

Appendix F  
Inter-Agency Guidelines for Implementing Best Management Practices for the  
Control of Terrestrial and Aquatic Invasive Species on Forest Preserve Lands  
In the Adirondack Park  
APA/DEC MOU

**Inter-Agency Guidelines  
for  
Implementing Best Management Practices  
for the Control of Terrestrial and Aquatic Invasive Species  
on Forest Preserve Lands in the Adirondack Park**

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**I. Introduction**

The negative impacts of invasive species on natural forest and aquatic communities are well documented (Appendix F). Colonization and unrestrained growth of invasive species cause the loss of biodiversity, interruption of normal hydrology, suppression of native vegetation, and significant aesthetic, human safety and economic impacts. Terrestrial and aquatic invasive species have been identified at increasing rates of colonization along roadsides in campgrounds, and in water bodies of the Forest Preserve within the past 10 years. Some of these species have the potential to colonize backcountry lands, lakes and ponds and degrade natural resources of the Forest Preserve.

These guidelines apply to Adirondack Forest Preserve lands, which are protected by Article XIV, Section 1 of the New York State Constitution. This Constitutional provision, which became effective on January 1, 1895 provides in relevant part:

*“The lands of the state, now owned or hereafter acquired, constituting the Forest Preserve as now fixed by law, shall be forever kept as wild forest lands. They shall not be leased, sold or exchanged, or be taken by any corporation, public or private, or shall the timber thereon be sold, removed or destroyed.”*

The New York State Department of Environmental Conservation (DEC or Department) has jurisdiction over the Forest Preserve, and its management of these lands must be in keeping with this Constitutional provision.

Furthermore, DEC’s management of the Adirondack Forest Preserve is governed by the Adirondack Park State Land Master Plan (Master Plan), which was initially adopted in 1972 by the Adirondack Park Agency (Agency or APA), with advice from and in consultation with the Department, pursuant to Executive Law §807 (recodified as Executive Law §816). The Master Plan provides the overall general framework for the development and management of State lands

in the Adirondack Park. The Master Plan sets forth the following classifications for State land within the Adirondack Park: Wilderness, Primitive, Canoe, Wild Forest, Intensive Use, Historic, State Administrative, Wild, Scenic and Recreational Rivers, and Travel Corridors, and sets forth management guidelines for each of these major land classifications.

Executive Law §816 requires the Department to develop, in consultation with the Agency, individual unit management plans (UMPs) for each unit of land under the Department's jurisdiction which is classified in one of the nine classifications set forth in the Master Plan. The UMPs must conform to the guidelines and criteria set forth in the Master Plan. Thus, UMPs implement and apply the Master Plan's general guidelines for particular classifications of State Land within the Adirondack Park.

Executive Law §816(1) provides in part that "(u)ntil amended, the master plan for management of state lands and the individual management plans shall guide the development and management of state lands in the Adirondack Park.

Article XIV, Section 1 of the New York State Constitution does not specifically address the issue of invasive species. However, since Article XIV directs that Forest Preserve lands be "forever kept as wild forest lands" and prohibits the removal or destruction of timber, care must be taken to ensure that decisions to eradicate invasive species do not result in a material cutting of Forest Preserve timber or adversely impact the wild forest character of Forest Preserve lands.

Although there are no explicit references to active invasive species management on Forest Preserve lands in the Master Plan, the Master Plan provisions are consistent with the concept of actively managing invasive species to protect the "wild forest" character of the Forest Preserve. For instance, page 1 of the Master Plan (2001 Update) states that, "If there is a unifying theme to the Master Plan, it is that the *protection and preservation* of the natural resources of the state lands within the Park must be paramount" (emphasis added). Surveys of Forest Preserve lands document the continued importation and expansion of invasive plants into and throughout the Adirondack Park (see Section II below). Given that models indicate that eradication of an invasive species becomes progressively more difficult, more expensive, and less effective the longer the species is allowed to grow without intervention (Chippendale 1991; Hobbs and Humphries 1995), it is critical for the Department and APA to address this problem in an expeditious manner.

The goal of these guidelines is to establish parameters known as best management practices (BMPs) for the control of terrestrial and aquatic invasive species while ensuring that such management activities do not alter the "forever wild" character of Forest Preserve lands. These guidelines are intended to harmonize the Constitution's "forever wild" provisions with the Master Plan's overriding directive to manage forest preserve lands for their protection and preservation. They have been developed pursuant to, and are consistent with, relevant provisions of the New York State Constitution, the Environmental Conservation Law (ECL), the Executive Law, the State Environmental Quality and Review Act (SEQRA), the Master Plan, and all other applicable rules and regulations, policies and procedures.

It is also important to determine if any regulatory jurisdictions or permits are triggered by a proposed management activity. For example, any management activities that may involve wetlands on private or public lands may require a permit from APA.

## **II. Present Extent of Terrestrial and Aquatic Invasive Species on Forest Preserve Lands**

An inventory of invasive species that are present and a measure of the extent of the invasive species populations is essential to determining the correct course of action. The Department conducts ongoing regular, systematic surveys to identify and quantify the extent of terrestrial and aquatic invasive species on Forest Preserve units in the Adirondack Park. The results of this continued survey have been included in Appendix E of these Guidelines and documented in UMPs. Appendix E and UMPs should be updated at the end of each calendar year to reflect the survey data from the previous growing season. DEC will present an annual report on the survey data from the previous growing season. The tabular information will include Forest Preserve land unit name, species name, total number of populations and area affected, and other pertinent information as identified by the Office of Invasive Species Coordination (OISC). Detailed location and population information shall be provided to the Regional Land Manager for each Region and be included in the iMap Invasive Species Database.

The Department shall seek to develop and foster a relationship with private landowners adjacent to or connecting Forest Preserve land units to share information regarding existing and potential invasive species populations or threats.

## **III. BMPs for the Control of Terrestrial and Aquatic Invasive Species and Procedure for Implementation**

The general parameters or BMPs for the control of invasive species that apply regardless of the targeted species are set forth below. Specific control methods for select terrestrial and aquatic invasive species are attached as Appendix B. These BMPs will be implemented through site specific work plans with corresponding SEQRA compliance, which must be approved by the Department's Central Office Bureau of Forest Preserve. Adopt-A-Natural Resource (AANR) Agreements with outside parties to conduct invasive species management must incorporate site specific work plans with corresponding SEQRA compliance. It is anticipated that if the proposed activities conform to these guidelines, they will be consistent with constitutional directives and authorized pursuant to the APA/DEC MOU, and will not require approval through the UMP process. However, if the Department determines during its review of a proposed site specific work plan that proposed management activities may potentially have a material effect on the character or use of the land or the vegetation thereon, DEC and APA staff will then consult to determine if the activity should be reviewed and approved as part of an individual UMP or UMP Amendment. Furthermore, application of these guidelines to all such management activities on Forest Preserve lands throughout the Adirondack Park will ensure that cumulative impacts will be avoided due to the fact that the BMPs being implemented through these guidelines avoid and mitigate impacts to native ecological communities.

The following BMPs apply to the control and management of invasive species.

### **1. Prevent the introduction of invasive plants and animals to uninfested sites**

Invasive species can be introduced to a site by moving infested equipment, sand, gravel, borrow, fill and other off-site material. Monitoring disturbed areas and proper sanitation of

equipment will help prevent new infestations. BMPs to prevent the introduction of invasive species include:

- Clean all clothing, boots, and equipment prior to visiting site.
- Begin activities in uninfested areas before operating in infested areas.
- Use native plants and weed-free seed and mulch (straw, wood fiber).
- Use fill that does not have invasive plant seeds or material.
- Keep equipment on site during the entire project.
- Incorporate invasive plant prevention into road work layout, design, and decisions. Use uninfested areas for staging, parking and cleaning equipment. Avoid or minimize all types of travel through infested areas, or restrict to those periods when spread of seed or propagules are least likely.
- When possible, to suppress growth of invasive plants and prevent their establishment, retain relatively closed canopies.

**2. Contain and treat new invasive plants and animals or those not yet well established.**

Controlling small infestations is more effective and economical than trying to control well-established, rapidly spreading infestations. Selected control measures need to be based on species biology and the individual characteristics of an infestation.

**3. Minimize transport of invasive plants and animals from infested to uninfested areas.**

Invasive species can be spread by moving infested materials and equipment. Cleaning vehicles and equipment (usually with steam or hot water) is the most effective method of preventing an introduction. BMPs involving the transport of off-site material and equipment include:

- Determine the need and identify sites where equipment can be cleaned. Seeds and plant parts need to be collected when practical and effectively disposed of (e.g., burned, dried, bagged and taken to landfill, etc.). Remove mud, dirt, and plant parts from project equipment before moving it into a project area and clean all equipment before leaving the project site, if operating in infested areas.
- Check, clean, and, when appropriate, dry all clothing, boots, and equipment (e.g., boats, trailers, nets, etc.) prior to visiting site.
- Don't move firewood. All cut tree material should be either chipped or dispersed onsite.
- Inspect material sources at site of origin to ensure that they are free of invasive plant material before use and transport. Treat infested sources for eradication, and strip and stockpile contaminated material before any use.
- Inspect and document the area where material from treated infested sources is used annually for at least three years after project completion to ensure that any invasive plants transported to the site are promptly detected and controlled.
- Minimize roadside sources of seed that could be transported to other areas.
- Periodically inspect roads and rights-of-way for invasion. Inventory and mark infestations and schedule them for treatment.
- Avoid working in infested areas if possible. Postpone such work until invasive plants have been eliminated from the site.

- When necessary to conduct work in infested areas, schedule activity when seeds or propagules are least likely to be viable and to be spread
- Perform road maintenance such as road grading, brushing, and ditch cleaning from uninfested to infested areas to help prevent moving seeds and plant material from infested areas into adjacent uninfested areas.
- Clean road graders and other equipment immediately after operating in infested areas.
- Clean all dirt and plant parts from the top and underside of mower decks.

#### 4. **Minimize soil disturbance.**

Invasive plants prefer and often thrive under disturbed conditions. Do not disturb the soil unless absolutely necessary. BMPs for activities involving soil disturbance include:

- Before starting ground-disturbing activities, inventory invasive plant infestations both on-site and in the adjacent area.
- Minimize soil disturbance and retain desirable vegetation in and around area to the maximum extent possible.
- Monitor infested areas for at least three growing seasons following completion of activities. Provide for follow-up treatments based on inspection results.
- Do not blade roads or pull ditches where new invaders are found, if possible.
- When it is necessary to conduct soil work in infested roadsides or ditches, schedule activity when seeds or propagules are least likely to be viable and to be spread.
- Do not move soil from infested area to prevent off-site spread.

#### 5. **Maintain desirable species.**

Establishing and maintaining competitive, desirable plants along roadsides and disturbed areas prevents or slows establishment of invasive plants. BMPs for re-vegetating disturbed areas include:

- Re-vegetate all disturbed soil, except on surfaced roads, in a manner that optimizes plant establishment for that specific site, unless ongoing disturbance at the site will prevent establishment of invasive plants.
- Use native material where appropriate and available. Re-vegetation may include planting, seeding, fertilizing, and mulching.
- Monitor and evaluate success of re-vegetation in relation to project plan.
- When re-vegetating areas that were previously dominated by invasive plants, try to achieve at least 90% control of the invasive before attempting restoration.

### **IV. General Practices**

1. **Minimum Tool Approach** – State land stewardship involving invasive species management practices should always incorporate the principles of the Minimum Tool Approach. Any group or individual implementing such practices on State land should only use the minimum tools, equipment, devices, force, actions or practices that will effectively reach the desired management goals. Implicit in this document is the structure to implement a hierarchy of management practices based upon the target species and site conditions starting with the least intrusive and disruptive methods. For the management

of aquatic invasive species, hand harvesting and benthic matting are to be used unless a different approach has been reviewed and approved by the Department and the Agency.

2. **Erosion Control** - Some of the species specific methods described in Appendix B require digging or pulling of plants from the soil. Where vegetation is to be removed, it must be determined if the proposed control method and extent of the action will destabilize soils to the point where erosion is threatened. Generally if more than 25 square feet of soil surface is cleared or plant removal occurs on steep slopes, staked silt fencing should be installed and maintained as a temporary erosion control practice. In some cases seeding and organic, non-hay mulching may be required.
3. **Re-vegetation** - Although not required, replanting or reseeding with native species may sometimes be necessary. All of the species specific control methods described in Appendix B are aimed at reducing or eliminating invasive species so that natives are encouraged to grow and re-establish stable conditions that are not conducive to invasive colonization. In most cases, removal or reduction of invasive populations will be enough to release native species and re-establish their dominance on a site. The site specific work plan for treatment of invasive species should include monitoring provisions and contingency plans for revegetating the site.
4. **Solarization** - Because of the extremely robust nature of invasive species, composting terrestrial invasive plants in a typical backyard compost pile or composting bin is not appropriate. In many instances, composting invasive plants has led to new infestations through the distribution of compost material off site. However, solarization methods can be used whereby sun-generated heat can be used to destroy the harvested plant materials. This process usually involves the storage of invasive plant materials in sealed 3 mil thickness (minimum) black plastic garbage bags that are placed on blacktop and exposed to the sun until the plant materials liquefy or dry out. If allowed ample sunlight, plant materials should be completely destroyed within 2 weeks of being laid out. If a larger section of blacktop is available, make a black plastic (4 mil thickness minimum) envelope sealed on the edges with sand bags. The plant material left exposed to the sun will liquefy in the sealed envelope without danger of dispersal by wind. The bags or envelopes must be monitored to make sure the plants do not escape through rips, tears or seams in the plastic. Once invasive plant materials have gone through the solarization process and are completely liquefied, they can be disposed of in an approved landfill or incinerated after attaining the appropriate permits.
5. **Material Collection and Transportation** – While on the control site, place all cut plant material in heavy duty, 3 mil or thicker, black contractor quality plastic clean-up bags. Securely tie the bags and transport from the site in a covered vehicle in order to prevent spread or loss of the plant material during transport from the control work site to the appropriate staging or disposal location. The main root structure, root fragments and/or horizontal rhizomes from harvested controlled Japanese, giant or bohemian knotweed infestation should be bagged only to facilitate transport to an appropriate staging area. All knotweed root structure, root fragments and rhizome propagules should be separately bagged from any cut, aerial canes and crowns. Over an open bag, remove as much

adherent soil as possible from the root/rhizome structure prior to spreading the root/rhizome parts out onto a secure, impervious surface. Once completely dried out, the root/rhizome structure may be burned or disposed of in an approved landfill.

The mature, upright stems and canes of common reed and the knotweeds can be cut, formed into bundles and securely bound with rope or twine. The bundles may then be transported to an appropriate staging or disposal location that has an impervious or near-impervious surfaced area. After the bundles have completely dried out they may be burned at an approved incinerator or burn pit with an appropriate permit.

## **V. Management Protocols**

- a. All Department personnel whose duties involve outdoor field work on State land (e.g., UMP Planners and State Land Managers, Forest Rangers, ECOs, Operations, etc.) will report the location of suspected terrestrial and aquatic invasive species encountered during the course of their ordinary work and to implement BMPs when conducting or supervising work to remove invasive species from State land. Terrestrial and aquatic invasive species identification and management training will be provided as needed.
- b. All site specific work plans must include a site map, an inventory of target and non-target species, an estimate of the size and age of the infestation, target species impacts and concerns, a Natural Heritage review, adjoining land uses and nearby State land units, a proposed treatment method and probability of success, treatment impacts and concerns, an assessment of treatment alternatives, a history of past treatment methods used on site, a timeframe by which the work will be undertaken and completed, a schedule of anticipated future work, and monitoring provisions to determine the effectiveness of the management action.
- c. All work on State land will be conducted using the BMPs and species specific control methods listed in Appendix B, pursuant to the DEC – APA Memorandum of Understanding.
- d. Any individual or group demonstrating an interest and appropriate expertise in implementing the species specific control methods may apply for an AANR agreement to manage terrestrial and aquatic invasive species.
- e. The treatment of invasive species by Department personnel or any other party will only be undertaken pursuant to a site specific plan for the treatment of invasive species and pursuant to all applicable State, federal and local regulations regarding pesticide use, residue removal and disposal.
- f. An AANR and a site specific work plan for treatment of invasive species are required for all non-Department personnel to implement species specific control methods and BMPs on State land.
- g. All site specific work plans and applications for AANRs for the treatment of invasive species will be noticed in the Environmental Notice Bulletin for a 15 day public comment period prior to final approval by the Department.

- h. Appropriate certification (NYS pesticide applicator/technician certification) is required for commercial pesticide applications. The only pesticide application methods allowed under these guidelines are spot treatments to individual plants by the following means:
- Foliar spray application using a back pack sprayer or hand sprayer
  - Wiper application using a wick applicator or cloth glove applicator
  - Stem injection application using a stem injection gun, unitary wash bottle, or hand sprayer
  - Cut stump application using a unitary wash bottle, paintbrush, or hand sprayer
  - Basal bark application using a hand sprayer, or paintbrush
  - Frill or tree injection method using an injection lance, hatchet and unitary wash bottle or spray bottle, or hypo hatchet

- i. **No broadcast herbicide applications using, for example, a truck-mounted sprayer, are allowed. In all cases, all herbicide directions for use and restrictions found on the label shall be followed by a New York State Certified Applicator, Technician, or a properly trained and supervised apprentice in an appropriate category. In all instances, the label is the law and should be followed accordingly. All invasive species to be treated and the method of treatment to be used must be present on the herbicide product label or included in additional supplemental labeling or an approved 2ee recommendation for that product. In addition, all product labels, supplemental labels, and approved 2ee's covering an invasive species for herbicide treatment must be in the applicator's custody and made available to the Department upon request at any time before, upon, during, or after application.** For more information on how to legally use herbicide to control invasive species, please refer to Appendix D. The application methods described and allowed are designed to reduce or eliminate the possibility that non-target species will be impacted by the pesticide use. All pesticide treatments require follow-up inspection later in the growing season and/or the following year to assess and document effects and possibly re-treat any plants that were missed. The following guidelines apply with respect to the application of herbicides, which must be applied according to respective labels under federal and state law:

- In wetlands with standing water, only glyphosate formulations which include aquatic labeling may be used. Applications of pesticides to, over, or near surface waters requires the incorporation of the project into a SPDES general permit for aquatic pesticide use via submission of a notice of intent to the NYSDEC Division of Water. . In wetlands with no standing water, either the RODEO®, ROUNDUP®, AQUAMASTER®, Accord Concentrate/XRT®, or the Glypro® formulations may be used.
- In uplands either ROUNDUP®, AQUAMASTER®, GLYPRO®, Accord Concentrate/XRT®, Rodeo®, Garlon 4 Ultra®, or Pathfinder II® formulations may be used.
- The proposed use of herbicides must be detailed in a site work plan.

*Note: The mention of any pesticide product in this document does not constitute endorsement of that product*

- j. All appropriate and applicable signage and public notification required for pesticide application by or on behalf of the Department shall be used, including adjacent landowner notification, newspaper notice, and temporary on and off-site signs.
- k. These Guidelines do not authorize the use of motor vehicles, motorized equipment (excluding battery powered backpack sprayers), or aircraft. All use of motorized equipment on State lands under the jurisdiction of the Department within the Adirondack Park shall be in compliance with Commissioner's Policy Number 17 (CP-17), and other pertinent Department policy regarding the use of motorized equipment on Forest Preserve Lands.
- l. A UMP or UMP Amendment may be required if the proposed implementation of an activity identified in these Guidelines is considered to cause a potential material change to the use of the land or the vegetation thereon due to its extent, intensity or duration.
- m. Invasive species management materials and methods evolve; any deviation from the BMPs and species specific control methods must be approved by the Department after consultation with the Agency.
- n. Any invasive species management action proposal that involves tree cutting for control or access must comply with constitutional requirements and will be carried out pursuant to LF-91 and a site specific work plan.
- o. Appendix A of these Guidelines contains a list of species that are considered terrestrial or aquatic invasive species. Other species may be added over time recognizing the constant threat of new invasive species. Note that to be eligible for management actions under these Guidelines, species specific control methods must be accepted by the Department after consultation with the Agency. New or revised control methods may be developed by other entities, but also must be reviewed and accepted by the Department after consultation with the Agency.
- p. Those individuals or groups applying for an AANR to manage any invasive species without an approved species specific control method must develop and submit a control method for the species of concern. The submitted control methods will be reviewed and must be approved by the Department and the Agency before the approval of a site specific work plan or issuance of the AANR agreement. Those individuals or groups applying for an AANR to manage aquatic plants identified in Appendix A are limited to hand-harvesting or benthic matting as described in a site specific work plan describing the full course of work.

## **VI. Potential Environmental Impacts**

The control methods and BMPs contained in these Guidelines restrict the use of herbicides so that adverse impacts to non-target species are avoided and native plant communities are restored.

Aquatic invasive species will be managed using non-mechanical harvesting techniques (hand-pulling) and temporary benthic matting as described in the Guidelines. Use of pesticides for aquatics is not a part of this guidance.

The removal of these species reduces the potential for disruption and harm to the native ecosystem. It is expected that by using the Guidelines invasive species populations will be managed, and hopefully eradicated, in a timely manner before significant impact to the Forest Preserve resource occurs. Successful implementation of these control methods and BMPs or other recommended control methods will allow natural processes to take place undisturbed by the impacts of invasive species colonization and proliferation.

Any of the control actions described in the Guidelines has the potential for environmental impact. For example, the use of pesticides may cause mortality to non-target species and cutting trees may have both visual and ecological impacts on the landscape. It is recognized that although the BMPs and species specific control methods seek to mitigate these impacts, the potential for impact is real and must carefully be weighed against all other possible actions, including the no-action alternative. It is believed that the protection, preservation, and restoration of native flora and fauna in the Adirondacks is an action that is worth reasonable associated risk. These Guidelines represent a tool for land managers to reduce the potential for disruption and harm to Forest Preserve lands from terrestrial and aquatic invasive species. It is expected that these actions will lead to the preservation and restoration of native ecological communities on State lands within the Adirondack Park.

## **VII. Effect of This Action**

The Guidelines seek to lay the ground rules for managing terrestrial and aquatic invasive species on Forest Preserve lands. It identifies certain species that, if left untreated, have the potential for colonizing backcountry land and water bodies causing severe disruption and degradation of natural systems. The Guidelines set out a protocol for action and recommend a set of comprehensive BMPs and specific control methods for dealing with invasive species of concern, and sets out a process for developing and incorporating new control methods for additional species. The control methods provide detailed guidance on the use of several techniques for managing terrestrial and aquatic invasive species including hand pulling, cutting, digging, matting and pesticides. Finally, the Guidelines identify a host of additional terrestrial and aquatic invasive species that require surveillance, early detection and, after appropriate consultation with the Regional Supervisor of Natural Resources a rapid response to protect Forest Preserve lands.

Adoption of the Guidelines and implementation through the UMP and site specific work planning process, gives the Department the basic tools needed to preserve, protect and restore the natural native ecosystems of the Forest Preserve.

## **VIII. Definitions**

- a. AANR – An Adopt-A-Natural-Resource Agreement is a stewardship agreement entered into between the Department and an individual or group pursuant to ECL section 9-0113 to preserve, maintain, or enhance state-owned resources. AANRs entered into pursuant to these Guidelines allow the implementation of these Guidelines and specify the responsibilities and limitations associated with the management activity. AANRs extend for a designated period of time and can be terminated by either party upon notification.
- b. Adirondack Park Invasive Plant Program (APIPP) – A partnership including the Department, the Agency, Department of Transportation, and the Adirondack Nature Conservancy whose goals are:

1. to coordinate a regional early detection and monitoring program in cooperation with staff, volunteers and the public;
  2. to facilitate invasive species management and control with public and private landowners; and,
  3. to increase public awareness and involvement to prevent the spread of invasive species through education and outreach.
- c. Agency – The New York State Adirondack Park Agency (APA), its officers and employees.
  - d. Aquatic Invasive Plant Species – A plant that is typically found in wetland or riparian settings (including lakes, ponds, rivers or streams) that is capable of rapid reproduction and displacement of native species.
  - e. Area – Lands under the jurisdiction of the Department.
  - f. Best Management Practice (BMP) – Best management practices are state-of-the-art mitigation measures applied on a site specific basis to reduce, prevent, or avoid adverse environmental or social impacts.
  - g. Biological Control – A method of controlling pests (including insects, mites, weeds and plant diseases) that relies on predation, parasitism, herbivory, or other natural mechanisms. It can be an important component of integrated pest management (IPM) programs.
  - h. Certified Applicator – An individual who has successfully completed the course of training and licensing and who holds a valid, appropriate pesticide applicators certificate in New York State.
  - i. Control Method – A field tested recommendation for the most effective control of invasive species. Species specific control methods for terrestrial invasive species are attached in Appendix B. As of this writing, only hand harvesting and/or benthic matting are approved control methods for aquatic invasive species.
  - j. Department – The New York State Department of Environmental Conservation (DEC), its officers and employees.
  - k. Herbicide – A pesticide that is registered in New York State that kills plants. Due to the sensitive nature of Forest Preserve lands, only selected herbicides are included for use under these Guidelines. Glyphosate in the Roundup®, Rodeo®, Accord Concentrate/XRT®, Aquamaster®, and Glypro® formulations and Triclopyr in the Garlon 4 Ultra® or Pathfinder II®, formulations are the herbicides of choice. In wetlands with standing water only glyphosate formulations with aquatic labeling may be used. In wetlands with no standing water either the RODEO®, ROUNDUP®, Accord Concentrate/XRT®, Glypro®, or the AQUAMASTER® formulations may be used. In uplands either ROUNDUP®, AQUAMASTER®, Accord Concentrate/XRT®, Rodeo®,

GLYPRO®, Garlon 4 Ultra®, or Pathfinder II® may be used. In all cases herbicides will be used in strict compliance with label precautions and the species specific control methods found in Appendix B.

*Note: The mention of any pesticide product in this document does not constitute endorsement of that product*

- l. Herbicide Application Method – The method of herbicide application will be by backpack sprayer, wick applicator, handheld spray or dropper/wash bottle applicator, stem injection, frill or tree injection, or cloth glove applicator. No application will be allowed by broadcast sprays or by equipment permanently mounted on a vehicle.
- m. Inter-Agency Guidelines (“Guidelines”) – The document agreed to by the Adirondack Park Agency and the Department of Environmental Conservation that outlines regulated management of terrestrial and aquatic invasive species on State land.
- n. Invasive Species – “invasive species” means a species that is: (a)  
nonnative to the ecosystem under consideration; and  
(b) whose introduction causes or is likely to cause economic or environmental harm or harm to human health. For the purposes of this paragraph, the harm must significantly outweigh any benefits.
- o. Pest – “Pest” means (1) any insect, rodent, fungus, weed, or (2) any other form of terrestrial or aquatic plant or animal life or virus, bacteria or other micro-organism (except viruses, bacteria or other micro-organisms on or in living man or other animals) which the Department Commissioner declares to be a pest.
- p. Pesticide – Any substance or mixture of substances that is registered in New York State to kill pests. A pesticide may be a chemical substance, biological agent (such as a virus or bacterium), antimicrobial, disinfectant, plant regulator, defoliant, or other device used against a pest.
- q. Site Specific Work Plan – A detailed description of work to be performed at a specific site, the Best Management Practices that will be used to perform the work and the desired final condition of the site once the work is complete .
- r. Terrestrial Invasive Plant Species – A plant that is typically found in upland settings that is capable of rapid reproduction and displacement of native species.

## **IX. Goal of the Guidelines**

The goal of the Guidelines is to restore and protect the native ecological communities on Forest Preserve lands in the Adirondack Park through early detection and rapid response efforts to eradicate or control existing or newly identified invasive species populations.

## **X. Objectives of the Guidelines**

These Guidelines provide a template for the process through which comprehensive active terrestrial and aquatic invasive species management will take place on Forest Preserve lands in the Adirondack Park. The Guidelines provide protocols for implementing BMPs on Forest Preserve land. The protocols describe what management practices are allowed and when they can be implemented, who can be authorized to implement the management practices, and which terrestrial and aquatic invasive species are targeted. The Guidelines are a living document and should be revisited and revised periodically to reflect the dynamic nature of invasive species and the state of knowledge of best management practices.

Reference to these Guidelines will be included in UMPs as they are drafted or revised. UMPs will also include available inventory information on the distribution of invasive terrestrial and aquatic species on or in close proximity to the Unit. The Guidelines will guide invasive terrestrial and aquatic species management activities on Forest Preserve units. The site specific plan for treatment of invasive species will contain up-to-date invasive species inventory data, specific location information, and specific management recommendations for each species on each site including control actions, materials and methods, monitoring, contingencies and restoration actions.

The Guidelines also describe a process by which the Department may enter into AANR Agreements with and facilitate individuals or groups to manage terrestrial and aquatic invasive species on Forest Preserve lands using the listed best management practices, including pesticide use, in the appropriate circumstances. The AANR will be accompanied with a site specific plan for treatment of invasive species based on the BMPs in the Guidelines and include provision for monitoring and additional actions to restore natural communities. As noted above, the site specific plan for treatment of invasive species will provide the detail regarding the selected management options on a site specific basis.

## **XI. Responsibilities**

The responsibility for interpretation and update of these Guidelines and overall management shall reside with the cooperating agencies. The Department shall be responsible for management of terrestrial and aquatic invasive species on Forest Preserve lands while the Agency will be responsible for providing review of, and advice on, the management activities contained in the Guidelines and the assessment of materiality of proposed actions and the management recommendations in UMPs.

## Appendix A. Invasive Species

The 92 species included here are non-native organisms that either occur in New York State or are found in adjacent states. They have a proven record of being invasive and disrupting native ecosystems. Asterisked species have recommended control methods that are included in Appendix B. This appendix should be reviewed and updated annually.

### Trees

- Black locust (*Robinia pseudoacacia*)
- Norway and sycamore-leaved maple (*Acer platanoides*, *A. pseudoplatanus*)
- Tree-of-Heaven (*Ailanthus altissima*)
- Japanese tree lilac (*Syringa reticulata*)
- Princess tree (*Paulownia tomentosa*)
- Crack willow (*Salix fragilis*)
- European gray willow (*Salix cinerea*)

### Shrubs

- Japanese, Morrow's, tatarian, Amur, Bell's and dwarf honeysuckles\* (*Lonicera japonica*, *L. morrowii*, *L. tatarica*, *L. maackii*, *L. x. bella*, *L. xylosteum*)
- Autumn and Russian olive (*Eleagnus umbellata*, *E. angustifolia*)
- Cherry eleagnus (*Eleagnus multiflora*)
- Common and Glossy buckthorn (*Rhamnus cathartica*, *R. frangula*)
- False Spiraea (*Sorbaria sorbifolia*)
- Multiflora and rugosa rose (*Rosa multiflora*, *R. rugosa*)
- Japanese and European barberry (*Berberis thunbergii*, *B. vulgaris*)
- False indigo (*Amorpha fruticosa*)
- Winged euonymus (*Euonymus alata*)
- Butterfly bush (*Buddleja davidii*)
- Blunt-leaved and common privet (*Ligustrum obtusifolium*, *L. vulgare*)

### Vines

- Oriental bittersweet (*Celastrus orbiculata*)
- Porcelain-berry (*Ampelopsis brevipedunculata*)
- Mile-a-minute vine (*Polygonum perfoliatum*)
- Kudzu (*Pueraria montana* var. *lobata*)
- Common periwinkle (*Vinca minor*)

### Herbs

- Purple loosestrife\* (*Lythrum salicaria*)
- Japanese, giant and bohemian knotweed\* (*Fallopia japonica* var. *japonica*, *F. sachalinensis*, *F. x bohemica*)
- Common reed\* (*Phragmites australis* ssp. *australis*)
- Garlic mustard\* (*Alliaria petiolata*)
- Yellow iris\* (*Iris pseudacorus*)
- Cypress and leafy spurge (*Euphorbia cyparissias*, *E. esula*)

- Giant Hogweed (*Heracleum mantegazzianum*)
- White and yellow sweet-clover (*Melilotus alba*, *M. officinalis*)
- Wild parsnip (*Pastinaca sativa*)
- Wild chervil (*Anthriscus sylvestris*)
- Reed canary-grass (*Phalaris arundinacea*)
- Black and Pale Swallowwort\* (*Cynanchum louiseae*, *C. rossicum*)
- Indian Cup Plant (*Silphium perfoliatum*)
- Japanese stiltgrass (*Microstegium vimineum*)
- Flowering rush (*Butomus umbellatus*)
- Spotted and brown knapweed (*Centaurea stoebe ssp. micranthos*, *C. jacea*)
- Canada and bull thistle (*Cirsium arvense*, *C. vulgare*)
- Goutweed (*Aegopodium podagraria*)
- Lesser celandine (*Ranunculus ficaria*)
- Common and yellow foxglove (*Digitalis purpurea*, *D. grandiflora*)

#### Aquatics

- Eurasian and variable-leaf watermilfoil, and parrotfeather (*Myriophyllum spicatum*, *M. heterophyllum*, *M. aquaticum*)
- Fanwort (*Cabomba caroliniana*)
- Curlyleaf pondweed (*Potamogetion crispus*)
- Waterchestnut (*Trapa natans*)
- Common frog-bit (*Hydrocharis morsus-ranae*)
- Yellow floating-heart (*Nymphoides peltata*)
- Brazilian elodea (*Egeria densa*)
- Hydrilla (*Hydrilla verticillata*)
- Brittle naiad (*Najas minor*)
- Water-lettuce (*Pistia stratiotes*)
- Pacific mosquitofern (*Azolla filliculoides*)
- Didymo (*Didymosphenia geminata*)
- Starry stonewort (*Eichhornia crassipes*)
- Water hyacinth (*Pistia stratiotes*)
- Water primrose (*Ludwigia peploides*)
- Pond water starwort (*Callitriche stagnalis*)
- Three-stamen waterwort (*Elatine triandra*)
- European water fern (*Marsilea quadrifolia*)
- Water spangles (*Salvinia minima*)
- Giant salvinia (*Salvinia molesta*)
- Water soldier (*Stratiotes aloides*)

#### Insects

- Emerald ash borer (*Agrilus planipennis*)
- Asian long-horned beetle (*Anaplophora glabripennis*)
- Hemlock wooly adelgid (*Adelges tsugae*)
- Sirex woodwasp (*Sirex noctilio*)
- Asian gypsy moth (*Lymantria dispar*)
- Balsam wooly adelgid (*Adelges piceae*)

- Elongate hemlock scale (*Fiorini a externa*)

## Appendix B. Species Specific Control Methods

### CONTROL METHODS FOR PURPLE LOOSESTRIFE (*Lythrum salicaria*)

#### PLANT DESCRIPTION

Purple loosestrife is a wetland perennial native to Eurasia that forms large, monotypic stands throughout the temperate regions of the U.S. and Canada. It has a vigorous rootstock that serves as a storage organ, providing resources for growth in spring and re-growth if the plant has been damaged from cuttings. New stems emerge from the perennial roots enabling the plant to establish dense stands within a few years. Seedling densities can approach 10,000 - 20,000 plants/m<sup>2</sup> with growth rates exceeding 1 cm/day. A single, mature plant can produce more than 2.5 million seeds annually which can remain viable after 20 months of submergence in water. In addition, plant fragments produced by animals and mechanical clipping can contribute to the spread of purple loosestrife through rivers and lakes.

#### MANAGEMENT OPTIONS

##### **1. Digging/pulling**

###### *Effectiveness:*

Can be effective in small, stands (i.e., <100 plants), low-med density (1-75% area), and <3 acres, especially on younger plants.

###### *Methods:*

Hand-pull plants <2 years old. Use mini-tiller for plants >2 years - gets most of roots with minimum soil disturbance, has 3 heavy duty prongs on 1 side that are pushed under base of plant, then pry back on handle to leverage plant out of ground. Tamp down all disturbed soil surfaces. Use weed wrench for plants > 2 years old - good with minimal soil disturbance. In mucky conditions, put base of wrench on small piece of wood (e.g., piece of 2x4) to keep wrench from sinking into mud. Use shovel for plants > 2 years old - dig up plant, then replace soil and any existing cover.

###### *Cautions:*

May increase habitat disturbance and increase spread of loosestrife. Requires follow-up treatments of sites for 3 years to eliminate re-sprouting from rhizome fragments left behind. Must pull/dig ENTIRE rootstock or re-rooting will occur. Must pull/dig before the plants begin setting seed or must remove flower/seed heads first (cut and place into bags) to prevent spread of seeds. Also remove previous year's dry seed heads. Erosion control may be necessary if greater than 25 square feet of soil surface is disturbed.

###### *Disposal:*

Bag all plant parts and remove from site. Solarize\* and then dispose of in approved landfill or incinerate with appropriate permits.

*Sanitation:*

Clean all clothing, boots, tools, and equipment and transport vehicles to prevent spread of seed.

## **2. Cutting**

*Effectiveness:*

Can be effective in small stands (i.e., <100 plants), low-med density (1-75% area), and <3 acres, especially on younger plants.

*Methods:* Remove flower heads before they go to seed so seed isn't spread during the cutting or mowing activity. Must do repeated cutting and mulching to permit growth of grasses.

*Cautions:*

Need to repeat for several years to reduce spread of plants. Doesn't affect rootstalk and thus, cut pieces can be spread that will re-sprout. Once severed, stems are buoyant and may disperse to other areas and re-sprout. Removal of seed heads should be done as late in the growing season as possible yet before seed set. Early cutting without additional seed head harvest could allow re-sprouting with greater subsequent seed production.

*Disposal:*

Bag all plant parts and remove from site (Solarize\*, dispose of in approved landfill or incinerate with appropriate permits).

*Sanitation:*

Clean all clothing, boots, and equipment to prevent spread of seed.

## **3. Herbicide**

*Effectiveness:* The timing and choice of application technique will determine control efficacy and should aim to minimize off-target effects.

Purple loosestrife can be effectively controlled by both glyphosate and triclopyr based herbicides. Neither glyphosate nor triclopyr formulations will affect subsequent seedling emergence of purple loosestrife or other plants.

*Controls:*

Use glyphosate or triclopyr formulations only. If possible treat seedlings before they reach 12" in height. Cut and bag flower heads before applying herbicide. Apply prior to or when in flower (late July/Aug) so plants are actively growing and transporting nutrients to the roots.

For spot treatments use any of the following application equipment:

- Wiper application - sponge tip applicator with wick.
- Cut stump application - commercial-grade spray bottle, wash bottle, eye dropper, or paintbrush
- Foliar spray application - commercial-grade spray bottle with adjustable nozzle and/or backpack sprayer with adjustable nozzle

*Cautions:*

Glyphosate based herbicides are nonselective (kills both monocots and dicots), thus should be

applied carefully to prevent killing of non-target species. Triclopyr formulations are selective and will only affect broadleaf weeds leaving grasses and conifers unaffected. All treatment mixes should be mixed with clean, potable water because glyphosate binds tightly to organic material, which reduces toxicity to plants.

Do not spray in windy conditions because spray will drift and kill other plants. Do not apply if rain is forecast within 12 hours because herbicide will be washed away before it can act. Choose glyphosate formulations with aquatic labeling for applications in standing water or along a shoreline. Herbicide applications should come to a close at least two weeks before the first hard killing frost to allow sufficient time for the product to take effect. Do not apply after the first hard killing frost as plants will no longer actively absorb herbicide into the roots.

Be sure to always take appropriate precautions and wear suitable clothing and equipment, and follow all instructions on the herbicide label. Use a biodegradable tracer dye in the herbicide mix so you can watch for accidental contact or spill and to keep track of where you have already applied herbicide.

Be patient. Systemic herbicides like glyphosate and triclopyr do not cause a “burn down” of plants like contact herbicides do. Within 1-2 weeks the plants will look sick. There may be dead tissue spots on most leaves and many yellowing leaves. Do not waste herbicide, money or effort by spraying plants twice. Sick plants cannot effectively absorb the herbicide through the leaf surface or move the herbicide to the roots

#### **4. Biocontrol**

Two species of leaf-feeding beetle, *Galerucella californiensis* and *G. pusilla*, have been shown to be effective in controlling purple loosestrife. Over 5 million of these beetles have been released in 30 states including New York, the northeastern and midwestern states as well as all of the Canadian Provinces. The beetles have shown dramatic decreases in purple loosestrife populations with subsequent increases in populations of native species. The scientific literature indicates that the beetles are very specific to purple loosestrife with only minor spillover effects that do not compromise non-target plant populations.

##### *Effectiveness:*

Use if site has at least a half acre of purple loosestrife of medium to thick density.

Best type of control for large patches of loosestrife >3-4 acres.

##### *Methods:*

The number of beetles released per site should be based on the size of the site, the density of loosestrife and the economics of purchase. More beetles are generally better than fewer. Both Cornell University and the NYS Department of Environmental Conservation have permitting and monitoring guidelines that should be reviewed prior to the release of any biological controls.

##### *Cautions:*

Use only if mowing, pesticide and herbicide use are not active practices on the site. The site must not be permanently flooded and should be sunny. Use only if winged loosestrife, (*Lythrum alatum*) and waterwillow (*Decodon verticillatus*) are not major components of the plant community on the release site.

## CONTROL METHODS FOR COMMON REED (*Phragmites australis ssp. australis*)

### PLANT DESCRIPTION

Phragmites is a perennial grass that can grow to 14 feet in height. Flowering and seed set occur between July and September, resulting in a large feathery inflorescence, purple-hued turning to tan. Phragmites is capable of vigorous vegetative reproduction and often forms dense, virtually monospecific stands. It is unclear what proportion of the many seeds that Phragmites produces are viable. **Please note that identification of phragmites should be done by a professional botanist prior to treatment to distinguish the invasive non-native race from the non-invasive native.**

### MANAGEMENT OPTIONS

#### **1. Cutting / Mulching**

##### *Effectiveness:*

Need to repeat annually for several years to reduce spread of plants. Hand-pulling, though labor intensive, is an effective technique for controlling common reed in small areas with sandy soils. Can be effective in small stands (i.e., <100 plants), low-med density (1-75% area) and <3 acres. The cutting of larger stands having high stem densities is not an effective control method unless coupled with an immediate cut stump application of glyphosate to the freshly-cut, stem cross sections.

*Methods:* The best time to cut common reed is when most of food reserves are in aerial portion of plant when close to tassel stage, e.g., at end of July/early August to decrease plant's vigor. Some patches may be too large to cut by hand, but repeated cutting of the perimeter of a stand can prevent vegetative expansion. Common reed stems should be cut below the lowest leaf, leaving a 6" or shorter stump. Hand-held cutters and gas-powered hedge trimmers work well. Weed whackers with a circular blade were found to be particularly efficient, though dangerous. Cut and mulch dead stems in winter to remove them and promote germination of other species. Repeat in second year and then every 3-5 years.

##### *Cautions:*

Since common reed is a grass, cutting several times during a season, at the wrong times, may increase stand density. However, if cut in late July/early August, most of the food reserves produced that season are removed with the aerial portion of the plant, reducing the plant's vigor. This cutting regime may eliminate smaller colonies if carried out annually for several years. Manual or mechanical cuttings of larger, high density, monospecific common reed stands without the application of glyphosate, is not recommended.

##### *Disposal:*

Cut material should be removed from the site, solarized\*, and then disposed of in an approved landfill or incinerated with the appropriate permits. If seed heads are removed, cut plant material can be bundled and allowed to decay on the upland to prevent resprouting and formation of rhizomes. Do not attempt to compost rhizomes.

##### *Sanitation:*

Clean all clothing, boots, and equipment to prevent spread of seed.

## **2. Herbicide**

### *Effectiveness:*

The timing and choice of application technique will determine control efficacy and should aim to minimize off-target effects.

Glyphosate based herbicides can be effective in controlling common reed. Herbicide use is at least a 2 year process because the plants may need “touch-up” application, especially in dense stands where subdominant plants are protected by a thick canopy and may not receive adequate herbicide coverage in the first application. Glyphosate formulations will not affect subsequent seedling emergence of common reed or other plants.

### *Controls:*

Use glyphosate formulations only. Apply throughout the tasseling stage when nutrients going back to rhizomes will translocate herbicide into roots. If time and available resources permit, after 3 to 4 weeks following application of glyphosate, cut or mow down the stalks to stimulate the emergence and growth of other plants previously suppressed. If the size of the infestation and/or the height of the plants inhibits effective spraying, cut back and apply a cut stump treatment of glyphosate using a spray bottle or Nalgene wide-mouth, Unitary wash bottle. . Another effective option that requires less time and energy is to cut or mow down the stalks in early summer, allow regrowth, and conduct a foliar spray of the regrowth in late summer. It is imperative that enough time (at least a month and a half) be given for plants to regrow so that enough plant surface area is present for proper coverage. Usually, previously cut plants will only reach about waist height by the end of the growing season and will not go to tassel. However, since common reed is a grass, cutting will stimulate increased stand density allowing for increased spraying surface area and reduced spray height.

For spot treatments use any of the following application equipment:

- Wiper application - sponge tip applicator with wick or cloth glove applicator
- Cut stump application - commercial-grade spray bottle, wash bottle, eye dropper, or paint brush
- Foliar spray application - commercial-grade spray bottle with adjustable nozzle and/or backpack sprayer with adjustable nozzle

### *Cautions:*

Glyphosate based herbicides are nonselective (kills both monocots and dicots), thus should be applied carefully to prevent killing of non-target species. All tank mixes should be mixed with clean, potable water because glyphosate binds tightly to organic material, which reduces toxicity to plants.

Do not spray in windy conditions because spray will drift and kill other plants. Do not apply if rain is forecast w/in 12 hours because herbicide will be washed away before it can act. Choose glyphosate formulations with aquatic labeling for applications in standing water or along a shoreline. Herbicide applications should come to a close at least two weeks before the first hard killing frost to allow sufficient time for the product to take effect Do not apply after the first hard killing frost as plants will no longer actively absorb herbicide into the roots.

Be sure to always take appropriate precautions and wear suitable clothing and equipment, and follow all instructions on the herbicide label. Use a biodegradable tracer dye in the herbicide mix so you can watch for accidental contact or spill and to keep track of where you have already applied herbicide.

Be patient. Systemic herbicides like glyphosate and triclopyr do not cause a “burn down” of plants like contact herbicides do. Within 1-2 weeks the plants will look sick. There may be dead tissue spots on most leaves and many yellowing leaves. Do not waste herbicide, money or effort by spraying plants twice. Sick plants cannot effectively absorb the herbicide through the leaf surface or move the herbicide to the roots

### **3. Black Plastic**

#### *Effectiveness:*

Can be effective in small stands (i.e., <100 plants), low-med density (1-75% area). Plants die off within 3-10 days, depending on sun exposure.

#### *Methods:*

Cut plants first to 6-8" (hand-pushed bush hog or weed whacker w/blade). After cutting a stand of common reed, anchor a sheet of black plastic or dark tarp over the cut area using sand bags or rocks. High temperatures under the plastic will eventually kill off the plants. This technique works best when the treated area is in direct sunlight. Plastic should be at least 6 millimeters thick. Hold plastic in place with sandbags, rocks, biodegradable stakes, etc. Runners can be treated along the plastic edges with a spot application of glyphosate. The plastic can be removed the following year when the covered plants have been killed. A few common reed shoots may return. These can be cut, hand-pulled or re-treated with appropriate herbicide.

#### *Cautions:*

Must monitor to determine if shoots are extending out from under the plastic.

#### *Disposal:*

Can leave cut material under plastic or bag all plant parts and remove from site (Solarize\*and then dispose of in an approved landfill or incinerate with appropriate permits.

#### *Sanitation:*

Clean all clothing, boots, and equipment to prevent spread of seed.

### **4. Pulling**

#### *Effectiveness:*

Can be effective in small stands (i.e., <100 plants). Very labor intensive control method, best results when infestation occurs in sandy soils.

#### *Methods:*

Hand-pull plants <2 years old. Use shovel for plants >2 years old - dig up plant, and then replace soil and any existing cover.

*Disposal:*

Bag and remove all plant parts from site (Solarize\* and then dispose of in an approved landfill or incinerate with appropriate permits).

*Sanitation:*

Clean all clothing, boots, and equipment to prevent spread of seed.

**5. Excavation**

*Effectiveness:*

Can be effective for patches up to 1 acre in size. Cost is the limiting factor.

*Methods:*

When working in wetlands only tracked equipment shall be used. Rubber-tired excavators can operate from adjacent pavement or upland areas.

*Cautions:*

The patch should be excavated to below the depth of rhizome development. Follow-ups later in the season or the following year must be conducted to verify that all the plants have been removed

*Disposal:*

Bag and remove all plant parts from site (Solarize\* and then dispose of in an approved landfill or incinerate with appropriate permits).

*Sanitation:*

Clean all clothing, boots, and equipment to prevent spread of seed.

# CONTROL METHODS FOR GARLIC MUSTARD (*Alliaria petiolata*)

## PLANT DESCRIPTION

Garlic mustard is a naturalized European biennial herb that typically invades partially shaded forested and roadside areas. It is capable of dominating the ground layer and excluding other herbaceous species. Its seeds germinate in early spring and develop a basal rosette of leaves during the first year. Garlic mustard produces white, cross-shaped flowers between late April and June of the following spring. Plants die after producing seeds, which typically mature and disperse in August. Normally its seeds are dormant for 20 months and germinate the second spring after being formed. Seeds remain viable for up to 7 years.

## MANAGEMENT OPTIONS

### **1. Pulling.**

#### *Effectiveness:*

Hand pulling is an effective method for removing small populations of garlic mustard, since plants pull up easily in most forested habitats. It is best to pull plants when seed pods are not yet mature, but they can be pulled during most of the year. Plants should not be pulled when seed pods begin to open unless a contractor's garbage bag is held over the entire plant and held tight against the stem as the plant is being removed. This effectively eliminates the chance of any new seed dispersal.

#### *Methods:*

Soil should be tamped down firmly after removing the plant. Soil disturbance can bring existing garlic mustard seed bank to the surface, thus creating a favorable environment for additional germination within the control site.

#### *Cautions:*

Care should be taken to minimize soil disturbance but to remove all root tissues. Re-sprouting may occur from mature plants root systems if not entirely removed. Cutting is preferred to pulling when garlic mustard infestations are interspersed amongst native grasses/forbs or other sensitive or rare flora.

#### *Disposal:*

If plants have capsules present, they should be bagged and disposed of to prevent seed dispersal. Bag and remove all plant parts from site (Solarize\* and then dispose of in an approved landfill or incinerate with appropriate permits).

#### *Sanitation:*

Clean all clothing, boots, and equipment to prevent spread of seed.

### **2. Cutting**

#### *Effectiveness:*

Cutting is effective for medium to large sized populations depending on available time and labor resources. Dormant seeds in the soil seed bank are unaffected by this technique due to minimal disturbance of the soil.

*Methods:*

Cut stems when in flower (late spring/early summer) at ground level either manually (with clippers or a scythe) or with a motorized string trimmer. This technique will result in almost total mortality of existing plants and will minimize re-sprouting.

*Cautions:*

Cuttings should be conducted annually for 5 to 7 years or until the seed bank is depleted.

*Disposal:*

Cut stems should be removed from the site when possible since they may produce viable seed even when cut. Bag and remove all plant parts from site (solarize\* and then dispose of in an approved landfill or incinerate with appropriate permits).

*Sanitation:*

Clean all clothing, boots, and equipment to prevent spread of seed.

### **3. Herbicide**

*Effectiveness:* The timing and choice of application technique will determine control efficacy and should aim to minimize off-target effects.

Garlic mustard can be effectively controlled by both glyphosate and triclopyr based herbicides. Neither glyphosate nor triclopyr formulations will affect subsequent seedling emergence of garlic mustard or other plants.

*Controls:*

Use glyphosate or triclopyr formulations only. Product should be applied after seedlings have emerged, but prior to flowering of second-year plants. Fall applications from late August into October can also be effective for the first year rosettes once the second year plants have been pulled or have senesced.

For spot treatments use any of the following application equipment:

- Wiper application - sponge tip applicator with wick or cloth glove applicator
- Foliar spray application - commercial-grade spray bottle with adjustable nozzle and/or backpack sprayer with adjustable nozzle

*Cautions:*

Glyphosate based herbicide is not selective (kills both monocots and dicots), thus should be applied carefully to prevent killing of non-target species. Triclopyr formulations are selective and will only affect broadleaf weeds leaving grasses and conifers unaffected. All tank mixes should be mixed with clean, potable water because glyphosate binds tightly to organic material, which reduces toxicity to plants. Do not spray in windy conditions because spray will drift and kill other plants. Do not apply if rain is forecast w/in 12 hours because herbicide will be washed away before it can act. Choose glyphosate formulations with aquatic labeling for applications in standing water or along a shoreline. Herbicide applications should come to a close at least two weeks before the first hard killing frost to allow sufficient time for the product to take effect. Do not apply after the first hard killing frost as plants will no longer actively absorb herbicide into the roots.

Be sure to always take appropriate precautions and wear suitable clothing and equipment, and follow all instructions on the herbicide label. Use a biodegradable tracer dye in the herbicide mix so you can watch for accidental contact or spill and to keep track of where you have already applied herbicide.

Be patient. Systemic herbicides like glyphosate and triclopyr do not cause a “burn down” of plants like contact herbicides do. Within 1-2 weeks the plants will look sick. There may be dead tissue spots on most leaves and many yellowing leaves. Do not waste herbicide, money or effort by spraying plants twice. Sick plants cannot effectively absorb the herbicide through the leaf surface or move the herbicide to the root

# CONTROL METHODS FOR JAPANESE, GIANT AND BOHEMIAN KNOTWEED

*(Fallopia japonica ssp. japonica, F. sachalinensis, and F. x. bohemica)*

## PLANT DESCRIPTION

The knotweeds are herbaceous perennials which form dense clumps 1-3 meters (3-10 feet) high. Its broad leaves are somewhat triangular and pointed at the tip. Clusters of tiny greenish-white flowers are borne in upper leaf axils during August and September. The fruit is a small, brown triangular achene. Knotweed reproduces via seed and by vegetative growth through stout, aggressive rhizomes. It spreads rapidly to form dense thickets that can alter natural ecosystems. Japanese knotweed can tolerate a variety of adverse conditions including full shade, high temperatures, high salinity, and drought. It is found near water sources, in low-lying areas, waste places, and utility rights of way. It poses a significant threat to riparian areas, where it can survive severe floods.

## MANAGEMENT OPTIONS

### **1. Digging**

*Effectiveness:*

This method is appropriate for very small populations < 2 m<sup>2</sup>.

*Methods:*

Remove the entire plant including all roots and runners using a digging tool. Juvenile plants can be hand-pulled depending on soil conditions and root development.

*Cautions:*

Care must be taken not to spread rhizomes or stem fragments. Any portion of the root system or the plant stem not removed will potentially re-sprout.

*Disposal:*

All plant parts, including mature fruit, should be bagged and disposed of to prevent re-establishment (Solarize\* and then dispose of in an approved landfill or incinerate with appropriate permits).

*Sanitation:*

Clean all clothing, boots, and equipment to prevent spread of seed.

### **2. Cutting**

*Effectiveness:*

Repeated cutting may be effective in eliminating Japanese knotweed. Manual control is labor intensive, but is a good option where populations are small and isolated or in environmentally sensitive areas.

*Methods:*

Cut the knotweed close to the ground at least 3 times a year. Plant native species to act as competitors as an alternative to continued treatment.

*Cautions:*

This strategy must be carried out for several years to obtain success. Both mechanical and herbicidal control methods require continued treatment to prevent reestablishment of knotweed.

*Disposal:*

Bag all plant parts and remove from site (Solarize\* and then dispose of in an approved landfill or incinerate with appropriate permits).

*Sanitation:*

Clean all clothing, boots, and equipment to prevent spread of seed.

### **3. Herbicide**

*Effectiveness:* The timing and choice of application technique will determine control efficacy and should aim to minimize off-target effects.

Glyphosate based herbicides can be effective in controlling knotweed species. Herbicide use is usually at least a 2 year process because the plants may need “touch-up” applications, especially in dense stands where subdominant plants are protected by a thick canopy and may not receive adequate herbicide coverage in the first application. Glyphosate treatments in late summer or early fall are much more effective in preventing re-growth of Japanese knotweed the following year. The most effective control of knotweed species has been attained through the stem injection of larger canes combined with a foliar spray of smaller plants. Cut stump and foliar spray treatments without stem injection are also moderately effective but usually result in the regrowth of deformed plants the following year. Also, stem injections can be conducted during windy or rainy conditions and result in no cut plant material to dispose of. Glyphosate formulations will not affect subsequent seedling emergence of knotweed species or other plants.

*Controls:*

Use glyphosate formulations only by one or more of the following means.

- Conduct a foliar spray in late summer during the flowering stage when nutrients are being transported to the roots. If the size of the infestation and/or the height of the plants inhibit effective spraying, cleanly cut down existing stalks/canes in early summer. Allow the knotweed to re-grow for at least a month and a half and spray all re-growth when the plants are about waist high. If possible, bag, remove, and solarize\* cut plant material. If this is not possible, leave cut stems on the treatment site where they were cut. This will ensure that if any resprouting of the cut material does occur, that it will receive treatment later in the season.

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\* See item #4 “Solarization” in General Practices section.

- A cut-stump treatment utilizing glyphosate formulations can be an effective control for smaller colonies of knotweed. In early to mid-July cut the existing stems just below the 2<sup>nd</sup> or 3<sup>rd</sup> node above the soil surface. Immediately after cutting apply by swab or small spray bottle a solution of glyphosate to the freshly-cut cross section and into the internodal cavity of each stalk/cane. Monitor treatment area by early to mid-August and repeat cut-stump treatment to any residual stems.

- Stem injection is another extremely effective control method for any sized colony of knotweed. Currently, supplemental labeling for this method is available for several glyphosate formulations . From July until immediately before the first hard killing frost, inject glyphosate below the 2<sup>nd</sup> or 3<sup>rd</sup> node above the ground of the larger stems in each clump. Use suitable equipment that penetrates into the internodal region. JKInternational manufactures a stem injection tool that is suitable and recommended for this control method. Once the larger stems have been injected, conduct a foliar spray of the smaller stemmed plants on the fringes of the infestation that were not able to be injected. A marking pen should be used to identify which stems have been injected with herbicide so that stems are not injected more than once.

For spot treatments use any of the following application equipment:

- f Cut stump application - commercial-grade spray bottle, wash bottle, eye dropper, or paintbrush
  - Foliar spray application - commercial-grade spray bottle with adjustable nozzle and/or backpack sprayer with adjustable nozzle
  - Stem injection application- stem injection gun with a short, stout needle or medical syringe

*Cautions:*

Established stands of Japanese knotweed can be difficult to eradicate even with repeated herbicide treatments. However, herbicide treatments will greatly weaken the plant and prevent it from dominating a site. Adequate control is usually not possible unless the entire stand of knotweed is treated (otherwise, it will re-invade via creeping rootstocks from untreated areas).

These herbicides are non-selective (kills both monocots and dicots), thus should be applied carefully to prevent killing of non-target species. All tank mixes should be mixed with clean, potable water because glyphosate binds tightly to organic material, which reduces toxicity to plants.

Do not spray in windy conditions because spray will drift and kill other plants. Do not apply if rain is forecast w/in 12 hours because herbicide will be washed away before it can act. Choose glyphosate formulations with aquatic labeling for applications in standing water or along a shoreline. Herbicide applications should come to a close at least two weeks before the first hard killing frost to allow sufficient time for the product to take effect. Do not apply after the first hard killing frost as plants will no longer actively absorb herbicide into the roots.

Be sure to always take appropriate precautions and wear suitable clothing and equipment, and follow all instructions on the herbicide label. Use a biodegradable tracer dye in the herbicide mix so you can watch for accidental contact or spill and to keep track of where you have already applied herbicide.

Be patient. Systemic herbicides like glyphosate and triclopyr do not cause a “burn down” of plants like contact herbicides do. Within 1-2 weeks the plants will look sick. There may be dead tissue spots on most leaves and many yellowing leaves. Do not waste herbicide, money or effort by spraying plants twice. Sick plants cannot effectively absorb the herbicide through the leaf surface or move the herbicide to the roots

## CONTROL METHODS FOR JAPANESE, MORROW'S, TATARIAN, AMUR AND BELL'S HONEYSUCKLES

(*Lonicera morrowii*, *L. tatarica*, *L. japonica*, *L. maackii*, *L. x. bella*)

### PLANT DESCRIPTION – JAPANESE HONEYSUCKLE

Japanese honeysuckle (*Lonicera japonica*) is a perennial trailing or climbing woody vine of the honeysuckle family (Caprifoliaceae) that spreads by seeds, underground rhizomes, and aboveground runners. It has opposite leaves that are ovate, entire (young leaves often lobed), 4-8 cm long, with a short petiole, and variable pubescence. In the southern part of the range the leaves are evergreen, while in more northern locales the leaves are semi-evergreen and fall off in midwinter. Young stems are reddish brown to light brown, usually pubescent, and about 3 mm in diameter. Older stems are glabrous, hollow, with brownish bark that peels in long strips. The woody stems are usually 2-3 m long, (less often to 10 m). *Lonicera japonica* creates dense tangled thickets by a combination of stem branching, nodal rooting, and vegetative spread from rhizomes.

*Lonicera japonica* (including the varieties) is easily distinguished from native honeysuckle vines by its upper leaves and by its berries. The uppermost pairs of leaves of *Lonicera japonica* are distinctly separate, while those of native honeysuckle vines are connate, or fused to form a single leaf through which the stem grows. *Lonicera japonica* has black berries, in contrast to the red to orange berries of native honeysuckle vines. The fruits are produced September through November. Each contains 2-3 ovate to oblong seeds that are 2-3 mm long, dark-brown to black, ridged on one side and flat to concave on the other.

The fragrant white (fading to yellow) flowers of *Lonicera japonica* are borne in pairs on solitary, axillary peduncles 5-10 mm long, supported by leaflike bracts. The species has white flowers tinged with pink and purple. Individual flowers are tubular, with a fused two-lipped corolla 3-4 (-5) cm long, pubescent on the outside. Flowers are produced late April through July, and sometimes through October.

### MANAGEMENT OPTIONS

#### **1. Mowing and Pulling**

##### *Effectiveness:*

Removing the above ground portion of *Lonicera japonica* reduces current year growth but does not kill the plant, and generally stimulates dense regrowth. Cut material can take root and should therefore be removed from the site and solarized\*. Do not mow or pull plants that are fruiting as this may aid in seed dispersal.

##### *Methods:*

Hand pulling is highly effective. Pull out Japanese honeysuckle by the roots in winter wherever it climbs, aim the roots upward and tie them in place. The absence of light energy causes the trailing vines to decline precipitously next year. This method greatly reduces spraying requirements.

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\* See item #4 "Solarization" in General Practices section.

##### *Disposal:*

All plant parts, should be bagged and disposed of to prevent re-establishment (Solarize\* and then dispose of in an approved landfill or incinerate with appropriate permits).

*Cautions:*

Mowing is an ineffective control method, stimulating growth and encouraging formation of dense, albeit shorter, mats. Bush-hogging is an ineffective control, as *Lonicera japonica* re-invades within one growing season.

*Sanitation:*

Clean all clothing, boots, and equipment to prevent spread of seed.

## **2. Herbicide**

*Effectiveness:*

The timing and choice of application technique will determine control efficacy and should aim to minimize off-target effects.

Glyphosate based herbicides can be effective in controlling Japanese honeysuckle. In northern states, *Lonicera japonica* retains some leaves through all or most of the winter (semi-evergreen or evergreen), when most native plants have dropped their leaves. This provides a window of opportunity from mid-autumn through early spring when it is easier to spot and treat with herbicides, fire or other methods without damaging native species. Glyphosate formulations will not affect subsequent seedling emergence of Japanese honeysuckle or other plants.

*Controls:*

Use glyphosate formulations only by either of the following means:

- A foliar application of glyphosate shortly after the first frost appears to be the most effective treatment, applied after native vegetation is dormant and when temperatures are near and preferably above freezing. Applications within 2 days before the first killing frost are more effective than applications later in the season. *Lonicera japonica* is less susceptible to herbicides after the first hard frost (-4°C). Foliar applications late in the summer or early fall after fruit formation can also be effective but poses the risk of affecting other desirable vegetation through spray drift.
- A cut stump application of glyphosate applied immediately after cutting is also an effective means of controlling this species. Cut stump treatments should be conducted during the growing season after full leaf expansion when nutrients are being actively transported to the roots. Delay in application after cutting may result in reduced effectiveness

For spot treatments use any of the following application equipment:

- Cut stump application - commercial-grade spray bottle with adjustable nozzle, wash bottle, eye dropper, or paint brush
- Foliar spray application - commercial-grade spray bottle with adjustable nozzle and/or backpack sprayer with adjustable nozzle

*Cautions:*

Soil disturbance should be avoided in infested areas to minimize germination of seed in the seedbank. Treated plants should be re-examined at the end of the second growing season, as plants

can recover from herbicide application.

Glyphosate herbicides are non-selective (kills both monocots and dicots), thus should be applied carefully to prevent killing of non-target species. All tank mixes should be mixed with clean, potable water because glyphosate binds tightly to organic material, which reduces toxicity to plants.

Do not spray in windy conditions because spray will drift and kill other plants. Do not apply if rain is forecast w/in 12 hours because herbicide will be washed away before it can act. Herbicide applications should come to a close at least two weeks before the first hard killing frost to allow sufficient time for the product to take effect. Do not apply after the first hard killing frost as plants will no longer actively absorb herbicide into the roots.

Be sure to always take appropriate precautions and wear suitable clothing and equipment, and follow all instructions on the herbicide label. Use a biodegradable tracer dye in the herbicide mix so you can watch for accidental contact or spill and to keep track of where you have already applied herbicide.

Be patient. Systemic herbicides like glyphosate and triclopyr do not cause a “burn down” of plants like contact herbicides do. Within 1-2 weeks the plants will look sick. There may be dead tissue spots on most leaves and many yellowing leaves. Do not waste herbicide, money or effort by spraying plants twice. Sick plants cannot effectively absorb the herbicide through the leaf surface or move the herbicide to the roots.

### **PLANT DESCRIPTIONS – BUSH HONEYSUCKLES**

Exotic bush honeysuckles (Morrow's, Bell's, Amur and tatarian) are upright, multi-stemmed, oppositely branched, deciduous shrubs that range in height from 2 m to 6 m. The opposite leaves are simple and entire, and paired, axillary flowers are showy with white, pink, or yellow corollas. The fruits of *Lonicera spp.* are red, or rarely yellow, fleshy berries (Gleason and Cronquist 1991).

In flower, exotic bush honeysuckles can be distinguished from all native bush honeysuckles except swamp fly-honeysuckle (*L. oblongifolia*) by their hirsute (hairy) styles. In fruit, the red or rarely yellow berries of the exotics separate them from the blue- or black-berried natives waterberry (*L. caerulea*) and bearberry honeysuckle (*L. involucrata*). The exotic bush honeysuckles also generally leaf-out earlier and retain their leaves longer than the native shrub honeysuckles.

Within the exotic bush honeysuckles, *L. maackii* alone has acuminate, lightly pubescent leaves that range in size from 3.5 to 8.5 cm long and peduncles generally shorter than 6 mm. Its flowers are white to pink, fading to yellow, 15-20 mm long. Its berries are red or with an orange cast. Height ranges to 6 m.

In North America, there has been considerable confusion regarding the correct identification of *L. morrowii*, *L. tatarica*, and *L. x bella*, their hybrid. The literature contains a number of references to plants called by the name of one of the parents, but described as having characters more like those of the hybrid, *L. x bella*. The hybrid therefore, may be more common than the literature would indicate, and accurate field identification may be similarly problematic.

The two parent species of *L. x bella*, however, are dissimilar. *L. morrowii* has leaves that are elliptic to oblong gray-green, soft-pubescent beneath, and are 3-6 cm long. Its flowers are pubescent, white fading to yellow, 1.5-2 cm long, on densely hairy peduncles 5-15 mm long. The fruits are red. The height ranges to 2 m. *L. tatarica* has leaves that are ovate to oblong, glabrous, and are 3-6 cm long. Its flowers are glabrous, white to pink, 1.5-2 cm long, on peduncles 15-25 mm long. The fruits are red or rarely yellow. Height ranges to 3 m.

*L. x bella* has intermediate characteristics. The leaves are slightly hairy beneath. Flowers are pink fading to yellow, on sparsely hairy peduncles 5-15 mm. long. Fruits are red or rarely yellow. Height ranges to 6 m.

## **MANAGEMENT OPTIONS**

### **1. Grubbing, Pulling, Cutting**

#### *Effectiveness:*

Mechanical controls include grubbing or pulling seedlings and mature shrubs, and repeated clipping of shrubs. Effective mechanical management requires a commitment to cut or pull plants at least once a year for a period of three to five years. Do not mow, pull, or grub plants that are fruiting as this may aid in seed dispersal.

#### *Methods:*

Grubbing or pulling by hand (using a Weed Wrench or a similar tool) is appropriate for small populations or where herbicides cannot be used. Mature *L. maackii* shrubs growing in shaded forest settings can be eradicated by clipping once a year, during the growing season, until control is achieved. Other bush honeysuckles growing in more open settings can be managed by clipping twice yearly, once in early spring and again in late summer or early autumn.

#### *Disposal:*

All plant parts, should be bagged and disposed of to prevent re-establishment (stockpile\* , dispose of in an approved landfill or incinerate with appropriate permits).

#### *Cautions:*

Any portions of the root system not removed can resprout. Because open soil can support rapid re-invasion, managers must monitor their efforts at least once per year and repeat control measures as needed. Winter clipping should be avoided as it encourages vigorous re-sprouting.

#### *Sanitation:*

Clean all clothing, boots, and equipment to prevent spread of seed.

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\* Stockpiling implies temporary storage prior to transfer to a permanent treatment facility.

### **2. Herbicides**

#### *Effectiveness:*

The timing and choice of application technique will determine control efficacy and should aim to minimize off-target effects.

Most managers report that treatment with herbicides is necessary for the control of *L. maackii* populations growing in full sun and may be necessary for all large bush honeysuckle populations. Glyphosate based herbicides can be effective in controlling bush honeysuckles. Glyphosate formulations will not affect subsequent seedling emergence of bush honeysuckles or other plants.

*Controls:*

Use glyphosate formulations only by either of the following means: .

- A foliar application of glyphosate can be applied in late summer or early fall after fruit formation. Applications made just before the first hard killing frost have proven effective and reduce the risk of non-target impacts to other desirable vegetation that have already senesced.
  
- A cut stump application of glyphosate applied immediately after cutting is also an effective means of controlling this species. Cut stump treatments should be conducted during the growing season after full leaf expansion when nutrients are being actively transported to the roots. Delay in application after cutting may result in reduced effectiveness

For spot treatments use any of the following application equipment:

- Cut stump application - commercial-grade spray bottle with adjustable nozzle, wash bottle, eye dropper, or paintbrush
- Foliar spray application - commercial-grade spray bottle with adjustable nozzle and/or backpack sprayer with adjustable nozzle

*Cautions:*

The subsequent flush of seedlings following all herbicide treatments must also be controlled. Glyphosate based herbicides are non-selective (kills both monocots and dicots), thus should be applied carefully to prevent killing of non-target species. All tank mixes should be mixed with clean, potable water because glyphosate binds tightly to organic material, which reduces toxicity to plants.

Do not spray in windy conditions because spray will drift and kill other plants. Do not apply if rain is forecast within 12 hours because herbicide will be washed away before it can act. Herbicide applications should come to a close at least two weeks before the first hard killing frost to allow sufficient time for the product to take effect. Do not apply after the first hard killing frost as plants will no longer actively absorb herbicide into the roots.

Be sure to always take appropriate precautions and wear suitable clothing and equipment, and follow all instructions on the herbicide label. Use a biodegradable tracer dye in the herbicide mix so you can watch for accidental contact or spill and to keep track of where you have already applied herbicide.

Be patient. Systemic herbicides like glyphosate and triclopyr do not cause a "burn down" of plants like contact herbicides do. Within 1-2 weeks the plants will look sick. There may be dead tissue spots on most leaves and many yellowing leaves. Do not waste herbicide, money or effort by spraying plants twice. Sick plants cannot effectively absorb the herbicide through the leaf surface or move the herbicide to the roots

## CONTROL METHODS FOR YELLOW IRIS (*Iris pseudacorus*)

### **Plant Description**

Yellow iris (*Iris pseudacorus*) is a robust, clumping perennial herb in the Iridaceae (Iris family). *Iris pseudacorus* is easy to identify in flower, since it is the only totally yellow-flowered *Iris* in wild lands in the United States. At maturity, *I. pseudacorus* grows to a height of 0.40-1.5 meters (1.3-4.9 ft) tall. Its thick fleshy rhizomes often form dense horizontal mats, with each rhizome measuring 1 to 4 cm in diameter with roots that may extend vertically 10-20 (30) cm deep. The stiff, sword-like leaves are glaucous, number approximately 10 per ramet, are about 50-100 cm long by 10-30 mm wide, have raised midribs, and are arranged with sheathing and overlapping leaf bases.

Flowers of *I. pseudacorus* are borne on tall erect peduncles. Each inflorescence may have one to several large, showy flowers. The flowers measure 8-10 cm in diameter and vary from pale yellow to almost orange in color. The flowers are bisexual. The perianth segments (3 sepals and 3 petals) are fused at the base, and form a flaring tube with the sepals spreading and reflexed. The 3 stamens are each individually fused by their filaments to the sepals, and the showy tongue-shaped sepals are often adorned with brown spots or purple veins, and are generally less than 6 cm long. The petals are erect and less conspicuous, and are narrower than the sepals. The 3 style branches are petal-like with two-lobed lips, are mostly < 25 mm long, and are opposite and curved over the sepals. *I. pseudacorus* has an inferior, 3-chambered ovary. Fruits are elongated capsules.

Seeds of *I. pseudacorus* are pitted, pale brown, disc-shaped (roughly circular and flattened), and measure approximately 2.0-5.0 mm in diameter and 0.5-3.0 mm tall. Seeds are arranged in three densely packed vertical rows within the seed pod or capsule. These erect capsules at maturity are a glossy green color and measure 4-8 cm in length, 5.0-8.0 mm in width, and are 3-angled and cylindrical.

### **1. Digging, Pulling, Cutting**

#### *Effectiveness:*

Manual or mechanical methods that remove the entire *I. pseudacorus* rhizome mass can successfully control small, isolated patches.

#### *Methods:*

Pulling or cutting *I. pseudacorus* plants may provide adequate control, but only if it is repeated every year for several years to weaken and eventually kill the plant. Dead-heading (removing the flowers and/or fruits) from plants every year can prevent seed development and seed dispersal, but will not kill those plants.

#### *Disposal:*

If plants have capsules present, they should be bagged and disposed of to prevent seed dispersal. Bag all plant parts and remove from site (Solarize\* and then dispose of in approved landfill or incinerate with appropriate permits).

These methods, however, are very time and labor-intensive, since even small rhizome fragments can resprout. Additionally, digging disturbs the soil, may fragment rhizomes, and promote germination of *I. pseudacorus* and other undesirable species from the soil seed bank. Care should be taken when pulling, cutting, or digging *I. pseudacorus*, since resinous substances in the leaves and rhizomes can cause skin irritation.

*Sanitation:*

Clean all clothing, boots, and equipment to prevent spread of seed.

## **2. Herbicide**

*Effectiveness:*

The timing and choice of application technique will determine control efficacy and should work to minimize off-target effects.

*Iris pseudacorus* can be effectively controlled by glyphosate based herbicides. Since it usually grows in or adjacent to water, an aquatic-labeled glyphosate based herbicide and adjuvant must be used. Glyphosate formulations will not affect subsequent seedling emergence of yellow iris or other plants.

*Controls:*

- A foliar application of glyphosate can be applied throughout the growing season when nutrients are being transported to the roots. In general, fall treatments seem to be somewhat more effective than spring or summer; however detection is difficult without the flower to distinguish between yellow flag iris and native blue flag iris.
  
- Stem injection is another effective option in controlling *Iris pseudacorus*. Cut flower stems with clippers 8-9 inches above the root crown, then push a cavity needle into the soft pithy center of the stem. This creates a hollow area in the center that will hold the herbicide. Slowly inject the product into the hollow while slowly withdrawing the cavity needle. This stem injection technique can be useful in minimizing injury to neighboring plants when compared to spray techniques. Also, stem injections can be conducted during windy or rainy conditions. A marking pen should be used to identify which stems have been injected with herbicide so that stems are not injected more than once.

For spot treatments use any of the following application equipment:

- Foliar spray application - commercial-grade spray bottle with adjustable nozzle and/or backpack sprayer with adjustable nozzle
- Stem injection application- stem injection gun with a short, stout needle or medical syringe

Glyphosate based herbicides are nonselective (kills both monocots and dicots), thus should be applied carefully to prevent killing of non-target species. All tank mixes should be mixed with clean, potable water because glyphosate binds tightly to organic material, which reduces toxicity to plants.

Do not apply in windy conditions because spray will drift and kill other plants. Do not apply if rain is forecast within 12 hours because herbicide will be washed away before it can act. Herbicide applications should come to a close at least two weeks before the first hard killing frost to allow sufficient time for the product to take effect. Do not apply after the first hard killing frost as plants will no longer actively absorb herbicide into the roots.

Be sure to always take appropriate precautions and wear suitable clothing and equipment, and follow all instructions on the herbicide label. Use a biodegradable tracer dye in the herbicide mix so you can watch for accidental contact or spill and to keep track of where you have already applied herbicide.

Be patient. Systemic herbicides like glyphosate and triclopyr do not cause a “burn down” of plants like contact herbicides do. Within 1-2 weeks the plants will look sick. There may be dead tissue spots on most leaves and many yellowing leaves. Do not waste herbicide, money or effort by spraying plants twice. Sick plants cannot effectively absorb the herbicide through the leaf surface or move the herbicide to the roots

## **CONTROL METHODS FOR BLACK & PALE SWALLOW-WORTS**

### **(*Cynanchum louiseae* & *C. rossicum*)**

#### **Plant Description**

Members of the milkweed family (*Asclepiadaceae*), both black and pale swallow-wort are herbaceous, with twining vines growing three to six feet in height. Both have opposite, shiny leaves, 2” to 4” long, and both have clusters of small (<1/4”) flowers. Black swallow-wort usually bears purple-black, star shaped flowers while pale swallow-wort usually shows light maroon, star shaped flowers, but this cannot be used for reliable identification. The flowers of Black swallow-wort have petals that are about half as wide (at the base) as they are long, whereas the flowers of pale swallow-wort are much narrower at the base than their length. In addition, the inner petals of Black swallow-wort flowers are hairy, whereas the inner petals of pale swallow-wort are hairless. Both produce seed pods, bearing numerous seeds which are typically wind-distributed, but they may also be transported on clothing or on animal fur. The name “swallow-wort” comes from the shape of the fruit, which resembles the forked “swallow tail.” Both Black and Pale swallow-wort grow from strong, central rhizomes. While some suggest this provides an asexual means of distribution, others contend the primary benefit is in perenniation not dispersal. The vines typically twine and sprawl over other vegetation and die back to the ground each year. The dark green leaves are opposite on the stem and are lanceolate (shaped like a lance head) to heart-shaped. Fruits are long slender green pods (two to three inches), that turn dark brown when ripe. They appear in pairs or sometimes threes, similar to milkweed pods, but longer and narrower. Seeds are also like common milkweed seeds, rounded and flattened, each with an attached tuft of silky hair. In winter, stems may be found entangled in small shrubs with remnants of old seedpods still attached.

#### **1. Digging, Pulling, Cutting**

##### *Effectiveness:*

Manual or mechanical methods that remove the entire *Cynanchum sp.* root crown can successfully control small, isolated patches.

##### *Methods:*

Digging up the root crowns is effective but relatively destructive and the whole crown must be removed. Pulling the plants by hand generally leads to resprouting but can prevent seed production, especially if repeated during the growing season. A less effective method is pod picking, which also limits seed production, but does little damage to the existing population. Mowing is best for preventing seed production. Mow frequently (one to two visits per season) just as the pods are beginning to form. It is extremely important to ensure that populations of swallow-wort are not allowed to go to seed as control measures usually need to persist for an additional 5 years after the last year of seed dispersal.

##### *Disposal:*

If plants have seed pods present, they should be bagged and disposed of to prevent seed dispersal. Bag all plant parts and remove from site (Solarize\* and then dispose of in approved landfill or incinerate with appropriate permits).

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\* See item #4 “Solarization” in General Practices section.

##### *Cautions:*

These methods, however, are very time and labor-intensive, since even very small root crown

fragments can resprout. Additionally, digging disturbs the soil, may fragment rhizomes, and promote germination of *Cynanchum sp.* and other undesirable species from the soil seed bank.

*Sanitation:*

Clean all clothing, boots, and equipment to prevent spread of seed.

**2.Herbicide**

*Effectiveness:*

The timing and choice of application technique will determine control efficacy and should aim to minimize off-target effects.

*Cynanchum sp.* can be effectively controlled by both glyphosate and triclopyr based herbicides. Neither glyphosate nor triclopyr formulations will affect subsequent seedling emergence of swallow-worts or other plants.

*Controls:*

- A foliar spray of glyphosate or triclopyr has been found to be effective in controlling *Cynanchum sp.* These herbicides should be applied when plants are actively growing, after flowering has begun. **DO NOT SPRAY TOO SOON.** Avoid the temptation to spray the plants as soon as they emerge in May. Only when the plants flower will they be large enough to receive enough spray on the exposed leaf surface to deliver a killing dose to the roots. Plants that are sprayed before pods form will probably not produce a viable seed crop that season. Swallow-wort control may take a few years of repeated treatment since seeds may remain viable for up to 5 years. Best herbicide control results have been documented when treatment occurs before the seed pods mature.

For spot treatments use any of the following application equipment:

- Foliar spray application - commercial-grade spray bottle with adjustable nozzle and/or backpack sprayer with adjustable nozzle

*Cautions:*

Glyphosate based herbicides are non-selective (kills both monocots and dicots), thus should be applied carefully to prevent killing of non-target species. Triclopyr formulations are selective and will only affect broadleaf weeds leaving grasses and conifers unaffected. All treatment mixes should be mixed with clean, potable water because glyphosate binds tightly to organic material, which reduces toxicity to plants.

Do not apply in windy conditions because spray will drift and kill other plants. Do not apply if rain is forecast within 12 hours because herbicide will be washed away before it can act. Choose glyphosate formulations with aquatic labeling for applications in standing water or along a shoreline. Herbicide applications should come to a close at least two weeks before the first hardkilling frost to allow sufficient time for the product to take effect Do not apply after the first hard killing frost as plants will no longer actively absorb herbicide into the roots.

Be sure to always take appropriate precautions and wear suitable clothing and equipment, and follow all instructions on the herbicide label. Use a biodegradable tracer dye in the herbicide mix so you can watch for accidental contact or spill and to keep track of where you have already applied herbicide.

Be patient. Systemic herbicides like glyphosate and triclopyr do not cause a “burn down” of plants like contact herbicides do. Within 1-2 weeks the plants will look sick. There may be dead tissue spots on most leaves and many yellowing leaves. Do not waste herbicide, money or effort by spraying plants twice. Sick plants cannot effectively absorb the herbicide through the leaf surface or move the herbicide to the roots.

## **CONTROL METHODS FOR ORIENTAL BITTERSWEET** **(*Celastrus orbiculatus*)**

### **Plant Description**

Oriental bittersweet is a rapidly spreading deciduous, twining vine with alternate round, glossy leaves. It often twines around and drapes itself over other trees and shrubs in successional fields and along forest edges, often completely covering the supporting vegetation. In the shade it grows less vigorously, sometimes forming small trailing shrubs. The outer surfaces of its roots are characteristically bright orange. The branches are round, glabrous, light to dark brown, usually with noticeable lenticels. Small greenish flowers occur in clusters in the leaf axils. At maturity, globular, green to yellow fruits split open to reveal three red-orange, fleshy arils that contain the seeds. This species may be distinguished from the native American bittersweet (*Celastrus scandens*) by the location of its fruit. *C. orbiculatus* has small clusters in the leaf axils while *C. scandens* has clusters only at its branch tips. Oriental bittersweet has been shown to hybridize with American bittersweet which may lead to the loss of American bittersweet's genetic identity through introgression.

### **1. Digging, Pulling, Cutting, Grubbing**

#### **Effectiveness:**

Frequent digging, pulling, cutting, or mowing can be effective in controlling small Oriental bittersweet populations. Grubbed roots and runners sprout unless they are completely removed, so management must be frequent enough to eventually exhaust the underground carbohydrate supply. Do not mow, pull, or grub plants that are fruiting as this may aid in seed dispersal.

**Methods:** Because of the persistence of the seed bank and ability to spread by root suckering, mechanical control of Oriental bittersweet is a long-term project. It is most practical in a small plot, or in an area where chemical control is not an option. At best it is a means of restricting growth until the roots and seeds are no longer viable. Pulling plants is rarely successful unless all the root material can be removed. Even then, germination of seeds will continue for several growing seasons. Grubbing can work with the same caveats as pulling. In both methods, disposal of all plant parts, including fruits is necessary to prevent re-seeding. Some measure of control can be achieved by regular cutting over several growing seasons. Small shoots may be mowed weekly for a year or more, although less frequent mowing (2-3 times a year) will stimulate re-sprouting from the roots. Large shoots require cutting to the ground at two-week intervals. Vines should be cut as close to the root collar as possible. Eventually the root stock will expend all of its stored energy, leaving only the seed bank to deal with.

#### **Disposal:**

All plant parts should be bagged and disposed of to prevent re-establishment (Solarize\* and then dispose of in an approved landfill or incinerate with the appropriate permits).

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\* See item #4 "Solarization" in General Practices section.

Cautions:

Any portions of the root system not removed can resprout. Because open soil can support rapid re-invasion, managers must monitor their efforts at least once per year and repeat control measures as needed.

Sanitation:

Clean all clothing, boots, and equipment to prevent spread of seed.

**2. Herbicide**

Effectiveness:

The timing and choice of application technique will determine control efficacy and should aim to minimize off-target effects.

Oriental bittersweet can be effectively controlled by both glyphosate and triclopyr based herbicides. However, overall better control has been documented with triclopyr. Neither glyphosate nor triclopyr formulations will affect subsequent seedling emergence of Oriental bittersweet or other plants.

Controls:

Use glyphosate or triclopyr formulations only by one or more of the following means:

- A foliar spray of glyphosate or triclopyr has been found to be effective in controlling large populations of Oriental bittersweet. These herbicides should be applied when plants are actively growing and transporting nutrients to the roots. Although spring and summer herbicide applications appear to be more effective, the ideal times to spray are in the early spring or after the first hard frost when most native plants are dormant but bittersweet is still actively photosynthesizing. Treatments made during these times reduce or eliminate the risk of affecting non-target species. If the size of the infestation or the height of the plants inhibit effective spraying, mow or cut all vines in the early summer, allow at least a month and a half of regrowth, and then spray the regrowth.
- A cut stump application of glyphosate or triclopyr applied immediately after cutting is also an effective means of controlling small to moderate sized populations of Oriental bittersweet. Use this method in areas where vines are established within or around non-target plants, or where vines have grown into the canopy. Cut stump treatments should be conducted during the growing season after full leaf expansion when nutrients are being actively transported to the roots. Delay in application after cutting may result in reduced effectiveness.
- A basal bark application of triclopyr can also be effective in controlling small to moderate sized populations of Oriental bittersweet. A string trimmer or hand saw should be used to remove a band of the foliage from the main vine near the ground. A triclopyr based herbicide and a penetrant should then be applied to the exposed vine. If the Oriental bittersweet vines are twining around other host shrubs or trees, avoid as applying herbicide to the host plant. This treatment method can be conducted year round although efficacy may vary seasonally. For best results temperatures should be above 50°F for several days.

For spot treatments use any of the following application equipment:

- Cut stump application - commercial-grade spray bottle with adjustable nozzle, wash bottle, eye dropper, or paintbrush
- Foliar spray application - commercial-grade spray bottle with adjustable nozzle and/or backpack sprayer with adjustable nozzle
- Basal bark application – commercial-grade spray bottle with adjustable nozzle or paintbrush

Cautions:

Glyphosate based herbicides are nonselective (kills both monocots and dicots), thus should be applied carefully to prevent killing of non-target species. Triclopyr formulations are selective and will only affect broadleaf weeds leaving grasses and conifers unaffected. All treatment mixes should be mixed with clean, potable water because glyphosate binds tightly to organic material, which reduces toxicity to plants.

Do not apply in windy conditions because spray will drift and kill other plants. Do not apply if rain is forecast within 12 hours because herbicide will be washed away before it can act. Choose glyphosate formulations with aquatic labeling for applications in standing water or along a shoreline.

Be sure to always take appropriate precautions and wear suitable clothing and equipment, and follow all instructions on the herbicide label. Use a biodegradable tracer dye in the herbicide mix so you can watch for accidental contact or spill and to keep track of where you have already applied herbicide.

Be patient. Systemic herbicides like glyphosate and triclopyr do not cause a “burn down” of plants like contact herbicides do. Within 1-2 weeks the plants will look sick. There may be dead tissue spots on most leaves and many yellowing leaves. Do not waste herbicide, money or effort by spraying plants twice. Sick plants cannot effectively absorb the herbicide through the leaf surface or move the herbicide to the roots.

## Appendix C. Herbicide Labels and Material Safety Data Sheets (MSDS)\*

\* Last updated in 2007. Please refer to Cornell University's Product, Ingredient, and Manufacturer System (PIMS) for the most up to date pesticide product information.  
<http://pims.psur.cornell.edu/>

## Appendix D. NYSDEC Steps for Using Herbicides to Control Invasive Plants

## Appendix E. State Land Terrestrial and Aquatic Invasive Plant Inventory

In 2004 and again in 2005 Adirondack Nature Conservancy/Adirondack Park Invasive Plant Program staff and Student Conservation Association/AmeriCorps Environmental Steward staff in cooperation with the Department undertook a systematic effort to identify and quantify the extent of terrestrial invasive species on Forest Preserve units in the Adirondack Park. Documented priority invasive threats included garlic mustard (*Alliaria petiolata*), Japanese knotweed (*Fallopia japonica ssp. japonica*), common reed (*Phragmites australis ssp. australis*), purple loosestrife (*Lythrum salicaria*), and Japanese barberry (*Berberis thunbergii*). Other invasive species found included black locust (*Robinia pseudoacacia*), Japanese, Morrow's, tatarian, Amur and Bell's honeysuckles (*Lonicera japonica*, *L. morrowii*, *L. tatarica*, *L. maackii*, *L. x. bella*), Canada and/or bull thistle (*Cirsium arvense*, *C. vulgare*) and wild parsnip (*Pastinaca sativa*). The following summary table documents the 2005 field work. Detailed location and population information has been provided to the Regional Land Manager.

| State Land Unit                    | Terrestrial Invasive Species Present                               | Total Number of Populations | Total Area Affected in Square Feet (acres) |
|------------------------------------|--|-----------------------------|--|
| Moose River Wild Forest            | garlic mustard, honeysuckle, wild parsnip                          | 12                          | 3620 (.08)                                 |
| Sargent Ponds Wild Forest          | garlic mustard, Canada thistle                                     | 6                           | 1210 (.03)                                 |
| Blue Mountain Wild Forest          | Japanese knotweed, wild parsnip                                    | 4                           | 3950 (.09)                                 |
| Vanderwhacker Mountain Wild Forest | purple loosestrife, Japanese knotweed, honeysuckle, Canada thistle | 27                          | 14310 (.33)                                |

| <b>State Land Unit</b>      | <b>Terrestrial Invasive Species Present</b>  | <b>Total Number of Populations</b> | <b>Total Area Affected in Square Feet (acres)</b> |
|-----------------------------|--|------------------------------------|---|
| Shaker Mountain Wild Forest | garlic mustard Japanese knotweed, purple loosestrife, black locust, honeysuckle, common reed       | 33                                 | 38870 (.89)                                       |
| High Peaks Wilderness       | Japanese knotweed  | 1                                  | 13500 (.31)                                       |
| Ferris Lake Wild Forest     | garlic mustard, Japanese knotweed, purple loosestrife, common reed, Japanese barberry, honeysuckle | 48                                 | 33780 (.78)                                       |
| West Canada Lake Wilderness | garlic mustard, Japanese knotweed  | 3                                  | 420 (.01)   |
| Black River Wild Forest     | garlic mustard, common reed, Japanese knotweed, honeysuckle  | 14                                 | 11950 (.27)                                       |
| Saranac Lakes Wild Forest   | Japanese knotweed, Japanese barberry, Canada thistle, honeysuckle                                  | 12                                 | 6130 (.14)  |
| <b>Total</b>                |  | <b>160</b>                         | <b>127740 (2.93)</b>                              |

In addition to the formal survey of the above nine Wild Forest units and one Wilderness unit, the survey team kept track of other invasive species occurrences on Forest Preserve lands noted during their ordinary course of work. Below is a summary table for several additional sites.

| <b>Location</b>                             | <b>Terrestrial Invasive Species Present</b> | <b>Total Number of Populations</b> | <b>Total Area Affected in Square Feet (acres)</b> |
|---|---|------------------------------------|---|
| Pepperbox Wilderness/Stillwater Dam         | Japanese knotweed                           | 2                                  | 700 (.02)   |
| Cascade/Porter Mountain Trailhead and trail | garlic mustard                              | 1                                  | 50 (.001)   |
| Barnum Pond Boat Launch                     | purple loosestrife                          | 1                                  | 1500 (.034)                                       |
| Second Pond Boat Launch                     | Japanese knotweed                           | 1                                  | 550 (.013)  |
| Camp Santanoni                              | Japanese knotweed                           | 2                                  | 1200 (.03)  |
| Mt. Arab Trailhead Parking Area             | Japanese knotweed                           | 4                                  | 2000 (.05)  |

| <b>Location</b>                             | <b>Terrestrial Invasive Species Present</b> | <b>Total Number of Populations</b> | <b>Total Area Affected in Square Feet (acres)</b> |
|---|---|------------------------------------|---|
| Grass River/Special Trout Area Parking Area | Japanese knotweed                           | 2                                  | 1050 (.024)                                       |
| Schroon Lake Boat Launch                    | purple loosestrife                          | 1                                  | 100 (.002)  |
| Region 6 Boonville Field HQ                 | giant knotweed                              | 1                                  | 300 (.007)  |
| Lake Colby Boat Launch and Public Beach     | purple loosestrife                          | 2                                  | 400 (.01)   |
| <b>Total</b>                                |   | <b>17</b>                          | <b>7850 (.18)</b>                                 |

There are approximately 81 Wilderness, Wild Forest, Canoe and Primitive State Areas in the Park that comprise 51 land management units. A straight extrapolation of the above data to all State land units would indicate 752 terrestrial invasive species populations occupying 600,378 square feet (13.8 acres). Of course, a straight extrapolation will not yield numbers as accurate as a comprehensive survey. Also it should be noted that the ten units were all Wild Forest areas and therefore have a higher level and more varied type of use than would be expected in Wilderness areas and potentially higher levels of terrestrial invasive species infestations. Furthermore, the numbers should be placed in context. There are approximately 2.4 million acres in Wilderness, Wild Forest, Canoe and Primitive classification. If there were 13.8 acres of terrestrial invasive species infestation it represents a very minute portion of the whole. This level of invasion is an indication that invasives are at very low population levels and the chance of eradication is high. It's also a sobering wake-up reminding us that *early detection and rapid response are key ingredients to protecting the natural systems on our State lands*. Experience in other parts of New York State and other states proves that if the infestation is allowed to consolidate it will be impossible to eradicate and will create an expensive, never-ending management effort merely to keep population levels low enough to limit environmental degradation.

The survey team also visited 28 of the 47 Department campgrounds in the Adirondack Park during summer 2005. Of the 28, 16 had minor to severe infestations of terrestrial invasive plants. The most common problem species was garlic mustard, followed by Japanese knotweed, purple loosestrife, and honeysuckle. The following table summarizes the extent of invasives knowledge on Forest Preserve campgrounds.

| <b>Campground</b>        | <b>Terrestrial Invasive Species Present</b> | <b>Number of Populations</b> |
|--------------------------|---|------------------------------|
| Paradox Lake Campground  | garlic mustard, wild chervil                | 2                            |
| Lewey Lake Campground    | garlic mustard                              | 3                            |
| Limekiln Lake Campground | garlic mustard, honeysuckle                 | 13                           |

| <b>Campground</b>                      | <b>Terrestrial Invasive Species Present</b> | <b>Number of Populations</b> |
|--|---|------------------------------|
| Carry Falls Camp Sites and Boat Launch | garlic mustard                              | several/many                 |
| Cranberry Lake Campground              | garlic mustard                              | 21+                          |
| Nick's Lake Campground                 | garlic mustard                              | 49                           |
| Eighth Lake Campground                 | garlic mustard                              | 33                           |
| Golden Beach Campground                | garlic mustard                              | 101+                         |
| Brown Tract Pond Campground            | garlic mustard, honeysuckle                 | 4                            |
| Lake Durant Campground                 | garlic mustard                              | 6                            |
| Lake Eaton Campground                  | garlic mustard                              | 6                            |
| Fish Creek-Rollins Pond Campground     | garlic mustard                              | 2                            |
| Meadowbrook Campground                 | garlic mustard                              | 1                            |
| Moffitt Beach Campground               | garlic mustard                              | 14                           |
| Sacandaga River Campground             | Japanese knotweed                           | 5                            |
| Taylor Pond Campground                 | purple loosestrife                          | 1                            |
| <b>Total</b>                           |   | <b>261+</b>                  |

The inventory provides a preliminary indication that the following Department campgrounds appear to be free of target terrestrial invasive plant species: Wilmington Notch, Jones Pond, Buck Pond, Meacham Lake, Sharp Bridge, Au Sable Point, Putnam Pond, Little Sand Point, Point Comfort, Poplar Point, Forked Lake and Fourth Lake Picnic Area.

The following campgrounds and day-use areas have not been inventoried: Alger Island, Caroga Lake, Crown Point Reservation, Eagle Point, Hearthstone Point, Hinckley Reservoir Picnic Area, Lake George Battlefield Picnic Area, Lake George Battlefield, Lake George Beach, Lake George Islands, Lake Harris, Lincoln Pond, Luzerne, Moffitt Beach, Northampton Beach, Poke-O-Moonshine, Roger Rock and Tioga Point.

It is noted that not all terrestrial invasive species infestations require the use of herbicides. The protocols in section VI and the best management practices attached in Appendix B provide clear guidance as to which actions are best and allowed. In addition, all pesticide use will be approved by the Regional Supervisor of Natural Resources through an AANR agreement and based on a site specific plan for treatment of invasive plants.

#### 2007 Field Inventory Data

Following is the update from Steven Flint based on 2007 field work. The survey team visited 40 of the 45 Department campgrounds in the Adirondack Park during summer 2007. Of the 40, 16 had minor to severe infestations of terrestrial invasive plants. The most common problem species

was garlic mustard, followed by Japanese knotweed, purple loosestrife, and honeysuckle. The following table summarizes the extent of invasives knowledge on Forest Preserve campgrounds.

| <b>Campground</b>                      | <b>Terrestrial Invasive Species Present</b>      | <b>Number of Populations</b> |
|--|--|------------------------------|
| Paradox Lake Campground                | garlic mustard, wild chervil, purple loosestrife | 3                            |
| Lewey Lake Campground                  | garlic mustard, purple loosestrife               | 6                            |
| Limekiln Lake Campground               | garlic mustard, honeysuckle                      | 13                           |
| Carry Falls Camp Sites and Boat Launch | garlic mustard                                   | several/many                 |
| Cranberry Lake Campground              | garlic mustard                                   | 80+                          |
| Nick's Lake Campground                 | garlic mustard, honeysuckle                      | 49                           |
| Eighth Lake Campground                 | garlic mustard, honeysuckle                      | 33                           |
| Golden Beach Campground                | garlic mustard                                   | 101+                         |
| Brown Tract Pond Campground            | garlic mustard, honeysuckle, crown vetch         | 4                            |
| Lake Durant Campground                 | garlic mustard                                   | 6                            |
| Lake Eaton Campground                  | garlic mustard                                   | 6                            |
| Fish Creek-Rollins Pond Campground     | garlic mustard at Rollins Pond, Fish Creek clean | 2                            |
| Meadowbrook Campground                 | garlic mustard                                   | 1                            |
| Moffitt Beach Campground               | garlic mustard, purple loosestrife               | 14                           |
| Sacandaga River Campground             | Japanese knotweed                                | 5                            |
| Taylor Pond Campground                 | purple loosestrife                               | 3                            |
| <b>Total</b>                           |  | <b>326+</b>                  |

The inventory provides a preliminary indication that the following Department campgrounds appear to be free of target terrestrial invasive plant species: Wilmington Notch, Buck Pond, Sharp Bridge, Point Comfort, Poplar Point, Eagle Point, Alger Island, Lincoln Pond and Fourth Lake Picnic Area.

The following campgrounds and day-use areas have not been inventoried: Hinckley Reservoir Picnic Area, Lake George Battlefield Picnic Area, Lake George Islands, Tioga Point, Indian Lake Islands and Lower Saranac Lake Islands.

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