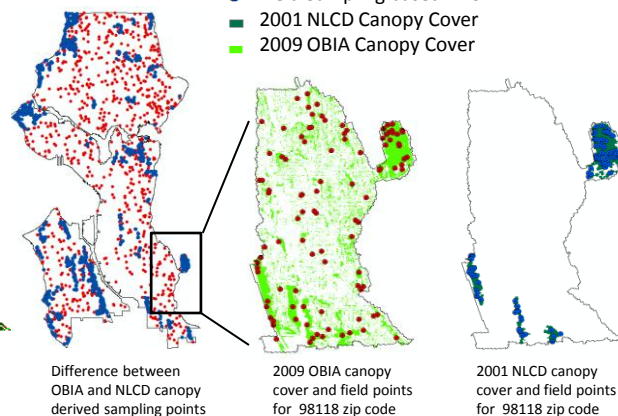
Difference between OBIA and NLCD canopy derived sampling points

2009 OBIA canopy cover and field points for 98118 zip code

2001 NLCD canopy cover and field points for 98118 zip code

Legend:
- Vegetation: Grass and Canopy Cover
- Impervious: Bare Ground, Buildings, Roads
- Water

0 1 2 4 km

THE ISSUE: Urban forest ecosystems provide a range of social and ecological services but, due to the heterogeneity of these canopies, their spatial extent is difficult to quantify and monitor. Traditional per-pixel classification methods have been used to map urban canopies, however, such techniques are not generally appropriate for assessing these highly variable landscapes. Landsat imagery, historically used for per-pixel driven land use/land cover (LULC) classifications, also lacks the spatial resolution limiting our ability to map small urban features.

THE KEY ISSUE:
Coarse resolution LULC classifications, such as those produced using Landsat satellite imagery, do not capture the heterogeneity of urban forests.

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