

**APPENDIX 21**  
**INVASIVE SPECIES CONTROL PLAN**

# **SDEIS Invasive Species Control Plan**

**for**

**The Modified Belleayre Resort at Catskill Park**

**Prepared For:**

**Crossroads Ventures LLC**

**Prepared by:**

**The LA Group P.C.**

**In Consultation With**

**The Catskill Regional Invasive Species Partnership & NYSDEC**

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## INTRODUCTION

The following plan has been prepared in consultation with NYSDEC (contact person Marcelo del Puerto, 518-402-8942, [mjdelpue@gw.dec.state.ny.us](mailto:mjdelpue@gw.dec.state.ny.us)) and the Catskill Regional Invasive Species Partnership (CRISP) (contact person Ben Murdock, 845-586-2611, [bmurdock@catskillcenter.org](mailto:bmurdock@catskillcenter.org)).

The Agreement in Principle for the Modified Belleayre Resort at Catskill Park included the following clause pertaining to invasive species control.

*42. Invasive Species. The Parties agree that Crossroads will prepare, in consultation with the NYSDEC and the Catskill Regional Invasive Species Project, a program for the prevention of invasive species during construction and operation to be incorporated into the SDEIS. For all plantings, excluding golf course turf, preference will be given to native plant species. In those instances where non-native plant species are used for ornamental purposes, then all species and cultivars utilized will be non-invasive (non-spreading) by all propagative means.*

### **1. Purpose of the this Plan**

This Invasive Species Control Plan is intended to identify the methods of controlling the introduction of known noxious, alien or invasive species (“NAIS”) during the construction and operation of the Modified Belleayre Resort at Catskill Park hereafter referred to as the “Project.”

This plan includes a listing of those plant species and cultivars that will be used in the landscaping plans that will be included in the project plan set that will be part of the SDEIS.

The plan will also impose best management practices (“BMP’s”) for the minimization and control of invasive species for those areas within the project site that will be affected by project construction. The BMP’s as described will be implemented by the Applicant, Crossroads Ventures LLC, and associated contractors involved with the construction of the project throughout its multiple phases, and the same BMP’s will be implemented by the Resorts’ grounds maintenance personnel during the operational phase of the project.

This document provides an overview of the target NAIS, the strategy by which and when treatments will be made, the techniques of treatment and follow-up, and the basis and of coordinated effort between the Applicant and NYSDEC and CRISP for the eradication and control of target species for the foreseeable future.

This document has been prepared based on a model that was developed for NAIS control for resort projects in New York’s Adirondack Park that has been reviewed and approved by the Adirondack Park Agency, a cooperator in the in the Adirondack Park Invasive Plant Program. The model has been adapted to take into account potential NAIS that would occur at the Project location in the Central Catskills

To achieve timely control of invasives in the Project area, and to be responsive to the sensitivity of the Project's location within the New York City Watershed, the following plan, which will be applicable to all areas of the Project site regardless of location relative to surface water and wetland resources, has been modeled after the BMP's developed as conditions for inclusion in the Adirondack Park Agency General Permit 2002-0002 for "Management of Terrestrial Invasive Plant Species In or Within 100' of Wetlands."

The management options presented in subsequent sections of this Plan are to be selected with consideration for the location and size of the infestations, the age of the plants, past control methods used at the site, time of year, weather conditions and adjoining and nearby land uses. Priority shall be given to non-chemical methods wherever and whenever appropriate so that implementation of this plan will be consistent with Item 43 of the Agreement in Principle which states,

43. Green Landscaping.

*a. Other than with respect to the lands that comprise the Wildacres Golf Course (the turf management and landscape maintenance provisions for which are set forth in paragraph 19 and Exhibit E of this Agreement in Principle), Crossroads will make best efforts to manage the grass, shrubs, flowers, trees and all other plantings and greenery on the project site, including both the Wildacres Resort and Highmount Spa Resort, without the use of synthetic chemicals.*

*b. In the event that Crossroads concludes that treatment with synthetic chemicals is necessary for any portion of such landscape, Crossroads will apply such treatment in a way that covers the smallest area practicable and/or for the shortest time period necessary.*

*c. Crossroads will include a discussion of its landscaping program that is consistent with this paragraph in its forthcoming SDEIS.*

*d. Crossroads will keep records in the regular course of business documenting the application of synthetic chemicals to any grass, shrubs, flowers, trees or other plantings or greenery on the project site, and will make such records available on request to the NYSDEC.*

This document requires:

- Coordination with the cooperators in NYSDEC and CRISP in the timely treatment and sustained vigilance of NAIS identified on the site of the resort project;
- The ability to treat identified NAIS prior to the start of site preparation;
- Follow-up spot or remedial treatment during construction;
- Maintenance treatments (post-construction); and
- Additional intermediate follow-up treatments, as needed.

## 2. Applicability

This Plan, and the resources referenced herein, is intended for use by Crossroads Ventures and contractors performing construction and/or vegetation management activities, including applying herbicide. This plan is a requirement (# 42) of the Agreement in Principle.

## 3. Landscaping Plans – Plant Palette

The following is a listing of those species that will be considered acceptable to utilize in the Landscape and Lighting Plans that are part of the plan set that accompanies and is part of the SDEIS.

<b>Latin Name</b>	<b>Common Name</b>
<b><u>Deciduous Trees</u></b>	
Acer rubrum	Red maple
Acer saccharum 'Green Mountain'	Green Mountain Sugar Maple
Betula alleghaniensis	Yellow Birch
Betula nigra 'Heritage'	Heritage River Birch
Betula papyrifera	Paper Birch
Betula populifolia	Gray Birch
Carpinus caroliniana	American Hornbeam
Carya ovata	Shagbark Hickory
Cladrastis kentukea	Yellowwood
Larix laricina	Tamarack
Platanus x acerfolia 'Bloodgood'	Bloodgood Planetree
Quercus alba	White Oak
Quercus macrocarpa	Bur Oak
Quercus palustris	Pin Oak
Quercus prinis	Chestnut Oak
Quercus rubra	Northern Red Oak
Ulmus americana 'Valley Forge'	American Elm
<b><u>Small Flowering Trees</u></b>	
Amelanchier arborea	Downy Serviceberry
Amelanchier canadensis	Shadblow Serviceberry
Cercis canadensis	Eastern Redbud
Cornus alternifolia	Pagoda Dogwood
Cornus florida	Flowering Dogwood
Crataegus phaenopyrum	Washington Hawthorn
Crataegus viridis 'Winter King'	Green Hawthorn
Malus 'Adirondack'	Adirondack Crabapple
Malus 'Dolgo'	Dolgo Crabapple
Malus 'Snowdrift'	Snowdrift Crabapple
Malus sp.	Malus species (No Malus baccata or its hybrids)

<i>Prunus sargentii</i>	Sargent Cherry
<i>Prunus subhirtella autumnalis</i>	Higan Cherry

### **Evergreen Trees**

<i>Abies balsamea</i>	Balsam Fir
<i>Juniperus virginiana</i>	Eastern Red Cedar
<i>Picea glauca</i>	White Spruce
<i>Pinus strobus</i>	Eastern White Pine
<i>Thuja occidentalis</i>	Northern White Cedar
<i>Tsuga canadensis</i>	Canadian Hemlock

### **Shrubs**

<i>Aesculus parviflora</i>	Bottlebrush Buckeye
<i>Aronia arbutifolia</i> 'Brilliantissima'	Red Chokeberry
<i>Azalea</i> Sp.	Azalea Species
<i>Calycanthus floridus</i>	Sweetshrub
<i>Ceanothus americanus</i>	New Jersey Tea
<i>Clethra alnifolia</i>	Summersweet Clethra
<i>Comptonia peregrina</i>	Sweetfern
<i>Cornus alba</i>	Tartarian Dogwood
<i>Cornus alba siberica</i>	Red Twig Dogwood
<i>Cornus alternifolia</i>	Pagoda Dogwood
<i>Cornus amomum</i>	Silky Dogwood
<i>Cornus canadensis</i>	Bunchberry
<i>Cotoneaster</i> sp.	Cotoneaster species
<i>Daphne caucasian</i>	Caucasian Daphne
<i>Daphne x burkwoodii</i>	Burkwood Daphne
<i>Dirca palustris</i>	Leatherwood
<i>Fothergilla gardenii</i>	Dwarf fothergilla
<i>Fothergilla major</i> 'Mt. Airy'	Mt. Airy Fothergilla
<i>Hamamelis virginiana</i>	Common Witchhazel
<i>Hydrangea quercifolia</i>	Oak-leaf Hydrangea
<i>Hypericum prolificum</i>	Shrubby St. John's Wort
<i>Ilex verticillata</i> 'Dwarf Male'	Common Winterberry
<i>Ilex verticillata</i> 'Red Sprite'	Common Winterberry
<i>Itea virginica</i>	Virginia Sweetspire
<i>Juniperus chinensis</i> 'Sargentii Viridis'	Green Sargent Juniper
<i>Juniperus horizontalis</i>	Creeping Juniper
<i>Kalmia angustifolia</i>	Sheep-Laurel
<i>Kalmia latifolia</i>	Mountain Laurel
<i>Kalmia latifolia</i> hybrids	Mountain Laurel
<i>Myrica pensylvanica</i>	Northern Bayberry
<i>Pieris x 'Brouwer's Beauty'</i>	Brouwer's Beauty Andromeda
<i>Prunus virginiana</i>	Chokecherry
<i>Rhododendron catawbiense</i> sp.	Catawba Rhododendron species
<i>Rhododendron</i> sp.	Rhododendron species

Rhus aromatica 'Gro-low'	Fragrant sumac
Spirea alba	Meadowsweet
Spirea tomentosa	Hardhack
Syringa meyeri 'Palabin'	Meyer Lilac
Vaccinium corymbosum	Highbush Blueberry
Viburnum carlesii	Koreanspice Viburnum
Viburnum dentatum	Arrow wood
Viburnum plicatum tomentosum	Double file Viburnum
Viburnum trilobum	American Cranberrybush Viburnum
Viburnum x burkwoodii	Burkwood Viburnum
Viburnum x carlcephalum	Fragrant Viburnum
Viburnum x juddii	Judd Viburnum

In addition to landscaping within the Resort, the hotel and spa building and the lodge building at Highmount will have green roofs. The following is an updated version of the plant list for roof planting that was developed by local Master Gardeners from Cornell Cooperative Extension of Ulster County Cornell and included in the 2003 DEIS. The update includes the elimination of plant species with invasive potential from the 2003 version.

### **XERISCAPE GREEN ROOF PLANT LIST**

#### **Zone**

<i>Achillea filipendula</i>	4-5*
<i>Achillea millefolium</i>	4-5*
Alyssum, Sweet	4-5
<i>Amelanchier alnifolia</i>	4-5
<i>Aronia arbutifolia</i>	4-5
<i>Artemisia absinthum</i>	4-5
<i>Artemisia ludoviciana</i>	4-5*
<i>Asclepias tuberosa</i>	4-5*
<i>Aurinia saxatilis</i>	4-5
Basket of Gold	4-5
Beardtongue	4-5*
Beebalm	4-5*
Bellflower	4-5
Bergenia	4-5
<i>Bergenia cordifolia</i>	4-5
Blanketflower	4-5*
Blazing Star	4-5*
Blue Mist Shrub	5
Blue Fescue	4-5
Blue Oat Grass	5
<i>Calamagrostis acutiflora</i>	5

<i>Campanula carpatica</i>	4-5
<i>Campis radicans</i>	5
<i>Caryopteris x clandonensis</i>	5
Catmint	4-5
<i>Cerastium tomentosum</i>	5
Chokeberry	4-5*
<i>Clematis paniculata</i>	5
<i>Coreopsis verticillata</i>	4-5
<i>Cotoneaster divaricatus</i>	4-5*
Cotoneaster	4-5*
Daylily	4-5
Dwarf Fountain Grass	5
<i>Echinacea purpurea</i>	4-5*
<i>Eschscholzia californica</i>	4-5*
<i>Euphorbia epithymoides</i>	4-5
False Sunflower	5
Feather Reed Grass	5
Fescue	5
<i>Festuca ovina glauca</i>	4-5
Feverfew	4-5
Flax	4-5*
<i>Gaillardia aristata</i>	4-5*
<i>Geranium</i>	Annual
Goldenrod	Annual
<i>Gomphrena globosa</i>	Annual
<i>Helictotrichon sempervirens</i>	4-5
<i>Heliopsis helianthoides</i>	4-5
<i>Hemerocallis</i>	4-5
<i>Heuchera micrantha</i>	4-5
<i>Hypericum frondosum</i>	4-5
<i>Iris siberica</i>	4-5
<i>Juniperus scopulorum</i>	4-5*
<i>Juniperus squamata</i>	4-5*
<i>Juniperus horizontalis</i>	4-5*
<i>Kniphofia hybrida</i>	4-5
Lamb's Ears	4-5
<i>Lavandula officinalis</i>	4-5
<i>Lavatera trimestris</i>	Annual

Lavender	4-5	
<i>Liatris spicata</i>	4-5*	
<i>Linium perenne</i>	4-5*	
Live Forever, Never Die	4-5*	
<i>Lobularia maritima</i>	5	
Mallow	Annual	
<i>Microbiota decussata</i>	4-5	
<i>Monarda didyma</i>	4-5	
Nasturtium	Annual	
<i>Nepata fassenii</i>	4-5	
<i>Oenothera missouriensis</i>	4-5	
<i>Origanum onites</i>	4-5	
<i>Panicum virgatum</i>		
<i>Pennisetum alopecuroides</i>	5	
<i>Penstemon digitalis</i>	4-5	
<i>Penstemon ambiguus</i>	4-5	
<i>Perovskia atriplicifolia</i>	4-5	4-5
<i>Physostegia virginia</i>	4-5*	
<i>Polystichum acrostichoides</i>	5	
<i>Portulaca grandiflora</i>	Annual	
<i>Potentilla fruticosa</i>	4-5*	
Potentilla	4-5	
Red Hot Poker	4-5	
<i>Rudbeckia fuglida</i>	4-5	
Russian Arborvitae	4-5	
Russian Sage	4-5	
<i>Salvia nemerosa</i>	4-5	
<i>Salvia officinalis</i>	4-5	
<i>Sanvitalia procumbens</i>	Annual	
Shadbush	4-5	
Snow-in-Summer	5	
<i>Solidago rugosa</i>	4-5	
<i>Stachys byzantina</i>	4-5	
Stone crop	4-5	
Sundrop	4-5	
Sweet Autumn Clematis	4-5	
<i>Tanacetum parthenium</i>	5	
<i>Tradescantia x andersoniana</i>	4-5	
<i>Tropaeolum majus</i>	Annual	

Trumpet Vine	5
<i>Veronica spicata</i>	4-5
<i>Veronica longifolia</i>	4-5
<i>Viburnum Korean Spice</i>	4-5
Zinnia, Narrowleaf	Annual
Zinnia augustifolia	Annual
Zinnia, Creeping	Annual

#### 4. General Practices for NAIS Control

The following management options, should be selected with consideration for the location and size of the infestations, the age of the plants, past control methods used at the site, time of year, weather conditions and adjoining and nearby land uses.

**Erosion Control** - Some of the methods described below require actual digging or pulling of plants from the soil. In all cases they require removal of vegetation whether or not there is actual soil disturbance. Each situation must be studied to determine 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.

**Revegetation** - Although not a specific condition, replanting or reseeding with native species is highly desired. All of the control methods below 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.

**Herbiciding** - The only herbicide application allowed is spot treatment to individual plants using a backpack or hand sprayer, wick applicator, cloth glove applicator, stem injection or herbicide clippers. **No broadcast herbicide applications using, for example, a truck-mounted sprayer, are allowed.** The only herbicides contemplated and approved for use are glyphosate which is marketed under the trade names ROUNDUP<sup>®</sup>, RODEO<sup>®</sup>, GLYPRO<sup>®</sup> or AQUAMASTER<sup>®</sup>. ROUNDUP<sup>®</sup> may be used only in situations where there is no standing water including wetlands, whereas RODEO<sup>®</sup> may be used where standing water is present. **In all cases all herbicide directions for use and restrictions found on the label must and shall be followed by a New York State Certified Applicator or Technician in an appropriate category.** Glyphosate is a non-selective herbicide that is applied to plant foliage, or cut stems or stem injected and is then trans-located to the roots. The application methods described and allowed are designed to reduce or eliminate the possibility

that non-target species will be impacted by the herbicide use. All herbicide spot treatments require follow-up inspection later in the growing season or the following year to re-treat any individuals that were missed.

This herbicide is not selective (kills both monocots and dicots), thus should be applied carefully to prevent killing of non-target species. Do not apply in windy conditions because spray will drift and kill other plants. All tank mixes should be mixed with clean (ideally distilled) water because glyphosate binds tightly to sediments, which reduces toxicity to plants. Do not apply if rain is forecast within 12 hours because herbicide will be washed away before it can act. Choose Rodeo® formulation for applications in standing water or along a shoreline.

**Equipment Sanitation** - All equipment used for invasive species control, whether it be hand or power driven, must be cleaned prior to entering onto a control site and prior to leaving the Project site. This is an effort to reduce transport of invasive plant seeds or plant propagules and reduce the potential for new invasive introductions. Use steam or hot water to clean equipment. Any on-site cleaning shall take place in a designated area from which runoff is controlled by silt fence or other similar structural control method. An Equipment Vendor Certification is included as Exhibit A of this plan.

**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 truck with a topper or cap 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 appropriate permit.

**Composting** - Because of the extremely robust nature of invasive species, composting in a typical backyard compost pile or composting bin is not appropriate. However, methods can be used whereby sun-generated heat can be used to destroy the harvested plant materials. For instance, storage in a sealed 3 ml thickness (minimum) black plastic garbage bags on blacktop in the sun until

the plant materials liquefy is effective. 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. **When composting is suggested later in the text it is understood that liquefying the plant material in or under plastic is the desired action; not disposal in backyard composters or open landfill composting piles.**

## 5. Operational Phase Implementation

Resort grounds maintenance personnel shall document occurrences of any invasive species encountered during the performance of their routine duties. Likewise, golf course management personnel shall similarly record encountered invasive species. Isolated finds shall be physically removed in accordance with the procedures in the following section. Larger occurrences will require additional evaluation and planning for eradication.

In addition to the less structured inspections above, there shall be a formal annual inspection of the entire Resort property by maintenance personnel during the growing season. One focus of this inspection shall be areas more susceptible to colonization including along roadsides and structures. Plant locations, types and numbers shall be recorded and mapped. Over the winter a plan for eradicating the plants will be developed for implementation the following year. The plan will include a description of the preferred eradication measure(s) and a schedule for when eradication measures shall be implemented. Each eradication site will be evaluated in the spring of the following year to determine eradication treatment effectiveness. If eradication is not successful or only partially successful, those sites should receive a re-treatment or different treatment that same year, and in following years if necessary to achieve full eradication.

The following section provides control strategies for those currently known invasive species in the region that have the highest likelihood to occur on this site. Those responsible for implementing this plan should take measures so as to be vigilant for new or unusual plants other than those described below, and should freely use the services of the Catskill Regional Invasive Species Program (CRISP), including plant identifications and recommendations for control strategies. For plant identification services, this should either be done *in situ*, or a voucher specimen should be collected, placed in a sealable plastic bag, labeled as to the date and location of collection, and hand delivered to a representative of CRISP for identification.

## 6. Specific Practices by Plant Type

The following guidelines contain acceptable practices for control of the following terrestrial invasive species:

- A. Purple loosestrife (*Lythrum salicaria*);

- B. Common reed (*Phragmites australis* ssp. *australis*);
- C. Garlic mustard (*Alliaria petiolata*)
- D. Japanese, giant and bohemian knotweed (*Fallopia japonica* ssp. *japonica*, *F. sachalinensis*, and *F. x. bohemica*);
- E. Japanese honeysuckle (*Lonicera japonica*);
- F. Bush (Morrow's, tatarian, Amur and Bell's) honeysuckles (*L. morrowii*, *L. tatarica*, *L. maackii*, *L. x. bella*);
- G. Yellow iris (*Iris pseudacorus*)
- H. Wild Chervil (*Anthriscus sylvestris*);
- I. Japanese barberry (*Berberis thunbergii*).

These species were chosen by LA Group Vegetation Ecologist Dr. Richard Futyma as target terrestrial plants to inventory, control, and monitor. They were targeted because they are currently observed as displaying this accelerated ability to invade natural systems, are expanding into sensitive areas faster and in greater abundance than other non-native plants, and are most likely to occur on this specific site due to the habitats present documented by Dr. Futyma in his extensive work on the property. As stated later in this plan, those responsible for its implementation shall be vigilant for all potential invasive species, including those other species on NYSDEC's current Interim List of Invasive Plant Species in New York State. A copy of this list is appended to this plan as Exhibit B.

## A. 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 w/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 w/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 the 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. Compost at DOT Residency, dispose of in approved landfill or incinerate with appropriate permits.

*Sanitation:*

Clean all clothing, boots, tools, equipment and transport vehicle 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 (compost at DOT Residency, 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:*

Use when >100 plants and <3-4 acres in size.

*Methods:*

Use glyphosate formulations only. If possible spray 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.

For spot application use:

- sponge tip applicator w/wick.
- injection into stem (w/ large gauge needle).
- 32 oz. commercial-grade spray bottle with adjustable nozzle.

*Cautions:*

This herbicide is not selective (kills both monocots and dicots), thus should be applied carefully to prevent killing of non-target species. All treatment mixes should be mixed with clean (ideally distilled) water because glyphosate binds tightly to sediments, 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 Rodeo® formulation for applications in standing water or along a shoreline.

#### **4. Bio-control**

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.

*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.

## **REVEGETATION**

Regardless of the management option implemented, all affected areas shall be revegetated using non-invasive species.

## ***B. 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. This 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 application of glyphosate to the freshly-cut, stem cross sections or with a cut-stem injection of glyphosate.

##### *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 and composted or allowed to decay on the upland to prevent sprouting 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:*

Herbicide use is a 2 year, 2 step process because the plants may need a “touch-up” application, especially in dense stands since subdominant plants are protected by thick canopy and may not receive adequate herbicide in the first application.

*Methods:*

Use glyphosate formulations only. Apply after tasseling stage when nutrients going back to rhizome and will translocate herbicide into roots. After 2 to 3 weeks following application of glyphosate, cut or mow down the stalks to stimulate the emergence and growth of other plants previously suppressed. If the plants are too tall to spray, cut back in mid summer and apply glyphosate using a spray bottle for individual foliar spot treatments or swab, syringe w/large gauge needle or Nalgene wide-mouth, Unitary wash bottle to apply 1-2 drops of 50% glyphosate solution directly into each cut stem.

*Cautions:*

This herbicide is not 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 (ideally distilled) water because glyphosate binds tightly to sediments, 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 Rodeo® formulation for applications in standing water or along a shoreline.

## **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. Can treat runners along the plastic edges with a spot application of Rodeo® or Roundup®. 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. Compost at DOT Residency, dispose of in 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, then replace soil and any existing cover.

*Disposal:*

Bag all plant parts and remove from site (compost at DOT Residency, dispose of in approved landfill or incinerate with appropriate permits). Do not attempt to compost rhizomes.

*Sanitation:*

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

## **REVEGETATION**

Regardless of the management option implemented, all affected areas shall be revegetated using non-invasive species.

## **C. 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 plants 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.

##### *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 all plant parts and remove from site (compost at DOT Residency, dispose of in 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 all plant parts and remove from site (compost at DOT Residency, dispose in approved landfill or incinerate with appropriate permits).

### *Sanitation:*

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

## **3. Herbicide**

### *Effectiveness:*

Roundup will not affect subsequent seedling emergence of garlic mustard or other plants.

### *Methods:*

Use glyphosate formulations only. Should be applied after seedlings have emerged, but prior to flowering of second-year plants. Application should be by spray bottle or wick applicator for individual spot treatments.

### *Cautions:*

This herbicide is not 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 (ideally distilled) water because glyphosate binds tightly to sediments, 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 Rodeo® formulation for applications in standing water or along a shoreline.

## **REVEGETATION**

Regardless of the management option implemented, all affected areas shall be revegetated using non-invasive species.

**D. 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.

*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 rhizome or stem fragments. Any portions 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 in the trash to prevent re-establishment (stockpile at DOT Residency, 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 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 (stockpile at DOT Residency, 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:*

Glyphosate treatments in late summer or early fall are much more effective in preventing re-growth of Japanese knotweed the following year.

### *Methods:*

Use glyphosate formulations only. In late June/early July cleanly cut or mow down existing stalks/canes. Allow the knotweed to re-grow. After August 1, spray knotweed all re-growth with ROUNDUP<sup>®</sup>, RODEO<sup>®</sup>.

A cut-stem 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 50% 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-stem treatment to any residual stems.

Stem injection is another promising control method for smaller colonies of knotweeds. Currently, a supplemental label for AQUAMASTER<sup>®</sup> (glyphosate) herbicide exists for this stem injection method. In late June/early July inject 5 mL of AQUAMASTER<sup>®</sup> below the 2<sup>nd</sup> node above the ground of each stem in the

clump. Use suitable equipment that must penetrate into the internodal region. JKInternational manufactures a stem injection tool that is suitable and recommended for this control method.

*Cautions:*

Established stands of Japanese knotweed are 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 not 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 (ideally distilled) water because glyphosate binds tightly to sediments, 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 Rodeo<sup>®</sup> formulation for applications in standing water or along a shoreline.

## **REVEGETATION**

Regardless of the management option implemented, all affected areas shall be re-vegetated using non-invasive species.

## ***E. CONTROL METHODS FOR JAPANESE, HONEYSUCKLE (Lonicera japonica)***

### **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 aboveground 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 (not practical with most infestations).

##### *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.

*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.

## **2. Herbicide**

*Effectiveness:*

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.

*Controls:*

A foliar application of 1.5% 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 of the first killing frost are more effective than applications later in the winter. *Lonicera japonica* is less susceptible to herbicides after the first hard frost (-4°C).

*Cautions:*

Soil disturbance should be avoided in infested areas to minimize germination of seed in the seed bank. Treated plants should be re-examined at the end of the second growing season, as plants can recover from herbicide application.

These herbicides are not 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 (ideally distilled) water because glyphosate binds tightly to sediments, 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.

## **REVEGETATION**

Regardless of the management option implemented, all affected areas shall be re-vegetated using non-invasive species.

***F. CONTROL METHODS FOR BUSH (MORROW'S, TATARIAN, AMUR AND BELL'S) HONEYSUCKLES (Lonicera morrowii, L. tatarica, L. maackii, L. x bella)***

**PLANT DESCRIPTION – 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.

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.

#### *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.

#### *Cautions:*

Any portions of the root system not removed can re-sprout. 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.

### 2. Herbicide

#### *Effectiveness:*

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.

#### *Controls:*

Use formulations of glyphosate (brand names Roundup, and for use near water bodies, Rodeo) as foliar sprays or cut stump sprays and paints with varying degrees of success. Glyphosate is a non-selective herbicide that kills both grasses and broad-leaved plants. For cut stump treatments, 20-25% solutions of glyphosate can be applied to the outer ring (phloem) of the cut stem. 2% solutions of glyphosate can be used for foliar treatments. Glyphosate should be applied to the foliage late in the growing season, and to the cut stumps from late summer through the dormant season.

#### *Cautions:*

The subsequent flush of seedlings following all herbicide treatments must also be controlled. These herbicides are not 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 (ideally distilled) water because glyphosate

binds tightly to sediments, 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.

## **REVEGETATION**

Regardless of the management option implemented, all affected areas shall be revegetated using non-invasive species.

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

### **PLANT DESCRIPTION – YELLOW IRIS**

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 (Ramey 2001). 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.

### **MANAGEMENT OPTIONS**

#### **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. Cutting the foliage, followed by an herbicide application (see below for details), can provide good control with minimal off-target effects.

*Cautions:*

These methods, however, are very time and labor-intensive, since even small rhizome fragments can re-sprout. 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.

## **2. Herbicide**

*Effectiveness:*

*Iris pseudacorus* can be effectively controlled by herbicides. Since it usually grows in or adjacent to water, an aquatic-labeled herbicide and adjuvant must be used. Glyphosate (for example, trade names Rodeo<sup>®</sup>, Aquamaster<sup>®</sup> or Glypro<sup>®</sup>) applied in a 25% solution (13% a.i.) using a driplless wick/wiper applicator, or applied in a 5 to 8% solution if sprayed, when used with the appropriate non-ionic surfactant adjuvant, can effectively kill *I. pseudacorus*. *I. pseudacorus* can be effectively controlled by stem injection utilizing Aquamaster<sup>®</sup> applied at .5 to .7 mL of product per flowering stem.

*Controls:*

The timing and choice of application technique will determine control efficacy and should work to minimize off-target effects. *Iris pseudacorus* can be controlled by either directly applying the herbicide to foliage, or by immediately applying herbicide to freshly cut leaf and stem surfaces. Herbicides can be directly applied to *I. pseudacorus* foliage or cut stems by a driplless wick system or using a backpack sprayer.

*Cautions:*

These herbicides are not 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 (ideally distilled) water because glyphosate binds tightly to sediments, 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. 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 of the herbicide.

## **REVEGETATION**

Regardless of the management option implemented, all affected areas shall be revegetated using non-invasive species.

## **H. CONTROL METHODS FOR WILD CHERVIL (*Anthriscus sylvestris*)**

### **PLANT DESCRIPTION:**

Wild chervil is a biennial or short-lived perennial herb of the parsley family, native to Eurasia. In its first year it develops a rosette of fernlike leaves and a deep taproot. In following years, starting in late May to early June, it produces flower stems up to 6 feet tall. The branched stems bear flat-topped clusters of small white flowers, each of which produces two small seeds. The plant also reproduces by means of buds at the top of the root stock. Wild chervil grows in pastures, old fields, along roadsides, and in open woods.

### **MANAGEMENT OPTIONS**

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

##### *Effectiveness:*

Control of wild chervil by pulling is limited because of its deep taproot, which can reach up to 6 feet deep. Digging may be effective in small, recently established patches.

##### *Methods:*

Use of a shovel or other digging tool, rather than pulling by hand, is recommended for removal of as much of the root system as possible. Soil should be tamped down firmly after removal of the plant to lessen the possibility of germination of seeds in the soil. Monitoring and re-treatment of the patch will be necessary in subsequent years.

##### *Cautions:*

Re-sprouting may occur if the root system is not completely removed. If digging takes place after about mid-June, the flowering stem should be carefully removed and bagged first in order to avoid spreading seeds that may have set. Like other members of the parsley family, the stems of wild chervil contain compounds that are absorbed into the skin and react with sunlight to produce a dermatitis. Therefore, long-sleeved shirts and gloves are recommended when handling the plants.

##### *Disposal*

Plant parts with fruits should be bagged and removed from the site. Dispose of the plant remains in an approved landfill or incinerate with appropriate permits.

##### *Sanitation:*

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

## **2. Cutting/mowing**

Cutting or mowing before seed set may be effective for small patches. Repeated mowing before flowers have had a chance to set seed can deplete root reserves.

### *Methods:*

Mowing soon after emergence of flowering stems should be followed by monitoring and repeated mowing if additional stems appear. Covering of mowed patch with black plastic film may help kill remaining plants. Repetition in following years may be necessary.

### *Cautions:*

Removal of the flowering stems does not prevent spread of the plants by root budding. Mowing after seed set may only help disperse the seeds. For this reason, untreated roadside patches that have gone to seed should be identified and mowing prohibited in order to keep from spreading the plants further along the roadside.

### *Disposal*

All plant parts should be bagged and removed from the site. Compost at DOT Residency, dispose of in approved landfill or incinerate with appropriate permits.

### *Sanitation:*

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

## **3. Herbicide**

### *Effectiveness*

Wild chervil has been found to be resistant to a number of herbicides. Good results have been reported for treatment with dicamba (Banvil<sup>®</sup>). This may be the only good treatment for large patches of wild chervil.

### *Methods:*

Application of dicamba at a rate of 2 lb. of active ingredient per acre has been found effective when applied to plants in the vegetative stage. It is also possible to mow prior to blooming of the plants, and to apply dicamba one month later. Treatment must be performed by a licensed applicator following all label directions. Do not apply in windy conditions to avoid drift onto non-target plants.

## **4. Bio-control**

No effective biological control of wild chervil has been found. The plant is palatable in the rosette stage, and grazing by cattle and sheep, as well as heavy trampling by cattle, have been reported to suppress its growth and spread. Of course, application of grazing is limited to agricultural lands, and is not practicable in residential or resort settings.

## **REVEGETATION**

Regardless of the management option implemented, all affected areas shall be revegetated using non-invasive species.

## ***I. CONTROL METHODS FOR JAPANESE BARBERRY (Berberis thunbergii)***

### **PLANT DESCRIPTION:**

Japanese barberry is a deciduous shrub 2-6 feet tall with small, obovate to spatulate leaves about 0.5 to 1.5 in long, that are shiny green to reddish purple. Its numerous branches are slender and have spine-like thorns at the leaf nodes. It produces many small, yellow flowers from mid-April to May, which develop into oblong red berries about 0.3 inch long. The berries develop from July to October and persist on the plant through the winter. The fruits are eaten by birds, especially grouse and turkey, and small mammals, aiding the spread of the plant. The seeds can remain viable in the soil for up to 10 years. Japanese barberry tolerates a wide range of soil moisture conditions and is shade-tolerant. It can be found on roadsides, along fences, in pastures and old fields, and in woods.

### **MANAGEMENT OPTIONS**

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

##### *Effectiveness:*

Mechanical removal of Japanese barberry is effective and minimally intrusive. This is recommended for relatively small patches and where investment of labor is possible.

##### *Methods:*

Digging with a hoe, mattock, or weed wrench<sup>®</sup> is recommended for uprooting the entire bush and its root system. Pulling up small plants by hand is possible, but gloves should be used to protect against the spiny stems. This plant leafs out very early in the spring, making it easily identified and possible to remove at that time with minimal disturbance to other plants.

##### *Cautions:*

Parts of the root system remaining in the ground may sprout, giving rise to new plants. Therefore, monitoring and follow-up treatments in subsequent years are recommended. If fruits are on the plant, removed parts should be bagged and taken from the site. If no fruits are present, the uprooted plants can be piled where they can provide cover for small animals, provided that roots are not touching the soil surface.

##### *Disposal*

Plant parts with fruits should be bagged and removed from the site. Compost at DOT Residency, dispose of in approved landfill or incinerate with appropriate permits.

*Sanitation:*

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

## **2. Cutting/mowing**

*Effectiveness:*

Cutting or mowing may provide effective control for young, small patches, where investment of labor for pulling or digging is not possible, or in environmentally sensitive places where herbicides cannot be used. Brush-hogging followed by occasional mowing may be practical where the use of herbicides is not possible. However, cutting and mowing will only control the spread of Japanese barberry and not eradicate it. Where possible, this method should be followed by herbicide application to cut stems.

*Methods:*

Cutting by hand, using lopping shears, saw, or machete, can be done at any time. Parts having attached fruits should be bagged and removed from the site. Mowing with power equipment should be performed only when there are no fruits on the plants, in order to avoid spreading the seed.

*Cautions*

Mowing and cutting leave the root systems intact, and re-sprouting will take place. Repeated treatment will be necessary to keep the plants from flowering and setting fruit.

*Disposal*

Plant parts with fruits should be bagged and removed from the site. Dispose of the plant remains in an approved landfill or incinerate with appropriate permits.

*Sanitation:*

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

## **3. Herbicide**

*Effectiveness*

Treatment with systemic herbicides like glyphosate (e.g., Roundup<sup>®</sup>) and triclopyr (e.g., Garlon<sup>®</sup>) is effective in controlling Japanese barberry infestations that are too large for hand-pulling or digging.

*Methods*

Foliar spraying is recommended early in the spring, when it is one of the few shrubs with leaves, to minimize impact to native vegetation. However, treatment in the late summer, during fruiting, may provide more effective control. This is the preferred control method for large thickets of Japanese barberry. Cut-stem

treatment is preferred where spraying may impact non-target species. When hand-spraying, thoroughly wet all leaves with a glyphosate product or Garlon<sup>®</sup> 3A as a 2% solution (8 oz. per 3-gallon mix) in water with a surfactant. For cut stems or basal bark application, use a glyphosate product or Garlon<sup>®</sup> 3A as a 25% solution (32 oz. per 1-gallon mix), covering the outer 20% of the stump.

#### *Cautions*

The herbicides are non-selective and should be applied carefully to prevent killing of non-target species. Follow all precautions mentioned in the “General Practices” section of this document.

#### **4. Bio-control**

##### *Effectiveness*

No biological control organisms for Japanese barberry are available.

#### **REVEGETATION**

Regardless of the management option implemented, all affected areas shall be revegetated using non-invasive species.

**EXHIBIT A**  
Equipment Vendor Certification

A permit condition, therefore a Condition of Contract for the Prime Contractor, any Subcontractors, and any heavy equipment vendors for the **Modified Belleayre Resort at Catskill Park Project** shall be required to Certify that their construction equipment (each piece of off-road equipment used on site) as 'clean'.

\_\_\_\_\_ (*name of firm*) hereby Certifies that

\_\_\_\_\_ (*make, model, and type*)

\_\_\_\_\_ (*equipment ID tag or #*)

1. before entry on to the job site, has been pressure washed and sufficiently cleaned to remove all accumulated mud, debris, plant fragments, and detritus that could harbor seeds, roots, or plant fragments of so-called invasive plant species; and
2. that the above piece of equipment has neither been off-loaded nor operated in the interval between cleaning and delivery to the jobsite.

\_\_\_\_\_ (*signed*)                      \_\_\_\_\_ (*dated*)

\_\_\_\_\_ (*printed name*)

\_\_\_\_\_ (*title*)

The signed original of this form (one for each excavator, dump truck, dozer, etc) is to be given to the Field Construction Manager assigned to the project.

**EXHIBIT B**  
**Interim List of Invasive Plant Species in New York State**

## INTERIM LIST OF INVASIVE PLANT SPECIES IN NEW YORK STATE

### Purpose

This list was not prepared pursuant to ECL 9-1705 (5) (h), the so-called “four-tier system”.

The primary purpose of this list to inform New York State agencies so they can incorporate invasive species management into their funding, regulatory and other activities pursuant to ECL 9-1705 (b) and especially ECL 9-1709 (2):

“...[DEC] in cooperation with [DAM] shall have the authority...to... coordinate state agency and public authority actions to do the following: (a) **phasing out uses of invasive species**; (b) **expanding use of native species**; (c) **promoting private and local government use of native species as alternatives to invasive species**; and (d) wherever practical and where consistent with watershed and/or regional invasive species management plans, **prohibiting and actively eliminating invasive species at project sites funded or regulated by the state;....”**

It is intended to inform regulatory actions pursuant to existing statutory authorities, e.g., protection of waters (ECL Article 15), wetlands (ECL Articles 24 and 25), State Environmental Quality Review (ECL Article 8), biocontrol (ECL Article 11), and pesticides (ECL Article 33). This list is also intended to inform non-regulatory management decisions and actions, such as for planning and priority-setting, prevention, early detection, monitoring, rapid response, control and eradication, restoration, research, and public education.

This list does not include *all* plant species that are invasive or potentially-invasive in New York State. Rather, it includes many of those plant species that are widely-recognized as invasive or potentially-invasive in New York State. ECL 9-1703 (10) defines “invasive species” as:

“...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.”

Thus, when complying with the provisions of 9-1709, agency staff use professional judgment in assessing the potential environmental harm (or harm to human health) when considering particular species in particular contexts.

\* \* \*

## INTERIM LIST OF INVASIVE PLANT SPECIES IN NEW YORK STATE

Floating & Submerged Aquatic	
Common Name	Scientific Name
Carolina Fanwort	<i>Cabomba caroliniana</i>
Rock Snot (diatom)	<i>Didymosphenia geminata</i>
Brazilian Elodea	<i>Egeria densa</i>
Water thyme	<i>Hydrilla verticillata</i>
European Frog's Bit	<i>Hydrocharis morus-ranae</i>
Floating Water Primrose	<i>Ludwigia peploides</i>
Parrot-feather	<i>Myriophyllum aquaticum</i>
Variable Watermilfoil	<i>Myriophyllum heterophyllum</i>
Eurasian Watermilfoil	<i>Myriophyllum spicatum</i>
Brittle Naiad	<i>Najas minor</i>
Starry Stonewort (green alga)	<i>Nitellopsis obtusa</i>
Yellow Floating Heart	<i>Nymphoides peltata</i>
Water-lettuce	<i>Pistia stratiotes</i>
Curly-leaf Pondweed	<i>Potamogeton crispus</i>
Water Chestnut	<i>Trapa natans</i>

Emergent Wetland & Littoral	
Common Name	Scientific Name
Flowering Rush	<i>Butomus umbellatus</i>
Japanese Knotweed	<i>Fallopia japonica</i>
Giant Knotweed	<i>Fallopia sachalinensis</i>
Yellow Iris	<i>Iris pseudacorus</i>
Purple Loosestrife	<i>Lythrum salicaria</i>
Reed Canarygrass	<i>Phalaris arundinacea</i>
Common Reed- nonnative variety	<i>Phragmites australis</i> var. <i>australis</i>

Terrestrial - Herbaceous	
Common Name	Scientific Name
Garlic Mustard	<i>Alliaria petiolata</i>
Mugwort	<i>Artemisia vulgaris</i>
Brown Knapweed	<i>Centaurea jacea</i>
Black Knapweed	<i>Centaurea nigra</i>
Spotted Knapweed	<i>Centaurea stoebe</i> ssp. <i>micranthos</i>
Canada Thistle	<i>Cirsium arvense</i>
Bull Thistle	<i>Cirsium vulgare</i>
Crown vetch	<i>Coronilla varia</i>
Black swallow-wort	<i>Cynanchum louiseae</i> ( <i>nigrum</i> )
European Swallow-wort	<i>Cynanchum rossicum</i>

Fuller's Teasel	<i>Dipsacus fullonum</i>
Cutleaf Teasel	<i>Dipsacus laciniatus</i>
Giant Hogweed	<i>Heracleum mantegazzianum</i>
Japanese Stilt Grass	<i>Microstegium vimineum</i>

<b>Terrestrial - Vines</b>	
Common Name	Scientific Name
Porcelain Berry	<i>Ampelopsis brevipedunculata</i>
Oriental Bittersweet	<i>Celastrus orbiculatus</i>
Japanese Honeysuckle	<i>Lonicera japonica</i>
Mile-a-minute Weed	<i>Persicaria perfoliata</i>
Kudzu	<i>Pueraria montana var. lobata</i>

<b>Terrestrial - Shrubs &amp; Trees</b>	
Common Name	Scientific Name
Norway Maple	<i>Acer platanoides</i>
Tree of Heaven	<i>Ailanthus altissima</i>
Japanese Barberry	<i>Berberis thunbergii</i>
Russian Olive	<i>Elaeagnus angustifolia</i>
Autumn Olive	<i>Elaeagnus umbellata</i>
Glossy Buckthorn	<i>Frangula alnus</i>
Border Privet	<i>Ligustrum obtusifolium</i>
Amur Honeysuckle	<i>Lonicera maackii</i>
Shrub Honeysuckles	<i>Lonicera morrowii/tatarica/x bella</i>
Bradford Pear	<i>Pyrus calleryana</i>
Common Buckthorn	<i>Rhamnus cathartica</i>
Black Locust	<i>Robinia pseudoacacia</i>
Multiflora Rose	<i>Rosa multiflora</i>

~ END ~