LCLUC Abstract

Development Sprawl Impacts on the Terrestrial Carbon Dynamics of the United States

This project will analyze the impacts of development on the terrestrial carbon dynamics of the 48 states. The impact will be analyzed by comparing ecosystem model runs made using land cover data with and without the current level of development.

The US has established a pattern of development sprawl with no end in sight. Surfaces covered by constructed materials (roads, buildings, etc.) are withdrawn from photosynthesis and respiration. This loss is counterbalanced to some extent by managed vegetation (lawns, trees, etc.), which may be irrigated and fertilized.

We will make use of multiple sources of data to generate a one km land cover grid of the USA with specific estimates of the percent cover of constructed materials, lawn and trees/shrubs within developed areas. The national data sets we plan to use include: 1) 30 meter land cover from Landsat TM (MRLC), 2) radiance calibrated nighttime lights from the Defense Meteorological Satellite Program (DMSP), 3) population and housing density (CIESIN), and 4) city and county economic data from the U.S. Census Bureau.

For calibration, development levels will be measured directly in a subsample of the area using aerial photography (1998-00) acquired along transects crossing major metropolitan areas in each region of the country. This analysis will be extended to surrounding areas through the analysis of Landsat 7 data (including the pan band). The level of development present in the 1 km grid cells will be estimated based on a multivariate analysis of the relations between the observations from the aerial photography, Landsat 7 data and the set of national data coverages.

Our results will improve understanding of the carbon budget of the US. With modification our methods should be extendible to the global monitoring of development and its impact on carbon dynamics, meeting monitoring objectives of UN Framework Convention on Climate Change.