Black Walnut in the Eastern U.S.: Current Status and Recent Trends Based on FIA Data

Thomas Goff

Black walnut (*Juglans nigra*) has an estimated population of more than 340 million trees and 4.9 billion cubic feet of net volume on forest land across the eastern United States. Over the past decade, the number and net volume of black walnut trees have increased by 11 percent and 23 percent, respectively. This article will examine the factors driving these increases as well as other important variables such as tree damage and seedling regeneration using the latest data from the USDA Forest Service's Forest Inventory and Analysis (FIA) program. Although orchards are excluded, the analyses give nut growers valuable information on the more suitable regions for growing black walnut and expected growth rates.

The USDA Forest Service's Forest Inventory and Analysis (FIA) Program has been monitoring the trends of forest resources in the United States for nearly a century. The inventory is accomplished by periodically visiting a network of permanent field plots that are spatially-distributed at an intensity of approximately one sample for every 6,000 acres (Westfall et al. 2022). Stand-level variables such as forest type, stand age, and canopy cover are assessed for each plot. Tree level variables like diameter, total height, tree grade, and tree damages are collected for each tree greater than 5 inches in diameter at breast height (d.b.h.) (FIA Glossary - www.fia.fs.usda.gov/library/docs/FIA_Glossary_Standard Terms%20REV2022-10-27.pdf), and tree seedlings are tallied by species. The data from these individual plots are expanded to produce publicly available estimates of the population by county (fig. 1) and the entire population (USDA Forest Service 2022).

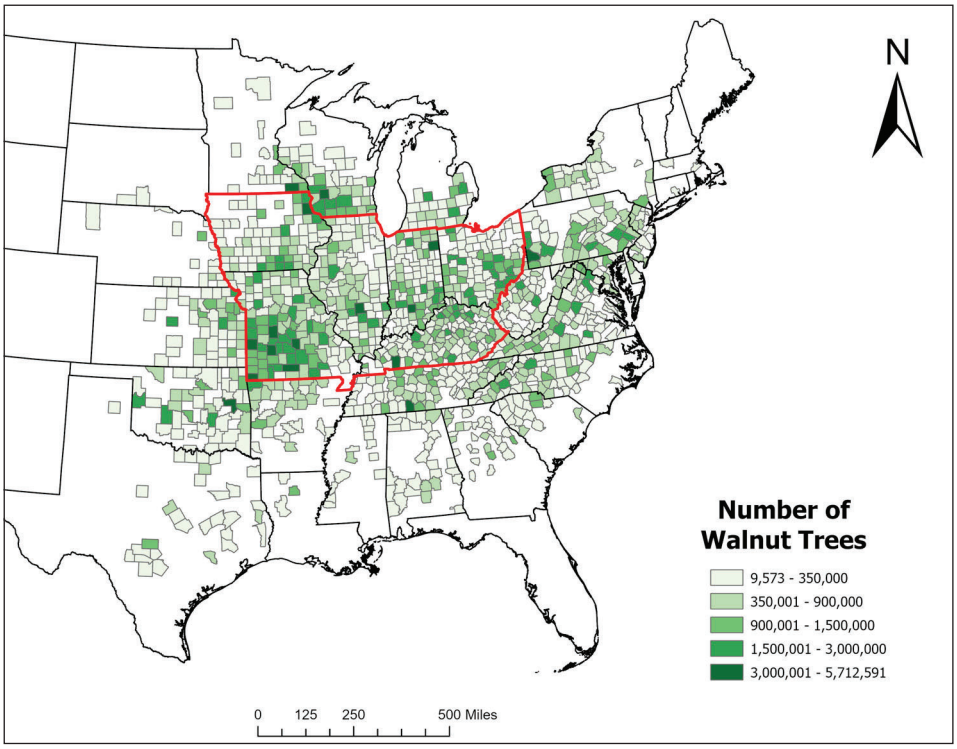

Figure 1.—*Choropleth map depicting the number of black walnut trees (at least 5 inches d.b.h.) by county, Eastern United States, 2020. Red outline denotes states containing approximately 50 percent of the total population of black walnut by number of trees.*

Black walnut rarely grows in pure stands and is more often found as a lesser component in other forest types (Burns and Honkala 1990). FIA data show that there are approximately 2 million acres of forest land in the black walnut forest type, which requires at least 50 percent stocking of the species, and 5.4 million acres where it comprised at least 20 percent of total overstory basal area. Evidence of artificial regeneration for the species is uncommon with only 135,000 acres of forest land planted with black walnut seedlings. FIA defines forest land as land having at least 10 percent cover in live trees, at least an acre in size, 120 feet in width and not subject to nonforest land use. Many walnut trees exist in nut orchards and landscapes that do not meet this definition and are not included in this analysis of black walnut on forest land.

Twenty-nine states had black walnut trees tallied in the most recent inventory totaling 340 million stems (at least 5 inches d.b.h.), an increase of 11 percent since 2010. Missouri has the highest proportion of the total number of trees (18 percent) and when you include the states of Ohio, Indiana, Kentucky, Iowa and Illinois, they account for over half

[1]Temporal comparisons of data made throughout this article, were made between 2010 and the most recent year available for each state which ranged from 2019-2022 but is referred to here as 2020.

[2]Growing stock refers to trees containing at least one merchantable 12-foot log or two non -contiguous merchantable 8-foot logs, now (sawtimber) or prospectively (poletimber).

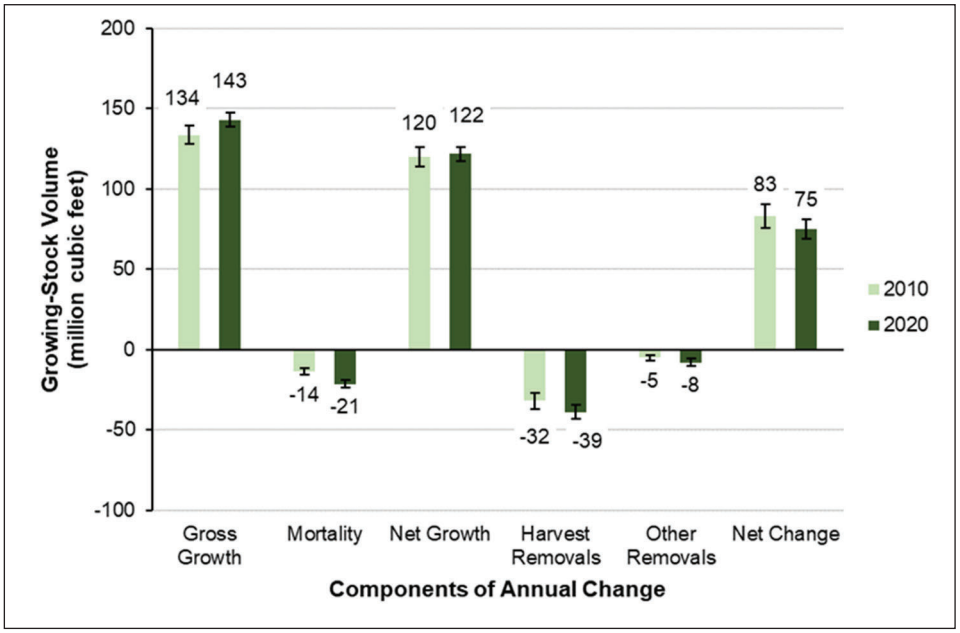

***Figure 2.**—Components of growing-stock volume change on timberland for black walnut by inventory year, Eastern United States. Error bars represent a 68 percent confidence interval.*

the population. Net volume on timberland increased 23 percent to 4.6 million cubic feet and 77 percent of that volume was in growing-stock[2] trees, a slight decrease from 80 percent in 2010. This proportional shift, although small, indicates that the volume of cull trees has increased at a greater rate than that of growing-stock trees. An increase in mortality was offset by an increase in gross growth, leaving net growth essentially unchanged at 122 million cubic feet per year (fig. 2). A slight increase in removals resulted in a slight decrease in net change to 75 million cubic feet per year. Perhaps the most common way to assess sustainability is a ratio of net growth to harvest removals, which was 3.1:1.0 for all states. Among states with at least 5 percent of total growing-stock volume, that ratio was highest in Illinois (4.8:1.0), Pennsylvania (4.1:1.0), and Indiana (3.5:1.0), and lowest in Ohio (1.8:1.0).

Sawtimber volume was 13.1 billion board feet (International ¼-inch) in 2020, a 28 percent increase over 2010. The proportion of sawtimber volume in grade 1 trees increased from 17 percent to 22 percent. The proportion of volume in grades 1 and 2 combined, often referred to as high quality grades, was 47 percent for all states and greater than 60 percent in Iowa, Wisconsin, and Indiana. According to mill surveys conducted in 2018 by the Timber Products Output (TPO: www.fia.fs.usda.gov/program-features/tpo), 85 percent of all roundwood harvested was processed for sawlogs while just 4 percent was processed for veneer and 25 percent of black walnut roundwood production came from Missouri.

Tree damage was observed on approximately 30 percent of black walnut trees compared to 28 percent on trees of all species. The most common damage observed was stem decay which was recorded on 17 percent of black walnut trees. Competition from vines occurred on 6 percent of walnut trees, more than nearly any other individual species.

In forests where walnut composed at least 20 percent of the overstory basal area, the number of black walnut seedlings averaged 43 per acre but varied greatly by state. Black walnut seedlings in these stands were most abundant in Wisconsin on both a per acre basis (128 seedlings per acre) and as a proportion of the total seedlings (10 percent). In nearly every state, the most common seedling species in these forests was either hackberry (*Celtis occidentalis*) or white ash (*Fraxinus americana*).

Eighty-two percent of the forest land in the Eastern U.S. is privately owned and this is especially reflected in the black walnut resource in terms of both number of trees (90 percent) and net volume (93 percent). FIA conducts the National Woodland Owner Survey (NWOS; www.fia.fs.usda.gov/nwos) in order to better understand the attitudes, behaviors, and other characteristics of these owners. These individuals generally list amenities such as scenery, wildlife habitat, and privacy as their top reasons for owning forest land. Among landowners with at least 10 acres of forest land, only 11 percent and 17 percent had a written management plan or had sought the advice of a professional forester in the last 5 years, respectively (Butler et al. 2020). This suggests that ample opportunities exist for increased engagement with these owners. Perhaps more than other important species, the future of black walnut will be determined by the decisions made by the individual forest owner.

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impacted the quality changes of pecans differently. Pecans coated with chitosan, gum arabic, and whey protein isolate showed increased moisture content after 6 months' storage. Pecans coated with gum Arabic and whey protein isolate had the lowest fatty acids concentration among all coated and uncoated pecans, indicating less lipid oxidation occurred. Pecans coated with whey protein isolate showed reduced hardness values but almost no change in fracturability after storage, while other coated pecans showed both reduced hardness and fracturability after storage. All the coated pecans showed increased redness but decreased yellowness after storage. In a nutshell, pecan coatings did provide some protection against the quality changes of pecans during 6 months' storage.

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ABOUT THIS ARTICLE

This article is a condensed version of a longer report prepared as a final report for grants from the Northern Nut Growers Association and Iowa State University Faculty Startup Fund. A longer report is available from the NNGA Grants Committee and will be published in a research journal.

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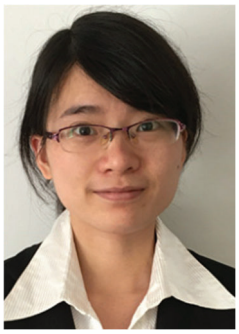

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