
A FRAMEWORK FOR REPORTING TREE COVER ATTRIBUTES IN AGRICULTURAL LANDSCAPES

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INTRODUCTION

The definition of forest land used by the USDA Forest Service's Forest Inventory and Analysis program includes area, width, and density requirements. These requirements frequently exclude from the inventory any trees occupying narrow riparian corridors or linear tree plantings (e.g., windbreaks and shelterbelts). With recent attention being paid to such topics as bio-fuel production and carbon sequestration, motivation exists to account for trees outside the forest (TOF). Because much of the tree cover in the Plains States occurs as TOF as opposed to definitional forest land, alternative methods are needed for collecting and reporting information about landscapes dominated by agricultural practices.

METHODOLOGY

Using aerial imagery from the USDA's National Agriculture Imagery Program (NAIP), an object-based image analysis technique was used to identify and quantify tree cover. The technique was applied to 316 3.75' x 3.75' quarter quadrangles covering seven counties in the state of Nebraska. An area of approximately 3,525 square miles was mapped into the following categories: water, tree, agriculture/other vegetation, man-made, and other non-vegetated (e.g., bare soil). In addition to area estimates, a series of descriptive measures was included to describe the spatial arrangement and extent of tree cover. The following metrics were calculated for each of the 7 counties: percent of county area, number of tree-covered patches, average patch size, minimum patch size, maximum patch size, largest patch index (percentage of tree cover area occupied by the largest patch), and patch density.

RESULTS

Sample metrics are presented for Kearney and Nemaha counties in Figure 1 and Table 1. The majority of tree-covered area (76 percent) in Nemaha County exists as large patches, i.e., those exceeding 10 acres in size. In contrast, most of Kearney County's tree cover (82 percent) is comprised of patches that fall into the two smaller size classes. County differences in tree cover are characterized by additional metrics in Table 1. Nemaha County has a higher percentage of tree cover, a higher patch density with larger patches, and a much larger patch index, as 10 percent of the county's tree cover occurs in one continuous patch of forest.

DISCUSSION

A method for mapping the extent and spatial arrangement of tree cover in agricultural landscapes has been developed using high-resolution imagery and object-based image analysis techniques. This method provides a useful alternative for describing TOFs and may complement traditional inventories of definitional forest land. The suite of metrics used here appears to capture important differences between counties with drastically differing composition of tree cover.

Table 1—Metrics describing the extent and spatial pattern of tree cover in Kearney and Nemaha Counties, NE.

TREE COVER METRICS	KEARNEY	NEMAHA
Area of tree cover (acres)	4,387	36,279
Percent of county area	1.3%	13.8%
FIA 2008 estimate of forest land (acres)	441	17,710
Number of patches	11,118	14,629
Average patch size (acres)	0.4	2.5
Minimum patch size (acres)	0.01	0.01
Maximum patch size (acres)	82	3,453
Largest patch index (percentage of tree cover area occupied by the largest patch)	2%	10%
Patch Density (number of patches per square mile of county area)	22	36

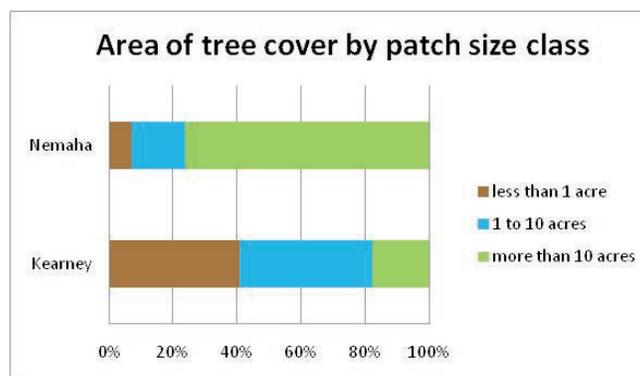


Figure 1—Distribution of tree-covered area by patch size class for Kearney and Nemaha Counties, NE.