Northeastern Section - 48th Annual Meeting (18–20 March 2013)

Paper No. 12
Presentation Time: 1:30 PM-5:00 PM

AN AUTOMATED APPROACH TO DOCUMENTING WATERSHED LAND-USE CHANGE OVER TIME IN VERMONT

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We used a combination of historical aerial image rectification and land-use change detection with an object oriented classification program, *eCognition*, to understand how land-use in Vermont watersheds has changed over the last 50 years. Interstate Highway construction and subsequent build-out had a profound effect on Vermont's landscape and hydrology; however, the location, pattern, and change in the amount of impervious surfaces over time has not been quantified.

In an effort to quantify interstate related build-out, I used *ERDAS IMAGINE* to rectify a series of historical panchromatic aerial photographs from 1962 and 1988. After rectification, I used *eCognition*, an automated image analysis program, to segment the historical photographs as well Digital Orthophoto Quadrangles (DOQs) from 1999 and 2011, into image objects. These objects were then categorized as land use classes (agriculture, forest, water, light impervious, and dark impervious) and a supervised classification was created. After some manual editing, land use was categorized and the percentage of impervious area was estimated.

Using Muddy Brook – an impaired watershed with both rural and urban areas near Burlington, Vermont – as a proof of concept, I tested the program's performance. I used a single Digital Orthophoto Quadrangle to gauge the performance of *eCognition* and found that manual digitization estimated an impervious area of 30.1%, while *eCognition* estimated an impervious area of 33.1%. When applied to the entire watershed, I found that impervious area in the Muddy Brook watershed increased from 2.9% in 1962, to 4.6% in 1988, to 6.6% in 1999, and to 7.1% in 2011.

Muddy Brook is listed as an impaired stream due to increased toxins, nutrients, and water temperature. Impaired waters are defined as those with chronic or recurring violations of water quality criteria. The portion of the watershed nearest the highway and the outlet of the Muddy Brook Watershed is much more heavily developed than the southern, rural section. This area is over 47% impervious. This high percentage of impervious surface near the outlet likely causes the observed impairment of stream water quality.

Session No. 59--Booth# 22

T6. State and Fate of Urban Watersheds in the Northeast (Posters)
Tuesday, 19 March 2013: 1:30 PM-5:00 PM

Grand Ballroom South (Omni Mount Washington Resort)

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