



This publication is part of a series of research notes that provide an overview of the 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

Autumn olive (*Elaeagnus umbellata*), a shrub of the Oleaster family (Elaeagnaceae), is native to eastern Asia and arrived in the United States in the 1830s. This vigorous invader was promoted for wildlife, landscaping, and erosion control. Tolerant of poor quality sites and full sun, it was often used for mine reclamation. Autumn olive disrupts native plant communities that require infertile soil by changing soil fertility through fixing nitrogen. Where it establishes, it can form dense thickets that shade out native plants (Czarapata 2005, Kaufman and Kaufman 2007, Kurtz 2013). Aside from the negative impact, autumn olive has important culinary and medicinal properties (Fordham et al. 2001, Guo et al. 2009).

Description

Growth: woody, perennial shrub to 20 feet, often multi-stemmed; simple, alternate leaves with slightly wavy margins, green upper leaf surfaces, and silvery bottoms; shrubs leaf out early in the spring and retain leaves late in the fall.

Flowers: fragrant, tubular, creamy to light yellow, with 4 petals (Fig. 1); appear singly or in clusters in leaf axils; spring.

Fruit: abundant small (<0.5 inch) green fruits mature to pink/red with silver to coppery spots (Fig. 2); each has one seed; seeds are dispersed by birds and mammals and germinate readily.

Reproduction: seeds; suckers.

Twigs and branches: twigs are silvery to golden brown with a speckled appearance; older branches are gray, often with thorns (Fig. 3).

Habitat: wide variety of habitats with low stocking such as prairies, old fields, open forests, and wastelands; rare in dense forests or on wet sites.

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

Growth Conditions and Range

Autumn olive has high drought tolerance, is hardy to -23 °F, requires a minimum of 150 frost free days, a pH between 5.0 and 7.5, 28 to 45 inches of precipitation, and a minimum rooting depth of 18 inches. It is currently found in 36 states as well as one Canadian province (Ontario) (NRCs 2016).



Figure 1.—Autumn olive flowers. Photo by Chris Evans, University of Illinois, from Bugwood.org, 1380001.



Figure 2.—Autumn olive fruit. Photo by Leslie J. Mehrhoff, University of Connecticut, from Bugwood.org, 5455269.



Figure 3.—Autumn olive thorns. Photo by James H. Miller, U.S. Forest Service, from Bugwood.org, 0016044.



Autumn Olive Cover on Phase 2 Invasive Plots

The percentage cover of autumn olive 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 in some states the overall averages are driven by a small number of plots (e.g., Kansas and South Dakota). For the states with a low number of observations, Figure 6 is more informative since individual plot values can be assessed. Autumn olive is most prevalent in the southern part of the region, with the highest average percentage cover on plots in Pennsylvania (6.5 percent). These maps, along with Figure 4, reveal important information related to the presence and abundance of autumn olive in the NRS region. Over time these maps will allow us to assess changes in abundance and spread.

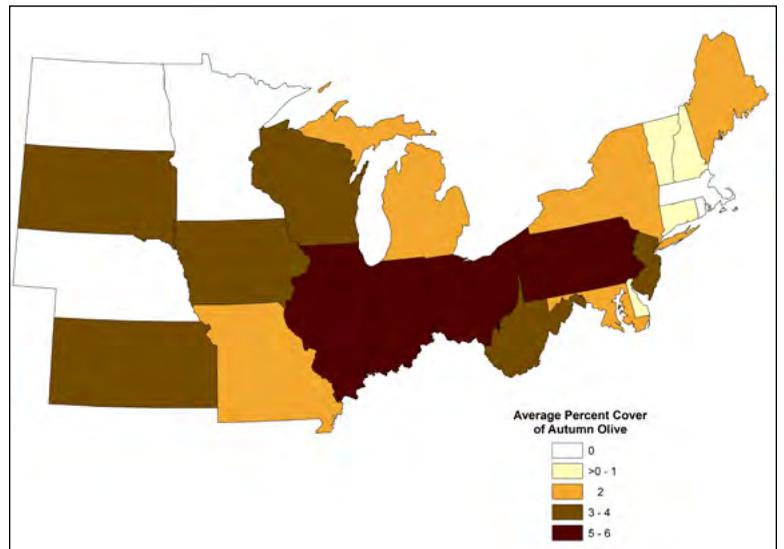


Figure 5.—Average percent cover³ of autumn olive on Phase 2 invasive plots, 2014. Percentages are rounded to the nearest whole number.

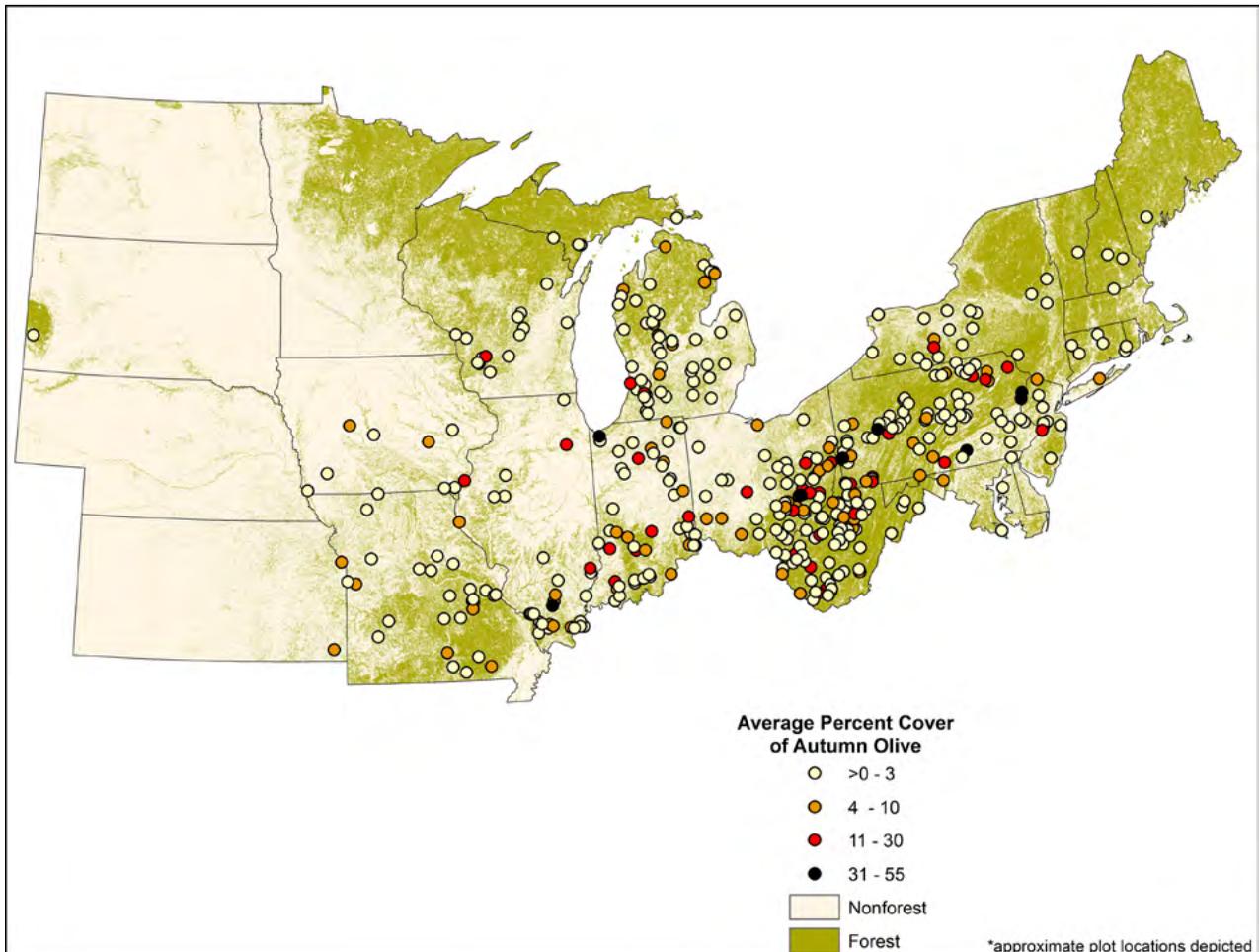


Figure 6.—Average percent cover³ of autumn olive observations on Phase 2 invasive plots, 2014. Percentages are rounded to the nearest whole number.

³ Average percent cover is calculated for plots with autumn olive 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 Plots with Autumn Olive

The P2 invasive data suggest that autumn olive is more common on plots near roads. There is a significant difference (t-test; $p < 0.05$) in the distance to the nearest road for plots with and without autumn olive (Fig. 7). However it is important to note the variability in both road density and autumn olive occurrence across the region before making further conclusions. Several studies have highlighted the effect of roads on invasive distribution. Roads are a conduit for seed dispersal, alter light and nutrient availability, and drainage. Vehicles traveling on roads carry propagules of many exotics which become dispersed along them. Roads are an important vector for IPS (Kurtz and Hansen 2013, Lundgren et al. 2004, Predick and Turner 2008). Due to the effects of roads and other types of fragmentation, it is important to strive to keep forest land intact.

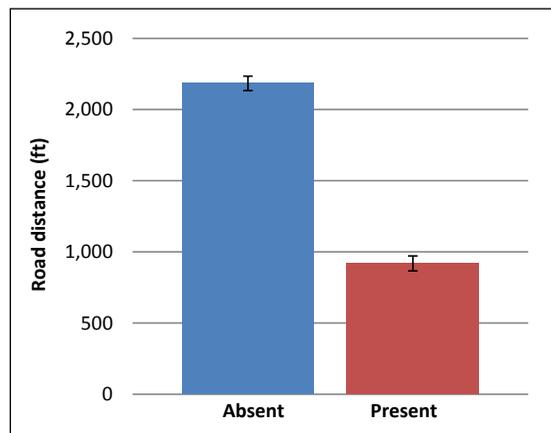


Figure 7.—Average distance to the nearest road for plots with and without autumn olive, 2014. Error bars show a 68 percent confidence interval for the observed mean.

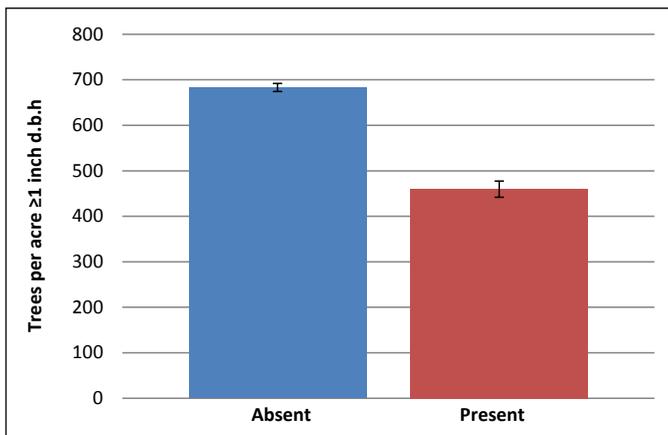


Figure 8.—Trees per acre ≥ 1 inch d.b.h. with and without autumn olive, 2014. Error bars show a 68 percent confidence interval for the observed mean.

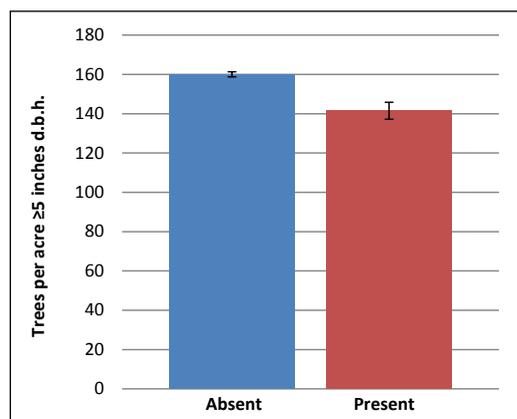


Figure 9.—Trees per acre ≥ 5 inches d.b.h. with and without autumn olive, 2014. Error bars show a 68 percent confidence interval for the observed mean.

Tree cover also differs for plots with and without autumn olive. The 2014 data suggest that there are fewer trees per acre on plots with autumn olive (Fig. 8 and 9) (t-test; $p < 0.05$). Since the study has only been underway for a short time (complete implementation across all of the NRS region in 2007), it is difficult to assess whether the invasives are influencing tree regeneration and growth, or if the IPS are establishing where there is reduced tree cover and less competition. Continued investigation into this matter is important because these plants can outcompete native species and without adequate understory regeneration to replace the aging overstory, the future of the forest remains in question. These preliminary investigations are important as they suggest there is a difference between plots with and without autumn olive.

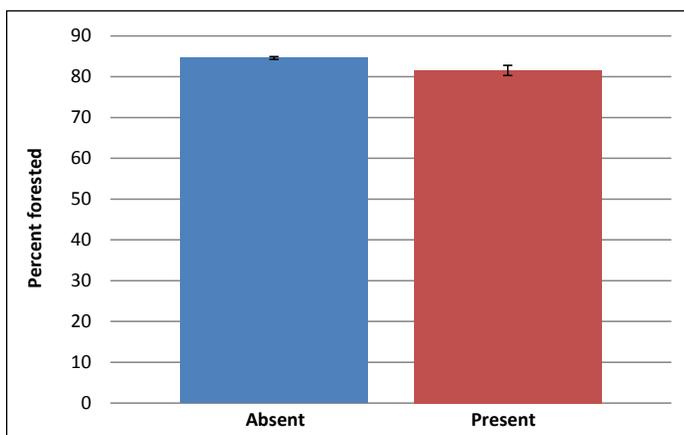


Figure 10.—Percentage of the plot that is forested for plots with and without autumn olive, 2014. Error bars show a 68 percent confidence interval for the observed mean.

Further analysis of plots with and without autumn olive shows that plots without autumn olive tend to be more forested than plots with autumn olive (Fig. 10) (t-test; $p < 0.05$). Overall, plots with this invader are 3.0 percent less forested when compared to plots without autumn olive.

Monitoring IPS offers insight on the status, trends, distribution, and population size, as well as helps to detect new populations. The trends found in this research note are important and need to be monitored in the future to help elucidate 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. This research is valuable to land managers and other concerned individuals as it provides nonbiased data to help make well-informed management decisions.



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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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