INVASIVE SPECIES HANDBOOK

A Guide to Invasive Species in the SLELO PRISM Region

Photo: Tom Heutte, USDA Forest Service, Bugwood.org

NEW YORK STATE OF OPPORTUNITY
Department of Environmental Conservation

INVASIVE SPECIES MANAGEMENT
SAINT LAWRENCE EASTERN LAKE ONTARIO

The Nature Conservancy

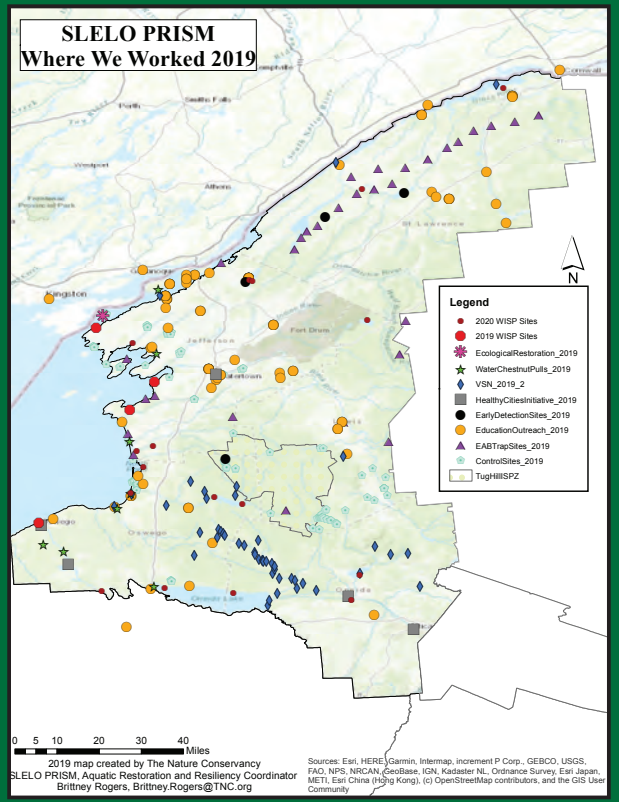
The St. Lawrence Eastern Lake Ontario Partnership for Regional Invasive Species Management is one of eight partnerships across New York that encompasses St. Lawrence, Jefferson, Lewis, Oswego and Oneida counties.

SLELO provides region-wide coordination for invasive species monitoring and management across terrestrial and aquatic ecosystems within the 7,600-square mile region. SLELO is a collaborative effort among organizations and individuals working to protect New York's natural and cultural resources from the threat of invasive species.

To learn more about SLELO PRISM:

www.sleloinvasives.org

This guidebook highlights invasive species currently found in or within proximity the SLELO region. This guidebook is not a comprehensive list of all invasive plants that are currently found on the SLELO PRISM region. Report invasive species observations via iMapinvasives.org.



Map credit: 2019 Map created by The Nature Conservancy, SLELO PRISM, Brittney Rogers ©

SLELO PRISM STRATEGIC INITIATIVES

Considering Changing Climate: Our climate is changing; impacts of these changes make environmental ecosystems more vulnerable to the invasion and establishment of invasive species. Changes in precipitation and seasonal temperatures can stress and weaken natural plant communities. Climatic changes resulting in raised temperatures in northern latitudes may cause many species to shift their ranges farther north and higher in elevation; in addition to range shifts, climate change may enhance the success of naturalized non-native species causing them to become invasive. The presence of invasive species can also contribute to our carbon footprint; for example, trees killed by invasive forest pests lose their ability to store carbon. SLELO partners consider how climate change will impact the way we manage invasive species and incorporate adaptive management strategies to prepare for these impacts.

Urban Forest Sustainability: Urban forests constitute a collection of trees growing along streets, yards, parks, cemeteries, school grounds and undeveloped open spaces. Urban forests have numerous environmental, social and economic benefits that are important to both nature and people, such as, providing shade and shelter, water filtration, air purification, and enhancing property values and positive health benefits for people. Invasive forest pests threaten the health of our urban forests and street trees effected by invasive forest pests or pathogens can become a liability. SLELO partners are working together to help enhance the sustainability of urban forests in the wake of invasive species and a changing climate.

Innovation: Developing and implementing innovative technologies helps us to better understand, visualize, alleviate or manage invasive species and their impacts. Innovation may also serve to strengthen ecosystem function and/or processes. In the SLELO region we are utilizing such things as environmental DNA or eDNA, underwater video technology and the use of integrated microscopes to better inform our work.

SPECIES QUICK FINDER

GRASSES

FORBS

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SPECIES QUICK FINDER

AQUATIC SPECIES

INSECTS

VINES

INVASIVE SPECIES HANDBOOK

A GUIDE TO INVASIVE SPECIES IN THE SLELO PRISM REGION

Fourth Edition, 2020

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

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Rob Williams, SLELO PRISM Program Director
Megan Pistolese, SLELO PRISM Education & Outreach Coordinator
Brittney Rogers, SLELO PRISM Aquatic Restoration & Resiliency Coordinator
Robert Smith, SLELO PRISM Terrestrial Restoration & Resiliency Coordinator
Josh Thiel, David Adams, Steven Pearson, Molly Hassett, Emma Antolos and Cathy McGlynn from the New York State Department of Environmental Conservation, Invasive Species Coordination Section

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Booklet design and pre-press by Robert McNamara, Art of Wilderness and Erin Zehr.

To provide comments or request additional copies, contact:

The Nature Conservancy
269 Ouderkirk Rd.
Pulaski, NY 13142
315-387-3600 x7725

WHAT IS AN INVASIVE SPECIES?

Invasive species are non-native plants, animals and insects that cause harm to the environment, economy and human health. Not all non-native species are invasive. Most experts agree that about 1/3 of the plants currently found in New York are non-native, but only a small fraction, perhaps 10 – 15%, cause enough damage to be considered invasive. Species that are invasive often grow to dominate an ecosystem to the detriment, and sometimes the exclusion, of native species.

How do they get here?
Human activities, such as trade, travel and tourism are the main pathways in which invasive species are introduced to new areas. Invasive species are often unintended hitchhikers on cargo and equipment or are deliberately introduced as pets, ornamental plants, food sources, or other purposes. Invasive species thrive in disturbed areas, such as along roadsides, and constructions zones. Invasive species can be spread by natural methods such as wind, water currents and by animals, but not at the speed or the broad scope that human activities spread them.

Why should we care?
On a global basis, invasive species are second only to habitat destruction as the greatest threat to native plants, animals and natural communities. In fact, experts estimate that invasive species have contributed to the population decline of 42% of threatened and endangered species in the U.S. Many invasive species threaten economically important industries such as farming, fisheries, forestry and tourism. Some invasive species, such as West Nile virus and giant hogweed threaten human health. Others compete directly with native species for nutrients, shelter and space. As a result, invasive species disrupt specialized relationships between plants and animals and degrade ecosystem benefits.

Why do Invasive Species Cause Harm?
Outside their native range, invasive species lack the natural conditions or predators that keep their populations under control. In addition, invasive species tend to be generalist species that can survive in conditions unfavorable to native species, such as in poor soil quality or low dissolved oxygen levels in water.

WHAT'S BEING DONE?

New York State has recognized the impacts caused by invasive species and is committed to proactively addressing these risks. One method of doing this has been through the creation of public-private partnerships called Partnerships for Regional Invasive Species Management (PRISMs) which have been established throughout the state. Statewide there are a total of 8 PRISMs tasked to foster local collaborations to prevent and control the spread of invasive species.

Prevention, early detection, rapid response, and education and outreach are top priorities utilized by the PRISM network.

The SLELO PRISM is a collaborative effort between numerous principal and cooperating partners throughout our region. Partner Organizations of the SLELO-PRISM Include:

- NYS Department of Environmental Conservation
- The Nature Conservancy
- Central New York Regional Planning & Development Board
- Cornell Cooperative Extension
- County Soil & Water Conservation Districts
- Ducks Unlimited
- Fort Drum Military Installation
- Indian River Lakes Conservancy
- New York Power Authority
- New York Sea Grant
- NYS Department of Transportation
- NYS Parks, Recreation & Historic Preservation
- Onondaga Audubon
- Save the River
- The St. Regis Mohawk Tribe-Environmental Division
- Thousand Islands Land Trust
- Tug Hill Commission
- Tug Hill Tomorrow Land Trust
- U.S. Coast Guard Auxiliary

GENERAL MANAGEMENT STRATEGIES

While eradication of invasive species may be desirable, it is not always feasible as a management goal. Controlling existing populations to prevent their spread and quickly treating new infestations is usually the most practical goal.

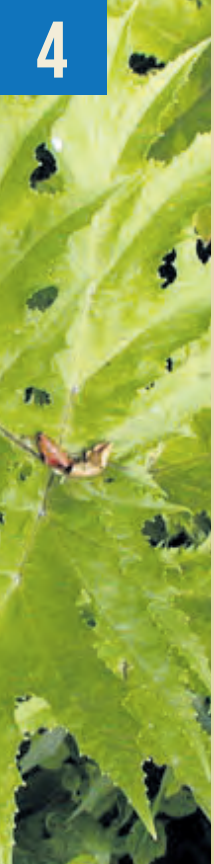
For most invasive species there are a variety of effective control measures. In this guidebook we describe alternative control methods that have been used successfully elsewhere; the most suitable one for your situation will depend on the invasive species, the size of the invasion, surrounding environmental conditions, and the management objectives for the area in question. We have divided the control options into three categories: mechanical, biological, and chemical. In some instances several control methods may be combined. Regardless of the control method, repeated treatment for many years is often required to deplete the seed bank.

Removal of invasive species often results in disturbance of the soil or large areas of bare soil where native vegetation has been displaced. In many cases it will be necessary to replant the area with native species. When seeding is completed it may be useful to plant a short-lived cover crop such as annual rye or oats to compete with the weedy species and control erosion as the native seedlings are becoming established.

MECHANICAL CONTROL

Mechanical methods include prescribed burning, pulling, mowing, cutting, and other techniques that physically remove all or part of the plants. It is important to minimize soil disturbance as much as possible when using mechanical control because disturbance encourages invasive species establishment. In general, mechanical control is most feasible for small invasions because of the intensive effort required. Depending on the species, it may be necessary to remove all plant material from the site and dispose of it by burning or burying very deeply to prevent roots or stems from re-sprouting.

Mechanical control can be done by hand or using common tools such as shovels, loppers, mowers, and saws. Weed wrenches are specialized tools designed specifically for pulling plants and are especially useful for trees and shrubs.



BIOLOGICAL CONTROL

In biological control, a plant's natural enemies, usually insects or diseases, are imported and released to control the invasive species. Before biological control agents are approved for use in the U.S. they must go through years of testing to ensure they attack only the invasive plant and do not have a negative effect on other plants or animals. At the time of writing, purple loosestrife is the only species in this guidebook for which biological control has been approved.

CHEMICAL CONTROL

Chemical control may be appropriate when the infestation is large or when there are no other effective control methods known. Herbicides are most often either sprayed, brushed or wicked on the foliage, basal bark or cut stumps or stems of target plants.

Regardless of which technique you use you should follow these guidelines:

- **Always carefully read and follow all label instructions. It is against the law to do otherwise.**
- **Use the safest effective herbicide at the safest time.**
- **Use appropriate personal protective equipment while working with herbicides.**
- **Always apply herbicide by working away from areas already treated.**
- **Do not over-apply chemical to the point of run-off from leaves, stems or stumps to minimize the effect on non-target plants and animals.**
- **Do not spray in windy conditions.**
- **Warn others by placing herbicide warning signs around the perimeter of the treated area.**

The Nature Conservancy does not endorse any particular herbicide or manufacturer, and therefore trade names are generally not used in the control recommendations. Many herbicides are readily available in garden stores.


Stem injection system

For foliar treatments, herbicides are applied to green leaves with a hand sprayer, sponge applicator, or wick. Herbicide should be applied uniformly, ensuring that all the leaves are thoroughly wetted but not dripping to avoid contact with non-target species. Spray applications will usually involve mixing a surfactant/dispersal agent with the herbicide; be sure to follow label directions. If label recommendations allow, colorants or marker dyes may be added to assist in proper herbicide application.

For cut-stump or cut-stem treatments, herbicide is applied to freshly cut trunks or stems with a hand-held sprayer, brush, sponge applicator or contact solution bottle. Herbicide should be applied as soon as possible after cutting. For woody plants, only the cambium layer just inside the bark needs to be treated, not the entire stump. Trees and shrubs should generally be cut at the end of the growing season so that chemicals will be actively absorbed into the stump, although many species may be treated in the winter. Winter application is best done with temperatures are above freezing to maximize translocation.

For basal bark treatments, herbicide is applied in a ring around an uncut trunk or stem. In general, it should be applied in a 6 – 18 in. band around the entire trunk approximately 6 – 12 in. from the base of the plant. Often the herbicide is mixed with horticultural oil to increase penetration through the bark but follow label instructions. The effectiveness of this treatment may not be consistent on trees larger than 5 – 6 in. in diameter at chest height.

In stem injection treatments, an herbicide is applied using a special injector system that delivers herbicide directly into the stem with little or no effect on non-target species. Always follow herbicide label directions.

For manual control, hand pulling treatments, take care to remove the roots and to dispose removed plant parts to avoid regeneration. Removing plants before they go to seed, or bear fruit helps reduce the seed bank and spread potential.

PRIORITY CONSERVATION & HIGHLY PROBABLE AREAS

Timing is critical when responding to the initial detection of an emerging invasive species in an area. However, the amount of time we can realistically spend monitoring our vulnerable waterbodies, wetlands and upland areas is often limited. When the sheer size of a land area or body of water makes it unfeasible to conduct a full survey of an area, it makes sense to focus investigative efforts on those areas where invasions are most likely to occur. For efficiency and when conducting early detection surveillance, SLELO PRISM partners have identified multiple **Priority Conservation Areas** (PCA) in which to focus our efforts. Minimum qualifications for a PCA include: The site must have some uniqueness or ecological importance such as unique habitat, grassland, alvar, wetland, dune, freshwater spawning area, fen, bog, etc. and the site "should be" host to a rare, threatened or endangered species.

Within each PCA we can further identify **Highly Probable Areas** (HPA) which include areas where human activities or site conditions increase the probability an invasive species becoming established. Examples of terrestrial HPA's include: trailheads, camp grounds, disturbed areas such as logging staging areas and homogeneous stands of trees. Examples of aquatic HPA's include: public boat launch sites, fishing hot-spots, quiet shallow coves.

Get Involved: You can help strengthen early detection efforts by learning to recognize and report invasive species. SLELO PRISM is recruiting and training volunteers to join our invasive species Volunteer Surveillance Network (VSN) to help keep an eye out for invasive species in our region. To join this effort please contact (315) 387 3600 x7724.

TIERED SPECIES LIST

Recognizing the need to further define actions related to specific species, the SLELO PRISM collaborated with the New York iMapInvasives team to develop a tiered system of species which allows us to prioritize species and communicate appropriate management actions between other NY PRISMs and partners. The SLELO Tiered System is as follows:

Tier 1 – Prevention/Early Detection Species. Not in PRISM, but within 100-mile buffer or introduction pathway exists. Highest level of early detection survey efforts.

Tier 2 – Eradication Species. Present in PRISM, but at low abundance making eradication feasible within Priority Conservation Areas.

Tier 3 – Suppression Species. Too widespread for eradication from PRISM. Targeted management to suppress the population within Priority Conservation Areas.

Tier 4 – Local Control Species. Present / widespread throughout PRISM with no chance of eradication. Localized, landowner management applied to protect high priority resources like rare plant or recreation assets.

Tier 5 – Species. These are species that may or may not be in PRISM but are difficult to respond to or that require more knowledge of. Monitor the species.

		Difficulty of Eradication/Cost of Control Abundance (In PRISM plus Buffer)				
		None in PRISM	Low (Eradication/Full containment may be feasible)	Medium (Strategic management to contain infestations and slow spread in PRISM)	High (Established/widespread in PRISM; only strategic localized management)	N/A
Impact (current and future)	Very High or High	Tier 1 *Early Detection/Prevention* Not in Prism, but within 100 mile buffer or introduction pathway exists. Highest level of early detection survey efforts.	Tier 2 *Eradication* Present in Prism, but at low abundance with suitable treatment methods available to make eradication feasible within Priority Conservation Areas (PCA's).	Tier 3 *Suppression* Too widespread for eradication from PRISM, but some areas remain unaffected. Targeted management to suppress the population within Priority Conservation Areas (PCA's).	Tier 4 *Local Control* Present and widespread throughout PRISM with no chance of eradication. Localized management applied to protect high priority resources like rare plant or recreation assets.	Tier 5 *Monitor* Species that may or may not be in PRISM but are difficult to respond to or that require more knowledge of.

COMMON REED GRASS

Phragmites australis

DESCRIPTION

Appearance: Herbaceous perennial grass reaching heights of 15 ft., usually growing in dense stands. **Leaves:** Dark green/gray long (7.5 – 16 in.), stiff leaves. **Flowers:** Large plumes of purplish brown flowers appear in July and turn tan-gray late in the season. **Stem:** Rigid, tan, ribbed stems grow very densely together. **Roots:** Dense mat of rhizomes.

THREATS/DAMAGE

This highly aggressive plant thrives in wetlands and disturbed and degraded soils. It often becomes established and spreads along roadsides and drainage ditches. It can tolerate a wide range of environmental conditions. Common reed grass typically forms dense, single species stands that exclude other wetland vegetation and alter community structure. This change can cause a decrease in wildlife abundance, including waterfowl and many marsh nesting birds. Common reed grass can also increase the potential for winter fires when above ground portions of the plant dry out and die.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Cutting: Cutting should be done near the end of July, when the season's food reserves in the leaves can be removed, thus reducing the plant's vigor. All cut portions of the plants must be removed and disposed of properly.

Burning: While prescribed fire is not effective at controlling common reed grass, it can be used to remove leaf litter and the large amount of dead material following cutting and/or chemical treatments.

CHEMICAL

Materials Application

Foliar treatment: For effective control, glyphosate approved for use near aquatic habitats should be applied when at least 95% of the plants are tasseling because that is when the plant is supplying nutrients to the roots. Care should be taken because even though it may be approved for use near aquatic habitats, glyphosate is non-selective. Both foliar and cut/stem applications have been successful.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

Photo: Joseph McCauley, U.S. Fish and Wildlife Service, Bugwood.org

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COMMON REED GRASS

JAPANESE STILTGRASS

Microstegium vimineum, Andropogon vimineus

DESCRIPTION

Appearance: Annual weak stemmed, reclining grass up to 3 ft. high. **Stem:** Hairless nodes on stems. By fall stems turn red. **Leaves:** Pale green ¼ - 3/8 in. wide and 1 1/8 – 3 3/16 in. long leaves have a pale shiny midrib on the upper surface. Mid-vein is slightly offset from center with a line of silvery hairs running down it. **Flowers:** Inflorescence up to 2 3/4 in. long blooms in late summer/early fall, typically with awn. **Fruit:** Ellipsoid grain 1/8 in. long matures in late fall and is dispersed by water and animals.

Note: Virginia cutgrass *(Leersia virginica)* a native perennial grass, looks similar to Japanese stiltgrass, but it does not have a shiny midrib or an awn on the fruits, and it has a hairy ring around the stem nodes.

THREATS/DAMAGE

Stiltgrass is shade tolerant and prefers closed canopy forests, especially riparian areas, but can also be found in sunny areas or disturbed areas, such as roadsides, forest borders, and fields. Dense single species stands can become quickly established, preventing native species from establishing. Stiltgrass may alter soil conditions to its benefit and the detriment of native species by increasing pH and nitrogen levels. Large invasions of stiltgrass can have negative impacts on ground nesting birds. In addition, stiltgrass may provide habitat for rats that prey on native bobwhite quail. Individual plants can produce up to 1,000 seeds, which remain viable in the soil up to 5 years.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Pulling: Hand pulling is very effective and often the preferred control method, but it can be time consuming and labor intensive. Pulling should be completed before seed production in August – September. Annual weeding is necessary to deplete the seed bank.

Cutting: Cutting can be effective to clear large patches of stiltgrass just prior to seed production in August - September.

CHEMICAL

Materials Application

Foliar treatment: Herbicide applications can be effective at controlling large patches of stiltgrass when applied during late summer. The greatest success has been found with imazameth, but varying degrees of success have also been achieved with fluazifop-p, glyphosate, and sethoxydim.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

JAPANESE STILTGRASS

Photo: Chris Evans, River to River CWMA, Bugwood.org

Photo: James H. Miller, USDA Forest Service, Bugwood.org

Photo: Chuck Bargeron, University of Georgia, Bugwood.org

Photo:Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Photo: Ted Bodner, Southern Weed Science Society, Bugwood.org

GIANT HOGWEED

Heracleum mantegazzianum

DESCRIPTION

Appearance: Biennial or perennial herb that stands 7-16 ft. tall. **Stem:** Often purple-mottled, up to 4 in. in diameter, hollow and ridged. **Leaves:** Alternate, three-parted and pinnate leaves are up to 10 ft. long with fine hairs underneath. Upper leaves become gradually smaller. **Flowers:** 50-150 small, white flowers appear on a compound umbel up to 5 ft. in diameter between June and August. Most plants flower in the third or forth year. **Fruit:** Elliptic, ridged and winged fruits, 3/8 – 5/8 in. in length are shed from elongate stalks in August – October.

THREATS/DAMAGE

Giant hogweed has two major impacts: ecological and human health. It suppresses growth of native plants, which has a negative impact on the animals that depend on them. In addition, direct skin contact with giant hogweed induces extreme photosensitivity, which can lead to severe, slow to heal burns and scarring. Costs are incurred for both medical treatment and efforts to keep the plant under control. Over 100,000 seeds per plant are dispersed annually by water, wind, or humans.

CONTROL/MANAGEMENT

Extreme caution should be used when handling this plant, as it can cause severe skin irritations

MANUAL/MECHANICAL

Methods

Pulling: Plants may be dug-out, but care should be taken to remove most of the root to prevent resprouting. Although this is the most common type of control, it can be difficult and unpleasant. Always wear protective clothing and avoid getting the sap on your skin.

Mowing: Mowing does not kill the plant and causes resprouting, but it might be successful if done consistently and persistently enough to starve the roots.

CHEMICAL

Materials Application

Foliar treatment: Glyphosate is considered the most effective herbicide and should be used in spring and early summer when plants are less than three ft. tall. A follow-up application in mid-summer may be necessary. Use caution around desirable species since it is nonselective.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

GIANT HOGWEED

Photo: Jan Samanek, State Phytosanitary Administration, Bugwood.org

Photo: Brittney Roberson-NRCS

Photo: Terry English, USDA APHIS PPQ, Bugwood.org

Photo: Jan Samanek, State Phytosanitary Administration, Bugwood.org

Photo: Donna R. Ellis, University of Connecticut, Bugwood.org

JAPANESE KNOTWEED

Fallopia japonica

DESCRIPTION

Appearance: Perennial plant that reaches 10 ft. or taller. **Stem:** Round, sometimes ridged, often mottled. **Leaves:** Simple and alternate leaves are 3-6 in. long and 2-5 in. wide, with abruptly pointed tips. **Flowers:** Thousands of greenish-white flowers 1/8 in. wide appear in mid- to late summer. **Fruit:** ¼ -3/8 in. fruits have 3 wings that are easily dispersed by wind and water.

THREATS/DAMAGE

Japanese knotweed is an aggressive invader in riparian areas, but it can also be found in other disturbed areas, such as roadsides. It spreads quickly and forms dense thickets that exclude native plants and alter the ecosystem. It also interferes with human activities, such as fishing, because it is too dense to walk through easily. All of the dead stems and leaves can create a fire hazard during the dormant season. It is particularly problematic in riparian areas because it can survive floods and rapidly colonize scoured shores and islands.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

In general, mowing is not recommended as even a small piece of stem will regrow wherever it touches the soil.

CHEMICAL

Materials Application

Cut stem treatment: In early fall, stems should be cut about 2 in. above the ground and followed immediately by application of glyphosate or triclopyr to the cut stem.

Foliar treatment: A foliar application of glyphosate can be used to control large populations, but multiple treatments may be required. It is most effective to spray in late summer or early fall after cutting the stems in late spring or early summer. **Note:** Care must be taken when using chemical treatment near water courses. **Stem Injection** can be effective for small populations.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

JAPANESE KNOTWEED

Photo: Tom Heutte, USDA Forest Service, Bugwood.org

Photo: Jack Kartesz, University of Tennessee, Bugwood.org

Photo: Jan Samanek, State Phytosanitary Administration, Bugwood.org

Photo: Jan Samanek, State Phytosanitary Administration, Bugwood.org

Photo: Tom Heutte, USDA Forest Service, Bugwood.org

SWALLOW-WORT, BLACK AND PALE

Cynanchum nigrum (black) & *Cynanchum rossicum* (pale)

DESCRIPTION

Appearance: Herbaceous perennial vines in the milkweed family that reach 2-6 ft. in height. **Stem:** Unbranched, twining. **Leaves:** Opposite, oval to wedge-shaped, leaves 2 ½-4 ½ in. long and 2-2 ¾ in. wide with pointed tips are glossy and medium-green in color. In summer, the leaves become a warm yellow color. **Flowers:** Small, fleshy, pink to maroon flowers with 5 petals are borne in loose clusters and are visible in late May-mid July. **Fruit:** Smooth, slender, pointed, light-green pods are frequently borne in pairs. They are abundant during July/August and, like milkweed, open in late summer, disseminating large numbers of downy seeds.

THREATS/DAMAGE

Swallow-wort is a very aggressive invader of Christmas tree plantations, perennial crops, pastures, roadsides, disturbed areas, and natural areas. It is drought tolerant and will thrive in a wide range of soil, moisture and light conditions, but it does not grow in wet areas. The wind dispersed seeds are produced in large numbers and can travel a great distance. Swallow-wort can interfere with forest regeneration and change the microbial composition of the soil. It is toxic, so deer and other grazers will not eat it. Since it is a member of the milkweed family, monarch butterflies will lay their eggs on pale swallow-wort, but the larvae do not survive.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Pulling: The complete root must be dug out, ideally before the seeds ripen. Plants bearing seeds should be burned or bagged and disposed of in a landfill.

Cutting/Mowing: Mowing will not eradicate swallow-wort, but it can be used to prevent seeds from appearing or maturing. Cutting is most effective at preventing a mature seed crop if done in early to mid-July when there are small, immature pods on the plants.

CHEMICAL

Materials Application

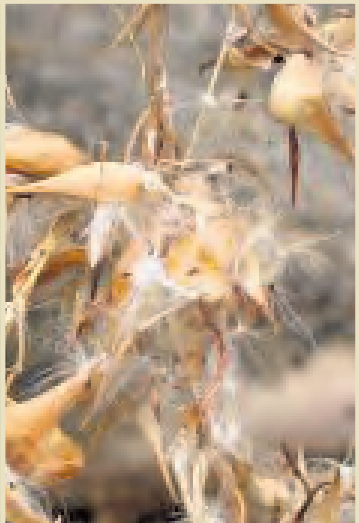
Foliar treatment: Triclopyr and glyphosate have been found to be effective in controlling swallow-wort when applied after plants flower. Earlier application is ineffective because there is not enough exposed leaf surface to deliver a killing dose to the roots.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

BIOLOGICAL

A biological control (Hypena opulenta) has been approved for suppression of swallow-wort.

Photo: Brittney Rogers TNC ©



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SWALLOW-WORT

WILD PARSNIP

Pastinaca sativa

DESCRIPTION

Appearance: Wild parsnip is a perennial herbaceous plant that can grow 6 feet in height. The leaves are arranged alternately and is made up of 5 -15 egg shaped leaflets along both sides of a common stalk; leaflets are sharply-toothed or lobed at the margins. The flowers are flat-topped broad clusters 2 - 6" wide, with numerous five-petal yellow flowers that bloom from June to late summer. The seeds are round, ¼" diameter, flat, slightly ribbed, and can remain viable in the soil for 4 years. This plant is often confused with giant hogweed.

THREATS/DAMAGE

The threats posed by wild parsnip are primarily to human health. Contact with this plant may cause severe burns and rashes to human skin.

CONTROL/MANAGEMENT

Caution should be used when handling this plant – the sap can cause painful, localized burning and blistering of the skin.

MANUAL/MECHANICAL

Methods

Cut the plant below the root crown before seeds set, and remove the cut plant.

MECHANICAL

Methods

Mowing is generally not recommended as this technique can broadcast toxic oils from the plant and spread seeds.

CHEMICAL

Materials Application

Herbicides can effectively control wild parsnip. Selective spot application, foliar application or stem injection with glyphosate can be effective but may need to be repeated for 2-3 years. Always follow herbicide label directions.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

WILD PARSNIP

COMMON BUCKTHORN

Rhamnus cathartica

DESCRIPTION

Appearance: Small trees 20-25 ft. tall and up to 10 in. in diameter with spreading, loosely-branched crowns. **Bark/Stem:** Grey to brown bark with elongate silvery projections (lenticels). Buckthorns often have multiple stems. Cut branches expose yellow sapwood and orange heartwood. **Twigs:** Closely-spaced leaf scars give a warty appearance. Twigs often end in stout thorns. **Leaves:** Small, dark glossy, ovate to elliptic, usually alternate, leaves with small teeth and a pointed tip appear early in spring and stay green late into fall. **Flowers:** Inconspicuous flowers appear in May or June clustered in the axils of the leaves. **Fruit:** Clusters of black fruit ¼ in. long ripen in August and September.

THREATS/DAMAGE

Common buckthorn aggressively invades maple forests and riparian woods but it can also be found in hedge rows, pastures, and abandoned fields. Plants leaf out early and retain leaves late into the fall creating dense shade, which has a particularly destructive effect on native herbaceous and low shrub communities. It may prevent the establishment of tree seedlings and completely shade out native wildflowers. Seeds have a laxative effect on birds who disperse them, which has a negative health effect.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Pulling: Plants less than $^{2}/_{5}$ in. in diameter can be hand pulled when the soil is moist. Plants up to $1^{1}/_{2}$ in. in diameter should be dug.

Cutting: Cutting any time will cause resprouting unless followed by herbicide application.

Stump Bag Method: Cut buckthorn stumps 6-inches from the ground using a saw or loppers. Place a black plastic bag over the cut stump and fan the bag out so it touches the ground around the stump to shade emerging shoots. Secure the bag around the stump with a zip-tie placed 3inches from the ground and leave for a year, it is best to place a sticker on the bag stating its purpose to deter tampering. Return the next year to cut any new buckthorn growth and remove and re-use the bags previously placed to cover newly cut stumps.

CHEMICAL

Materials Application

Cut-stump treatment: Cut stems near soil in fall or winter and immediately treat the vascular tissue just inside the bark with glyphosate or triclopyr (water or oil dilution).

Basal bark spray treatment: Triclopyr (oil dilution) or 2,4-D can be applied to uncut stems but may not kill large trees. Treat one side for stems less than 2 in.; otherwise treat full stem.

Foliar treatment: Spray in the fall with glyphosate when native plants are leafless but buckthorn is not and temperatures will remain above freezing for a few days. Fosamine (water dilution) can also be applied in the fall. It will not kill all plants, but mortality will be apparent the next growing season. Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.


Photo: The Nature Conservancy

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COMMON BUCKTHORN

HONEYSUCKLE

Lonicera tatarica, Lonicera morrowii, Lonicera x bella

DESCRIPTION

Appearance: Upright, dense, deciduous shrub generally 5-12 ft. in height. **Bark/Stem:** Shrubs usually have multiple stems. Older stems have grey shaggy bark and are often hollow. **Leaves:** Opposite, 1½ in. long, oval or oblong shaped and untoothed. They vary in color and texture from smooth, hairless and bluish-green to downy. **Flowers:** Pairs of fragrant tubular flowers bloom in the leaf axils in May and June. They range in color from white to red but are most often pink. **Fruit:** Red, yellow or orange berries that are situated in pairs in the leaf axils ripen in early summer.

Note: Native honeysuckles are all woody, vine-like, twining species that are easy to distinguish from the exotic, invasive shrubs.

THREATS/DAMAGE

Most natural communities are susceptible to invasion by honeysuckle, but woodlands are particularly vulnerable, especially if they are already disturbed. Honeysuckle thrives in sunny upland sites, including forest edges, roadsides, pastures, and abandoned fields but can also be found in wetlands and lakeshores. Honeysuckle leafs out early in spring, and eventually it may entirely replace native plants in an area by shading and depleting the soil of moisture and nutrients. Seeds are readily dispersed by birds, but the fruits are carbohydrate-rich and do not provide high enough fat content for long flights, causing a negative health effect on birds.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Pulling: Small plants can be pulled by hand in early spring when soil is moist. Larger plants can be pulled if the roots are loosened with a shovel. Pulling should be avoided in sensitive areas where soil disturbance can lead to more invasions.

Cutting: Cut plants several times a year until root stores are depleted. Honeysuckle will resprout vigorously, so repeated cutting or herbicide application is essential.

Burning: Prescribed burning in the spring will kill seedlings and top kill mature shrubs.

CHEMICAL

Materials Application

Cut-stump treatment: Cut stems at the base and immediately treat with glyphosate in fall or with triclopyr (formulated for oil dilution) any time of year (triclopyr formulated for water dilution is ineffective).

Basal bark spray treatment: Apply triclopyr (formulated for oil dilution) around the entire stem base.

Foliar treatment: Spray seedlings or shrubs with glyphosate in early spring or late fall when native plants do not have leaves.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

HONEYSUCKLE

Photo: Chuck Bargeron, University of Georgia, Bugwood.org

Photo: The Nature Conservancy

JAPANESE BARBERRY

Berberis thunbergii

DESCRIPTION

Appearance: Small, compact, deciduous spiny shrub, usually 3-6 ft. tall with slightly curving branches. **Bark/Stem:** The bark is brown but the inner wood is yellow. **Leaves:** Clusters of rounded, untoothed leaves 1-2 in. long grow close to the branches. They appear early in the spring and turn reddish in the fall. **Spines:** A single, sharp spine grows off the stem beneath each leaf cluster. Small leaves are found in the axils. **Flowers:** Yellow flowers, 1/3 in. across and single or in clusters of 2-4, bloom in late May. **Fruit:** Bright red, egg-shaped berries 1/3 in. long, in clusters or alone, mature in August and stay on the shrub through winter. **Roots:** Yellow.

THREATS/DAMAGE

Japanese barberry prefers well-drained soils and partial sunlight, but it can also survive on wet, calcareous sites and under the shade of a forest canopy. It is most common along woodland edges, roadsides, fences, old fields, and in open woodlands. Japanese barberry spreads vegetatively through horizontal lower branches that root freely, and, once established, it quickly forms dense stands in woodlands, forests, and meadows that shade out native plants. The dense stands and sharp spines can make woodlands difficult to walk though. Seeds are dispersed by birds and rabbits.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Pulling: Plants may be pulled or dug in the spring when they are easy to identify. This is more effective for controlling small infestations. Roots are shallow but tough, so a hoe, weed wrench or mattock should be used to uproot the bush and all connected roots. Heavy gloves should be worn for protection from the shrub's spines.

Burning: Prescribed fire effectively kills the plant and prevents future establishment.

Mowing: Although mowing is not effective for removing large, well established plants, regular mowing will control resprouts after initial removal by other means.

CHEMICAL

Materials Application

Cut-stump treatment: Cut near the soil and immediately treat with glyphosate or triclopyr. It is most effective in the fall, when sap is running toward the roots, and least effective in spring, when sap is running away from the roots.

Basal bark spray treatment: Apply triclopyr around the base of an uncut stem.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

Photo: Barry Rice, sarracenia.org

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JAPANESE BARBERRY

TREE-OF-HEAVEN

Ailanthus altissima

DESCRIPTION

Appearance: Rapid growing tree reaches 80-100 ft. **Leaves:** Pinnately compound leaves (stem with leaves on each side), with 10 to 40 leaflets which range 1-4 ft. in length. Two glandular teeth at the base of each leaf and smooth or "entire" leaf margins are distinguishing features (natives typically have serrated margins). **Flowers:** Flowers are small, yellow-green and appear in clusters in late spring or early summer. **Seed:** Wind dispersed 1-2 in. long twisted samaras with one seed each. Bark/Stem: Smooth resembling a cantaloupe, green when young to gray when mature. A notable foul odor is released when foliage is crushed, or twigs are broken. **Roots:** Seedlings often grow a strong taproot and can grow 3-6 ft. in first year. Root suckers are common and can be found up to 50 ft. from the parent tree, growing 10-15 ft. in one year.

THREATS/DAMAGE

Tree-of-heaven was introduced in the late 1700s as a horticultural specimen, from China and Taiwan, which is easily established and can thrive in unfavorable conditions. Prolific seed production and absence of insect or disease problems are favorable for the success of this invasive tree. Its aggressive root systems can cause damage to sidewalks, sewers and even building foundations. Allelopathic chemicals produced in leaves, roots, and bark can limit or prevent the establishment of other plants around it. Tree-of-heaven is a preferred host for the spotted lanternfly (see page 48).

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Pulling: Pull seedlings by hand before taproot develops ensuring entire root is removed.

Cutting: Temporarily reduces female ability to spread, may result in increased growth and tree density from root suckers. Most effective when integrated with chemical treatment.

CHEMICAL

Materials Application

Foliar: Used where tree height and distribution allow effective coverage without chemical contact with nearby desirable native plants.

Cut-stump: Best used when seedlings are established within non-target plants, may result in extensive root suckers

Basal-bark: May be most effective method for control when integrated by following up with cutting and cut-stump treatment to keep root suckers to a minimum.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

TREE-OF-HEAVEN

Photos: Brittney Rogers

ASIAN CARP

Silver & Bighead carp: Hypophthalmichthys and Ctenopharyngodon

DESCRIPTION

Asian carp, including the silver and bighead carp are freshwater fish. They have large, scale-less heads, a large mouth, and eyes located very low on the head. Adults usually have a mottled silver-gray-black coloration. Adults can be quite large. Record sizes occasionally approach 143 pounds.

Asian carp include the Silver and Bighead carp are considered a highly destructive invasive fish species in the United States. Bighead carp and the closely related silver carp were imported to the United States to remove excess or undesirable plankton and thus improve water quality in sewage treatment plants and aquaculture facilities. However, some fish escaped into the Mississippi River basin, where they are now firmly established. Communities are attempting to contain the spread of the extremely invasive bighead carp. New York has banned the import and possession of live bighead carp, with the exception of New York City, where they still may be legally sold in live food markets (but they must be killed before they leave the premises).

Resources used: R. Williams

THREATS/DAMAGE

Populations of Asian carp may lead to reductions in populations of native species that rely on plankton for food, including all larval fishes, some adult fishes, and native mussels. In addition, they compete for food, cause significant changes in the composition of macrophyte, phytoplankton, and invertebrate communities; interfere with the reproduction of other fishes and may significantly alter the food web and trophic structure of aquatic systems by inducing changes in plant, invertebrate, and fish communities.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Prevention: Preventing the sale and transport of Asian carp is the most cost-effective means by which to prevent infestations from occurring.

Regulations: Which prohibit the possession, sale, transport of carp.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

Photo: Pam Fuller, Bugwood.org

Photo: Lindsey Lewis, Bugwood.org

Keel extends only partway along belly

BIGHE

(Hypophthalm

RUSTY CRAYFISH

Orconectes rusticus

DESCRIPTION

Appearance: Identifying crayfish can sometimes be difficult. Here are some general characteristics that you can use to help identify Rusty Crayfish as compared to other crayfish. The Rusty Crayfish typically have two spots (rust color) on each side of their carapace. The tips of their claws are usually black.

THREATS/DAMAGE

Rusty Crayfish may cause several ecological and economic impacts. This species can be highly dominant and aggressive towards other native species of crayfish and bottom dwelling organisms. This aggressiveness can displace native crayfish and may harm fish populations by eating fish eggs.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Intensive harvesting may not eradicate crayfish, but may help reduce adult populations and minimize some impacts.

CHEMICAL

Materials Application

Chemicals do not selectively kill rusty crayfish without killing other crayfish species and should not be considered

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

RUSTY CRAYFISH

Photos: U.S. Geological Survey Archive, U.S. Geological Survey, Bugwood.org

FANWORT

Cabomba caroliniana

DESCRIPTION

Appearance: Submerged aquatic plant native to South America. Its name is derived from the fan-like appearance of its foliage. **Leaves:** Submerged, opposite and feathery and are "Y-shaped" at the end, often referred to look like a snake's tongue. **Stems** are slender and commonly grow between 3-4 feet long. **Flowers:** Six white petals with yellow stamens. side of their carapace.

THREATS/DAMAGE

Fanwort can overwinter and grows rapidly in the spring and summer, outcompeting and dominating the native vegetation. Fanwort's dense foliage reduces light availability for benthic organisms and native plants. This results in a decline in populations of fish and other animals dependent on these native organisms. Dissolved oxygen is also depleted as fanwort decays in autumn, causing a reduction in present animal populations.

Fanwort is easily spread by plant fragmentation. Be sure to Clean, Drain, Dry your watercraft and equipment, and avoid driving watercrafts through established fanwort stands.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Pulling: Hand pulling can be effective and selective, by targeting only fanwort plants in small areas. Fanwort doesn't root deeply and are easily uprooted but care should be taken to capture plant fragments to avoid spread. Mechanical control using motorized harvesters, weed rollers and benthic barriers, are typically not desirable since this method removes (or smothers) non-target species as well, but may be effective in small scale, dockside areas.

CHEMICAL

Materials Application

Fanwort can be controlled using herbicide treatments of fluridone and endothall. However, chemical treatments can be expensive and may need to be repeated annually. Any control of fanwort should be selective allowing for the retention of a native plant community.

FANWORT

Photo: Graves Lovell_Alabama Dept. Of Conservation and Natural Resources_bugwood.org

Photo: Shaun Winterton_Aquarium and Pond Plans of the World, Edition 3_USDA APHIS PPQ Bugwood.org

Photo: Leslie J Mehrhoff_University of CT_bugwood.org

Photo: Leslie J Mehrhoff_Univeristy of CT. Bugwood.org

HYDRILLA

Hydrilla verticillata

DESCRIPTION

Appearance: Hydrilla is a rooted aquatic plant (macrophyte). The leaves are arranged in whorls around the stem (generally five leaves per whorl). Serrations or small spines are apparent along the leaf edges. The midrib of the leaf is often reddish when fresh.

THREATS/DAMAGE

Hydrilla can invade deep, dark waters where most native plants cannot grow. The plant's aggressive growth (hydrilla can grow up to an inch per day) can spread into shallow water areas and form thick mats that block sunlight to native plants below, effectively displacing the native vegetation of a waterbody. Major colonies of hydrilla can alter the physical and chemical characteristics of lakes. It is one of the world's worst aquatic invasive plants. It blocks sunlight and displaces more beneficial native plants. The weight and size of sportfish can be reduced when open water and natural vegetation are lost. Waterfowl feeding areas and fish spawning sites are eliminated by dense surface mats of hydrilla. The value of waterfront property can be significantly reduced, hurting both homeowners and the communities that rely on taxation of shoreline property.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Prevention: Preventing the sale and transport of hydrilla is the most cost-effective means by which to prevent infestations from occurring

Pulling: Hand pulling of small infestations can be effective but only if the tuber and the entire plant is removed.

Suction harvesting or hydraulic dredging of hydrilla growth by divers using very strong vacuum hoses can be used to remove hydrilla from confined areas. However, if the underground tubers are not removed by dredging following the suction harvesting, regrowth can take place from the tubers during the next growing season. Further, any fragments that might escape during vacuum activities can float away to root and start new infestations.

CHEMICAL

Materials Application

Chemicals are easier to apply, but also costly. Aquatic herbicide spraying or tablets works best in small, enclosed bodies of water. Herbicides can also have unintended impacts on native flora, as well. For those reasons, permits for chemical control of hydrilla are required for chemical treatments in New York waterways.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

HYDRILLA

Photo: Chris Evans, River to River CWMA, Bugwood.org

Photo: Robert Videki, Doronicum Kft., Bugwood.org

Photo: Robert Videki, Doronicum Kft., Bugwood.org

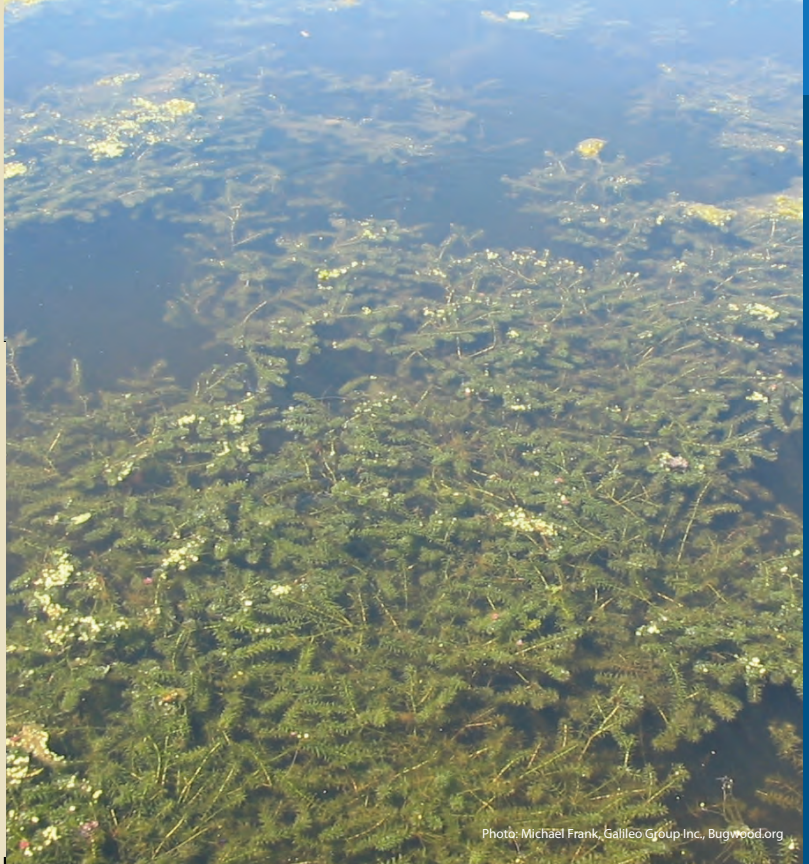


Photo: Michael Frank, Galileo Group Inc., Bugwood.org

TENCH

Tinca tinca

DESCRIPTION

Tench are an invasive fish native to Europe and Western Asia. They are a member of the minnow/carp family Cyprinidae. **Introducution:** Tench was illegally introduced by an unlicensed fish farm in the 1980s to the Richelieu River, a tributary of the St. Lawrence River. It is currently found in the Columbia watershed within British Columbia and Washington State, and is well established in the U.S. Mississippi River Watershed. Tench has been detected within the St. Lawrence River spanning from Quebec City to the Bay of Quinte in Lake Ontario. **Appearance:** Tench have dark olive to pale golden coloring and a white bronzy belly and bright red/orange eyes. They have a terminal mouth with a barbel at each corner. Fins are dark colored and rounded, with no spines. They can grow up to 18 inches in length and weigh up to 10-12 pounds.

THREATS/DAMAGE

Tench inhabit weedy/muddy water bottoms. They have high reproductive rates, long lifespans and can survive in low-oxygen and high temperature environments. They are generalist predators whose diet includes fish eggs, snails and other benthic invertebrates which puts them in direct competition with many native fish species. Tench diminish aquatic food-webs, increase water turbidity, and introduce non-native parasites into the Great Lakes.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Prevention is currently the best control method for tench. Do not use tench as bait. Fishing down known tench populations and using existing barriers such as dams and locks to block passage reduces spread potential.

If tench is found put it on ice (do not release), take photos, note your location and contact 315 387 3600 x7725.

TENCH

Photo: Sunci Avlijias, Mc. Gill University

Photo: Sunci Avlijias, Mc. Gill University

Photo: Sunci Avlijias, Mc. Gill University

EURASIAN WATERMILFOIL

Myriophyllum spicatum

DESCRIPTION

Appearance: Eurasian watermilfoil is a submerged aquatic plant (macrophyte) that when reaching the surface of the water can grow horizontally creating large dense mats. The stem can range from pale pink to red to reddish color. Leaves are divided into leaflets usually numbering greater than 9 per leaf. The ends of the leaves form a blunt tip. Between 3 to 5 leaves grow in a whorled pattern around the stem. When Eurasian watermilfoil is pulled out of the water, the leaves lose their rigidity and often collapse around the stem. The growing tips of the plant are often bright red.

THREATS/DAMAGE

Eurasian watermilfoil competes aggressively to displace and reduce the diversity of native aquatic plants. Eurasian watermilfoil can form thick underwater stands of tangled stems and vast mats of vegetation on the water's surface, especially in shallow, nutrient-rich water. These mats can limit recreational activities including boating, swimming, and fishing. Eurasian watermilfoil can disrupt the balance of aquatic ecosystems by crowding out important native plants needed for a healthy fishery and aquatic system. It can potentially reduce property values as well.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Hand pulling can be effective and selective, targeting only Eurasian watermilfoil plants in small areas. Mechanical control using motorized harvesters, weed rollers and benthic barriers, are typically not desirable since this method removes (or smothers) non-target species as well, but may be effective in small scale, dockside areas.

CHEMICAL

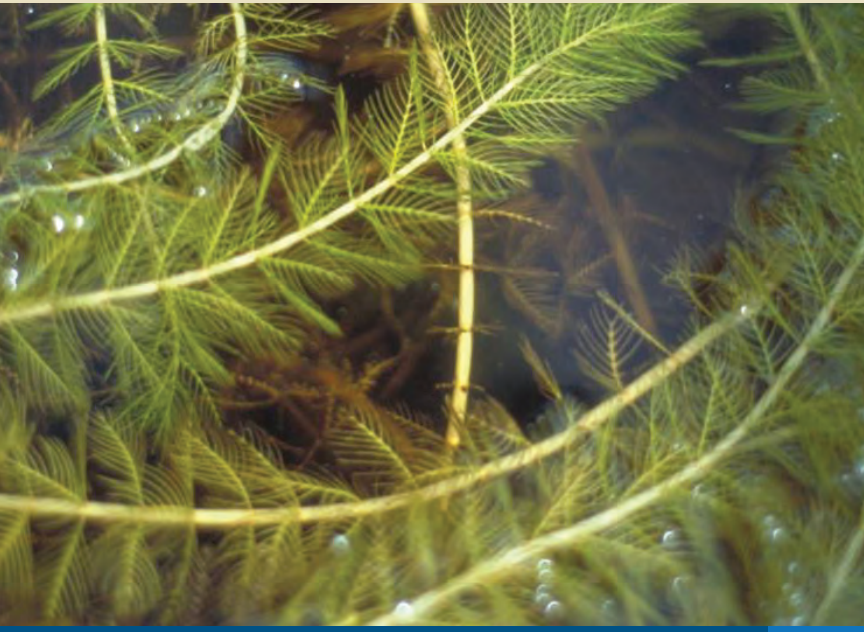
Materials Application

Chemical controls of Eurasian watermilfoil can be effective, however, chemical controls can be expensive and may need to be repeated annually. Any control of Eurasian watermilfoil should be selective allowing for the retention of a native plant community.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

BIOLOGICAL

Current biological control efforts are focused on the native milfoil weevil, Euhrychiopsis lecontei, which has been associated with natural declines of Eurasian watermilfoil and has shown potential in controlled field experiments. The milfoil weevil is native to North America and prefers Eurasian over its native host northern watermilfoil. The costs of adult weevils can range from $1.00/ weevil to $3.00/ weevil and are typically introduced at a rate of 1.5 weevils per watermilfoil stem. Introduction of the weevil usually requires a permit.



WATER CHESTNUT

Trapa natans

DESCRIPTION

The water chestnuts plant is a highly invasive aquatic plant found in ponds, lakes, bays, canals, and slow moving rivers with muddy bottoms. It is very common in central New York and within the lower portions of the SLELO region. This plant tends to grow in shallower (littoral) water.

Upper leaves are diamond-shaped with toothed edges and are shiny on the upper side and dull with fine hairs underneath. They are alternately arranged on spongy stalks and occur in floating clusters known as rosettes. Opposite submersed leaves are long and narrow. Green feather-like structures often replace the linear underwater leaves. Flowers are small with 4 white or light-purple petals on short, thick stalks that float among the upper leaves. The large (2.5 cm), variously-shaped nuts are swollen at the middle and have 2-4 sharp spines. Each nut contains a single, fleshy seed.

THREATS/DAMAGE

Water chestnuts have numerous impacts to include; aesthetic, recreation, fisheries, ecosystem and human health. Aesthetically water chestnut plants can completely dominate waterways to the extent where the water is not visible and swimming impossible or unpleasant. Dense populations are so thick that boating is impossible. Fisheries - areas of dense growth are avoided by fishes and large mats may alter underlying water temperatures. From an ecosystem perspective large populations of water chestnuts outcompete desirable native plant species and may alter substrate composition. The seeds (nuts) are spiny and can cause injuries if stepped on.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Prevention: Preventing the transport of water chestnuts is the most cost-effective means by which to prevent infestations from occurring.

Manual Hand Pulling: Hand pulling of small infestations can be effective but must be done repeatedly and prior to seed drop.

Mechanical Harvesting: Mechanical harvesting is effective for this particular aquatic plant especially in highly infested areas. Mechanical harvesting should be done prior to seed drop.

CHEMICAL

Materials Application

Chemicals are easier to apply, but also costly. Aquatic herbicide spraying works well in small, enclosed bodies of water. Herbicides can also have unintended impacts on native flora, as well. For those reasons, permits for chemical control of water chestnuts are required for chemical treatments in New York waterways.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

WATER CHESTNUT

Photo: Brittney Rogers TNC 2019 ©

Photo: Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Photo: Steve Hurst, USDA NRCS PLANTS Database, Bugwood.org

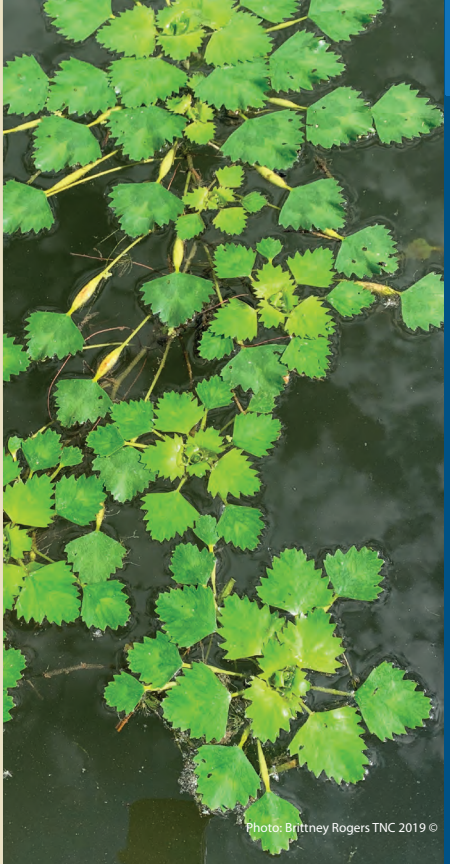


Photo: Brittney Rogers TNC 2019 ©

ASIAN LONGHORNED BEETLE

Anoplophora glabripennis

DESCRIPTION

Appearance: 1½ inch long shiny, black beetle with irregular white markings. Black and white banded antennae, longer than the body. **Eggs:** Laid in chewed depressions in bark. Hatches in 10-15 days. **Larvae:** Feed by tunneling through the bark, into the cambium and xylem. **Pupae:** Pupal chambers are dug in heartwood, where insect is most secure. **Adults:** Emerge through round ½ circular holes.

THREATS/DAMAGE

Asian longhorned beetle (ALB) will attack many kinds of trees including maples, elms, horsechestnut, willow, sycamore, and birch. Larvae tunnel into cambium and through heartwood of trees, weakening the tree's structure and preventing nutrient flow. Eventually, the tree will die from the infestation. Branches of infected trees can break off, creating a threat to public safety. In the Tug Hill region, maple syrup production could be impacted by the spread of ALB.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Remove and chip or burn infected trees. Tree must be chipped no larger than 1 inch in two dimensions. Roots of host trees should be removed to a minimum of 9 inches below the ground. Trees may be moved to an approved burning site via tarped or covered vehicle and held no longer than 24 hours prior to burning at site.

CHEMICAL

Materials Application

Soil or trunk injection of systemic insecticide Imidacloprid can be applied by a licensed applicator. This method has been successful on adults, egg laying females and young larvae.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

Photo: Melody Keena, USDA Forest Service, Bugwood.org

Photo: Steven Katovich, USDA Forest Service, Bugwood.org

Photo: Conservation and Natural Resources-Forestry Archive, Bugwood.org

Photo: Dennis Haugen, USDA Forest Service, Bugwood.org

EMERALD ASH BORER

Agrilus planipennis

DESCRIPTION

Appearance: 3/8-3/4 inch long metallic, emerald green beetle. **Eggs:** Laid singly in bark, hatch in 7-10 days. **Larvae:** White to cream colored, flattened, with bell-shaped segments. **Pupae:** Pupate in chambers created in the bark or up to ½" deep in tree. **Adults:** Emerge after 1-2 weeks through a D-shaped exit hole, 1/8-1/6 inch in size.

THREATS/DAMAGE

Emerald ash borer (EAB) beetles attack trees in the genus *Fraxinus*. In the Tug Hill region, this includes black ash *(F.nigra)*, green ash *(F.pennsylvanica)*, and white ash *(F.americana)*. Larvae feed into phloem and cambium layers, creating S-shaped "galleries" that disrupt the flow of nutrients through the tree, eventually weakening and killing the tree. An infestation can be difficult to detect, but trees may exhibit signs including vertical splits in bark, increased woodpecker activity, epicormic shoots, and thinning tree canopy.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Trees with commercial timber value can be harvested and sold. Consult a local forester for assistance with this process. Trees can be used for firewood as long as local and statewide quarantine regulations are followed. Do not move untreated wood more than 50 miles or outside of a quarantined zone.

CHEMICAL

Materials Application

Systemic Insecticide: Several options exist for protecting threatened ash trees. A systemic soil drench type insecticide is over the counter and may be applied by homeowners. Soil injection and trunk injection systemics are available, but must be administered by a professional. Note: The methods are effective for 1-3 years after application. It will be necessary to retreat threatened trees, possibly several times, in order to ensure protection from EAB. This method is not feasible for large woodlots.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

EMERALD ASH BORER

HEMLOCK WOOLLY ADELGID

Adelges tsugae

DESCRIPTION

Appearance: 2mm long, aphid-like insect with a black, oval shaped soft body. **Eggs:** Very small, brownish-orange, laid in white, woolly masses of wax. **Nymphs:** Also called crawlers, they attach specialized mouthparts to underside of hemlock needles. **Adults:** Hemlock woolly adelgid (HWA) reproduce in two ways: Some adults are wingless and remain on host tree, feeding and reproducing. Other winged adults must seek out a suitable spruce tree to complete their life cycle. The spruce trees in our area are not suitable for this purpose and the winged adults die soon after without producing offspring. This may contribute to reductions in total HWA population.

THREATS/DAMAGE

HWA threatens hemlock trees, genus *Tsuga*. It feeds on the tree's needles, attacking the food storage cells. The hemlock "walls off" the area where the HWA is feeding, causing a disruption in nutrient flow and, eventually, killing the needle. Needles will dry out, gray, and fall off. Over several years, whole limbs will die back, killing the host tree from the bottom up.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Stress on infested hemlocks can be reduced by pruning dead or dying branches and watering trees during dry periods.

BIOLOGICAL

Several HWA predators, including beetles and fungal pathogens, are being tested for effectiveness in treating infested hemlocks on a large scale. While more research is needed to assess long term feasibility, studies have shown this to be a promising method of controlling HWA.

CHEMICAL

Materials Application

Individual trees can be treated with a systemic insecticide, applied as soil drench or basil bark spray. Once applied, the treatment can provide years of protection for the tree.

Hemlock foliage may also be treated with horticultural oils and insecticidal soaps as long as the trees are small enough to be saturated, ensuring that the HWA has been exposed.

Note: Avoid fertilizing hemlocks with a nitrogen fertilizer as it will encourage HWA reproduction and survival.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

HEMLOCK WOOLLY ADELGID


Photo: Kelly Oten, Bugwood.org


Photo: Bugwood.org

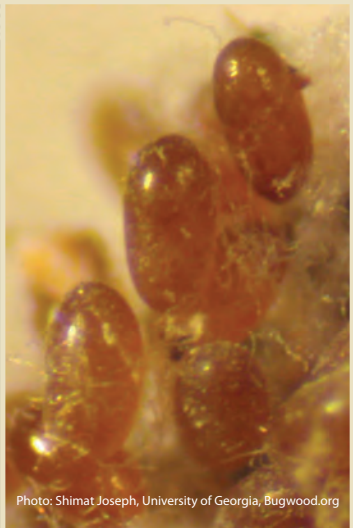


Photo: Shimat Joseph, University of Georgia, Bugwood.org

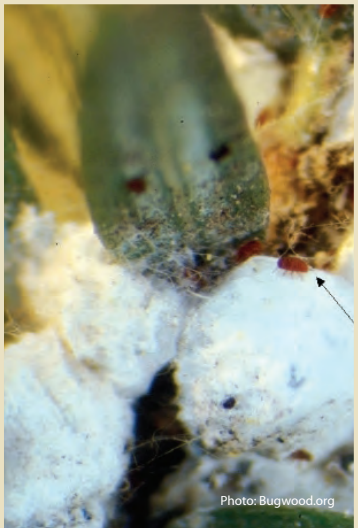


Photo: Bugwood.org


Photo: Jason VanDriesche, Bugwood.org

SPOTTED LANTERNFLY

Lycorma delicatula

DESCRIPTION

Spotted lanternfly (SLF) is an invasive insect from Asia that threatens a wide variety of plants such as hops, grapevine, walnut, fruit trees, maple trees. Its preferred host is an invasive plant called tree of heaven (Ailantus altissima). **Introduction:** SLF was likely introduced to the US as egg masses on a stone shipment from China, India, Vietnam or South Korea. The first infestation was discovered in 2014, in Berks County Pennsylvania and has since spread to PA, DE, MD, NJ, VA & West VA. As of December 2019, there are no known SLF infestations in NY, but presence of the insect has been confirmed in multiple counties within the state and spread potential for this insect is high. **Appearance:** Early stage SLF nymphs are black with white spots, they range in size depending on their life-cycle stage. SLF turn red with white spots just before they transform into winged adults. Adults are 1 inch long and ½ inch wide with greyish colored forewings and red hindwings with black spots, their upper wing portions are dark with white stripes. Adult SLF usually appear in July. In the fall, SLF adults lay egg masses that are an inch long with a smooth brownish gray waxy appearance, as the egg masses age they turn brown and scaly.

THREATS/DAMAGE

SLF adults and nymphs use piercing mouth parts to suck plant sap making their hosts vulnerable to disease and attack from other insects. SLF swarm host plants and feed by the thousands and secrete an unpleasant sticky honeydew that attracts mold that interferes with photosynthesis directly interfering with crop yields. The honeydew also hinders outdoor activities as it gives off a foul odor and attracts swarms of other insects that may sting. **Signs of infestation:** sap oozing or weeping from wounds on host plants that appear wet and may give off a fermented odor. The presence of egg masses that are one-inch-long and appear to be brownish-gray and waxy or are brown and scaly.

CONTROL/MANAGEMENT

The best mode of control for SLF is prevention. SLF easily spreads by hitchhiking to new areas on vehicles, firewood, outdoor furniture, stone etc. Be sure to check your vehicles and gear when traveling from or stopping within known quarantine areas (PA, NY, DE, MD and VA). Monitor tree of heaven populations for signs of SLF.

MANUAL/MECHANICAL

Monitor tree of heaven, young black walnut, wild grapevines and other SLF host plants for signs of infestation. Use a plastic card or putty knife to scrap egg masses into a container filled with rubbing alcohol or hand sanitizer to collect a specimen for confirmation. Banding trees with specifically designed bug bands helps catch nymphs and adult SLF and reduces by-catch. Recent research in PA indicates removal of Tree of heaven increases SLF dispersal, as they seek suitable hosts further away.

If you find SLF, take photos, collect a contained specimen, note the location of the observation and report to www.spottedlanternfly@dec.ny.gov.

CHEMICAL

There are pesticides labeled for specific crops and application restrictions for spotted lanternfly in New York State. For regulations and guidance for controlling spotted lanternfly with pesticides reach out to the NYS Integrated Pest Management out of Cornell University at nysipm@cornell.edu.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

SPOTTED LANTERNFLY

Photo: Emelie Swackhamer, Penn State Extension

Photo: Emelie Swackhamer, Penn State Extension

Photo: Stephen Ausmus USDA-ARS (Public Domain)

Photo: Michigan State University College of Agriculture

Photo: Emelie Swackhamer, Penn State Extension

KUDZU

Pueraria lobata

DESCRIPTION

Appearance: Kudzu is a perennial vine native to Southeast Asia. It has trifoliate leaves composed of three leaflets. Each leaflet is large and ovate with two to three lobes and hair on the underside. Along the vines are nodes, points at which stems or tendrils can propagate to increase support and attach to structures. Kudzu uses stems or tendrils that can extend from any node on the vine to attach to and climb most surfaces.

THREATS/DAMAGE

Kudzu is a highly invasive plant that will grow over anything in its path (other plants, buildings, road signs) and eventually kill other plants it covers because it blocks out sunlight. This allows this plant to dominate native habitats reducing the value of the native habitat. Kudzu has been reported to grow roughly one foot per day once established.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Prevention: Preventing the sale and transport of kudzu is the most cost-effective means by which to prevent infestations from occurring.

CHEMICAL

Materials Application

Glyphosate (5% solution) can be an effective option for small stands growing up poles or fences in residential areas. However, repeat applications will be necessary.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

KUDZU

Photo: David Stephens, Bugwood.org

Photo: James H. Miller & Ted Bodner, Southern Weed Science Society, Bugwood.org

Photo: Daren Mueller, Iowa State University, Bugwood.org

Photo: James H. Miller & Ted Bodner, Southern Weed Science Society, Bugwood.org

MILE-A-MINUTE

Persicaria perfoliata

DESCRIPTION

Appearance: Mile-a-minute weed, or Asiatic tearthumb, is an herbaceous, annual vine. Stems have barbs which are also present on the underside of the leafs. The light green colored leaves are shaped like a triangle and are alternate along the stem. Flowers are small, white and inconspicuous. The fruits are attractive, deep blue and arranged in clusters.

THREATS/DAMAGE

Mile-a-minute grows very rapidly and covers over shrubs and other beneficial vegetation. This blocks the foliage of covered plants from available light, and reducing their ability to photosynthesize, which stresses, weakens and eventually may kill the underlying plants. Large infestations of mile-a-minute may completely dominate native species, altering the native habitat and has the potential to be a problem to nursery and horticulture crops.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Prevention: Preventing the sale and transport of mile-a-minute is the most cost-effective means by which to prevent infestations from occurring

Biological: A biological control program using a small weevil, Rhinoncomimus latipes Korotyaev, has been found to be host-specific to mile-a-minute weed, and field release was approved by USDA-APHIS in 2004. Weevil adults feed on mile-a-minute foliage, and larvae feed within nodes and can suppress growth and reduce seed production.

Manual: Hand pulling of seedlings is best done before the curved barbs on the stem and leaves harden, but may be done afterwards with the help of thick gloves. Long pants and a long-sleeved shirt will help prevent skin abrasion. Manual removal of vines may be conducted throughout the summer but use caution once seeds have developed to prevent spread to new areas.

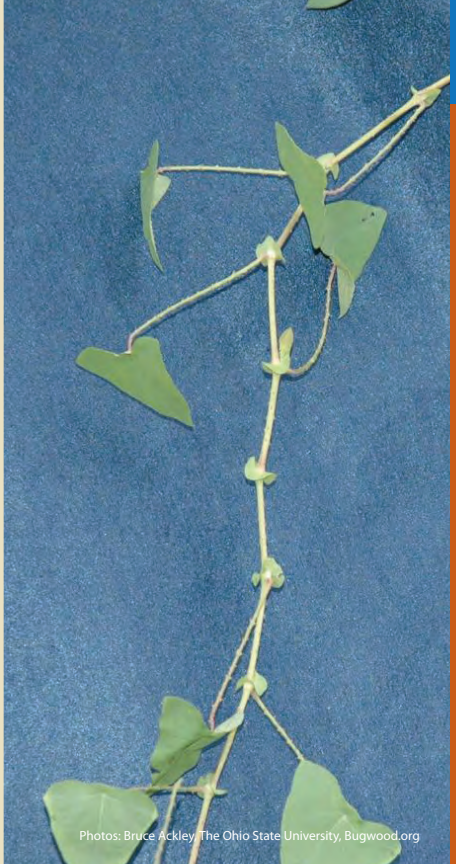
Mechanical: For low growing infestations that cover the ground, repeated mowing of vines may reduce the plants seed reserves.

CHEMICAL

Materials Application

Mile-a-minute is sensitive to moderate rates of widely used herbicides. However, because it can begin setting seed by mid-June, and will grow onto and over desirable vegetation, selective control with herbicides is difficult. Pre and post-emergent herbicides triclopyr (Garlon 3A) and glyphosate (Glyphomate 41), are effective.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.



Photos: Bruce Ackley, The Ohio State University, Bugwood.org

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MILE-A-MINUTE

ORIENTAL BITTERSWEET

Celastrus orbiculatus

DESCRIPTION

Appearance: Deciduous woody perennial vine in the staff-tree family that may reach 66 ft in length. **Stems:** Occasionally branching, twining, and up to 4 in. wide. **Leaves:** Alternate, light green in color (turn yellow in fall), oblong to elliptical shaped (highly variable), 2-5 inches long and 1.4-2.0 inches wide with round, fine toothed margins and a tip that comes to an abrupt sharp point or short taper to a point. **Flowers:** Small greenish yellow flowers with 5 petals that are clustered in leaf axils from May-June. **Fruit:** Occurs from July to October. Starts out green in color then turns yellow late in summer with outer layer splitting into 3 parts revealing bright red fruit inside. **Lookalike:** American bittersweet *(Celastrus scandens)* is native and looks very similar **to** oriental bittersweet. It typically has more elliptical leaves while oriental bittersweet typically has more oval leaves. This difference must be observed with caution since oriental bittersweet leaves are highly variable. The best distinguishing feature is the **flowers/fruits,** which are clustered in the leaf axils on oriental bittersweet and at the end of the branch on American bittersweet. Also, the husks of its fruits are yellow, rather than orange.

THREATS/DAMAGE

Oriental bittersweet invades a great variety of sites including thickets, forests, beaches, roadsides, old fields, and urban areas. It outcompetes trees, shrubs, and other vegetation through climbing and shading. It may also kill trees by girdling them. The seeds are dispersed by water, humans, and animals. Birds and small mammals are attracted to the red inner portion of the fruit and spread the seeds after ingesting. Oriental bittersweet can grow in many different soil types and tolerates a range of soil moistures. It is shade and sun tolerant and can survive and grow slowly in closed canopy forests until sunlight through disturbance becomes available

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Pulling: This method requires the removal of the entire plant including the roots and should be used only for small patches. All climbing vines should be first cut at a comfortable height prior to removal of rooted portion. Damage to host tree should be minimized. Plants bearing fruit should be burned or bagged and disposed of in a landfill. Repeat pulling will likely be required since re-sprouting is likely to occur without chemical treatment.

CHEMICAL

Materials Application

Cut stem treatment: Stems should be cut about 2 in. above the ground and followed immediately by application of 25% glyphosate or triclopyr solution to the cut stem.

Basal bark treatment: Use a string trimmer or hand saw to remove some of the foliage in a band a few feet from the ground. Apply 20% solution of triclopyr ester in commercially available basal oil with a penetrant to vine stems. Avoid getting herbicide on host tree.

Foliar treatment: This method should be used for large patches of oriental bittersweet. Apply either 2% solution of triclopyr ester or triclopyr amine mixed in water with a non-ionic surfactant to the leaves Thoroughly wet the foliage with herbicide, but not to the point of runoff.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

Photos: Bob Stromberg

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ORIENTAL BITTERSWEET

PORCELAIN BERRY

Ampelopsis brevipedunculata

DESCRIPTION

Porcelain berry is an invasive woody vine in the grape family from northeast Asia. **Appearance:** Leaves vary in shape from a simple heart-shaped leaf with coarse teeth, to a deeply loped leaf with ridged edges. **Flowers** are green to white and form in small clusters in mid-summer. Fruit are small berries that can range in color from yellow to purple to blue and appear shiny similar to porcelain – hence the name.

THREATS/DAMAGE

Porcelain berry was introduced to the United States in 1870 as an ornamental. Since its introduction, it has invaded moist soils and forest edges in twelve states in the northeast including New York. With the ability to climb over 15 feet in a growing season, porcelain berry easily creates mats of thick twining vines which smother native vegetation. If established in residential or commercial areas, it is difficult to remove from fences, porches, and buildings and can incur costs for property owners. Porcelain berry is easily spread by birds and other wildlife that eat its berries.

CONTROL/MANAGEMENT

MANUAL/MECHANICAL

Methods

Pulling: Hand pull vines in the fall or spring to prevent flower buds from forming the following season. Beware of removing the roots of desirable plants when hand pulling porcelain berry vines. Stems should be cut close to the ground using pruning shears or a mechanical brush cutter. Stem cutting should be completed before fruiting occurs to avoid building a seed bank. Porcelain berry has an extensive root system that is difficult to eradicate using manual control methods alone.

CHEMICAL

Materials Application

Large vines must be cut near the ground and spot treated with a chemical herbicide such as, triclopyr and glyphosate. Chemical treatment should be completed before fruiting occurs to avoid building a seed bank and are most effective at the end of the growing season when plants are actively transporting nutrients to their root system.

Note: Successful management strategies may require a multi-year effort. Always follow chemical label instructions.

PORCELAIN BERRY

The first three leaves from the left are variations of porcelain berry, the fourth leaf from the left is hops, the far-right leaf is a native grape.

Photo: Megan Pistolese

Photo: Leslie J Mehrhoff_University of CT_Bugwood.org

Photo: Rob Williams

Photo: Megan Pistolese

Photo: Megan Pistolese

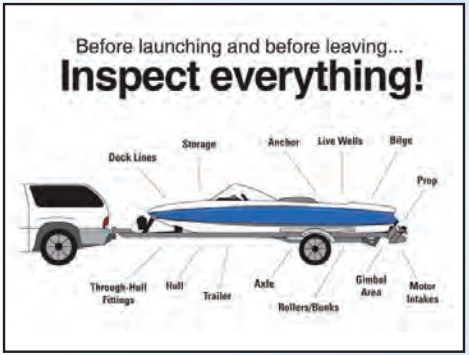
Aquatic nuisance species often travel by hitching a ride on boats, personal watercrafts (PWC), trailers and other equipment used in and around the water. Help stop Aquatic Hitchhikers by following these simple steps every time you leave a waterbody.

In May 2016, statewide regulations known as the Aquatic Invasive Species (AIS) Spread Prevention regulation, or 6 NYCRR Part 576, were adopted that require that "reasonable precautions", such as cleaning, draining and treating, and drying are taken to prevent the spread of aquatic invasive species prior to placing watercraft or floating docks into public waterbodies.

CLEAN: Before launching, inspect and clean anything that has come in contact with the water, including all motorized vessels, canoes/kayaks, trailers, equipment, fishing gear, dogs, boots and waders. Remove aquatic plants (weeds), zebra mussels, other animals, mud, and other debris before leaving an area.

DRAIN: Empty all water from engines, live-wells, bilges and every other potential space or item that can hold water before leaving the area. Dump live bait in the trash or at bait disposal sites and never introduce live fish between bodies of water.

DRY: All equipment for 5 days before using it again. If you need to use it sooner, wash it with VERY HOT water (local car washes are OK; so is a 10% water/chlorine solution before using your equipment in another body of water.



Don't Move Firewood

Forest pests and pathogens pose a major threat to the health of the forest ecosystems and the economy in our region. Movement of firewood and other wood products such as pallets and packing materials can spread harmful pests. Reducing the movement of firewood can significantly reduce the spread of invasive forest pests, like emerald ash borer and Asian longhorned beetle.

In 2009, DEC Regulation law Part 192.5 was passed to enforce Firewood restrictions to protect trees and forests from invasive species. In New York State, it is unlawful to transport untreated firewood more than 50 miles from its source or origin unless it has been heat-treated to 71° C (160° F) for 75 minutes.

- If transporting untreated firewood cut for personal use (i.e. not for sale) you must fill out a Self-Issued Certificate of Origin, downloadable from DEC website.

- If purchased untreated firewood, it must have a receipt or label that identifies the firewood source. **NOTE! Source is sometimes, but not always, the same as where it was purchased.** Consumers need to use the source to determine how far the firewood may be transported.

- If purchasing and transporting heat-treated firewood, it must have a receipt or label that says, "**New York Approved Heat-Treated Firewood/Pest Free**". This is the producers' declaration that the firewood meets New York's heat-treatment requirements. Most "kiln-drying" processes meet the standard, but not all, so it is important to look for the appropriate label. Heat-treated firewood may be moved unrestricted.

For questions regarding the firewood regulation, please email foresthealth@dec.ny.gov or call the DEC's toll-free number at 1-866-640-0652.

DONTMOVEFIREWOOD.org

Site Development and Topsoil Relocation

As land clearing occurs for site development it is often necessary to import topsoil or transport topsoil off-site. Unfortunately the topsoil is rarely examined for the presence of invasive species seeds or plant fragments, each of which can produce new populations in other locations. Topsoil that is relocated from one site to another can be a significant pathway for the spread of invasive species. The following are simple steps site developers can take to reduce the spread of invasive species:

1. In the early stages of site planning, hire a trained professional to scout the site for invasive species, or consider training construction staff to identify common invasive species, record the locations of invasive species.

2. At least 10 days prior to earth moving, and depending on the type of invasive species found, apply the appropriate control method to each species identified. This may include herbicide treatment, manual removal or a controlled burn.

3. Topsoil contaminated with invasive species remnants should be kept separate from topsoil scheduled to be re-used. Only clean topsoil should be moved offsite.

Invasive Species Disposal Methods

Invasive species that are not properly disposed of can live, grow and become relocated to uncontaminated areas. Here is a list of suggested disposal methods by category:

Woody Plants	Herbaceous Plants	Grasses & Sedges	Aquatic Plants	Aquarium Plants/ Fish	Live Bait
Air dry until dead	Air dry until dead	Air dry until dead	Bury on dry land	Return to store	Freeze solid & bury
Bag & compost	Bag & compost	Bag & compost	Bag & compost	Freeze & bury	Bag, trash & landfill dead mtl.
**Take care to bag, tarp, dry, chip or drown plant parts before composting to ensure invasive plants do not take root.*					
Landfill dead material	Bag, compost & landfill	Bag, compost & landfill	Bag, compost & landfill	Freeze & landfill	
Burn or place in brush piles					

GLOSSARY

Alternate – Leaves occur singly on the stem, branch, or twig, with each leaf on the opposite side from the ones above and below it.

Awn – A bristle-shaped appendage found on grass flowers.

Axil – The space between where a leaf or branch attaches to the stem and the stem itself.

Basal bark treatment – A control method where herbicide is applied in a ring around an uncut trunk or stem.

Biennial – A plant the lives for two years, usually flowering and fruiting in the second year.

Compound leaves – Leaves with two or more leaflets attached to a single stalk. Black locust is an example.

Crown – The branches, twigs and leaves that form the top of a tree.

Cut-stump treatment – A control method where herbicide is applied to freshly cut trunks or stems with a hand held sprayer, brush, sponge applicator or contact solution bottle.

Elliptic – Narrow at the ends and broad in the middle.

Foliar spray – A control method where herbicides are applied to green leaves with a hand sprayer, sponge applicator, or wick.

Forb – a herbaceous flowering plant that is not a graminoid (grass, sedge, or rush).

Graminoid – a herbaceous plant with a grass-like morphology, i.e. elongated culms with long, blade-like leaves.

Heartwood – The harder wood found in the center of a trunk or branch.

Herbaceous – Any plant that does not have a woody stem, therefore not a tree or shrub.

Inflorescence – A cluster of flowers growing from a single stalk.

Lance shaped – Narrow at the tip, widest below the middle, and either tapering to a point or rounded at the other end.

Leaflet – The individual blades that make up a compound leaf.

Midrib – The central vein or "rib" in a leaf.

Nodes – The point where a leaf, twig or branch attaches to the stem

Opposite – Leaves are found in pairs on either side of the stem, branch, or twig.

Ovate – Egg-shaped, with the broader end at the base

Palmate venation – A pattern of leaf veins where all main veins originate from a central point at the base of the leaf and radiate out towards the edges like fingers on a hand.

Panicles – Loose, irregular clusters of flowers with pedicels (like small stems) that originate from the same place.

Perennial – A plant that lives for many years.

Pinnate – Leaflets in a compound leaf that are attached on either side of a stalk.

Root suckering – New stems grow from old roots, either as the roots grow away from the original stem or when the old stem has been cut.

Runners – Branches that grow along the ground and put out roots where they touch the soil.

Sapwood – The most recently produced wood in a stem or branch that grows in a ring closest to the bark.

Sepals – The modified leaves that grow at the base of a flower.

Sheathing – Enclosed by a tubular envelope, often where a grass leaf attaches to the stem.

Simple – Leaves that are not compound.

Tasseling – Another word for flowering that refers specifically to grasses.

Toothed – The edge of the leaf is divided into small segments or teeth

Tubular – With the base of the petals joined to form a tube.

Untoothed – The edge of the leaf is smooth with no breaks.

Variegated – Marked, striped, or blotched with some color in addition to the plant's overall color.

Whorled – Multiple leaves are found in a circle around the stem, branch or twig.

INVASIVE SPECIES MANAGEMENT
SAINT LAWRENCE EASTERN LAKE ONTARIO

CONTACT US

SLELO PRISM Office
269 Ouderkirk Rd. Pulaski NY 13142

SLELO PRISM Coordinator: (315) 387-3600 x7725 rwilliams@tnc.org
Education/Outreach Coordinator: (315) 387-3600 x7724 megan.pistolese@tnc.org
Aquatic Restoration and Resiliency Coordinator: (315) 387-3600 x7730 brittney.rogers@tnc.org
Terrestrial Restoration and Resiliency Coordinator: (315) 387-3600 x7723 robert.l.smith@tnc.org

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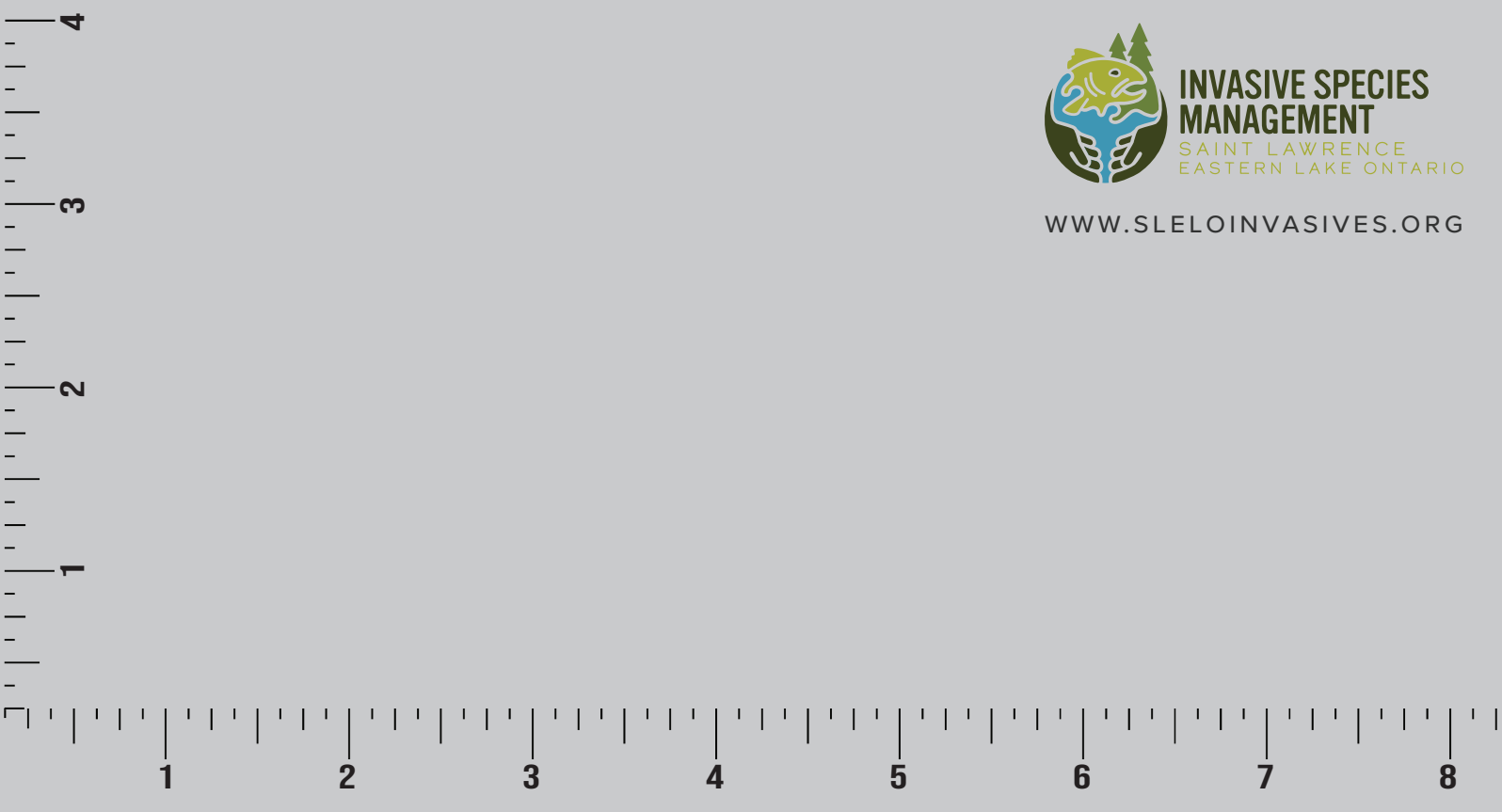
Explore, Observe, Report: Join our invasive Species Volunteer Network, learn to recognize and report invasive species via iMapInvasives.org. Contact 315 387 3600 x7724 to join.

Visit www.imapinvasives.org to learn how to report invasive species online.

To view additional resources please visit www.sleloinvasives.org/invasive-species-handbook-resource (note: site page is being created and is currently set to private)



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