NATIONAL CONSORTIUM FOR REMOTE SENSING EDUCATION, RESEARCH, AND APPLICATIONS

IndianaView
PROJECT FACT SHEET

http://www.indianaview.org

High-resolution carbon modeling and monitoring using remote sensing technologies in Indiana State Forests.

Gang Shao, Purdue University, West Lafayette, IN (E-Mail: gshao@purdue.edu)

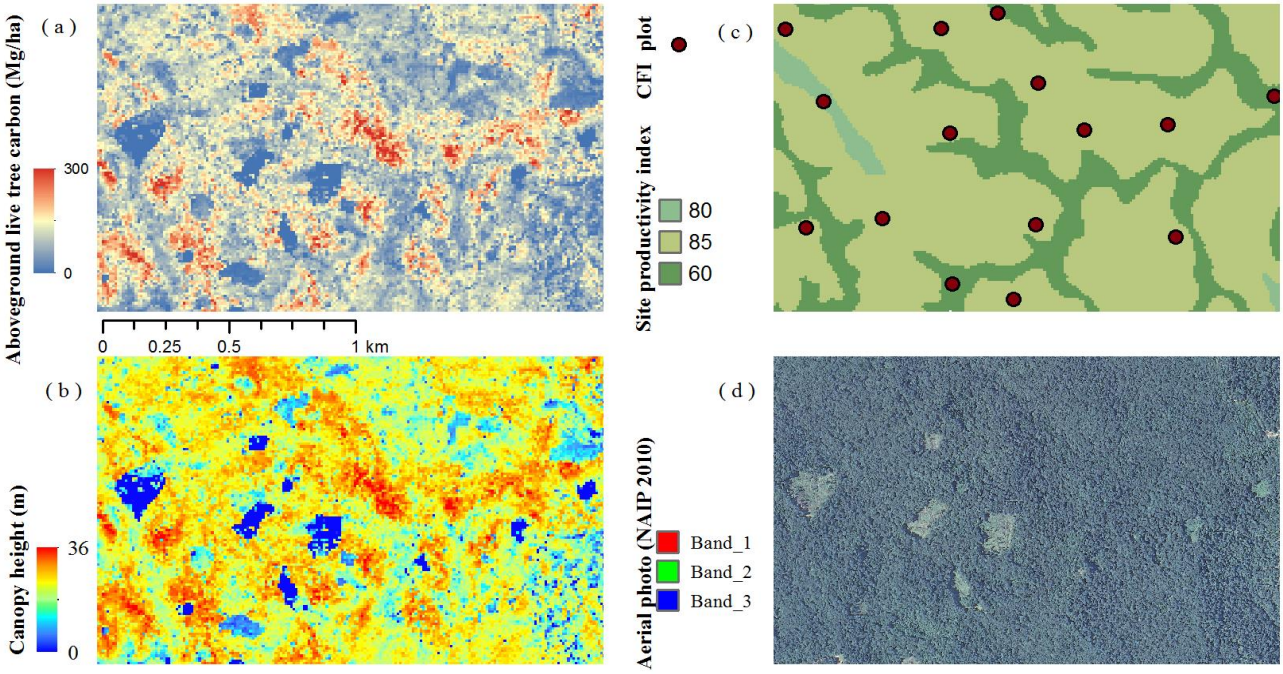

Figure 1. High-resolution forest carbon map in Yellowwood State Forest, IN (a), lidar-based canopy height metric (b), locations of field-measured CFI data and information of site productivity (c) and reference aerial photo (d).

Project Overview: High-resolution forest carbon distribution is required to monitor forest structure, biodiversity and the impacts of changing carbon storage on climate. In this study, we utilized advanced laser remote sensing technology, light detection and ranging (lidar), to obtain the horizontal and vertical structural information of forests. Then the lidar-based forest structural features were able to estimate forest carbon incorporating with field observed carbon information

Field work: Observed forest carbon information was collected by the forest inventory program, Continues Forest Inventory (CFI), established by Indiana Department of Natural Resource (IDNR). With the funds provided by IndianaView Consortium, we improved the coordinate information of CFI measurements using differential global positioning system (DGPS). Then, the observed carbon information was qualified to be as reference for remote sensing based estimations.

Remote sensing inputs:

- Lidar-based canopy height metrics including maximum, mean, minimum and quantile (from 10% to 90%) heights
- Lidar-based canopy coverage metrics
- Lidar-based elevation, slope and aspect
- Site productivity from soil features

Carbon simulation: Varied nonlinear regression models was employed and compared to investigate the relationship between observed carbon density and remote sensing based structural metrics. The best fit regression model was used to produce high-resolution forest carbon maps of study area in Indiana State Forests.

Results: The lidar metrics were able to explain over 67% variance of forest carbon distribution using multiplicative nonlinear regression model. The standard error of carbon estimation was 26.2 Mg ha^{-1}, about 35% of the mean carbon density in the study area. This project highlighted the ability of advanced remote sensing technology to map high-resolution forest carbon distribution.

Acknowledgements: This project was supported in part by IndianaView Consortium Scholarship.

FOR FURTHER READING:

The results of this research will be submitted to Remote Sensing of Environment and purposed to be presented in AGU Conference 2016.