

An Assessment of Common Buckthorn in Northern U.S. Forests

Research Note NRS-250

This publication is part of a series of 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 USDA 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

Common buckthorn (*Rhamnus cathartica*; also known as European buckthorn) is a woody shrub that is native to Eurasia and was introduced to North America as an ornamental from Europe in the 1800s (Kurtz 2013). It is a problematic invader as it can grow across a range of light levels. In addition, plants leaf out early and the leaves remain on the plants until late in the season. In a Wisconsin study, Delanoy and Archibold (2007) found that up to 35 percent of the annual carbon is gained by this invader prior to leaf emergence of native species and leaf retention is 58 days longer than comparable native shrubs. These characteristics give common buckthorn a photosynthetic advantage.

Common buckthorn is also problematic in agricultural areas as it is an alternate host for oat crown rust (*Puccinia coronata*) and the primary overwintering host for the soybean aphid (*Aphis glycines*).

Accurate identification is important as there are native shrubs (e.g., Carolina buckthorn [*Rhamnus caroliniana*] and alder buckthorn [*Rhamnus alnifolia*]) that resemble common buckthorn.

Description

Growth: to 25 feet tall; foliage is shiny, mostly alternate, with smooth upper and lower surface and fine teeth; veins curve toward tips; thorns at tips of twigs (Fig. 1).

Reproduction: small greenish-yellow flowers (Fig. 2) yield abundant round black fruit (Fig. 3) that can remain on the tree until spring and remain viable for several years.

Habitat: open woodlands, urban areas.

Growth conditions: full sun to shade with vigor reduced in deep shade; seedling survival is affected by hot summers, cold winters, thick litter layers, and acidic, dry, and water-logged soils; presence declines south of 42° N latitude.

Control: various chemical and mechanical methods; repeated monitoring is necessary due to seedbanks and resprouting (Kurtz 2013).

Growth Conditions and Range

Common buckthorn is currently found in 34 states and eight Canadian provinces.



Figure 1.—Common buckthorn foliage and thorn.

Photo by Chris Evans, University of Illinois, from Bugwood.org.



Figure 2.—Common buckthorn in flower.

Photo by Robert Vidéki, Doronicum Kft., from Bugwood.org



Figure 3.—Fruit of common buckthorn.

Photo by Jan Samanek, Phytosanitary Administration, from Bugwood.org

Common Buckthorn Presence on Phase 2 Invasive Plots, 2016

FIA crews visited 4,981 forested Phase 2 (P2) invasive plots across the NRS region for the 2016 inventory. These P2 invasive plots are a subset of the standard P2 plots where 40 invasive plant species¹ (IPS) (39 species and one undifferentiated genus [nonnative bush honeysuckle]²) are monitored. 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, 52.0 percent of forested plots have one or more of the monitored invasives present.

Common buckthorn is found throughout most of the NRS region. This noxious shrub occurs on 321 plots (6.4 percent) across 19 of the 24 NRS states (Fig. 4). Field crews did not observe this invasive shrub in Delaware, Kansas, Maryland, New Jersey, or West Virginia. Detection maps (NRCS 2018) show common buckthorn in all 24 states of the NRS, but it

is important to remember that this inventory samples only forest land.³ New York has the greatest percentage of plots with common buckthorn (19.9 percent). This invasive shrub is also prevalent in Minnesota (18.0 percent of plots), Rhode Island (15.4 percent), and Wisconsin (14.9 percent).

For the 2016 inventory, common buckthorn is the ninth most commonly observed invasive species after multiflora rose (30.5 percent), nonnative bush honeysuckles (19.4 percent), garlic mustard (11.2 percent), Japanese honeysuckle (8.0 percent), autumn olive (7.5 percent), Japanese stiltgrass (7.3 percent), Japanese barberry (7.1 percent), and black locust (6.5 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).

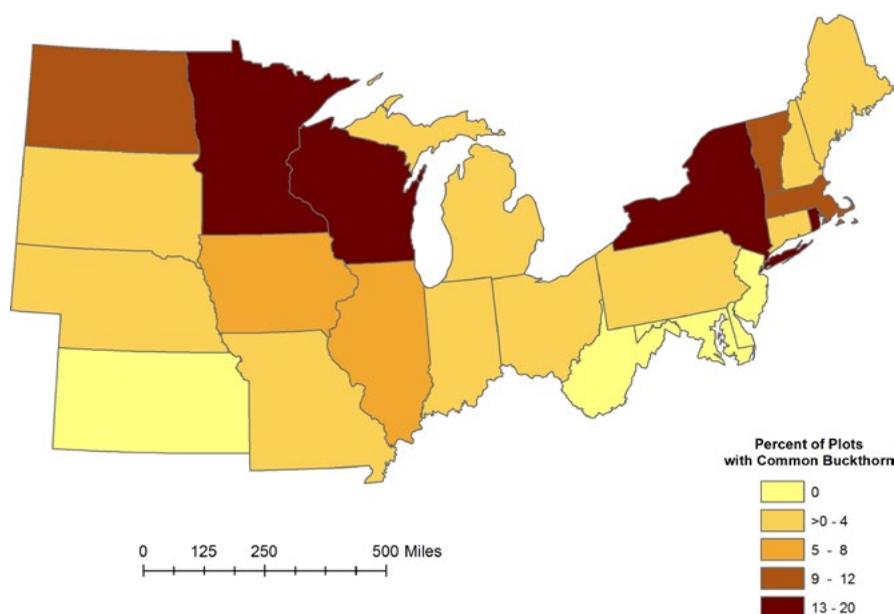


Figure 4.—Percentage of Phase 2 invasive plots with common buckthorn, 2016. Percentages are rounded to the nearest whole number.



Common buckthorn infestation.

Photo by Steven Katovich, USDA Forest Service, 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 thunbergii*), leafy spurge (*Euphorbia esula*), Louise's swallow-wort (*Cynanchum louiseae*), multiflora rose (*Rosa multiflora*), Japanese stiltgrass (*Microstegium vimineum*), nonnative bush honeysuckle (*Lonicera* spp.), Norway maple (*Acer platanoides*), Oriental bittersweet (*Celastrus orbiculatus*), princess tree (*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 honeysuckle) are hereafter referred to as "invasive species", "invasive plants", "invasives", or "IPS".

³ FIA defines forest land as land that is at least 10 percent stocked with trees of any size or land formerly having had such tree cover and not currently developed for nonforest use. Generally, the minimum area for classification as a forest is 1 acre in size and at least 120 feet in width. There are more specific criteria for defining forest land near streams, rights-of-way, and shelterbelt strips (USDA Forest Service 2015).

Common Buckthorn Cover on Phase 2 Invasive Plots, 2016

The percentage cover of common buckthorn 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. For the states with a low number of observations, Figure 6 is more informative since individual plot values can be assessed. Illinois is the state with the highest average percent cover of common buckthorn on plots, 21.6 percent. For the 2016 survey, 12 of the 144 plots (8.3 percent) in this state had common buckthorn present. These maps, along with Figure 4, reveal important information related to the presence and abundance of this species in the NRS region. Over time these maps will allow us to assess changes in abundance and spread throughout this region.

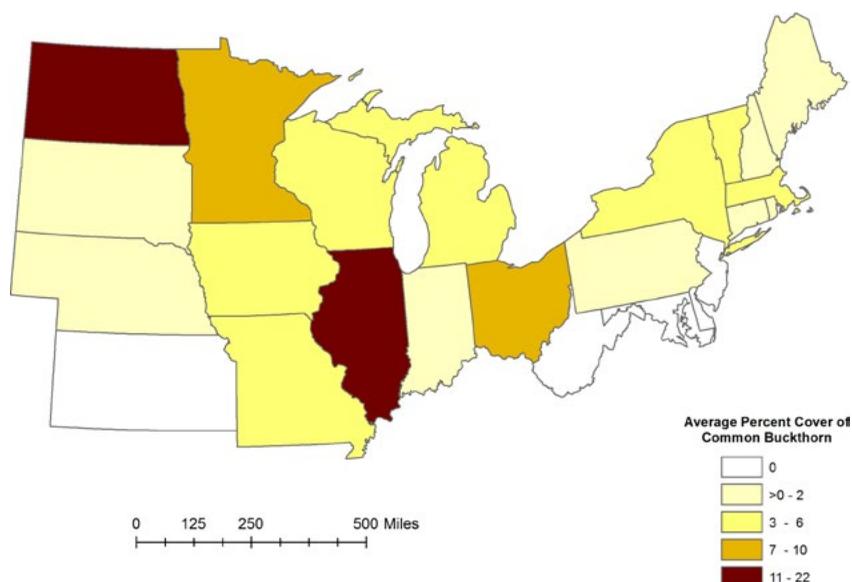


Figure 5.—Average percent cover⁴ of common buckthorn on Phase 2 invasive plots, 2016. Percentages are rounded to the nearest tenth of a whole number.

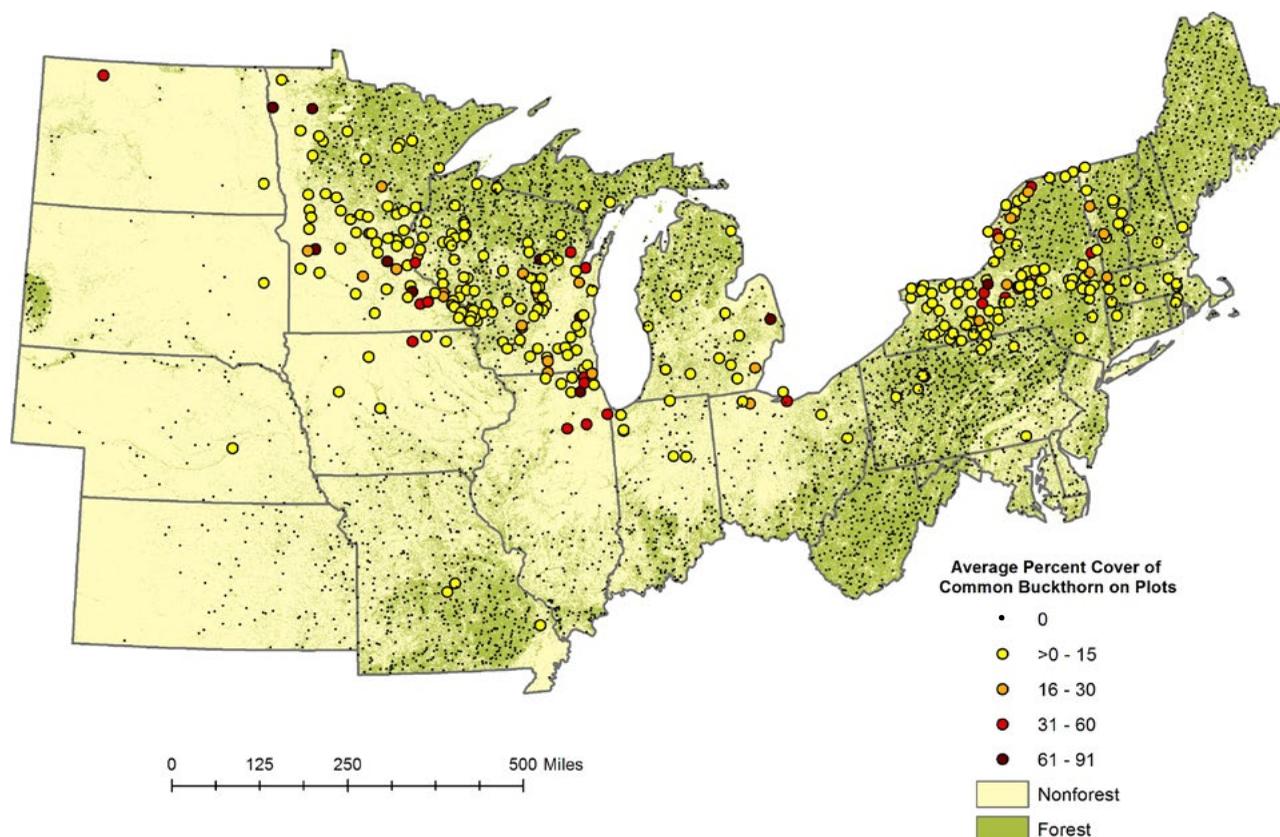


Figure 6.—Average percent cover⁴ of common buckthorn on Phase 2 invasive plots, 2016. Approximate plot locations depicted. Percentages are rounded to the nearest tenth of a whole number.

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

Characteristics of Plots with Common Buckthorn

The data analysis in this section was limited to the nine NRS states with common buckthorn present on greater than 5 percent of plots, resulting in the analysis of 1,817 plots. Of the 1,817 plots, this noxious shrub is present on 278. The nine states in this analysis are Illinois, Iowa, Massachusetts, Minnesota, New York, North Dakota, Rhode Island, Vermont, and Wisconsin.

Data collected on sample plots suggest that common buckthorn is more common on plots near roads (Fig. 7; t-test; $p < 0.05$). 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 conduits 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. Wildlife, using these roads as corridors, also spread IPS along them.

Tree cover differs for plots with and without common buckthorn. The 2016 data suggest that there are fewer seedlings and saplings per acre on plots with common buckthorn (Fig. 8A and 8B; t-test; $p < 0.05$). Since the study is relatively new, with complete implementation across all of the NRS region in 2007, it is difficult to assess whether the invasive plants are influencing tree regeneration and growth or if the invasive plants are establishing where there is reduced tree cover and less competition. Continued investigation 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.

Further analysis of the tree data suggests that there is not a significant difference in the number of trees 5 inches diameter at breast height (d.b.h.) or greater on plots with or without common buckthorn (Fig. 9; $p > 0.05$). However, there is a significant difference in the percentage of the plot that is forested for plots with and without common buckthorn (Fig. 10; $p < 0.05$). It will be important to continue monitoring how fragmentation affects the presence of common buckthorn.

Monitoring IPS offers insight on the status, trends, distribution, and population size, and helps to detect new populations. These preliminary investigations are important as they suggest there is a difference between plots with and without common buckthorn and future studies will help determine the effects of these species. IPS can affect property and timber value, biodiversity, habitat quality, and sustainability. The trends reported in this research note are important and need to be watched in the future to help elucidate important factors related to the presence of these invasives as well as to evaluate the impacts of these species on ecosystems.

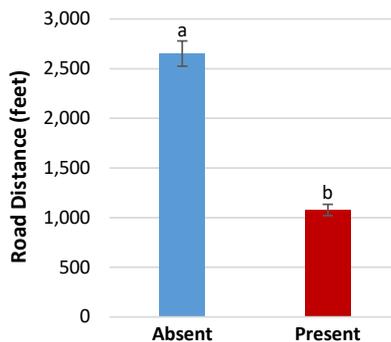


Figure 7.—Average distance to the nearest road for plots with or without common buckthorn, 2016.⁵

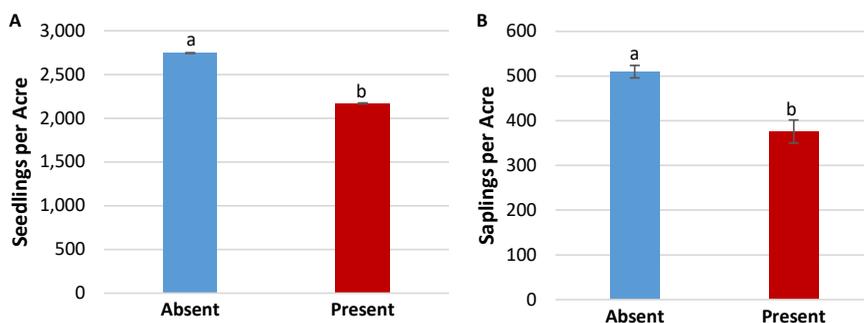


Figure 8.—Number of seedlings (A) and saplings (B) per acre for plots with or without common buckthorn, 2016.⁵

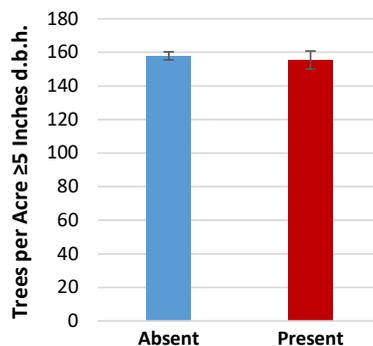


Figure 9.—Trees per acre ≥ 5 inches d.b.h. for plots with or without common buckthorn, 2016.⁵

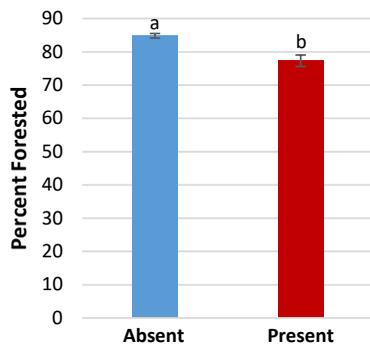


Figure 10.—Percentage of the plot that is forested for plots with or without common buckthorn, 2016.⁵

⁵The error bars in Figures 7 through 10 show a 68% confidence interval for the observed mean. Significantly different values are noted with letters (t-test; $p < 0.05$).



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FIA Program Information

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Additional Invasive Plant Information

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/>

Contact

Analyst: Cassandra Kurtz, (651) 649-5149; cmkurtz@fs.fed.us

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