AMERICA VIEW

NATIONAL CONSORTIUM FOR
REMOTE SENSING EDUCATION,
RESEARCH, AND APPLICATIONS

IndianaView
PROJECT FACT SHEET
http://www.indianaview.org

Tree canopy mapping using LiDAR data and color-infrared air photos

Adam Berland, Ball State University (E-Mail: amberland@bsu.edu); **Riley McCreary,** Ball State University

Objectives and Approach: Urban trees provide important environmental, social, and economic benefits. Tree canopy cover measures the area of land occupied by trees when viewed from above; this measure is one of the primary metrics used in urban forestry management.

Delaware County, IN did not have a tree canopy map, so we used publicly available data sets to produce a high-resolution tree canopy map to share with municipal and county government. Specifically, we used 2018 color-infrared air photos from the NAIP program to calculate the normalized difference vegetation index (NDVI). NDVI can be used to identify vegetated land. Then we used countywide LiDAR data collected in 2017 to map the highest points (first returns) and lowest points (last returns) for each pixel. Subtracting the lowest points from the highest points resulted in a height map indicating the heights of objects occupying each pixel. A smoothing filter was applied to the height map to reduce the prevalence of gaps (anomalously low heights) within tree canopies. To create the tree canopy map, we combined the vegetation map and the height map, where trees were classified as pixels that were both vegetated and tall (>3 feet in the smoothed height map). This strategy differentiated tree pixels from low-lying vegetation found in pixels that were vegetated and short, and from non-vegetated surfaces such as impervious surfaces, bare soil, and water.

Results and Significance: The final tree canopy map covers the entirety of Delaware County at 2-foot spatial resolution (Figure 1). The tree canopy map has an overall assessed accuracy of 96.5% within incorporated places in the county. Most of the errors of commission appear to occur along the edges of buildings where pixels are incorrectly classified as tree canopy. Tree canopy cover ranges from 14.1% in Eaton to 24.7% in Selma (Figure 2).

This product is publicly available for urban forestry management and other applications. As the first high-resolution, countywide tree canopy map, this product will be useful for prioritizing tree plantings, and for tracking changes over time as additional tree canopy maps are produced with data acquired in the future.

Figure 1: An example of the mapped tree canopy classification (bright green).
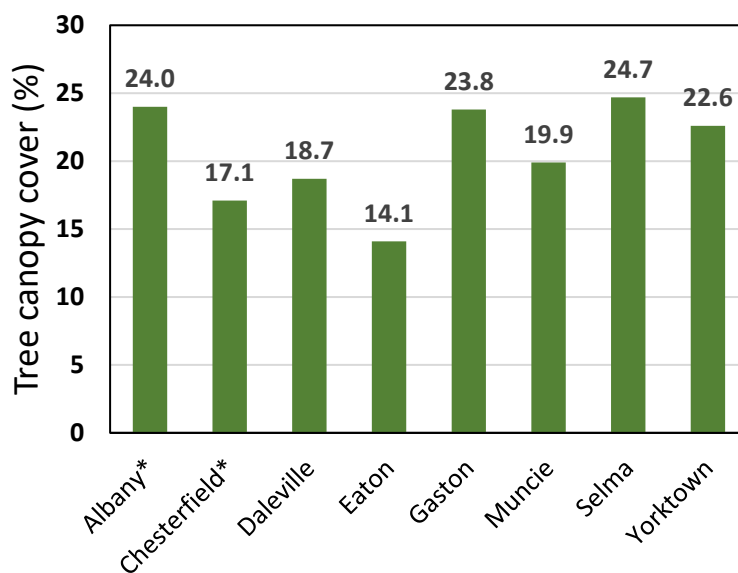
* Only includes the portion located in Delaware County

Figure 2: Percent tree canopy cover for incorporated places in Delaware County.