USDA United States Department of Agriculture

An Assessment of Canada Thistle in Northern U.S. Forests

Research Note NRS-252

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 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

Canada thistle (*Cirsium arvense*) is an herbaceous perennial in the Aster family. Since its arrival to North America from Europe in the early 1600s via contaminated crop seed, it has caused considerable impact by displacing native plants and reducing crop and pasture productivity (Czarapata 2005, Kaufman and Kaufman 2007).

Canada thistle is troublesome because each plant can produce 1,500 to 5,000 seeds and the seeds remain viable up to 20 years (Kurtz 2013). Additionally the plants have sharp spines (Fig. 1) and send out extensive root systems. Birds, small animals, humans, and water are vectors of this species. While it is considered a problematic species due to its aggressive spread and agricultural impact, there are some beneficial qualities to note. Canada thistle offers nectar for a multitude of birds and insects (Fig. 2). It also is claimed to have medicinal value for dysentery, diarrhea, as a bowel tonic, dewormer, as well as for skin eruptions and ulcers, poison ivy rash, and tuberculosis treatment (Foster and Duke 2000). Despite these important traits, it is considered noxious in much of the United States where its spread threatens native species by competing for resources such as light and nutrients.

Description

Growth: stems to 5.0 feet long, often with hair along; dense clone growth; crinkly leaves up to approximately half a foot with abundant spines.

Reproduction: numerous purple (Fig. 3), lavender, to sometimes white flowers, around 0.5-inch diameter, that bloom in mid to late summer; seeds are small with a tuft of hair at the tip facilitating wind dispersal.

Habitat: agriculture fields, pastures, roadsides, disturbed areas, urban areas, along wetlands.

Growth conditions: prefers sun.

Control: herbicide can be effective but sensitivity of other plants is important; for small infestations, plants can be covered with black plastic and "cooked"; repeated mowing (Czarapata 2005, Kaufman and Kaufman 2007).

Growth Conditions and Range

Canada thistle is hardy throughout North America. Its northern limit corresponds with the January average temperature of -40.0 °F (Royer and Dickinson 1999). It is currently found throughout the United States and Canada (NRCS 2019).

Figure 1.—Crinkled leaves and spines of Canada thistle. Photo by Leslie J. Mehrhoff, University of Connecticut, 5451395 from Bugwood.org.

Figure 2.—Canada thistle in flower. Photo by Ohio State Weed Lab, The Ohio State University, 1560037 from Bugwood.org.

Figure 3.—Comparison of bull thistle (left) to Canada thistle (right). Photo by Steve Dewey, Utah State University, 1459748 from Bugwood.org.

Canada Thistle Presence on Phase 2 Invasive Plots, 2017

FIA crews visited 4,462 forested[1] Phase 2 (P2) invasive plots across the NRS region for the 2017 inventory. These P2 invasive plots are a subset of the standard P2 plots where 40 invasive plant species (IPS[2]) (39 species and one undifferentiated genus [nonnative bush honeysuckle][3]) 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, 53.1 percent of forested plots have one or more of the monitored invasives present with the number of species ranging from 1 to 12 per plot.

Canada thistle occurs on 177 plots (4.0 percent) across 14 of the 24 NRS states (Fig. 4). Though it was not observed on plots in 10 NRS states, this does not mean the species is absent from those states. Field crews did not record this IPS on plots in Delaware, Kansas, Massachusetts, Maryland, Missouri, New Hampshire, North Dakota, Rhode Island, Vermont, or West Virginia. Minnesota has the highest percentage of plots with Canada thistle (15.8 percent, based on 56 plots). It is important to remember only forested plots are monitored for IPS. Additionally the number of plots varies within states and must be considered when making conclusions. This number of plots per state and additional information is presented in Table 1.

For the 2017 inventory, Canada thistle is the twelfth most commonly observed invasive species after multiflora rose (30.7 percent), nonnative bush honeysuckles (20.3 percent), garlic mustard (12.2 percent), autumn olive (8.0 percent), Japanese honeysuckle (7.9 percent), Japanese stiltgrass (7.8 percent), Japanese barberry (7.2 percent), common buckthorn (6.7 percent), black locust (6.4 percent), reed canarygrass (5.8 percent), and Oriental bittersweet (5.0 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).

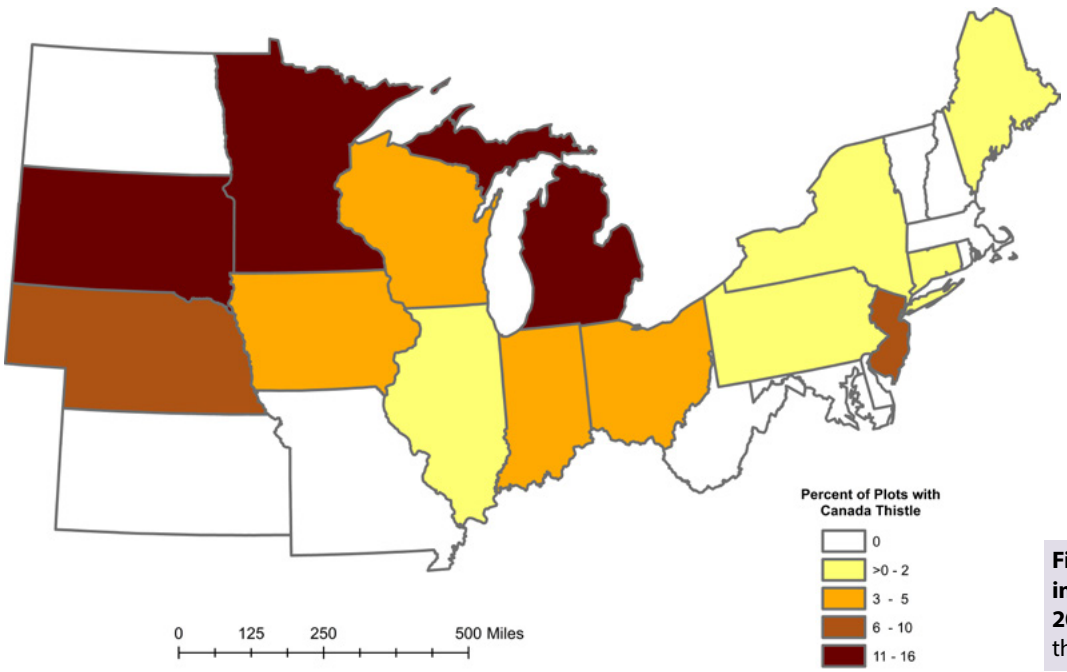


Figure 4.—Percentage of Phase 2 invasive plots with Canada thistle, 2017. Percentages are rounded to the nearest whole number.

[1] FIA defines forest land as land with at least 10 percent canopy cover of live tally tree species of any size or formerly having at least 10 percent canopy cover of live tally species in the past. Additionally, the condition is not subject to nonforest use(s) intended to prevent normal tree regeneration and succession. 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 2018)

[2] Hereafter IPS may also be referred to as "invasive species", "invasive plants", or "invasives".

[3] 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 honeysuckle (*Lonicera* spp.), Norway maple (*Acer platanoides*), Oriental bittersweet (*Celastrus orbiculatus*), princesstree (*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*).

Along with assessing the distribution of invasive plants, it is also important to monitor cover. As cover increases, native plants face greater competition for space and resources like nutrients and water. Where the species is found, cover data helps to assess abundance. It is important for managers to monitor changes in distribution and abundance to determine how to most effectively and efficiently allocate funding for management. Watching for new occurrences as well as increases or decreases in presence can offer insight as to how management practices influence a species.

Average percent cover of Canada thistle varies throughout the region with higher cover on plots in the Midwestern part of the NRS region (Fig. 5). This portion of our region is also where Canada thistle is more common (Fig. 4). Used in tandem, figures 4 and 5 reveal important information related to the presence and abundance of this noxious invader in the NRS states. Over time these maps will allow us to assess changes across the region.

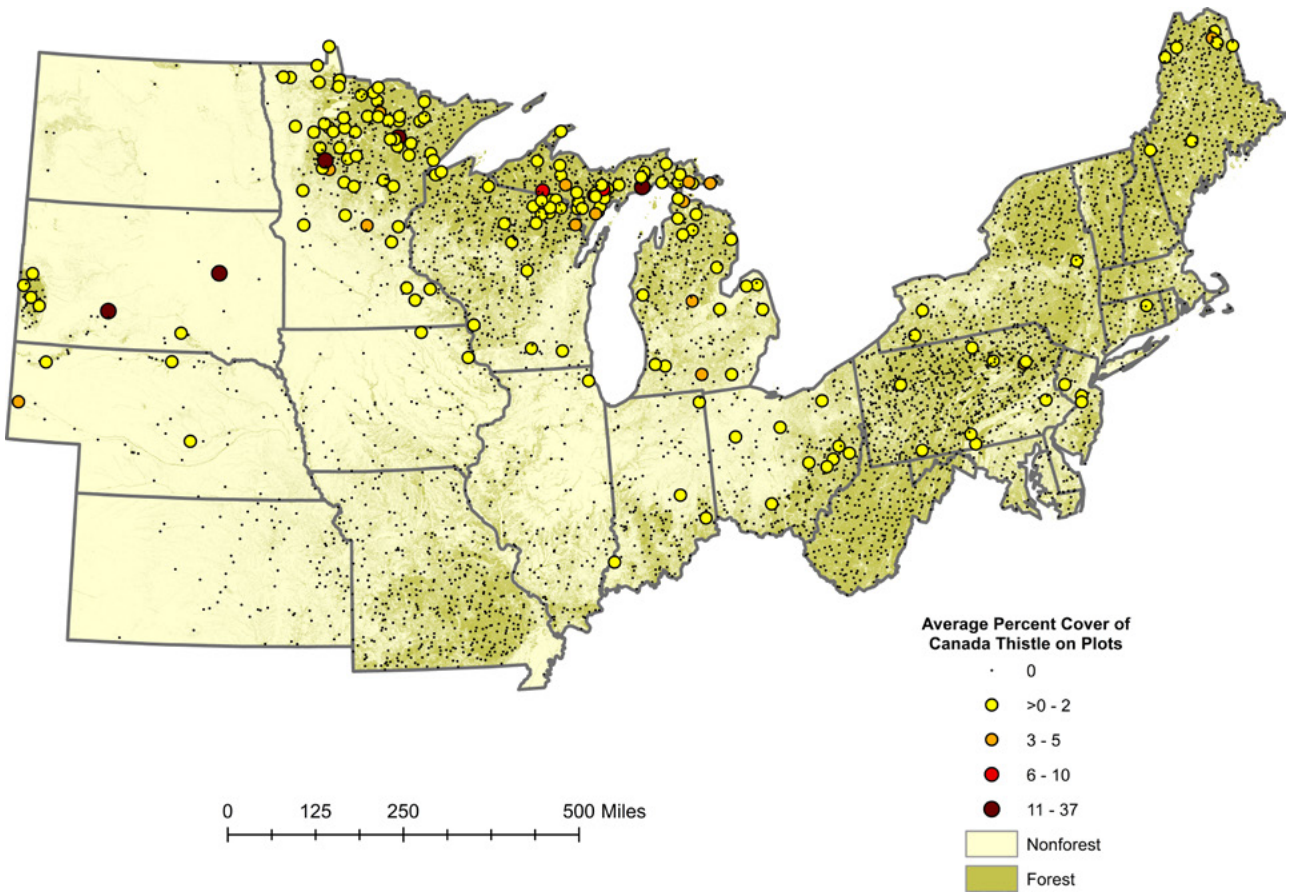


Figure 5.—Average percent cover[4] of Canada thistle on Phase 2 invasive plots, 2017. Percentages are rounded to the nearest tenth of a whole number.

[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 1/24-acre subplots located at the corners and center of an equilateral triangle that is 208 feet on a side.

Characteristics of Plots with Canada Thistle, 2017

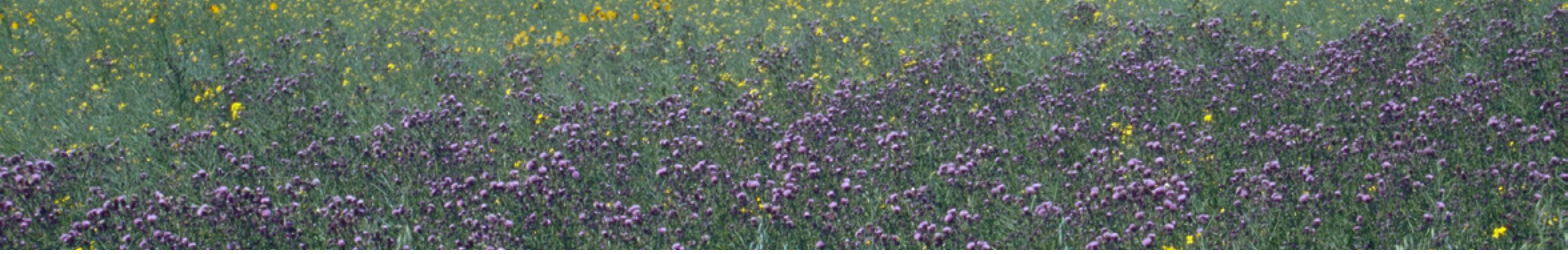
In the region monitored by NRS, Canada thistle was most abundant in the northern part of the Midwest (Table 1). Breaking the plot data down by percentage, Canada thistle increased in presence in ten states, decreased in six states, and two states showed no change. Additionally, Canada thistle remained absent from plots in six states. Across the region, Canada thistle presence increased by 0.6 percent in the last 5 years.

To assess if plots with Canada thistle differed from their counterparts, analyses were restricted to states where this species occurred on at least 10 percent of the plots. This resulted in 844 plots in Michigan, Minnesota, and South Dakota. Of these 844 plots, this invader was present on 114. For these states, the average number of seedlings per acre on plots with Canada thistle is 2,968 versus 3,213 seedlings per acre for those without Canada thistle. Despite differences in the number of seedlings per acre, the difference is not statistically significant (t-test; $p>0.05$). There is also no significant difference (t-test; $p>0.05$) in the percentage of the plot that was forested when Canada thistle was present.

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 may be differences in plots with and without invasives. IPS can affect property and timber value, biodiversity, habitat quality, and sustainability. Future studies will help to derive important factors related to invasives presence and ecosystem impacts.

Table 1.—Canada thistle presence by state, 2012 and 2017

State	Plots with Canada thistle (2017)	Plots monitored for IPS (2017)	Plots with Canada thistle in 2017 (%)	Plots with Canada thistle (2012)	Plots monitored for IPS (2012)	Plots with Canada thistle in 2012 (%)	Change in % since 2012
Connecticut	1	45	2.2	1	65	1.5	0.7
Delaware	0	16	0.0	0	60	0.0	0.0
Illinois	1	124	0.8	2	210	1.0	-0.2
Indiana	4	128	3.1	10	377	2.7	0.4
Iowa	2	80	2.5	1	114	0.9	1.6
Kansas	0	81	0.0	1	129	0.8	-0.8
Maine	8	383	2.1	7	578	1.2	0.9
Maryland	0	54	0.0	0	82	0.0	0.0
Massachusetts	0	72	0.0	0	100	0.0	0.0
Michigan	51	440	11.6	76	686	11.1	0.5
Minnesota	56	354	15.8	81	1,088	7.4	8.4
Missouri	0	370	0.0	2	573	0.4	-0.4
Nebraska	4	55	7.3	5	63	7.9	-0.6
New Hampshire	0	102	0.0	0	152	0.0	0.0
New Jersey	3	48	6.3	2	70	2.9	3.4
New York	3	408	0.7	4	606	0.7	0.0
North Dakota	0	13	0.0	5	26	19.2	-19.2
Ohio	9	203	4.4	11	315	3.5	0.9
Pennsylvania	9	667	1.3	8	596	1.3	0.0
Rhode Island	0	9	0.0	0	30	0.0	0.0
South Dakota	7	50	14.0	7	67	10.5	3.5
Vermont	0	99	0.0	0	139	0.0	0.0
West Virginia	0	221	0.0	2	350	0.6	-0.6
Wisconsin	19	440	4.3	36	1,103	3.3	1.0
Grand total	177	4,462	4.0	261	7,579	3.4	0.6



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FIA Program Information

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USDA Forest Service. 2018. **Forest inventory and analysis national core field guide, vol. 1: field data collection procedures for phase 2 plots, ver. 8.0.** 439 p. www.fia.fs.fed.us/library/field-guides-methods-proc/ (accessed April 26, 2019).

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

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Page 1 and 5 header: Canada thistle infestation. Photo by Alec McClay, McClay Ecoscience, 1929056 from Bugwood.org.