

2002 Land-cover Analysis of the Greater Puget Sound Region

A combination of Landsat TM and ETM+ imagery covering the extent of the greater Puget Sound region was acquired for this project. Thematic Mapper (TM), an instrument of NASA distributed by the U.S. Geological Survey (USGS), is a multi-spectral, scanning radiometer carried on Landsat satellites 4 and 5. It has been providing continuous, 16-day cycle, global coverage since July 1982. TM contains seven spectral bands (bands 1-5 and 7) representing the visible, near-infrared and mid-infrared wavelength regions, with a spatial resolution of 30-meters. The Enhanced Thematic Mapper (ETM+), launched on Landsat satellite 7 in April 1999, contains the same data parameters as TM, but has upgraded radiometric calibrations.

We acquired four summer and four winter scenes in 2001 and 2002 (Figure 1) via Earth Explorer, an on-line data browser and acquisition service of USGS. The datasets cover the full map extent of the Greater Puget Sound Region (Figure 2), and the full spatial extent of twelve Washington counties, including Whatcom, San Juan, Skagit, Island, Snohomish, Jefferson, Kitsap, King, Grays Harbor, Mason, Thurston and Pierce. Large portions of other counties are also covered.

A series of geographic, radiometric, data conversion, image inter-calibration and data management steps were applied to the summer scenes to prepare them for land-cover classification. Many of the processing steps were performed using RSI's *Environment for Visualizing Images* (ENVI), a comprehensive image processing software used for advanced hyper-spectral image analysis, radiometric and geometric corrections and image classification. Other steps, including all classification methodologies were performed using ESRI's *Erdas Imagine*, a comprehensive, geographic imaging suite.

Note on Data Use: Caution must be applied in the interpretation and use of the land cover data described in this report. We recommend the users of these data to carefully consider all the technical specifications described in the report to evaluate their suitability for the specific application of interest. The user should also be aware that the land cover data were derived from 30-meter resolution LANDSAT Thematic Mapper (TM) and Landsat ETM+. However the accuracy assessment of the land cover classification and change analysis was performed at the 90-m resolution. The accuracy should therefore be interpreted at the 90-m scale.

We made a preliminary assessment of the accuracy of the land-cover image through the preparation of a confusion matrix. Confusion matrices compare the relationship between actual and known land-cover types (as on the ground) and the results of an automated classification. We applied high-resolution, digital, ortho-photography covering the spatial extent of the spectral images as reference data for our assessment. Our method consisted of constructing a continuous, 90-meter grid covering the spatial extent of the image data, selecting a random sample of 10% of the grids, and converting these to a polygon cover, which we overlaid onto the ortho-photography. We interpreted polygons containing homogeneous cover-types in the ortho-photography and interpreted them to a highly detailed, 22-class, land-cover classification scheme. We aggregated the total number of polygons we interpreted (2986 in all) to a super-classification of the land-cover product, comprised of 8-classes, which included intense urban; low-medium urban; bare ground; clear-cut forest; grass/crops/shrubs; mixed/deciduous forest;

coniferous forest; and water. We calculated the proportion of polygons assigned to each land-cover in the highly detailed classification scheme for each super-class theme, and used these results to construct the confusion matrix. Accuracy Assessment: A preliminary assessment indicates that the classification has good accuracy at the 90-m resolution.

Forthcoming Paper on Methods:

Alberti, M., Weeks, R., and S. Coe. 2004. Urban Land Cover Change Analysis for the Central Puget Sound: 1991-1999. *Journal of Photogrammetric Engineering and Remote Sensing*.

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