

Maine's Top 10 Most Invasive Plant Species: Spread and Management

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DEPARTMENT OF
Agriculture, Conservation & Forestry

Introduction

- Invasion Dynamics
- iMap Invasives
- 10 Most Documented Invasive Plants
 - Spread
 - Control
- Disposal
- Management Priorities
- Resources



(www.financialtimes.com)



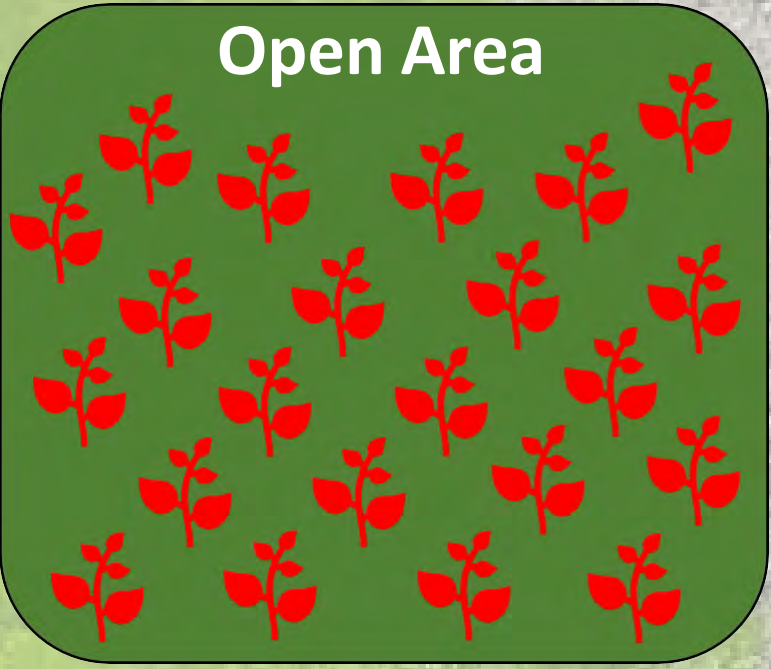
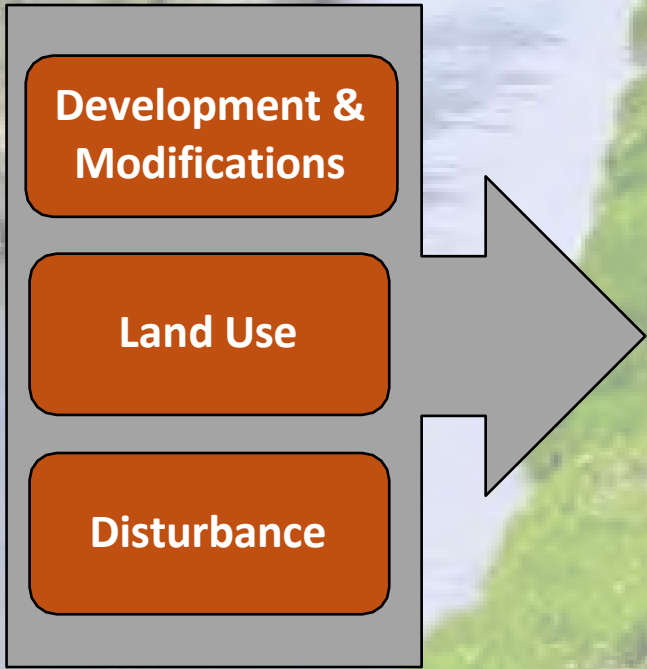
(www.illinoisiam.blogspot.com)

Invasion Dynamics

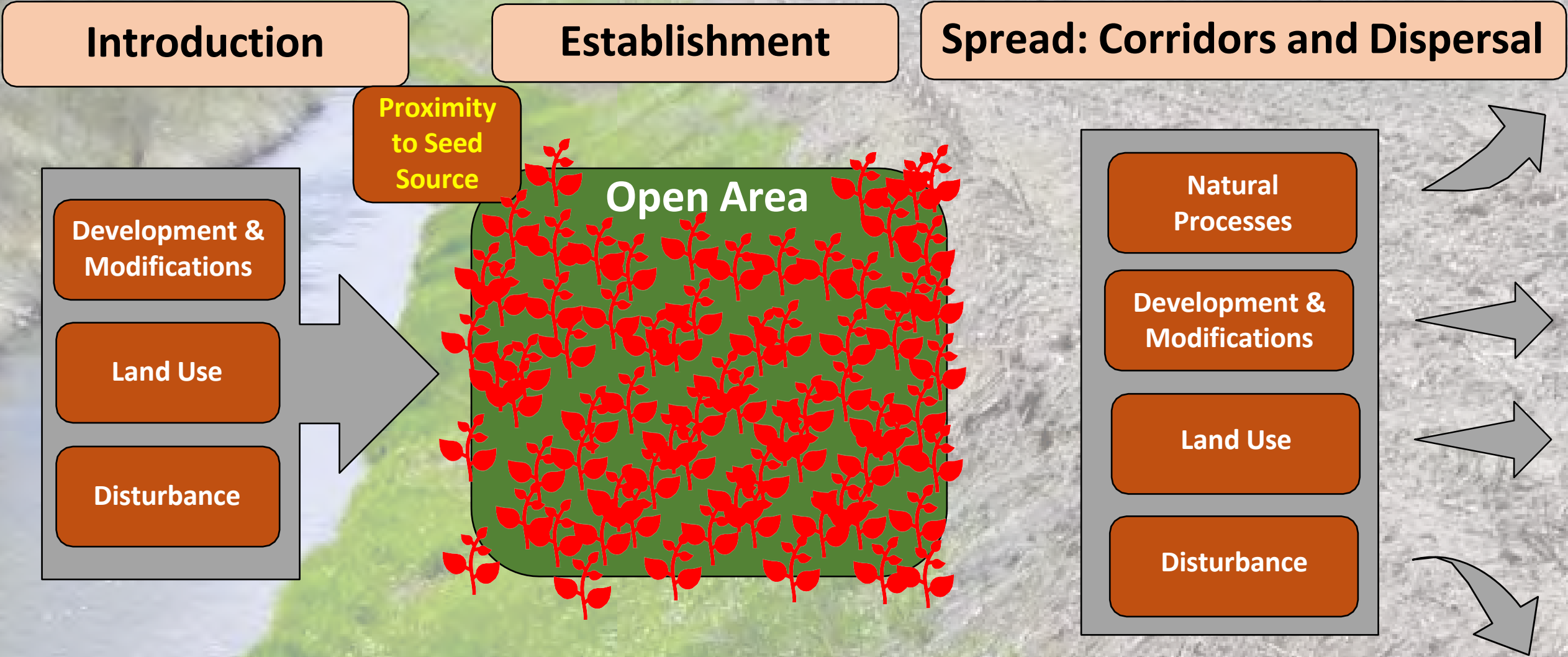
Introduction

Establishment

Spread: Corridors and Dispersal

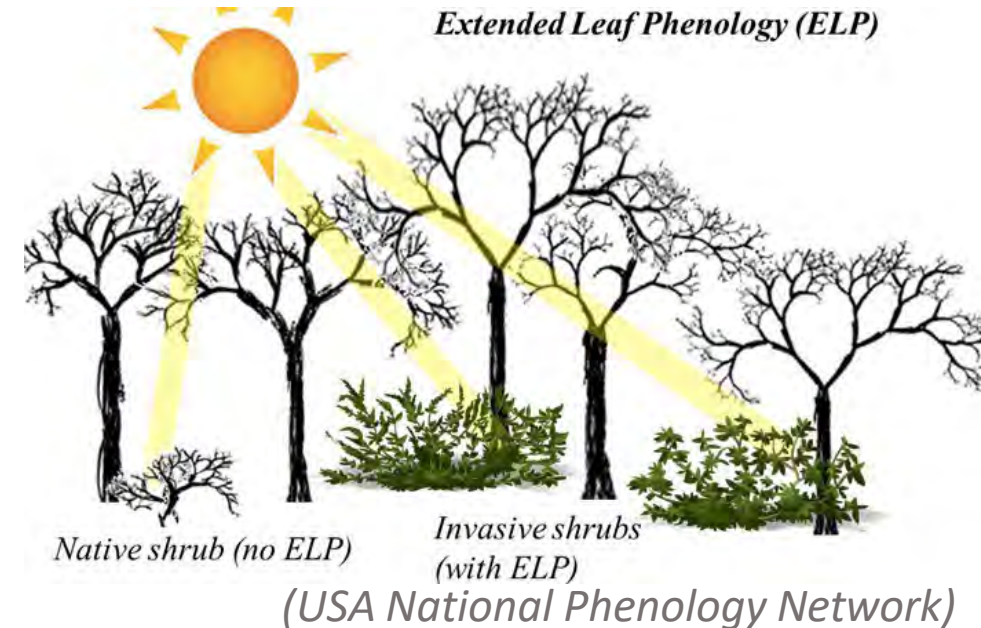


Invasion Dynamics



Dense Stands Outcompete Native Species

- Enemy release
 - No need for defense = better competitors
- More efficient resource use
- Differential timing of resource use
- Habitat alterations
 - E.g., Allelopathy
- **Aggressive growth of biomass & root structures**
 - Monocultures
- **Extended leaf phenology (ELP)**





iMapInvasives is an online mapping tool for landowners, citizen scientists, and natural resource professionals. It's free, it's simple to use, and it can help you keep track of what species are in your area or under management on your property. Your entries also help scientists understand invasive species distributions.

For more information, visit the iMapInvasives website.

imapinvasives.org



- iMap Invasives Mobile App & Survey 123 Mobile App
 - No connection necessary!

• YouTube



24,647 total records since 2014
~70 total species

Common Name	Scientific Name	# Observations	Percent (%)
Honeysuckle Shrub (species unknown)	<i>Lonicera spp.</i>	4737	19
Asiatic Bittersweet	<i>Celastrus orbiculata</i>	3683	15
Multiflora Rose	<i>Rosa multiflora</i>	3474	14
Japanese Barberry	<i>Berberis thunbergii</i>	2708	11
Glossy False Buckthorn	<i>Frangula alnus</i>	1379	6
Common Buckthorn	<i>Rhamnus cathartica</i>	1198	5
Japanese Knotweed	<i>Fallopia japonica</i>	1150	5
Autumn Olive	<i>Elaeagnus umbellata</i>	982	4
Norway Maple	<i>Acer platanoides</i>	708	3
Purple Loosestrife	<i>Lythrum salicaria</i>	575	2
	Total	20594	84

Morrows Honeysuckle & other Shrub Honeysuckle

*(Lonicera
morrowii;
tatarica; x
bella)*

Reproduction & Spread

Prolific sexual and vegetative reproduction

- Monoecious
- Red or orange round berries

Seed/fruits – present mid summer to winter

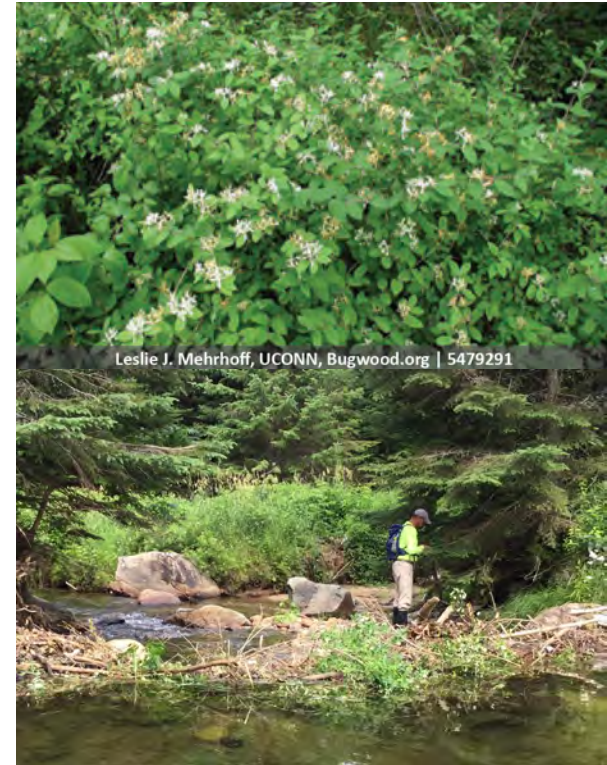
- Birds and mammals
- Water/flooding
- Beavers!

Can reproduce vegetatively

- Root collar only

Noteworthy Characteristics for Management

- *Cannot sprout from root fragments!*
- *Can re-root*
- *Prolific stump-sprouter!*
- *Extended leaf phenology (ELP)*



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Morrows Honeysuckle & other Shrub Honeysuckle

(*Lonicera
morrowii*;
tatarica; *x
bella*)

Control

Seedlings/small plants:

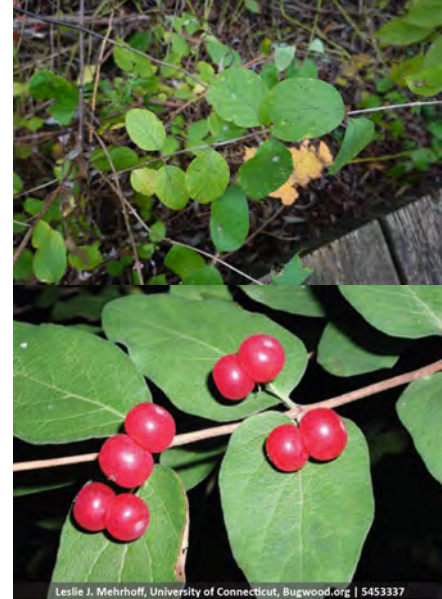
- **Hand-Pulling**
 - Roots in the air!
 - Proper ID
- **Constant mowing**
 - 6x/year for 3 years
 - Prohibits establishment/no seeds
 - Non-selective

Medium Plants:

- Cut roots and pull-out plant
 - Shallow roots
 - Root collar vs. root fragments
 - Honeysuckle popper/Weed Wrench

Large plants:

- Cut off aboveground crown
 - Monitor for resprouting - it will resprout!
 - Cut/treat shoots



Morrows Honeysuckle & other Shrub Honeysuckle

*(Lonicera
morrowii;
tatarica; x
bella)*

Control (Cont.)

Solarization

- Solarize with thick black bag
 - After cutting crown.....
 - 6" stump
 - Buckthorn baggie
 - Inspect for damage
 - Inspect for sprouts
 - Entire/multiple growing season(s)
 - www.buckthornbaggie.com

Fire

- Burn with a torch for several minutes
- Prescribed burn
 - Will resprout
 - Treat Sprouts
 - Monitor area



Morrows Honeysuckle & other Shrub Honeysuckle

*(Lonicera
morrowii;
tatarica; x
bella)*

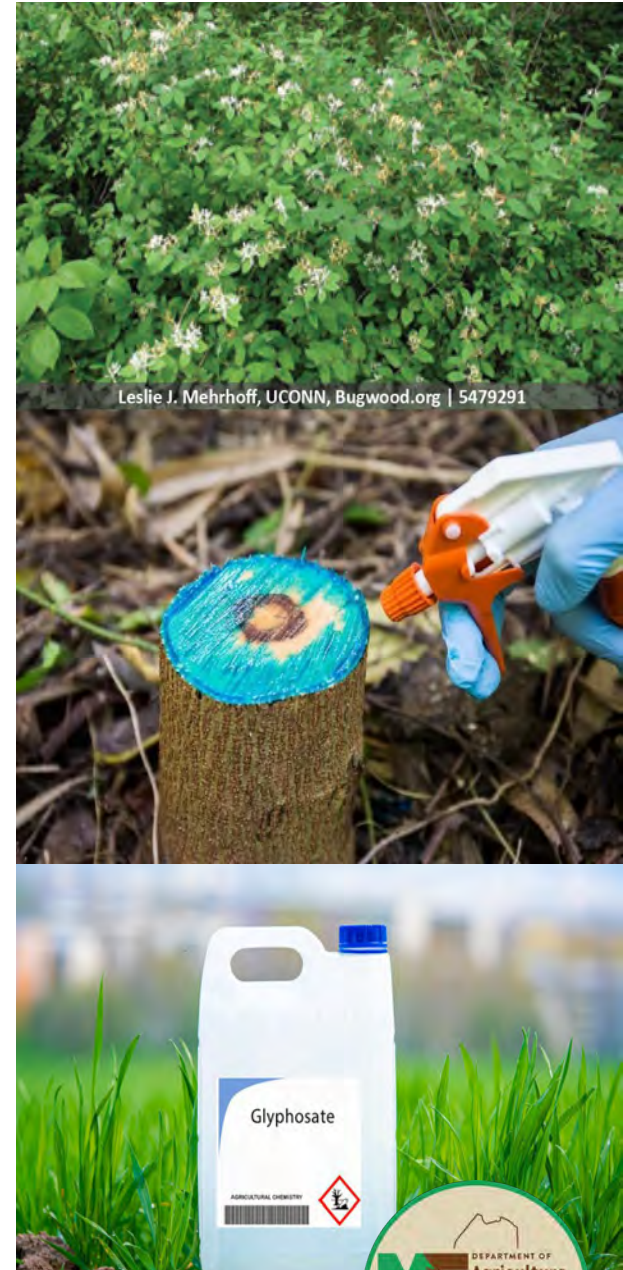
Herbicide Control

Cut-Stump Method

- Targeted application
 - Less chemicals
 - Less non-target damage
- Immediately apply to cut-stump
 - Glyphosate solution
 - Sponge/brush/low-pressure sprayer
- Conduct in Fall
 - Better translocation to roots

Foliar Spray

- Spring or fall is best
 - ELP
 - Less not-target damage
 - Reduce overspray and/or drip



Multiflora Rose

(*Rosa multiflora*)

Reproduction & Spread

Prolific sexual and vegetative reproduction

- High seed production and viability
 - Up to 500,000 per plant (*Munger 2002*)
- Monoecious
- Present late summer throughout winter
- Birds and mammals eat fruits and disperse seeds

Noteworthy Characteristics for Management

- Early detection and rapid response is important!
 - Slow —————> fast
- Rooting from twig tips
 - “layering”
- Root fragments can sprout
- Extreme Extended leaf phenology



Multiflora Rose

(Rosa multiflora)

Control

Seedlings and Small Plants:

- **Hand-Pulling**
 - Gloves
 - Moist soil
 - Roots can sprout!
 - Stems can root (layering)
- **Constant mowing-Grazing**
 - 6x/year for 3 years
 - No establishment/no seeds
 - Non-selective

Medium Plants:

- Honeysuckle popper/Weed Wrench
- Shallow roots
- Root collar and roots!

Large plants:

- Cut off aboveground crown
 - Monitor for resprouting (*it will resprout!*)
 - Cut/treat shoots



Multiflora Rose

(Rosa multiflora)

Control (Cont.)

Fire

- Cut & Torch Root Crown & Stems
- Prescribed burn
 - Will resprout
 - Treat Sprouts
 - Monitor area

Herbicide Control: Glyphosate

Cut-Stump Method

- Immediately spray the cut-stumps
 - Fall
- Sponge/Brush/low-pressure sprayer

Foliar Spray

- Often follow-up after cutting
- Spring or fall is best
 - ELP
- Reduce overspray and/or drip

Basal Bark Application: Less effective, many small stems

Solarization: Less effective, bag damage



Asiatic Bittersweet

*(Celastrus
orbiculatus)*

Reproduction & Spread

Sexual and Vegetative reproduction

- Seed/fruits late summer throughout winter
- Dioecious- only females produce fruit
- Birds and mammals eat fruits and disperse seeds
- Can reproduce from root collar and roots!
 - Stump Sprouts
 - Root Suckers

Noteworthy Characteristics for Management

- Root fragments can sprout and regenerate
- New shoots from extensive underground root system
- Stump sprouting can occur
- Seeds viable for only 1-2 years



Leslie J. Mohrhoff, UCO



Asiatic Bittersweet

*(Celastrus
orbiculatus)*

Control

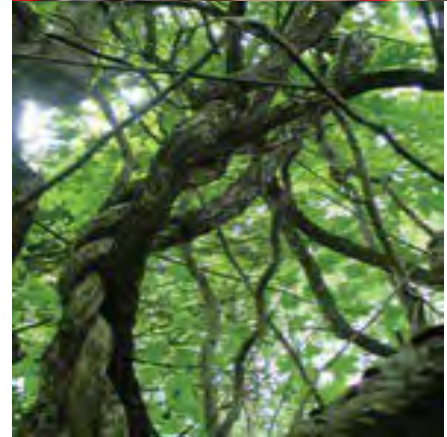
Seedlings and small plants:

Hand-pulling when soil is moist

- Root-suckers
- Root fragments

Constant mowing

- 6x/year for 3 years
- Will prevent seedlings from establishing
 - May promote germination of seed bank
- Only works on small plants/populations
- Makes large populations angry
 - Root suckers will expand area!
- Non-selective
 - Damages native plants



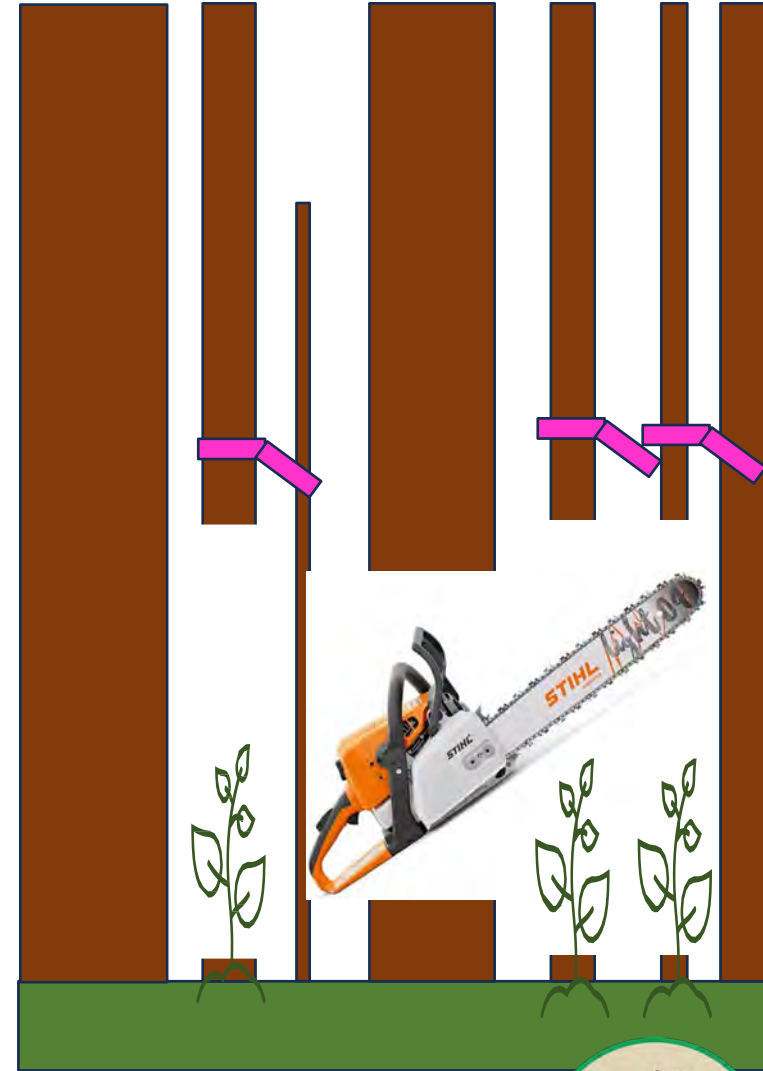
Asiatic Bittersweet

(Celastrus orbiculatus)

Control

Medium & Large plants:

- Cut vines & treat regrowth!
 - Window-cut
 - Monitor for resprouting (it will resprout!)
 - Cut new shoots for several years
 - 6x/year for 3 years
- Vines can be left in tree canopy to die
 - Don't Pull!
- Cutting only is not an effective means
 - Will resprout
- Solarizing doesn't work
 - Root-suckers



Asiatic Bittersweet

*(Celastrus
orbiculatus)*

Herbicide Control

- Triclopyr > Glyphosate; or a mix of both

Foliar Spray

- Cut vines – treat sprouts
 - Cut vines mid-summer
 - Spray following summer
 - More manageable shoots
 - Late in growing season but before flowering

Cut-Stump Method

- Immediately apply to the cut-stump - Fall
 - Sponge/brush/low-pressure sprayer

Basal Bark

- Treat lower 12-15” of stem with Triclopyr and horticultural bark oil and dye solution

Hack-n-Squirt

- 1” apart
- Small cups
- **Do not girdle**



Japanese Barberry

*(Berberis
thunbergii)*

Reproduction & Spread

Sexual and vegetative reproduction

- Rooting from twig tips “layering”
- Sprouts vigorously from root collar
- Root fragments can sprout
- New shoots from extensive underground root system
 - Root suckers

Seed/fruits late summer throughout winter

- High seed production
- Birds and mammals eat fruits and disperse seeds
- Seeds viable in soil for 1-5 years

Noteworthy Characteristics for Management

- High Extended leaf phenology
- Shallow fibrous roots up to 3x greater biomass than natives
 - Outcomplete and spread
 - Hard to remove
- Highly defended against predation



Japanese Barberry

(*Berberis
thunbergii*)

Control

Seedlings and small plants:

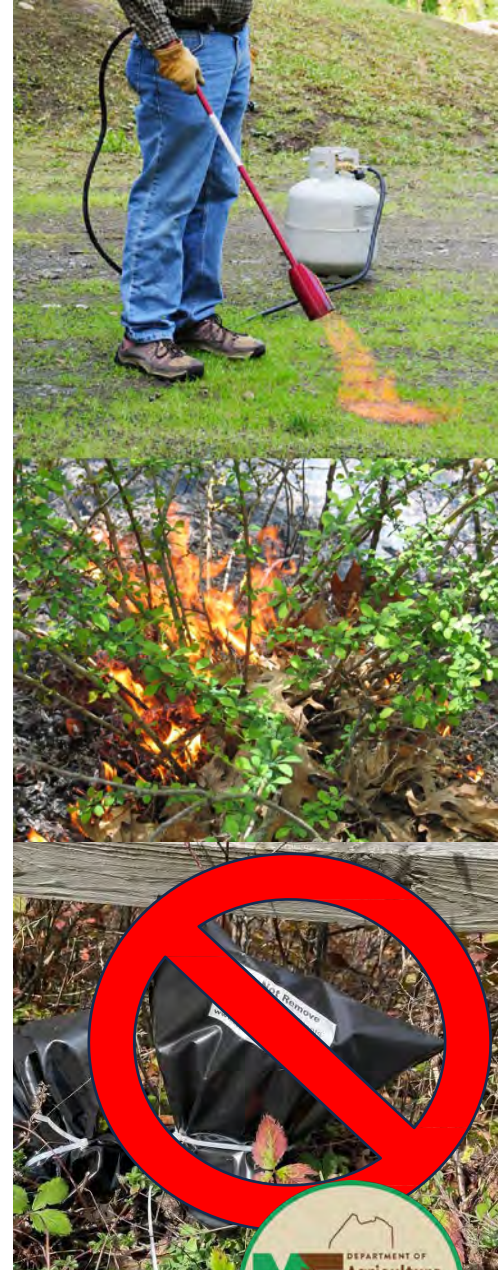
- Hand-Pulling when soil is moist
- Constant mowing throughout growing season
 - Limits seed production

Large plants:

- Cut off aboveground crown
 - Monitor for resprouting (it will resprout!)
 - Cut new shoots for several years

Fire

- Burn with a torch for several minutes 2x during growing season
- Prescribed burn
 - Will resprout
 - Treat sprouts
 - Monitor area



Japanese Barberry

*(Berberis
thunbergii)*

Herbicide Control: Glyphosate is most effective

Cut-Stump Method

- Cut late in growing season to 1" above ground
- Immediately brush or sponge the cut-stump
- Brush/sponge applicator or sprayer

Cut-Stump/Treat Sprouts Method

- Cut in growing season 1" above ground
- Let it sprout
- Cut sprouts & treat with glyphosate
 - within 5 min
 - Fall

Foliar Spray

- Spring or late fall when native trees, shrubs, and wildflowers are dormant
- Barberry still has green foliage (ELP)



Common & Glossy Buckthorn

(*Rhamnus cathartica*
&
Frangula alnus)

Reproduction & Spread

Prolific sexual and vegetative reproduction

- Seed/fruits – present mid summer throughout winter
- Common: Dioecious
- Glossy: Monoecious
- Seeds viable for 2-4 years
- Birds, mammals and water
 - Appealing to birds and mammals
- Vegetatively – stump sprouting

Noteworthy Characteristics for Management

- Can re-root
- Prolific seeds and sprouting
- Can sprout from large root fragments



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Common & Glossy Buckthorn

(*Rhamnus cathartica*
&
Frangula alnus)

Control

Seedlings and small plants:

- Hand-Pulling when soil is moist
- Constant mowing throughout growing season

Medium Plants:

- Honeysuckle popper
- Weed Wrench

Large plants:

- Cut off aboveground crown or Girdle
 - Monitor for resprouting (it will resprout!)
 - Cut new shoots for several years
- Buckthorn Baggie
 - Entire/multiple growing seasons



Common & Glossy Buckthorn

(*Rhamnus cathartica*
&
Frangula alnus)

Fire

- Burn root collar/crown with a torch
- Prescribed burn
 - Spring and fall
 - May encourage resprouting

Herbicide Control: Glyphosate & Triclopyr are most effective

Cut-Stump Method

- Immediately spray the cut-stump
- Close to the ground as possible
- Conduct in Fall
- Sponge/brush applicator or low-pressure sprayer

Foliar Spray

- Cut/Girdle stem and treat sprouts
- Spring or fall is best

Basal Bark Application (Triclopyr)



Japanese Knotweed

(Fallopia japonica)

Reproduction & Spread

Prolific Sexual and vegetative reproduction

- Small winged seeds disperse long distances
 - wind and water
- Stem fragments can resprout at nodes
 - roots and shoots
- Construction/Earth-moving activities
- Cutting/Mowing

Noteworthy Characteristics for Management

- Allelopathic
- Stem, root, rhizome fragments can all sprout
- Rhizome fragments dormant for many years
- Removal of aboveground stems expands the population



Japanese Knotweed

(Fallopia japonica)

Mechanical Control:

Cutting Small Plants and Patches

- Repeatedly cut for several years
 - Stimulates dormant buds on rhizome system
 - Expands further and extends the limit of population
 - Fragments can re-sprout

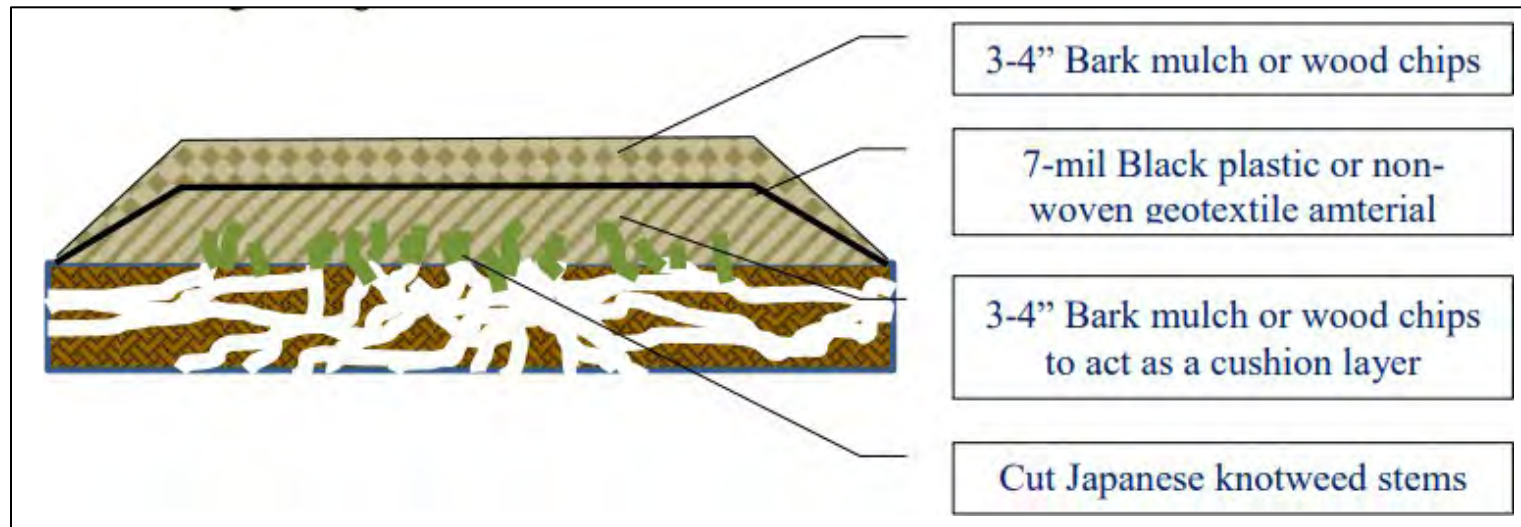
Hand-pulling/Digging:

- Small **AND** young plants only
 - If plant is resistant, use shovel and dig up rhizome
-
- **Large Patches will require additional smothering and/or herbicides**



Smothering Japanese Knotweed

- 1) Let plants grow in spring
- 2) Before flowering, cut at base
- 3) Put grass/mulch/carpet over stems as cushion
- 4) Cover with thick black plastic (~6-10 mil)
 - Extend 2-5' beyond extent of population in all directions
- 5) Weigh plastic down with rocks, mulch, bark, etc.
- 6) Leave covered for ~5 years
- 7) Monitor and replant



<https://www.agriculture.nh.gov/publications-forms/documents/japanese-knotweed-bmps.pdf>



Japanese Knotweed

(Fallopia japonica)

Chemical Control:

Small patches: use stem injection or cut-fill applications of glyphosate

- **Stem Injections:** inject concentrated glyphosate into the stem between nodes, in fall
 - Very effective
 - Targeted kill
 - Best herbicide option for sensitive areas
- **Cut-fill:**
 - Remove viable material beneficial
 - woody stems hard to pierce
 - Cut plant above 1st node
 - Apply concentrated glyphosate directly into hollow stem
- **Foliar Spray:** Larger Patches
 - Cut when plants are approximately 3-5' tall
 - Apply glyphosate or triclopyr as foliar spray when plants have re-grown later in the same growing season
 - Apply to uncut, mature stems just before flowering.



Autumn Olive

(Elaeagnus umbellata)

Reproduction & Spread

Seed/fruits – present mid summer to winter

- Vegetatively – stump sprouting
- Seeds viable for 3-5 years
- Birds and mammals

Noteworthy Characteristics for Management

- Can re-root
- Can reproduce vegetatively from root collar only
- Cannot grow/sprout from root segments below root collar



Autumn Olive

(Elaeagnus umbellata)

Control

Seedlings and small plants:

- Hand-Pulling when soil is moist
- Constant mowing throughout growing season

Medium Plants:

- Cut roots and Pull-out plant
- Honeysuckle popper
- Weed Wrench

Large plants:

- Cut off aboveground crown
 - Monitor for resprouting (it will resprout!)
 - Cut new shoots for several years
- Solarize with thick black bag and leave covered for the entire/multiple growing season(s)
 - Buckthorn Baggie



Autumn Olive

(Elaeagnus umbellate)

Herbicide Control: Glyphosate and/or triclopyr is most effective

Cut-Stump Method

- Immediately spray the cut-stump
- Conduct in Fall
- Sponge applicator or low-pressure sprayer

Foliar Spray

- Spring or fall is best
- Reduce overspray and/or drip

Basal Bark Application

- Mixed with oil
- 12-18" up
- Year around, except in snow or rain



Reproduction & Spread

Prolific seed producers and dispersers

- Seeds germinate very quickly
- Vegetatively – stump sprouting
- Wind and water, long distances

Noteworthy Characteristics for Management

- Can re-root
- Prolific seeds and sprouting
- Far dispersal
- Can sprout from large root fragments

Norway Maple *(Acer platanoides)*



Leslie J. Mehrhoff, University of Connecticut, Bugwood.org | 5448557



Norway Maple

(*Acer platanoides*)

Control

Seedlings and small plants:

- Hand-Pulling when soil is moist
 - Roots up
- Constant mowing throughout growing season

Medium Plants:

- Honeysuckle popper
- Weed Wrench

Large Trees:

- Cut off aboveground crown
 - Monitor for resprouting (it will resprout!)
 - Cut new shoots for several years
- Girdle vs cut
- Solarize with thick black bag and leave covered for the entire/multiple growing season(s)
 - Buckthorn Baggie



Norway Maple

(*Acer platanoides*)

Herbicide Control: Glyphosate and Triclopyr

Cut-Stump Method

- Immediately spray the cut-stump
- Conduct in Fall
- Sponge/brush applicator or low-pressure sprayer

Foliar Spray

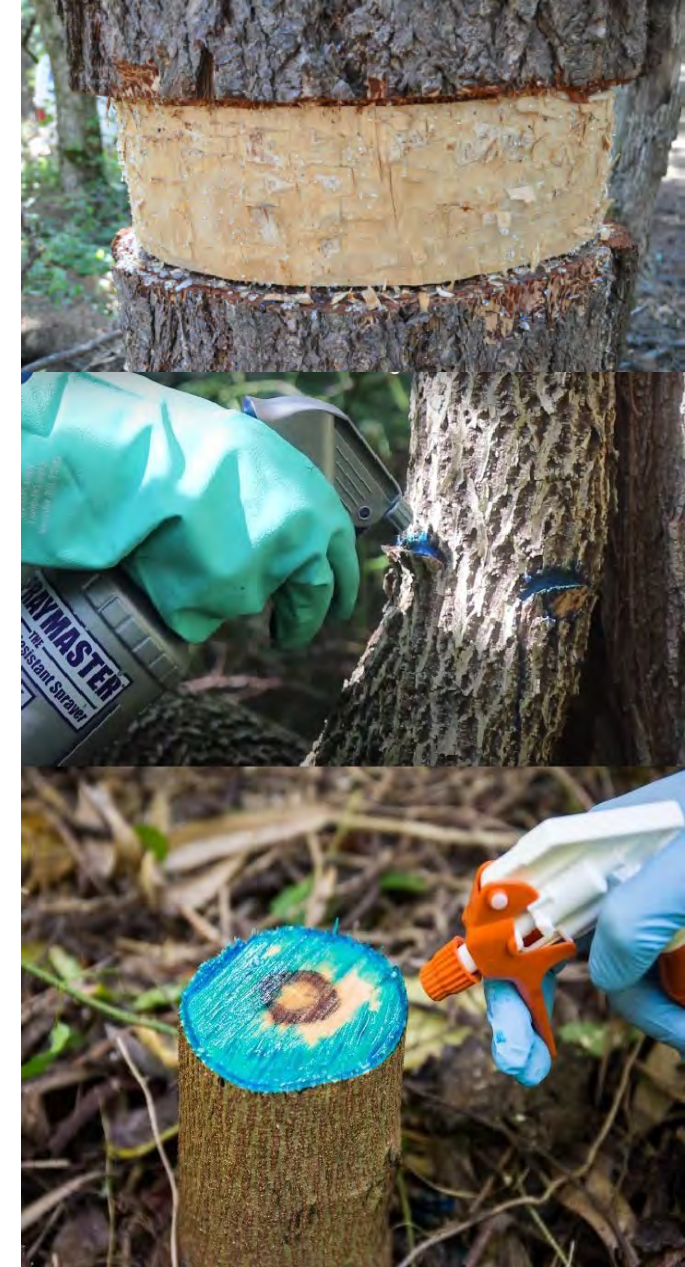
- Spring or fall is best
- Reduce overspray and/or drip

Basal Bark Application

- Trees < 4" in diameter
- 12-14" up from base

Hack n squirt

- Trees > 4" in diameter



Purple Loosestrife (*Lythrum salicaria*)

Reproduction & Spread

Prolific Sexual and Vegetative Reproduction

- Wind, water, birds, animal (fur), turtles
- Seed mixtures, contaminated soil and equipment, clothing, footwear and vehicles
- Seeds float – Flooding, flowing water, boats
- Germinates faster than most natives
- Perennial rootstock with 30-50 shoots
 - ~2,000,000 tiny seeds
 - Viable for 2-3 years

Vegetative Reproduction

- Can resprout!
 - Broken stems, roots and plant fragments

Noteworthy Characteristics for Management

- If mowed, fragments can root and form new plants



Purple Loosestrife (*Lythrum salicaria*)

Mechanical/Physical Removal:

Possible for smaller stands of plants (< 100 plants)

- Often small groups near parent population
- Ensure that all root and plant pieces are dug out of the soil
 - Prior to seeding time (~August)
- Removal will not eliminate the seedbed
 - Monitor and follow-up treatments
- Removed biomass should be burned or tightly bagged to prevent the spread of seeds or resprouting
 - No composting
- If hand-pulling during flowering time, cut off the flower stalk and bag it before removing the plant and roots to minimize seed dispersal



Purple Loosestrife (*Lythrum salicaria*)

Chemical Control

In dry areas, Glyphosate can be used for control

Small pops can be selectively sprayed

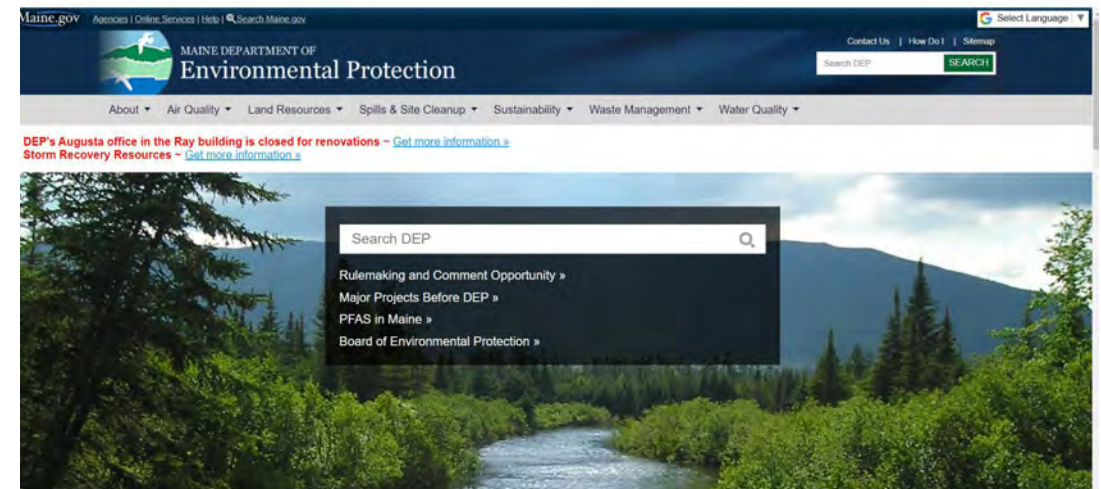
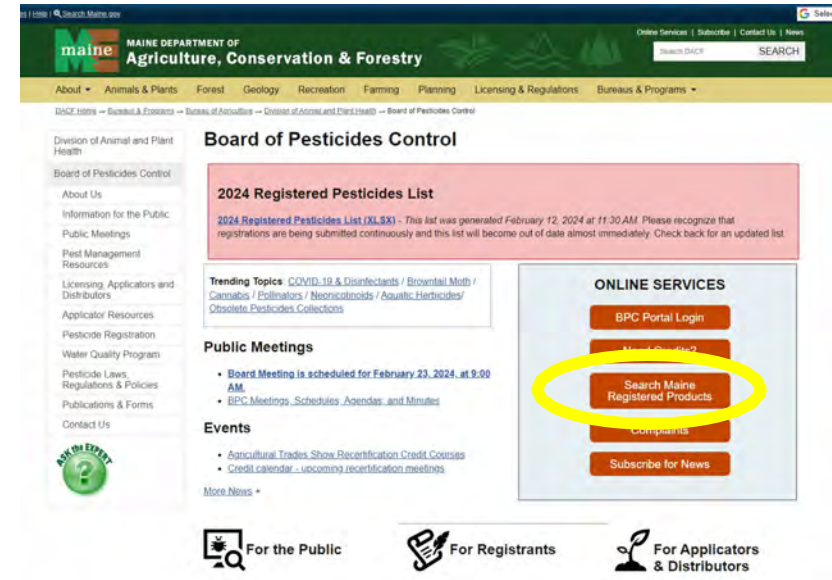
Cut/Spot application:

- Cut all stems ~6" above ground
 - Late in growing season but before seeding
- Paint or drip glyphosate solution on cut surface
- Monitor and follow up as new seedlings (seed bed) will emerge and plants may resprout



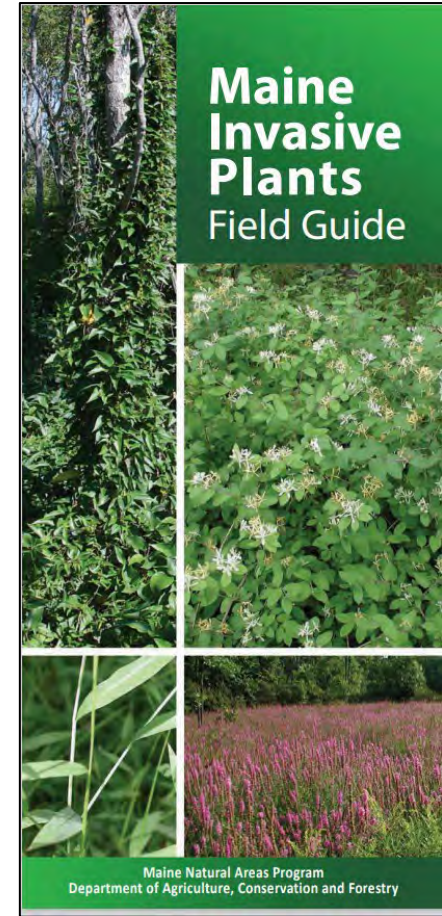
Herbicide BMP's

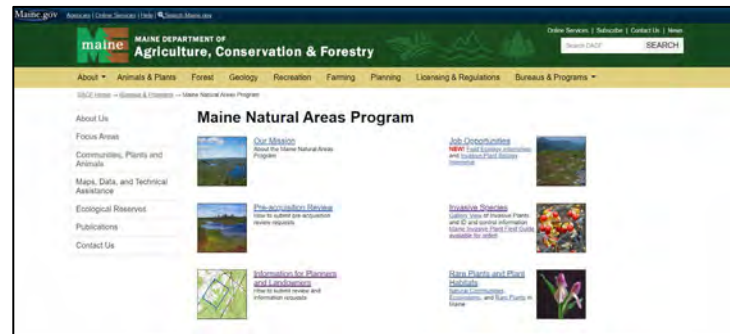
- Ensure Registered in Maine
- The Label is the Law
- Bees and Pollinators
- Wind
- Rain
- Sun and Heat
- Dew
- Contamination/Run-off
- Water Sources
 - *Maine Board of Pesticides Control*
 - *Maine Department of Environmental Protection*



Disposal

- **Remove invasive plants before they flower and start producing fruits and seeds**
- **Avoid moving invasive plant material and minimize distances**
 - Leave plants on site if possible
 - Cut before fruiting
 - Seed bank is present and monitoring is already recommended
- **Air drying plants, especially the roots**
 - Hang or pile – Roots up!
- **Bag and bake (solarization)**
 - Thick black contractor bag
 - Bake in sun for a few weeks
 - Trash or compost
- **Burning and Chipping**
- **Garbage collection and transfer stations**
 - Check for ordinances and regulations





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For more information, visit the iMapInvasives website.

imapinvasives.org



Biotic Resistance Hypothesis

Species and Functional diversity

Increase community competitive ability

Less available niche space and resources available to invaders

Trait-based framework to increase resistance

Functional diversity

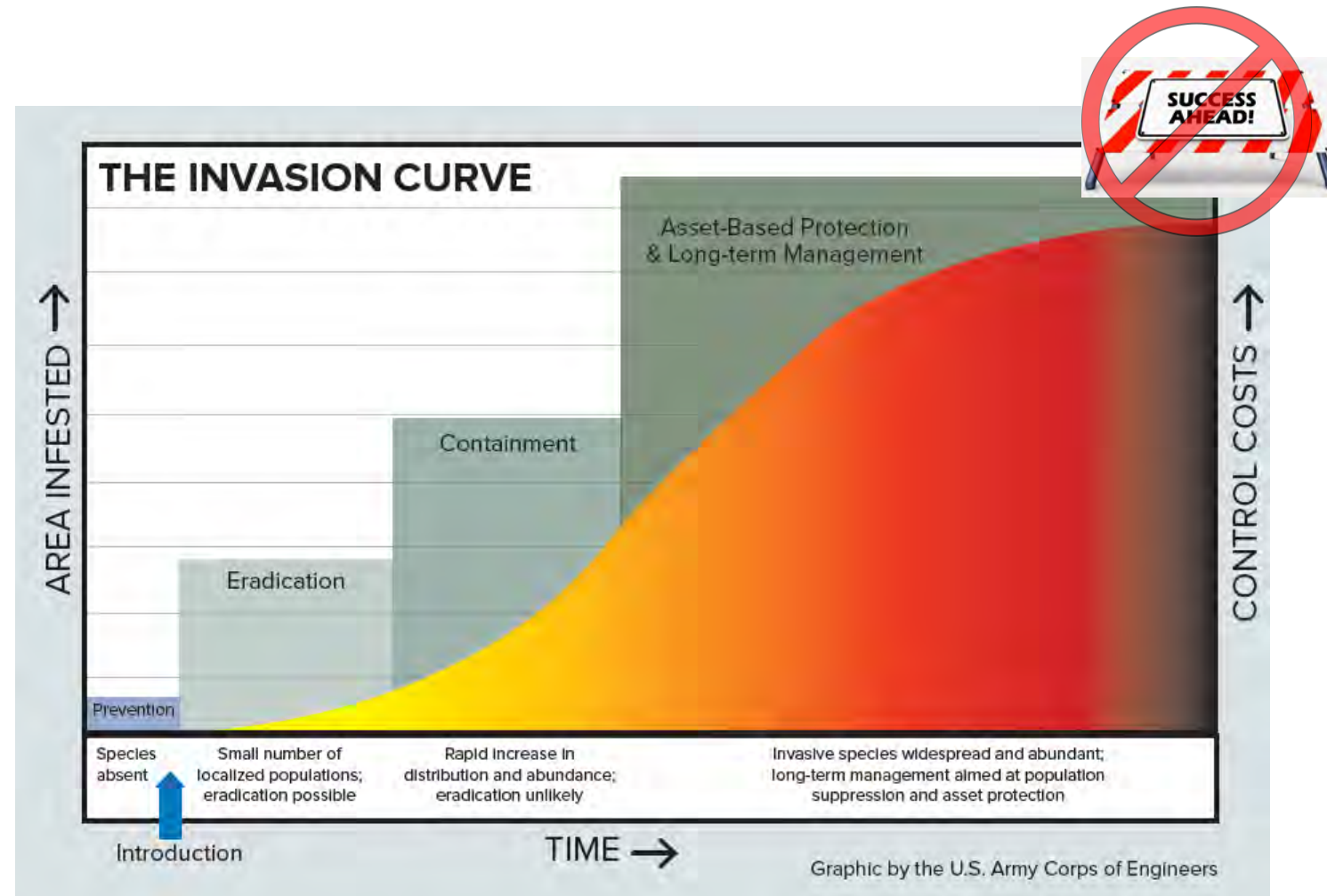
Traits of the invader

(Funk et al. 2008)



Early Detection and
Rapid Response

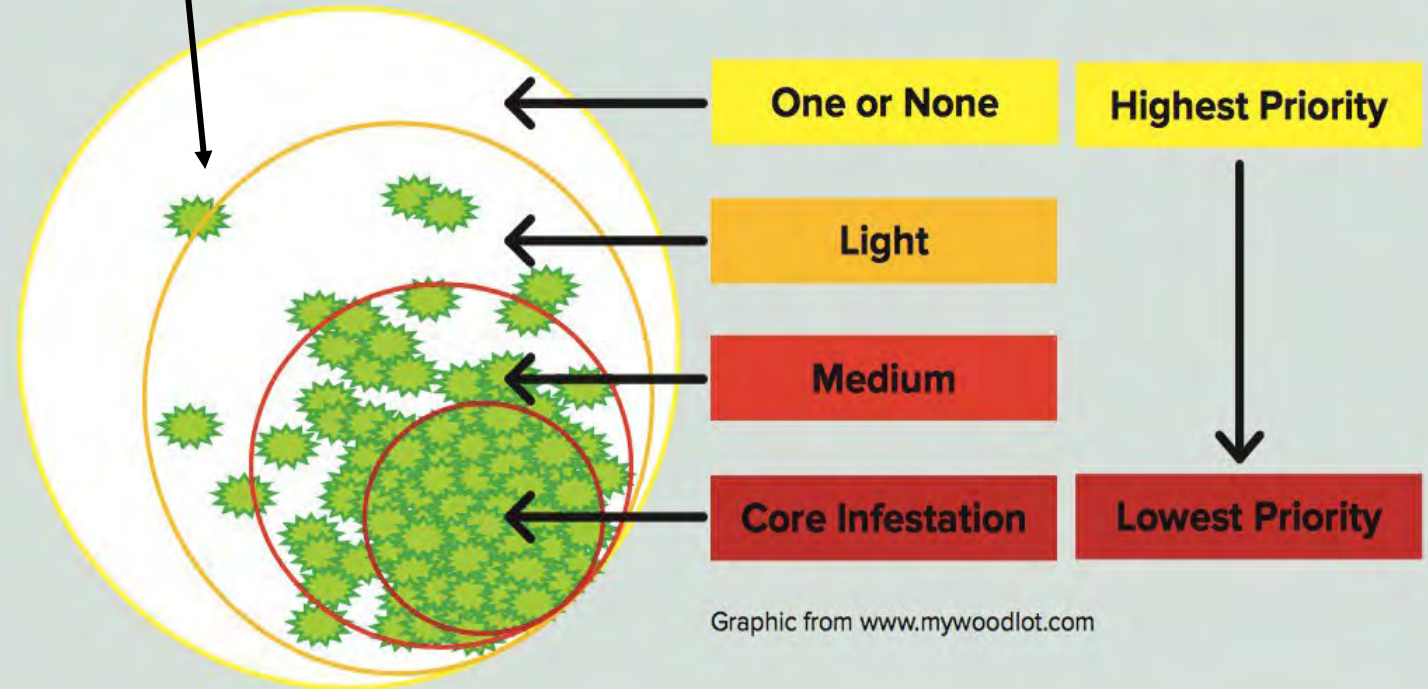
**EDRR and Monitoring
is critical!**



Prioritizing Management

- Prioritize control efforts by the size and intensity of the invasion
- Work towards core areas over time
- Prevents smaller infestations from becoming unmanageable

Control work would begin here



Timing

The best time for any control option is just before a plant flowers. In addition, the application of herbicides in July, August, and up to mid-September gives maximum chemical control. These are the months during which carbohydrates and other plant compounds are being manufactured in the leaves by way of photosynthesis and are transported from the leaves to the roots for storage. This downward flow of plant compounds helps facilitate the transport of foliar and stump applied herbicide to the roots for more effective kill. The mechanical control of cutting or mowing is also very effective during these months for the same reason. For example, when you cut the top off any plant, the roots naturally respond by pushing up more top growth (sprouting), reducing the root reserves (carbohydrates and other growth compounds) and stressing the plant. Every time you cut the top off, you force the plant to sprout which reduces the root reserves and weakens the plant.

Reduce size and density of enemy and waeaken it. Then go in for the kill. This is war!

Allowing the stumps to re-sprout during the summer months draws carbohydrate and other growth compounds from the roots and depletes some of the root energy making herbicide kill *more* effective.

