

Status of Invasive Plants and Management Techniques in Minnesota: Results from a 2018 Survey¹

by

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ABSTRACT

Invasive weeds are an ongoing concern in Minnesota. Despite broad interest in addressing invasive plant-related problems in the state, there are relatively few datasets regarding species-specific concerns, costs, and management efforts. In this study, we address this knowledge gap using a questionnaire-survey approach. We asked landowners, stakeholders, and land managers a series of questions regarding thirteen invasive weeds in Minnesota, including both buckthorn species (*Rhamnus cathartica*, *Frangula alnus*) and wild parsnip (*Pastinaca sativa*). Respondents (249 total) shared their concerns, cost information, and information regarding recent and planned management efforts for these weeds. Frequently-cited concerns varied considerably by species and type of respondent, but broadly included the potential impacts of weeds on conservation and ecology, weed-related impacts on forest regeneration, and weed-related impacts on recreation. Reported costs and management approaches varied depending on respondent type (private landowner or public lands professional), with public land professionals generally more willing and able to implement more expensive management approaches (i.e., mechanical removal, controlled burn) than private landowners. The broad results and data from this survey may be of interest to a number of researchers and natural resource professionals, as it provides some foundational context for further analyses.

1. INTRODUCTION

Noxious and invasive weeds are a growing concern across Minnesota, garnering attention from experts and stakeholders (MITPPC 2018) and the media (e.g., Highberger 2016, Meilner 2018, Onile-Ere 2018). Despite this growing concern, however, most invasive weed management decisions are still made at local levels, without the benefit of regional coordination or broader scale prioritization efforts across municipalities. One of the largest obstacles to developing any sort of regional or statewide management plan is the lack of relevant species-specific datasets – particularly regarding the concerns, costs, and management efforts of invasive plants by different groups of stakeholders or landowners. Such information is vital for conducting economic analyses, prioritization analyses, and developing broad scale management plans.

Here, we attempt to address this knowledge gap by surveying stakeholders across the state. In cooperation with the Minnesota Department of Agriculture, we constructed a web survey to gather information regarding invasive weed-related concerns, impacts, costs, and management approaches. Minnesota landowners (including residential landowners), natural resource managers, right of way managers, municipal, township and county employees, and other vegetation management professionals were among those invited to participate. We asked respondents about 13 different invasive plants found in Minnesota, ranging from common buckthorn (*Rhamnus cathartica*) to wild parsnip (*Pastinaca sativa*) (Table 1).

The “Noxious and Invasive Weed Survey” was conducted with the goal of informing future research and acting as a resource for understanding the weed-related concerns of different stakeholders. The information from this survey is being used to support the development of a statewide tactical invasive plant management plan; particularly in the development of economic models that will be used to help strategize invasive plant management across the state. The results and data from this survey may be of interest to researchers, students, managers, or landowners.

2. OBJECTIVES

Broadly, the objective of this survey was to gain insight from landowners, stakeholders, and land managers regarding their concerns, incurred costs, and overall management approach toward the invasive plants included on our list. Specifically, our objectives were to:

1. Identify which invasive plants were commonly observed by Minnesota landowners and professionals,
2. Assess which types of land uses or habitats these weeds impacted,
3. Assess how the reported plants affected land use, particularly if it resulted in an economic impact,
4. Determine which weed species respondents were most concerned about, and the primary concerns associated with those weeds,
5. Determine the management approaches being used to control each plant, and assess the perceived effectiveness of each approach, and

6. Analyze and compare the results between types of stakeholders (i.e., private landowners and public land professionals).

Alongside the survey questions directly relating to these primary objectives, we assessed a number of additional concerns, economic considerations, and management approaches for the primary noxious weeds in Minnesota.

3. STUDY AREA AND INVASIVE PLANT SPECIES

For this study and survey, we were interested in responses from stakeholders across Minnesota. Minnesota is home to a wide range of different land uses, stakeholder interests, and ecosystems. The heavily-forested northeastern and north-central part of the state, described in the Minnesota Ecological Classification System (MN ECS) as the Laurentian Mixed Forest Province, consists of a mixed-ownership landscape where timber and conservation interests are common. In contrast, the western and southern parts of the state are dominated by agricultural land, particularly row cropland used to grow corn (>7 million acres), soybeans (>8 million acres), hay (>1.5 million acres), and wheat (>1 million acres) (USDA 2017). While the regional contrast in land use and ecological composition is significant, there are private landowners and public land professionals throughout the state with a wide variety of interests and concerns. This study and survey included questions regarding 13 invasive plant species found in Minnesota, listed in Table 1.

Table 1. List of invasive species included in the study along with their status on the MN noxious weed list at the time of the survey (MDA 2018).

| Common Name | Latin Name | MN Status ¹ |
|------------------------|-----------------------------|------------------------|
| Common buckthorn | <i>Rhamnus cathartica</i> | Restricted |
| Glossy buckthorn | <i>Frangula alnus</i> | Restricted |
| Canada thistle | <i>Cirsium arvense</i> | Prohibited, Control |
| Garlic mustard | <i>Alliaria petiolata</i> | Restricted |
| Japanese knotweed | <i>Polygonum cuspidatum</i> | Specially Regulated |
| Leafy spurge | <i>Euphorbia esula</i> | Prohibited, Control |
| Multiflora rose | <i>Rosa multiflora</i> | Restricted |
| Narrowleaf bittercress | <i>Cardamine impatiens</i> | Prohibited, Control |
| Plumeless thistle | <i>Carduus</i> spp. | Prohibited, Control |
| Purple loosestrife | <i>Lythrum salicaria</i> | Prohibited, Control |
| Spotted knapweed | <i>Centaurea stoebe</i> | Prohibited, Control |
| Common tansy | <i>Tanacetum vulgare</i> | Prohibited, Control |
| Wild parsnip | <i>Pastinaca sativa</i> | Prohibited, Control |

¹The status definitions are as follows: **Restricted:** may not be sold, transported illegally, or intentionally planted in MN. **Prohibited, Control:** must be controlled preventing the maturation and spread of propagating parts. **Specially Regulated:** shall be handled, controlled, or eradicated according to specified regulations. See MDA 2018 for more information.

These species encompass a range of concerns spanning forests (e.g., common and glossy buckthorn) (Knight et al. 2007, Frappier et al. 2003) to agricultural land (e.g., Canada thistle) (Donald 1990). The majority of species are classified as prohibited, while the remainder are restricted, with one specially regulated plant (Japanese knotweed) (Table 1). This list represents invasive plants which are too abundant to realistically eradicate completely, but are perceived to be problematic enough to warrant serious control, prohibition efforts, and restrictions.

4. QUESTIONNAIRE

To address our objectives, we constructed a dynamic web survey using the Qualtrics survey-building platform (Qualtrics, Provo, UT). The survey questions and structure are outlined in Appendix 1. The survey was built using a branching structure such that only questions relevant to each respondent appeared. This allowed us to keep the estimated survey length under the Qualtrics-recommended 15 minutes despite having a total question count of 69.

The survey was distributed as a url hyperlink via email, accompanied by a cover letter (Appendix 2) and via web by posts on websites associated with the University of Minnesota Extension and other outreach platforms, including both MyMinnesotaWoods (myminnesotawoods.umn.edu) and Morning Ag Clips (morningagclips.com). The Minnesota Noxious Weed Advisory Committee (NWAC) was instrumental in distributing the survey via relevant email lists and contact groups. The Minnesota Department of Agriculture commissioner’s office helped with distribution by sending the survey to agricultural growers groups, and county agricultural

inspectors helped the survey reach growers across the state. The survey was open for seven weeks, from June 11, 2018 through July 27, 2018.

5. DATA ANALYSIS

Response data were analyzed following the survey’s closure and completion of final open sessions. Quantitative response data were analyzed using the Stats iQ framework on the Qualtrics platform (Qualtrics, Provo, UT). Text-based responses were analyzed using the Reports tool within the Qualtrics platform.

6. RESULTS

Respondent Information

We received a total of 249 survey responses from June 11, 2018 through July 27, 2018. Of these, 142 responses were from private landowners and 107 were from public land professionals; this amounts to a 57% / 43% split between the two types of stakeholder groups. The land use associations most commonly reported by private landowners were Residence and Woodland/Forest with 116 (82%) and 99 (70%) responses, respectively (Table 2).

Table 2. Land use associations reported by private landowners. Categories were not mutually exclusive.

| Private Landowners | |
|----------------------------|--------------|
| Associated Land Use | Count |
| Residence | 116 |
| Woodland or Forest | 99 |
| Pasture | 28 |
| Row Crops | 22 |
| Other | 0 |

The distribution of respondents varied across counties (Figure 1), with the largest number of responses coming from Hennepin and Rice counties (12 and 9 responses, respectively). Note that not every respondent reported a county, and several respondents – particularly public lands professionals – may work statewide rather than in specified counties.

Table 3. Professional association as reported by public land professionals.

| Public Land Professionals | |
|------------------------------------|--------------|
| Organization or Association | Count |
| MN Department of Natural Resources | 50 |
| Municipal and Local | 12 |
| County | 12 |
| Other | 10 |
| Volunteer | 7 |
| Tribal | 6 |
| MN Department of Agriculture | 4 |
| Federal | 4 |
| MN Other (State-Level) | 3 |

The associations reported by public land professional respondents represent a range of management scopes and interests. Indeed, when asked what type of land management or other professional (or volunteer) efforts they typically engaged in, we received a range of responses (Table 4). Conservation (62, 70%), Wildlife Management (57, 65%), and Restoration (55, 63%) were the most common responses by a significant margin, followed by Riparian Zone management (35, 40%) and a series of forestry- and agriculture-related responses.

Table 4. Land management and other professional efforts reported by public land professional respondents. Selections were not mutually exclusive.

| Public Land Professionals | |
|---------------------------------|--------------|
| Management Category | Count |
| Conservation | 62 |
| Wildlife Management | 57 |
| Restoration | 55 |
| Riparian Zone Management | 35 |
| Forestry (Sawtimber Production) | 20 |
| Forestry (Pulp Production) | 17 |
| Agriculture (Row Crops) | 14 |
| Other | 10 |
| Agriculture (Livestock) | 9 |
| Transportation | 8 |

Invasive Plant Information

We asked both private landowners and public land professionals to report which of the invasive plants on our list were present on their land (or the land they worked with). For private landowners, common buckthorn (79, 72%) and Canada thistle (63, 57%) were the most frequently-reported species (Figure 2). While every species was reported by at least one private landowner, there were species with very few (< 12 reports) overall private landowner reports,

including leafy spurge, spotted knapweed, plumeless thistle, purple loosestrife, Japanese knotweed, multiflora rose, and narrowleaf bittercress (Figure 2).

In the public land professional group, the most commonly reported invasives were also common buckthorn (77, 71%) and Canada thistle (67, 63%). For the public land professionals, however, the dropoff in reports after these two species was not as dramatic (Figure 2). Leafy spurge, wild parsnip, spotted knapweed, and common tansy followed somewhat closely behind (Figure 2). In general, the public land professional respondents reported finding many more invasive plants on the land they worked with, even species which were relatively infrequently reported by private landowners (e.g., leafy spurge, spotted knapweed) (Figure 2).

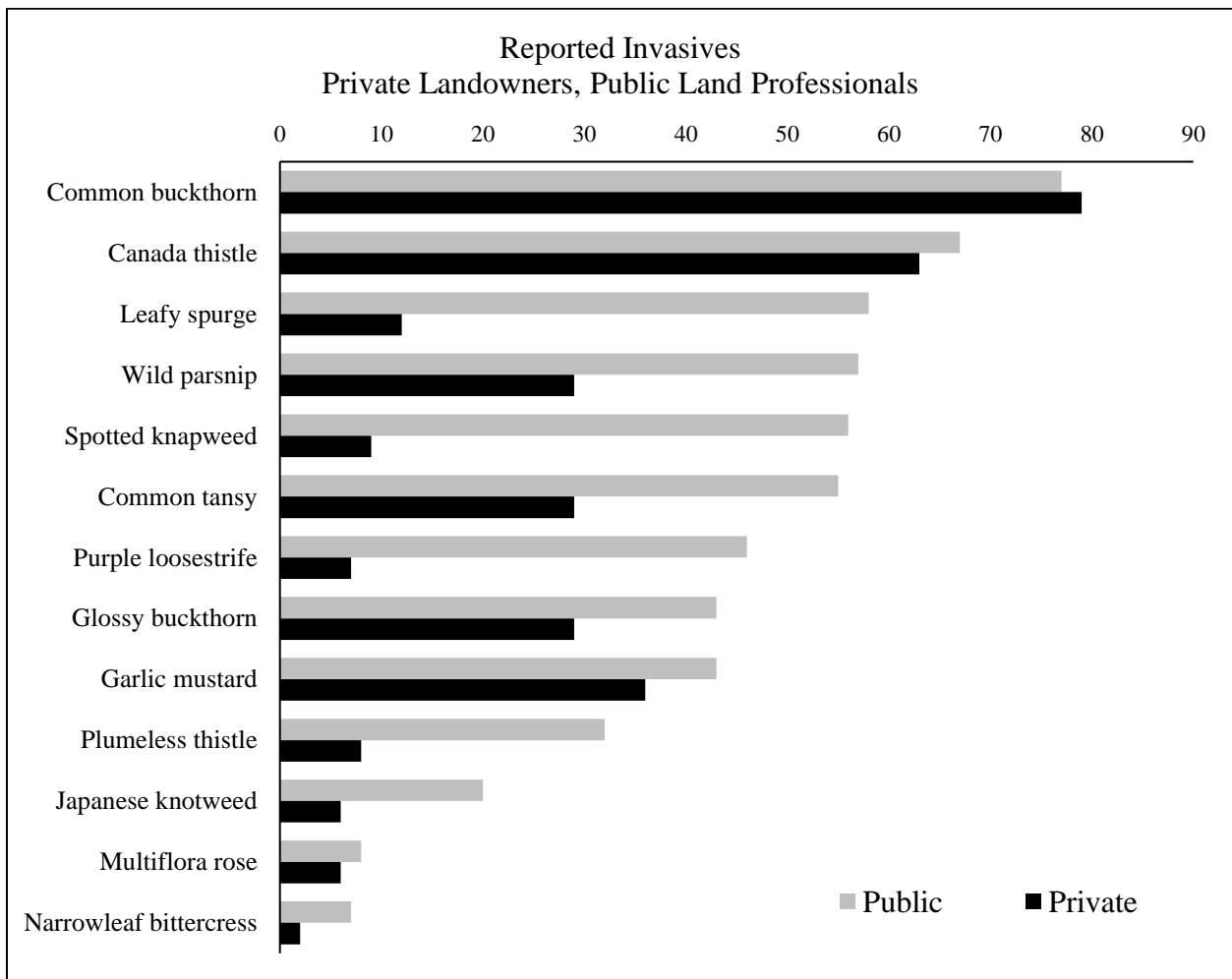


Figure 2. Reported invasives by respondent group.

When we compared the reported invasive plants from each respondent with their reported counties, we found some spatial variation across the state and among species (Figures 3 and 4). Multiple species had relatively high report rates from Hennepin county, which may reflect the density of respondents reporting that county as their county of residence or work (Figure 1). Other notable trends include common tansy’s high report rate in northeastern Minnesota (Figure

4), which matches known reports from databases such as EDDMapS (2018b), and the very limited report rate for species such as narrowleaf bittercress and multiflora rose (Figure 4).

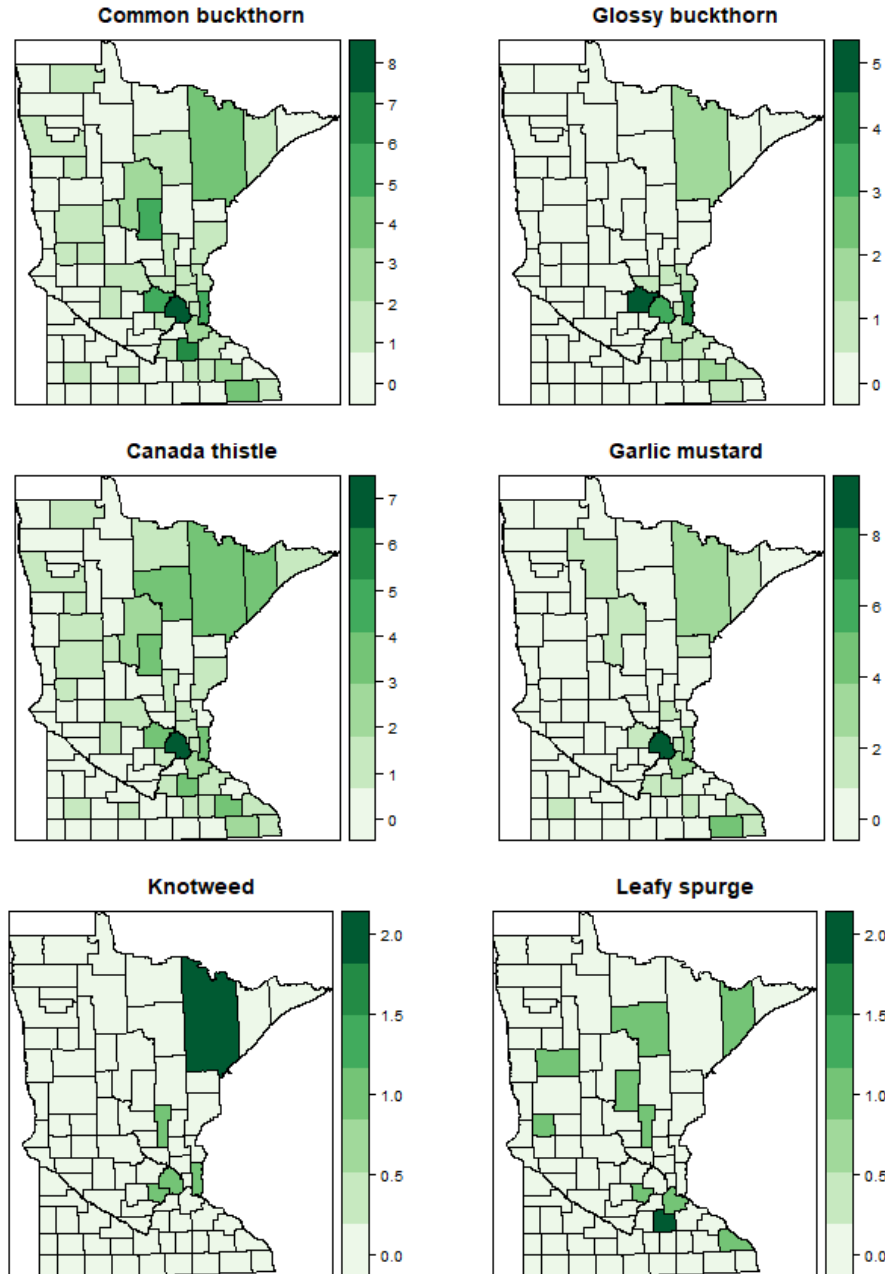


Figure 3. Maps illustrating the density of survey respondent reports for each species. Darker color indicates higher density. Note that not every respondent reported a county of residence or professional focus, so the number of reports broken down by county is not the same as the total reports for each species.

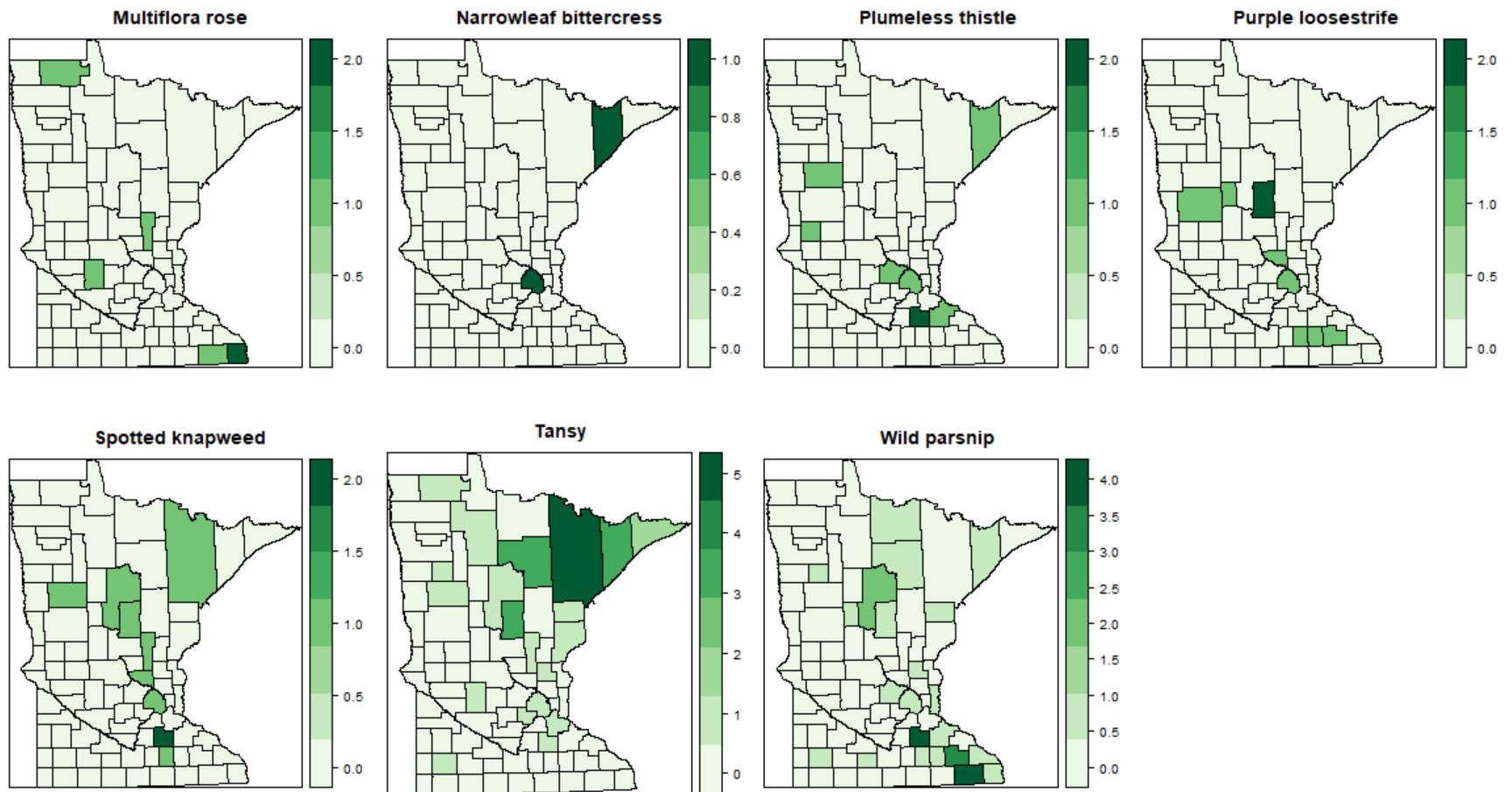


Figure 4. Maps illustrating the density of survey respondent reports for each species. Darker color indicates higher density. Note that not every respondent reported a county of residence or professional focus, so the number of reports broken down by county is not the same as the total reports for each species.

After reporting which invasive plants were on their land (or the land they worked with), we asked each respondent to identify those species they were most concerned about. Private landowners reported common buckthorn as their species of greatest concern substantially more often than any other plant (Figure 5). Public land professionals reported common buckthorn and wild parsnip as their plants of greatest concern by a wide margin (Figure 5).

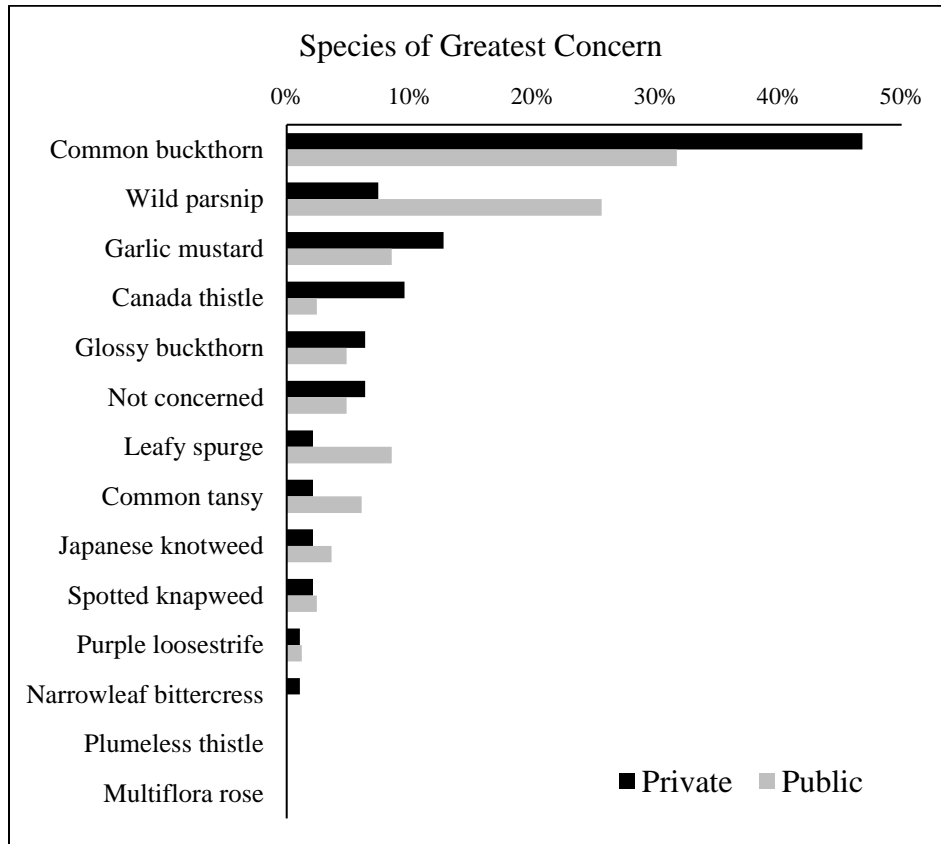


Figure 5. Species of greatest concern by respondent group.

We also asked respondents to report their primary concerns regarding each of these plants of greatest concern (questions 14 and 87, 45 and 86 in Appendix 1). The concern categories ranged from agricultural yield, forestry considerations, and conservation. An ‘Other’ category with an open-ended text option was included for users to input their own concerns. For private landowners, the top two most frequently reported concern categories were Conservation or Ecological Impacts (n=56, 65%) and Forest Regeneration (n=48, 56%) (Table 5). Public land professionals reported Conservation or Ecological Impacts (n=65, 84%), Impacts on Recreational Activities (n=38, 49%), and Forest Regeneration (n=33, 43%) as their top concerns (Table 6). The much higher emphasis on recreational concerns among public land professionals is noteworthy here.

Considering all respondents together, we find the potential impact of invasive plants on Conservation or Ecological factors (n=121, 74%), Forest Regeneration (n=81, 50%), and Recreational Activities (74, 45%) to be the most frequently-reported concerns (Table 7). The potential impact of the invasive plants on our list on Agricultural Yields was the least-reported concern (n=7, 4%), followed by Livestock Grazing (n=14, 8%).

Table 5. Number of primary reported concerns by species; private landowners. Concerns were reported (Question #87) for species respondents identified as being of greatest concern (Question #14).

| Private Landowners | | | | | | | | |
|------------------------|---------------------------------------|-------------------------------------|---------------------------------------|---|--------------------------------|---|---|--------------|
| | Impacts on agricultural yields | Impacts on livestock grazing | Impacts on forest regeneration | Impacts on forest growth and yield | Impacts on game species | Impacts on recreational activities | Conservation or ecological impacts | Other |
| Common buckthorn | 1 | 1 | 27 | 22 | 13 | 20 | 32 | 6 |
| Glossy buckthorn | 0 | 1 | 6 | 4 | 2 | 3 | 3 | 2 |
| Canada thistle | 3 | 4 | 4 | 3 | 1 | 5 | 4 | 1 |
| Garlic mustard | 0 | 0 | 8 | 6 | 3 | 4 | 7 | 3 |
| Japanese knotweed | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 0 |
| Leafy spurge | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 |
| Multiflora rose | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Narrowleaf bittercress | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Plumeless thistle | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Purple loosestrife | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Spotted knapweed | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| Common tansy | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Wild parsnip | 0 | 1 | 0 | 0 | 1 | 4 | 3 | 3 |

Table 6. Number of primary reported concerns by species; public land professionals. Concerns were reported (Question #86) for species respondents identified as being of greatest concern (Question #45).

| Public Land Professionals | | | | | | | | |
|---------------------------|--------------------------------|------------------------------|--------------------------------|------------------------------------|-------------------------|------------------------------------|------------------------------------|-------|
| | Impacts on agricultural yields | Impacts on livestock grazing | Impacts on forest regeneration | Impacts on forest growth and yield | Impacts on game species | Impacts on recreational activities | Conservation or ecological impacts | Other |
| Common buckthorn | 0 | 0 | 22 | 10 | 10 | 11 | 23 | 2 |
| Glossy buckthorn | 0 | 0 | 2 | 2 | 1 | 3 | 4 | 0 |
| Canada thistle | 2 | 1 | 0 | 0 | 1 | 1 | 2 | 0 |
| Garlic mustard | 0 | 0 | 4 | 1 | 2 | 1 | 6 | 1 |
| Japanese knotweed | 0 | 0 | 1 | 2 | 0 | 2 | 3 | 1 |
| Leafy spurge | 0 | 1 | 0 | 0 | 2 | 1 | 7 | 2 |
| Multiflora rose | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Narrowleaf bittercress | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plumeless thistle | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Purple loosestrife | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Spotted knapweed | 0 | 0 | 1 | 0 | 1 | 1 | 2 | 0 |
| Common tansy | 0 | 1 | 3 | 1 | 1 | 2 | 3 | 3 |
| Wild parsnip | 1 | 4 | 0 | 0 | 3 | 16 | 14 | 7 |

Table 7. Number of primary reported concerns by species; all respondents. Concerns were reported (Questions #86 and 87) for species respondents identified as being of greatest concern (Questions #14 and 45).

| All Respondents | | | | | | | | |
|------------------------|--------------------------------|------------------------------|--------------------------------|------------------------------------|-------------------------|------------------------------------|------------------------------------|-------|
| | Impacts on agricultural yields | Impacts on livestock grazing | Impacts on forest regeneration | Impacts on forest growth and yield | Impacts on game species | Impacts on recreational activities | Conservation or ecological impacts | Other |
| Common buckthorn | 1 | 1 | 49 | 32 | 23 | 31 | 55 | 8 |
| Glossy buckthorn | 0 | 1 | 8 | 6 | 3 | 6 | 7 | 2 |
| Canada thistle | 5 | 5 | 4 | 3 | 2 | 6 | 6 | 1 |
| Garlic mustard | 0 | 0 | 12 | 7 | 5 | 5 | 13 | 4 |
| Japanese knotweed | 0 | 0 | 2 | 2 | 0 | 2 | 5 | 1 |
| Leafy spurge | 0 | 1 | 1 | 0 | 3 | 1 | 8 | 3 |
| Multiflora rose | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Narrowleaf bittercress | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Plumeless thistle | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Purple loosestrife | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| Spotted knapweed | 0 | 0 | 1 | 0 | 1 | 1 | 4 | 0 |
| Common tansy | 0 | 1 | 3 | 1 | 1 | 2 | 4 | 4 |
| Wild parsnip | 1 | 5 | 0 | 0 | 4 | 20 | 17 | 10 |

Management Information

We asked each respondent a series of questions about their planned and current management efforts for invasive plants in general, and for the specific invasive plants they reported being most concerned about. Private landowners reported that they were likely to survey for invasive plants (74), undertake manual removal efforts (69), and implement herbicidal treatments (60) (Table 8). Mechanical removal was less of a likely option (37), and controlled burns were frequently reported as not likely to be used at all (8) (Table 8).

Table 8. Likelihood of implementing different management approaches for invasive plants in general. Private landowners. Choices were not mutually exclusive.

| Likelihood | Private Landowners | | | | |
|------------------------|----------------------|----------------|----------------------|--------------------|-----------------|
| | Survey for invasives | Manual removal | Herbicidal treatment | Mechanical removal | Controlled burn |
| I am likely to do this | 74 | 69 | 60 | 37 | 8 |
| Somewhat likely | 7 | 13 | 10 | 5 | 5 |
| Maybe / Unsure | 6 | 3 | 5 | 10 | 14 |
| Not very likely | 3 | 5 | 7 | 13 | 14 |
| Not likely at all | 6 | 4 | 14 | 16 | 40 |

In addition to what they were likely to do, we asked private landowners to report what management actions they had taken to manage specific species on our list over the past three years (Question #12, Appendix 1). Mirroring the likely treatment responses, private landowners reported using manual removal and herbicidal treatment methods much more often than mechanical removal approaches (Table 9, Figure 6). Private landowners reported very few instances of controlled burn usage.

Table 9. Reported management approaches by species. Private landowners.

| | Private Landowners | | | | |
|------------------------|--------------------|----------------------|--------------------|-----------------|-------|
| | Manual Removal | Herbicidal Treatment | Mechanical Removal | Controlled Burn | Other |
| Common buckthorn | 61 | 52 | 18 | 4 | 3 |
| Glossy buckthorn | 22 | 17 | 8 | 0 | 1 |
| Canada thistle | 28 | 38 | 17 | 5 | 1 |
| Garlic mustard | 27 | 20 | 2 | 0 | 0 |
| Japanese knotweed | 4 | 5 | 1 | 0 | 0 |
| Leafy spurge | 8 | 4 | 0 | 2 | 1 |
| Multiflora rose | 1 | 3 | 0 | 1 | 0 |
| Narrowleaf bittercress | 1 | 1 | 0 | 0 | 0 |
| Plumeless thistle | 3 | 6 | 4 | 1 | 0 |
| Purple loosestrife | 2 | 2 | 0 | 0 | 0 |
| Spotted knapweed | 6 | 4 | 1 | 1 | 0 |
| Common tansy | 12 | 10 | 4 | 2 | 2 |
| Wild parsnip | 7 | 12 | 10 | 1 | 1 |

Similarly, we asked public land managers to report the management efforts they had undertaken in the past three years for each of the species on our list (Question #67, Appendix 1). Public land professionals reported relatively high usage of manual removal and herbicidal treatment methods, similar to private landowners (Table 10, Figure 6). Unlike private landowners, however, public land professionals reported using mechanical removal approaches at a much more comparable level, as well as reporting the use of controlled burning for several species – particularly common buckthorn (Table 10, Figure 6).

Table 10. Reported management approaches by species. Public land professionals.

| | Public Land Professionals | | | | | Other |
|------------------------|---------------------------|----------------------|--------------------|-----------------|----|-------|
| | Manual Removal | Herbicidal Treatment | Mechanical Removal | Controlled Burn | | |
| Common buckthorn | 54 | 64 | 48 | 30 | 6 | |
| Glossy buckthorn | 27 | 33 | 25 | 13 | 1 | |
| Canada thistle | 13 | 52 | 32 | 18 | 3 | |
| Garlic mustard | 33 | 21 | 4 | 6 | 1 | |
| Japanese knotweed | 3 | 11 | 1 | 1 | 2 | |
| Leafy spurge | 13 | 37 | 7 | 7 | 17 | |
| Multiflora rose | 1 | 3 | 4 | 3 | 0 | |
| Narrowleaf bittercress | 6 | 2 | 0 | 0 | 0 | |
| Plumeless thistle | 6 | 23 | 16 | 10 | 0 | |
| Purple loosestrife | 10 | 14 | 2 | 1 | 23 | |
| Spotted knapweed | 19 | 38 | 13 | 7 | 11 | |
| Common tansy | 12 | 42 | 16 | 3 | 4 | |
| Wild parsnip | 28 | 45 | 21 | 8 | 2 | |

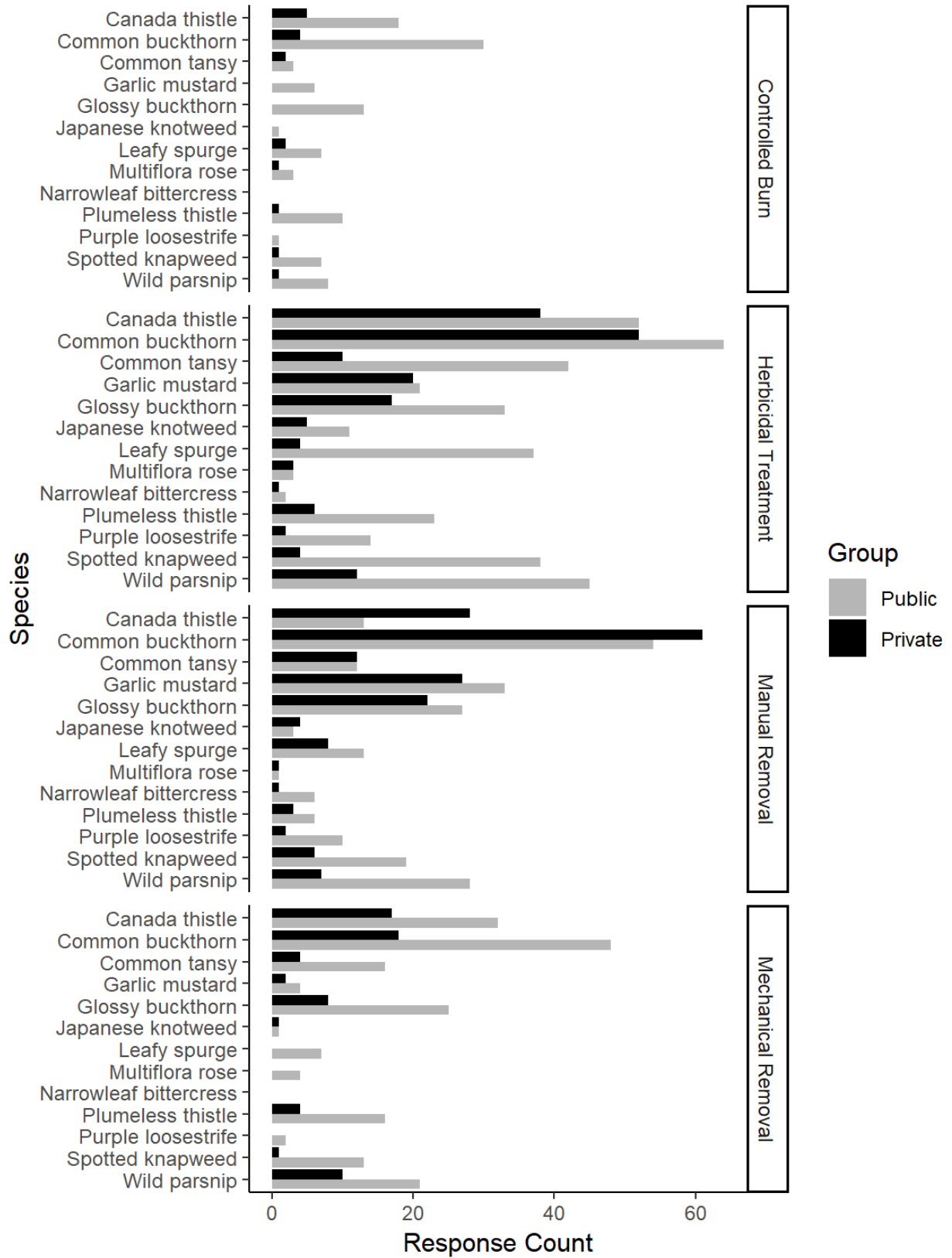


Figure 6. Reported management approaches (count) by species and respondent group.

In addition to asking respondents about any of their recently-implemented management activities, we also asked users to rate the effectiveness of each management treatment they reported implementing. Private landowners reported herbicidal treatments and manual removal efforts as being effective (Table 11). Mechanical removal efforts received slightly lower effectiveness ratings than manual or herbicidal approaches. Controlled burning was not used very often by private landowners and therefore had relatively few rankings (Table 11).

Similar to the private landowner group, the public land professionals reported herbicide as being generally effective (Table 12). Public land professionals found manual removal to be effective as well – slightly more effective than mechanical treatments, on average (Table 12). Controlled burns were used more often than for private landowners and reported as being moderately to slightly effective for controlling common buckthorn.

Table 11. Reported/perceived effectiveness of different management approaches for controlling each species. Private landowners. Species with all zeros were excluded from each category.

| Controlled Burn | | | | | |
|-----------------------------|---------------------|----------------|----------------------|--------------------|----------------------|
| | Extremely effective | Very effective | Moderately effective | Slightly effective | Not effective at all |
| Common buckthorn | 0 | 0 | 2 | 2 | 0 |
| Garlic mustard | 0 | 0 | 1 | 0 | 0 |
| Wild parsnip | 0 | 0 | 1 | 0 | 0 |
| Herbicidal Treatment | | | | | |
| | Extremely effective | Very effective | Moderately effective | Slightly effective | Not effective at all |
| Common buckthorn | 11 | 10 | 2 | 3 | 2 |
| Canada thistle | 3 | 4 | 1 | 0 | 0 |
| Garlic mustard | 4 | 0 | 2 | 2 | 0 |
| Glossy buckthorn | 0 | 2 | 3 | 0 | 0 |
| Wild parsnip | 2 | 1 | 0 | 0 | 1 |
| Japanese knotweed | 0 | 1 | 1 | 0 | 0 |
| Leafy spurge | 0 | 1 | 0 | 0 | 0 |
| Manual Removal | | | | | |
| | Extremely effective | Very effective | Moderately effective | Slightly effective | Not effective at all |
| Common buckthorn | 11 | 7 | 6 | 7 | 2 |
| Garlic mustard | 2 | 1 | 4 | 1 | 1 |
| Glossy buckthorn | 1 | 3 | 2 | 0 | 0 |
| Canada thistle | 1 | 1 | 1 | 2 | 0 |
| Japanese knotweed | 0 | 1 | 0 | 1 | 0 |
| Spotted knapweed | 0 | 0 | 1 | 1 | 0 |
| Wild parsnip | 1 | 0 | 1 | 0 | 0 |
| Leafy spurge | 0 | 0 | 1 | 0 | 0 |
| Purple loosestrife | 0 | 0 | 0 | 1 | 0 |
| Mechanical Removal | | | | | |
| | Extremely effective | Very effective | Moderately effective | Slightly effective | Not effective at all |
| Common buckthorn | 2 | 1 | 2 | 4 | 1 |
| Glossy buckthorn | 0 | 0 | 4 | 0 | 1 |
| Wild parsnip | 1 | 0 | 0 | 2 | 1 |
| Canada thistle | 0 | 0 | 1 | 1 | 0 |
| Common tansy | 0 | 0 | 0 | 0 | 1 |
| Japanese knotweed | 0 | 0 | 0 | 0 | 1 |
| Spotted knapweed | 0 | 0 | 0 | 1 | 0 |

Table 12. Reported/perceived effectiveness of different management approaches for controlling each species. Public land professionals. Species with all zeros were excluded from each category.

| Controlled Burn | | | | | | |
|-----------------------------|---------------------|----------------|----------------------|--------------------|----------------------|--|
| | Extremely effective | Very effective | Moderately effective | Slightly effective | Not effective at all | |
| Canada thistle | 0 | 0 | 1 | 0 | 0 | |
| Common buckthorn | 0 | 1 | 4 | 3 | 0 | |
| Garlic mustard | 0 | 1 | 0 | 0 | 0 | |
| Japanese knotweed | 0 | 0 | 0 | 0 | 1 | |
| Leafy spurge | 0 | 0 | 0 | 2 | 0 | |
| Spotted knapweed | 0 | 1 | 0 | 0 | 1 | |
| Wild parsnip | 0 | 0 | 0 | 0 | 1 | |
| Herbicidal Treatment | | | | | | |
| | Extremely effective | Very effective | Moderately effective | Slightly effective | Not effective at all | |
| Canada thistle | 0 | 1 | 0 | 0 | 0 | |
| Common buckthorn | 5 | 7 | 6 | 0 | 0 | |
| Common tansy | 1 | 2 | 2 | 0 | 0 | |
| Garlic mustard | 0 | 4 | 1 | 0 | 0 | |
| Glossy buckthorn | 0 | 1 | 0 | 0 | 0 | |
| Japanese knotweed | 0 | 2 | 0 | 1 | 0 | |
| Leafy spurge | 0 | 1 | 2 | 3 | 0 | |
| Purple loosestrife | 0 | 0 | 1 | 0 | 0 | |
| Spotted knapweed | 1 | 0 | 0 | 0 | 1 | |
| Wild parsnip | 0 | 8 | 5 | 1 | 0 | |
| Manual Removal | | | | | | |
| | Extremely effective | Very effective | Moderately effective | Slightly effective | Not effective at all | |
| Canada thistle | 0 | 1 | 0 | 1 | 0 | |
| Common buckthorn | 2 | 4 | 4 | 4 | 1 | |
| Garlic mustard | 0 | 4 | 1 | 0 | 0 | |
| Glossy buckthorn | 0 | 0 | 1 | 1 | 0 | |
| Japanese knotweed | 0 | 0 | 0 | 0 | 1 | |
| Leafy spurge | 0 | 0 | 1 | 0 | 0 | |
| Purple loosestrife | 0 | 1 | 0 | 0 | 0 | |
| Spotted knapweed | 0 | 0 | 0 | 0 | 1 | |
| Wild parsnip | 2 | 2 | 4 | 4 | 0 | |
| Mechanical Removal | | | | | | |
| | Extremely effective | Very effective | Moderately effective | Slightly effective | Not effective at all | |
| Canada thistle | 0 | 0 | 1 | 1 | 0 | |
| Common buckthorn | 0 | 2 | 4 | 4 | 2 | |
| Common tansy | 0 | 0 | 0 | 1 | 1 | |
| Garlic mustard | 0 | 0 | 1 | 0 | 0 | |
| Glossy buckthorn | 0 | 0 | 0 | 2 | 0 | |
| Japanese knotweed | 0 | 0 | 0 | 0 | 1 | |
| Leafy spurge | 0 | 0 | 0 | 0 | 1 | |
| Spotted knapweed | 0 | 0 | 0 | 0 | 1 | |
| Wild parsnip | 0 | 1 | 1 | 3 | 1 | |

Cost Information

We asked respondents to report the estimated yearly cost and acreage treated for each of their plants of greatest concern – if they were willing and able to provide such information (Questions #20 and #47, Appendix 1). The bulk of cost information reported by private landowners was related to common buckthorn management, with some reported costs for Canada thistle, garlic mustard, and glossy buckthorn (per-acre costs outlined in Table 13). Public land professionals reported costs for a wider range of species and management efforts (Table 14), though common buckthorn was again the primary source of reports.

Table 13. Average per-acre species × management approach cost estimates from reported data, in US dollars. Private landowners. Species where fewer than three reports of management costs were reported have been excluded from the table.

| Species | Manual Removal | Mechanical Removal | Herbicidal Treatment | Controlled Burn |
|------------------|----------------|--------------------|----------------------|-----------------|
| Canada thistle | - | - | \$51 | - |
| Common buckthorn | \$90 | \$502 | \$56 | \$112 |
| Garlic mustard | - | - | \$76 | - |
| Glossy buckthorn | - | - | \$109 | - |

Table 14. Average per-acre species × management approach cost estimates from reported data, in US dollars. Public land professionals. Species where fewer than three reports of management costs were reported have been excluded from the table.

| Species | Manual Removal | Mechanical Removal | Herbicidal Treatment | Controlled Burn |
|-------------------|----------------|--------------------|----------------------|-----------------|
| Common buckthorn | \$638 | \$214 | \$213 | \$70 |
| Common tansy | - | - | \$534 | - |
| Garlic mustard | \$377 | - | \$277 | \$4 |
| Glossy buckthorn | \$100 | \$117 | \$133 | - |
| Japanese knotweed | - | - | \$600 | - |
| Leafy spurge | - | - | \$240 | - |
| Wild parsnip | \$200 | \$51 | \$530 | - |

7. DISCUSSION OF PRIMARY FINDINGS

Our survey responses reflected a relatively even split between private landowners (57%) and public land professionals (43%). While certainly not exhaustive, this respondent group is large and varied enough to provide useful information regarding invasive plants in Minnesota. Most of the private landowners' property was associated with a residence (82%) and/or a woodland or forest (70%), which may provide context for the reported concern regarding common buckthorn -- a notable invasive plant in woodland and forest systems. The majority of public land professionals reported being associated with the Minnesota Department of Natural Resources (57%), followed by municipal, local, and county affiliations at a combined 28%. This distribution of respondents is useful because these two categories make up a large portion of the public land professionals in the state.

Common buckthorn and Canada thistle were the most frequently reported species, consistent across both respondent groups (Figure 2). Common buckthorn is a well-known and increasingly widespread invasive plant in wooded ecosystems, and the high frequency of reports of this species is consistent with our respondents, given the types of land-use frequently reported by private landowners (Residences and Woodlands/Forests) and the most frequently-reported types of management work engaged in by public land professionals (Conservation, Wildlife Management, Restoration). Canada thistle's high report rate is likely a result of the plant being ubiquitous across the state, present in virtually every municipality and county (EDDMapS 2018a).

The report rates across species seem to vary considerably between the two respondent groups outside of common buckthorn and Canada thistle (the two most frequently reported species; Figure 2). While it is not possible for us to definitively discern the cause of this, there are a number of possibilities, including but not limited to: 1.) actual differences in the spatial distribution of respondents in each category and the species in question, 2.) differences in awareness of each species between the two respondent groups, or 3.) differences between 'survey' effort or ecosystem-awareness between the two respondent groups. Particularly notable differences can be seen in the report rates of leafy spurge, purple loosestrife, and spotted knapweed (Figure 2).

We also found substantial differences between the two respondent groups in terms of the species they reported as being of greatest concern (Figure 5). Common buckthorn was again the most frequently-reported species in this category. Nearly half of all private landowners reported common buckthorn as their species of greatest concern, compared to only a third of public land professionals. Perhaps one of the largest differences in this category is the difference between respondents from each group reporting wild parsnip as the species of greatest concern (Figure 5). Public land professionals reported wild parsnip at nearly the same rate as common buckthorn, while private landowners reported it considerably less often. This disparity could be a result of a number of different factors, including differences in priorities between the respondent groups -- perhaps public land professionals are concerned about liability and public accessibility in a way that private landowners are not; this is a concern due to wild parsnip's skin-irritating properties (Aberer 1992; see also MNDNR 2018).

Breaking down the concerns by species across the type (or source) of concern, we find a few additional differences between respondent groups (Tables 5 and 6). While private landowners reported Conservation or Ecological impacts and Forest Regeneration as their top concerns, public land professionals reported Conservation or Ecological impacts, Recreation impacts, and Forest Regeneration as top concerns. The fact that conservation and forest regeneration concerns were consistent across respondent groups is likely a result of the species for which concerns are being reported. Conservation impacts were frequently cited as a concern regarding common buckthorn, garlic mustard, and wild parsnip. Forest regeneration impacts were frequently cited as a concern for common buckthorn and garlic mustard. Where the difference between the groups come in -- public land professionals citing recreation as a major concern -- seems to reflect those respondents' concern regarding wild parsnip in particular (see Table 6 and Figure 5).

Both private landowners and public land professionals reported relying on herbicidal treatments and manual removal efforts to control these invasive plants over the past three years (Tables 9 and 10). However, likely reflecting their better access to resources, public land professionals reported using mechanical removal and controlled burn management approaches much more frequently than private landowners (Tables 9 and 10). Both respondent groups reported herbicidal treatments as being relatively more effective than other approaches (Tables 11 and 12).

We were able to generate more cost estimates from public land professionals (Table 14) than private landowners (Table 13), based on the complete responses received. While many of these cost estimates do not have a point of comparison in the published literature, we were able to find some points of comparison, particularly for common buckthorn. Private landowners reported the cost of mechanical removal of common buckthorn at \$502/acre on average, and public land professionals at \$214/acre (Tables 13 and 14). The Anoka Nature Preserve Buckthorn Removal Project (ANPBRP 2014) cites a cost of \$852 per acre, which likely includes labor costs. A commercial estimate from Midwest Prairies, LLC, puts the cost of mechanical buckthorn removal between \$350-500 per acre (MWP 2018). There are likely a lot of variables that determined how respondents answered these questions related to cost -- the inclusion of labor, equipment rental, site-specific factors, etc. -- but overall, it seems the buckthorn mechanical removal costs generated from respondent answers are generally in line with the numbers elsewhere. Other cost estimates, such as the \$56/acre private landowner estimate for herbicidal treatments (Table 13) seem more out of line with outside numbers (e.g., \$562/acre in the Anoka project and an estimate of \$150-250 from Midwest Prairies).

Broadly, the results from this survey provide us with some much-needed context regarding the perceptions, concerns, and management preferences that different types of stakeholders have for each of the invasive plants included in the study. These data will be useful in filling knowledge gaps and as a reference point for future work in assessing the potential impacts of, and decision making tools available for, these invasive plants.

8. ACKNOWLEDGEMENTS

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10. APPENDIX 1: SURVEY

11. APPENDIX 2: COVER LETTER

10. APPENDIX 1: COVER LETTER



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Greetings,

Noxious and invasive weeds are a growing concern across Minnesota, but little is known about how concerns, costs, and management efforts differ between people, groups, and industries. The University of Minnesota and the Minnesota Department of Agriculture are conducting a survey to better understand these differences and concerns. **We're interested in hearing from you.**

Please consider taking this survey to share your concerns and activities related to noxious and invasive weeds. Minnesota landowners (including residential landowners), natural resource managers, right of way managers, municipal, township and county employees, and other vegetation management professionals are invited to participate. This survey is being conducted in an effort to better understand some of the concerns, costs, and management efforts associated with several noxious and invasive weed species -- across all 87 Minnesota counties. **Your input is vital** and will be used to help construct a statewide tactical invasive plant management plan. We strongly encourage you to complete this survey.

Please be assured that no information will be recorded or released that can be linked to you. No personally identifying information will be recorded, and respondents will only be known by a numerical survey code.

The survey can be accessed here:

https://umn.qualtrics.com/jfe/form/SV_0p0i0mJfzUVzVJP

Photos and information regarding the plant species mentioned in this survey can be accessed here:

<http://www.dot.state.mn.us/roadsides/vegetation/pdf/noxiousweeds.pdf>

Your participation is encouraged and will greatly enhance our understanding of noxious and invasive weeds in Minnesota. After the survey is completed, we will post a publicly accessible summary of responses on the University of Minnesota Digital Conservancy. If you have any questions about this survey or the associated research, please feel free to contact us with the information below.

Thank you,

Jason R. Reinhardt
Department of Forest Resources
University of Minnesota
reinh215@umn.edu
612-626-7153

11. APPENDIX 2: SURVEY

Noxious and Invasive Weeds Survey

Block: Initial Association Question (1 Question)

Branch: New Branch

If

If In which capacity are you filling out this survey? Private Landowner Is Selected

Standard: Private Landowner Category (1 Question)

Standard: Private - General (11 Questions)

Branch: New Branch

If

If Which, if any, of the following invasive plant species are currently on your land? If necessary... q://QID8/SelectedChoicesCount Is Equal to 0

Block: Private - no invasives present or of concern (5 Questions)

Block: Private and public - additional comments (2 Questions)

EndSurvey:

Standard: Private - Parsnip (3 Questions)

Standard: Private - Most concerned species (7 Questions)

Standard: Private - conservation, hunting, recreation (2 Questions)

Branch: New Branch

If

If Which of the following land use type(s) are you associated with? Select all that apply. Residence / Homestead Is Selected

Standard: Private - Residence Questions (3 Questions)

Branch: New Branch

If

If Which of the following land use type(s) are you associated with? Select all that apply. Agriculture - Row Crops Is Selected

Or Which of the following land use type(s) are you associated with? Select all that apply. Woodland or Forest Is Selected

Or Which of the following land use type(s) are you associated with? Select all that apply. Agriculture - Pasture Is Selected

Standard: Private - Agriculture / forestry questions (6 Questions)

Branch: New Branch

If

If In which capacity are you filling out this survey? Public Lands Professional (Municipal, County, State, Tribal, or Federal) or Other (Contractor, Volunteer) Is Selected

Standard: Public Land Professional Survey (19 Questions)

Standard: Public - Parsnip (3 Questions)

Block: Public - Most concerned species (6 Questions)

Standard: Private and public - additional comments (2 Questions)

EndSurvey:

Page Break

Start of Block: Initial Association Question

Q1

In which capacity are you filling out this survey?

- Private Landowner (1)
- Public Lands Professional (Municipal, County, State, Tribal, or Federal) or Other (Contractor, Volunteer) (2)

End of Block: Initial Association Question

Start of Block: Private Landowner Category

Q5 Which of the following land use type(s) are you associated with?

Select all that apply.

- Residence / Homestead (1)
- Agriculture - Row Crops (2)
- Agriculture - Pasture (3)
- Woodland or Forest (4)

End of Block: Private Landowner Category

Start of Block: Private - General



Q11 How many acres of vegetation are devoted to each of the following land use types?
(If none, use 0)

Woodland / Forest (1) _____

Pasture (2) _____

Crops / Row Crops (3) _____

Wetland (4) _____

Prairie / Grassland (6) _____

Other (5) _____

Q9 In which county or counties is your land mainly located?

Q8 Which, if any, of the following invasive plant species are **currently on your land**?

If necessary, photos and descriptions can be found here (opens a new window):

<http://www.dot.state.mn.us/roadsides/vegetation/pdf/noxiousweeds.pdf>

Common buckthorn (1)

Glossy buckthorn (2)

Canada thistle (3)

Garlic mustard (4)

Japanese knotweed (5)

Leafy spurge (6)

Multiflora rose (7)

Narrowleaf bittercress (8)

Plumeless thistle (9)

Purple loosestrife (10)

Spotted knapweed (11)

Common tansy (12)

Wild parsnip (13)

Skip To: End of Block If Selected Choices = 0

Carry Forward Selected Choices from "Q8"



Q63 Where on your land do these species occur?

| | Woodland / Forest (1) | Agriculture - Crops (2) | Agriculture - Pasture (3) | Wetlands (4) | Prairie / Grassland (6) | Other (5) |
|-----------------------------|--------------------------|--------------------------|---------------------------|--------------------------|--------------------------|--------------------------|
| Common buckthorn (x1) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Glossy buckthorn (x2) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Canada thistle (x3) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Garlic mustard (x4) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Japanese knotweed (x5) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Leafy spurge (x6) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Multiflora rose (x7) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Narrowleaf bittercress (x8) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Plumeless thistle (x9) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Purple loosestrife (x10) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Spotted knapweed (x11) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Common tansy (x12) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Wild parsnip (x13) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Display This Question:

If Q63 [Agriculture - Crops] (Count) >= 1

Carry Forward Selected Choices from "Q63"



Q67 You have indicated that the following species occur on cropland. With which crop(s) are these species generally found?

| | Field Corn (1) | Sweet Corn (8) | Soybeans (2) | Sugarbeets (3) | Small Grains (wheat, barley, oats) (4) | Grasses (hay, alfalfa) (5) | Potatoes (6) | Other (10) |
|------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--|-------------------------------------|--------------------------|--------------------------|
| Common buckthorn (xx1) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Glossy buckthorn (xx2) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Canada thistle (xx3) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Garlic mustard (xx4) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Japanese knotweed (xx5) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Leafy spurge (xx6) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Multiflora rose (xx7) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Narrowleaf bittercress (xx8) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Plumeless thistle (xx9) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Purple loosestrife (xx10) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Spotted knapweed (xx11) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Common tansy (xx12) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Wild parsnip (xx13) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Display This Question:

If Q63 [Agriculture - Crops] (Count) >= 1

Or Q63 [Agriculture - Pasture] (Count) >= 1

Q69 Has the presence of any of these species **on or near your agricultural land** resulted in any **extra** costs or labor? (i.e., costs or labor that you would not have had to do if the invasive plants were not present)

Yes (1)

No (4)

Display This Question:

If Q69 = Yes



Q70

You have indicated that the presence of one or more invasive plants **on or near your agricultural land** has resulted in extra costs or labor.

Can you very briefly describe the extra costs or labor?

What additional activities or labor had to be undertaken? (1)

How much did this cost (per-year costs if applicable)? (2)

Page Break

Q13 Over the past three years, have you taken any actions to control or manage any of these species?:

#{Q8/ChoiceGroup/SelectedChoices}

Yes (1)

No (2)

Display This Question:

If Q13 = Yes

Carry Forward Selected Choices from "Q8"



Q12 Which of the following actions have you implemented on your land to control any of these species in the past three years? (Check all that apply)

Manual removal includes cutting plants with a chainsaw, extracting roots by hand, etc.

Mechanical treatments include mowing, tilling, skid steers, etc.

Herbicidal treatments consist of targeted or broadcast herbicidal chemicals

Controlled burns consist of carefully managed fire treatments

| | Manual Removal (1) | Mechanical Treatment (2) | Herbicide Treatment (3) | Controlled Burn (4) | Other (5) |
|-----------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Common buckthorn (x1) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Glossy buckthorn (x2) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Canada thistle (x3) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Garlic mustard (x4) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Japanese knotweed (x5) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Leafy spurge (x6) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Multiflora rose (x7) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Narrowleaf bittercress (x8) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Plumeless thistle (x9) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Purple loosestrife (x10) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Spotted knapweed (x11) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Common tansy (x12) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Wild parsnip (x13) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Page Break

Display This Question:

If Q12 = Herbicide Treatment

Q22

You indicated that you used herbicide on the following species: [\\${Q12/ChoiceGroup/SelectedChoicesForAnswer/3}](#)

When using herbicides, which active ingredients or products did you use?

If you used multiple products, please list each separated by commas. If unsure, leave blank.

Page Break

Q18 In general, how likely are you to implement any of the following in the next three years?

| | Not likely at all (1) | Not very likely (2) | Maybe / Unsure (3) | Somewhat likely (4) | I am likely to do this (5) |
|--|--------------------------|------------------------|-----------------------|------------------------|-------------------------------|
| Examine/survey land for invasive plant species (1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Manual removal of invasive plant species (2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Mechanical removal of invasive plant species (3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Herbicidal treatment of invasive plant species (4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Controlled burn to control invasive plant species (5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

End of Block: Private - General

Start of Block: Private - no invasives present or of concern

Q71 Are you concerned about a **potential invasion** by any of the following invasive plant species?
(Check all that apply; if not concerned then select none)

Common buckthorn (1)

Glossy buckthorn (2)

Canada thistle (3)

Garlic mustard (4)

Japanese knotweed (5)

Leafy spurge (6)

Multiflora rose (7)

Narrowleaf bittercress (8)

Plumeless thistle (9)

Purple loosestrife (10)

Spotted knapweed (11)

Common tansy (12)

Wild parsnip (13)

Skip To: End of Survey If Selected Choices = 0

Q73 Are you concerned that any of these invasive plant species might have an **economic** impact if they successfully invade?

Yes (25)

No (26)

Display This Question:

If Q73 = Yes

Carry Forward Selected Choices from "Q71"



Q74 In which of the following areas are you concerned these invasive plants will have **economic impacts?**

(Check all that apply)

| | Crop yields (1) | Livestock grazing (2) | Timber growth and yield (3) | Timber restocking (4) | Timber, other (5) | Hunting, game species (6) | Recreation (7) | Other / Not sure (8) |
|-----------------------------|--------------------------|--------------------------|-----------------------------|--------------------------|--------------------------|---------------------------|--------------------------|--------------------------|
| Common buckthorn (x1) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Glossy buckthorn (x2) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Canada thistle (x3) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Garlic mustard (x4) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Japanese knotweed (x5) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Leafy spurge (x6) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Multiflora rose (x7) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Narrowleaf bittercress (x8) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Plumeless thistle (x9) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Purple loosestrife (x10) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Spotted knapweed (x11) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Common tansy (x12) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Wild parsnip (x13) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Page Break

Q75

You indicated a general concern regarding these species: [\\${Q71/ChoiceGroup/SelectedChoices}](#)

Are you concerned that any of these invasive plant species will have **conservation** or **ecological impacts**?

Yes (1)

No (2)

Display This Question:

If Q75 = Yes

Carry Forward Selected Choices from "Q71"



Q76

What kind of conservation or ecological impacts are you concerned these species will have?
(Check all that apply)

| | Overall biodiversity (1) | Native plant species (2) | Birds (3) | Mammals (4) | Other wildlife (5) | Forest health (6) | Soil health (7) | Other (8) |
|-----------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Common buckthorn (x1) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Glossy buckthorn (x2) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Canada thistle (x3) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Garlic mustard (x4) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Japanese knotweed (x5) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Leafy spurge (x6) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Multiflora rose (x7) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Narrowleaf bittercress (x8) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Plumeless thistle (x9) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Purple loosestrife (x10) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Spotted knapweed (x11) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Common tansy (x12) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Wild parsnip (x13) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

End of Block: Private - no invasives present or of concern

Start of Block: Private and public - additional comments

Q60 Other than the species included in this survey, are there any other invasive plant species that you are concerned about? If listing multiple species, please separate them with commas.

Q61 Do you have any additional comments or feedback on this topic? Please let us know by writing below.

End of Block: Private and public - additional comments

Start of Block: Private - Parsnip

Display This Question:
If Q8 = Wild parsnip

Q24 If wild parsnip is present on your land, have you or anyone else ever experienced blistering or skin irritation after being exposed to it?

- Yes (1)
- No (2)

Display This Question:
If Q24 = Yes

Q25 Was the exposure to wild parsnip severe enough to require medical treatment?

Yes (1)

No (2)

Display This Question:

If Q25 = Yes

Q26 What was the estimated out-of-pocket costs of the associated medical treatment?

End of Block: Private - Parsnip

Start of Block: Private - Most concerned species

Carry Forward Selected Choices from "Q8"



Q14 Which of these invasive plants are you **most** concerned about?

- I am not very concerned about any of these (1)
- Common buckthorn (2)
- Glossy buckthorn (3)
- Canada thistle (4)
- Garlic mustard (5)
- Japanese knotweed (6)
- Leafy spurge (7)
- Multiflora rose (8)
- Narrowleaf bittercress (9)
- Plumeless thistle (10)
- Purple loosestrife (11)
- Spotted knapweed (12)
- Common tansy (13)
- Wild parsnip (14)

Skip To: End of Block If Q14 = I am not very concerned about any of these

Q87 What are your primary concerns regarding $\{Q14/ChoiceGroup/SelectedChoices\}$?

- Impacts on agricultural yields (1)
- Impacts on livestock grazing (2)
- Impacts on forest regeneration (3)
- Impacts on forest growth and yield (4)
- Impacts on game species (5)
- Impacts on recreational activities (6)
- Conservation or ecological impacts (7)
- Other: (8) _____

Display This Question:

If Q87 = Impacts on forest regeneration

Q64 How many acres of regenerating forest do you currently have on your land?

Page Break _____

Q83 Have you taken any action to control or manage $\{Q14/ChoiceGroup/SelectedChoices\}$ over the past three years?

Yes (1)

No (2)

Display This Question:

If Q83 = Yes

Q20 Which of the following actions have you implemented on your land in the past three years to control $\{Q14/ChoiceGroup/SelectedChoices\}$, and how much did those treatments cost?

| | Select all actions that apply | Estimated yearly cost | Estimated acreage treated |
|--|-------------------------------|------------------------------|----------------------------------|
| | Actions taken: (1) | \$ per year (1) | acres (1) |

| | | | |
|--------------------------|--------------------------|--|--|
| Manual Removal (1) | <input type="checkbox"/> | | |
| Mechanical Removal (2) | <input type="checkbox"/> | | |
| Herbicidal Treatment (3) | <input type="checkbox"/> | | |
| Controlled burn (4) | <input type="checkbox"/> | | |
| Other (5) | <input type="checkbox"/> | | |

Skip To: End of Block If Q20 = Manual Removal

Carry Forward Selected Choices from "Q20#1"



Q23 How effective do you think these treatments were at controlling
 \${Q14/ChoiceGroup/SelectedChoices}?

| | Extremely effective (1) | Very effective (2) | Moderately effective (3) | Slightly effective (4) | Not effective at all (5) |
|---------------------------|-------------------------|-----------------------|--------------------------|------------------------|--------------------------|
| Manual Removal (x1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Mechanical Removal (x2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Herbicidal Treatment (x3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Controlled burn (x4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Other (x5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Display This Question:

If Q20#1 = Herbicidal Treatment [Actions taken:]

Q21 When using herbicides, which active ingredients or products did you use?

If you used multiple products, please list each and separate with commas.

End of Block: Private - Most concerned species

Start of Block: Private - conservation, hunting, recreation

Carry Forward Selected Choices from "Q8"



Q32

How concerned are you about the potential impacts of the listed invasive plant species on: **1) hunting, 2) recreation, or 3) conservation** on your land?

For each category, select one of "Not very concerned", "Somewhat concerned", or "Very concerned" for each species. **Leave blank if not at all concerned.**

| | Impact on Hunting | | | Impact on Recreation | | | Conservation or Ecological I | |
|--|-------------------|----------|------|----------------------|----------|------|------------------------------|----------|
| | Not very | Somewhat | Very | Not very | Somewhat | Very | Not very | Somewhat |
| | | | | | | | | |

| | concerned (1) | concerned (2) | concerned (3) | concerned (1) | concerned (2) | concerned (3) | concerned (1) | concerned (2) | concerned (3) |
|-----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Common buckthorn (x1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Glossy buckthorn (x2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Canada thistle (x3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Garlic mustard (x4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Japanese knotweed (x5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Leafy spurge (x6) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Multiflora rose (x7) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Narrowleaf bittercress (x8) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Plumeless thistle (x9) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Purple loosestrife (x10) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Spotted knapweed (x11) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Common tansy (x12) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Wild parsnip (x13) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Display This Question:

If Q32#3 [Very concerned] (Count) >= 1

Or Q32#3 [Somewhat concerned] (Count) >= 1

Q33 You indicated concern about conservation or ecological impacts from one or more invasive plants. Which of the following are you concerned about? (check all that apply):

- Overall biodiversity (1)
- Native plants (2)
- Birds (3)
- Other wildlife (mammals, reptiles, etc.) (4)
- Forest health (5)
- Soil health (6)
- Other (7) _____

End of Block: Private - conservation, hunting, recreation

Start of Block: Private - Residence Questions

Q7 You have indicated that your property contains a residence or homestead.

Have any of your structures (home, shed, barn, etc.) ever experienced structural damage from Japanese knotweed or any other invasive plant included in this survey?

- Yes (1)
- No (2)

Display This Question:

If Q7 = Yes

Q35 Did you have the structural damage repaired?

- Yes (1)
- No (2)

Display This Question:

If Q35 = Yes

Q34 Do you have an estimate of how much the structural damage cost to repair? (\$ USD)

End of Block: Private - Residence Questions

Start of Block: Private - Agriculture / forestry questions

Q27 **How concerned** are you about the impact of invasive plant species on the profitability of agricultural production or timber production on your land (or the land you work with)?

- A great deal (1)
- A lot (2)
- A moderate amount (3)
- A little (4)
- None at all (5)

Page Break

Display This Question:

If Q27 = A moderate amount

Or Q27 = A lot

Or Q27 = A great deal

Or Q27 = A little

Q65 In terms of the potential impacts of invasive plants on the profitability of agricultural or timber production, which areas concern you the most? (Check all that apply)

Agriculture - impacts on crop yield (1)

Agriculture - impacts on grazing (2)

Agriculture - other (3)

Forestry - growth and yield (4)

Forestry - restocking and regeneration (5)

Forestry - other (6)

Other (7)

Page Break

Display This Question:

If Q5 = Agriculture - Pasture

And If

Q8 = Canada thistle

Or Q8 = Plumeless thistle

Or Q8 = Common tansy

Q28 You have indicated: **1)** you either own or work with pasture lands,
and: **2)** you may have Canada thistle, Plumeless thistle, or Common tansy on your land

Has the presence of these species reduced the amount of grazing on the pasture(s)?

Yes (1)

No (2)

Page Break

Display This Question:

If Q28 = Yes

Q29 Do you have an estimate of how much the grazing was reduced due to these invasive plant species?

Select and fill in the information for each type of livestock that you work with. **Leave blank if not applicable.**

| Type of animals grazed | # Animals that would have been grazed if the invasive plants were not present (i.e., normally) | How many fewer days were you able to graze the pasture? (due to invasive plants) | # Animals that were grazed (as reduced by invasive plant presence) | Did the presence of invasive plants reduce number of animals grazed? | | How many days would you normally have been able to graze the pasture? |
|--------------------------|--|--|--|--|--------|---|
| Check all that apply (1) | Number of animals: (1) | Number of days: (1) | Number of animals: (1) | Yes (1) | No (2) | Number of days: (1) |
| | | | | | | |

| | | | | | | | |
|-------------------------------|--------------------------|--|--|--|-----------------------|-----------------------|--|
| Mature beef cows (1) | <input type="checkbox"/> | | | | <input type="radio"/> | <input type="radio"/> | |
| Stocker cattle (2) | <input type="checkbox"/> | | | | <input type="radio"/> | <input type="radio"/> | |
| Mature dairy cows (3) | <input type="checkbox"/> | | | | <input type="radio"/> | <input type="radio"/> | |
| Dairy replacement heifers (4) | <input type="checkbox"/> | | | | <input type="radio"/> | <input type="radio"/> | |
| Sheep (5) | <input type="checkbox"/> | | | | <input type="radio"/> | <input type="radio"/> | |
| Other (6) | <input type="checkbox"/> | | | | <input type="radio"/> | <input type="radio"/> | |

Page Break

Display This Question:

If Q8 = Common tansy

Q30 You indicated that common tansy was either present on your land, or a concern.

Have you noticed any adverse health effects on the grazing cattle from consuming the tansy?

Yes (1)

No (2)

Display This Question:

If Q30 = Yes

Q31 Can you very briefly describe the health impacts on cattle caused by tansy consumption?

End of Block: Private - Agriculture / forestry questions

Start of Block: Public Land Professional Survey

Q6 Which of the following ownership categories are you associated with? (If multiple, check all that apply)

Municipal / Local (1)

County (2)

State - Department of Agriculture (3)

State - Department of Natural Resources (4)

State - Other (5)

Federal (6)

Tribal (7)

Volunteer (10)

Other (8) _____

Q38 How would you describe your professional or volunteer role? (i.e., what is your job title?)

Q39 What type of land management or other professional/volunteer efforts are you typically engaged in?
(Check all that apply)

- Agriculture - crop related (1)
- Agriculture - livestock related (2)
- Forestry - sawtimber production (4)
- Forestry - pulp production (5)
- Transportation/highway engineering or maintenance (6)
- Conservation (3)
- Restoration (7)
- Wildlife management (10)
- Riparian zone management (8)
- Other: (9) _____



Q40 What percentage of the land you work with do you consider to be:
Forested, Cultivated cropland, Wetland, Prairie or Grassland, Roads or Right-of-Way, or Other?

Click or drag bars to the desired value. Total must sum to 100%.

- _____ Forested (1)
 - _____ Cultivated crops (2)
 - _____ Wetland (4)
 - _____ Prairie / Grassland (6)
 - _____ Road / Right-of-Way (5)
 - _____ Other (9)
-

Q41 Which of the following invasive plant species are you confident that you, or any employees/volunteers, could identify?

Common buckthorn (1)

Glossy buckthorn (2)

Canada thistle (3)

Garlic mustard (4)

Japanese knotweed (5)

Leafy spurge (6)

Multiflora rose (7)

Narrowleaf bittercress (8)

Plumeless thistle (9)

Purple loosestrife (10)

Spotted knapweed (11)

Common tansy (12)

Wild parsnip (13)

Carry Forward All Choices - Displayed & Hidden from "Q41"



Q62 Which, if any, of the following invasive plant species are **currently present** on land you work with? Approximately how many acres of land are infested?

| | Currently on land | Infested area (estimated) |
|--|-------------------|---------------------------|
| | | |

Species present: (1)

Acres: (1)

| | | |
|-----------------------------|--------------------------|--|
| Common buckthorn (x1) | <input type="checkbox"/> | |
| Glossy buckthorn (x2) | <input type="checkbox"/> | |
| Canada thistle (x3) | <input type="checkbox"/> | |
| Garlic mustard (x4) | <input type="checkbox"/> | |
| Japanese knotweed (x5) | <input type="checkbox"/> | |
| Leafy spurge (x6) | <input type="checkbox"/> | |
| Multiflora rose (x7) | <input type="checkbox"/> | |
| Narrowleaf bittercress (x8) | <input type="checkbox"/> | |

| | | |
|--------------------------|--------------------------|--|
| Plumeless thistle (x9) | <input type="checkbox"/> | |
| Purple loosestrife (x10) | <input type="checkbox"/> | |
| Spotted knapweed (x11) | <input type="checkbox"/> | |
| Common tansy (x12) | <input type="checkbox"/> | |
| Wild parsnip (x13) | <input type="checkbox"/> | |

Skip To: Q44 If Q62 =

Carry Forward Selected Choices from "Q62#1"



Q69 Where do these species of concern generally occur?

| | Forest (35) | Cropland (36) | Pasture (37) | Wetlands (38) | Prairie or Grassland (41) | Roadsides or Highways (39) | Other (40) |
|------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|---------------------------------|-------------------------------------|--------------------------|
| Common buckthorn (xx1) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Glossy buckthorn (xx2) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Canada thistle (xx3) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Garlic mustard (xx4) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Japanese knotweed (xx5) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Leafy spurge (xx6) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Multiflora rose (xx7) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Narrowleaf bittercress (xx8) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Plumeless thistle (xx9) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Purple loosestrife (xx10) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Spotted knapweed (xx11) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Common tansy (xx12) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Wild parsnip (xx13) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Display This Question:

If Q69 [Cropland] (Count) >= 1

Carry Forward Selected Choices from "Q69"



Q70 You have indicated that the following species occur on cropland. With which crop(s) are these species generally found?

| | Field Corn (1) | Sweet Corn (7) | Soybeans (2) | Sugarbeets (3) | Small Grains (wheat, barley, oats) (4) | Grasses (hay, alfalfa) (5) | Potatoes (6) | Other (10) |
|-------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--|-------------------------------------|--------------------------|--------------------------|
| Common buckthorn (xxx1) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Glossy buckthorn (xxx2) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Canada thistle (xxx3) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Garlic mustard (xxx4) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Japanese knotweed (xxx5) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Leafy spurge (xxx6) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Multiflora rose (xxx7) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Narrowleaf bittercress (xxx8) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Plumeless thistle (xxx9) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Purple loosestrife (xxx10) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Spotted knapweed (xxx11) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Common tansy (xxx12) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Wild parsnip (xxx13) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Display This Question:

If Q69 [Cropland] (Count) >= 1

Or Q69 [Pasture] (Count) >= 1

Q71 In your experience, does the presence of any of these species **on or near agricultural land** typically result in any extra costs or labor? (i.e., costs or labor that would not be incurred if the invasive plants were not present)

Yes (1)

No (3)

Display This Question:

If Q71 = Yes



Q72

You have indicated that one or more invasive plants typically result in extra costs or labor when found **on or near agricultural land**.

Can you very briefly describe or list the extra costs or labor?

What additional labor or activities are commonly required? (1)

How much do these extra activities generally cost on an annual basis? (2)

Page Break

Display This Question:

If Q69 [Roadsides or Highways] (Count) >= 1

Carry Forward Selected Choices from "Q69"



Q79 You have indicated that the following species are found along roadsides or highways. In your estimation, **are these plants more common near roads than elsewhere?**

| | Yes (1) | Maybe / Not sure (2) | No (3) |
|-------------------------------|-----------------------|-----------------------|-----------------------|
| Common buckthorn (xxx1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Glossy buckthorn (xxx2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Canada thistle (xxx3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Garlic mustard (xxx4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Japanese knotweed (xxx5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Leafy spurge (xxx6) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Multiflora rose (xxx7) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Narrowleaf bittercress (xxx8) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Plumeless thistle (xxx9) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Purple loosestrife (xxx10) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Spotted knapweed (xxx11) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Common tansy (xxx12) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Wild parsnip (xxx13) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Display This Question:

If Q69 [Roadsides or Highways] (Count) >= 1

Carry Forward Selected Choices from "Q69"



Q80 Is there regular mowing or other land clearance where these species are present along roadsides?

| | Yes (1) | Maybe / Not sure (2) | No (3) |
|-------------------------------|-----------------------|-----------------------|-----------------------|
| Common buckthorn (xxx1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Glossy buckthorn (xxx2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Canada thistle (xxx3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Garlic mustard (xxx4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Japanese knotweed (xxx5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Leafy spurge (xxx6) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Multiflora rose (xxx7) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Narrowleaf bittercress (xxx8) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Plumeless thistle (xxx9) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Purple loosestrife (xxx10) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Spotted knapweed (xxx11) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Common tansy (xxx12) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Wild parsnip (xxx13) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Page Break

Carry Forward Selected Choices from "Q62#1"



Q67 Which of the following actions have been implemented by you or your colleagues to control any of these species in the past three years? (check all that apply)

| | Manual Removal (1) | Mechanical Treatment (mowing, skid steer, etc.) (2) | Herbicide Treatment (3) | Controlled Burn (4) | Other (5) |
|------------------------------|--------------------------|--|----------------------------|--------------------------|--------------------------|
| Common buckthorn (xx1) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Glossy buckthorn (xx2) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Canada thistle (xx3) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Garlic mustard (xx4) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Japanese knotweed (xx5) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Leafy spurge (xx6) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Multiflora rose (xx7) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Narrowleaf bittercress (xx8) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Plumeless thistle (xx9) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Purple loosestrife (xx10) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Spotted knapweed (xx11) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Common tansy (xx12) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Wild parsnip (xx13) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Display This Question:

If Q67 [Herbicide Treatment] (Count) >= 1

Q68

You indicated that herbicide was used to treat the following species: \${Q67/ChoiceGroup/SelectedChoicesForAnswer/3}

When using herbicides, which active ingredients or products were used?

If multiple products were used, please list each separated by commas. If unsure, leave blank.

Page Break



Q44 Broadly, how concerned are you about **potential invasions** of any of the following plants?

| | Not concerned at all (1) | Not very concerned (2) | Unsure (3) | Slightly concerned (4) | Very concerned (5) |
|------------------------------|-----------------------------|---------------------------|-----------------------|---------------------------|-----------------------|
| Common buckthorn (xx1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Glossy buckthorn (xx2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Canada thistle (xx3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Garlic mustard (xx4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Japanese knotweed (xx5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Leafy spurge (xx6) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Multiflora rose (xx7) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Narrowleaf bittercress (xx8) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Plumeless thistle (xx9) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Purple loosestrife (xx10) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Spotted knapweed (xx11) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Common tansy (xx12) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Wild parsnip (xx13) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Q54 Broadly, how concerned are you about invasive plant species in terms of the **economic impact** they might have?

- Very concerned (1)
- Slightly concerned (2)
- Unsure / Neutral (3)
- Not very concerned (4)
- Not at all concerned (5)

Display This Question:

If Q54 = Very concerned

Or Q54 = Slightly concerned

Q55 In which of the following areas are you concerned about the **economic** impacts of invasive plants?
(Check all that apply)

- Agriculture - crops (1)
- Agriculture - livestock (2)
- Forestry - growth and yield (3)
- Forestry - restocking and regeneration (4)
- Forestry - other (5)
- Hunting - impacts on game species (6)
- Recreation (7)
- Other (8) _____

Page Break

Q58 How concerned are you about the potential **conservation** or **ecological impacts** that invasive plants might have?

- Very concerned (1)
- Slightly concerned (2)
- Unsure / Neutral (3)
- Not very concerned (4)
- Not at all concerned (5)

Display This Question:

If Q58 = Very concerned

Or Q58 = Slightly concerned

Q59

What kind of conservation or ecological impacts are you most concerned about?

- Impacts on overall biodiversity (1)
- Impacts on native plant species (2)
- Impacts on birds (3)
- Impacts on mammals (4)
- Impacts on other wildlife (5)
- Impacts on forest health (6)
- Impacts on soil health (7)
- Other (8) _____

End of Block: Public Land Professional Survey

Start of Block: Public - Parsnip

Display This Question:

If Q8 = Wild parsnip

Q50 If wild parsnip is present, have you, an employee, or a colleague ever experienced blistering or skin irritation after being exposed to it?

Yes (1)

No (2)

Display This Question:

If Q50 = Yes

Q51 Was the exposure to wild parsnip severe enough to require medical treatment?

Yes (1)

No (2)

Display This Question:

If Q51 = Yes

Q52 What was the estimated out-of-pocket costs of the associated medical treatment?

End of Block: Public - Parsnip

Start of Block: Public - Most concerned species

Carry Forward Selected Choices from "Q62#1"



Q45 Of the species currently present on your land, which are you **most** concerned about?

- I am not very concerned about any of these (1)
- Common buckthorn (2)
- Glossy buckthorn (3)
- Canada thistle (4)
- Garlic mustard (5)
- Japanese knotweed (6)
- Leafy spurge (7)
- Multiflora rose (8)
- Narrowleaf bittercress (9)
- Plumeless thistle (10)
- Purple loosestrife (11)
- Spotted knapweed (12)
- Common tansy (13)
- Wild parsnip (14)

Skip To: End of Block If Q45 = I am not very concerned about any of these

Page Break

Q86 What are your primary concerns regarding $\{Q45/ChoiceGroup/SelectedChoices\}$?

- Impacts on agricultural yields (1)
- Impacts on livestock grazing (2)
- Impacts on forest regeneration (3)
- Impacts on forest growth and yield (4)
- Impacts on game species (5)
- Impacts on recreational activities (6)
- Conservation or ecological impacts (7)
- Other: (8) _____

Display This Question:

If Q86 = Impacts on forest regeneration

Q65 On average (annually), how many acres of forest are regenerating on the land you are associated with?

Page Break

Q82 Have you taken any action to control or manage $\${Q45/ChoiceGroup/SelectedChoices}$ over the past three years?

Yes (1)

No (2)

Display This Question:

If Q82 = Yes

Q47 Which of the following actions have you implemented on your land in the past three years to control $\${Q45/ChoiceGroup/SelectedChoices}$, and how much did those treatments cost?

| | Select all actions that apply | Estimated yearly cost | Estimated acreage treated |
|--|-------------------------------|------------------------------|----------------------------------|
| | Actions taken: (1) | \$ per year (1) | acres (1) |

| | | | |
|--------------------------|--------------------------|--|--|
| Manual Removal (1) | <input type="checkbox"/> | | |
| Mechanical Removal (2) | <input type="checkbox"/> | | |
| Herbicidal Treatment (3) | <input type="checkbox"/> | | |
| Controlled burn (4) | <input type="checkbox"/> | | |
| Other (5) | <input type="checkbox"/> | | |

Skip To: End of Block If Q47 = Manual Removal

Carry Forward Selected Choices from "Q47#1"



Q48 How effective do you think these treatments were at controlling
 \${Q45/ChoiceGroup/SelectedChoices}?

| | Extremely effective (1) | Very effective (2) | Moderately effective (3) | Slightly effective (4) | Not effective at all (5) |
|---------------------------|-------------------------|-----------------------|--------------------------|------------------------|--------------------------|
| Manual Removal (x1) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Mechanical Removal (x2) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Herbicidal Treatment (x3) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Controlled burn (x4) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Other (x5) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Page Break

End of Block: Public - Most concerned species
