

This publication is part of a series of research notes 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

Japanese stiltgrass (*Microstegium vimineum*), a member of the grass family (Poaceae), is an annual that is native to southeastern Asia. Around 1919 this aggressive grass, also known as Nepalese browntop or Chinese packing grass, was introduced to Tennessee from Oriental porcelain packaging material containing seeds (Kaufman and Kaufman 2007, Kurtz 2013).

Japanese stiltgrass has low wildlife value and deer may promote its spread by creating soil disturbance to favor its growth. It can grow in sun or shade. Due to its shade tolerance, this species is of particular concern within forested areas and in optimal conditions one plant can yield 1,000 seeds annually. Large, dense patches of Japanese stiltgrass can quickly cover the forest floor, shading out other vegetation (Czarapata 2005, Kaufman and Kaufman 2007).

### Description

**Growth:** shallow rooted, hairless stems; similar to other grasses but can be distinguished by the silver stripe along the upper surface of the lime-colored leaves (Fig. 1); leaves up to 4 inches long and 0.5 inch wide; leaves alternate, well-spaced, lance shaped, pointed at each end; matures to around 3 feet.

**Flowers:** inflorescence of multiple thin, hairy spikes with flowers or seeds clustered along them (Fig. 2); originate at leaf axils or ends of stems; late summer to fall.

**Reproduction:** seed; plants can root where nodes contact soil.

**Habitat:** floodplains, stream banks, roadsides, forests, disturbed areas.

**Control:** various mechanical and chemical methods; plants can be pulled easily in moist soil (Fig. 3); eradication may take years because of the seed bank (Czarapata 2005, Kaufman and Kaufman 2007).

### Growth Conditions and Range

Colonization is often rapid on disturbed sites with slower/reduced infestation on sites that have not been disturbed. Other favorable conditions are acidic to neutral organic soils along stream banks and floodplains (Kurtz 2013). It is currently found in 24 primarily southeastern states, as well as Puerto Rico (NRCS 2017).



**Figure 1.—Distinct silver stripes of Japanese stiltgrass leaves.** Photo by Leslie J. Mehrhoff, University of Connecticut, Bugwood.org, 5483594.



**Figure 2.—Japanese stiltgrass inflorescence.** Photo by Leslie J. Mehrhoff, University of Connecticut, from Bugwood.org, 5483867.



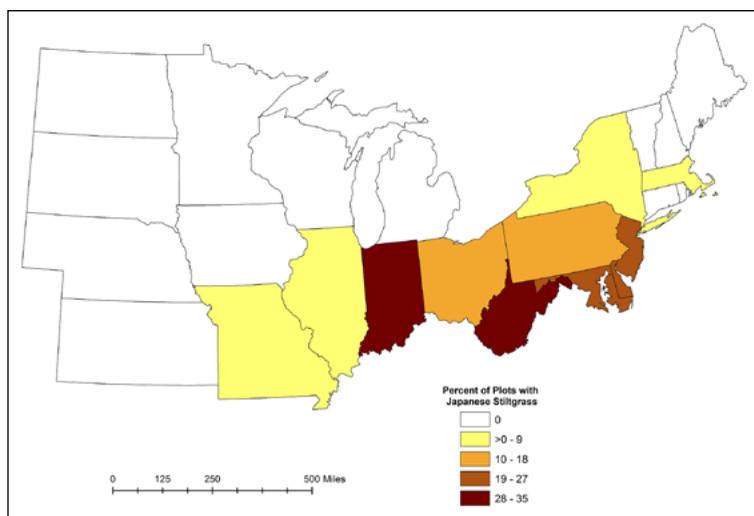
**Figure 3.—Shallow root system of Japanese stiltgrass.** Photo by Leslie J. Mehrhoff, University of Connecticut, Bugwood.org, 5503518.

## Japanese Stiltgrass 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. On P2 Invasive plots, 40 invasive plant species<sup>1</sup> (IPS) (39 species and one undifferentiated genus [nonnative bush honeysuckles]<sup>2</sup>) 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.

Japanese stiltgrass is widespread throughout the region, occurring on 402 plots (6.9 percent) across 11 of the 24 NRS states (Fig. 4). Field crews observed this invasive grass in Delaware, Illinois, Indiana, Maryland, Massachusetts, Missouri, New Jersey, New York, Ohio, Pennsylvania,

and West Virginia. These results differ slightly from the Plants Database (NRCS 2017) though it is important to remember that this inventory samples only forest land. West Virginia has the highest percentage of plots with Japanese stiltgrass (35.0 percent). This invasive grass is also prevalent in Indiana (29.6 percent of plots) and Maryland (27.4 percent). For the 2015 inventory, Japanese stiltgrass is the sixth 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), and autumn olive (7.3 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 Japanese stiltgrass, 2015.** Percentages are rounded to the nearest whole number.



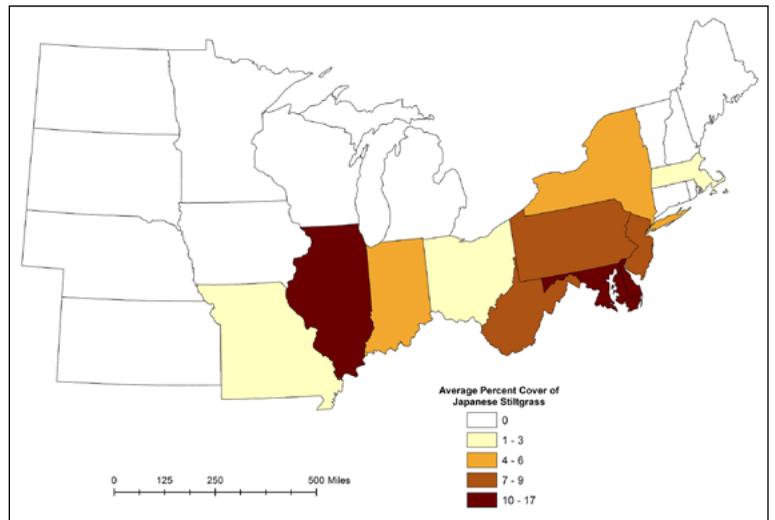
**Japanese stiltgrass infestation.** Photo by Leslie J. Mehrhoff, University of Connecticut, from Bugwood.org, 5501107.

<sup>1</sup> 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*), Japanese stiltgrass (*Microstegium vimineum*), nonnative bush honeysuckles (*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*).

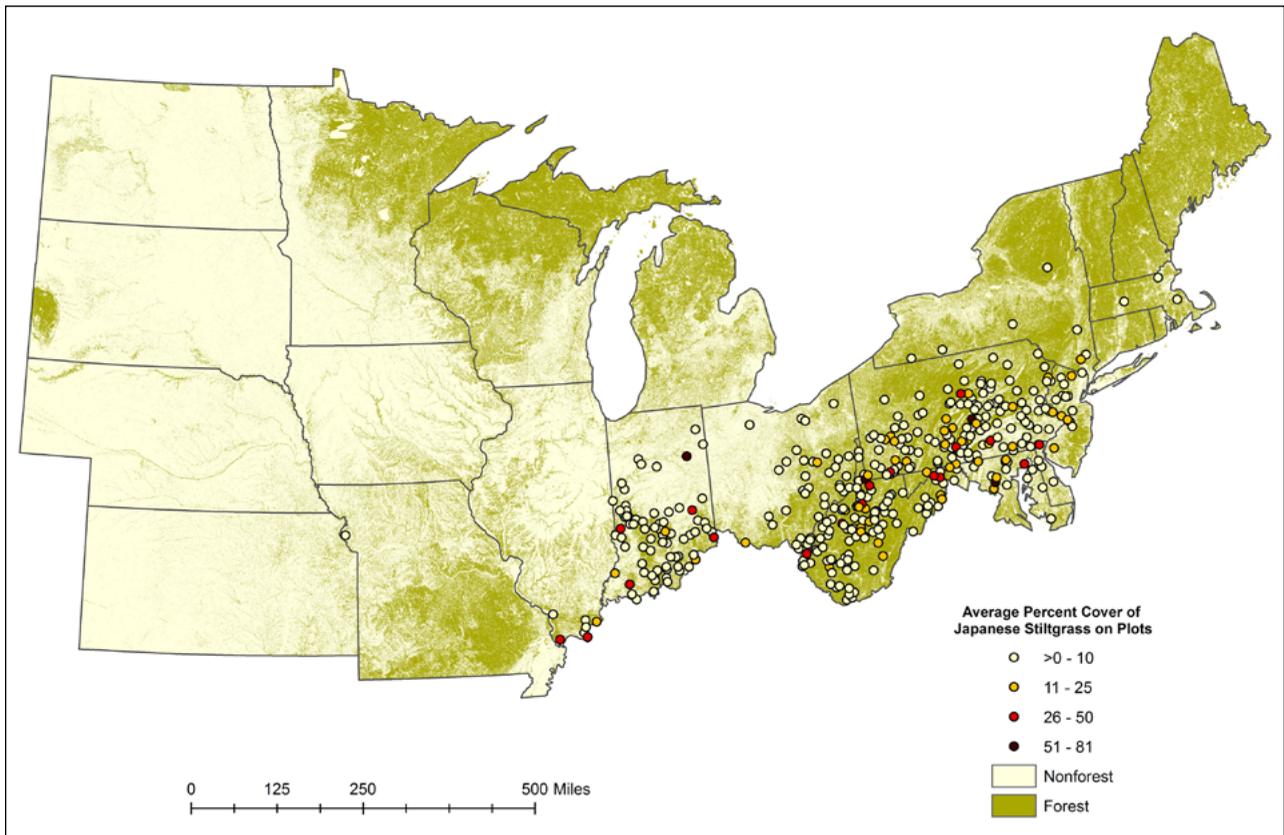
<sup>2</sup> The 39 IPS and one undifferentiated genus (nonnative bush honeysuckles) are hereafter referred to as "invasive species", "invasive plants", "invasives", or "IPS".

## Japanese Stiltgrass Cover on Phase 2 Invasive Plots

The percentage cover of Japanese stiltgrass 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. Delaware is the state with the highest average percent cover of Japanese stiltgrass on plots (16.9 percent). However, it is important to note that Delaware only had five plots with Japanese stiltgrass. These maps, along with Figure 4, reveal important information related to the presence and abundance of this species in the NRS region. As can be seen in these maps, the occurrence of Japanese stiltgrass is greatest in the southeastern part of this region. Over time these maps will allow us to assess changes in abundance and spread throughout this region.



**Figure 5.—Average percentage cover<sup>3</sup> of Japanese stiltgrass on Phase 2 invasive plots, 2015.** Percentages are rounded to the nearest whole number.

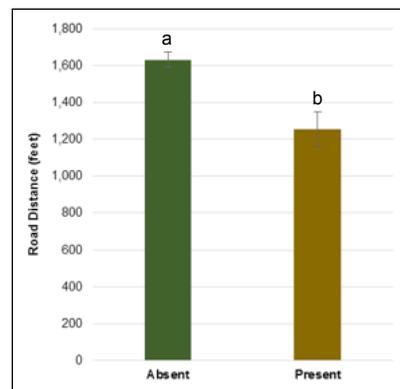


**Figure 6.—Average percentage cover<sup>3</sup> of Japanese stiltgrass on Phase 2 invasive plots, 2015.** Percentages are rounded to the nearest whole number.

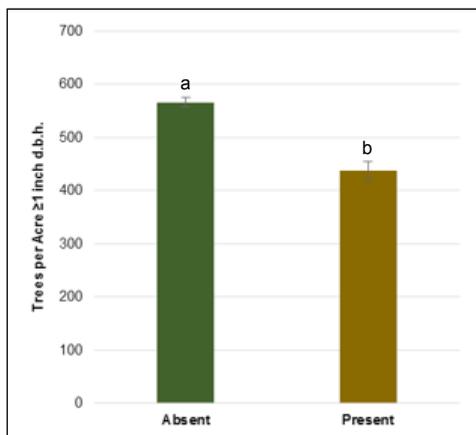
<sup>3</sup> Average percent cover is calculated for plots with Japanese stiltgrass based on subplot data for the portion of the plot that is forested. Each FIA plot consists of four circular 1/24-acre subplots located at the corners and center of an equilateral triangle that is 208 feet on a side.

## Characteristics of Plots with Japanese Stiltgrass

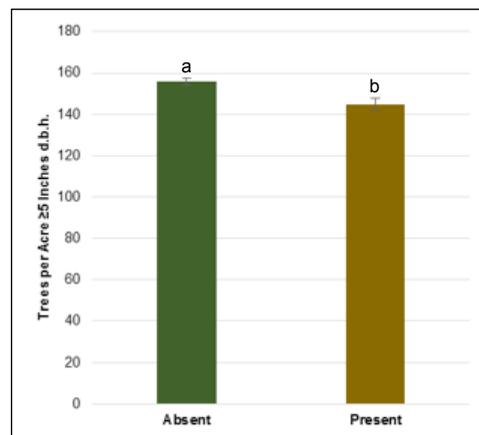
The P2 invasive data suggest that Japanese stiltgrass is more common on plots near roads. The road distance data were analyzed for the 11 NRS states where Japanese stiltgrass was observed which resulted in an analysis of 3,637 plots. There is a significant difference (t-test;  $p < 0.05$ ) in the distance to the nearest road for plots with and without Japanese stiltgrass (Fig. 7). Several studies have highlighted the effect of roads on invasive distribution (Kurtz and Hansen 2013, Lundgren et al. 2004, Predick and Turner 2008). Roads are 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 Japanese stiltgrass, 2015.<sup>4</sup>**

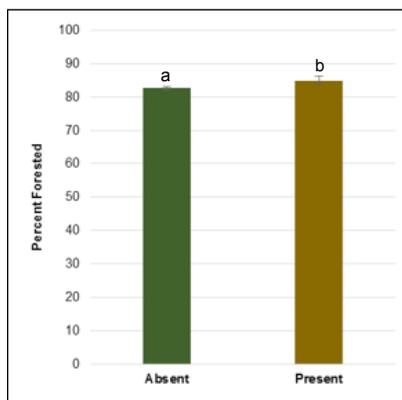


**Figure 8.—Trees per acre ≥ 1 inch diameter at breast height (d.b.h.) with or without Japanese stiltgrass, 2015.<sup>4</sup>**



**Figure 9.—Trees per acre ≥ 5 inches d.b.h. with or without Japanese stiltgrass, 2015.<sup>4</sup>**

Tree cover also differs for plots with and without Japanese stiltgrass. The 2015 data for the 11 NRS states where Japanese stiltgrass was found (3,637 plots) suggest that there are fewer trees per acre on plots with Japanese stiltgrass (Fig. 8 and 9; 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.

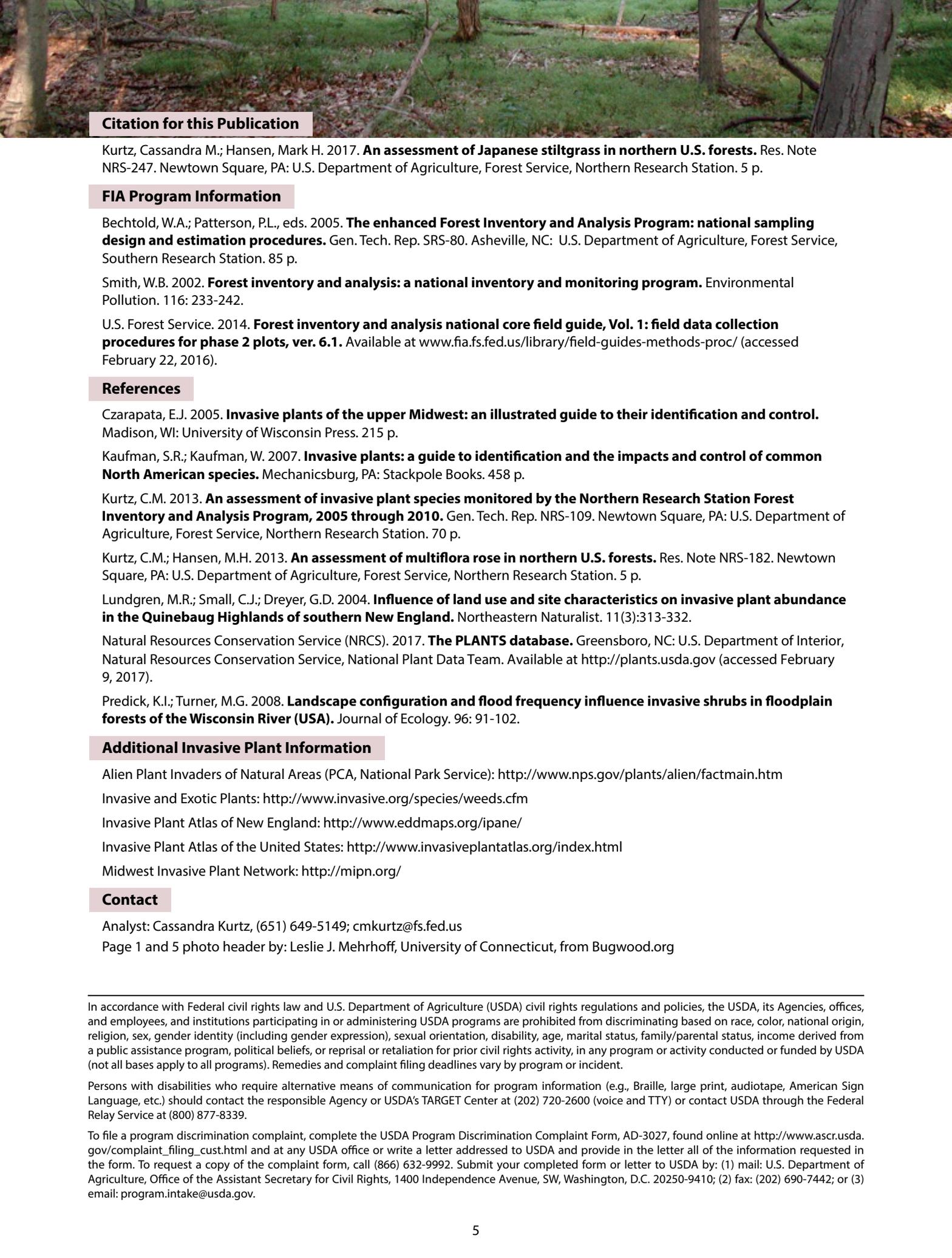


**Figure 10.—Percentage of the plot that is forested for plots with or without Japanese stiltgrass, 2015.<sup>4</sup>**

Further analysis of the 3,637 plots of the 11 NRS states where Japanese stiltgrass is present suggests that there is not a significant difference in the amount of the plot that is forested where this species is observed (Fig. 10; t-test;  $p > 0.05$ ). This will be important to monitor over time to observe the relationship between forested area and the presence of Japanese stiltgrass.

Monitoring IPS offers insight on the status, trends, distribution, and population size, as well as helps to detect new populations. These preliminary investigations are important as they suggest there is a difference between plots with and without Japanese stiltgrass and future studies will help determine the effects these species are causing. 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 find out the impacts these species are causing on biota and ecosystems.

<sup>4</sup>The error bars in Figures 7 through 10 show a 68% confidence interval for the observed mean.

A photograph of a forest floor with green grass, fallen branches, and tree trunks. The image is used as a background for the top section of the document.

## Citation for this Publication

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## FIA Program Information

Bechtold, W.A.; Patterson, P.L., eds. 2005. **The enhanced Forest Inventory and Analysis Program: national sampling design and estimation procedures.** Gen. Tech. Rep. SRS-80. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 85 p.

Smith, W.B. 2002. **Forest inventory and analysis: a national inventory and monitoring program.** Environmental Pollution. 116: 233-242.

U.S. Forest Service. 2014. **Forest inventory and analysis national core field guide, Vol. 1: field data collection procedures for phase 2 plots, ver. 6.1.** Available at [www.fia.fs.fed.us/library/field-guides-methods-proc/](http://www.fia.fs.fed.us/library/field-guides-methods-proc/) (accessed February 22, 2016).

## References

Czarapata, E.J. 2005. **Invasive plants of the upper Midwest: an illustrated guide to their identification and control.** Madison, WI: University of Wisconsin Press. 215 p.

Kaufman, S.R.; Kaufman, W. 2007. **Invasive plants: a guide to identification and the impacts and control of common North American species.** Mechanicsburg, PA: Stackpole Books. 458 p.

Kurtz, C.M. 2013. **An assessment of invasive plant species monitored by the Northern Research Station Forest Inventory and Analysis Program, 2005 through 2010.** Gen. Tech. Rep. NRS-109. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 70 p.

Kurtz, C.M.; Hansen, M.H. 2013. **An assessment of multiflora rose in northern U.S. forests.** Res. Note NRS-182. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 5 p.

Lundgren, M.R.; Small, C.J.; Dreyer, G.D. 2004. **Influence of land use and site characteristics on invasive plant abundance in the Quinebaug Highlands of southern New England.** Northeastern Naturalist. 11(3):313-332.

Natural Resources Conservation Service (NRCS). 2017. **The PLANTS database.** Greensboro, NC: U.S. Department of Interior, Natural Resources Conservation Service, National Plant Data Team. Available at <http://plants.usda.gov> (accessed February 9, 2017).

Predick, K.I.; Turner, M.G. 2008. **Landscape configuration and flood frequency influence invasive shrubs in floodplain forests of the Wisconsin River (USA).** Journal of Ecology. 96: 91-102.

## 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/>

## Contact

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