



New York State
Department of Transportation

BEST MANAGEMENT PRACTICES

FOR

ROADSIDE INVASIVE

PLANTS

IN THE

ADIRONDACK PARK

2014

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Christine Perron, Senior Environmental Manager, NHDOT, Bureau of Environment

The following people contributed in the development of this manual:

- **Ed Frantz**, Environmental Specialist III, Adirondack & Catskill Park Manager
- **Pete Howard**, Environmental Specialist II, Region 1 Maintenance Environmental Coordinator
- **Jim Ayers**, Environmental Specialist II, Region 7 Maintenance Environmental Coordinator
- **Ray Oram**, Environmental Specialist II, Region 2 Maintenance Environmental Coordinator
- **John Falge**, Environmental Specialist II, NYSDOT APIPP Prism Coordinator
- **John Rowen**, Right of way Vegetation Manager, NYSDOT
- **Brendan Quirion**, Terrestrial Invasive Species Project Coordinator, Adirondack Park Invasive Plant Program
The Nature Conservancy – Adirondack Chapter

LOCATION MAP:

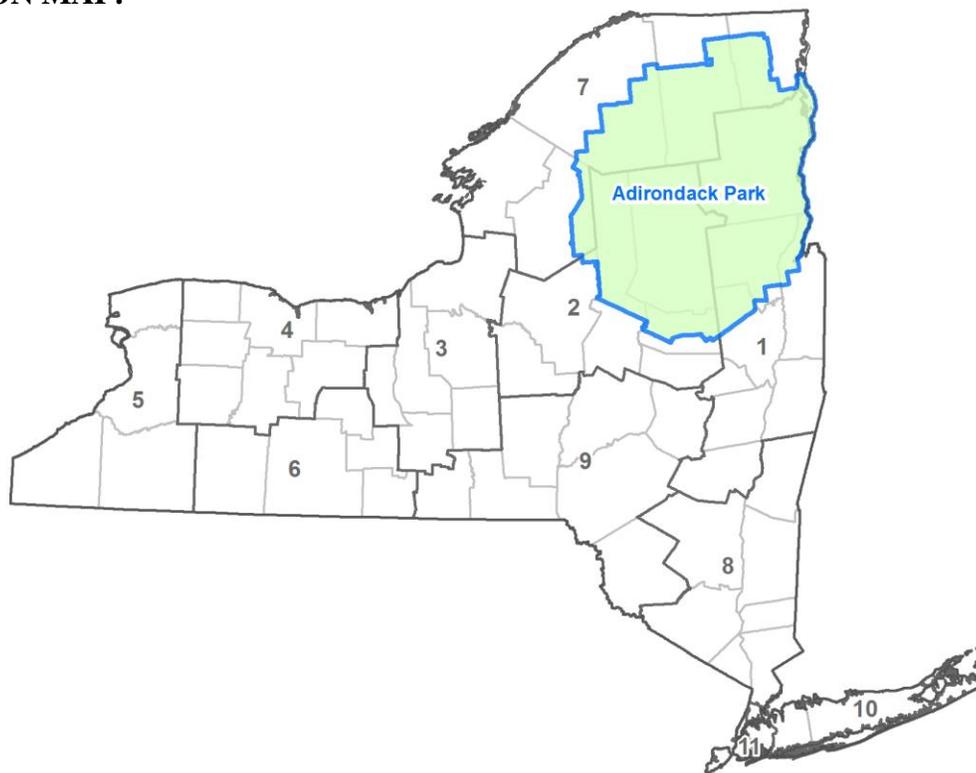


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INTRODUCTION

It is the mission of the New York State Department of Transportation (NYSDOT) to ensure our customers -- those who live, work and travel in New York State (NYS) -- have a safe, efficient, balanced and environmentally sound transportation system

The NYSDOT recognizes that in order to deliver the Department's mission, the potential threats of non-native invasive plants to New York State's transportation system must be addressed. Invasive species present an on-going threat to society, economies, and the environment globally and human activities influence the introduction and spread of these problematic species. For the NYSDOT, many roadside maintenance and construction activities have the potential to introduce and spread invasive plants, and these challenges are faced across the state. The Adirondack region presents many similar challenges but also unique opportunities for action. This document is intended to serve the Adirondack region and provides a more focused consideration of these challenges and opportunities. This document will likely benefit other regions of the State and future modifications/additions may be a consideration.

The NYSDOT has had a long history and commitment to invasive species related issues in the Adirondack region, and the Department's collaborative effort with the Adirondack Park Invasive Plant Program (APIPP) and other partners has lead to national recognition. The creation of this document and subsequent related trainings continue this important effort. In addition, this document is consistent with recommendations being made as part of the NYSDOT Travel Corridor Unit Management Planning process, the Department's commitment to the continuation and promotion of environmentally related training efforts, the NYSDOT's Guidelines for the Adirondack Park, and the Adirondack Park Invasive Plant Program's Memorandum of Understanding (MOU) established in 1998.

Impacts of invasive plants

An invasive terrestrial plant is a non-native plant that is able to persist and proliferate outside of cultivation, resulting in ecological and/or economic harm. These plants readily colonize disturbed areas and habitat edges, such as transportation and river corridors. Once established in these areas, invasive plants often continue to spread to adjacent habitats. All invasive plant species are aggressive competitors with the ability to significantly reduce diversity of native plant and animal species along with compromising the safety and integrity of the transportation infrastructure.

The land adjacent to roadways tends to be ideal habitat for invasive plants because of its high level of disturbance and abundant sunlight. According to the Federal Highway Administration, roadside rights-of-way account for more than 10 million acres of land in the United States. This is a significant amount of land on which invasive plants readily establish. The right-of-way environment creates long, linear habitats that serve as pathways for the spread of invasive plants into new regions and onto adjacent lands. Once established, invasive plants can affect the safety and maintenance of transportation infrastructure and wreak havoc on the natural environment.

Invasive plants spread by a variety of mechanisms, including birds, wind, and water. Human activities are also a major factor in the spread of these plants, from gardening and transport of nursery stock to erosion control and wildlife plantings. Routine maintenance and construction activities along

transportation corridors can also play a significant role in the spread of invasive plants by dispersing or introducing seeds and other viable plant materials.

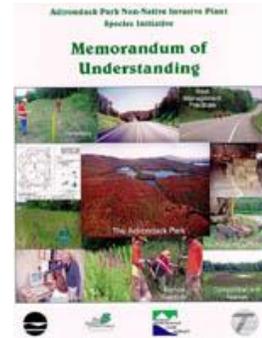
In addition to ecological and environmental threats, invasive roadside plants can compromise traveling public safety by reducing line of sight distances and blocking signage or signal systems. Prolific root growth can also compromise highway drainage systems and damage sub base material which can accelerate the roadway infrastructure deterioration.

Invasive plant partnership & Memorandum of understanding

In 1998, the Adirondack Nature Conservancy (ANC), NYS Adirondack Park Agency (APA), NYS Department of Transportation (DOT), and NYS Department of Environmental Conservation (DEC) partnered together and plotted a course of action to address the threat that terrestrial invasive plant species posed to the Adirondack's native ecosystems. Preliminary survey data showed that roadways and their respective rights of way (ROW) act as conduits for the spread of invasive plants.

In 2001, the four partners—ANC, APA, DOT, and DEC — formalized their commitment to the invasive plant project in a Memorandum of Understanding and agreed upon the following objectives:

- Identify invasive species of concern
- Initiate and maintain roadside inventories
- Investigate and implement best management practices for control and containment
- Monitor to measure success
- Continue surveillance to identify and record new locations
- Increase public and agency awareness through education and outreach
- Meet the goals of 2/3/99 [Federal Executive Order 13112](#)



Using This Manual

The intent of this manual is to continue fostering the Department's awareness of terrestrial invasive plants in the Adirondack Park and the role that the Department can play in managing existing infestations as well as limiting the spread of these species along our rights-of-way and into adjacent habitats. The information in this manual is meant as guidance for maintenance and construction personnel, as well as contractors working for the Department. This manual is divided into three sections:

Section I: This section lists the invasive plant species that are part of the management guidelines for the Adirondack Prism as described in the 2010 "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". The Department should be using all the general BMP's found in this document when encountering any of the species mentioned.

Section II: The general Best Management Practices (BMPs) that are discussed are applicable to all invasive plants, including those listed on the AIPPP target Invasive Species list. When followed, these BMPs will reduce the likelihood of introducing invasive plants into new areas via transportation maintenance and construction activities.

Section III: Priority invasive plant species are discussed, including appropriate species-specific BMPs and Preferred Control Methods. Priority species are those species that have at least two of the following characteristics: 1) easily spread by NYSDOT activities, 2) significant negative impact on transportation infrastructure, 3) very difficult to eradicate and, 4) a threat to human health. The four priority species are Japanese knotweed, purple loosestrife, common reed, and Giant Hogweed. All of these priority species are on APIPP’s target species list. All of the priority species are already located along roadsides within the Adirondack region, with the exception of giant hogweed, which is currently found only in scattered populations in the park.

- | | |
|-----------------------|---------------------------------|
| 1. Japanese Knotweed | <i>Fallopia japonica</i> |
| 2. Purple loosestrife | <i>Lythrum salicaria</i> |
| 3. Common reed | <i>Phragmites australis</i> |
| 4. Giant Hogweed | <i>Heracleum mantegazzianum</i> |

Section IV: Table format of some of the recommended Department management practices.

Section V: Department contacts and other resources are listed to provide sources for more information, especially in regard to invasive plant identification. The websites, publications, and links listed in this section provide detailed invasive plant information including identification characteristics and photographs.

A glossary is included to define terms used throughout the manual.

SECTION I - Adirondack Park Invasive Species List

The species included in this list are non-native invasive plants that either occur in New York State or are found in adjacent states. They have a proven record of invasiveness and disrupting native ecosystems. Asterisked species have recommended control methods that are included in the Transportation BMP’s. Although not critical to the transportation infrastructure, the Department recognizes the additional problems associated with the invasive plant species listed below. These plants should be subject to the stewardship management practices of the travel corridor within the Adirondack Park.

<u>Trees</u>	<u>Common Name</u>	<u>Scientific Name</u>
	1. Black locust	<i>Robinia pseudoacacia</i>
	2. Norway maple	<i>Acer platanoides</i>
	3. Sycamore-leaved maple	<i>Acer pseudoplatanus</i>
	4. Tree-of-Heaven	<i>Ailanthus altissima</i>
	5. Japanese tree lilac	<i>Syringa reticulata</i>
	6. Princess tree	<i>Paulownia tomentosa</i>
	7. Crack willow	<i>Salix fragilis</i>
	8. European gray willow	<i>Salix cinerea</i>

Shrubs	Common Name	Scientific Name
1.	Honeysuckle	
	○ Japanese	<i>Lonicera japonica</i>
	○ Morrow's	<i>Lonicera morrow</i>
	○ Tatarian	<i>Lonicera tatarica</i>
	○ Amur	<i>Lonicera maackii</i>
	○ Bell's	<i>Lonicera x. bella</i>
	○ Dwarf	<i>Lonicera xylosteum</i>
2.	Autumn olive	<i>Eleagnus umbellata</i>
3.	Russian olive	<i>Eleagnus angustifolia</i>
4.	Cherry eleagnus	<i>Eleagnus multiflora</i>
5.	Common buckthorn	<i>Rhamnus cathartica</i>
6.	Glossy buckthorn	<i>Rhamnus frangula</i>
7.	False Spiraea	<i>Sorbaria sorbifolia</i>
8.	Multiflora rose	<i>Rosa multiflora</i>
9.	Rugosa rose	<i>Rosa rugosa</i>
10.	Japanese barberry	<i>Berberis thunbergii</i>
11.	European barberry	<i>Berberis vulgaris</i>
12.	False indigo	<i>Amorpha fruticosa</i>
13.	Winged euonymus	<i>Euonymus alata</i>
14.	Butterfly bush	<i>Buddleja davidii</i>
15.	Blunt-leaved privet	<i>Ligustrum obtusifolium</i>
16.	Common privet	<i>Ligustrum vulgare</i>

Vines	Common Name	Scientific Name
1.	Oriental bittersweet	<i>Celastrus orbiculata</i>
2.	Porcelain-berry	<i>Ampelopsis brevipedunculata</i>
3.	Mile-a-minute vine	<i>Polygonum perfoliatum</i>
4.	Kudzu	<i>Pueraria montana var. lobata</i>
5.	Common periwinkle	<i>Vinca minor</i>

Herbs	Common Name	Scientific Name
1.	Purple loosestrife*	<i>Lythrum salicaria</i>
2.	Knotweed*	
	i. Japanese	<i>Fallopia japonica var. japonica</i>
	ii. giant	<i>Fallopia sachalinensis</i>
	iii. bohemian	<i>Fallopia x bohemica</i>
3.	Common reed*	<i>Phragmites australis ssp. australis</i>
4.	Giant Hogweed*	<i>Heracleum mantegazzianum</i>
5.	Garlic mustard	<i>Alliaria petiolata</i>
6.	Yellow iris	<i>Iris pseudacorus</i>
7.	Cypress spurge	<i>Euphorbia esula</i>
8.	Leafy spurge	<i>Euphorbia cyparissias</i>
9.	White sweet-clover**	<i>Melilotus alba</i>

10. Yellow sweet-clover	<i>Melilotus officinalis</i>
11. Wild parsnip	<i>Pastinaca sativa</i>
12. Wild chervil	<i>Anthriscus sylvestris</i>
13. Reed canary-grass	<i>Phalaris arundinacea</i>
14. Black Swallowwort	<i>Cynanchum louiseae</i>
15. Pale Swallowwort	<i>Cynanchum rossicum</i>
16. Indian Cup Plant	<i>Silphium perfoliatum</i>
17. Japanese stiltgrass	<i>Microstegium vimineum</i>
18. Flowering rush	<i>Butomus umbellatus</i>
19. Spotted knapweed**	<i>Centaurea stoebe ssp. micranthos</i>
20. Brown knapweed **	<i>Centaurea stoebe ssp. jacea</i>
21. Canada thistle**	<i>Cirsium arvense</i>
22. Bull thistle**	<i>Cirsium vulgare</i>
23. Goutweed	<i>Aegopodium podagraria</i>
24. Lesser celandine	<i>Ranunculus ficaria</i>
25. Common foxglove	<i>Digitalis purpurea</i>
26. Yellow foxglove	<i>Digitalis grandiflora</i>

* - *NYS DOT Target Species for Management*

** - *NYS DOT Target Species Watch*

SECTION II - General Best Management Practices

Soil Disturbance and Stabilization

- **BMP #1:** Minimize soil disturbance whenever possible. Invasive plants readily colonize areas of disturbed soil. Monitor recent work sites for the emergence of invasive plants.
- **BMP #2:** Stabilize disturbed soils as soon as possible by seeding and/or using straw mulch, rip-rap, or gravel where the source is free of invasive plant material. Seeds of native species should be used whenever possible. Species on the prohibited or regulated invasive plant lists under New York State's invasive species prevention act should never be planted.
- **BMP #3:** Materials such as fill, loam, straw mulch, rip-rap, and gravel should **not** be brought into project areas from sites where invasive plants are known to occur. If the absence of invasive plant parts in these materials cannot be guaranteed, recent work sites should be monitored for the emergence of invasive plants for a minimum of two years after project completion.

Movement and Maintenance of Equipment

- **BMP #4:** If work in areas containing invasive plants cannot be avoided, then the movement of maintenance and construction equipment should be from areas not infested by

invasive plants to areas infested by invasive plants whenever possible. This is especially important during ditch cleaning and shoulder scraping activities.

- **BMP #5:** Locate and use staging areas that are free of invasive plants to avoid spreading seeds and other viable plant parts.
- **BMP #6:** If equipment must be used in areas where invasive plants occur, all equipment, machinery, and hand tools should be cleaned of all visible soil and plant material before leaving the project site. Equipment should be cleaned at the site of infestation. Acceptable methods of cleaning include, but are not limited to:
 - Portable sprayer with treated water
 - Portable wash station that contains runoff from washing equipment (containment must be in compliance with discharge regulations);
 - High pressure air;
 - Brush, broom, or other hand tools (used without water).
- **BMP #7:** If equipment must be used in areas containing Japanese knotweed, phragmites, or purple loosestrife, aboveground plant material should be cut and properly disposed of (see BMP #11) prior to the start of work. *If excavation occurs in these areas, see BMPs #13-16.*

Mowing

- **BMP #8:** These invasive plants have the ability to sprout from stem and root fragments: **purple loosestrife, phragmites, and Japanese knotweed.** Mowing these plants should be avoided whenever possible, except as part of an Invasive Management strategy (see BMP #9). Staking or flagging roadside populations of these plants as “do not mow” is one way to accomplish this. If these plants are cut, all plant material must be rendered nonviable and extra care should be taken to avoid spreading plant fragments (see BMP #11).
- **BMP #9:** In areas where invasive plants occur and the plants listed in BMP #8 (purple loosestrife, phragmites, and Japanese knotweed) are present, an attempt should be made to mow the right-of-way prior to seed maturation (approximately August 1st). This could be accomplished by identifying specific roads that are either heavily infested with invasive plants or roads that are in sensitive habitat areas, and making those roads a priority in the mowing schedule. A herbicide program should be considered as part of any invasive management strategy either separately or in conjunction with a mowing.
- **BMP #10:** Mowing equipment should be cleaned at least daily, as well as prior to transport (see BMP #6). This is particularly important if mowing occurs after seed maturation (after August 1st).

Disposal of Plants

- **BMP #11:** When invasive plants are cut or removed for roadside maintenance, construction, or control of plants, the spread of viable plant material must be avoided by rendering plant material nonviable. The following methods can be used to destroy plant material:

- Drying/Liquefying: For large amounts of plant material or for plants with rigid stems, place the material on asphalt, tarps, or heavy plastic, and cover with tarps or heavy plastic to prevent the material from blowing away. For smaller amounts of plant material or for plants with pliable stems, bag the material in heavy-duty (3-mil or thicker) garbage bags. Keep plant material covered or bagged for at least one month. Material is nonviable when it is partially decomposed, very slimy, or brittle. Once material is nonviable, it can be disposed of in the normal waste stream or as normal surplus material.

Recommended for: Japanese knotweed, purple loosestrife, & phragmites.

- Brush Piles: Plant material from most invasive plants can be piled on site to dry out. However, when piling purple loosestrife, phragmites, and Japanese knotweed, care must be taken to pile stems so that cut surfaces are not in contact with the soil.

Recommended for: Woody shrubs, trees, and vines; spotted knapweed; large quantities of purple loosestrife, phragmites, and Japanese knotweed.

NOT recommended for: any invasive plant with seeds or fruit attached, unless plants can be piled within the limits of the infestation.

- Burying: Plant material from most invasive plants should be buried a minimum of five feet below grade. This method is best used on a job site that already has disturbed soils.

Recommended for: any invasive plant.

- Herbicide: Herbicide applications must be carried out by a licensed applicator under permit from the NYSDEC. If application is in a wetland or buffer area the selected herbicide must be label approved for use in wetlands.

Recommended for: any invasive plant, especially purple loosestrife, phragmites, & Japanese knotweed.

- **BMP #12:** Invasive plant material must be covered during transport.

Ditching and Excavated Material

- **BMP #13:** Excavated material taken from sites that contain invasive plants cannot be used away from the site of infestation until all viable plant material is destroyed. Excavated material from areas containing invasive plants may be reused within the *exact* limits of the infestation.
- **BMP #14:** Any excavated material that contains viable plant material and is not reused within the limits of the infestation must be stockpiled on an impervious surface until viable plant material is destroyed OR the material must be disposed of by burying a minimum of five feet below grade.
- **BMP #15:** Whenever possible, excavation should be avoided in areas containing Japanese knotweed, purple loosestrife, and phragmites. If excavation does occur in these areas, the BMPs described in Section III must be followed.
- **BMP #16:** Ditched areas should be stabilized daily as part of the regular work operations. The disturbed soils and new ditch profile are to be protected as soon as possible by stone, erosion control materials or seeding and mulch from a source free of invasive plant material. Seeds of native species should be used whenever possible. Mulch may be straw or a manufactured product.
- **BMP #17:** Soil and other materials containing invasive plants or plant parts must be covered during transport.

Capital Program Screening (see also EI 09-001 & EI 09-002)

- **BMP #18:** All Capital Program Projects proposed in the Adirondack Park shall be screened for the presence of invasive plant species prior to any earthmoving activities. These infested areas should be identified as soon as possible and considered a priority by NYSDOT Operations Spray Crew for herbicide treatment. A minimum of two applications should be applied before construction activities take place. Monitoring by operations within the project limits should take place for up to five years following project completion to ensure that invasive plants have not regenerated or spread into adjacent areas. Any new infestations shall be treated with herbicide on an annual basis.

SECTION III -NYS DOT PRIORITY INVASIVE SPECIES

Knotweed

Fallopia japonica
(Formally known as *Polygonum cuspidatum*)

<i>Knotweed</i>				
				
Height	Stem	Leaf	Flower	Roadside
Annual shrub 3-10 feet	1 to 3 inch diameter Purple blotches, stiff bristles	Compound, lobed, deeply incised; up to 5 feet wide	Small GreenishWhite flowers August/September form a mass of white over the plant	Upland, dry locations in fast growing dense mass of plants



Species Management Practices

KNOTWEED

- **Knotweed MP #1:** Any treatment or control of knotweed should take place prior to seed maturation (late August). While knotweed spreads primarily via vegetative reproduction, it does produce viable seeds that can germinate in the wild.
- **Knotweed MP #2:** Do not mow knotweed, especially if it is growing near a ditch line, wetland, or surface water. Mowing knotweed creates small stem fragments that can be spread by the mowing equipment or moving water. These fragments can sprout and start new populations of knotweed.
- **Knotweed MP #3:** If knotweed must be removed (i.e. for safety reasons), a control plan should be implemented using preferred control methods (see following page). If a control plan is not implemented, the preferred method of removal is hand cutting, especially near water. The cut stems must be rendered nonviable by using a method listed in Section I – General Best Management Practices (BMP #11).
- **Knotweed MP #4:** If hand cutting is not feasible and mowing equipment must be used, the site should be raked immediately after mowing and as much plant material as possible should be collected and rendered nonviable by using a method listed in Section I (BMP #11). All mowing equipment should be cleaned prior to leaving the site (see Section I – BMP #6). *Note that cutting, whether manual or mechanical, is generally not an effective method for eradicating knotweed.*
- **Knotweed MP #5:** If excavation will occur in areas containing knotweed, one or more of the following methods must be used to avoid spreading viable plant material:
 - a) Treat all knotweed stems with pesticide (see Control Option #1 on the following page). This control method should be carried out at least two years prior to excavation in order to allow time to perform an adequate number of pesticide treatments to kill the entire root system.
 - b) Excavate as needed and spread all material containing roots and stems on an *impervious surface*. Care must be taken not to spread plant material during excavation and transport. Root material should be broken up as much as possible to promote a faster drying time. Once material has completely dried out, it is nonviable and can be used or disposed of on or off site.
 - c) If the above methods are not feasible, excavated material can be buried *at the site of infestation* at least **five** feet below grade.

Preferred Control Methods

KNOTWEED

- **Knotweed Control Option #1: Chemical Control**

Herbicide treatment is the most effective way to eradicate knotweed. The best time to apply herbicide is late summer or early fall, when the plants are just starting to flower. The following application methods are effective; however, treatments will likely be required for at least two consecutive years, regardless of the method used.

Effective herbicide treatments:

- a) Early summer cut followed by a late summer/early fall foliar spray – best for small to medium sized populations
- b) Foliar spray twice in one growing season – best for large, dense populations
- c) Stem injection – best for small to medium sized populations

Important considerations:

- Any method that requires cutting the knotweed stems necessitates proper disposal of the cut stems.
- Presently, the NYSDEC requires knotweed to be listed on the pesticide label as a target species for a specific application method.
- Application of herbicide must be consistent with herbicide label and carried out by a licensed applicator.
- Applying herbicide to the right-of-way may require going through a public notification process.
- Avoid herbicide drift and spillage to minimize impacts to non-target species.

- **Knotweed Control Option #2: Mechanical Control**

If herbicide treatment is not an option cutting is sometimes successful in eradicating knotweed, but only with small, young populations, and only when done repeatedly (at least 4 times each growing season) for several years. Cutting by hand with a scythe or loppers is preferable to mowing. Cut material should be destroyed as described in Section I (BMP #11), and all equipment should be cleaned prior to leaving the site (see Section I - BMP #6).

Purple Loosestrife

Lythrum salicaria

Purple Loosestrife				
				
Height -Growth	Stem	Leaf	Flower	Roadside
Erect perennial Shrub can grow up to 10 feet generally 3-5' Rhizomatous growth is insignificant in purple loosestrife	up to 50 stems arising from its base. Shoots destroyed by fire, pesticides, or mechanical removal can also regenerate from the rootstock.	sessile, opposite or whorled, lanceolate (1-4" long and .2-.5" wide)	Multiple rose-purple spike like inflorescence that consists of five to seven petals.	strong taproot generally likes moist soils, ditches and wetlands mature plant produces about 2,700,000 seeds annually



Species Management Practices

LOOSESTRIFE

- **Loosestrife MP #1:** Any treatment or control of loosestrife should take place prior to seed maturation (early August). A mature loosestrife plant can produce more than 2 million seeds.
- **Loosestrife MP #2:** Do not mow loosestrife if it can be avoided. Mowing loosestrife creates small stem fragments that can be spread by the mowing equipment or moving water. These fragments can sprout and start new populations of loosestrife.
- **Loosestrife MP #3:** If excavation will occur in areas containing purple loosestrife, one or more of the following methods must be used to avoid spreading viable plant material:
 - a) Treat all loosestrife stems with pesticide (see Control Option #3 on the following page). This control method should be carried out at least two years prior to excavation in order to allow time to perform an adequate number of pesticide treatments to kill the entire root system.
 - b) Excavate as needed and spread all material containing roots and stems on an *impervious surface*. Care must be taken not to spread plant material during excavation and transport. Root material should be broken up as much as possible to promote a faster drying time. Once material has completely dried out, it is nonviable and can be used or disposed of on or off site.
 - c) Excavated material can be buried on or off site at least **five** feet below grade.

Preferred Control Methods

LOOSESTRIFE

- **Loosestrife Control Option #1: Mechanical Control**

Cutting or pulling out by the roots can be effective in eradicating small, young populations. However, this treatment must be continued for several years and any disturbed soil must be stabilized. Any material that is cut or pulled must be rendered non-viable (see Section I - BMP #11). Both stem and root fragments can sprout new plants.

- **Loosestrife Control Option #2: Biological Control**

Biological control measures have been developed for loosestrife and consist of leaf-feeding and root-feeding beetles. This control method is best for large, dense populations. More information about this option can be obtained from the NYSDEC.

- **Loosestrife Control Option #3: Chemical Control**

Herbicide can be applied in late July. Treatments will likely be required for at least two consecutive years, regardless of the method used.

Effective herbicide treatments:

- a) Foliar spray
- b) Cut stem

Important considerations:

- Presently, the NYSDEC requires loosestrife to be listed on the herbicide label as a target species for a specific application method.
- Application of herbicide must be consistent with herbicide label and carried out by a licensed applicator.
- Applying pesticide to the right-of-way may require going through a public notification process.
- Avoid herbicide drift and spillage to minimize impacts to non-target species.

Phragmites / Common Reed
Phragmites australis

<i>Phragmites/ Common Reed</i>				
				
Height	Stem	Leaf	Flower/Seed	Roadside
Perennial grass Tall up to 15'	<1" in dia. Dead stems often persist	1-1.5" elongated	Late July/August bushy purple/golden panicles	Spread by seed and rhizomes generally 4xH Also vegetative cuttings



Species Management Practices

COMMON REED / PHRAGMITES

- **Phragmites MP #1:** Do not mow phragmites if it can be avoided. Phragmites spreads vigorously by vegetative reproduction. Mowing phragmites creates small stem fragments that can be spread by the mowing equipment or moving water. These fragments can sprout and start new populations.
- **Phragmites MP #2:** Cutting by any method, when done at the wrong time, can increase stand density. Cutting should be timed to coincide with tasseling (when flowers begin to develop at the top of stem - late July/early August). This is when most of the plant's food reserves are aboveground.
- **Phragmites MP #3:** If excavation will occur in areas containing phragmites, one or more of the following methods must be used to avoid spreading viable plant material:
 - a) Treat all phragmites stems with pesticide (see Control Option #2 on the following page). This control method should be carried out at least two years prior to excavation in order to allow time to perform an adequate number of pesticide treatments to kill the entire root system.
 - b) Excavate as needed and spread all material containing roots and stems on an *impervious surface*. Care must be taken not to spread plant material during excavation and transport. Root material should be broken up as much as possible to promote a faster drying time. Once material has completely dried out, it is non-viable and can be used or disposed of on or off site.
 - c) Excavated material can be buried on or off site at least **five** feet below grade.

Preferred Control Methods
COMMON REED / PHRAGMITES

- **Phragmites Control Option #1: Mechanical Control**

Cutting by hand, pulling, or digging can be effective in eradicating small, new populations. These methods should be used in late July or early August when the plants are close to or in tasseling stage. This treatment must be continued for several years and any disturbed soil must be stabilized. Any material that is removed must be rendered non-viable (see Section I - BMP #11). Both stem and root fragments can sprout into new plants.

- **Phragmites Control Option #2: Chemical Control**

Herbicide can be applied in late summer (after tasseling). Treatments will likely be required for at least two consecutive years, regardless of the method used.

Effective herbicide treatments:

- a) Foliar spray
- b) Stem injection

Important considerations:

- Presently, the NYSDEC requires phragmites to be listed on the herbicide label as a target species for a specific application method.
- Application of herbicide must be consistent with the herbicide label and carried out by a licensed applicator.
- Applying herbicide to the right-of-way may require going through a public notification process.
 - Avoid herbicide drift and spillage to minimize impacts to non-target species.

Giant Hogweed

Celastrus orbiculatus

Giant Hogweed				
				
Height	Stem	Leaf	Flower	Roadside
15 to 20 feet	1 to 3 inch diameter Purple blotches, stiff bristles	Compound, lobed, deeply incised; up to 5 feet wide	White flowers, flattopped, umbrella, up to 2.5 feet across	Upland, dry locations in clumps of plants



Species Management Practices

- **Giant Hogweed MP #1:** Giant hogweed is very difficult to eradicate. Although the stems, stalks, leaves and flowers can be killed with herbicides this tends to be less effective at killing the plant's tuberous perennial roots. Any treatment or controls of giant hogweed should take place prior to seed maturation (August). Unfortunately, owing to the plant's persistence and spread by blowing seeds, such control can take many seasons worth of effort to achieve 100% control. Giant hogweed produces large flowers and many resultant seeds.

Preferred Control Methods

- **Giant hogweed Control Option #1: Chemical Control**

Herbicide treatment is the most effective way to control giant hogweed. Giant hogweed is very difficult to eradicate. Although the stems, stalks, leaves and flowers can be killed with a number of common selective pesticides, such as 2,4-D (the third most-often used pesticide in North America), dicamba (a benzoic acid pesticide), TBA (terbuthylazine) and MCPA, these pesticides are not effective at killing the plant's tuberous perennial roots. Another common, selective broadleaf pesticide, triclopyr (a common brand name is Brush-B-Gone®), is also effective, particularly when applied directly to the entire surface of leaves and stems during periods of active growth; numerous applications may be needed to kill the root stalk. Cornell Cooperative Extension recommends early application (during the bud stage and the period of active plant growth) of glyphosate (commonly sold under the trade names Rodeo® and Roundup®).

Effective pesticide treatments:

- a) Foliar spray – best for small, young plants
- b) Cut stem – best for large plants

Important considerations:

- Presently, the NYSDEC applicators license requires giant hogweed to be listed on the herbicide label as a target species for a specific application method.
- Applying herbicide to the right-of-way may require going through a public notification process.
- Application of herbicide must be consistent with herbicide label and carried out by a licensed applicator.
- Avoid herbicide drift and spillage to minimize impacts to non-target species.

- **Giant hogweed Control Option #2: Mechanical Control**

If herbicide treatment is not an option, cutting can be successful to reduce expansion of existing populations, but usually only with small, young stems, and only when done repeatedly (monthly during each growing season for several years). **All workers should be required to wear disposal protective clothing, gloves and eye protection to eliminate any potential contacts with the plant sap and exposed skin.** Care should be taken not to get sap on uncovered skin when touching tools that have been in contact with the plant. All tools should be thoroughly cleaned with soap and water after use.

Individual plants can be dug out, removing the entire root stalk, a difficult process, particularly in patches where the plant has spread by root growth. Mowing and use of line trimmers should be avoided. Unfortunately, unless performed numerous times during a season, mowing only serves to stimulate budding on the rootstalk.

All of these methods should be done with extreme care and only while wearing protective clothing and eye protection. Skin contact with soiled clothing should also be avoided.

Cut material should be destroyed as described in Section I - BMP #11.

SECTION IV - NYSDOT Priority Plant Compendium

Control method/issues	Japanese Knotweed	Purple Loosestrife	Phragmites	Giant Hogweed
General				
Undertake <i>any</i> controls before seeds mature. Estimated “treat by dates’ for seeds shown for each species - - although seeds can appear sooner or later.	Late August	Early August	Late July early August	August
Do not mow. Mowing creates small stem fragments, from which plants can grow, a process known as “vegetative reproduction.” In particular, avoid mowing in/near ditches.	Yes. If mowed, rake and remove as much plant material as possible	Yes	Yes	Yes. Mowing stimulates regrowth
If excavation occurs in areas containing plant use, one or more of following methods to avoid spreading viable plant material: a) Treat all stems with pesticide. Treat at least two years before excavation, to allow time to make an adequate number of pesticide treatments to kill entire root system. b) Excavate as needed; spread any material with roots and stems on an <i>impervious surface</i> . Take care not to spread plant material during excavation and transport. Break up root material as much as possible, to promote faster drying. Once material is completely dried out, it is nonviable and may be used/disposed of on/off site. c) Excavated material can be buried on or off site at least three feet below grade.	Yes Note: For Knotweed, bury excavated material at least five feet below grade.	Yes	Yes	Yes
Herbicides: At least two seasons applications required; likely more for Giant Hogweed.				
Application timing	Late summer/early fall, when plants flowering	Late July	Late summer after tasseling	Apply end May early June
Foliar sprays. If controlling a medium-sized knotweed infestation, early summer cut, followed by late summer/early fall herbicide application, is most effective.	Yes. See note under “control method”	No	Yes	No
Stem injections or cut and fill, cutting stems and filling with herbicide	Effective and feasible for small infestations			
<ul style="list-style-type: none"> • Depending on site, herbicide may require labeling for wetlands • Location of species, fee/non-fee owned right of way, presence of buildings may require advanced notifications of posting before making applications • Planners/applicators <i>must</i> read herbicide label before applications 	Yes	No	Yes	Yes
Mechanical controls				
Cutting by hand can be effective in eradicating small, new populations. Follow up cutting or pulling required for several years afterwards and revegetation with desirable plants should be done.	Herbicide treatment more effective; must cut at least four times per year	Digging or pulling may also be effective for small infestations		Herbicide control more effective; must cut frequently. Beware of sap; causes burns!
Biological controls: Beetles are available that can control large Purple Loosestrife; biological controls not available for other species.				

Note: Giant Hogweed contains sap that severely burns skin. Anyone working around this plant shall wear protective clothing, gloves and eye protection!

NYSDOT Project Design Screening Process

SECTION V – INVASIVE PLANT RESOURCES

NYS DOT Contacts

REGION	COUNTY	NAME	PHONE	E-MAIL
1	Warren, Essex Saratoga, Washington	Peter Howard	(518)485-5427	Peter.howard@ Dot.ny.gov
	Essex	Resident Engineer	(518)873-2170	
	Saratoga	Resident Engineer	(518)584-3790	
	Warren	Resident Engineer	(518)623-3511	
	Washington	Resident Engineer	(518)747-4724	
2	Hamilton, Herkimer Fulton, Oneida	Ray Oram	(315)793-2771	Ray.oram@ Dot.ny.gov
	Fulton	Resident Engineer	(518)853-3441	
	Hamilton	Resident Engineer	(518)648-5551	
	Herkimer	Resident Engineer	(315)866-1123	
	Oneida	Resident Engineer	(315)732-8032	
7	Franklin, Clinton Lewis, St. Lawrence	Jim Ayers	(315)785-2318	Jim.Ayers Dot.ny.gov
	Clinton	Resident Engineer	(518)563-2020	
	Franklin	Resident Engineer	(518)483-0770	
	Lewis	Resident Engineer	(315)376-3523	
	St. Lawrence	Resident Engineer	(315)265-2320	
7	All	John Falge	(315)785-2343	John.falge@ Dot.ny.gov
All	All	John Rowen	(518)457-4469	John.rowen@ Dot.ny.gov
All	All	Ed Frantz	(315)793-2421	Ed.frantz Dot.ny.gov

Websites, Publications & Links

<https://www.dot.ny.gov/divisions/engineering/design/landscape/trees/invasive-species/>
New York State Department of Transportation invasive species resource page

<http://www.dec.ny.gov/animals/6989.html>, New York State Department of
Environmental Conservation Web Page

<http://www.apa.ny.gov/Forms/2003G-1r%20Invasive%20GP.swf>, The Adirondack Park
Agency General Permit for terrestrial invasive species removal

<http://www.adkinvasives.com/>, The Adirondack Park Invasive Plant Program (APIPP)

<http://www.lib.uconn.edu/webapps/ipane/search.cfm> Invasive Plant Atlas of New England—photographs and information on habitat

http://www.na.fs.fed.us/fhp/invasive_plants/weeds/ US Forest Service—fact sheets on invasive plants in the northeastern United States

<http://tncweeds.ucdavis.edu/esadocs.html> The Global Invasive Species Initiative—photographs, management information

<http://www.invasivespeciesinfo.gov/plants/main.shtml> National Invasive Species Information Center—species profiles with links to other resources

<http://www.fhwa.dot.gov/modiv/invasive.htm> Federal Highway Administration—Guide to Roadside Invasives—photographs grouped by flower color; includes many weeds that are not considered invasive in NH.

www.fs.fed.us/eng/pubs/

Control of Invasive Species: A Synthesis of Highway Practice
National Cooperative Highway Research Program - Synthesis 363 (2006)

www.trb.org

Dangerous Travelers: Controlling Invasive Plants Along America's Roadways
USDA Forest Service (Training Video)

Vehicle Cleaning Technology for Controlling the Spread of Noxious Weeds and Invasive Plants

USDA Forest Service (2005)

www.fs.fed.us/eng/pubs/

Control of Invasive Species: A Synthesis of Highway Practice

National Cooperative Highway Research Program - Synthesis 363 (2006)

www.trb.org

Dangerous Travelers: Controlling Invasive Plants Along America's Roadways
USDA Forest Service (Training Video)

www.fs.fed.us/invasivespecies/prevention/dangeroustravelers.shtml

Copies are available to borrow from the NHDOT Bureau of Environment

Invasive Plants:

A Landowner's Guide to Managing Invasive Plants



Top Invaders:

- | | |
|---------------------------|--|
| Japanese Knotweed | Invades forest edges, stream banks and open or disturbed areas |
| Purple Loosestrife | Invades wetlands, wet fields and roadsides |
| Garlic Mustard | Invades forest understories and roadsides |
| Yellow Iris | Invades wet areas and shorelines |
| Common Reed | Invades wet areas and roadsides |



Management Strategies

Invasive plants are non-native species that rapidly reproduce, displacing native plants and causing ecological harm. Having invasive plants on your property can be overwhelming, but it isn't the end of the world. There are strategies to remove them and restore desirable vegetation.

Pulling – effective for some terrestrial invasive plants and recommended for small infestations.

Digging up – effective for some terrestrial invasive plants and recommended for small infestations.

Herbicide – effective for some terrestrial invasive plants and recommended for larger infestations.

Removing invasive plants can be a long and difficult process. To set your project up for success, management is recommended for at least three years to reduce the seed bank. With proper management and continued removal of new plants, you can take back your property. Species-specific management information is listed in this guide.

Thank you!

Thank you for your interest in managing invasive plants on your property and your efforts to keep Adirondack woods and waters free of invasive plants!



APIPP PRODUCT SUMMARY
AT ALL TIMES PRODUCT LABELS SUPERCEED THIS TABLE

APIPP Herbicide Treatment Cheat Sheet										
Product Name	Active Ingredient	NYS Use Category	Aquatic Labeling?	Labeled Invasive Species	Treatment Methods	Maximum Labeled Rate	Recommended Rate	Oz. of Product used in 1 Gallon Solution with Water for Recommended Rate	Maximum Application Rate Per Acre Per Year	Non-ionic Surfactant Required in Foliar Spray?
Aquamaster	Glyphosate 53.8%	Restricted	Yes	Phragmites	Foliar Spray	0.75%	0.75%	1	8 quarts/acre	Yes
					Stem Injection	50.00%	25.00%	32		
				Japanese knotweed	Foliar Spray	2.00%	2.00%	2.65		
					Stem Injection	100.00%	100.00%	Raw Product		
				Purple Loosestrife	Foliar Spray	1.50%	1.50%	2		
				Yellow Iris	Stem Injection	100.00%	100.00%	Raw Product		
				Oriental Bittersweet	Foliar Spray	2.00%	2.00%	2.65		
Giant Hogweed	Stem Injection	5.00%	5.00%	6.4						
Rodeo	Glyphosate 53.8%	Restricted	Yes	Phragmites	Foliar Spray	0.75%	0.75%	1	8 quarts/acre	Yes
					Stem Injection	100.00%	100.00%	Raw Product		
				Purple Loosestrife	Foliar Spray	1.50%	1.50%	2		
				Garlic Mustard	Foliar Spray	2.00%	2.00%	2.65		
				Giant Hogweed	Foliar Spray	1.5 - 3 pints/acre	2.00%	2.65		
					Stem Injection	5.00%	5.00%	6.4		
Accord Concentrate	Glyphosate 53.8%	Restricted	Yes	Phragmites	Foliar Spray	0.75%	0.75%	1	8 quarts/acre	Yes
					Stem Injection	100.00%	100.00%	Raw Product		
				Japanese knotweed	Foliar Spray	Not Specified	5.00%	6.4		
					Stem Injection	100.00%	100.00%	Raw Product		
				Purple Loosestrife	Foliar Spray	1.50%	1.50%	2		
				Swallow-wort	Foliar Spray	2.00%	2.00%	2.65		
Oriental Bittersweet	Foliar Spray	Not Specified	2.00%	2.65						
RoundUp Custom	Glyphosate 53.8%	Restricted	Yes	Phragmites	Foliar Spray	0.75%	0.75%	1	8 quarts/acre	Yes
					Stem Injection	50.00%	25.00%	32		
				Japanese knotweed	Stem Injection	100.00%	100.00%	Raw Product		
				Purple Loosestrife	Foliar Spray	1.50%	1.50%	2		
				Yellow Iris	Stem Injection	100.00%	100.00%	Raw Product		
				Giant Hogweed	Stem Injection	5.00%	5.00%	6.4		
RoundUp Pro	Glyphosate 41%	General	No	Phragmites	Foliar Spray	2.00%	2.00%	2.65	10.6 quarts/acre	No
				Japanese knotweed	Stem Injection	100.00%	100.00%	Raw Product		
				Garlic Mustard	Foliar Spray	3.00%	3.00%	4		
				Giant Hogweed	Stem Injection	5.00%	5.00%	6.4		
RoundUp Pro Max	Glyphosate 48.7%	General	No	Phragmites	Foliar Spray	1.50%	1.50%	2	7 quarts/acre	No
					Stem Injection	100.00%	100.00%	Raw Product		
				Japanese knotweed	Foliar Spray	1.50%	1.50%	2		
				Swallow-wort	Foliar Spray	4.00%	4.00%	5		
				Oriental Bittersweet	Foliar Spray	1.50%	1.50%	2		
				Giant Hogweed	Foliar Spray	1.5 - 3.3 quarts/acre	2.00%	2.65		
	Stem Injection	5.00%	5.00%	6.4						
RoundUp Pro Concentrate	Glyphosate 50.2%	General	No	Phragmites	Foliar Spray	1.60%	1.60%	2.1	8.5 quarts/acre	No
					Stem Injection	100.00%	100.00%	Raw Product		
				Japanese knotweed	Foliar Spray	2.00%	2.00%	2.65		
				Oriental Bittersweet	Foliar Spray	2.00%	2.00%	2.65		
				Giant Hogweed	Foliar Spray	1.6 - 4 quarts/acre	2.00%	2.65		
	Stem Injection	5.00%	5.00%	6.4						
Accord XRT II	Glyphosate 50.2%	General	No	Phragmites	Foliar Spray	1.50%	1.50%	2	7 quarts/acre	No
					Stem Injection	100.00%	100.00%	Raw Product		
				Japanese knotweed	Foliar Spray	.75 - 3 quarts/acre	5.00%	6.4		
				Giant Hogweed	Foliar Spray	1.5 - 7.5 pints/acre	2.00%	2.65		
	Stem Injection	5.00%	5.00%	6.4						
Garlon 4 Ultra	Triclopyr 60.45%	Restricted	No	Purple Loosestrife	Foliar Spray	1.8 quarts/acre	2.00%	2.65	8 pints/acre	Yes
				Swallow-wort	Foliar Spray	1-8 quarts/acre	2.00%	2.65		
				Giant Hogweed	Foliar Spray	1 - 2 quarts/acre	2.00%	2.65		
Arsenal Powerline	Imazapyr 26.7%	General	No	Phragmites	Foliar Spray	4 - 6 pints/acre	0.50%	0.6	6 pints/acre	Yes
				Japanese knotweed	Foliar Spray	4 - 6 pints/acre	0.50%	0.6		
				Purple Loosestrife	Foliar Spray	3 - 4 pints/acre	0.50%	0.6		
Clearcast	Imazamox 12.1%	Restricted	Yes	Phragmites	Foliar Spray	2.00%	2.00%	2.65	1 gallon/acre	Yes
				Japanese knotweed	Foliar Spray	64 - 128 oz./acre	5.00%	6.4		
				Key	Phragmites	Purple Loosestrife	Yellow Iris	Oriental Bittersweet		
					Japanese knotweed	Garlic Mustard	Swallow-wort	Giant Hogweed		

GLOSSARY

Annual – a plant that completes its life cycle in one year.

Emergent – having most vegetative growth above water.

Germination – beginning of growth, as from a seed.

Herb – a plant that does not produce woody, persistent tissue.

Herbaceous – having aboveground stems that are fleshy instead of woody.

Native – occurring naturally in a given range; not introduced by humans.

Non-native – introduced to areas outside of the species' natural geographic range.

Nonviable – not capable of living or developing.

Perennial – a plant that lives for two years or more.

Rhizome – a horizontal, underground stem that can produce roots and aboveground stems.

Vegetative reproduction – propagation by means other than seeds, including rhizomes, runners, stem cuttings, and root cuttings.

Viable – capable of growing or developing.

Woody – having hard, lignified stem tissue that persists throughout the year.