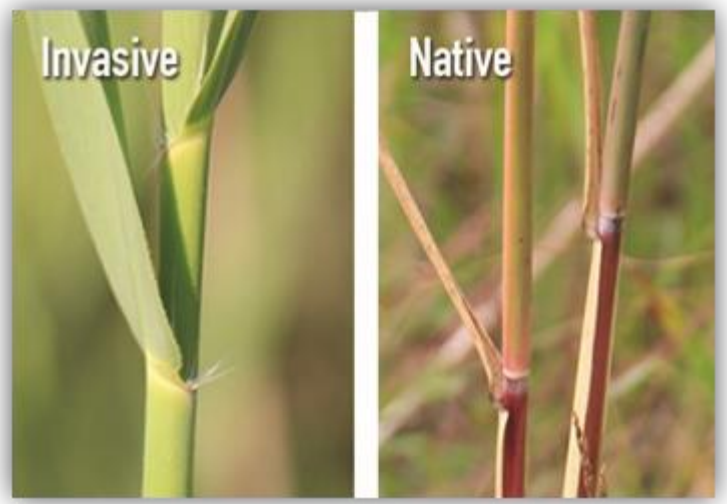
Invasive Plant Management Training

Invasive Species Centre

Common Reed *Phragmites sp.* Identification



Mitt Watershed Council

Invasive	Native
Rough, dull stem	Smooth shiny stem
Blue-green leaf	Yellow-green leaf
Leaf sheaths remain attached, difficult to remove	Leaf sheaths easily removed in fall
Base stem tan coloured in spring/summer	Base stem red coloured in spring/summer
High density	Low density

Caleb Slemmons, National Ecological Observatory Network, Bugwood.org

Rob Routledge, Sault College, Bugwood.org

Common Reed
Phragmites sp.

Impacts

Travis McMahon, MIA Consulting, Bugwood.org

Economic	Social	Ecological
• High maintenance costs on roadways and private property • Fire hazard • Reduced visibility	• Impedes access to natural areas • Cut stocks can post health risk	• Serious losses to plant and animal diversity • Affect all reptiles that are considered SAR

Common Reed *Phragmites sp.* Management

Caleb Slemmons, National Ecological Observatory Network, Bugwood.org

Dry-Land Management

- Herbicide
  - Active ingredients: Glyphosate or Imazapyr
  - **Refer to legislation for requirements on applying herbicide to your project*
- Selective cutting and spading
  - Manually cutting stalks below the soil surface- may be required more than once in a growing season

Wet Land Management

- Flooding
  - During spring to summer
  - Location- areas to control water levels or flood prone areas
- Selective cutting and spading in water
  - Cut close to substrate with a minimum of 30cm water depth
  - Handheld tools or amphibious cutting vehicles

Additional Control

- Cultural control
- Mulching (does not impact root system)
- Prescribed burning (combined with other management techniques)
- Excavating
- Cutting seed heads

Best Management Practices – Ontario Invasive Plant Council

Periwinkle
Vinca minor

Identification

Common ID features:

Flowers	Leaves	Growth form
• 20-30 mm wide • Flowers are purple to white in colouration • 5 petals per flower • Visible in late spring to early summer • White star-shaped silhouette sometimes present in center of flower	• Oblong to ovate shaped leaves • Oppositely arranged • Dark glossy green in colour • Short petiole (leaf stem) • Exude a milky juice when crushed/ broken • Faint white veins present	• Vine-like growth • Trailing stems grow close to the ground • Vines can reach up to 15 cm long

Deena C, Bugwood.org

Invasive Species Centre

Jil Swearingen, USDI National Park Service, Bugwood.org

Periwinkle
Vinca minor

Impacts

Social	Ecological
• Is readily available at local nurseries	• Can aggressively out-compete native ground-layer species • Shallow, trailing roots allow it to escape ornamental gardens and spread to natural forested areas • Grows as a dense ground cover that prevents native tree seedlings from becoming established

Invasive Species Centre

Periwinkle
Vinca minor

Management

Manual Removal

•Cutting plants during active growing season (spring)

•Digging out plants by hand

•Removal of all plant and roots

*can be used as a species for volunteer community pulling events

Invasive Species Centre

Giant hogweed
Heracleum mantegazzianum

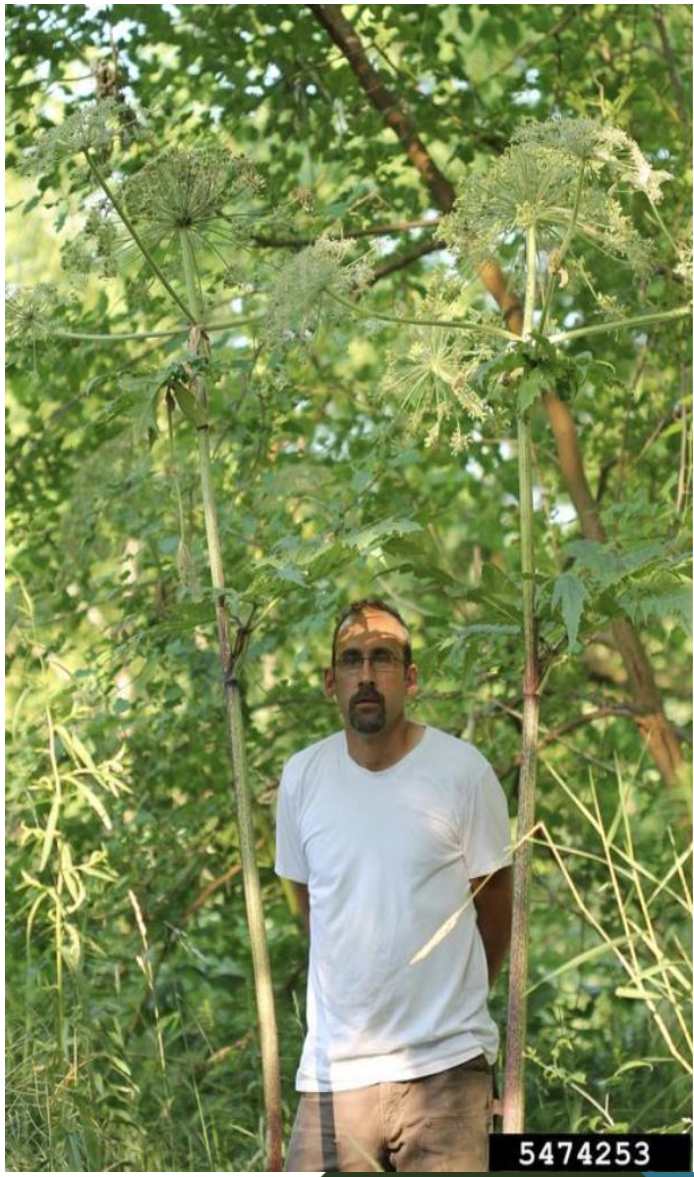
Identification

Common ID features:

Flowers	Growth form
• Flowers appear in early to mid-June • Clustered in white umbel-shaped heads • Can measure up to 1 m in diameter • Each compound umbel can have 50-150 rays (separate stems) which can lead to a single plant producing well over 50,000 flowers	• Under ideal growing conditions, can reach heights up to 5 meters • Heights of 3 - 4.5 meters are most common

Terry English, USDA APHIS PPQ, Bugwood.org

Invasive Species Centre



Rob Routledge, Sault College, Bugwood.org

Giant hogweed
Heracleum mantegazzianum

Identification Continued

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

Common ID features:

Leaves	Stem
• Prominently spiked with a pronounced jagged appearance • Mature plant leaves are divided into three equal parts which are then divided into a further 3 parts (ternate) • Smaller plants may just be deeply lobed • Leaves can grow up to 1 m wide. • Leaf tips come to a sharp point	• Can range from 10-15 cm in diameter • Covered in coarse sharp hairs/prickles • Bright green and often speckled with red/ purple blotches • Stems can be entirely purple

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

Giant hogweed
Heracleum mantegazzianum

Impacts

Economic	Social	Ecological
• Growth in agricultural fields may impacts crop yields	• Contains phototoxic sap which can cause second degree burns with skin contact when exposed to UV light • Can also cause temporary blindness sap is in contact with eyes and exposed to sunlight • May discourage outdoor recreation in areas it is present • Pets are often the ones going blind as they walk through stand	• Shades out native plants • Rapid growth can out compete native plants • Forms dense stands in riparian areas resulting in increased erosion in stream banks, threatening salmon spawning sites

USDA APHIS PPQ - Oxford, North Carolina , USDA APHIS PPQ, Bugwood.org

Invasive Species Centre

Giant hogweed
Heracleum mantegazzianum

Management

Terry English, USDA APHIS PPQ, Bugwood.org

***Proper PPE must be worn when working with this plant**

The best time to remove the plant is in late April or early May.

Mechanical Control

- Handpulling/digging
- Mowing
- Tilling
- Flower removal

Chemical Control

- Systematic herbicide

Disposal

- **DO NOT BURN**
- **DO NOT COMPOST**
- Dispose of plant material in construction grade black (labeled) or clear garbage bags & leave in sunlight to dry out (1 week)

Thomas B. Denholm, New Jersey Department of Agric

Best Management Practices – Ontario Invasive Plant Council

Himalayan balsam *Impatiens glandulifera*

Identification

Leaves	Stem	Growth form
• 6-15 cm long and are widest in the middle • Oblong/egg-shaped with finely serrated margins • Arranged in whorls (usually in threes) • Purple mid-vein	• Stems can be easily snapped or broken • Hollow & square shaped • Green in colour, with tinges of purple and red throughout	• Shallow thin roots • Can reach heights exceeding 2 m

Invasive Species Centre

Invasive Species Centre

Invasive Species Centre

Invasive Species Centre

Himalayan balsam *Impatiens glandulifera*

Identification continued

Common ID features:

Flowers	Seed pods/ capsules
• Light to dark pink • Helmet-shaped • Drooping appearance • 5 irregular petals per flower • Up to 5-10 flowers on each stem.	• Seed pods are light green when young • 3-5 cm long, up to 1.5 cm wide • Contain up to 16 seeds per pod • Seed pods break open and curl when touched dispersing seeds within • Seeds disperse up to 5 m away from parent plant

Invasive Species Centre

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

Himalayan balsam
Impatiens glandulifera

Impacts

Invasive Species Centre

Economic	Social	Ecological
• Can be costly to remove large amounts of material	• Can completely take over an area, including walking trails • Spread commonly by people through improper dumping and yard clippings	• Replaces native plants along riparian areas • Shallow root system increases erosion, impacting water quality • Produces a lot of nectar, pulls pollinators from other native species

Himalayan balsam *Impatiens glandulifera*

Management

Mechanical Control

- Hand pulling plants before seed sets (flowered)
- Removing entire plant from shallow root when soil is soft
- Dispose plants in sealed black garbage bags, in direct sunlight for 1-3 weeks
- Larger stands may be mowed with repeated maintenance - essential to get below first node to ensure no regrowth

*herbicide may be used per permit approval (consideration on herbicide treatment around riparian areas)

Invasive Species Centre

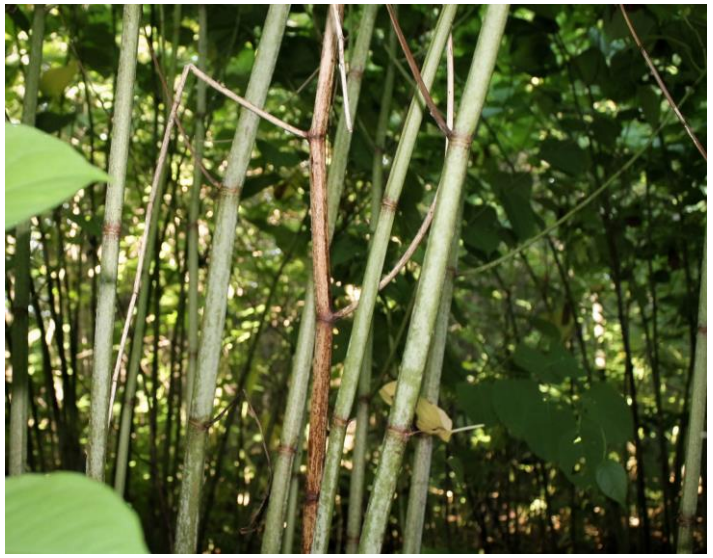
Japanese knotweed
Fallopia japonic

Identification

Common ID features:

Stems	Growth form
• Height 1-3 m • Hollow & bamboo-like in appearance	• New stems appear red to purplish • Turning green with purple specks as they mature • Grows rapidly in large bamboo-like clumps

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



Invasive Species Centre

Emma Erler, University of New Hampshire, Bugwood.org

Japanese knotweed
Fallopia japonic

Identification Continued

Common ID features:

Leaves	Flowers
• Alternate 10-17 cm long, 1-10 cm wide • Oval to heart shaped with a flat base with pointed tip	• Flowers are greenish-white • Flowers cluster upright along the stem • Flower clusters are longer than closest leaves • Fruits are small and winged which helps wind dispersal

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

Jan Samanek, Phytosanitary Administration, Bugwood.org

Invasive Species Centre

Japanese knotweed

Fallopia japonic

Impacts

Invasive Species Centre

Economic	Social	Ecological
• Very expensive to control • Can break through concrete, damaging infrastructure, costing homeowners and reducing property values	• Can take over an area, including public parks/ trails	• Outcompetes native species • Reproduces via rhizomes (only 1 cm fragment needed) • 2/3 of its biomass is underground • Degrades wildlife habitats

Japanese knotweed
Fallopia japonica

Management

Mechanical Control

Mowing or cutting

- Stems once a month throughout growing season
- Combination with other control methods

Tarping plants

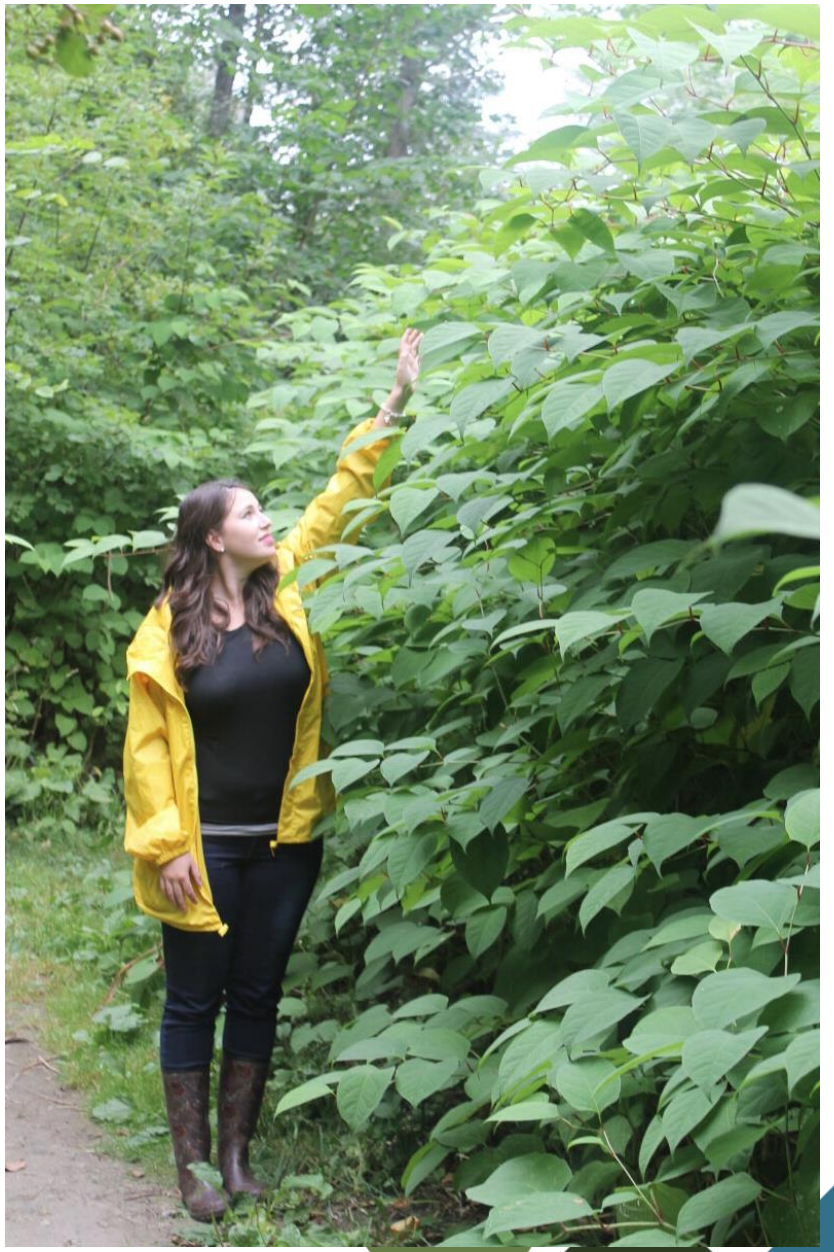
- Late spring and continue through season
- Covering population with dark material to block sunlight, “cooks” the root system
- Re-plant when area is cleared to prevent resprouting

Chemical Control

Herbicide

- Following label directions
- Needs multiple application

BMP is being updated based on emerging research.



Invasive Species Centre

Best Management Practices- Ontario Invasive Plant Council

Common buckthorn
Rhamnus cathartica

Identification

Common ID features:

Berries	Leaves	Flowers
• Black fruits are produced on the female trees and are found in dense clusters in the leaf axils (where the leaf attaches to the stem) • Appear in July and August • Each fruit contains 3-4 seeds and has deep narrow grooves on the back. • Fruits remain well into winter	• Dark green & smooth to the touch • Oppositely to sub oppositely arranged • 3-5 strongly curved veins arching toward the tip of the leaf • Finely serrated leaf margins	• Pale green/ yellow • Four-petals per flower • 6 mm across and appear in early June on short threadlike stalks.

Paul Wray, Iowa State University, Bugwood.org

Invasive Species Centre

Invasive Species Centre

Common buckthorn
Rhamnus cathartica

Identification Continued

Growth	Bark
• Ranges in size from a shrub to small tree • Can reach heights of up to 6 - 7 meters tall • Older specimens can have trunks up to 25 cm in diameter	• The cambium layer (directly under the bark) is bright orange. • Bark is dark greyish brown in colouration with distinct small lenticels (small circular or elongated scars) scattered throughout the trunk and branches. • Younger bark will appear smoother and shinier, while older bark develops a roughened texture as it matures.

Richard Webb, Bugwood.org

Chris Evans, University of Illinois, Bugwood.org

Common buckthorn
Rhamnus cathartica

Impacts

Economic	Social	Ecological
• Outcompeting forest regeneration • Creates even-aged stands	• Encroaching on established trails • Reducing aesthetic value by reducing wildflowers • Openings left by the loss of ash trees are being taken over by buckthorn • Hazardous due to terminal thorns	• Berries are purgative • Outcompetes forest regeneration and vegetation • Allelopathic • Spreads quickly

Invasive Species Centre

Common buckthorn *Rhamnus cathartica*

Management

Chris Evans, University of Illinois, Bugwood.org

Mechanical Control

Hand pulling

- When soil is soft (fall/ early winter)
- Removing entire root (re-sprouting occurs)
- Weed wrench tool for plants up to 5cm in diameter

Cutting

- Causes sprouting (other management required)
- Cut stump without herbicide, place bag to cover over stumps

Girdling

Larger plants that cannot be pulled

- Girdle down to the Cambrian layer
- Band should be 3 inches wide

*girdling will cause resprouting

Disposal at municipal compost, pile branches before they dry and ensure no seeds are present

*ensure there are no seed present if disposing at compost

Chemical Control

Herbicide application

- Following label instructions
- Cut stump method late to early spring

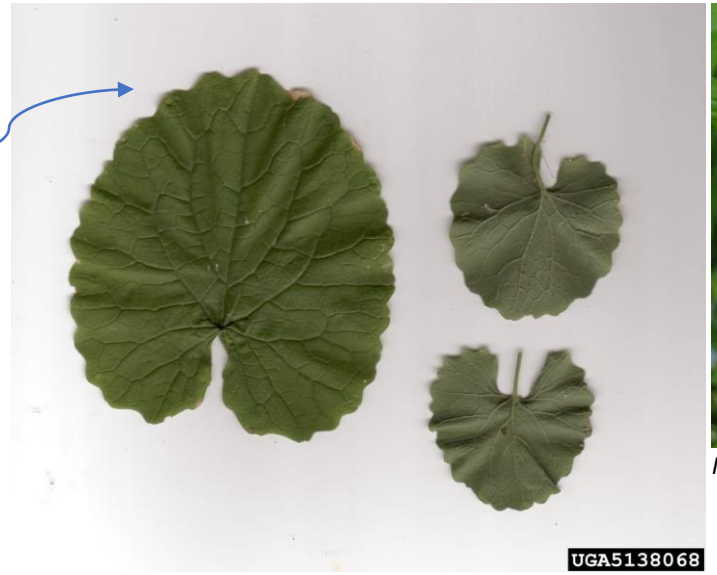
[Best Management Practices in Ontario- Ontario Invasive Plant Council]

Garlic mustard

Alliara petiolata

Identification

First Year Leaf



Lynn Sosnoskie, University of Georgia, Bugwood.org

Invasive Species Centre

Growth	Flowers	Leaves
• "S" shaped taproot	• 4 white petals, 2nd yr flowering stalk • Flowers in early May	• 3-4 leaves per rosette • Dark green kidney shape • Scalloped margins, deep veins • Appear alternate on stem 2nd year growth • Smells like garlic when crushed

Invasive Species Centre

Second Year Leaf (seed Producing plant)

David Cappaert, Bugwood.org

Garlic mustard
Alliara petiolata

Impacts

Economic	Ecological
• Long-term management plans are required to control populations • Stands can double in size every four years	• Outcompetes and inhibits the growth of native species, including species at risk like American ginseng • Allelopathic • Thrives in wide variety of conditions, including forest understory • Not a valuable food source for animals

Steven Katovich, Bugwood.org

Garlic mustard

Alliara petiolate

Management

Manual Removal

- Hand pulling
  - Plants can be hand pulled- remove the whole “S” shaped taproot
  - Focus your control efforts on the second year (seed-producing) plants, removing these prevents further seed dispersal
  - Start with outlying populations and work your way in, this will prevent edge expansion

Connie Gray, GA-EPPC, Bugwood.org

*Remove before seeds drop: mid-May to early June

*Do not compost, place is construction grade garbage bags sealed tightly, and place in direct sunlight for 1 week.

*Ideal plant for a community invasive species pull

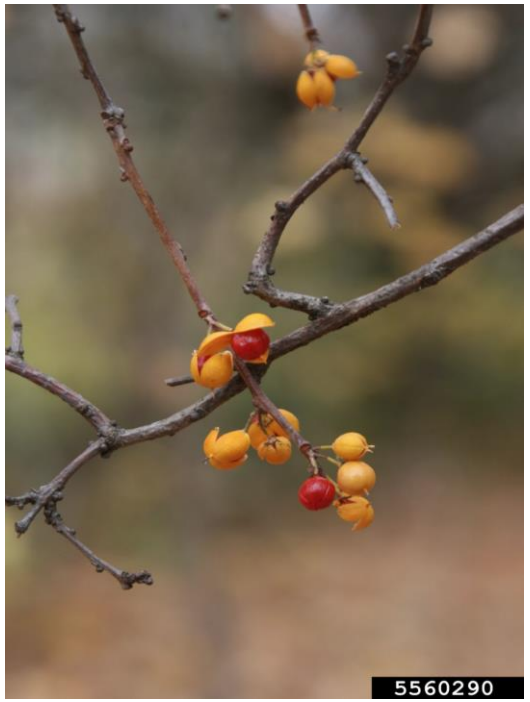
Oriental bittersweet
Celastrus orbiculatus

Identification

Growth	Bark
• Young stem looks bright green and grows to have red-brown bark • Leaves are round with toothed edge • Alternates leave along stem • Yellow fruit appear in late summer and splits with red center on the fall	• Bark has cracked fish netted texture • Smooth stems climb by winding around host plants

Chris Evans, University of Illinois, Bugwood.org

Chris Evans, University of Illinois, Bugwood.org



Chris Evans, University of Illinois, Bugwood.org

Chris Evans, University of Illinois, Bugwood.org

Oriental bittersweet *Celastrus orbiculatus*

Impacts

Ecological	Social
• Grows rapidly and shades out native vegetation • Weaken mature trees with weight of woody vines • Displaces native plants by stealing space, light, water and other crucial resources •Girdles trees which can “cut” off flow of water and nutrients	• Trees that are covered with Oriental bittersweet are susceptible to damage in ice, snow and windstorms, due to the added weight, creating a hazard to human health

David L. Clement, University of Maryland, Bugwood.org

Oriental bittersweet
Celastrus orbiculatus

Management

Mechanical Control
Cutting – consistent cutting or mowing vines if done often throughout the growing season, may eventually deplete the plant's energy reserves.

Hand pulling - Manage seedlings and small populations by hand pulling or digging. Monitor sites where it has been observed and removed for possible regrowth.

• Be cautious when moving soil in areas where Oriental bittersweet is present. Root fragments can resprout and become a new plant.

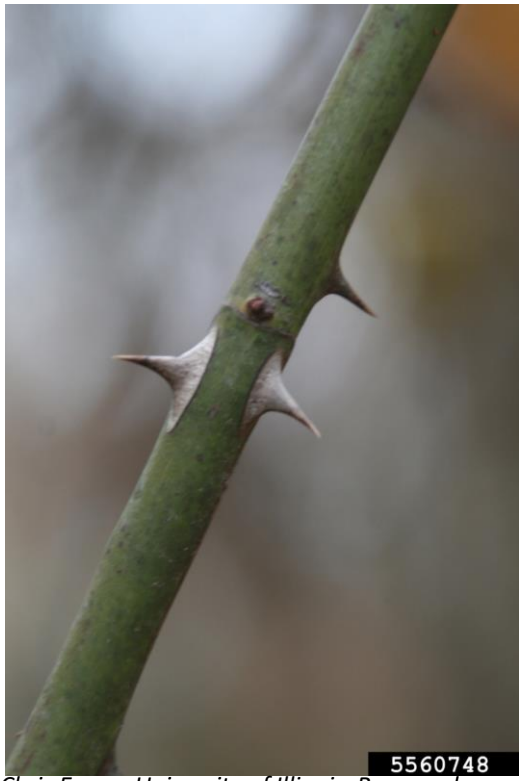
Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Multiflora rose *Rosa multiflora* Identification

Leaves	Flowers	Fruit
• Alternate; pinnately compound • 5-11 leaflets with serrated edges • Green and smooth on surface, paler with short hairs on underside	• Clusters of white/pink flowers • Blooms May-June	• Oval, bright red and fleshy • <6mm diameter • Fruits Aug-winter

Rob Routledge, Sault College, Bugwood.org

Chris Evans, University of Illinois, Bugwood.org



Chris Evans, University of Illinois, Bugwood.org

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

Multiflora rose

Rosa multiflora

Impacts

Richard Gardner, Bugwood.org

John M. Randall, The Nature Conservancy, Bugwood.org

Economic	Social	Ecological
• Thickets can invade agricultural fields • Reduce grazing areas • Degrade forage quality	• Can invade and restrict recreational areas with thickets	• Grows rapidly once established • Invades native plant communities • Thickets shade out native species for light and nutrients

Multiflora rose
Rosa multiflora

Management

Nancy Dagley, USDI National Park Service, Bugwood.org

Mechanical Control

Hand pulling

- Seedlings
- Digging out the root

Hand cutting

- Pruning back thickets to allow other plants to grow (continued maintenance)
- Early spring or summer followed by another cut in the fall

Mulching

- Before leaf-out (winter/early spring)

Chemical (not during bird nesting season)

- Foliar – when leaves are fully opened (July- mid Sept)
- Cut Stump/Stem - during dormant season, cut stem as close to the ground as possible
- Basal bark- dry conditions, apply all around stem

Disposal in municipal compost

* Proper PPE must be worn when working with this plant

[Best Management Practice- Ontario Invasive Plant Council]

Yellow iris
Iris pseudacorus

Identification

Flowers	Leaves	Seed pods
• Irregular yellow flowers • 3 large drooping sepals with purple veins & brown spots at the base • 3 smaller erect petals • 2-3 flowers per stalk • Flowers May-July	• Blue-green in colour • Sword-shaped & flattened in a “V” as they emerge • Emerge from base of plant • Pink rhizomes	• Glossy green, oblong capsules • Seeds are “puck” shaped

Nancy Loewenstein, Auburn University, Bugwood.org

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

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

John Ruter, University of Georgia, Bugwood.org

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

Yellow iris
Iris pseudacorus

Impacts

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

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

Economic	Social	Ecological
• Mats may clog irrigation systems and storm management ponds • Decreases recreational areas in areas of infestation	• Toxic to humans and animals if ingested • Plant sap can cause skin irritation	• Forms dense mats to shade out native vegetation

Yellow iris
Iris pseudacorus

Management

Mechanical Control

Hand pulling & digging

- April-June
- Several times throughout growing season
- Wear gloves pulling entire rhizome
- Use sharp spade & remove entire rhizome

Selective cutting in water

- April-June
- Remove leaves and cut stem below waterline, submerge all stems in 10cm of water

Remove seed pods

- Wear gloves & use clippers to sever seed pods
- Dispose in garbage bags

Benthic barriers

- Once a year to be placed over several growing seasons
- Cut plant down to base
- Place heavy PVC barrier (dig trench & push liner into sediment)

Disposal should be removed from site & placed into garbage bags in the sun for 2-3 weeks

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

[Best Management Practices – Ontario Invasive Plant Council]