

# Program Feasibility Study - Invasive Plants in Forests

WDNR Forestry Division

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Report prepared by the Invasive Plants Study Team:

*Eunice Padley, Colin Kelly, Mary Ann Buenzow, Kelly Kearns, Colleen Matula, Ted Pyrek, Rob Strand, Melody Walker, Rick Dailey, Darrell Zastrow, Dennis McDougall, Nancy Berlin.*

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## 1. Executive Summary

The Invasive Plant Program Feasibility Study was commissioned by the Forestry Leadership Team (FLT) and Forestry Operations Team (FOT) early in 2005. The study was needed because non-native invasive plants are impacting forest regeneration and productivity, and the issue has become a concern in the forestry community. Impetus from the Wisconsin Council on Forestry and the Wisconsin Council on Invasive Species was also a factor, along with other actions being taken by the Department. The study prospectus (included in Appendix R) and Section 2 of this report provide additional information on the background and rationale for conducting the study.

Since the inception of this study, a number of events have taken place that put Forestry Division in a better position to respond to invasive plant issues. These include the reallocation of 0.75 FTE as an invasive plants coordinator and the program components initiated since receipt of the 2005-'07 biennial budget. See Appendix Q for more updates.

Invasive plants that currently pose the greatest threat to forest ecosystems and forestry operations are described in Section 3 of this report. It is difficult to get accurate distribution information for these species, as weedy, non-native plants are less-often reported to herbaria than native species. Many invasive plants have no official record in many counties of the state; yet, based on observation and reports from field staff, it is clear that they are widespread. This situation highlights a need to develop statewide data management and information sharing systems, coordinated with inventory and monitoring programs.

Woody shrub species may be the most widespread and problematic invasive plants currently affecting our forests. The two buckthorn species and four bush honeysuckle species already cover large acreages of forest understory. Autumn olive and multiflora rose are common in areas where agriculture has been practiced, and Japanese barberry is gaining a hold in the southeast and south central parts of the state. The non-woody shrub Japanese knotweed is becoming more common in riparian areas and mesic uplands. Reed canary grass is widespread in forested wetlands and also occupies moist upland sites. Few herbaceous species can compete in the shade of a forest understory, but garlic mustard is an exception and is spreading across the state faster than any plant we have observed to date. Dame's rocket has a similar growth habit, but does not appear to be as competitive. Leafy spurge and spotted knapweed are other herbaceous species of concern, mainly invading barrens and semi-open forests. Oriental bittersweet, a vine, is widespread and becoming locally abundant at scattered locations around the state. Black locust is a tree species that is widely distributed and spreading in the state. It is a native of the Appalachians that was planted here for erosion control. Several of these common invasives were raised and distributed by DNR nurseries in the past.

The ecological effects of invasive plants are summarized in Section 4. Some scientific literature was found, but in general, quantitative information is lacking. There has been little money available to researchers to study the specific effects of these species on forests. It appears that direct competition for resources is the main mechanism by which invasive plants impact native trees and other desirable species. Allelopathy is also implicated as a factor in the success of several invasive species. Finally, vines can overwhelm mature trees by shading the canopy, girdling branches or stems, and sometimes pulling them down with added weight.

A large number of additional invasive plants are expected to be a problem in the future. Some of these are already in Wisconsin, but have not yet become widespread and abundant. Others are not present at this time but are almost certain to arrive eventually; these are species already established in nearby states, or in the northeast U.S. where climate and soils are similar. New vines are a particular concern; some of these species are extremely difficult to control and can cause heavy damage to established forests. Invasive tree species, such as Siberian elm and tree-of-heaven, are already present and are likely to be very competitive. Additional shrubs and herbaceous species will compete with tree seedlings and native plants, and, presumably, with invasives already present.

It is even more difficult to find information on economic impacts of invasive plants on forests, as this issue has not been studied to any great extent by economists. Models for predicting economic impacts of the damage done by invasive species are lacking, particularly when projecting effects at broader scales and over longer time periods. One estimate for the entire U.S. is that the harm done by all invasive species, including pests, causes damages of \$138 billion each year. It is easier to calculate the costs of controlling invasive plants,

which are known to be expensive. We estimate that if the state had attempted eradication of common buckthorn infestations across all ownerships in 1996, first-year treatments alone would have cost \$2.85 million.

To gather information on what constituents thought about invasive plants, and what Forestry Division could do to help address the issue, we interviewed members of various customer groups. Results of the interviews are summarized in Section 5 of this report. The categories of customer groups are shown in Appendix B, locations where the interviewees work appear in Appendix C, and the text of full interview responses is found in Appendix D.

Interviewees had varying levels of awareness about invasive plants. Individuals who work in southern Wisconsin had more experience and familiarity with invasives than those working in the northern part of the state. Most thought that forestry practices can be a factor in the spread of invasives, but few had directly observed this. Most interviewees had received information on invasive plants, some from WDNR, but they wanted guidance that was more nuanced and site-specific. They also thought information should be easier to find. The vast majority of respondents thought WDNR needed an invasive plants program, but did not want it to pull resources away from existing functions. Desired components of the program, in order of the largest number of responses, were: 1) education and training, 2) strategic planning, mapping, and monitoring, 3) research and field trials, 4) cost sharing, and 5) policy and regulation. In response to questions about existing programs that could serve as a model, the Forest Health Protection Program (FHPP) was mentioned most often.

Internal WDNR staff provided similar responses about the structure and function of a program, also citing FHPP as a possible model, but placed additional emphasis on the need for education and training. They felt that services should be provided to external constituents as well as to internal staff. Some important potential partners were noted, including WDNR-Bureau of Endangered Resources, University of Wisconsin-Extension (UWEX), and County Land Conservation Departments (LCDs).

Existing authorities for managing invasive plants are summarized in Section 6, and the full text is provided in Appendix F. The Invasive Species Statute (s. 23.22, Wis. Stats.) authorizes the Department to establish an invasive species program, but does not specifically authorize or limit the development of programs within Divisions. Statutes and administrative rules that pertain to the roles and policies of the forestry program (ss. 26.02 and 28.04, Wis. Stats.; ss. NR 150.025 and NR 1.211, Wis. Adm. Code) establish a goal of sustainability, contributing to a healthy natural environment, and preventing damage to the environment. These authorities provide the background for taking action against damaging impacts in forests of the state.

Section 7 describes activities that are already occurring in Forestry and Lands Divisions without the benefit of a formally designated program. Considerable activity during the past two years has focused on tasks identified in the Invasive Species Statute. The WDNR provides staff support to the Wisconsin Council on Invasive Species, currently developing a regulatory classification system and criteria and processes for placing species in categories. This work will culminate in a rulemaking process, and will eventually assist us in halting additional sale and distribution of harmful species. Additionally, Forestry Division has devoted some efforts toward educational activities and invasive plant control on State Forests. Lands Division has played a large role in coordination among agencies and organizations, and has fostered many initiatives, including the early detection project.

A number of interview respondents identified the FHPP as a structure that an invasive plants program could be modeled after. The FHPP has nine FTE's, including three with statewide responsibilities and others providing services to regions. Staff are located in Spooner, Rhinelander, Green Bay, EauClaire, and Madison. Major roles of the program are survey and detection, management of existing pest populations, and providing public information. The FHPP cooperates with DATCP, USDA Animal Plant Health Inspection Service (APHIS) and the USDA Forest Service in providing these services.

Potential partners for an invasive plants program were suggested by interviewees, and further deliberated by the study team. In addition to maintaining partnerships within the Department (e.g. with the Bureau of Endangered Resources, and the Aquatic Invasive Species program in Water Division), it is desirable from our perspective to form partnerships with County Land Conservation Departments (LCDs), University of

Wisconsin-Extension (UWEX), Wisconsin Woodland Owners Association (WVOA), and the Wisconsin County Forest Association (WCFA). These organizations would need to be approached, and would likely want to engage in a process of internal assessment of capabilities and potential benefits of partnering with WDNR Forestry Division, before agreeing to formally partner in any programs. A partnership with LCDs would provide an avenue for sharing technical expertise, administering cost sharing programs (if funding were to become available for such programs), and facilitating coordination among local units of government, organizations, and citizens, such as in the formation of Cooperative Weed Management Areas. UWEX's role is education and outreach, and a partnership with them would help in reaching citizens with information, facilitating public awareness and early detection of invasive plants. WVOA and CFA partnerships would provide links to the forestry community, including forest landowners and county forests, that would further enhance education and outreach efforts, as well as providing feedback on proposed policy and guidance. It could also lead to additional cooperation at the local level, with opportunities for pooling resources to jointly work on important projects. Additional organizations to seek partnerships with may include the Invasive Plants Association of Wisconsin, the Natural Resources Conservation Service, and the Farm Service Agency. We may wish to encourage the development of local Cooperative Weed Management Areas, and form partnerships with them in the future.

Alternatives for an invasive plants program are presented in Section 8 of this report. In the no-action alternative, the program functions would remain as they have been, with a contact person in Forestry Division and involvement by field staff in educational and control activities.

The low-level alternative includes one full-time Invasive Plants Coordinator who would work extensively on policy development, relying on networking and partnerships for most program services. This and all additional alternatives call for the formation of an Invasive Plants working group, modeled after the State Forests working group. It would assist in planning, budgeting, and development of Forestry Division policy and guidance.

A mid-level alternative would include, in addition to the Invasive Plants Coordinator, an adjustment of position descriptions to provide the equivalent of a half FTE per region. These regional employees would provide field assistance, conduct training, develop demonstration areas, assist in property planning, and foster local partnerships. At this level, the program would have some ability to reach citizens and local organizations, engaging their participation in preventing new invasions and working collaboratively on important control projects.

The mid-high level alternative is similar to the FHPP structure, with three statewide staff and one additional staff member in each region, providing additional capacity to develop partnerships, provide education and outreach, and manage existing invasives. This alternative also calls for significant program funding, sufficient to control invasive plants on a large proportion of forested state lands, and to cooperatively support research on biocontrols and silvicultural techniques for regenerating forests with invasives.

A full, ideal statewide program is envisioned as a desirable alternative, but a statewide program is beyond the purview of the study team and Forestry Division. We recommend that the WDNR Leadership Team consider creating a Department-wide program to strategically manage invasive species across programs.

The study team recommends that Forestry Division proceed with developing an invasive plants program. The low-level alternative has already been nearly achieved through the recent decision to allocate .75 FTE as an invasive plants coordinator, and because of funding received in the 2005-2007 biennial budget. The team recommends that Forestry Division move toward implementing the mid-level alternative because it provides the minimum level of resources that would be needed to initiate action at the local level. Over the longer term, the mid-high level alternative is desirable because it includes a research component for new biocontrols and silvicultural methods that are seen as essential to the long-term success of our efforts against invasive plants.

## 2. Background

Invasive plants are an emerging issue in forestry. Aggressive non-native species are impacting forest regeneration in many parts of the state, and potentially harmful species continue to arrive. Invasive plant issues led the Wisconsin Council on Forestry to form a task group on invasive species. The Council has developed a report and a set of recommendations which include a call for agency actions. A Wisconsin Council on Invasive Species has been meeting during the past year, and is actively working with WDNR on classifying invasive species. This effort is likely to result in new administrative rules to regulate the sale and transfer of many invasive species, including plants. Forestry Division does not currently have a formalized program for addressing invasive plants, but the threat to forest resources and the growing level of interest from external groups warrants additional effort in this area.

A review of the existing Forest Health Protection Program (FHPP) within Forestry Division was initiated in 2004. Shortly thereafter, a related study was commissioned by the Forestry Leadership Team and the Forestry Operations Team to assess the threats presented by invasive non-native plants and recommend ways to mitigate their impacts through actions of Forestry Division. A prospectus for the study was developed and approved by FLT in December, 2004, and by FOT in January, 2005.

The purposes of the Invasive Plants Program Feasibility Study were identified as follows:

- Examine the invasive plants issue as it affects forest resources within the state. Document the current level of resource damage, based on occurrence information and observations of field staff. Summarize conditions, and identify trends and potential threats.
- Identify actions currently being taken by Forestry Division and other forest managers, and determine what additional efforts are needed.
- Develop possible alternatives for addressing invasive plant issues that affect forestry.
- Identify potential additional partners in the delivery of invasive plant management assistance, and identify niches for which Forestry Division may be best suited.

An Invasive Plants Study Team was appointed to examine the invasive plants issue. The team represents different geographic areas of the state and organizational levels of the agency. A list of team members appears in Appendix A. The team began this study in March, 2005, compiling existing information from a variety of sources, and using the results of interviews conducted with internal staff and members of external interest groups. This report includes a review of existing literature, both quantitative and anecdotal, information on current distribution and impacts of invasive plants, results of interviews, and programmatic alternatives for addressing this issue.

### 3. Plants currently a problem in Wisconsin's forests

There are a suite of non-native invasive plants that are currently impacting Wisconsin's forests and forestry operations. A summary of their invasive characteristics and known distributions is presented in this section.

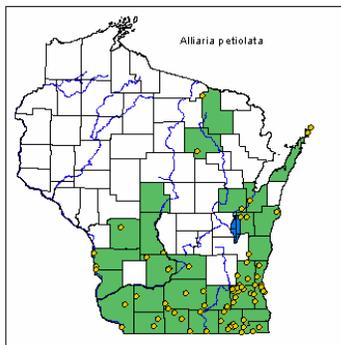
The lack of up-to-date distribution information is a problem in managing invasive plants. The University of Wisconsin (UW) Herbarium website offers maps of known locations for which authenticated observations and voucher specimens have been recorded. However, non-native invasive plants are under-reported, so many counties where we know the plants occur are not shown in the distribution maps. Also, there is a lag time in recording and posting observation data at the Herbarium site. There is a need for the state to develop more capacity in inventory, data management and information sharing capabilities.

The Forest Inventory and Analysis Program (FIA), part of USDA Forest Service, conducted a pilot project for inventorying invasive plants. Between September, 2003, and August, 2004, the pilot project measured 133 plots in ten counties, including Adams, Ashland, Columbia, Iowa, Monroe, Oconto, Price, Rusk, Shawano and Walworth. During the summer months (June, July, and August), 55 of the 133 plots were revisited to determine whether invasive plants could be adequately identified during the winter. FIA was satisfied with the results of the winter/summer comparison, and the invasive plant inventory has been incorporated into the FIA program. It will be a number of years before enough data are available to estimate acreage infested or rate of expansion, but the information will be highly valuable at a later date. Preliminary results from the pilot study are included here for comparison with information found at the UW Herbarium. More information on the FIA pilot program is found in Appendix P.

#### **Garlic Mustard (*Alliaria petiolata*)**

Garlic mustard is a rapidly spreading woodland weed that is displacing native forest and woodland flora. It dominates the forest floor and can displace most native herbaceous species within ten years. It can also outcompete tree seedlings. This plant is a major threat to Wisconsin's flora and the wildlife that depend on it.

Unlike most invasive plants that typically invade disturbed habitats, garlic mustard readily spreads into undisturbed forests.



<http://www.botany.wisc.edu/wisflora/pictures/dotmap/ALLPET.gif>

Garlic mustard can form dense stands that choke out seedlings of many tree species, as well as much of the native herbaceous vegetation. There is also some evidence that it may produce chemicals that impact beneficial mycorrhizae.

It is widely distributed throughout the northeastern and Midwestern U.S. from Canada to South Carolina and west to Kansas, North Dakota, and as far as Colorado and Utah. In Wisconsin, the plant is most abundant in the southeastern and northeastern counties. Based on observations and anecdotal information not captured in Herbarium records, we believe it is now present in nearly all counties of the state.

<http://www.dnr.state.wi.us/org/land/er/invasive/factsheets/garlic.htm>

The FIA Invasive Pilot study (Haugen 2004) found garlic mustard on plots in Columbia, Iowa, and Walworth Counties. It was not found at study plots in Adams, Ashland, Monroe, Oconto, Price, Rusk, or Shawano Counties. This phase of the study only examined these ten counties.

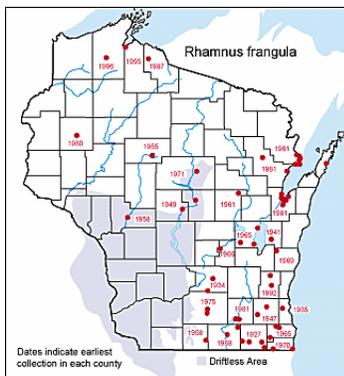
#### **Common Buckthorn (*Rhamnus cathartica*) and Glossy Buckthorn (*Rhamnus frangula*)**

Buckthorns are able to spread aggressively because they thrive in habitats ranging from full sun to shaded understory, and are abundant seed producers. They form dense thickets as they mature into tall shrubs, cutting off light to herbaceous plants and tree seedlings. There is also some evidence that they are allelopathic, using toxins to outcompete other vegetation.

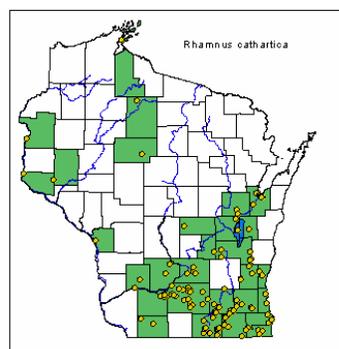
Common buckthorn is a major problem in oak forests of southern Wisconsin where it often limits regeneration. Buckthorn must be set back for oak seedlings to establish and grow. Glossy buckthorn typically occurs in moister locations, and can expand rapidly after an aspen harvest and overtop the new sprouts.

Common buckthorn was planted in Wisconsin as early as 1849. It is naturalized from Nova Scotia to Saskatchewan, south to Missouri, and east to New England. It is well established and rapidly spreading in Wisconsin. Glossy buckthorn has been documented throughout much of the eastern and central US and adjacent Canada, and in the northwestern US. It is also well-established, and appears to be spreading rapidly in the upper Great Lakes region (Voss 1985, GLIFWC 2002, WIS 2004). As in southern Ontario (Catling and Porebski 1994), it appears to be spreading from cities and towns, where the narrow “Columnar Buckthorn” growth form is still commonly used in hedge plantings (GLIFWC 2002). Based on observations and anecdotal information not captured in Herbarium records, we believe these two species are present in nearly all counties of the state. <http://www.glifwc.org/epicenter/>; <http://www.dnr.state.wi.us/org/land/er/invasive/factsheets/buckthorns.htm>

The FIA Invasive Pilot study (Haugen 2004) found common buckthorn on plots in Ashland, Columbia, Iowa, Monroe, Price, Rusk, Shawano, and Walworth Counties. It was not found at plots in Adams or Oconto Counties. This phase of the study only examined these ten counties. Glossy buckthorn was not recorded on any study plots.



<http://www.botany.wisc.edu/wisflora/pictures/handmap/RHAFRA.gif>



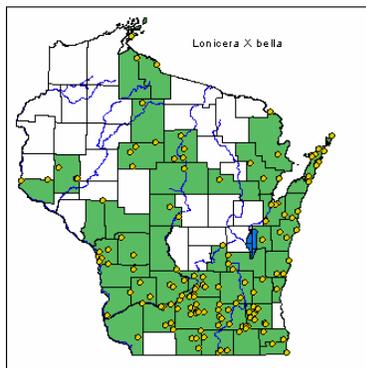
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### **Bush Honeysuckles - Bell's Honeysuckle (*Lonicera x bella*), Morrow's Honeysuckle (*Lonicera morrowii*), Tatarian Honeysuckle (*Lonicera tartarica*), Amur Honeysuckle (*Lonicera maackii*)**

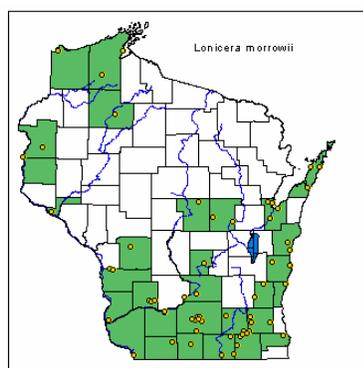
The vigorous growth of these species, collectively known as “bush honeysuckles”, inhibits the development of native shrubs, ground layer plants, and tree seedlings. Eventually, they may form large thickets that entirely replace native species by cutting off sunlight to the forest floor, and competing for soil moisture and nutrients. The early leafing of bush honeysuckles is particularly injurious to spring ephemerals, which rely on a springtime life cycle to capture sunlight before trees and shrubs have leafed out.

Proliferation of bush honeysuckles typically began near urban areas or from horticultural plantings, but rural infestations have occurred where these species were planted in an attempt to provide wildlife habitat, and they are now spread additionally by birds. Bush honeysuckles have naturalized from New England and southern Canada as far south as North Carolina and west to Iowa. Bell's, Morrow's, and Tatarian honeysuckle are spread throughout Wisconsin, although different species predominate at various locations within the state. Amur honeysuckle is not common in Wisconsin, but has been moving in from areas further south and is now being noted in a number of locations. Based on observations and anecdotal information not captured in Herbarium records, with the exception of Amur honeysuckle, we believe these species are distributed in nearly all counties of the state. <http://www.dnr.state.wi.us/org/land/er/invasive/factsheets/honeysuckles.htm>

The FIA Invasive Pilot study (Haugen 2004) found bush honeysuckles (including *Lonicera x bella*, *L. morrowii*, *L. tartarica*, and possibly *L. maackii*) on plots in Adams, Iowa, Monroe, Shawano, and Walworth Counties.

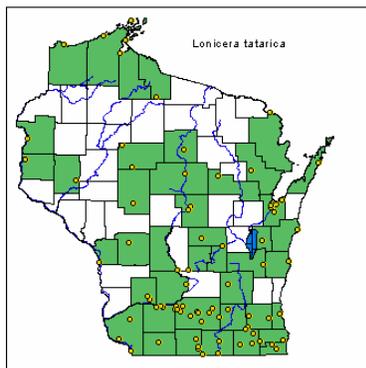


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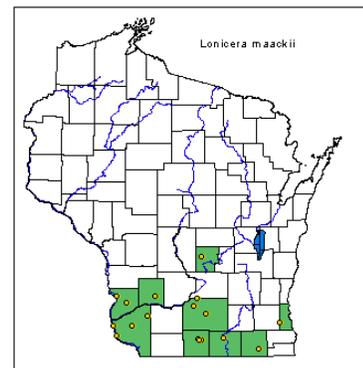


<http://www.botany.wisc.edu/wisflora/pictures/dotmap/LONMOR.gif>

Bush honeysuckles were not found at plots in Ashland, Columbia, Oconto, Price, or Rusk Counties. The phase of the study only examined these ten counties.

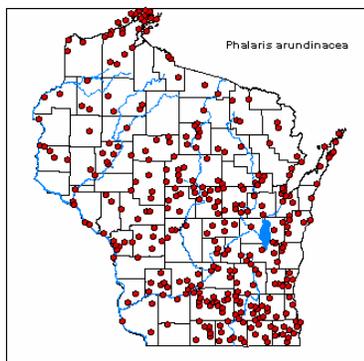


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<http://www.botany.wisc.edu/wisflora/pictures/dotmap/LONMAA.gif>

### Reed Canary Grass (*Phalaris arundinacea*)



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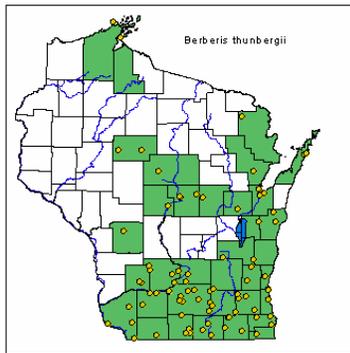
Reed canary grass readily invades native wetlands, and will also form dense stands in moist areas with water tables near the surface. Invasion is usually associated with disturbances, including ditching of wetlands, stream channelization, sedimentation, and intentional planting. The difficulty of control makes reed canary grass invasion of particular concern. Once established, reed canary grass dominates an area by building up a tremendous seed bank that can readily recolonize treated sites. Reed canary grass can rapidly take over bottomland and swamp forests when the canopy is opened by harvesting or natural disturbance. If scattered individuals of reed canary grass are present before a harvest, rapid expansion is likely to occur.

<http://www.dnr.state.wi.us/org/land/er/invasive/factsheets/reed.htm>

The Eurasian ecotype of reed canary grass has been selected for its vigor and has been planted throughout the U.S. since the 1800's for forage and erosion control. It has become naturalized in much of the northern half of the U.S., and is still being planted on steep slopes and banks of ponds and created wetlands. Based on observations and anecdotal information, we believe this species is even more widespread than indicated by Herbarium records shown in the distribution map.

The FIA Invasive Pilot study (Haugen 2004) found reed canary grass on plots in Rusk County. It was not found on plots in Adams, Ashland, Columbia, Iowa, Monroe, Oconto, Price, Shawano, and Walworth Counties. This phase of the study only examined these ten counties.

## Japanese Barberry (*Berberis thunbergii*)



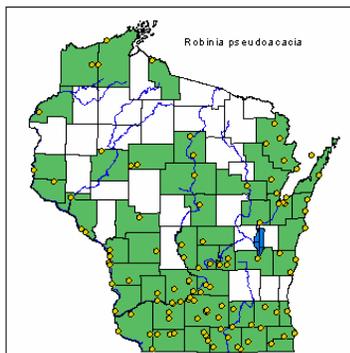
<http://www.botany.wisc.edu/wisflora/pictures/dotmap/BERTHU.gif>

Japanese barberry is not yet abundant in most of Wisconsin's forests and could still be controlled if land owners and managers take action soon. This plant is widespread and abundant in the northeast United States, where it causes problems in forest management similar to those caused by buckthorn and multiflora rose. Dense thickets of these plants limit light to the forest floor and impact forest regeneration. Its many sharp thorns make it difficult to work and recreate in infested woodlands.

Japanese barberry was introduced from Japan around 1875. It is commonly planted for ornamental reasons - its scarlet fruit and autumnal foliage in shades of orange, red, and crimson make it an attractive hedge -, as well as for wildlife and erosion control. It easily naturalizes because its fruit is often eaten by birds, and they subsequently disperse the seed. Its range in North America extends from Nova Scotia south to North Carolina, and westward to Montana. <http://www.dnr.state.wi.us/org/land/er/invasive/factsheets/barberry.htm>

The FIA Invasive Pilot study (Haugen 2004) found Japanese barberry on plots in Walworth County. It was not found on plots in Adams, Ashland, Columbia, Iowa, Monroe, Oconto, Price, Rusk and Shawano Counties. This phase of the study only examined these ten counties.

## Black Locust (*Robinia pseudoacacia*)



<http://www.botany.wisc.edu/wisflora/pictures/dotmap/ROBPSE.gif>

Black locust is a deciduous tree that is frequently found in upland open areas such as roadsides and old fields. It prefers sandy or loamy, well-drained soils in open, sunny locations. It often invades forest edges, or openings within the forest, and then spreads into the understory of wooded areas, proliferating in any forest gaps with available sunlight.

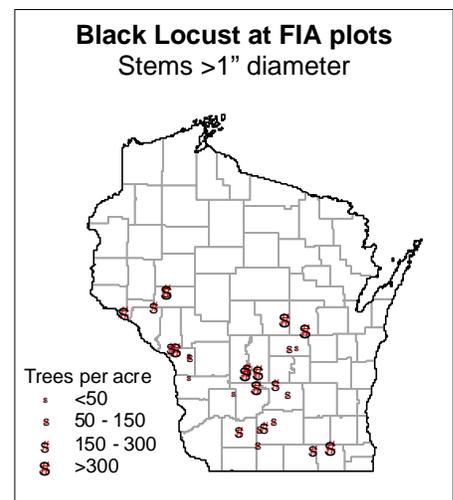
The native range of black locust is found in two discontinuous locations. The eastern part is in the Appalachian Mountains from central Pennsylvania south to northern Alabama and Georgia. It is also in southern Ohio and southeastern Indiana. The western portion of its range is in the Ozark region of southern Missouri, north and west central Arkansas, and eastern Oklahoma. Locally it is in southern Illinois and southwestern Indiana" (Fowells 1965).

<http://tncweeds.ucdavis.edu/esadocs/documnts/robipse.html>

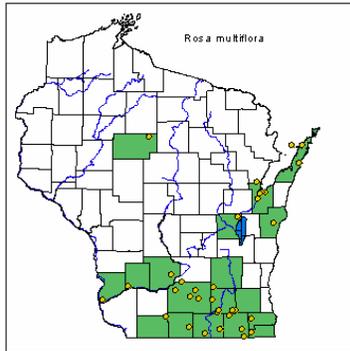
Black locust was introduced throughout Wisconsin in the early 1900's because its aggressive growth pattern and extensive root system discourage soil erosion. It was supplied by WDNR, and recommended for use in stabilizing eroding gullies.

<http://www.dnr.state.wi.us/org/land/er/invasive/factsheets/locust.htm>

Black locust is a tree species tracked in all FIA plot measurements, so was not part of the FIA Invasive Pilot study. Black locust recorded at plots used in the 1996 summary are shown in the figure at the right. Of note is the abundance of stems at many of the plots where it was recorded, and also its presence in several counties that lack herbarium records.



### Multiflora Rose (*Rosa multiflora*)



<http://www.botany.wisc.edu/wisflora/pictures/dotmap/ROSMUL.gif>

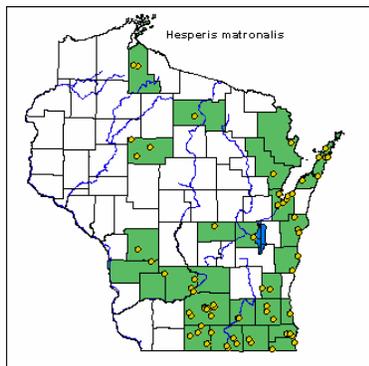
Multiflora rose readily invades forest edges as well as mature forests, especially where there has been land disturbance (e.g. grazing). It can form dense thickets that outcompete native vegetation. The impenetrable, thorny thickets make forestry work difficult and can impede recreational activities.

Multiflora rose has naturalized in most of the northeastern and midwestern United States. Although abundant throughout Illinois, multiflora rose has thus far only become a problem in the southernmost tier of counties in Wisconsin. Presumably, its northern range is limited by an inability to tolerate winter temperatures below -28°F.

<http://www.dnr.state.wi.us/org/land/er/invasive/factsheets/rose.htm>

The FIA Invasive Pilot study (Haugen 2004) found multiflora rose on plots in Iowa and Walworth Counties. It was not found on plots in Adams, Ashland, Columbia, Monroe, Oconto, Price, Rusk and Shawano Counties. This phase of the study only examined these ten counties.

### Dame's Rocket (*Hesperis matronalis*)



<http://www.botany.wisc.edu/wisflora/pictures/dotmap/HESMAT.gif>

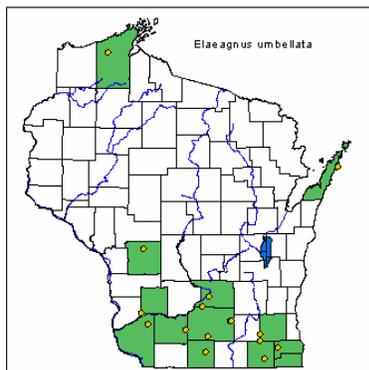
Dame's rocket is an herbaceous biennial that invades mesic woodlands, woodland edges, roadsides, and open areas. It is spreading rapidly in Wisconsin, but its future effects on forests are not yet known. Its growth habit is similar to that of garlic mustard – it forms dense stands 2-3' tall in the forest understory - but it may be less competitive with our native species.

Dame's rocket is native to Eurasia but was introduced to North America in the 1600's. It is now distributed throughout Canada and all of the U.S. except for the southernmost tier of states. This species is frequently included in "wildflower" seed mixes, and the public has unwittingly introduced it to many areas from these plantings.

<http://www.dnr.state.wi.us/org/land/er/invasive/factsheets/dames.htm>

The FIA Invasive Pilot study (Haugen 2004) found Dame's rocket on plots in Walworth County. It was not found on plots in Adams, Ashland, Columbia, Iowa, Monroe, Oconto, Price, Rusk and Shawano Counties. This phase of the study only examined these ten counties.

### Autumn Olive (*Elaeagnus umbellata*)



<http://www.botany.wisc.edu/wisflora/pictures/dotmap/ELAUMB.gif>

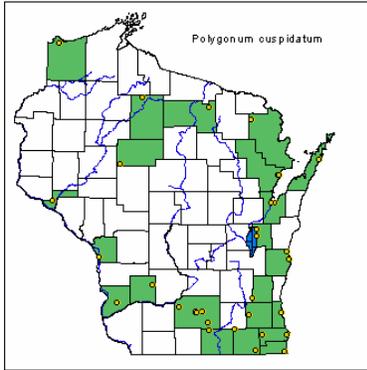
Autumn olive, and the related shrub species Russian olive (*Elaeagnus angustifolia*), were widely planted in an effort to provide wildlife habitat. These species are now spread by birds, and typically become established in open areas such as roadsides or old fields. From there, they may spread into woodland openings or proliferate in small gaps, where they compete with native tree species. These shrubs are also quite thorny, so working in infested areas can be difficult.

Autumn olive is found throughout the eastern half of the U.S., and Russian olive occurs throughout the U.S. except in the southeastern states. In Wisconsin, based on observations and anecdotal information, we believe it to be much more widespread than indicated by Herbarium records. It was formerly supplied by WDNR as part of efforts to enhance wildlife habitat.

<http://tncweeds.ucdavis.edu/esadocs/documnts/elaeumb.html>

The FIA Invasive Pilot study (Haugen 2004) found autumn olive only on plots in Columbia County. It was not found on plots in Adams, Ashland, Iowa, Monroe, Oconto, Price, Rusk, Shawano, and Walworth Counties. This phase of the study only examined these ten counties.

### Japanese Knotweed (*Polygonum cuspidatum*)



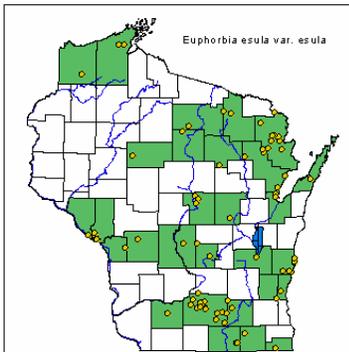
<http://www.botany.wisc.edu/wisflora/pictures/dotmap/POLCUS.gif>

Japanese knotweed is a non-woody perennial shrub, forming dense stands that can cut off sunlight to native plants, including tree seedlings. It spreads primarily along river and stream banks, where vegetative parts are carried in the water and take root on shores of new areas. Japanese knotweed also spreads from horticultural plantings or previously invaded areas, and will proliferate in wetlands, mesic uplands (including forests), along roadways, and in other disturbed areas (Beerling, 1990; Conolly, 1977; Muenscher, 1950). <http://tncweeds.ucdavis.edu/esadocs/documnts/polycus.html>

In North America, Japanese knotweed is widely distributed in the eastern U.S. and has been observed as far north as Nova Scotia and Newfoundland, south to North Carolina, in much of the Midwest and in the coastal areas of Washington and Oregon (Locandro, 1978; Patterson, 1976; Pauly, 1986). Large stands have been noted in western Pennsylvania, in particular along the banks of the Ohio and Allegheny Rivers and on the islands in these rivers (Wiegman, pers. comm.).

The FIA Invasive Pilot study (Haugen 2004) did not find Japanese knotweed on any plots in the ten counties that were part of the pilot study.

### Leafy Spurge (*Euphorbia esula* var. *esula*)



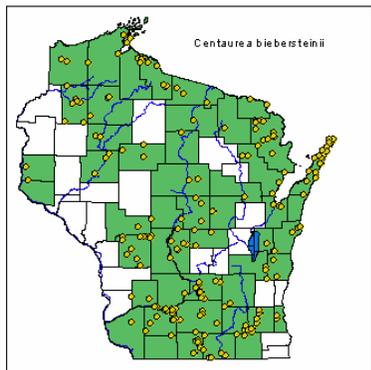
<http://www.botany.wisc.edu/wisflora/pictures/dotmap/EUPESUvESU.gif>

Leafy spurge is an herbaceous perennial that primarily invades open areas, where it is toxic to deer and cattle. It has been a tremendous problem on rangelands in the western U.S., and is of concern here from a wildlife standpoint. It will also invade open woodlands, savannas, and barrens, and may be allelopathic to native flora. In Wisconsin it is usually found on dry to dry-mesic sites. It is difficult to control due to an extensive, deep root system, which sends up new above-ground shoots in response to disturbance.

The species was first recorded in the U.S. in 1827, and was probably introduced accidentally. It is now found throughout the U.S. except in the southeastern states, and is widespread in the Prairie Provinces of Canada. <http://www.dnr.state.wi.us/org/land/er/invasive/factsheets/spurge.htm>

Leafy spurge was not included in the recent FIA Invasive Pilot study as it is primarily an open land invader (Haugen 2004).

### Spotted Knapweed (*Centurea biebersteinii*)



<http://www.botany.wisc.edu/wisflora/pictures/dotmap/CENBIE.gif>

Spotted knapweed is an herbaceous perennial that has become a serious problem in the rangelands of the western U.S. Over the past decade, the species has invaded dry sites in Wisconsin, including disturbed and relatively undisturbed areas. Its potential effects on forests in our area are not well known. Sandy barrens and open jack pine forestlands appear to be the most vulnerable to invasion.

<http://www.dnr.state.wi.us/org/land/er/invasive/factsheets/knapweed.htm>

Spotted knapweed is distributed throughout the U.S. except in the southeastern states, and is also common in the western Canadian provinces. In Wisconsin, based on observations and anecdotal information, we believe it to be even more widespread than indicated by Herbarium records, likely in every county in the state. It was not included in the recent FIA Invasive Pilot study as it is primarily an open land invader (Haugen 2004).

### Oriental bittersweet (*Celastrus orbiculata*)



<http://www.botany.wisc.edu/wisflora/pictures/dotmap/CELORB.gif>

Oriental bittersweet, also known as round-leaved or Asiatic bittersweet, is a perennial vine of ornamental value which has escaped from cultivation. Trees that are overtaken by Oriental bittersweet experience decreased photosynthesis, and may incur structural damage from girdling or the weight of the vines. The increased weight also increases susceptibility to wind and ice damage. Oriental bittersweet often becomes established in forest edges or open areas, and then moves into forests. Its seeds are now spread by birds. It is difficult to distinguish from the native American bittersweet, with which it can hybridize.

This species is native to China, Korea and Japan, and is now distributed throughout most of the eastern U.S. In Wisconsin, based on observations and anecdotal information, we are certain that this species is considerably more widespread than indicated by Herbarium records, perhaps present in half the counties of the state, and locally abundant in at least a few areas.

## 4. Ecological and Economic Impacts of Invasive Plants

### Ecological Impacts

As the exchange of products and people continues unabated around the world, there is an increasing awareness that non-native, invasive plants are causing serious problems wherever they are found. Called by some the “least reversible” of all human impacts, exotic invasive species invasions can cause great harm to the environment, economies, human health, and aesthetics. Such invasions threaten biological diversity by producing population declines of native species, as well as altering key ecosystem processes like hydrology, nitrogen fixation, and the fire regime (White and Britton, 1997).

Despite a fair amount of research by scholars, land managers and other interested individuals, there is little information that quantifies the ecological and/or economic effects of these plants. In spite of this, it is useful to consider the anecdotal, qualitative, and scattered measures of quantitative information that these studies offer. Most of the studies attempt to illustrate how invasive plants affect forest regeneration, species richness, biodiversity, ecosystem processes, and nest predation.

One of the species of greatest concern in forests today is garlic mustard (*Alliaria petiolata*). Garlic mustard is a biennial herb in the Brassicaceae family whose new leaves produce a distinct garlic odor when crushed. The plant has no known natural enemies in North America, is self-fertile, and is difficult to eradicate once established (Nuzzo, 2000). Importantly, garlic mustard has the ability to invade mature second-growth forests – habitats that are often considered to be more resistant to many invasives, especially herbaceous plants – as well as displace native vegetation in these invaded areas (Meekins and McCarthy (1999). The mechanism for this displacement may be phytotoxic chemicals that are produced by garlic mustard, which may inhibit mycorrhizal activity (Vaughn and Berhow, 1999).

Previous research has shown that when garlic mustard is experimentally removed from a forested area, the richness and abundance of understory species, especially annuals and woody perennials including tree seedlings increase (McCarthy, 1997). Nuzzo (2000) conducted an 8-year monitoring study in Illinois and found that in areas with garlic mustard, cover of native perennial herbaceous species declined significantly but species richness did not change.

Garlic mustard's effect on oak forests may be of particular concern, especially considering the vast resource in Wisconsin. Meekins and McCarthy's experiment (1999) indicated that, even at low densities, chestnut oak seedlings were negatively affected by competition with garlic mustard. Therefore, it is likely that oak seedlings could be seriously affected by the presence of garlic mustard in forested habitats. Specifically, upland oak forest may be more vulnerable to garlic mustard invasion than moist, lowland forests with a boxelder overstory and a jewelweed understory. Furthermore, Lorimer (1992) found that a dense understory composed primarily of shade-tolerant species can lead to a drastic decline in oak survival.

Other plants have illustrated that the movement of an invasive species into an area can lead to native species displacement and a corresponding loss of local diversity (Herbold and Moyle, 1986). Exotic bush honeysuckles are a prime example of this trend. Trisel (1997) examined the effects of shoot and root competition of Amur honeysuckle (*Lonicera maackii*) - a non-indigenous invasive shrub - on seedlings of four native tree species: sugar maple (*Acer saccharum*), white ash (*Fraxinus Americana*), black cherry (*Prunus serotina*), and red oak (*Quercus rubra*). The presence of Amur honeysuckle greatly reduced tree seedling survival, mainly through competition for light. Similarly, Amur honeysuckle had a negative effect on native herbaceous plants. There was a significant decrease in fitness of bedstraw (*Gallium aparine*), yellow jewelweed (*Impatiens pallida*), and clearweed (*Pilea pumila*) when grown in the presence of Amur honeysuckle, possibly because of competition for light, water, and nutrients (Gould, 1996).

In another study, Woods (1993) suggested that competition for light was responsible for the impact of Tatarian honeysuckle (*Lonicera tartarica*) on the diversity and cover of native understory herbs in a New England forest. Invasive trees also play a role in affecting forest diversity. Martin (1999) found a lower richness of seedlings and saplings in areas invaded by Norway maples than in nearby uninvaded forests.

With regard to the effect of invasive species on birds, Schmidt and Whelan (1999) monitored nests of robins through the breeding season in a deciduous forest in Illinois and found higher nest predation in the introduced common buckthorn (*Rhamnus cathartica*) and Amur honeysuckle (*Lonicera maackii*) than in native shrubs and trees. This was attributed to a combination of lower nest height and the absence of sharp thorns on the exotic species.

Invasive vine species also have the potential to cause significant problems in forests and other natural landscapes. Problem vines in Wisconsin include Oriental bittersweet (*Celastrus orbiculatus*) and black swallowwort (*Vincetoxicum nigrum*). Porcelain-berry (*Ampelopsis brevipedunculata*) is present in Wisconsin, but not yet widespread. Kudzu (*Pueria montana*) and mile-a-minute vine (*Polygonum perfoliatum*) have not yet reached Wisconsin, but are causing great concern, as are pale swallowwort (*Vincetoxicum rossicum*) and Chinese yam (*Dioscorea oppositifolia*). Kudzu kills or degrades other plants by overwhelming them with a solid blanket of leaves, by girdling woody stems and tree trunks, and by breaking branches or uprooting entire trees and shrubs through the force of its weight. Once established, Kudzu plants grow quickly, extending as much as 60 feet per season at a rate of about one foot per day (Bergmann and Swearingen, 2005).

The other invasive vines mentioned above disturb ecosystems in a similar fashion. They grow rapidly over trees, shrubs, and other vegetation, blocking the foliage of covered plants from available light. Among other problems, this compromises their ability to photosynthesize. They also girdle and uproot their host, under the force of their massive weight. Ultimately this can lead to a reduction of native plant species in an area (Young, 2005).

According to Oliver (1996), mile-a-minute presents serious problems for reforestation because it thrives where forests are clear-cut. Like the others, the plant poses a threat to natural and restored ecosystems because of its capacity to grow rapidly and overgrow other species. Silveri *et al.* (2001) found that logging roads provided Oriental bittersweet with prime habitat for establishment and growth following timber harvest. A study of naturally occurring vines in a logged forest indicated that Oriental bittersweet invaded two years after harvest, and that the invasion may have been triggered by logging disturbance. Vine stems were more abundant on former logging roads than in surrounding selectively logged areas.

Plants themselves are not the only contributors to the invasives problem. Allelopathy, the chemical inhibition of one plant species by another, may also play a role in the successful establishment of common buckthorn (*Rhamnus cathartica*) within woodlands and savannas of the upper Midwest (Wilson *et al.*, 2002). Some observations indicate that common buckthorn possesses such chemicals within the fruit and leaf structures (Boudreau and Wilson, 1992). Allelopathic chemicals act as a germination or growth inhibitor to other organisms that could potentially occupy the affected area. The extent to which *R. cathartica*'s release of allelopathic chemicals to the soil accounts for native plant displacement has yet to be determined.

Non-native, invasive plants have the potential to cause great problems in forests and other natural ecosystems. They have been shown to affect forest regeneration, species richness, biodiversity, ecosystem processes, and nest predation. Garlic mustard, common buckthorn, and bush honeysuckles are just a few examples of herbs and shrubs that are negatively affecting forests today. A suite of invasive vines – including Oriental bittersweet, black swallowwort, and porcelain-berry – are also causing problems in Wisconsin, and a number of other species will likely move into the state soon. These vines have an adverse effect on mature trees; they cut off light to foliage, weaken and sometimes girdle the tree, and can pull it down due to the added biomass.

## **Invasive Plants of the Future**

There are many plant species known to be invasive in states near Wisconsin, and in areas with similar climate and soils, such as the northeast U.S. In addition to the vines mentioned in the previous section - kudzu, Chinese yam, mile-a-minute, and pale swallowwort - other herbaceous species pose an imminent threat to forestry. One of these is Japanese stilt grass (*Microstegium vimineum*), an inconspicuous grass that spreads in the forest understory, usually starting from a road, and forms a dense mat that restricts tree regeneration. This grass is present in Illinois and states further east. Wineberry (*Rubus phoenicolasius*) is a relative of our native *Rubus* species, and will aggressively form thickets in forest openings after harvests. It is also present in Illinois and other eastern states. A variety of landscaping plants that are currently used in Wisconsin are

beginning to escape into forests, and are expected to become a bigger problem in the future. These include privets (*Ligustrum ovalifolium*, *L. sinense*, *L. vulgare*), burning bush (*Euonymus alatus*), periwinkle/myrtle (*Vinca minor*), climbing Euonymus or wintercreeper (*Euonymus fortunei*), Siberian peashrub (*Caragana arborescens*), Russian olive (*Elaeagnus angustifolia*), Siberian elm (*Ulmus pumila*), garden heliotrope or garden valerian (*Valeriana officinalis*), bishops goutweed (*Aegopodium podagraria*), moneywort or creeping Jenny (*Lysimachia nummularia*), Japanese or Amur corktree (*Phellodendron amurense*), princess tree or royal Paulownia (*Paulownia tomentosa*), saltcedar or tamarisk (*Tamarix ramosissima*), Tree-of-heaven (*Ailanthus altissima*), sawtooth oak (*Quercus acutissima*), and Japanese honeysuckle (*Lonicera japonica*). A list of future invasive species is found in Appendix H.

## Economic Impacts

According to Kelly (2005), comprehensive data about economic impacts are scarce, and assessing economic and ecological costs for invasive plant species in a meaningful way is a daunting task. The extent of economic damage caused by invasive species is only beginning to be appreciated by economists and policy makers, and the methods by which to do so are still being explored or haven't been tested at the landscape scale.

Pimentel *et al.* (2000) explained that some non-indigenous species have caused major economic losses in agriculture, forestry, and several other segments of the U.S. economy, in addition to harming the environment. One study reported that 79 exotic species had caused approximately \$97 billion in damages during the period 1906-1991 (OTA 1993). It has been estimated that invasive species in the USA cause economic damage of \$138 billion per annum, roughly 2% of GDP (Lonsdale, 2004).

The single invasive plant species that had an economic impact or cost associated with it was multiflora rose. According to Van Driesche *et al.* (2002), experimental control programs in West Virginia during the early eighties indicated that more than 36,500 hectares were heavily infested. Furthermore, a ten-year eradication program using herbicides would cost more than \$40 million (Williams and Hacker, 1982). At today's rates, this cost would exceed \$48 million.

Plant lists from a 1996 survey of selected FIA plots, conducted to identify Forest Habitat Types, were used to estimate the extent of common buckthorn. At that time, 570,000 acres of Wisconsin's public and private timberland were estimated to have common buckthorn present. These shrubs - along with invasive bush honeysuckles - are well-established and spreading quickly throughout Wisconsin. Treatment of invasive shrubs on woodlots can range from \$500 to \$2,000 per acre. A minimum cost estimate for controlling the 570,000 acres of common buckthorn that existed in 1996 is \$2.85 million. This, however, would only cover one-time treatments; the long-term costs of control, as well as the loss of productivity of affected forests, can drive up cost estimates significantly. See Appendices N and O for more details on buckthorn extent identified in the FIA Habitat Type survey, and costs of control on the Kettle Moraine State Forest.

The WFLGP program provides cost sharing for private landowners, including brush treatment as a part of timber stand improvement practices. From 1998 through 2004, a total of 19,431 acres were treated by either chemical or mechanical means, and \$1,071,134 was expended. For more information on cost sharing programs that provide funding for invasive plant control, see Appendix I. For details on WFLGP expenditures for brush treatments, see Appendix J.

Forestry Division staff have expressed frustration about the increased difficulty of managing stands infested with invasives, noting that additional time is required for cruising and marking because they sometimes cannot see through brush thickets, or become entangled in thorny plants. Some field staff have experienced skin burns from wild parsnip (*Pastinaca sativa*). These additional obstacles to forest management increase costs, although we have no way of estimating the amount at present.

Though much work remains to be done with regard to the accurate estimation of costs in controlling invasive species, it is clear that the task is likely going to incur great financial costs. Because of the opportunistic tendency of invasive species, the costs of control will be ongoing; that is, one time treatments will probably not be effective. Nevertheless, if the maintenance - or increase - in the production of high quality timber, biological diversity, and aesthetic values in Wisconsin are the objectives, such costs will need to be considered.

## 5. Results of interviews with customers and staff

### Abstract

Clark Forestry and WDNR conducted interviews with 56 people between May and July 2005. Interviewees were primarily professionals who have some role in managing invasive plants, or who might be served by a Forestry Division invasive plants program if one were developed. Interviewees represented distinct customer groups, both within and outside WDNR. They were asked general questions regarding their experiences with invasive plants and their support needs relative to invasive plant species. Internal WDNR staff were asked additional questions about the possible make-up and structure of an invasive plants program. Customer groups are listed in Appendix B, locations where the interviewees work appear in Appendix C, and the text of full interview responses is found in Appendix D. Results of two previous surveys, undertaken by the Education team and the NOR, are found in Appendices K and L.

The level of experience, level of knowledge and the opinions held about the effects and significance of invasive plants in forestry is quite varied. Some of this variation appears to be a function of geography. In general, forestry practitioners in northern Wisconsin have less experience with invasive plants and less knowledge of their impacts than their counterparts in southern Wisconsin.

Two-thirds of respondents believed that traditional forestry practices including logging could contribute to invasive plant problems; however there was a variety of opinion within that group about the significance of that effect, and few had actually observed it. Over three-quarters of the respondents believed an invasive plants program is needed in Wisconsin, although there was a variety of opinions about what functions the program might provide and how it might be structured. Of programs that could serve as a model, the Forest Health Protection Program was mentioned most often.

Internal WDNR staff provided similar responses about the structure and function of a program, but placed some emphasis on the need for education and training. They felt that services should be provided to external constituents as well as to internal staff. Important potential partners were identified, including WDNR-Bureau of Endangered Resources, UWEX, and LCD's.

### Methods

Interview questions were developed by the study team with guidance from Ed Nelson of ISS. The intent of using personal interviews as a study tool was to gain depth rather than breadth, gathering insights about the needs of staff and customers, and getting their ideas about how a program could be structured. The ability to develop statistical projections was not a goal of the study.

Using a list of potential interviewees prepared by the study team, Fred Clark and Colin Kelly contacted 70-75 of them, and scheduled and conducted telephone interviews with 56 people representing all of the assigned group types. Two interviews were conducted in person. The remaining interviews were by telephone, most lasting 30 minutes or so. Everyone was asked 15 general questions, and internal WDNR staff were asked an additional 5 questions regarding program composition.

Responses for Question 1, which dealt with awareness of specific invasive plants, were captured in narrative for people with limited experience, or by means of a detailed worksheet e-mailed to people with extensive experience.

All the respondents were offered the chance to be anonymous, but no one elected that option. We did not create a response record for most respondents who had no opinion on a question or for whom the question was non-applicable.

In the quantitative listing of responses many respondents provided one or more responses to the question – so the number of responses tallied for a question in this summary is usually greater than the number of respondents who actually answered the question.

## Summary of interview responses

*Interviewees representing the general public - Questions G1 – G15 (56 respondents)*

### **G1. What invasive plants species do you see most commonly in your area? How extensive and rapidly spreading are they? What effects do they cause?**

Responses were quite diverse due to the variable nature of the interviewees. Supervisors and organizational people had less specific knowledge. In general, individuals working in southern Wisconsin have much more direct experience and are familiar with more specific invasive plants than those in the North. Specific responses were captured and tabulated in a separate table, and reported in "Phase II Invasive Species responses by Species".

### **G2. What conditions do you think are contributing to the spread of invasive plants in Wisconsin Forests?**

The answers were quite variable and included socio-economic factors (e.g. lack of awareness, global free trade), physical – direct human activity factors (e.g. ATV's) , and biological factors (e.g. lack of fire). Following were the most commonly cited contributing conditions in order of frequency:

<b>Issue – Contributing Factor</b>	<b># Respondents Citing</b>
'Unintentional' Spread (seeds spread by people, etc.)	18
'Intentional' Spread (landscaping, plant introductions)	13
Recreational Use – Hunting, ATV's, Horses	13
Wildlife Movement – Deer, Birds, etc.	10
Roadside Management – Ditchbank Mowing, Plowing, etc.	10
Habitat Fragmentation – Land Parcelization	5
Gravel Pits and Quarries	3
International Trade	2
Global Warming	1
Others – ( lack of awareness, no policies, no planning)	4

### **G3. Do you think forest management practices are contributing to the spread of invasives in forests? How?**

The majority of respondents believed forestry is a contributing factor, however direct experience for many people is limited so their opinion is sometimes based on presumption. A few feel logging is not a big problem, and don't want to see loggers overly burdened by regulation.

*Summary of respondents' opinions.*

<b>Yes – sees the threat or impact as significant.</b>	<b>Yes – is not sure if the threat is significant, or sees the impact as minor.</b>	<b>No – has not seen such impacts.</b>	<b>Not sure or has not had direct experience.</b>
16	18	7	10

### **G4. What actions are you taking to control or manage invasive plants in forests?**

Most respondents had not had much if any direct control experience with invasive plants, but a few have extensive experience. Types of activities are extremely variable and range from very hands-on to assisting others through indirect support.

*Control methods reported used directly by respondents*

Monitoring	Planning	Harvest Timing	Modified Silviculture	Herbicide	Mechanical Control	Hand Control	Fire Control
6	9	1	1	14	7	16	5

**G5. Have your actions been successful? For how long?**

Even fewer people have enough history to answer. Many of those that do noted that short-term results seemed to be good – but that longer-term control success was still uncertain. Measures of success are not well-defined so most people are unable to answer this unequivocally.

*Degree of success reported by respondents actively controlling invasive plants*

Successful	Partially Successful	Not Successful	Too Early to Tell
11	18	2	6

**G6. Can you estimate the costs per acre, or time per acre required for various treatments you have performed?**

Only a few responses were received for this question. Type of activity and methods of executing work are so variable that direct comparisons are of limited value. Additional data may need to be gathered more systematically to set cost-sharing levels, for example. Typical costs reported ranged from \$20 per acre for selective basal bark treatment of invasive shrubs at light density to \$150-\$300 per acre for more extensive mechanical brushing, or chemical control / cut-stump treatment in high density.

**G7. Have you received any information or technical assistance in controlling invasive plants in forests? What kind? Who provided it?**

Almost everyone has – and the sources of information are very diverse. Few people seem to go to the same place for information. However, a number of individuals said they got their information through one-on-one contact and/or WDNR staff. Many noted that they had to look hard to find information – so they wonder how easily accessed it will be by less motivated persons.

*Sources of information reported accessed by respondents*

WDNR Staff	Other Agencies (USFS, IPAW, TNC, UWEX)	General Conferences	Targeted Training Sessions	Books, Brochures, Magazines	E-mail, Websites	One-on-One Advice (includes WDNR)
13	7	6	6	14	13	11

**G8. Are you getting the information you need to effectively manage non-native invasive plants?**

29 respondents said that, in at least some areas, they are not getting the information they need. 22 respondents said they are getting enough information, however many of those noted lack of resources or lack of a mandate to take effective action.

While most people feel that they can get enough information on invasive plant ID and direct control, more easily accessed information and better delivery methods are needed. Many people also noted that while basic information exists, there is still a strong need for more strategic information including regional occurrence mapping information and decision support tools to aid managers in using resources wisely for management efforts.

**G9. If not, what additional information do you need? What form should that information take?**

Respondents identified a wide range of needs, but most focused on better identification tools, such as field guides, and more information on a range of site specific control options. Respondents also mentioned a range of preferred delivery methods with on site field tours being mentioned most frequently as the preferred learning method, followed by printed materials (for field guides especially – the more color photos the better) and electronic resources.

*Information needs cited by respondents*

Treatment Options / Decision Support Tools	Invasive Plants Habitats, Ecology and Impacts	Field Guides for Identification	Information on Emerging Species	Cost of Control Information	Urban Forest Issues for Invasive Plants
14	6	5	3	1	1

**G10. Have you been aware of the work that WDNR does with non-native invasives? Have you had any contact with WDNR staff about that? Where did that contact occur? What was the topic?**

Most people said that they were aware of the work that the WDNR does, though a number of people had little awareness of WDNR activities with upland invasive plants. Some had experience with an individual project with field foresters or other WDNR field staff. Many have been to workshops where Kelly Kearns or Eunice Padley presented information.

*Respondents' awareness of WDNR work on invasive plant species*

Strong or Ongoing Awareness of Multiple Projects / Issues	Some Awareness or Awareness of a Single Issue	No or Very Little Awareness
22	16	13

**G11. Do you think the WDNR needs an invasive plants program or are we getting the job done now?**

Overwhelmingly the answer was yes – although a few people thought it was not needed and that existing resources were adequate.

*Respondents' opinions on need for a WDNR invasive plants program*

We Need a Program	We Do Not Need a Program	Not Sure
41	2	10

**G12. What services from a forest invasive plants program would you find most valuable?**

Answers were fairly consistent. Almost all responses called for services in the following areas: 1) education and delivery of information; 2) additional strategic services, such as mapping, co-ordination of partner's efforts, especially early stage control efforts, survey and monitoring; 3) research and adaptive management efforts to develop better tools for managers; 4) cost-sharing assistance; 5) policy and regulation.

*Most needed invasive plant services cited by respondents*

Education and Training (all audiences)	Strategic Planning, Mapping, Monitoring for Control	Research on Impacts and Adaptive Management Trials	Provide / Administer Cost Sharing	Formulate Policy and Regulation	Direct Consulting
30	18	14	10	7	5

**G13. What concerns would you have about creation of an invasive plants program within the WDNR Forestry Division?**

Many people had no concerns. Generally concerns that were expressed fell into 2 categories.

Some were concerned that placing the program in Forestry Division would result in a lack of partnering with other programs and possible over-emphasis on forestry invasives, with not enough emphasis on other upland non-forest invasives. Some feel that “Forests” are an inappropriate limiter for an invasives program - that a program should be more broadly focused on, for example, upland invasive plants, or all invasive plants.

The other main concern was that resources supporting an invasive plants program would be taking away from other needed forestry functions – either by overloading existing staff with too much to do – or pulling positions away from other needs. Most everybody is supportive of a program if the resources are added, and not just shifted.

**G14 Can you think of an example of a program similar to this within or outside of WDNR that you feel could be used as a model for an invasive plants program?**

A very wide range of responses were offered on this question. There was some cross over in responses between those suggesting simply models (as the question intended), versus those suggesting existing programs where they felt the program might be best housed. There was a diversity of responses in the “Other” category including the Wild Ones, IPAW, GLIFWC, the Prairie Enthusiasts, Fort McCoy, and the WDNR’s own naturalists. Most responses shared a focus on balance of central office resources together with regional field staff. Most people felt a regional field staff was needed. A few suggested that field-level activity could be handed to existing WDNR field staff. Most models suggested have strong elements of cooperation and partnering.

*Number of respondents citing a Model for Invasive Plants Program*

WDNR-Forest Health Protection Program	WDNR B.E.R. Program	WDNR Aquatic Invasives Program	WDNR Non-point Program	Karner Blue HCP Program	County LCD’s	UWEX Basin Educator Program	Other
9	3	2	1	1	1	2	9

**G15. What do you think are the best long-term strategies for gaining control over the invasive non-native plant problem?**

*Number of respondents citing specific long-term strategies for control*

Education and Public Awareness	Surveys, Monitoring and Early Detection	Prevention	Use of Bio-controls	Regulations
28	10	9	4	6

Also cited (by one respondent each) were: cost/sharing for control; research; taking action beyond Wisconsin’s borders; and voluntary incentives.

*Summary of responses for internal WDNR staff - Questions I1 – I5 (15 Respondents)*

***11. If the Forestry Division were to develop an invasive plants program how could it be structured and linked to existing programs?***

Most respondents offered the FHPP as a model, or suggested the program be housed in the Office of Forest Sciences. Five respondents suggested that the program either be housed within BER, or should be co-located to share responsibilities with Lands Division. Another suggested that a new program should mirror the gypsy moth program in its organization.

***12. Can you describe with some detail the minimum level of services appropriate for beginning this effort.***

Answers to this question were similar to those for G12 but with a smaller sample size.

*Respondents citing needs for invasive plant program services*

<b>Education and Awareness for Internal WDNR Customers</b>	<b>Education and Awareness for External Customers</b>	<b>Survey, Monitoring and Early Detection</b>
9	7	3

***13. Can you describe what you would see as a fully functioning program within about ten years?***

Most common answers included a vision for one or more of the following:

- State-of-the-art technology for managing survey and detection efforts, and tracking species populations and management efforts are used.
- Research on effects of invasives and best management strategies for addressing them are well-developed.
- Well-developed partnerships for coordinated management exist.
- Adequate funding for control efforts is available.
- A strong education and awareness program is in place.

***14. If an invasive plants program is developed within the Division of Forestry, should it focus on services to Division staff, or to external constituents, or both?***

Everyone responded that both internal and external constituents need to be served.

***15. We are considering options for addressing the workload that would be associated with an invasive plants effort. What other parts of WDNR do now or could provide services instead of DF? What external partners could assist in this effort?***

The top three partners most commonly mentioned include (in order of most responses): WDNR-Bureau of Endangered Resources, UWEX, LCDs, and / or NRCS. Other partners mentioned include The Nature Conservancy, IPAW, RC&Ds and Regional Planning Commissions.

## 6. Current Departmental Authorities

Several Wisconsin statutes provide authority for WDNR to manage harmful invasive plants. The Invasive Species statute (s. 23.22, Wis. Stats.) gives the Department responsibility for establishing a statewide program to control invasive species, including promulgating administrative rules to classify species into regulatory categories. This statute, along with s. 15.347 (18), Wis. Stats., set up the Wisconsin Council on Invasive Species and outline its duties. Our attorneys interpret the statute as giving the Department broad authority to take action against invasive species, although it must be noted that statutory authority for establishing a program is vested at the Department level. The statute does not specifically provide for programs at other levels of the organization.

The rulemaking process is proceeding, with drafts of proposed regulatory categories and criteria for placing species in categories being developed collaboratively by the Wisconsin Council on Invasive Species and the WDNR Invasive Species Team. Iterations of these drafts are reviewed and approved by the Council and its committees. Because of intense stakeholder interest in this process, it is expected to be lengthy, so it will be several years before any new rules are in place to provide additional authority for Departmental initiatives.

A group of older statutes deal with “nuisance weeds” and “noxious weeds”. These laws refer to particular species that are not typically a problem in forests, with the exception of leafy spurge (*Euphorbia esula*), a specified “noxious weed”, which can invade barrens and semi-open forests. The Noxious Weed statute (s. 66.047, Wis. Stats.) requires landowners to control leafy spurge, Canada thistle (*Cirsium arvense*), and field bindweed (*Convolvulus arvensis*) on their properties. The statute also allows counties and municipalities to designate additional noxious weed species. The Nuisance Weed statute (s. 23.235, Wis. Stats.) prohibits the sale and distribution of multiflora rose, and provides authority for control of purple loosestrife.

Statutes that apply to the Department of Agriculture, Trade, and Consumer Protection (DATCP) (ss. 94.38, 94.39, 94.41 and 94.45, Wis. Stats.) restrict the amount of weed seed that can be included with agricultural seeds for sale or distribution. These statutes also require seed labeling and provide seed inspection authority. Additionally, s. 94.03 Wis. Stats. gives DATCP authority to regulate the import of federally listed noxious weeds and parasitic plants, some of which are in trade throughout the continental U.S.

A number of additional statutes and administrative rules describe roles and policies of the forestry program in the state (ss. 26.02 and 28.04, Wis. Stats.; ss. NR 150.025 and NR 1.211, Wis. Adm. Code), and provide planning guidance for state properties (s. NR 44.04, Wis. Adm. Code). They describe in general terms a requirement for maintaining long-term sustainability of forest ecosystems and communities. Further relevant statements include: contribute to a healthy natural environment; provide a full range of benefits for present and future generations, including outdoor recreation and native biological diversity; and prevent or eliminate damage to the environment. These authorities, although general in nature, provide a legal framework for protecting forests from destructive agents that impact native species and forest productivity.

The full text of these Statutes and Administrative Rules is found in Appendix F.

## 7. Current invasive plant activities and partnerships

Although Forestry Division does not have a formalized program to address invasive plants, a large and ever-increasing effort has been taking place over the past several years. Elsewhere in the Department, the Bureau of Endangered Resources has had a major leadership role in coordinating invasive plant efforts throughout the state. The Aquatic Invasive Species program has been effective in securing stable funding through the motorboat gas tax and has developed an active program to limit invasive species spread through lakes and rivers. Other state agencies, local units of government, and non-governmental organizations have been involved in combating invasive plants in various ways. This section provides a summary of the roles of some of the most important agencies and organizations. Some of them could be potential partners with Forestry Division in a more formalized program. Others may be models for structuring an invasive plants program. A more detailed description of these activities and programs is found in Appendix E.

### **Roles of Forestry Division , WDNR**

The major roles of Forestry Division include:

- Managing invasive plants on State Forests and a few other state properties where timber production occurs.
- Providing education for internal staff, forest landowners, certain partners, and occasionally for the general public.
- Developing policy, guidance, and budget proposals for Forestry Division, and participating in the rulemaking process.
- Administering cost-share programs, particularly the Wisconsin Forest Landowner Grant Program (WFLGP), which provides funding for landowners to control invasive woody shrubs and conduct other forest management activities.

While there are no Forestry staff members specifically identified to work on invasive plants, a number of individuals devote a portion of their time to this issue. The primary role of Central Office staff has been in developing regulation, policy, and budgets via participation in the DNR Invasive Species Team, its associated Workgroup, and as staff to the Wisconsin Council on Invasive Species. Another important role of Central Office staff, with assistance from the Northern Region Ecologist/Silviculturist, has been education and internal guidance on forestry-specific issues. Also, staff members prepare responses to inquiries from the Councils, Legislature, various teams and organizations, and the general public. The Stewardship program administers cost-share programs.

Field foresters play a large role in communicating with forest landowners and partners at the local level. Many foresters identify invasive plants during field reconnaissance, provide control information and guidance to landowners, and organize educational and volunteer activities. Many foresters cooperate with counties and other local governments to share information and jointly plan activities. Foresters working on state lands perform management activities on invasive plants as a routine part of site preparation and competition control. Supervisory staff who serve on policy teams and working groups spend a portion of their time deliberating the invasive plants issue and developing guidance.

### **Roles of Lands Division, WDNR**

The Bureau of Endangered Resources (BER) has played a prominent role in invasive plant efforts in Wisconsin. The Plant Protection Specialist, who focuses most of her time on invasive plants, has been instrumental in raising awareness of this issue through outreach and coordination. Major roles of BER include:

- Coordination among states, agencies, organizations, and individuals. For example, initiating formation of the Invasive Plants Association of Wisconsin (IPAW), a non-profit organization that provides a statewide framework for work on many aspects of invasive plants, including education, inventory, monitoring, and local coordination. BER was similarly involved in forming the Midwest Invasive Plants Network to better coordinate efforts among states.
- Education and outreach, including work with UW Extension, WDNR's Communication and Education Program, nature centers, schools, non-profit organizations, and many others to develop and distribute informational materials, give presentations, lead field trips, conduct radio interviews, develop websites, and organize conferences.

- Developing policy and guidance, budget and grant proposals, and participating in the rulemaking process.
- Initiating coordination among inventory and monitoring projects that collect invasive plant information. A workshop was held, and an initiative begun with the University of Wisconsin-Madison Herbarium to manage and share these data. Through IPAW, a standard data form was developed and endorsed by partners.
- Working on a prevention program, in cooperation with the University of Wisconsin-Madison Herbarium and others, to implement an early detection project for harmful plants not yet present in the state.
- Managing invasive plant infestations on some state properties, particularly State Natural Areas, as resources become available from general land management funding, grants, or volunteer efforts.
- Maintaining a list of research needs, keeping in contact with the research community, and distributing research information as it becomes available.

### **Models for an Invasive Plants Program**

One question posed during interviews was, "Can you think of an example of a program similar to this within or outside of DNR that you feel could be used as a model for an invasive plants program?" The program most often identified was the WDNR Forest Health Protection Program (FHPP).

The FHPP is a long-standing program within Division of Forestry. The program was initiated as the Forest Pest Control Unit of the Wisconsin Department of Conservation shortly after the Forest Pest Control Act of 1957 was passed. The FHPP cooperates with DATCP, USDA Animal Plant Health Inspection Service (APHIS) and the USDA Forest Service to prevent introduction, detect new occurrences, monitor spread, and manage populations of harmful insects and diseases in Wisconsin's forests, including both native and non-native species. It assists cooperating agencies with the development and implementation of surveys. It conducts management trials on established populations, and monitors areas where management activities for established insect or disease pests have occurred. It provides a conduit of information to and from the public and other state and federal agencies as new occurrences of pest species are reported. Management recommendations for forest pests are frequently integrated into forest management plans on state and private forestlands. Forest health specialists present biological and management information to land managers through annual workshops.

The FHPP is active in two major areas, including the Cooperative Gypsy Moth Program, and the Survey, Detection and Management Program.

The Cooperative Gypsy Moth Program is a joint effort between DATCP and WDNR. WDNR employs a gypsy moth statewide program coordinator, three full time regional gypsy moth suppression coordinators and four LTE's working on public information, education and suppression program support. This effort includes managing a spray program, developing forest management recommendations, training a wide variety of internal and external partners, public outreach, and oversight of a research component in cooperation with the University of Wisconsin.

The Survey, Detection, and Management Program is another function of the FHPP. Over the past five years, emphasis has shifted from native forest health issues to invasive and exotic insects and diseases. Five regional forest health specialists, one forest pathologist, and three LTE's annually conduct detection and monitoring surveys to determine where various exotic species are located and what impact they are having on the health status of the state's forests.

Structurally, the FHPP is housed within the Division of Forestry, Office of Forest Sciences. Its authority is set forth in Statute 26.30. It has nine FTE's with skills and backgrounds in either forest pathology or forest entomology, located in Spooner, Rhinelander, EauClaire, Green Bay, and Madison. Three of the positions - the forest health protection coordinator, the gypsy moth coordinator, and forest pathologist - have statewide responsibilities, while the other positions work within regions. Several LTE's assist the program at various locations as needed. The FHPP conducts annual work planning sessions to prioritize that year's efforts, and also prepares an annual report describing the program's activities and findings.

## **Potential Partnerships**

Interview respondents suggested a number of potential partners that could work cooperatively with Forestry Division to provide a greater benefit to the public. One of these was the Bureau of Endangered Resources, whose current roles have been discussed above. Other potential partners identified as particularly important were the County Land Conservation Departments (LCDs), and University of Wisconsin-Extension (UWEX), which are described here. Descriptions of several other potential partner programs are found in Appendix E.

### *The Wisconsin Land and Water Conservation Association and County Land Conservation Departments as Potential Cooperators*

The Wisconsin Land and Water Conservation Association (WLWCA) is a nonprofit, umbrella organization representing Wisconsin's 72 County Board Land Conservation Committees (LCCs) and Departments (LCDs). Their mission is "to assist Land Conservation Committees and Departments with the protection, enhancement and sustainable use of Wisconsin's natural resources and represent Land Conservation Committees and Departments through education and governmental interaction." It is our recommendation that any effort to create a statewide exotic plant management program – within the forestry division or beyond – should include consultation with WLWCA regarding potential partnering efforts that could be developed with their assistance.

Wisconsin's Soil Conservation District Law - Chapter 92 of the Wisconsin Statutes - was enacted in 1937. During the 1940s and 50s, most Wisconsin counties formed Conservation Districts governed by the Agriculture and Extension Education Committee of the County Boards. However, Chapter 92 was amended in 1982 abolishing Conservation Districts and requiring each county to create a committee to oversee former Conservation District activities. Today, these districts are known as Land Conservation Committees (LCCs). About 450 LCC members have the responsibility of developing and encouraging adoption of local programs aimed at conserving our soil, water and natural resources.

As mentioned, all county governments in Wisconsin include a LCC that oversees local, state, and federal land and water resource conservation programs that are active in their particular county. Though the specific activities undertaken in each county differ, LCCs are generally charged with administering and implementing agricultural conservation projects and the farmland preservation program – most of which were substantially developed and/or funded by other government entities. Historically DNR, DATCP, and other agencies have partnered with county LCCs and LCDs to successfully deliver several agricultural conservation and water quality programs, including the Priority Watershed Program. In recent years, many LCDs have expanded their role in county government and have become involved in non-metallic mining ordinances, land use planning, urban stormwater management, and other resource issues. A few LCDs (e.g. Dane County) have also become involved with information and education efforts for exotic species – both aquatic and terrestrial.

An opportunity may exist to involve LCDs as partners in some elements of an invasive plant program. LCDs may be particularly well suited to assist if the program is developed to include efforts on private lands and/or if the program makes a comprehensive effort to include terrestrial and aquatic invasive species. Some LCDs already employ staff with knowledge or expertise on invasive species. Other LCDs may be interested in hiring staff for invasive species work if funding is made available. Information/education, invasive plant distribution surveys, as well as technical assistance to landowners who want to control invasive plants are potential services that could be provided in this manner.

### *University of Wisconsin - Cooperative Extension*

The UWEX conducts programs that provide outreach and education throughout the state. The Agriculture and Natural Resources program utilizes partnerships of University faculty, staff, and representatives from farm organizations and agricultural industries. Jointly, these teams develop educational programs in agriculture and natural resources.

In addition, UWEX programs in Community, Natural Resource and Economic Development (CNRED) help Wisconsin communities deal with their own challenges including resource constraints, growth management, environmental protection and the quality of life. Natural resource and environmental educators work with teachers and students, environmental and conservation groups, and businesses that rely on the state's natural amenities. Embedded within UWEX and CNRED are statewide self-directed issue teams working on

natural resources. Two teams that the WDNR could partner with include the Forestry and Invasive Species teams.

The Forestry Team works in cooperation with both statewide and local partners to develop and deliver educational materials on forest use and management for Wisconsin's forestry community. Programming focuses on woodland owner education, professional and leadership development for foresters, and education surrounding efficient use of forest resources for industries within the state. This role could be expanded to include providing information on invasive plants found in Wisconsin forests.

The Invasive Species Team addresses issues related to terrestrial and aquatic invasive species in the state. The team has done this by building a network within and outside of Extension to coordinate educational programming, and the sharing of research and learning tools. Like the Forestry Team, the Invasive Species Team could be an excellent partner in the WDNR's continued efforts to confront the invasive plants problem.

Another potential partnership lies in the Environmental Resources Center (ERC). ERC, in collaboration with UWEX, promotes informed decision making on resource issues by working in partnership with individuals, community leaders, and resource professionals to develop and deliver research-based educational programs and materials.

UWEX has offices in each county of the State, which could provide the WDNR with an opportunity to partner with them on education and outreach for invasive plants. The role of these county offices is to conduct educational programs in cooperation with the University of Wisconsin. County UWEX offices are a part of county government, established by county boards under Wisconsin Statute 59.56. The statute provides a framework for partnerships among USDA, land grant universities, and county governments.

Other programs in WDNR (e.g. Aquatic Invasive Species Program) have partnered with UWEX to achieve mutual goals. WDNR provides partial support for a position that accomplishes outreach under the auspices of UWEX.

#### Wisconsin Woodland Owners Association (WWOA)

The Wisconsin Woodland Owners Association, Inc. is a nonprofit educational organization established in 1979 to:

- Advance the interests of woodland owners and the cause of forestry.
- Develop public appreciation for the value of Wisconsin's woodlands and their importance in the economy and overall welfare of the state.
- Foster and encourage wise use and management of Wisconsin's woodlands for timber production, wildlife habitat and recreation.
- Educate those interested in managing Wisconsin's woodlands.

WWOA has a number of active committees. They include:

- The Education Committee, which works on expanding the educational efforts of WWOA, including encouraging financial support for programs such as Project Learning Tree, Trees for Tomorrow, and the Arbor Day Writing Contest.
- The Finance Committee, which develops financial policies and monitors budgets, and also assists the Treasurer in making recommendations to the Board on the annual budget.
- The Legislative Committee reviews proposed state and federal legislative issues that have the potential to affect private woodland management. Legislators are invited to address the committee on such issues. The committee makes recommendations to the Board and writes newsletter articles to keep the membership informed.
- The Marketing Committee stays informed on products, local markets, timber prices, trends, and other issues related to marketing timber.
- The Membership Committee encourages active woodland owners to join WWOA, making the organization more effective in encouraging woodland stewardship throughout Wisconsin.
- The Publications Committee produces the quarterly '*Woodland Management*' newsletter for the WWOA membership.

- The Science Committee stays informed on issues related to forest management, including tree genetics, diseases, new management techniques, and chemical use, and prepares articles on these topics for 'Woodland Management'.

WVOA has 14 local chapters in the state which sponsor field days and informational meetings on local forest issues and management techniques. Many Chapters have already been involved in invasive plants issues, highlighting plant identification and control techniques at chapter meetings, and viewing problem areas and treatment sites at field days. If DNR Forestry had the capability and expertise to participate more fully in WVOA training sessions, there would be many opportunities to reach forest landowners with information, and to encourage early detection of invasives. Also, there is likely a possibility for including articles in 'Woodland Management' and communicating with the Science Committee on new developments in the effort against invasive plants. The Legislative Committee could also be involved in developing and reviewing proposed legislation and administrative rules.

The Wisconsin County Forest Association, Inc. (WCFA)

The WCFA was established in 1968 to provide a forum for consideration of issues and policies common to the County Forestry Committees who are responsible for County Forests. The association also provides leadership and counsel to County Forest administrators and forestry committees through regular meetings and active committees on legislative and recreational issues. The organization has been effective in unifying the efforts of the individual County Forests and promoting sustainable forest management.

The WCFA is a non-profit association incorporated under Chapter 181 of the Wisconsin Statutes. Members are elected County Board officials who serve on their respective County Forestry Committees. WCFA members meet annually in November. Ten delegates elected by the membership serve on the WCFA's Board of Directors, who meet quarterly. In addition, an Executive Director provides communications and administrative services to the association, maintaining records and an office, and serving as a spokesperson.

The WCFA currently represents 29 county forestry programs that collectively manage 2.35 million acres of forest land, primarily in the northern and west central parts of the state. This represents over 40 percent of all public land, making the County Forests the largest public landholder in Wisconsin.

WCFA and WDNR-Forestry Division have been partners in forest management for many years. WCFA members serve as members of WDNR's standing teams, including Public Lands, Silviculture, and Prescribed Fire. WDNR foresters are assigned responsibilities in each county and work cooperatively with county-employed foresters. In addition to technical assistance, the DNR provides aid payments and a number of grants and loans to the counties to assist in forest management. These cooperative relationships could be utilized to further partner with County Forests on invasive plant management activities, including education and outreach within county government, and active control on county lands. It may also be an avenue to help develop broader partnerships that involve many agencies, organizations, and citizens at the local level, where pooling resources for important projects can contribute to greater effectiveness.

Other potential partners

In addition to the potential partnerships described above, Forestry Division would continue to partner with the Bureau of Endangered Resources and other invasive species programs within the Department, as members of the WDNR Invasive Species Team and as cooperators in a variety of projects. Many additional partnerships are possible, some at the local level, and some possibly more project-oriented or short-term. Some of these potential partners - the Invasive Plants Association of Wisconsin, Natural Resources Conservation Service, Farm Service Agency, and Cooperative Weed Management Areas - are described in Appendix E. These opportunities should be further investigated as the invasive plants program develops.

## 8. Alternatives for an invasive plants program in Forestry

### Functions

Functions that interviewees identified as integral to an invasive plants program were used as a way to begin the process of prioritizing and determining what services could be provided through alternative program structures. These functions are:

- Information that's easy to access
- Field demonstration areas
- Technical assistance
- Training
- Improved information exchange
- Occurrence mapping
- Strategic management (early detection and rapid response)
- Policy recommendations
- Control (in some cases)
- Cost-sharing (via WDNR funding)
- Biocontrols
- Applied research
- Forest management guidelines to reduce spread.
- Internal respondents emphasized surveying and monitoring, information exchange, and education

### Alternatives

1. No-action alternative

In the no-action alternative, functions would stay as they are now. Forestry has one “contact person” for invasive plants. This role is not widely publicized because it is not possible to accommodate the workload it would generate. A major task is participating in policy development as part of WDNR teams and in support of the Wisconsin Council on Invasive Species. Many of Forestry’s field staff are involved in educational activities, and some conduct control activities, but we do not have information on how much of this activity is occurring. The NOR Forest Ecologist/Silviculturist also spends a significant amount of time working on this issue. In addition, Forestry benefits from services provided by BER, including education, information sharing, and guidance. If this Alternative is selected, we recommend that existing roles should be formalized in position descriptions.

2. Low-level alternative

- This alternative would include one full-time contact person. This person would have the title of ‘Invasive Plants Program Coordinator’, and the position would reside within the FHPP.
- Policy development would be a major role for the Coordinator at this level; the person would work closely with Division Administrators, WDNR invasive species teams, and the Wisconsin Council on Invasive Species.
- The Coordinator would be assisted by two half-time LTE positions. One would focus on education and training, with internal staff and important partners being the highest priority initially. Another LTE would focus on coordinating inventories and data sharing.
- An invasive plants “working group” would be formed, modeled after the State Forests working group. It would assist in long-term and annual work planning and budgeting; development and review of policies and guidance; proposing improvements in practices; providing assistance to special studies or the work of specialist teams; and addressing other invasive plant issues that may arise.
- Program services at this level would focus on networking, relying heavily on partners and information sharing. A Forestry invasive plants web page, analogous to the FHPP page, would be an important tool.
- Important partners would be those who play a major role in education and networking, including BER, UWEX, LCDs, IPAW, and NRCS. The program would also seek to form partnerships with private woodland owner groups such as WWOA.

- The Coordinator would provide information to field foresters, coordinate training sessions, work with partners, maintain contacts with researchers, and apply for a limited number of grants. Only a relatively low level of activity would be possible in most of the functions.
- The FHPP network would be used to disseminate information.
- Costs for this alternative would be approximately \$85,000 annually for salary, travel, and materials.

3. Mid-level alternative

- In addition to a coordinator and the program elements listed above, adjust position descriptions for existing staff members to provide the equivalent of ½ FTE per region. Since some of the smaller regions have few resources, there is less flexibility to make these adjustments within the region. For these cases, it may be necessary to review workplans and consider adjustments from other parts of the state. With the Division's changing emphasis toward public land management, there may be flexibility in positions in parts of the state that have little public ownership.
- Regional staff would provide field assistance, develop demonstration sites, conduct training, coordinate occurrence mapping, conduct strategic planning in cooperation with property staff, and provide education and outreach. They would also serve as members of the Invasive Plants working group.
- The Coordinator, with assistance from regional staff, would develop and administer cost-share programs. This role would be integrated with WFLGP. Federal funding would be sought. The FHPP may be a model in this area.
- Partnerships would be sought at a local level, with groups that have an organizational structure in counties or regions within the state, such as Basin Educators, LCDs, CFA, and UWEX. These partnerships would allow sharing of technical expertise and resources at the local level. Coordination with local chapters of private organizations would be another goal of this program. Also, cooperative relationships could be fostered with county transportation departments, community colleges in some locations, and environmental education centers. Northland College may have a partnership role in northern Wisconsin.
- There is a need for science and education roles in an invasive plants program, but at this level there is not sufficient staffing to devote much effort to research and monitoring. The Coordinator could encourage research and monitoring, and possibly help set up pilot projects that others would be responsible for.
- Costs for this alternative would be approximately \$260,000 annually for salary, travel, and materials. Additional funding for monitoring, early detection, eradication, and control activities would be appropriate at this level, as guided by strategic plans. A staff of this size may be able to effectively administer \$500,000 of funding for forested state land management, and a similar amount for cost-share programs.

4. Mid-high level alternative

- This alternative would be similar in structure to the FHPP. It would include three statewide staff, including an overall Coordinator who would deal primarily with policy and regulations. Another staff person would handle training, education, and public information. The third staff member would be in charge of work on science-related tasks, including data management, partnerships with research, disseminating research results and other scientific information, preparing grant proposals for research and management studies, conducting silvicultural trials, and assisting in the development of biocontrols).
- The education coordinator could be located within Forestry Division, or in C&E such as the gypsy moth outreach position, or within UWEX (similar to the partnership with the aquatic invasives program).
- A statewide position to coordinate biocontrols is needed at this level, including coordination with researchers, making arrangements for data collection and field testing for new biocontrols, and implementing a release program for biocontrols that are available. Forestry should partially support such a position, to be housed in the Research Bureau.
- One staff member in each region would provide field visits, technical assistance, demonstration plots, training, occurrence mapping and data summaries. Regional staff would also pursue local partnerships as described in the mid-level alternative.

- At this level, the Invasive Plants working group could be expanded, with subcommittees identified to work specifically on education, prevention/eradication, improving forest practices, or other topics that warrant additional effort.
- Program funding for implementation would be needed (e.g., equipment and services for control). Grants could be sought from federal sources and foundations; possibly also from forest industries, chemical companies, or recreation organizations.
- Research could occur in partnership with universities, and through pilot projects. Long-term monitoring plots could be established on forested state lands. Research topics identified through the Governor's Conference on Forestry could be addressed through this program in cooperation with universities, Forest Service Research Stations, and other research institutions. Topics include:
  - Assess the invasiveness potential of plants and insect species that are known to be invasive in similar environments, but not yet present or widespread in Wisconsin.
  - Continue researching methods for controlling or mitigating the effects of invasive species, including biocontrol development and the use of integrated pest management techniques.
  - Investigate the role of travel corridors such as power lines, ATV trails, logging roads, etc. in the spread and establishment of exotic plant species and develop recommendations to reduce the spread of exotics.
  - Research and document the economic, silvicultural, and ecological effects of exotic plant, insect and disease infestations in Wisconsin.
  - Develop silvicultural techniques for regenerating forests where invasive plants are already well-established. (Note: a more extensive list of research needs is found in Appendix G.)
- The program would seek to partner and provide input on federally-sponsored research efforts, such as those conducted by Forest Service research stations.
- Costs for this alternative would be approximately \$555,000 annually for salary, travel, and materials. A relatively high level of funding for monitoring, early detection, eradication, control activities, and research would be appropriate at this level, as guided by strategic plans. A program at this level may be able to effectively administer \$1,000,000 of funding for forested state land management, and a similar amount for cost-share programs. Research and field trials to address priority topics would be funded from multiple sources; the state would be looked to by partners to provide a portion of the funding. The total cost for this program would be approximately \$3 million. Ideally, much of this funding could come from other sources.
- Although the program elements for this mid-high level alternative would be very expensive, even this program would not likely be able to fully address the invasive plants issue through meaningful actions, such as:
  - Monitoring all lands managed by Forestry Division for the early arrival of species we know will be extremely damaging, and eradicating them before they become established and begin to spread widely.
  - Providing substantial support for development of biocontrols for plant species that are already widespread and abundant.
  - Slowing the spread of damaging invasives that are already present, to expedite the effectiveness of biocontrol agents when they become available.
  - Keeping natural areas and other reference areas free of invasive plants.
  - Treating established infestations when necessary for regenerating trees, protecting investments, or to attack source areas where invasives can be greatly spread by human or animal activity (e.g. trailheads).
  - To fully accomplish monitoring and control activities on forested state lands, in addition to providing services and outreach to private and county lands, and supporting research, would require a program of approximately \$5 million.

5. Full, ideal statewide program

- This alternative would involve much broader participation than Forestry Division. Developing the details of how this program would function would require a different team, with representation from all WDNR Divisions and from other state agencies.
- This alternative would provide all the functions noted above, but at a higher level and with greater integration than can be provided by a Forestry Division program.
- DATCP, DOT, Tourism, Commerce, and UWEX should be represented in program development. Funding and staffing would be located in several agencies.

- A statewide program would link to the Wisconsin Council on Invasive Species and fulfill requirements of the Invasive Species Statute.
- Functions that the study team suggested would be addressed at this level include:
  - A “citizen monitoring” program, incorporating quality control mechanisms. A website would be developed to allow individuals to self-report occurrences of invasive plants, and follow-up with voucher specimens or photographs. A central location would store and maintain data, and make information publicly available over the Internet.
  - Development of statewide policy and recommendations for consistency in agency activities (e.g. equipment cleaning).
  - Support for CWMA’s; coordination at the local level would be provided through them.
  - A greater level of coordination with local organizations, such as Friends groups.
  - Additional data collection via agencies’ inventory and monitoring programs, and citizen monitoring.
  - Strategic planning, which would be enhanced at all levels and integrated among WDNR Divisions and other agencies.

## **Recommendations**

The study team favors the eventual adoption of a full statewide program as briefly described in Alternative 5. Because this would be a broader program than Forestry Division, we recommend that the WDNR Leadership Team take up the issue of developing such a program to strategically manage all invasive species across programs.

The team also recommends that Forestry Division develop its own invasive plants effort for the immediate future. Forestry Division is already nearly at Alternative 2, the low-level alternative, due to recent developments in staffing and funding. We recommend that Forestry Division move toward implementing Alternative 3, the mid-level alternative. The rationale for this recommendation is that Alternative 3 provides the minimum level of resources that would be needed to initiate action at the local level. While Alternative 2 is important in developing a policy framework needed for prevention and strategic planning, it does not provide the capability to foster local partnerships and organizations, conduct outreach in counties and municipalities, and implement control and restoration activities in cooperation with local partners. Alternative 3 is a level at which citizens and local organizations could be engaged to recognize invasives and eradicate them on their properties before they become widespread and virtually uncontrollable.

Implementation of the mid-level alternative could begin at once, by adjusting responsibilities of FTE's in regions. As the Division moves toward emphasizing management on public lands, there may be flexibility in positions in parts of the state that are dominantly in private ownership. Additional funding needs identified in the mid-level alternative could be forwarded as budget initiatives for 2007-2009.

Over the longer term, we recommend that Forestry Division work toward Alternative 4, the mid-high level alternative, which includes a significant effort in partnering with research. We believe that the development of new biocontrols and silvicultural methods are essential to the long-term success of our efforts against invasive plants. This alternative also provides additional capacity for local partnerships, outreach, and management of existing infestations.

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## **Appendices**

- A.** Members of the Invasive Plants Program Feasibility Study Team
- B.** Groupings for interviewees
- C.** Location map of interviewees
- D.** Full text of interview results
- E.** Description of additional roles and partners
- F.** Full text of Statutes and Administrative Rules
- G.** List of research needs
- H.** List of future invasives
- I.** Cost-share program descriptions
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- K.** Education team survey of regional foresters
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- N.** Costs of buckthorn control on Kettle Moraine State Forest
- O.** Extent of buckthorn in 1996 based on Habitat Type survey at FIA plots
- P.** Description of FIA invasive plants pilot study
- Q.** Updates