Eastern Upper Peninsula Cooperative Weed Management Area Strategic Plan

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INTRODUCTION

Invasive plants threaten the integrity and economic value of the ecosystem by reducing biodiversity, displacing native plants, damaging wildlife habitat and reducing their food sources. Resulting in decreased land productivity and diminishing aesthetic values of the land. Annually, invasive species cost society millions of dollars in lost revenues or redirected economic resources.

Cooperative efforts among federal, state, tribal, local and private organizations and land managers are recognized as the key to accomplishing successful control of invasive plant species. The Eastern Upper Peninsula Cooperative Weed Management Area (EUP CWMA) is composed of interested agencies, organizations, and other groups through a signed cooperative agreement, referred to as the Memorandum of Understanding (MOU), which formally recognized the organization and intent of the group.

The EUP CWMA was convened in 2010 under an agreement between the Hiawatha National Forest (HNF) and the Chippewa East Mackinac Conservation District (CEMCD) using Great Lakes Initiative Restoration funds from the Environmental Protection Agency.

The following plan outlines the strategic approach with an emphasis on education, early detection, and rapid response to coordinate and implement best management practices in controlling specific invasive terrestrial and aquatic plant species in the Eastern Upper Peninsula. This plan is intended to bring together those responsible for weed management within Chippewa, Mackinac and Luce counties. The partners will develop common management objectives, set realistic management priorities, facilitate effective treatment, and coordinate efforts along logical geographic boundaries with similar land types, use patterns, and problem species. (see Appendix C)

PURPOSE

The purpose of the Eastern Upper Peninsula Cooperative Weed Management Area is to work cooperatively with partners and others to control or eliminate non-native invasive plants from significant places on the landscape, prevent new introductions and to communicate why this is important to the public.

EUP CWMA PARTNERS

The EUP CWMA recognizes the importance of cooperation among all stake holders. The purpose of the Memorandum of Understanding (MOU) is to establish and formalize a cooperative effort for the integrated management and control of invasive terrestrial and aquatic plant species across jurisdictional boundaries in Chippewa, Luce and

Mackinac Counties, and thus create the Eastern Upper Peninsula Cooperative Weed Management Area (EUP CWMA).

The EUP CWMA will actively recruit new participants in its activities and target non-participatory portions of the EUP CWMA community in education and outreach activities. (See Appendix A for a complete list of partners)

All interested parties are encouraged to sign the Memorandum of Understanding (MOU) as a Signatory to become a part of the EUP Cooperative Weed Management Area and actively participate in the EUP CWMA. Additional parties may, and are encouraged to, be added to the CWMA at anytime.

PARTNER ROLES AND RESPONSIBILITES

- Meet as a member of the EUP CWMA at least once annually to review and coordinate invasive species management activities. Strategies and priorities will be established based on the non-native invader species and their potential for further spread and subsequent damage.

- Allow for the exchange of personnel, equipment, supplies, and/or contract crews throughout the EUP CWMA.

- Seek and allow any participants to contribute to the management of non-native invasive species within the EUPCWMA through education programs, research, inventory and monitoring, grants and fundraising, and citizen's participation programs.

- Elect to manage invasive species within their own jurisdiction in whole or part through either utilizing the EUP CWMA or utilizing their own personnel, equipment and supplies.

- Assist in mapping current infestations and advising the EUP CWMA of new infestations.

- Insure management of invasive species will be integrated and incorporate effective and safe control measures. Integrated control measures may include prevention, education, awareness programs, mechanical and manual methods, biological controls, plant competition, fire and herbicides.

- Annually coordinate weed management activities, which will be documented each year in an Annual Operating Plan. These activities will implement the Strategic Management Plan.

- Share information among interested Parties and provide assistance and expertise regarding invasive species management (e.g. control methods, prevention measures, restoration tools, standardized data collection, etc.) on their lands and waters.

- Provide opportunities to outside interest groups, private landowners, and the public for involvement in carrying out weed management on lands and waters within the EUP CWMA.

STEERING COMMITTEE

The purpose of the Steering Committee, on behalf of the MOU partners, is to provide direction, identify opportunities, and further the goal of cooperative invasive plant management. The Steering Committee will assist the partners by preparing alternatives for group deliberation. Steering Committee meetings will be open to all partners. The Committee will have up to 9, but not fewer than 5 members. Serving as a member of the Steering Committee is voluntary. The members will serve 2-year terms.

Steering Committee members will be nominated, including self-nominations, every 2 years during an annual spring meeting of the partnership. If more than 9 members are nominated, a vote will be taken. Only 2 representatives from a signatory group (of the MOU) may be on the Steering Committee at the same time.

Decisions made by the Steering Committee, or made by the EUP CWMA partners will be made by consensus where possible. If not, a simple majority vote will be used for decision-making. In the case of the Steering Committee voting, there will be one vote allowed per member. In the case of the EUP CWMA partners, there will be one vote per signatory group (one vote per each signing agency or organization).

If a Steering Committee member cannot complete his/her full 2-year term due to illness, leaving the area, or any other reason, the member should notify the CWMA coordinator. At the next regularly scheduled meeting of the EUP CWMA partners, nominations for a new Steering Committee member to fill out the term of the departing member will be solicited.

In addition to the Steering Committee, sub committees will be formed to complete tasks such as creating and reviewing documents, or portions of documents (MOU, strategic plan), developing educational materials, developing programs for early detection and rapid response (EDRR), developing management zones, and other tasks as the partners see fit.

The Steering Committee will meet as often as necessary to carry out their duties.

FUNDING AND ADMINISTRATION

Funding is anticipated to be primarily through competitive grants and gifts. Required matching funds may be provided by individual Partner funds, volunteer hours or other available sources and any combination thereof. Funds will be administered through the Chippewa/East Mackinac Conservation District (CEMCD), a Signatory member. The EUP CWMA will retain a coordinator to facilitate projects towards the achievement of goals set forth by the CWMA partnership.

Partners will communicate with other partners about grants and/or funds they plan to seek and look for opportunities to collaboratively write grants. Strong fiscal management policies will continue to build the CWMA's program capacity and maintain continual operation of the EUP CWMA for long term success in weed management.

Partners are asked to attach dollars (or resources needed) to the annual work plan as part of tracking for future grants and administration.

COORDINATOR

The Coordinator of the EUP CWMA supports the communication and collaboration of a large number of diverse partners including local, state, tribal and federal agencies, as well as private organizations and individuals. The Coordinator will work with the partners in the effort to control invasive species and educate the public as to their impacts on the ecosystem. The Coordinator will plan and facilitate all EUP CWMA meetings, workshops, and workdays. The Coordinator will complete and submit all necessary paperwork and reports in a timely manner.

REGIONAL COORDINATION

The EUP CWMA will cooperate with larger special interest groups such as the Midwest Invasive Plant Network and others as pertinent. The EUP CWMA will cooperate with adjacent weed management areas.

EUP CWMA GEOGRAPHIC DESCRIPTION

<u>Ownership:</u>

The EUP CWMA encompasses 2,297,786 acres or 3,590 square miles.
Total Chippewa County acres 1,017,728

Total Luce county acres is 582,120

Total Mackinac County acres is 698,938

- 42,624 acres of water
- 100 miles of great lakes shoreline
- 36 islands with Bois Bland being the largest at 25,000 acres
- 570,000 Forested
- 13% farming, urban and residential

Total Bay Mills Tribal ownership in the EUP Reservation/Trust land 3,225 acres

- Whitefish Bay Reserve 77,170 acres
- Waishkey Bay 1, 500 acres
- Inland Lakes 72.5 acres
- Streams/Rivers 5 miles
- Wetlands 1,085 acres
- Wetland Preserve 460 acres
- Shoreline (Great Lakes & inland) 5.16 miles
- Forestland 1,653 acres, Ash Preserve 10 acres
- Low Density Residential 250 acres
- Governmental (Tribal Center, etc.) 10 acres
- Commercial (Casinos, etc.) 37 acres
- Golf Course 220 acres.

Total Sault Tribe ownership in EUP in acres:

- Chippewa County 1276.78 acres
- Luce county 16.42 acres
- Mackinaw County 301.92 acres

Total Hiawatha National Forest in the EUP approximately 400,000 acres

Total State ownership in the EUP 677,500 acres.

<u>Public Facilities in the EUP:</u>

4 State Parks
3 Fish Hatcheries
1 State Forest
1 National Forest
1 National Wildlife Refuge

The Eastern Upper Peninsula (EUP) CWMA is characterized by a relatively flat topography, with large expanses of open peat lands and forested lowland swamps. Today, the majority of the landscape is still forested, except for highly productive agricultural or pastoral lands occurring on ground moraines and the clay lake plain in the eastern most part of the peninsula (Albert, 1995).

Within the EUP CWMA the climate can be generally characterized as cooler as and more variable than Lower Michigan, and compared to areas of equal latitude in the state, the winters are warmer and the summers are cooler. Lake effect snow and rain are characteristic near the Great Lakes shorelines, especially Lake Superior, and because of this influence the EUP CWMA has more evenly distributed rainfall.

Intensive logging, beginning with white pine in the late 1800's then moving to hemlock, northern hardwoods, and other species has resulted in major changes in forest types and composition in the EUP. According to Albert's Regional Landscape Ecosystems of Michigan 1995, Pre-European settlement vegetation (Circa 1800) consisted of diverse forests, including northern hardwood forest, jack pine barrens, white pine-red pine forest, hardwood- conifer swamp, conifer swamp and muskeg. Where bedrock was exposed at the surface, grassland communities were present, and extensive Great Lakes marshes were dominant along the shoreline. Wind throw and fire were common and important natural disturbances on the landscape.

Ecologically significant communities within the EUP CWMA include Alvar, which is a globally rare grassland plant community growing on thin soils over limestone or dolomite. Other state and globally significant communities include patterned fens, Great Lakes marsh, wooded dune and swale complex, caves of karst origin and cobble beaches.

Associated geological landforms of significance include the Niagara escarpment, Tahquamenon Falls, and the Mackinac breccia formation of Castle Rock. Animal species of conservation concern in the EUP CWMA include the gray wolf, bald eagle, osprey, common loon, red-shouldered hawk, Lake Huron locust, moose, lake sturgeon and yellow rail. Plants of conservation concern include Michigan monkey flower, Lake Huron tansy, Pitcher's thistle, Dwarf Lake Iris, Houghton's goldenrod and butterwort to name a few. In addition, the forests of the EUP CWMA are recognized as critical habitat for Neotropical migratory songbirds (Albert, 1995) and the area of Whitefish Point in particular a large migratory bird pathway.

Abundant groundwater resources in the EUP produce high quality trout streams, springs and unique wetland types. Numerous inland lakes, kettle holes and warm water streams are interspersed throughout the landscape. In addition, the EUP CWMA is the only region in the state that is bordered by three of the Great Lakes- Huron, Michigan and Superior.

The extensive forests of the EUP CWMA are managed as either national or state forest, with large areas of private forestland. Private forestland includes commercial forest operations as well as individual land ownership. It is all of our responsibilities as land managers, landowners and stewards to ensure the sustainability of the EUP CWMA natural resources for present and future generations.

GOALS AND OBJECTIVES

The primary goal of the EUP Cooperative Weed Management Area is to prevent the introduction, slow the spread, and suppress infestations of non-native invasive weeds in the three Eastern Upper Peninsula counties of Michigan.

The four main objectives will fulfill these goals:

1. To identify the locations of invasive plant species throughout the area for cooperative and comprehensive management efforts.
2. To educate targeted audiences regarding identification and control methods, preventing the spread, and early detection of non-native invasive plant species.
3. To develop and implement a practical and convenient reporting and monitoring system.
4. To use an integrated approach to manage current infestations.

OBJECTIVE 1: To identify the locations of invasive plant species throughout the area for cooperative and comprehensive management efforts.

A. Mapping

Protocol forms have been developed to document occurrences that will create a unified database of invasive species within the Eastern Upper Peninsula, in partnership with the Midwest Invasive Species Information Network (MISIN). These mapping protocols will assist partners within the EUP CWMA in documenting the existing infestations, new occurrence infestations, prioritized management efforts, and track spread of invasive plants across the three county areas (Chippewa, Mackinac, and Luce Counties). The data we collect will allow us to develop and implement effective control strategies. (See Appendix B)

B. Survey Documentation

All information about invasive species occurrences will be documented using accepted protocol. All locations will be recorded using latitude and longitude data. (See Appendix B for all mapping documents)

OBJECTIVE 2: To educate targeted audiences regarding identification and control methods, preventing the spread, and early detection of non-native invasive plant species.

A. Education/Awareness/Outreach

Education is essential to the success of EUP CWMA. While non-native invasive plants should be everyone's concern, not everyone is aware of the problem. Only when the public is aware and educated can they provide valuable assistance in reducing the impact of non-native invasive plants in the EUPCWMA. The EUPCWMA will distribute information in many forms to educate the general public and provide specific information to target audiences about the impacts of invasive plants and their roles and responsibilities.

The EUPCWMA will work with members to promote educational and training activities and will provide:

- Workshops for members and others on invasive plant identification, treatment methods, and landscape alternatives.

- Website with map; interactive so public can post sightings---for vetting and removal if appropriate.

- An on-line forum to communicate learning opportunities and workdays within the CWMA.

- An electronic newsletter e-mailed to members and others to share new invaders, funding opportunities, workdays, etc.

- Video/slide shows.

- Workshops and educational materials to target education and removal of exotics promoted in years past for wildlife or cover, i.e. Autumn Olive, Scotch pine.

- Displays at trail heads and in chamber of commerce buildings.

- Noxious weed identification kiosks and placards.

- Printed literature and identification workshop on native plants.

- Youth education, so that elementary-aged children understand the difference between native plants and non-native invasive plants.

- Targeted groups that have been identified are: outdoor users, landowners and land managers, decision makers, and landscapers/nurseries. Each group has unique interests and needs; therefore education and outreach to each will be tailored to the group.

B. Prevention

While citizens may be environmentally aware, they may not be conscious of how human activities spread non-native invasive plants. Prevention measures in communities can dramatically curtail the expansion of invasive plant infestations. The EUPCWMA will work to:

- Educate landowners to not purchase non-native invasive plants (buy native species instead).

- Educate nurseries about the problems that result from selling non-native invasive species.

- Collaborate with other organizations to develop and distribute Best Management Practices to prevent the introduction and spreading of invasive species.

- Establish prevention methods at key sites (boot scrubbers at trail heads, boat wash stations, etc.)

- Create a Clean Boat Initiative.

- Create a native seed bank and promote the establishment of native plants instead of non-native invasives.

C. Early Detection/Rapid Response

Early detection and rapid response (ED&RR) efforts increase the likelihood that invasions will be addressed successfully while populations are still localized and population levels are not beyond that which can be contained and eradicated. Once populations are widely established, all that might be possible is the partial mitigation of negative impacts. In addition, the costs associated with ED&RR efforts are typically far less than those of long-term invasive species management programs.

The EUPCWMA will:

- Form early detection networks based on weed management zones.
- Create rapid response teams in each of the weed management zones that will verify identification, assess each site to determine if rapid response is warranted, determine method of treatment, and develop site plans.
- Form a mechanism to rapidly respond to priority invasive species infestations.

OBJECTIVE 3: To develop a practical and convenient reporting and monitoring system.

A. Reporting system

The EUP CWMA will implement a reporting system which will be used region wide and allow for integration into state and national reporting systems.

B. Monitoring and evaluation programs

The EUP CWMA is developing and implementing a monitoring and evaluation process with help from our MOU partners and others working on this in the State of Michigan. The monitoring and evaluation process will include:

- A multi-year plan for monitoring treated sites and results reported in the EUP CWMA database and MISIN websites.

- An evaluation of the effectiveness of treatments, to determine if the treatment is working and if further treatment is necessary.

- Standardized monitoring and evaluation forms for all partners.

- Sharing these evaluations with all partners on a yearly basis.

- Sharing with the public achievements made by the EUP CWMA partners.

OBJECTIVE 4: To use an integrated approach to manage current infestations.

A. Control Methods

Due to the large number of invasive plants already present in the EUP Cooperative Weed Management Area and the limited resources available to control them, management efforts will need to be prioritized. Management priorities will take into account the plant's potential ecological and economic impacts, management objectives of infested areas, available resources, and landowner/land manager support.

The EUP CWMA will adhere to legal guidelines regarding the use of herbicides and tools and will encourage the appropriate use of all required personal protective equipment in its collective activities.

1. **Manual and mechanical**

   Manual and mechanical techniques such as pulling, cutting, or otherwise stressing plants can be used to control some invasive plants, particularly if the population is relatively small. In some cases, this may be the only effective control technique. These techniques can be extremely specific, minimizing damage to desirable plants and animals, but they are generally very laborious and time intensive. Manual treatments must typically be administered several times to prevent a weed from re-establishing. During the course of treatment, laborers and equipment may severely trample vegetation and disturb the soil, providing suitable conditions for re-invasion of the same or other invasive species. Manual and mechanical techniques are generally favored if the infestation is small or if a large pool of volunteer labor is available. Manual control is also frequently used in combination with other techniques. For example, shrubs may be pulled and cut (manual treatment) and re-sprouts and seedlings may be treated with herbicides (chemical treatment) or fire (cultural alternative) several weeks or months later.

2. **Chemical**

   In some instances, herbicide application is the only practical way to control an invasive species due to the physiology of the plant or the extent of infestation. Although chemical controls (i.e., herbicides) are an effective means of controlling

unwanted vegetation, they may also have adverse consequences. The risk of using a herbicide must be weighed against the negative impact of the invasive species on the area of concern, and the effectiveness of chemical control should be compared to other control methods.

Many herbicides contain the same active ingredients but are designed for either terrestrial or aquatic applications. Prior to using an herbicide, it is critical to research product effectiveness against the target plant, product guidelines and legal constrains for its use. A herbicide must be registered for use in the state where plant control will take place. It is also important to read the entire label prior to mixing and application. Information on the proper use of an herbicide, including procedures related to the rate and timing of application, transportation, storage, cleanup, and emergency situations and must be followed at all times. Some chemicals may require a licensed or certified applicator.

3. **Biocontrol**

Biological control (biocontrol for short) is the use of animals, fungi, or microbes to feed upon, parasitize or otherwise stress a targeted pest species. Successful biocontrol programs significantly reduce the abundance of the pest or prevent the damage caused by the pest. Biocontrol is often seen as a progressive and environmentally friendly way to control pest organisms. Biocontrol leaves no chemical residues that might harm humans or other organisms and, when successful, can provide essentially permanent, widespread control with a very favorable cost-benefit ratio. However, some biocontrol programs have resulted in significant, irreversible harm to untargeted (non-pest) organisms and to ecological processes. Of course, all pest control methods have the potential to harm non-target native species, and the pests themselves can cause harm to non-target species if they are left uncontrolled. Therefore, before releasing a biocontrol agent (or using other methods), it is important to balance its potential benefit to conservation targets and management goals against its potential to cause harm.

4. **Cultural**

Cultural control involves the use of methods such as flooding, smothering (covering with light barrier), controlled or wild land fires, or the use of cover vegetation to reduce the impact of invasive species. The feasibility of such methods is related to the size of the infestation, the location and the regulatory and permitting processes for flooding and burning. The use of cultural methods is best suited to small scale applications, such as local homeowners or small businesses through the use of noninvasive plantings and mulch.

B. Integrated Weed Management

Integrated Weed Management (IWM) is a multi-disciplinary, ecological approach that uses an array of effective weed management technologies, often in combination with one another, to maintain or develop ecologically healthy desired plant communities that are relatively weed-resistant while meeting other land use objectives. Together these strategies and techniques are economically and environmentally more effective than any single option. Elements of Integrated Weed Management include prevention, education, detection/inventory, treatment, monitoring and restoration.

1. Weed Management Zones

The EUP CWMA has been divided into four Weed Management Zones. These Zones will facilitate logistical objectives for incident reporting rapid response and longer term management and monitoring. The weed management zones are defined by roads or other easily recognized geographical features. Boundaries are defined follows: (See Appendix C for maps)

A.) Whitefish Bay Zone (A): This zone includes all areas north of M-28 and west of M-123/Whitefish Bay, north to Lake Superior and West to the Luce County line.

B.) St. Mary's River Zone (B): West of I-75, this zone includes all areas east of M-123 / Whitefish Bay south to H-40; East of I-75, this zone includes all areas north and east of M-48 including Drummond Island and other adjacent islands.

C.) Les Cheneaux Zone (C): This zone includes those areas south and west of M-48 and H-40, lying north and east of M-123/I-75 to the Mackinac Bridge. This zone includes the 36 Les Cheneaux Islands, Mackinac, Round, Bois Blanc and adjacent Islands.

D.) Cut River Zone (D): This zone includes those parts west of I-75 / M-123 and south of M-28 to the Schoolcraft County line. This zone includes all adjacent islands.

2. Custodial Management Units:

Within each Management Zone, Management Units (MU's) are defined to focus weed management objectives, priorities and prescriptions based on ecological factors and partner management objectives. A management plan will be developed for control of invasive plants associated with coastal, upland, lowland and highly modified habitat sites. Special emphasis criteria include:

* Restoration opportunity
* Specific funding sources
* Heightened public interest
* Active Partnerships
* Active landowners
* Unique ecological values

A.) Coastal Management Unit: Great Lakes lacustrine habitats, St. Mary's River riparian habitats, and those adjacent habitats significantly influenced by these coastal systems, including all coastal islands.

B.) Upland Management Unit: Habitats dominated by mesic or xeric habitat types. Will include some lowlands. Management may require specific modifications for inclusive lowlands.

C.) Lowland Management Unit: Habitats dominated by lowland habitat types. Will include some uplands. Management may require specific modifications for inclusive uplands.

D.) Highly Modified Habitat Management Unit: Includes concentrations of urban, residential, industrial, agricultural, road right-of-way, etc.

3. Weed Treatment Objectives and Priorities by Unit:

Management objectives and procedures will be defined for each Unit.

A.) High Quality Resource Areas: Within each Management Unit, identify "Pristine" areas based on partner objectives as well as current or potential biological condition.

1.) These areas will be considered top priority for prevention, rapid response, and eradication when practical.
2) Consider tagging with a "weed free" designation, when appropriate, to publicize and prevent future invasions.

B.) Treatment objective and priorities will be established for each invasive plant species:

1.) Not known in the EUP CWMA yet; eradicate new occurrences immediately ("new invaders") (e.g. Swallow-Wort, Mile-a- Minute weed)
2.) Work to eradicate wherever found (high threat invasives) (e.g. non-native phragmites)
3.) Control established occurrences and eradicate outliers (e.g. garlic mustard)
4.) Known EUP invaders - attempt eradication in high priority areas (e.g. spotted knapweed in piping plover coastal areas)
5.) Status in EUP CWMA uncertain, control site specific.

C.) Each inventoried site (i.e. infestation) will be prioritized based on the objectives and priorities established for that unit.

D.) <u>Activities in the Annual Operating Plan will be determined by the priorities established for each of the MUs, but may also depend on available treatment options and resources</u>

Appendix A: Eastern Upper Peninsula Cooperative Weed Management Area Partners:

- USDA Forest Service, Hiawatha National Forest
- Chippewa/East Mackinac Conservation District
- The Nature Conservancy
- USDA Natural Resources Conservation Service
- Michigan Department of Natural Resources and Environment, Tahquamenon Falls State Park
- Michigan Department of Natural Resources and Environment, Brimley State Park
- Michigan Department of Natural Resources and Environment, Muskallonge Lake State Park
- Michigan Department of Natural Resources and Environment, Straits State Park
- Michigan Department of Natural Resources and Environment, Forest Management Division
- Michigan Department of Natural Resources and Environment, Wildlife Division
- Bay Mills Indian Community
- Les Cheneaux Watershed Council
- Northern Wild Plant and Seed Co-op
- Upper Peninsula Resource Conservation & Development Council
- The Forestland Group
- Michigan Karst Conservancy
- Hiawatha Shore-to-Shore, North Country Trail Association
- Luce/West Mackinac Conservation District
- Seney National Wildlife Refuge

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Appendix B: Inventory Protocol

1.) EUP CWMA Invasive Species Survey (Protocol)
2.) EUP CWMA Invasive Species Survey Form
3.) EUP CWMA Field Log Protocol
4.) EUP CWMA Invasive Species Field Log
5.) EUP CWMA Invasive Species Code Sheets

EUP CWMA Invasive Species Survey

Objective

The objective of the Invasive Species Survey is to develop a unified database of invasive species occurrences within the Eastern Upper Peninsula, in partnership with the Midwest Invasive Species Information Network (MISIN). These guidelines will assist all partners within the Eastern Upper Peninsula Cooperative Weed Management Area (EUP CWMA) in documenting the occurrence and spread of invasive plants across the three county area (Chippewa, Mackinac, and Luce Counties). The data we collect will allow us to develop and implement effective control strategies.

Documentation

All information about invasive species occurrences must be documented using the categories on the official data form. All locations must be recorded using a GPS device.

SURVEY FORM

An individual paper data form will be used for each site. For each GPS position collected, record the following information on the Survey Form.

- Date
- Observer's Name
- Contact Information: a) e-mail address and b) phone number
- County (Chippewa, Mackinac or Luce)
- Other location information: a) Township; b) Townline; c) Range; and d) Section (if available).
- GPS Coordinates: Example — "N44.75723 and W85.65276" (should all be in decimal degrees)
- Map Box—Draw a map of the invasive plant location. Include information such as road name, nearest crossroad, which side of road the invasive is located, etc.
- Plant Species Name
- Area: Select one of the following options:
  - **0** = None
  - **1** = Individual/few/several
  - **2** = <1,000 square feet (half tennis court)
  - **3** = 1,000 square feet to 0.5 acre
  - **4** = 0.5 acre to 1.0 acre (football field w/o end zones)
  - **5** = > 1 acre
- Density: Select one of the following options
  - **1 = Sparse (**scattered individual stems or very small stands)
  - **2 = Patchy (**a mix of sparse and dense areas)
  - **3 = Dense (**greater than 40% of the area)
  - **4 = Monoculture (**nearly 100% of area)
- Treatment Status: Check "Untreated", "Consecutive Years Treated", "Nonconsecutive Treatment" or "Don't know". If consecutive years treated is known, please enter the number of years.
- Comments: Note use of flagging, general quality of natural community, last year treated (if known) or other pertinent information about the location, species infestation or mapping.

Invasive ID Code (For Office Use Only)

The box on the upper right corner of the Survey Form is reserved for a unique ID code to be used in mapping the location of each invasive plant found. The code will be developed in the following manner: "MCWWGM001" where MC is the two letter code for the county, WW is the observer's initials, GM is the invasive species code, and 001 is the three digit sequence number. Note: Within each county, the three digit sequence number of the ID for each person must never repeat.

EUP CWMA Invasive Species Survey Form

Date: _____

Invasive
ID Code: _____
(Office Use Only)

Observer's Name: _____

E-mail address: _____ Phone Number _____

Location Information of Invasive Species County: _____

Township: _____ Townline: _____ Range:_____ Section:_____

GPS Coordinates: _____Latitude _____ Longitude

Map

N

Plant Species:_____

Area — Circle one of the following options:
0 = None
1 = Individual/few/several
2 = <1,000 sq. ft. (half tennis court)
3 = 1,000 sq. ft. to 0.5 acre (half football field)
4 = 0.5 acre to 1.0 acre (football field w/o end zones)
5 = > 1.0 acre

Density — Circle one of the following options:
1 = Sparse (Scattered individual stems or very small stands)
2 = Patchy (A mix of sparse and dense areas)
3 = Dense (Greater than 40% of the area)
4 = Monoculture (Nearly 100% of the area)

Treatment Status (Check one):
_____ Untreated

_____ Consecutive years treated (# of years:_____)

_____ Nonconsecutive Treatment

_____ Don't know

Comments:

_____
_____
_____
_____
_____
_____

EUP CWMA Field Log Protocol

FIELD LOG

A field log will be used to record each volunteer's field activity. This will be helpful in maintaining sequence for site ID numbers and provide back-up information if individual Survey Forms are misplaced. A separate Field Log sheet should be maintained for each county the volunteer performs survey work. There are 8 columns on the Field Log sheet. Record the information in the following manner:

Waypoint Code

The waypoint code is a unique ID code to be used in mapping the location of each invasive plant found. The 9 digit code will be developed in the following manner: "MCWWPH001" where MC is the two letter code for the county, WW is the observer's initials, PH is the invasive species code, and 001 is the three digit sequence number. Waypoint Code details:

- **County** — "CC" = Chippewa County; "MC" = Mackinac County; and "LC" = Luce County
- **Observer Initials**—First initial of first name and first initial of last name. Example: Willie Work would be "WW".
- **Species**—Enter the two digit code for the invasive plant species found at the location. Each volunteer will be given a code sheet with all of the invasive plant common names, scientific names, and the two digit abbreviation codes. Example: phragmites = PH
- **Site ID Number**—This is a three digit sequence number. The first entry should be "001", the second "002", the third "003", etc. A sequence number of the ID for each person should never repeat in the county being surveyed.

Area—Select one of the following:

0 = None
1 = Individual/few/several
2 = < 1,000 square feet (half tennis court)
3 = 1,000 square feet to 0.5 acre
4 = 0.5 acre to 1 acre (football field w/o end zones)
5 = > 1 acre

Density—Select one of the following options:

1 = Sparse (scattered individual stems or very small stands)
2 = Patchy (a mix of sparse and dense areas)
3 = Dense (greater than 40% of the area)
4 = Monoculture (nearly 100% of area)

Treatment Status—Enter "U" for untreated; or "N" for nonconsecutive years treated; or enter the number of years of consecutive treatment; or "D" for don't know.

GPS Coordinates—Set a waypoint for each plant species found at each location. All coordinates must be recorded in decimal degrees. For example: N44.75723 W85.65276.

Comments—Use this space to record anything of interest about the find; i.e. note the use of flagging, general quality of natural community, last year treated (if known) or other pertinent information about the location, species infestation or mapping.

EUP CWMA Invasive Species Field Log

Observer:_____ County:_____

Waypoint Code	Species	Area	Density	Treatment Status	Latitude i.e. N44.75723	Longitude i.e. W85.65276	Comments

Waypoint Code: XXYYZZ001 XX = County Code YY = Observer's Initials ZZ = Species 001 = Site ID Number (consecutive, ascending, and non-repeating, i.e. 001, 002, 003, etc.	Area 0 = None 1 = Individual/few/several 2 = < 1,000 sq. ft. (half tennis court) 3 = 1,000 sq. ft. to 0.5 acre 4 = 0.5 acre to 1 acre (football field w/o end zones) 5 = > 1 acre	Density 1 = Sparse (scattered individual stems or very smalls stands) 2 = Patchy (a mix of sparse and dense areas) 3 = Dense (greater than 40% of the area) 4 = Monoculture (nearly 100% of area)	Treatment Status U = Untreated #= Consecutive years treated N = Nonconsecutive years treated D = Don't know

Updated January 3, 2011

EUP CWMA Invasive Species Code Sheet—Page 1 of 2

Top 10 Invasive Species Found in the EUP CWMA

Common Name	Code	Scientific Name
canada thistle	CT	*Cirsium arvense*
common buckthorn	CB	*Rhamnus cathartica*
eurasion milfoil	EM	*Myriophyllum spicatum*
garlic mustard	GM	*Alliaria petiolata*
japaneese knotweed	JK	*Fallopia japonica*
leafy spurge	LS	*Euphorbia isula*
phragmites (non-native)	PH	*Phragmites australis*
purple loosestrife	PL	*Lythrum salicaria*
scots/scotch pine	SP	*Pinus sylvestris*
spotted knapweed	SK	*Centaurea maculosa*

Invasive Species Network—Species of Concern

Common Name	Code	Scientific Name
austrian pine	AP	*Pinus nigra*
autumn olive	AO	*Elaeagnus umbellate*
baby's breath	BB	*Gypsophila paniculata*
bigleaf periwinkle	BP	*Vinca major*
bittersweet nightshade	BN	*Solanum dulcamara*
birdfoot trefoil	LC	*Lotus corniculata*
black jetbead	BJ	*Rhodotypos scandens*
black locust	BL	*Robinia pseudoacacia*
bouncing bet	SO	*Saponaria officinalis*
bristly locust	RH	*Robinia hispida*
bull thistle	BT	*Cirsium vulgare*
callery pear	CP	*Pyrus calleryana*
common chickweed	CC	*Stellaria media*
common St. John's wort	SJ	*Hypericum perforatum*
common tansy	TV	*Tanacetum vulgare*
common teasel	DF	*Dipsacus fullonum/sylvestris*
cow-vetch	VV	*Vicia villosa*

Invasive Species Network—Species of Concern—Continued

crown vetch	CV	*Coronilla varia*
cypress spurge	CS	*Euphorbia cyparissias*
dame's rocket	DR	*Hesperis matronalis*
european highbush cranberry	HC	*Viburnum opulus*
european swamp thistle	ST	*Cirsium palustre*
field hedge parsley	TA	*Torilis arvensis*
giant knotweed	GK	*Polygonum sachalinensis*
glossy buckthorn	GB	*Rhamnus frangula*
honeysuckle(s)	HS	*Lonicera sp.*
japanese hedge parsley	TJ	*Torilis japonica*
jimsonweed	JW	*Datura stramonium*
lily-of-the -valley	LV	*Convallaria majalis*
lombardy poplar	LP	*Populus nigra var. italic*
lyme grass	LG	*Leymus arenarius*
money plant	MP	
mullein	MN	*Verbascum Thapsus*
multiflora rose	MR	*Rosa multiflora*
narrow-leaved cattail	NC	*Typha angustifolia*
norway maple	NM	*Acer platanoides*
orange day lily	OD	*Hemerocallis fulva*
oriental bittersweet	OB	*Celastrus orbiculatus*
periwinkle	PW	*Vinca minor*
reed canary grass	RC	*Phalaris arundinacea*
russian olive	RO	*Elaeagnus angustifolia*
sawtooth oak	QA	*Quercus acutissima*
smooth brome	SB	*Bromus inermis*
white poplar	PA	*Populus alba*
white sweet clover	WS	*Melilotus alba*
wild parsnip	WP	*Pastinaca sativa*
yellow flag	YF	*Iris pseudacorus*
yellow sweet clover	YS	*Melilotus officinalis*

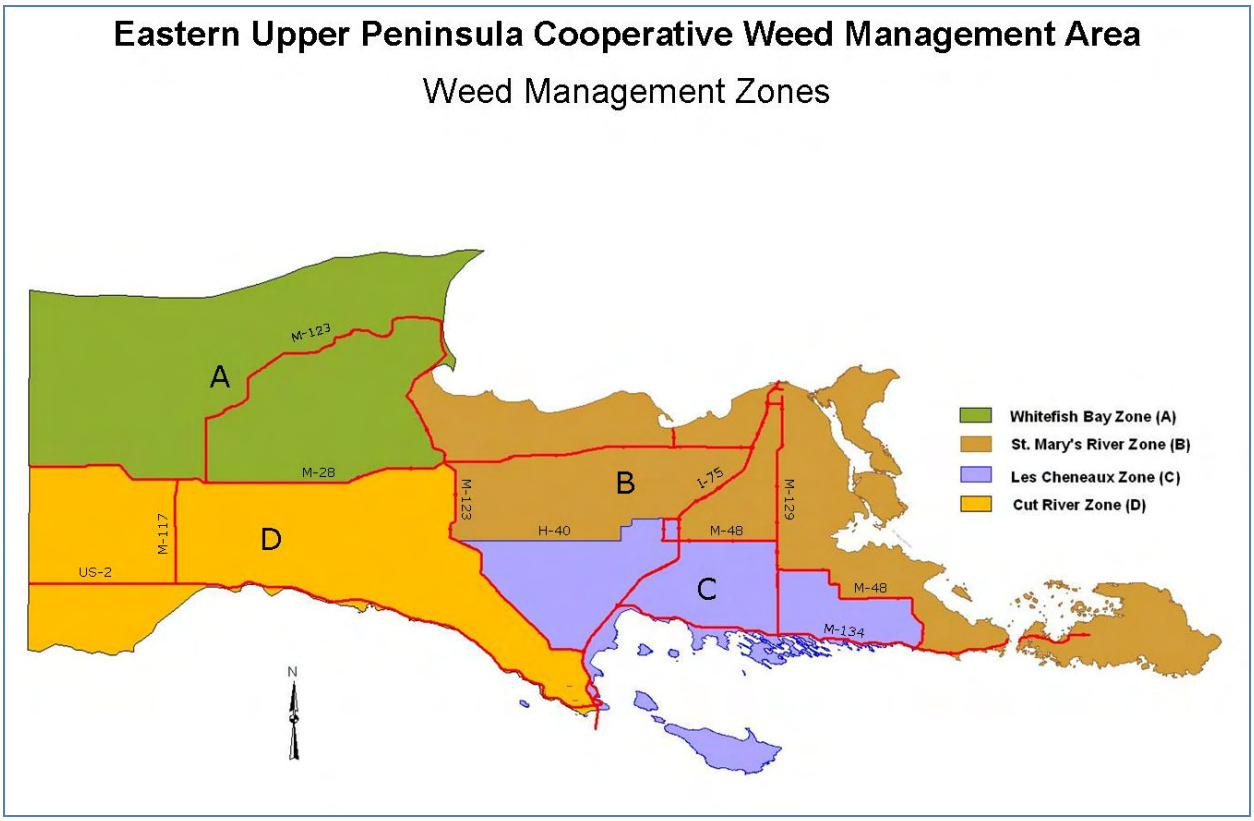
EUP CWMA Invasive Species Code Sheet—Page 2 of 2

Invasive Species Network—Species of Concern
Early Detection Rapid Response Species

Common Name	Code	Scientific Name
amur cork-tree	AC	*Phellodendron amurense*
black alder	BA	*Alnus glutinosa*
black swallow-wort	VN	*Vincetoxicum nigrum*
brazilian water-weed	BW	*Egeria densa*
coltsfoot	CF	*Petasites hybridis*
cotton thistle	OA	*Onopordon acanthium*
dotted duck-weed	DD	*Landoltia punctata*
european frog-bit	FB	*Hydrocharis morsus-ranae*
european water clover	WC	*Marsilea quadrifolia*
flowering rush	FR	*Butomus umbellatus*
giant hogwood	GH	*Heracleum mantegazzianum*
giant salvinia	GS	*Salvinia spp.*
hydrilla	HD	*Hydrilla verticillata*
indian balsam	IB	*Lagarosiphon major*
japanese hops	JH	*Humulus japonicas*
japanese stiltgrass	JS	*Microstegium vimineum*
kudzu	KZ	*Pueraria lobata*
lesser naiad	LN	*Najas minor*
mile-a-minute-weed	MM	*Polygonum perfoliatum*
moneywort	MW	*Lysimachia nummularia*
musk thistle	MT	*Carduus nutans*
pale swallow-wort	VR	*Vincetoxicum rossicum*
parrot feather	PF	*Myriophyllum aquaticum*
plumeless thistle	PT	*Carduus acanthoides*
reed manna grass	RM	*Glyceria maxima*
sacred lotus	SL	*Nelumbo nucifera*

Common Name	Code	Scientific Name
water chestnut	TN	*Trapa natans*
water-hyacinth	WH	*Eichhornia crassipes*
water lettuce	WL	*Pistea stratioides*
yellow floating heart	FH	*Nymphoides peltata*

Appendix C: Weed Management Zone Map for the EUP CWMA



Appendix D:
Top 10 Management Invasive Weed List 2010

1. Garlic mustard *Alliaria petiolata*

2. Spotted Knapweed *Centaurea biebersteinii*
3. Canada thistle *Cirsium arvense*
4. Leafy spurge *Euphorbia esula*
5. Purple loosestrife *Lythrum salicaria*
6. Buckthorns *Rhamnus frangula*
7. Eurasian water milfoil *Myriophyllum spicatum*
8. Japanese Knotweed *Polygonum cuspidatum*
9. Scotch Pine *Pinus sylvestris*
10. Common reed *Phragmites australis*

***Alliaria petiolata* - Garlic Mustard**

Ecosystems Threatened: Mesic forest, and other shaded woodlands; not a lot on the HNF or the UP yet, but a truly destructive weed in northern hardwoods.

Manual/Mechanical Control: Small patches, flowering plants (second year plants) can be hand-pulled to prevent seed production (spring). Cutting plants low with a weed whip, just before flowerings an option when the patch is dense. Pulling and cutting plants will prevent flowering. If plants have started to form seed pods when they are cut or pulled, they must be bagged and removed from site. A second site visit a few weeks later is required to catch adults missed during the initial treatment. Propane weed torch may be used to scorch first year plants in the spring. Weed torch works not by starting a ground fire, but by using the torch's flame to wilt the target leaves and kill plant. This can be done in very early spring as species is green and susceptible while native plants are still under the ground. Torching or pulling will continue for 5-7 years on a site to deplete the seed bank. If monitoring shows this to be ineffective, herbicide use will be considered.

Chemical Control: Foliar spot spray/broadleaf selective - triclopyr (ex. Garlon3A); stump treatment and foliar/non-selective (ex. glyphosate/Roundup). Large patches (>.004 acre) are best controlled with combination of herbicide, hand-pulling and scorching. To avoid impacts to native ground layer; apply glyphosate early spring or late fall. In some situations, the broad-leaf selective herbicide triclopyr may be used. Repeat pulling and/or herbicide for up to 5 years as population is reduced over time.

***Centaurea* biebersteinii – Spotted Knapweeds**

Ecosystems Threatened: Great Lakes shorelines of various substrates, roadsides, openings, alvar, savannah, disturbed areas

Manual/Mechanical Control: Small populations less than 14 x 14 feet (.004acre) removed by hand-pulling; early spring the easiest time to pull. If plants are flowering when they are cut or pulled, they must be bagged and removed from site. Mowing suggested for roadsides and fields, at the phenological stage just before plants bloom in mid July. If monitoring shows that pulling small populations is ineffective, chemical treatments will be considered.

Chemical Control: Foliar spray/broadleaf selective (ex. clopyralid/Transline). Larger infestations spot treated with clopyralid, a broadleaf weed killer, during bolt or bud stage via backpack sprayer. If damage to surrounding vegetation is not a concern, the area will be spot treated with glyphosate. Knapweed can be chemically treated during all stages of growth from June through September except late when the seed is viable. Mowing just before flowers bud, prior to herbicide treatment, will stress plants, making the herbicide more effective. Ideally treat with one chemical treatment per year per site. Follow up with monitoring in subsequent years with chemical and manual treatment for missed plants and regrowth.
Biological Control: *Urophora affinis, U. quadrifasciata*

***Cirsium arvense* - Canada Thistle**
Ecosystems threatened: Roadsides, wetlands, alvar, savannah, openings in cedar swamps, Great Lakes shorelines, etc. Requires minimal disturbance for establishment; relatively recent in UP and HNF.
Manual/ Mechanical Control: For smaller sites, less than .004 acres, the whole plant can be cut or pulled during early bud stage when root reserves are low (usually early to mid July). This will be repeated, if possible, 2 more times during the growing season. On very sparse, small sites the root of this perennial species can be severed below ground using a narrow shovel. These manual methods will require repeat visits for several years to deplete the seed bank.
Chemical Control: Foliar spray/broadleaf selective (ex. clopyralid/Transline). Larger sites spot treated with the broadleaf specific herbicide, clopyralid applied with a wand applicator (preferred) or spot sprayer in order to avoid non target vegetation. Also, using this broadleaf specific chemical will avoid damage to grasses and sedges during treatment (providing soil stabilization). Follow herbicide application with hand pulling 1-2 weeks later. Sites monitored and retreated for 3-5 years. If damage to surrounding vegetation is not a concern, area spot treated with glyphosate.

***Euphorbia esula* - Leafy Spurge**
Ecosystems Threatened: Roadsides, fields, various open habitats. Still minimal occurrences on the HNF.
Manual/Mechanical Control: Small populations (less than 100 plants or about .004 acres) can be hand-pulled. Hand-pulling will require repeat visits for up to 7 years. If monitoring proves this to be ineffective, herbicide use will be considered. On roadsides, larger populations can be mowed or cut June to early July to stress populations and remove flowering heads (may be followed by chemical treatment).
Chemical Control: Foliar/non-selective (ex. imazapic/Plateau). Follow up mowing or cutting larger sites (>.004 acre) or smaller sites where complete eradication is desired, with spot treatment of imazapic or glyphosate. Herbicide can be applied August to mid-October as long as sap flows from cut stems. Most effective time to apply herbicide is

mid-September. Single chemical treatment per year per site followed by monitoring in subsequent years and treatment of missed plants and resprouts. Follow up treatment will take several years until seed bank is exhausted.
Biological Control: Leafy spurge flea beetles, *Aphthona flava, A. lacertosa, A. nigriscutis*

***Lythrum salicaria* - Purple Loosestrife**
Ecosystems Threatened: All types of riparian and wetland areas. Forms monocultures and results in habitat loss.
Manual/Mechanical Control: Most sites are small (<.004 acre). The species will be pulled or dug with a shovel, taking care not to leave any roots. If plants are flowering when they are cut or pulled, they must be bagged and removed from site. It may take 2-3 yearly visits to eliminate a site with a few plants as seed can sprout when ground is disturbed. If monitoring proves this ineffective, the use of herbicide on individual plants will be considered.
Chemical Control: Foliar near water/non-selective (ex. glyphosate/Rodeo). If sites expand to over 100 plants, spot treat with glyphosate (if near open water, a formula suitable for use near water will be used). Where feasible, apply glyphosate to cut stems with wiping technique. Plants can be treated anytime during growing season but before they set seed in August with a single chemical treatment per site per year. This followed by monitoring in subsequent years and treatment of missed plants and resprouts with hand pulling or herbicide.
Biological Control: *Galerucella calmariensis, G. pusilla, Hylobius transversovittatus*

***Myriophyllum spicatum* - Eurasian water milfoil**
Ecosystems Threatened: Aquatic habitats, grows on almost any substrate
Manual/Mechanical Control: Reproduces vegetatively, so a single stem fragment can take root and form a new colony. Hand removal would be ineffective. Mechanical harvesters used after widespread infestation must be done twice during the growing season for 2 or more seasons. Continuous monitoring of waters not yet infested is essential.
Chemical Control:
Biological Control: Milfoil weevil, *Euhrychiopsis lecontei*

***Phragmites australis* - Common Reed/non-native genotype**
Ecosystems Threatened: Wetlands, riparian areas, shorelines. We will map all *Phragmites australis* occurrences but only control/eliminate non-native populations (see electrophoretic studies in literature).

Manual/Mechanical Control: Cut or mow affected area at the end of July and repeat annually. Cut plants with a circular blade weed trimmer below lowest leaf leaving a 6 inch stump.
Chemical Control: Foliar near water/non-selective (ex. glyphosate/Rodeo). Spray plants with glyphosate (formulated for wetlands) in late summer (August) when in full bloom. If plants are too tall to spray, cut back in mid-summer and apply glyphosate when regrowth reaches 2-3 feet tall. Repeat in subsequent years. Cut back dead stalks several weeks after herbicide application to stimulate growth of native plants previously suppressed.

***Rhamnus* frangula - Glossy Buckthorn**
Ecosystems Threatened: Forested wetlands and wet prairies, forested areas, edges of openings, roadsides, etc. Not yet widely dispersed in UP/ HNF.
Manual/ Mechanical Control: Small plants (<5 mm diameter or <0.5m tall) with shallow root systems can be hand pulled and soil shaken off at site. Non-fruiting size plants can be left on site; those with fruit or seeds may be bagged or piled and burned. These methods will require repeat control visits as well as monitoring of the site, perhaps for 4-5 years or longer. If monitoring shows that pulling leaves behind roots that spout, or is otherwise ineffective, spot sprayed herbicide will be considered on these small plants. Plants may be pulled anytime the ground is not frozen. Scorching sprouts in fall may be used when sprouts emerge thickly following death of parent tree.
Chemical Control: Foliar spot spray/broadleaf selective (ex. triclopyr/Garlon3A). Cut larger shrubs and treat stump with glyphosate or triclopyr, in late summer/fall/early winter. Compatible dye will be added to the herbicide mixture so that the cut stump treatment can be distinguished. Herbicide applied with sponge type applicator to avoid contracting non target plants. Alternative method is to paint triclopyr on the basal bark and leave the shrub. Thick patches of young seedlings may be spot sprayed with glyphosate. Herbicide treatment can be applied almost anytime of the year optimally September - November. Make a single chemical treatment per site per year followed by monitoring in subsequent years for treatment of missed plants and resprouts.

***Polygonum cuspidatum* - Japanese Knotweed**
Ecosystems Threatened: It spreads quickly to form dense thickets that exclude native vegetation and greatly alter natural ecosystems. It poses a significant threat to riparian areas, where it can survive severe floods and is able to rapidly colonize scoured shores and islands. Once established, populations are extremely persistent.
Manual/Mechanical Control: It is difficult to control because of its ability to re-grow from vegetative pieces and from seed.

- Manual - Hand pull young plants; remove all roots and runners to prevent re-sprouting.

- Chemical - It can be effectively controlled using any of several readily available general use herbicides such as glyphosate or triclopyr. Apply herbicides to freshly cut stems or to foliage. Follow label and state requirements.

***Pinus sylvestris* - Scotch Pine**

Ecosystems Threatened: Savannah, Great Lakes shoreline, various other sites, usually planted or escaped. Scotch pine is the most widely distributed pine in the world. It has been naturalized in northern New York. The associated trees are black cherry *(Prunus serotina),* red maple *(Acer rubrum),* sugar maple *(A. saccharum),* American beech *(Fagus grandifolia),* quaking aspen *(Populus tremuloides),* and eastern white pine *(Pinus strobus).* In many areas the aggressive reproductive habit established a mat of seedlings, and has concerned foresters. Where Scotch pine has been intermixed with red or white pine at planting, the Scotch pine grows so much more aggressively during the first few years that its roots crowd out roots of the other species leaving only Scotch pine.

Manual/ Mechanical Control:

Manual - Hand pull young seedlings; cut larger trees. Chemical - It can be effectively controlled using any of several readily available general use herbicides such as glyphosate or triclopyr. Follow label and state requirements.

Natural Enemies**:** Some of the natural enemies include: coneworm larvae *(Dioryctria* spp.), tip moths *(Rhyacionia* spp.*)* and the pine root collar weevil *(Hylobius radicis)* that is a major cause of tree death in young plantations in the Lake States.

Other Invasive Species For Consideration:

***Phalaris arundinacea* - Reed Canary Grass**

Ecosystems Threatened: Wetlands, riparian areas.

Manual/Mechanical Control: Cut or mow affected area mid-June and again in early October. Repeat annually.

Chemical Control: Foliar near water/non-selective (ex. glyphosate/Rodeo). This control is often more effective in combination with other treatment methods, such as cutting. Cut affected areas in early spring, let plants resprout, and then treat with glyphosate in late August - September. For heavy infestation, monitor and treat again if necessary. If standing water is present, use foliar application of glyphosate formulated for use near water.

***Pastinaca sativa* - Wild Parsnip**

Ecosystems Threatened: Openings, alvar, fen, roadsides, seasonally wet areas, full to partial sun. Phototoxic.

Manual/Mechanical Control: Small sites less than 100 or so plants, root of this biennial will be cut below ground level with sharp, narrow shovel or hand-pulled. Large roadside sites may be mowed just after peak flowering before seeds ripe. Areas may be mowed again if plants re-flower; this will decrease the seed bank. If monitoring shows this ineffective, the use of herbicide will be considered.
Chemical Control: Foliar spot spray/broadleaf selective (ex. triclopyr/Garlon3A); stump treatment and foliar/non-selective (ex. glyphosate/Roundup). Treat basal rosettes of first year parsnip with spot application of glyphosate. Plants can be treated anytime during growing season but best to treat before seed set in August. As an alternative, triclopyr may be used as it is broadleaf specific and will not harm grasses. The ideal treatment time is July when root reserves are low. A single chemical treatment per year per site is ideal, followed by monitoring in subsequent years for treatment of missed plants and re-sprouts via hand-pulling or herbicides.

***Melilotus alba* – White Sweetclover**
Ecosystems Threatened: Great Lakes shorelines, alvar, roadsides, openings, savannahs and various open habitats.
Manual/Mechanical Control: Small populations can be hand pulled or dug up with a shovel before seeds set. If plants are cut or pulled after flowering, they must be bagged and removed from site. Inspect the area frequently for late flowering plants. Mowing at the end of summer, results in high rates of winter mortality. Populations can be reduced by prescribed burning 2 years in a row.
Chemical Control: Herbicides such as 2,4-D and dicamba are effective.
Biological Control: Sweetclover weevil, *Sitona cylindricollis*

LITERATURE CITED:
Bailey, R.G. 1995. Description of the Ecoregions of the United States, 2d ed., USDAForest
U.S. Census Bureau. 2005a. GCT-T1. 2005 population estimates. Population Estimates