

This publication is part of a series that provides an overview of the presence of invasive plant species monitored on an extensive systematic network of plots measured by the Forest Inventory and Analysis (FIA) program of the U.S. Forest Service, Northern Research Station (NRS). Each research note features one of the invasive plants monitored on forested plots by NRS FIA in the 24 states of the midwestern and northeastern United States.

Background and Characteristics

Black locust (*Robinia pseudoacacia*), a tree of the legume family (Fabaceae), is native to the southern Appalachian Mountains (Pennsylvania to Alabama), Ozark Plateau, and mid-south (Fig. 1). Black locust wood is utilized for firewood, fence posts, and building due to its strength and durability. The prolific pea-like blossoms are aesthetically pleasing and provide nectar for bees and butterflies (Fig. 2). Within and outside of its native range, black locust has been extensively planted for ornamental purposes and land reclamation where its ability to fix nitrogen helps increase soil fertility. Except for reclamation, most forest managers consider this tree a weed species that can be a strong competitor against more desirable species (Czarapata 2005, Kaufman and Kaufman 2007, Huntley 1990).

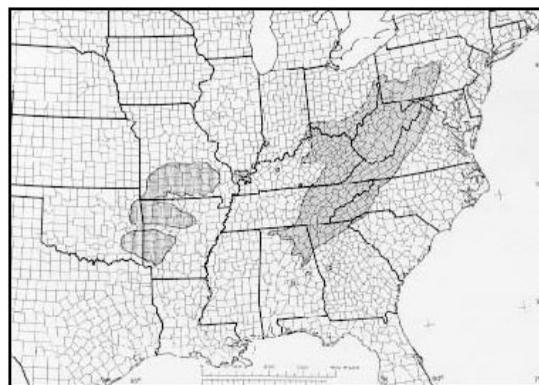


Figure 1.—Native range of black locust.
(Huntley 1990).

Description

Growth: woody, perennial tree to 100 feet, clonal. Compound leaves with 7 to 21 smooth, oval-shaped leaflets which turn yellow in the autumn.

Flowers: fragrant, creamy to light yellow, pea-like (Fig. 2); appear in long drooping clusters; spring.

Fruit: toxic, bean-shaped pods which are smooth, shiny, dark brown, and flattened. Each pod contains several seeds that frequently remain on trees until the following spring.

Reproduction: seed, suckers.

Twigs, branches, bark: bark on older trees is dark gray/brown with deep furrows and flat ridges. Young branches have paired thorns which can reach over ½ inch in length (Fig. 3). Thorns are located where the leaves attach to the stem.

Habitat: a wide variety of locations due to its ability to withstand suboptimal conditions such as salt spray, poor soil, and many pollutants. Prefers full sun.

Control: various mechanical and chemical methods; resprouts readily (Czarapata 2005, Kaufman and Kaufman 2007).

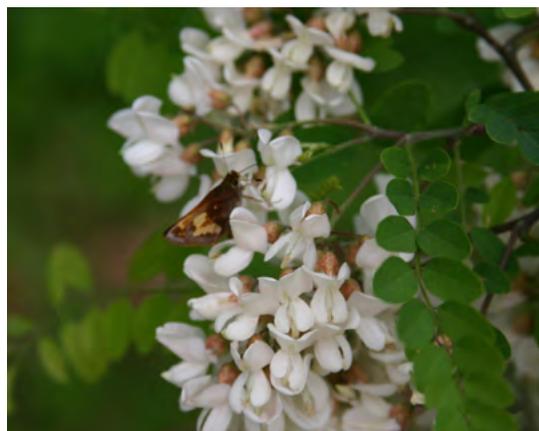


Figure 2.—Butterfly on black locust flowers.
Photo by Leslie J. Mehrhoff, University of Connecticut, from Bugwood.org.

Growth Conditions and Range

Black locust is hardy to -37 °F, requires 16 to 65 inches of annual precipitation, a minimum of 140 days frost free, pH of 4.6 to 8.2, and a minimum of 36 inches rooting depth. It is currently found in all of the lower 48 states as well as British Columbia, Ontario, Quebec, New Brunswick, and Nova Scotia (NRCS 2017).



Figure 3.—Black locust thorns. Photo by Leslie J. Mehrhoff, University of Connecticut, from Bugwood.org.

Black Locust Presence on Phase 2 Invasive Plots, 2015

FIA crews visited 5,865 forested Phase 2 (P2) invasive plots across the NRS region for the 2015 inventory (the 2015 inventory covers plots measured in 2010 to 2015). On P2 invasive plots, 40 invasive plant species¹ (IPS) (39 species and one undifferentiated genus [nonnative bush honeysuckles]²) are monitored. On each of these plots, various attributes are collected including: the occurrence and coverage of IPS as well as the standard forest variables measured on P2 plots (e.g., tree diameter, height). Overall, 52.1 percent of forested plots have one or more of the monitored invasives present.

Black locust is widespread throughout the region, occurring on 384 plots (6.6 percent) across 18 of the 24 NRS states (Fig. 4). Field crew did not observe this invasive tree in Maine, Nebraska, New Hampshire, North Dakota, Rhode

Island, and South Dakota. These results differ slightly from the Plants Database (NRCS 2017), though it is important to remember this inventory only occurs on forest land. West Virginia, a state where black locust is native, has the highest percentage of plots with black locust (38.8 percent). This invasive tree is also prevalent in Ohio (19.5 percent of plots) and Maryland (19.2 percent of plots). For the 2015 inventory, black locust is the eighth most commonly observed invasive species, after multiflora rose (30.0 percent of P2 invasive plots), nonnative bush honeysuckles (18.9 percent), garlic mustard (10.4 percent), Japanese honeysuckle (8.0 percent), autumn olive (7.3 percent), Japanese stiltgrass (6.9 percent), and reed canarygrass (6.6 percent). Additional information about the invasives monitored and county level occurrence maps for the NRS region from 2005 through 2010 can be found in Kurtz (2013).

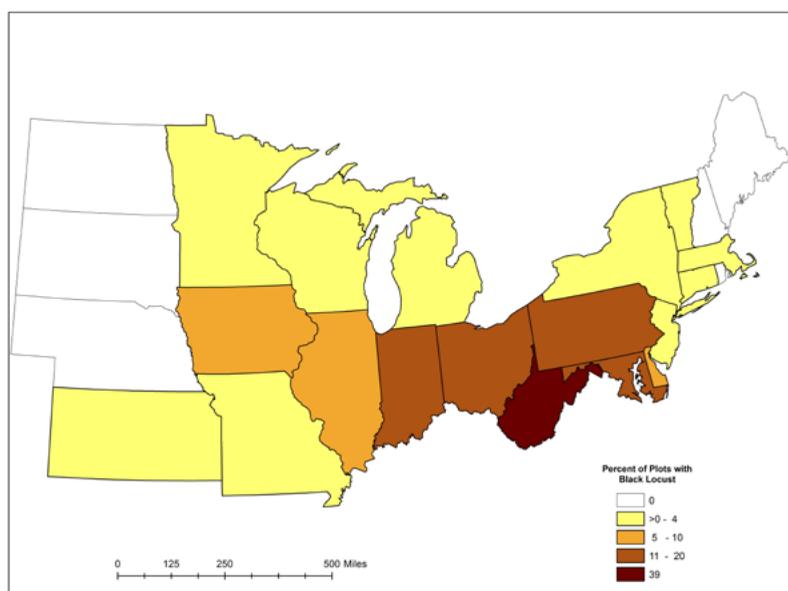


Figure 4.—Percentage of Phase 2 invasive plots with black locust, 2015.³



Black locust in flower. Photo by Robert Vidéki, *Doronicum Kft.*, from Bugwood.org.

¹ Autumn olive (*Elaeagnus umbellata*), black locust (*Robinia pseudoacacia*), Bohemian knotweed (*Polygonum xbohemicum*), bull thistle (*Cirsium vulgare*), Canada thistle (*Cirsium arvense*), Chinaberry (*Melia azedarach*), common barberry (*Berberis vulgaris*), common buckthorn (*Rhamnus cathartica*), common reed (*Phragmites australis*), creeping jenny (*Lysimachia nummularia*), dames rocket (*Hesperis matronalis*), English ivy (*Hedera helix*), European cranberrybush (*Viburnum opulus*), European privet (*Ligustrum vulgare*), European swallow-wort (*Cynanchum rossicum*), garlic mustard (*Alliaria petiolata*), giant knotweed (*Polygonum sachalinense*), glossy buckthorn (*Frangula alnus*), Japanese barberry (*Berberis thunbergii*), Japanese honeysuckle (*Lonicera japonica*), Japanese knotweed (*Polygonum cuspidatum*), Japanese meadowsweet (*Spiraea japonica*), leafy spurge (*Euphorbia esula*), Louise's swallow-wort (*Cynanchum louiseae*), multiflora rose (*Rosa multiflora*), Nepalese browntop (*Microstegium vimineum*), nonnative bush honeysuckles (*Lonicera* spp.), Norway maple (*Acer platanoides*), Oriental bittersweet (*Celastrus orbiculatus*), princestree (*Paulownia tomentosa*), punktree (*Melaleuca quinquenervia*), purple loosestrife (*Lythrum salicaria*), reed canarygrass (*Phalaris arundinacea*), Russian olive (*Elaeagnus angustifolia*), saltcedar (*Tamarix ramosissima*), Siberian elm (*Ulmus pumila*), silktree (*Albizia julibrissin*), spotted knapweed (*Centaurea stoebe* ssp. *micranthos*), tallow tree (*Triadica sebifera*), tree of heaven (*Ailanthus altissima*).

² The 39 IPS and one undifferentiated genus (nonnative bush honeysuckles) are hereafter referred to as “invasive species”, “invasive plants”, “invasives”, or “IPS”.

³ Percentages in figures 4 through 6 are rounded to the nearest whole number.

Black Locust Cover on Phase 2 Invasive Plots

The percentage cover of black locust is shown in two figures, one that illustrates cover by state (Fig. 5) and a second that focuses on plot level data (Fig. 6). It is important to use caution when looking at Figure 5 because the overall average in most states is driven by a small number of plots (11 of the 18 states have 9 or fewer plots with black locust). Due to the low number of observations across most states, Figure 6 is more informative since individual plot values can be assessed. The state with the highest average percentage cover of black locust on plots is Iowa (17.8 percent), however it is important to note this is based on six observations. These maps, along with Figure 4, reveal important information related to the presence and abundance of black locust in the NRS region. As can be seen in these maps, the occurrence of black locust is greatest in the southeastern part of this region. Over time these maps will allow us to assess changes in abundance and spread.

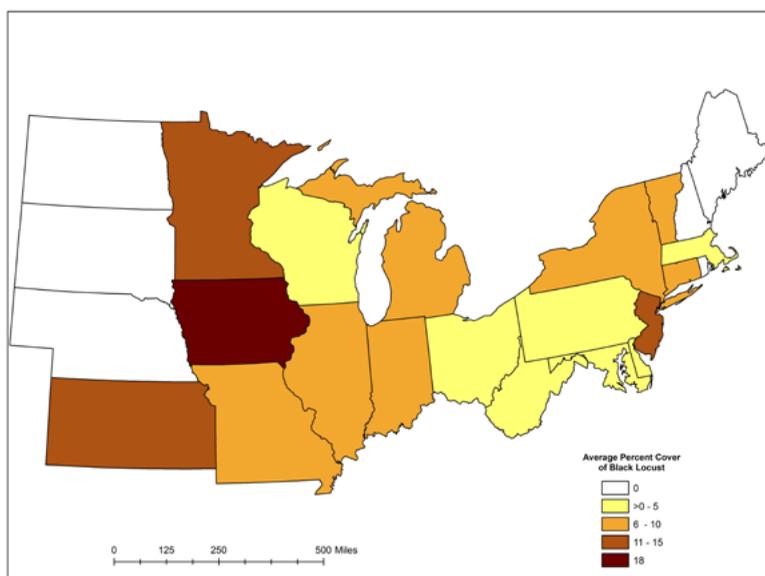


Figure 5.—Average percent cover of black locust on Phase 2 invasive plots, 2015.^{3,4}

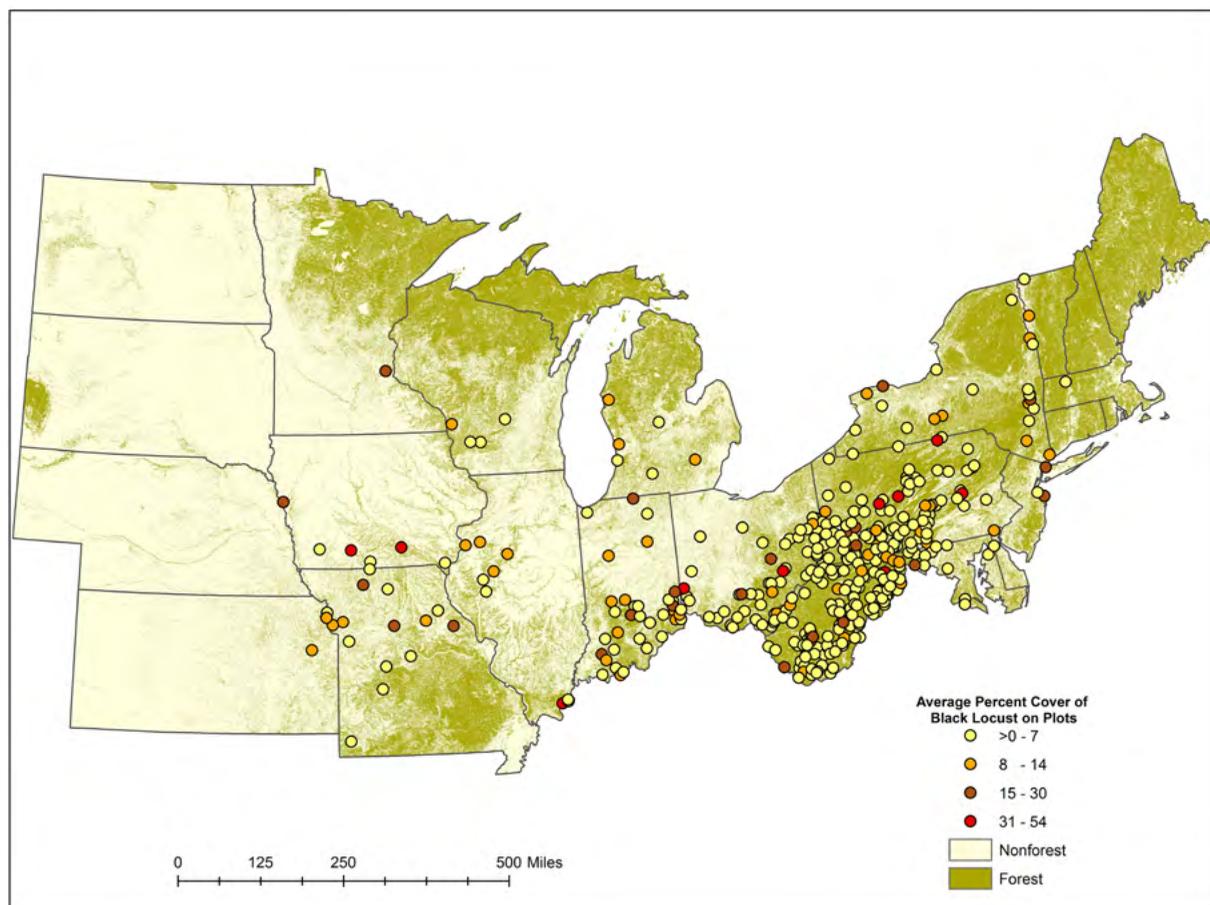


Figure 6.—Average percent cover of black locust occurrences on Phase 2 invasive plots, 2015.^{3,4}

⁴ Average percent cover is calculated for plots with black locust based on subplot data for the portion of the plot that is forested. Each FIA plot consists of four circular 1/24-acre subplots located at the corners and center of an equilateral triangle that is 208 feet on a side.

Characteristics of Phase 2 Invasive plots with Black Locust

The road distance data were analyzed by taking the midpoint of the categorical road distance data recorded by the field crew. Only states where black locust was found on greater than 5 percent of plots were analyzed. This resulted in 1,882 Phase 2 invasive plots. After analyzing these plots, the Phase 2 invasive data suggest that there is no significant difference in average distance to the nearest road for plots with or without black locust ($p>0.05$) (Fig. 7). Despite this finding, several studies have highlighted the effect of roads on invasive distribution (Kurtz and Hansen 2013, Lundgren et al. 2004, Predick and Turner 2008). Roads act as a conduit for seed dispersal and alter light and nutrient availability, as well as drainage. Vehicles traveling on roads carry propagules of many exotics which become dispersed along them.

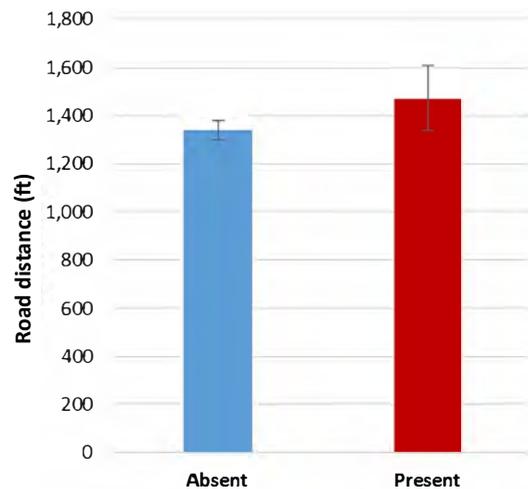


Figure 7.—Average distance to the nearest road for plots with or without black locust, 2015.

The error bars in Figure 7 show a 68% confidence interval for the observed mean.

Despite black locust being native in parts of the NRS region (Fig. 1), the spread of this species outside of its native range is a concern. It has been planted extensively outside of its native range which has caused ecological concern due to its ability to compete with native vegetation (Kurtz 2013). A fast growing species with many appealing characteristics, black locust has been planted across the globe even in climates that differ from its native range (Huntley 1990). Looking at the 1,833 Phase 2 invasive remeasured plots, the number of plots with black locust remained about the same over time. The plots were initially measured in 2007 through 2011 with second measurements from 2011 to 2016. At the first measurement, 120 plots had black locust. When the 1,833 plots were remeasured, 106 plots had black locust. The average cover was 10.7 percent during the first Phase 2 invasive inventory and 12.8 percent on the remeasured plots. These trends will be important to monitor over time as the spread and abundance provide important information about the presence of this species.

Monitoring IPS offers insight on the status, trends, distribution, and population size, as well as help in detecting new populations. These preliminary investigations are important as they help to elucidate differences in plots with and without IPS as well as help to determine the effects invasive species may be causing. The trends reported in this research note are important and need to be watched in the future to help determine important factors related to the presence of these invasives as well as to find out the impacts these species are causing on biota and ecosystems.



Black locust fruit. Photo by Ohio State Weed Lab, Ohio State University, from Bugwood.org



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FIA Program Information

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Additional Invasive Plant Information

Alien Plant Invaders of Natural Areas (PCA, National Park Service): <http://www.nps.gov/plants/alien/factmain.htm>

Invasive and Exotic Plants: <http://www.invasive.org/species/weeds.cfm>

Invasive Plant Atlas of New England: <http://www.eddmaps.org/ipane/>

Invasive Plant Atlas of the United States: <http://www.invasiveplantatlas.org/index.html>

Midwest Invasive Plant Network: <http://mipn.org/>

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