

Bayfield County Highway Department Roadside Invasive Plant Management Plan 2012

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Northwoods Cooperative Weed Management Area

www.northwoodscwma.org



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A. Introduction

According to Wisconsin state statutes, invasive plants are any species of plant that is not native to our area and causes, or is likely to cause, harm to the economy, the environment, and/or human health. In an area where forestry, agriculture, tourism, and recreation are important to the economy, it is important to keep invasive plants from affecting those industries. In 2009, the state passed a rule – Chapter NR 40 – which regulates the transfer, transport, introduction, and possession of invasive species. This rule affects the management of rights-of-way in Wisconsin.

The time to begin managing invasive species in the rights-of-way is *before* they arrive in your area. Once they get a foothold, the best chance at controlling them is to start management as soon as possible, saving considerable time and money in the future. This plan will set priorities for the control or eradication of invasive plants that have already become established in the county, and outline practices to prevent the introduction of new invasive plants.

A prioritized list of the invasive plants found on Bayfield County highways can be found in section C. Please keep in mind that not all county highways were surveyed for this management plan, and there may be other invasive species on your roadsides that need to be managed. Detailed descriptions and control tips for species that were identified during our surveys can be found in section E. In addition, the maps attached in section D illustrates the areas that were surveyed and found to have invasive plants in a survey conducted during the summer of 2011.

We have also identified a list of priority trouble spots to target early efforts in the hope of minimizing the long-term workload. The first priority (after prevention) is to manage new infestations, beginning with those that are the fastest growing, cause the most damage, and occur near uninfested natural areas. It is also important to consider the difficulty of control, giving higher priority to infestations where control is most likely to succeed with available resources. Section F will detail the best management practices (BMPs) for rights-of-way in order to streamline this process. Section B and the attached appendices in section H offer additional recommendations and resources for the best results in controlling invasive plants.

B. General Management Recommendations

1. Mowing Twice

Repeatedly mowing roadsides and rights-of-way (twice or more per year) helps prevent plants from being able to flower, and without flowers they do not produce seeds or spread. In most cases, mowing will *not* eradicate invasive plants, but it can be a good strategy for containing their spread.

In order to prevent seed spread, it is important to mow before or during flowering, but *not* after. Mowing after plants have gone to seed is likely to spread the seeds in the wind, or allow them to attach to mowing equipment where they will hitch a ride to other areas. The mowing recommendations in Appendix 2 suggest times of year when mowing is likely to help or hinder invasive plant management (timing based on typical plant growth seasons in northern Wisconsin).

An alternative to repeated mowing is to use chemical “plant growth regulators” (PGRs). These chemicals stunt the growth of plants so they remain short throughout the growing season, limiting or eliminating the need to mow. Because of our short growing season, plant growth regulators can be a cost-effective alternative to mowing in our region. PGRs have an added benefit of preventing plants from reaching maturity, where they will flower and produce seeds. This makes PGRs a useful management tool in roadsides that are infested with invasive plants. As with any chemical application on public land or rights-of-way, this approach may not be acceptable or appropriate in some communities.

2. Monitoring Disturbed Areas

Any time that road construction, maintenance, or a similar disturbance takes place, it sets the stage for new invasive plants to colonize. This is why culverts and bridges are often densely populated with invasive species. Gravel pits are also a hotbed for invasive plants, which can germinate in roadsides where the gravel is spread.

Inspect disturbed areas 2-3 times a year for at least three growing seasons following the disturbance (i.e. construction, etc.). Inspections can be carried out during mowing or other routine operations. Treat and remove any invasive plants that crop up before they have a chance to spread and become a much larger problem. Monitoring and managing invasives for at least three years will give desirable plants a chance to get established. Once the site is densely covered with plants that are *not* invasive, it is much harder for invasive plants to move into the site.

3. Seeding with Invasive-Free Mixes

Historically, many invasive species (such as kudzu) were intentionally introduced for the purpose of erosion control, only to discover too late that they are nearly impossible to contain once introduced. To prevent this, use seed mixes that do not include invasive plants. Go with trusted species that are not persistent, and avoid new “miracle” species or seed mixes. Also, include annuals in your seed mix which will quickly germinate and cover exposed soil, making it harder for invasive plants to get a foothold. Species to avoid in seed mixes include bird’s foot trefoil and crown vetch. A sample seed mix is included in Appendix 4.

4. Routine Control of Current Populations

Once an area with invasive plants has been identified, it is important to monitor and treat it regularly. This could mean mowing three times per season in a certain area for roadside patches, or treating specific areas with an herbicide once per season.

While it would be ideal to strive for a weed-free gravel pit, it may be impractical. At a minimum, consider treating the section of the gravel pit from which you are actively hauling gravel. This will not eliminate invasive plant seeds, but it will reduce them substantially, making it much easier to manage invasives at sites where the gravel used. Some plants, such as Japanese knotweed, are a high priority for control and should be managed intensively. Other plants, like bull thistle, can be controlled just by mowing. A prioritized list of species for your township can be found in section C. Further explanation of control procedures can be found in sections E and F.

C. Priorities

1. Prioritized Species List for Bayfield County Highways

(See section E for detailed descriptions and photographs of the following plants.)

- a. **Black locust** – priority because of its ability to choke out other tree species and spread into forests adjacent to roadside; foresters for county and national forests in our area are currently battling this species
- b. **Sweet Clover** (White and Yellow) – priority because it impedes visibility on roadsides once it becomes established, and is difficult to mow because of its persistent woody stems; also replaces native plants and reduces biodiversity.
- c. **Spotted knapweed** – priority because of its potential to spread into local pastures and hay/crop fields (as well as fallow fields), reducing acreage of productive land. Also priority because of its impacts to the globally rare Pine Barrens. Barrens soils are ideal for this invasive plant, making it extremely difficult to control or contain once it gets established in this highly vulnerable ecosystem. Some areas of the state are overrun with this species, but it is still manageable on your county highways.
- d. **Canada thistle** – priority because of its quick spread, and because it is very difficult to control once established. Has potential to invade local fields being pastured or used for hay/crop production (as well as fallow fields), reducing acreage of productive land
- e. **Tansy** - priority because it is very difficult to control once established, and because of its potential to spread into local fields being pastured or used for hay/crop production, reducing acreage of productive land.
- f. **Crown vetch** – non-native plant which can spread and replace native plants. Can also be difficult to eradicate once established.
- g. **Bull thistle** – non-native plant, should be controlled.

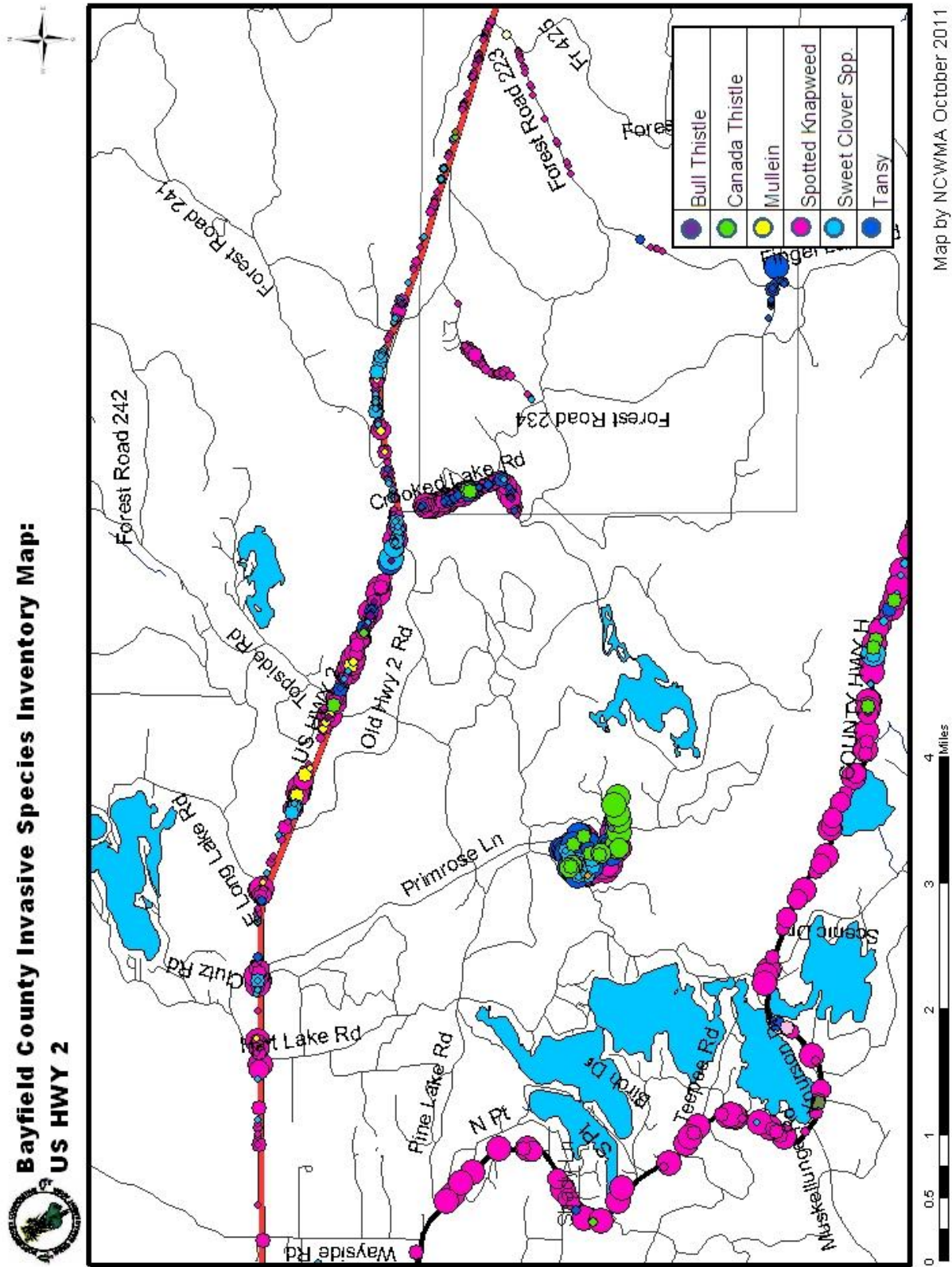
2. Trouble Spots for Bayfield County Highways

This is a list of the densest areas of invasive plants that we found. These areas should be targeted for treatment first, and monitored to ensure treatment was effective. They are listed in order of importance.

- **Black Locust:** The black locust patch at the intersection of County Highway H and Evergreen Ln. is a good example of an extremely dense infestation. Though this patch is on private property, black locust can quickly spread, so this would be a good one to keep an eye on.

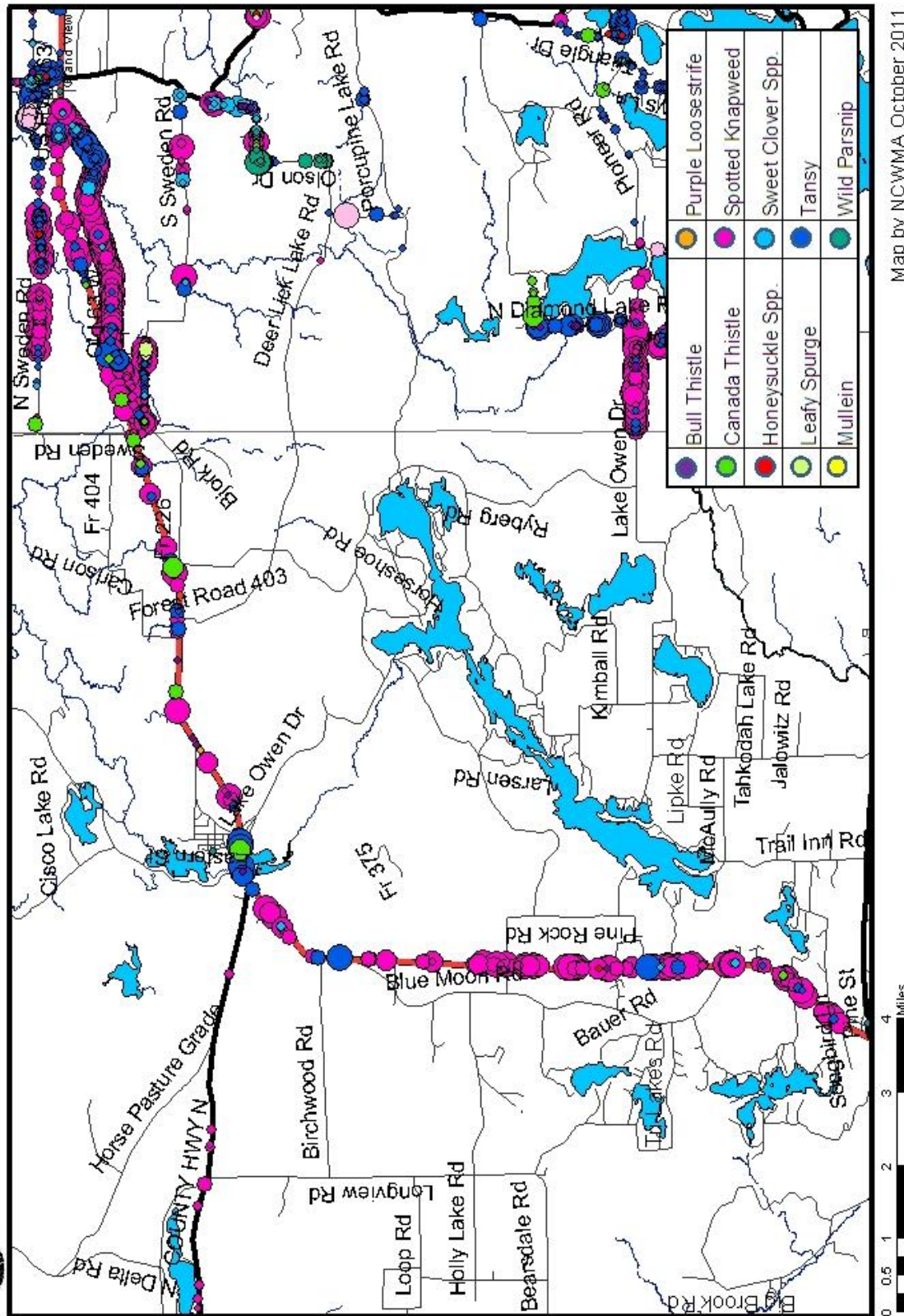
- **Spotted Knapweed:** This is found on every road that we surveyed. Dense patches are found on County Highway C between North Boundary Rd. and Old C; US Highway 2 between Old 2 Rd. and Topside Rd.; and US Highway 63 between E. Cable Lake Rd. and Pine Rock Rd.
- **Tansy:** This is found on every road that we surveyed. Dense patches are found on County Highway C between Forest Rd. 696 and 439; and on US Highway 2 between Old 2 Rd and Topside Rd.

D. Maps





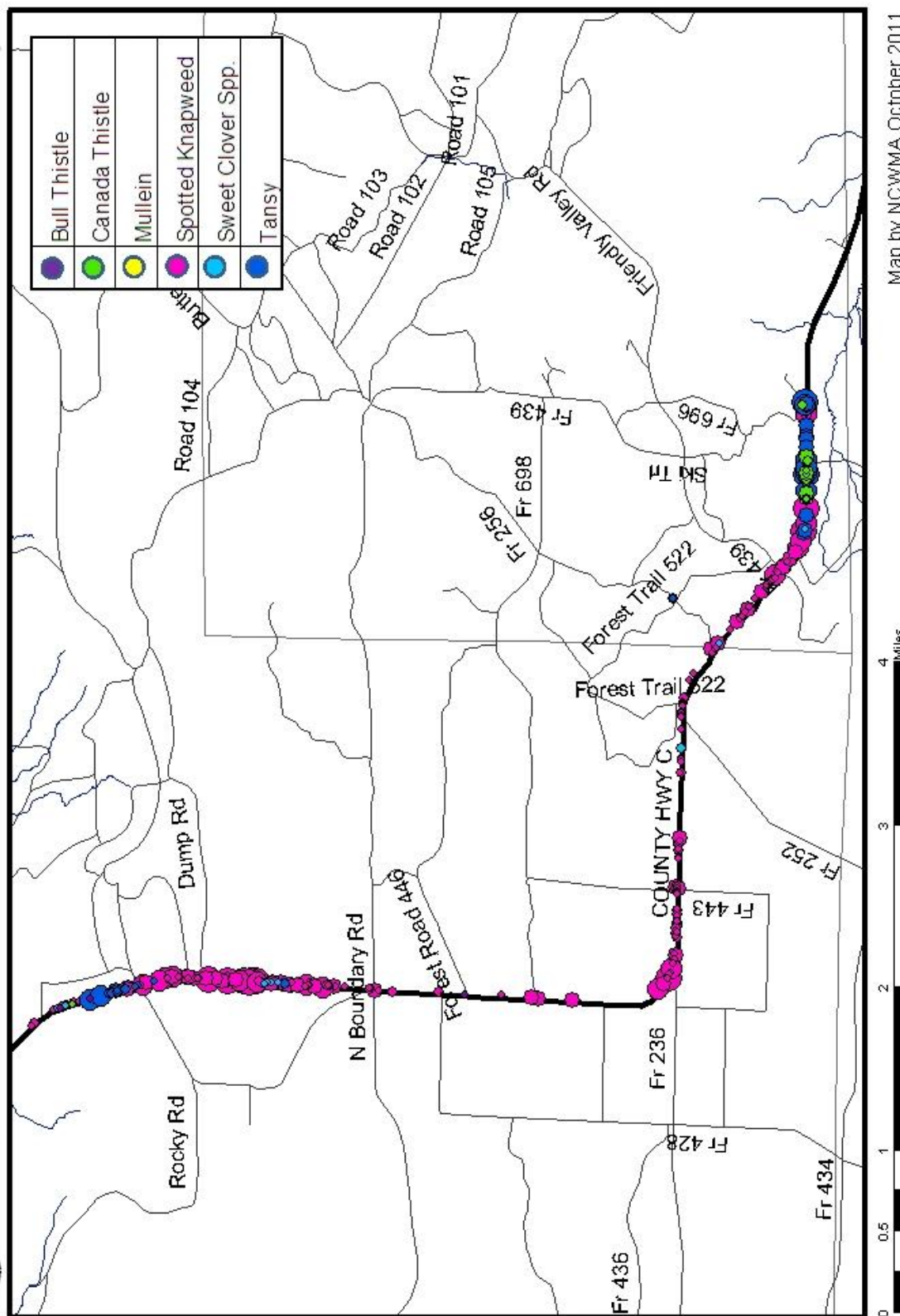
Bayfield County Invasive Species Inventory Map: US HWY 63



Map by NCWMA October 2011



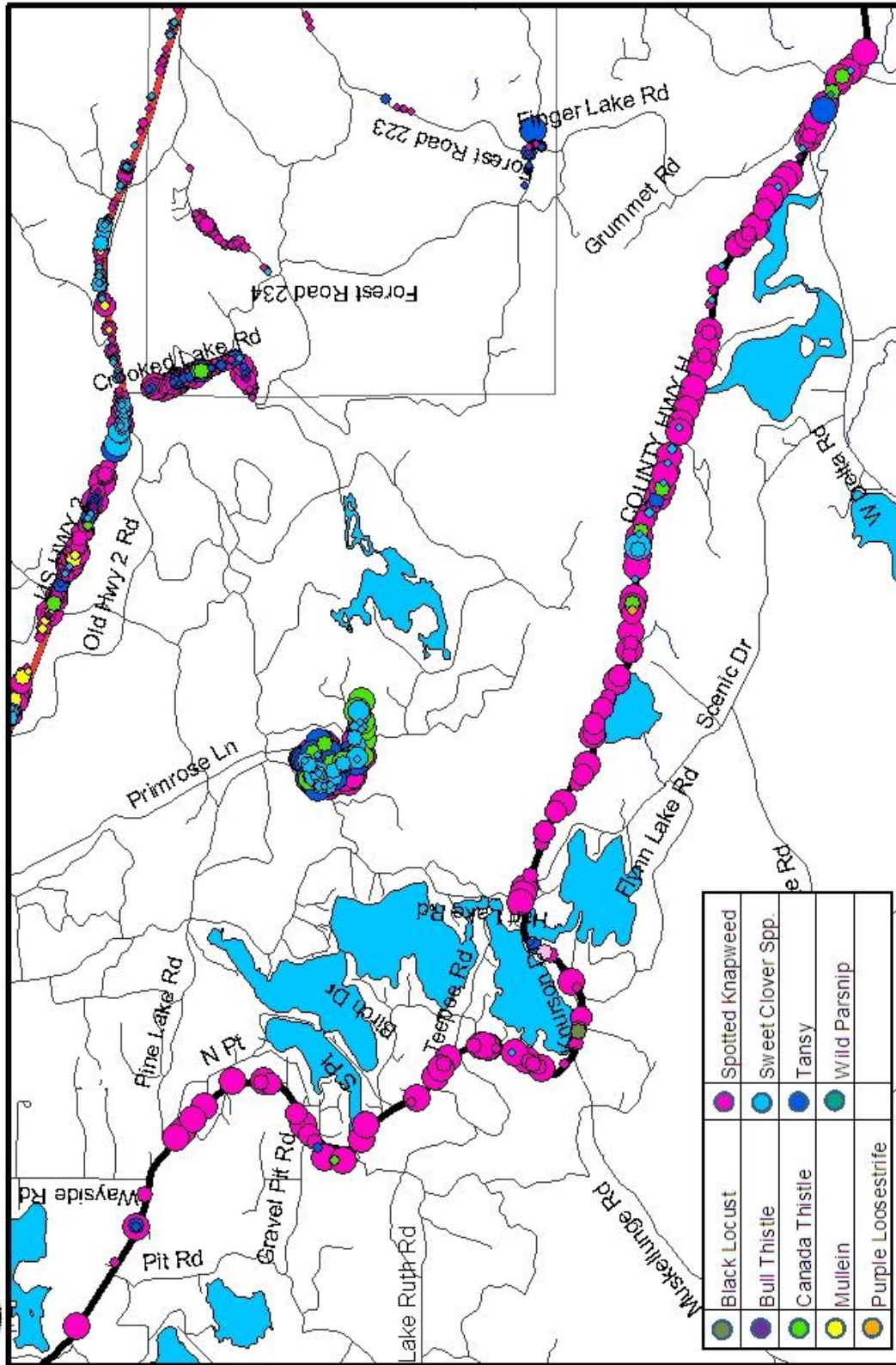
Bayfield County Invasive Species Inventory Map: County HWY C



Map by NCWMA October 2011



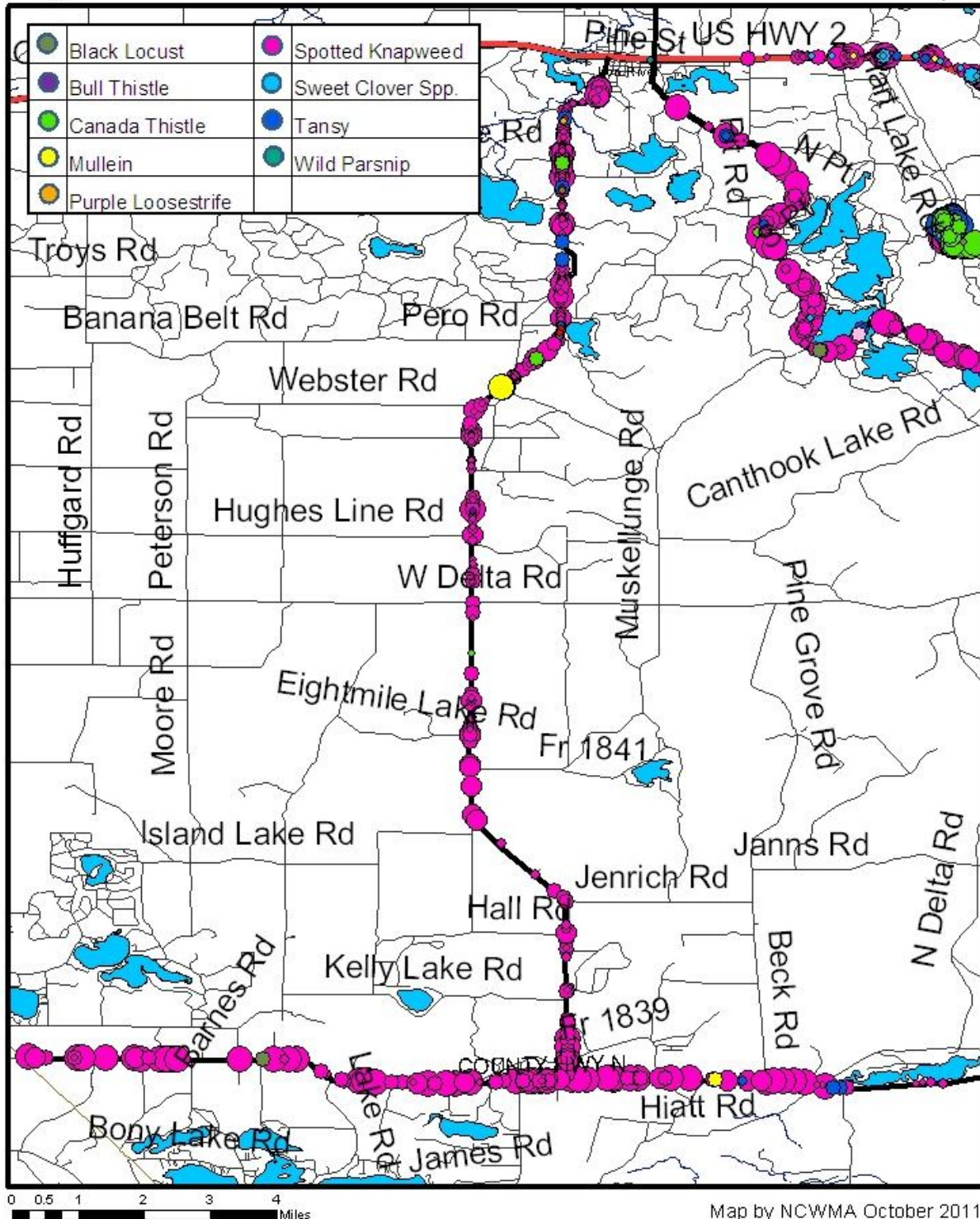
Bayfield County Invasive Species Inventory Map: County HWY H



Map by NCWMA October 2011



Bayfield County Invasive Species Inventory Map: County HWY A and N



E. Species Information and Control Methods



Chris Evans

Black Locust

Robinia pseudoacacia

Description: Black locust is a deciduous tree (loses its leaves in winter) that grows from 40-100 feet tall. Leaves are ½ inch across and oval, and grow opposite from one another on a central stem. Young trees have large, triangular thorns. Locust trees bloom in mid-spring with whitish yellow, sweet-smelling flowers that hang in long clusters. The flowers give way to a smooth, thin seed pod that is 2-4 inches long, and resembles a flat pea pod. There are usually 4-12 small, dark, flat seeds per pod. The bark of black locust is light brown, rough, and becomes deeply grooved with age.



Leaves (James H. Miller)



Bark (Paul Wray)



Flowers (Leslie J. Mehrhoff)



Seed pods (Paul Wray)



Seeds and pods (Leslie J. Mehrhoff)

How and Where it Grows: Locust trees have many seeds (up to 12 in a pod) and sprout quickly in sunny areas. The young trees have very large thorns, which protect them from being eaten by wildlife. Cutting the locust tree down and leaving it untreated does not kill the tree—in fact, it will vigorously re-sprout, creating a dense spiny hedge. Mowing locust saplings creates the same effect, and within a season of mowing, there will be up to ten times the density of tree stems that there was previously.

History: Black locust is in the pea family, even though it is a tree. It is native to the Southern Appalachians, the Ozarks, and other portions of the Mid-south, but is considered an invasive species in the prairie and savanna regions of the Midwest where it can dominate and shade those open habitats.

Look-a-likes: The leaves of the American mountain ash (*Sorbus americana*) grow in pairs opposite one another similar to those of black locust, but the ash leaves are sharply pointed at the

tips whereas locust leaves are rounded. Also, ash develops clusters of bright red berries whereas black locust has long seed pods. Black locust closely resembles honey locust, but this species is generally only found in far southern Wisconsin.

Management Recommendations

Hand-pulling and Mowing: Hand pulling is not recommended because of the large, sharp thorns. Mowing patches of young saplings is often ineffective, and can make the problem worse when the trees re-sprout and create a dense hedge.

Herbicide: The most effective way to control black locust is with herbicide. For herbicidal controls to be effective, herbicides should be applied while the plants are actively growing. Seedlings and small saplings can be treated by spraying the leaves with a selective broadleaf herbicide (which will not kill grass), such as aminopyralid (Milestone VM®). Mix the herbicide according to the label directions and spray the foliage of the plant (called a “foliar spray”) with a backpack sprayer during the growth and flowering stages. Spray just enough to wet the leaves but avoid excess runoff. The addition of a commercial herbicide surfactant (ex. Tactic®) mixed according to the label, improves the efficacy of the herbicide by allowing it to stick to the leaves and circulate through the plant more effectively. Using a dye will help show which plants have been sprayed, which reduces the chance of spraying an area more than once, and ultimately decreases the amount of herbicide used. Do not use Milestone VM over open water. Read the entire herbicide label for other restrictions prior to use!

For foliar spraying using Milestone VM, use 2 teaspoons of herbicide for every 3 gallons of water (enough to fill a backpack sprayer), or approximately 0.09% solution.

To control older saplings and mature trees, cut the trunk within 2-6 inches of the ground and *do NOT* treat the stump. Wait for the stump to grow new shoots (2-12 months depending on when it was cut), and then treat the fresh shoots with a foliar application following the directions above. If needed, apply multiple treatments and consistent monitoring until the root system is fully exhausted and no new sprouts appear.

Sweet Clover (White and Yellow)

Melilotus albus and *Melilotus officinalis*

Description: Sweet clover is a biennial (lives for two years). The first year, it produces only leaves, and the second year it produces flowers and seeds. Plants can grow to 6-8 feet tall, and can sometimes be woody at the base. The leaves are three-lobed in a typical “clover” shape. They flower from June to September when small yellow or white, pea-like flowers develop at the ends of the branched stems. Flowers are less than ¼ in. long. Fruits are small, wrinkled, and light brown pods that contain one seed.



Jamie Nielsen



Steve Dewey



beetberry.com



wikibooks.org

How and Where it Grows: Plants occur along roadsides, in open fields, pastures and other disturbed areas. Because of its very tough, woody stem, sweet clover can be difficult to mow, especially later in the growing season.

History: Sweet clovers are native to Europe and Asia. They were brought to North America in the late 1600's as an agricultural crop for forage and honey production. These clovers also fix nitrogen, and are popular cover crops and soil enhancers. The chemical used in the production of the blood thinner Warfarin was first discovered in sweet clover. Sweet clovers are found in all fifty states, although they are most frequently found in the states of the Upper Midwest. Sweet clovers grow well in direct sunlight or in partial shade. They cannot tolerate complete shade.

Look-a-likes: When it is very small, sweet clover can easily be confused with red or white clover, but sweet clover grows much larger than red or white clover, and the flowers are very dissimilar.

Management Recommendations

Hand Pulling: Small amounts of sweet clover can be controlled by hand-pulling in late fall after first-year plant root-crown buds have developed, or in May or June before second-year plants flower. Pulling is easier when the soil is wet. Plants can also be cut at ground level. If you pull too early in the year, many plants may be missed or mistaken for other clovers (red or white

clover), and those with succulent stems may break off and resprout. However, pulling must be done before seeds are set, otherwise cut plants will have to be removed from the area. It is necessary to inspect the area a couple of times in summer for late flowering plants.

Mowing: For very dense small patches, mowing is effective. The stand should be cut just before flowering, and checked a week later for plants that may have been missed. Conduct annual inspections to remove scattered individual plants. Disturbed areas provide habitats that can allow sweet clover to spread very quickly over time. Sweet clover seed can be viable for up to 30 years in the soil, and so monitoring and management must be regular and continued.

Herbicide: For herbicidal controls to be effective, herbicides should be applied while the plants are actively growing. Aminopyralid (Milestone VM®) has been shown to be effective in controlling sweet clover. Aminopyralid (Milestone VM) is selective to broad-leaved plants (it will not kill grass), and so it can be used in areas where native grasses are intermingled with the target plants. When treating sweet clover, it is helpful to add a commercial surfactant (such as Tactic ®) according to the label direction in order to permeate the water-resistant coating on the leaves. Using a dye will help show which plants have been sprayed, which reduces the chance of spraying an area more than once, and ultimately decreases the amount of herbicide used. Do not use Milestone VM over open water. Read the entire herbicide label for other restrictions prior to use!

For Milestone VM, use 1 teaspoon per 1 gallon of water, or approximately 1 tablespoon per 3-gallon backpack sprayer (0.13% solution).



Leslie J. Mehrhoff

Spotted Knapweed

Centaurea biebersteinii

Description: Spotted knapweed is a perennial (same plant grows year after year from the same roots) that grows 1-4 feet tall with pale, grayish-green leaves covered in fine short hairs. Leaves get progressively smaller toward the top. The main stem is stiff, hairy and branching. First-year plants do not flower, but have a small dandelion-like “rosette” of leaves that grow close to the ground (see photo below). It has pink or purple thistle-like flowers. The flowers resemble tiny pineapples topped with a showy ring of pinkish purple, thin petals; the tips of the scales covering the pineapple-like base (called “bracts”) are dark, giving it the spotted look for which the plant is named. Each plant can produce 400 or more seeds per flower stalk. Most seeds fall within a 3-4 foot radius of the parent plant, unless they become attached to wildlife or livestock, hay or commercial seed, or vehicles.



Top Left: first-year leaf “rosette” (Linda Wilson)
 Bottom Left: flowering plant (Steve Dewey, bugwood.org)
 Center: leaves (Ohio State Weed Lab Archive)
 Right: flowers (University of Idaho Archive)

How and Where it Grows: Spotted knapweed reproduces by seed. Seeds germinate in the fall and early spring, and may be viable for up to eight years. Because of the longevity of the seeds, it is important to continue monitoring at disturbed sites, as described in section B. Once a seed starts to grow, it spends the first year growing a long tough taproot, waiting until after its first year to start flowering. Plants may flower only once, or up to three years in succession, and perennial plants may have up to 20 flowering stems. Spotted knapweed can tolerate a wide range of soil depth, soil moisture, and temperature, but seems to prefer sunny areas with sandy or disturbed soils such as roadsides, dry fields, and pine barrens. Spotted knapweed is an especially aggressive invasive because it is *allelopathic*, meaning it produces a chemical that inhibits the

growth of other plants nearby. This chemical, called catechin, is secreted by the roots of spotted knapweed and has been shown to stop germination and growth of some native plants, grasses, and crops such as wheat.

History: Spotted knapweed is a native of Europe and western Asia, originating from central and southeast Europe, northern Italy, and central Russia. Spotted knapweed is a member of the Aster family, and is related to dandelions, sunflowers, goldenrod, and other asters. It is classified as a Restricted species under Chapter NR 40.

Look-a-likes: Flowers resemble thistles, but the plant is not spiny or prickly and does not grow as tall as thistles. Relatives of spotted knapweed – brown knapweed and meadow knapweed (both non-native) – have larger, darker purple flowers, and brown scale tips instead of black. Control methods for brown knapweed and meadow knapweed are the same as for spotted knapweed.

Management Recommendations

Hand Pulling: If caught early enough, a small area of spotted knapweed can be removed by hand-pulling or digging with a spade. In denser areas, repeated spot-burning is more effective and efficient. Gloves should be worn when hand-pulling.

Herbicide: For herbicide to be effective, it should be applied during the growing season while the plants are actively growing. The best time to spray spotted knapweed is just before it flowers when there are buds on the plants. It can be hard to find patches of knapweed before the plants begin to flower, so you may opt to wait until a few plants have started to flower before you begin spraying. However, it is best to treat as soon as possible once you begin to see flowering plants.

Glyphosate (ex. RoundUp®, Makaze®) is ineffective for treating spotted knapweed. The most effective chemical currently available is aminopyralid (trade name Milestone VM®), which is a selective herbicide that does not harm grasses when applied correctly. Apply with a backpack sprayer, using just enough spray to wet the leaves but avoiding excessive dripping. The addition of a commercial herbicide surfactant (ex. Tactic®) mixed according to the label, improves the efficacy of the herbicide by allowing it to stick to the leaves and circulate through the plant more effectively. Using a dye will help show which plants have been sprayed, which reduces the chance of spraying an area more than once, and ultimately decreases the amount of herbicide used. Do not use Milestone VM over open water. Read the entire herbicide label for other restrictions prior to use!

For Milestone VM, use 1 teaspoon per 1 gallon of water, or approximately 1 tablespoon for a 3-gallon backpack sprayer (0.13% solution). Always read herbicide labels thoroughly prior to use.



(Mary Ellen [Mel] Harte)

Canada Thistle

Cirsium arvense

Description: Canada thistle is perennial (grows back year after year from the same roots) that grows up to 5 feet tall. The stem and leaves are dark green, with a lighter green stripe running down the center of each leaf. Leaves are 3-12 inches long, curly on the edges, with spines at the tips and edges. Unlike bull thistle, the leaves of Canada thistle are not hairy. Flowers develop at the top of the plant. Canada thistles bloom from late June to August. The light-purple (occasionally pink) flower heads are approximately 1/2 inch in diameter. In early fall, the flowers “puff” like a dandelion, and the wind can spread the seeds.



Seeds (Richard Old)



Leaves (Leslie J. Mehrhoff)



Infestation in bloom
(Alec McClay)



Infestation going to seed
(UAF Cooperative Extension Archive)

How and Where it Grows: Canada thistles can invade almost any type of disturbed area, such as forest clearings, pastures, and roadsides. It tolerates open sun and partial shade, dry soils and moist soils, although it will not grow in standing water. Plants often form very dense thickets, choking out other wildflowers, grasses, and forage crops. The spiny, prickly nature of Canada thistle makes it inedible for most wildlife and livestock, and reduces the forage quality of pastures and hay fields.

History: Canada thistle is native to Europe and Asia and was accidentally introduced to North America in the 1600s. It is classified as a Restricted species.

Look-a-likes: Bull thistle, another introduced species, may be mistaken for Canada thistle. Bull thistles have larger flowers and typically grow as a single plant, while Canada thistle often grows in dense patches. The flowers of spotted knapweed look very similar to those of Canada thistle, but spotted knapweed does not have spines on its leaves.



Canada Thistle (Mary Ellen [Mel] Harte)



Bull Thistle

(Forest & Kim Starr)



Spotted Knapweed

(University of Idaho Archive)

Management Recommendations

Hand Pulling: Canada thistle is difficult to remove by hand. Its spines are painful and require sturdy leather gloves to handle. Also, it has a very extensive root system. Very small plants (less than 12 inches) can be dug up, but larger plants are difficult to completely remove, and are likely to regrow from root fragments left behind.

Mowing: Plants in the flower bud stage may be mowed to prevent seed spread, but mowing will not kill Canada thistle. When mowed, Canada thistles may regrow and bloom later. To prevent this, mow 2-3 times per summer (if this is the only control method being used). Plants should be cut June through early August before seeds mature, and cut as low to the ground as possible.

Herbicide: For herbicide to be effective, it should be applied while the plants are actively growing. Glyphosate (RoundUp®) is not very effective on Canada thistle, although it will stunt its growth during the season in which the herbicide is applied. Aminopyralid (Milestone VM®) is effective in controlling thistles. Aminopyralid is selective to broad-leaved plants (it will not kill grass), and so it can be used in areas where native grasses are intermingled with the target plants. Do not use it over standing water or wetlands. The addition of a commercial herbicide surfactant (ex. Tactic®) mixed according to the label improves the effectiveness of herbicide by allowing it to stick to the leaves and circulate through the plant more effectively. Using a dye will help show which plants have been sprayed, which reduces the chance of spraying an area more than once, and ultimately decreases the amount of herbicide used. Read the herbicide label thoroughly prior to use.

Recent studies show that treating in early fall (September) is most effective. For Milestone VM, use $\frac{3}{4}$ teaspoon per 1 gallon of water, or 2 teaspoons per 3-gallon backpack sprayer (0.09% solution).

Tansy

Tanacetum vulgare

Description: Tansy is a perennial (grows back year after year from the same roots) that reaches 2-4 feet tall. It has lacy, fern-like, dark-green leaves, along a stiff, sometimes reddish stem. The leaves have a strong, pungent smell (somewhat like Lysol or Vick's VapoRub) when crushed or mowed. The flowers are round, flat-topped, button-like, yellow heads that bloom from mid- to late-summer. The flowers resemble a cluster of daisies without petals. Seed heads resemble the flowers, but they are brown. Seeds are easily spread by wind and water.

Steve Dewey



Flowers (Richard Old)



New plants with last year's stalks
(Steve Dewey)



Field infestation (Steve Dewey)

How and Where it Grows: A tansy infestation begins with a few plants that spread outward in a circle as the roots grow each year, eventually leading to very dense patches. Tansy prefers sunny, disturbed areas such as roadsides, fields, and abandoned construction areas.

History: Native to Europe and Asia; brought to the United States as an ornamental and medicinal plant. In Europe, tansy historically was used to treat a wide variety of ailments such as worms, fevers, bad skin, and measles. It was also used as an herb to induce miscarriages, and reportedly has an abortive effect on livestock. The leaves and flowers are toxic to people and livestock if consumed in large quantities; the volatile oil contains toxic compounds, which can cause seizures, and liver and brain damage. It can also irritate skin. It has been shown to be an effective insect repellent when crushed and rubbed on clothing. It is classified as a Restricted species under Chapter NR 40.

Management Recommendations

Hand Pulling and Digging: Small patches of tansy can be hand-pulled or dug up with a spade. Plants are easiest to pull after they have bolted (a long stem has grown), but before they flower. Moist soil is best for hand-pulling or digging the roots. Use gloves for hand pulling.

Mowing: Mowing twice per season can help control tansy, although it will not kill it. Ideally, mowing should occur in early summer, before or just after it flowers, and again in the late summer to knock back any re-growth or new flowers. This will prevent it from going to seed.

Herbicide: For herbicide to be effective, it should be applied while the plants are actively growing. Glyphosate (RoundUp®, Makaze®) is somewhat effective on tansy, but will require multiple treatments; a chemical called Imazapyr (Habitat®) is very effective on tansy, and is approved for use over wet areas. Mix the herbicide according to the label directions and apply with a backpack sprayer before or during the flowering stage. Use just enough spray to wet the leaves but avoid excessive dripping. The addition of a commercial herbicide surfactant (ex. Tactic®) mixed according to the label improves the effectiveness of herbicide by allowing it to stick to the leaves and circulate through the plant more effectively. Using a dye will help show which plants have been sprayed, which reduces the chance of spraying an area more than once, and ultimately decreases the amount of herbicide used. Read the herbicide label thoroughly prior to use.

For glyphosate (ex. RoundUp®, Makaze®), use 5 tablespoons per one gallon of water, or 1 cup per 3-gallon backpack sprayer (2% solution). For best results, add ½ teaspoon of dish soap per gallon, or use a commercial surfactant mixed according to the label directions. Do not apply glyphosate over wetlands or standing water unless you are using a formulation specifically approved for such use (ex. Rodeo®). Always read the herbicide and surfactant labels thoroughly prior to use.

For Imazapyr (Habitat®), mix ¼ cup per gallon of water, or ¾ cup for a 3-gallon backpack sprayer (1.5% solution). Habitat® is approved for use over wetlands or standing water. Always read the herbicide and surfactant labels before use.



Crown Vetch

Coronilla varia

Description: Crown vetch has a creeping stem reaching 6 to 12 feet in length. The leaves range from 1 to 3 inches in length, and have numerous small leaves on a main stem. The leaves have a water-resistant coating on them, which causes water to form small beads on the leaves. The flowers are circular or “crown” shaped. Flowers are pink with some white and appear in late May-August. Flowers become small (1/2 to 1 inch) pea-like “pods,” with 6 to 12 seeds inside. Seeds remain viable in the soil for several years, requiring consistent post-treatment monitoring.



Dan Tenaglia, MissouriPlants.com, Bugwood.org

How and Where it Grows: Crown vetch spreads by seed and through underground roots (“rhizomes”). The perennial roots anchor the plant and serve as a storage structure for nutrients. Flowers emerge May through August and seeds will mature by September. Crown vetch is primarily found along roadsides, fields, and road cuts. It does well in most habitats from rocky dry sites to moist well-drained areas. It does not like full shade but will grow in sparse shade along the edge of forested areas. It grows throughout Wisconsin and most of the United States.



James H. Miller, US Forest Service, Bugwood.org

History: Crown vetch is a member of the Pea family. This low growing vine was commonly used throughout the United States for erosion control, roadside planting and crop rotation. Crown vetch is toxic to horses; it contains a chemical compound called *nitroglycosides*. If consumed in large amounts, it can cause slow growth, paralysis, or death. Crown vetch is native to Europe, Asia and Africa. It has been widely cultivated as a ground cover and for erosion control in the U. S. since the 1950’s. It has become naturalized in much of the U.S. and southern Canada. In some areas, crown vetch will totally dominate pastures and abandoned fields.



Richard Old, XID Services, Inc., Bugwood.org

Look-a-likes: Crown vetch may be confused with other vetches and non-native plants in the Pea family, such as hairy vetch. However, the circular “crown” shape of the flower heads is unique to this species.

Management Recommendations

Hand Pulling: Hand pulling can be effective for mature plants when controlling small initial infestations, as long as the roots are fully removed. Disturbed areas should be re-seeded with a non-invasive seed mix.

Mowing: Plants in the bud stage (just before flowering) can be mowed to reduce the chance of further spread. Mowing should occur 2-3 times per summer to control spread. Plants should be cut before seeds mature (June through early August) and as low to the ground as possible..

Herbicide: For herbicidal controls to be effective, herbicides should be applied while the plants are actively growing. Aminopyralid (ex. Milestone VM®) and Clopyralid (ex. Transline®) have been shown to be effective in controlling crown vetch. Aminopyralid is selective to broad-leaved plants (it will not kill grass when applied according to label specifications). Do not use Milestone over or near water. Apply with a backpack sprayer, using just enough spray to wet the leaves but avoiding excessive dripping. The addition of a commercial herbicide surfactant such as Tactic® (mixed according to the herbicide label) improves the effectiveness of treatments on crown vetch by breaking through the water-resistant cuticle on the leaves. Using a dye will help show which plants have been sprayed, which reduces the chance of spraying an area more than once, and ultimately decreases the amount of herbicide used. Read the herbicide label thoroughly prior to use.

For Milestone VM, use 1 teaspoon per 1 gallon of water, or approximately 1 tablespoon per 3-gallon backpack sprayer (0.13% solution). For best results when treating crown vetch, use a commercial surfactant according to the label directions. Always read the herbicide and surfactant labels thoroughly prior to use.



Darienne McNamara

Bull Thistle

Cirsium vulgare

Description: Bull thistle is a biennial (lives for two years) that grows 4 to 7 feet tall. The stem and leaves are thick, spiny, and dark-green. Leaves are 3-12 inches long, pointed, spiny at the tips, and very hairy. In the first year, the plant forms a “rosette” (see photo). Second-year plants “bolt,” growing a tall flowering stalk that goes to seed. Flowers develop at the top of the plant. Bull thistles bloom from June to September. The purple flower heads are large, up to 2 inches in diameter. In early fall, the flowers “puff” like a dandelion.



First-year ‘rosette’ of leaves (Michael Shephard)



Stem and leaves (Dan Tenaglia)



Seed ‘puff’ (Forest & Kim Starr)

How and Where it Grows: Bull thistle invades almost any type of disturbed area, such as forest clearings, pastures, and roadsides. It typically grows as a single plant or in small groups of 2-5 plants, rarely forming large patches. It prefers full sun, but can also grow in semi-shaded areas. The spiny, thorny leaves and stem of the plant make it inedible for most wildlife and livestock, and reduces the forage quality of pastures and hay fields.

History: Bull thistle is native to Europe, western Asia, and northern Africa. It is thought to have been introduced to the eastern United States during colonial times and spread to the western United States in the late 1800s. It is currently found in all 50 states.

Look-a-likes: Bull thistle can be mistaken for Canada thistle (see page 16).

Management Recommendations

Hand Pulling: Hand-pulling or digging is an effective control method for bull thistle. If enough of the taproot is removed, they will not grow back. If the plant is already flowering, be sure to bag and dispose of the flower, as it may still develop into viable seed even after it has been severed from the roots.

Mowing: Plants in the flower bud stage can be controlled with mowing. With repeated mowing each season, they will eventually die back. Plants should be cut before seeds mature (June through early August) and as low to the ground as possible.

Herbicide: Same as for Canada thistle, see page 16.

F. Summary of Best Management Practices (BMPs)

These BMPs are taken from the *Invasive Species Best Management Practices for Transportation and Utility Rights-of-Way Manual* published by the Wisconsin Council on Forestry and the Wisconsin Department of Natural Resources in 2009. The full 63-page text is available on the internet at <http://council.wisconsinforestry.org/invasives/transportation/> and contains further descriptions, considerations, and suggestions for each BMP.

1. Soil Disturbance BMPs

Planning

- BMP SD 1: Prior to implementing right-of-way activities, scout for, locate and document invasive species infestations.
- BMP SD 2: Consider the need for action based on: 1) the degree of invasiveness; 2) severity of the current infestation; 3) amount of additional habitat at risk for invasion; 4) potential impacts; and, 5) feasibility of control with available methods and resources.
- BMP SD 3: Plan activities to limit the potential for introduction and spread of invasive species, prior to construction.
- BMP SD 4: Provide appropriate resources for identification of local invasive species for workers.

Activities

- BMP SD 5: Minimize soil disturbance, which may include using existing roads, access points, staging areas and alternative construction.
- BMP SD 6: Avoid invasive species populations when feasible and minimize the spread of invasive species during activities that require soil disturbance.
- BMP SD 7: Prior to moving equipment into an uninfested area or out of an infested area, clean soils, seeds, plant parts, or insects from exterior surfaces to the extent practical.
- BMP SD 8: Stabilize disturbed soils as soon as possible.
- BMP SD 9: Use non-invasive cover crops or native seed for revegetation.

2. Vegetation Management and Inspection/Monitoring BMPs

Planning

- BMP VM 1: Prior to implementing right-of-way activities, scout for, locate and document invasive species infestations.
- BMP VM 2: Plan activities to limit the potential introduction and spread of invasive species, prior to construction.
- BMP VM 3: Assess current available resources and seek new resources to prevent invasive species spread.
- BMP VM 4: Provide training in identification, control and prevention of known invasive species to employees and contractors performing vegetation management.

Activities

- BMP VM 5: Prior to moving equipment into an uninfested area or out of an infested area, clean soils, seeds, plant parts, or insects from exterior surfaces to the extent practical.
- BMP VM 6: Inspect and clean clothing, footwear and gear for soils, seeds, plant parts, and insects before and after activities.
- BMP VM 7: Carefully dispose of soils, seeds, plant parts or insects found during inspection and cleaning.
- BMP VM 8: Locate and use staging areas that are free of invasive plants to avoid spreading seeds and other viable plant parts (ex. root fragments).
- BMP VM 9: Consider the likely response of invasive species when conducting activities that result in disturbed soil, increased sunlight, fire, etc.
- BMP VM 10: Ensure that control methods are done within the appropriate time window.
- BMP VM 11: Monitor ROW's during day-to-day activities and post-management activities; determine necessary treatments based on presence of invasive species.

3. Transport of Materials BMPs

Planning

- BMP TM 1: Take steps to avoid moving invasives to non-infested areas.
- BMP TM 2: Prior to transporting materials, manage the load to limit the spread of invasive species.

Activities

- BMP TM 3: Prior to moving equipment into an uninfested area or out of an infested area, clean soils, seeds, plant parts, or insects from exterior surfaces to the extent practical.
- BMP TM 4: Dispose of soils, seeds, plant parts or insects found during inspection and cleaning.
- BMP TM 5: Establish staging areas and temporary facilities in locations that are free of invasives.
- BMP TM 6: Use soil and aggregate material from sources that are free of invasive species.
- BMP TM 7: Manage stock piles to limit the spread of invasive species.
- BMP TM 8: Do not transport woody material that may contain invasive species (ex. Emerald Ash Borer).
- BMP TM 9: If you must transport woody material that may contain invasive species, bring them to a designated area for appropriate disposal.
- BMP TM 10: Keep and reuse onsite materials rather than importing new materials.

4. Revegetation and Landscaping BMPs

Planning

- BMP RV 1: Plan activities to limit the potential introduction and spread of invasive species, prior to revegetation.

BMP RV 2: Select non-invasive or native species for revegetation and landscaping activities.

Activities

BMP RV 3: Inspect and clean clothing, footwear and gear for soils, seeds, plant parts, or insects before and after activities.

BMP RV 4: Prior to moving equipment into an uninfested area or out of an infested area, clean soils, seeds, plant parts, or insects from exterior surfaces to the extent practical.

BMP RV 5: Revegetate disturbed soils as soon as possible to minimize invasive species establishment.

BMP RV 6: Where site conditions permit, allow natural revegetation to occur.

BMP RV 7: Ensure the species specified in the plan are the ones being used.

BMP RV 8: Monitor the revegetation site.

G. Summary of Chapter NR 40

NR 40 is a Wisconsin rule administered by the Department of Natural Resources that, among other things, classifies invasive species as Prohibited or Restricted and regulates the transportation, possession, transfer, and introduction of those species. The major purpose of the rule is to educate people in Wisconsin about invasive species, and the actions they can take to minimize their spread and the damage they cause. The full text of the bill can be seen on the internet at <http://dnr.wi.gov/invasives/classification/>.

1. Definitions of key terms:

Invasive species – species or “varieties” that are not native to Wisconsin and that cause, or are likely to cause, economic or environmental harm or harm to human health.

Prohibited invasive species – not currently found in Wisconsin, or are only found as small infestations, but which, if introduced into the state, are likely to cause significant harm.

Restricted invasive species – already well-established in the state; known to cause, or have the potential to cause, significant harm.

Introduce – release an invasive species into the environment.

Possess – own, maintain control over, restrain, hold, grow, raise or keep. Landowners “posses” plants growing on their property.

Transfer – buy, sell, trade, barter, exchange, give or receive, or to offer to do any of these.

Transport – cause, or attempt to cause, an invasive species to be moved within the state. This includes importation.

Reasonable precautions – actions that prevent or minimize the transport and introduction of invasive species. Reasonable precautions include BMP's approved by the WDNR.

2. Major points of the rule:

- Unless there is a specific exemption or a permit has been issued under the rule, no one may transport, transfer or introduce a Prohibited or Restricted invasive species. No one may possess any Prohibited species or any Restricted fish.
- It is not a violation if the department reasonably determines that the conduct was incidental or unknowing, and was not due to the person's failure to take *reasonable precautions* (defined above, includes BMPs from Section F of this plan).
- The rules allow the transport of Prohibited and Restricted invasive species for the purpose of identification, control or disposal. The location of Prohibited species must be reported to the WDNR.
- The rules also require preventive measures or limit certain common activities that may function as pathways for the inadvertent introduction or spread of invasive species. Examples include several measures that are intended to prevent the introduction of invasive aquatic species, and prohibiting the transportation of an identified carrier of an invasive species from a quarantine area or infestation control zone, such as moving firewood or ash trees from an area known to have Emerald Ash Borer.
- The rules include authority to enter lands for the purpose of inspection, sampling and control of Prohibited invasive species; allow the department to order landowners to implement control measures, and allow for state control at the landowner's expense if the landowner is unable or unwilling to comply and is determined to be at fault for the introduction.
- Not all invasive species have been assessed and classified at this time. Many are pending assessment. Other species (primarily plants) that are known to be invasive are administratively listed as "non-restricted" and are not regulated under the rules because of their economic value.

3. Classification Criteria and Requirements

Invasive species are classified into the following four categories: (a) Prohibited, (b) Restricted, (c) Caution, and (d) Non-restricted. Only species in the Prohibited and Restricted categories are listed in NR 40. Species are classified based on the following criteria:

- The potential to directly or indirectly cause economic or environmental harm or harm to human health.
- The extent to which it is already established in the state, or in portions of the state.
- The likelihood that, upon introduction, it will become established and spread in the state.

- The potential for eradicating or controlling its spread, including the technical and economic feasibility of eradication or control.
- The socio-economic value afforded by the species, including any beneficial uses or value it may provide for recreation, commerce, agriculture or industry.

Prohibited Category

- **Actions Prohibited:** No person may import, transport, possess, transfer or introduce a Prohibited invasive species. Landowners technically “posses” plants growing on their property.
- **Control Requirements:** (a) Unless the lands are public, if the WDNR has reason to believe a prohibited species is on a property, they may enter for inspection or control only with permission or an inspection warrant. (b) If the prohibited species population is deemed reasonable and feasible to control, the WDNR may ask any person who owns, controls or manages land to control the Prohibited species in accordance with a plan approved by the department. The WDNR will seek funds to assist in the control. However, the landowner/manager is ultimately responsible for the control. (c) If voluntary cooperation is not achievable or likely, the WDNR or its designee may control or order the control of the species. If the department determines that the landowner/manager is at fault for the presence of the prohibited species, the department may recover expenses incurred for control.
- **Exemptions:** (a) Persons are allowed to transport a Prohibited invasive species for the purpose of identification, control or disposal without a permit, provided that the person reports the location of the Prohibited invasive species to the WDNR. (b) It is not a violation if the department reasonably determines that the conduct was incidental or unknowing, and was not due to the person’s failure to take reasonable precautions.

Restricted Category

- **Actions Prohibited:** No person may import, transport, transfer or introduce a Restricted invasive.
- **Control Requirements:** Any person who grows a Restricted plant at a nursery shall make a good faith effort to destroy it upon closure of the nursery.
- **Exemptions:** (a) Persons are allowed to transport a Restricted invasive species for the purpose of identification, control or disposal without a permit. (b) No permit is required for persons to transport, transfer or introduce parts of a Restricted plant species that are incapable of reproducing or propagating. (c) It is not a violation if the department reasonably determines that the conduct was incidental or unknowing, and was not due to the person’s failure to take reasonable precautions.

H. Appendices

1. List of Further Resources

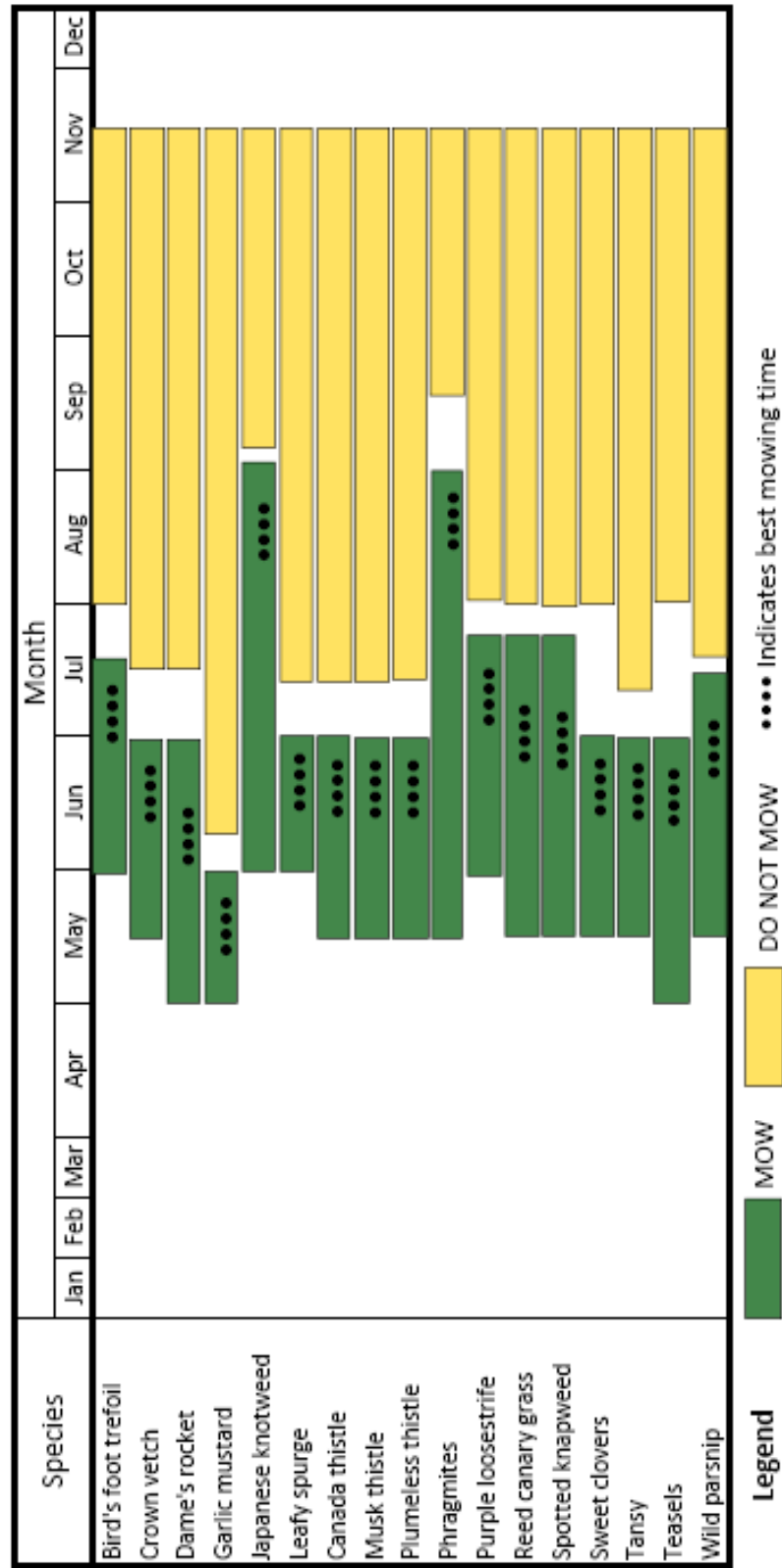
- a) **Northwoods Cooperative Weed Management Area** – local network of professionals and citizens working to protect the northwoods of Wisconsin from invasive species, and educate people about their impacts. Can provide:
- technical assistance regarding plant identification, site-specific and species-specific control recommendations, and much more through an extensive network of professionals around the region
 - tools and equipment available for loan through the community tool shed
 - brochures and fact sheets regarding invasive plants in our area
 - contact information for local professionals working with invasive plants
 - assistance finding and writing grants for local groups and municipalities
 - website with information specific to rights-of-way managers, as well as information for homeowners in northern Wisconsin

The Coordinator can be reached at info@northwoodscwma.org, or visit their website at www.northwoodscwma.org for more information.

- b) **Online Weed ID Tool** – find out which species you have using this online plant key designed for the amateur. Go to <http://weedid.wisc.edu/weedid.php>.
- c) **Invasive Plant Atlas** – online resource with numerous photos and other information about invasive plants. Go to invasiveplantatlas.org.
- d) **Material safety data sheets (MSDS) and product labels** – free up-to-date versions are available for most herbicides online at cdms.net under Services.

2. Mowing guide

Mowing times for common invasive species in northern Wisconsin



3. Seed mix guide

** Note that common names and scientific names are provided. *Please check scientific names when you purchase seeds.* Common names vary among different distributors and locations. Some invasive species are sold under different common names, but the scientific name should always be the same.

Recommended Species:

- Oats (*Avena sativa*)
- Canada Wildrye (*Elymus canadensis*)
- Annual Rye (*Lolium multiflorum*)
- Big Bluestem (*Andropogon gerardii*)
- Little Bluestem (*Schizachyrium scoparium*)
- Red Fescue (*Festuca rubra*)
- White Clover (*Trifolium repens*)
- Red Clover (*Trifolium pratense*)

Species to AVOID when seeding:

- Bird's Foot Trefoil (*Lotus corniculatus*)
- Crown Vetch (*Coronilla varia*)
- Hairy Vetch (*Vicia villosa*)
- Cow vetch (*Vicia cracca*)
- Reed Canarygrass (*Phalaris arundinacea*)
- White Sweet Clover (*Melilotus officinalis*)
- Yellow Sweet Clovers (*Melilotus alba*)

WI DOT seed mixes preferred:

- 10
- 20
- 40
- 60
- 70
- 70A
- 75 (erosion)
- 80 (salt tolerant)

4. Sample inventory / monitoring / treatment form

COLLECTION INFORMATION

State _____ County _____ Date observed _____
Collector name _____
Street address _____ City _____ Zip _____
Phone _____ Email _____

CHARACTERISTICS & LOCATION

Plant name (Common and/or Latin name)

Size & density of infestation. Describe spread and estimate numbers

Habitat description. Describe general habitat type such as forest interior, forest edge, old field, prairie, wetland, lakeshore, crop field, pasture, disturbed ground, urban setting type. Is it public or private land?

Location landmarks. Provide enough details so site can be found again. Note nearby landmarks such as city name, roads, intersections, driveways, lake edges and other natural and cultural features.

Geographic coordinates (Complete one.)

1. Latitude _____ N Longitude _____ W

2. UTM _____ E _____ N

3. Township, Range, Section, Part Section
