Invasive Alien Plants and You

Better Management Practices (BMP) and Control Methods for Priority Invasive Plants in the Annapolis Valley

Marika Godwin
October 2007

Clean Annapolis River Project

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Funded by the Invasive Alien Species Partnership Program (IASPP),
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Canada

Cover Photo: Removing glossy buckthorn (*Rhamnus frangula*) in the Annapolis Royal Marsh using a "Weed Wrench" tool. Taken by Levi Cliche, Clean Annapolis River Project.

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What You Need to Know About Invasive Alien Plants

Invasive alien plants threaten the biodiversity of our native ecosystems. Areas that are valued for their natural qualities, such as parks, trails, waterways, and campgrounds, may be at risk of being forever changed. We can all play a key role in reducing new introductions, and preventing the spread of invasive plants.

An alien species is any species (plant, animal, microbe) introduced by human action outside its natural range. They may originate on another continent, in another country, or in another part of Canada. These species introductions may be intentional or accidental, and include a number of pathways.

An invasive alien species (IAS) is an alien whose introduction and/or spread may threaten the environment, the economy, or society (including human health). Plants are just one type of alien invader wreaking havoc on Canadian ecosystems. Some of our most notorious invasive aliens include the zebra mussel (*Dreissena polymorpha*), the purple loosestrife (*Lythrum salicaria*) plant, and the brown spruce longhorn beetle (*Tetropium fuscum*). High productivity, good dispersal, long growth periods, and lack of natural controls contribute to their success in new environments. Due to increases in global trade, travel, and resource extraction, species introductions are on the rise. Access to formerly pristine areas for recreation and resource extraction is of particular concern.

While purple loosestrife is the virtual "poster-child" for invasive alien plants, there are a number of less well known exotic beauties that are equally, if not more, detrimental. Their effects on native plants may include direct impacts, ecosystem alteration, and genetic dilution. Direct impacts include competition for light, water, and nutrients; physical displacement; and toxicity. Native ecosystems can be altered by changes to the hydrological cycle; fire frequency; soil erosion rates; and soil chemistry. By displacing native plants, or by hybridizing with them, invasive plants have the potential to reduce genetic diversity.

The Scope of the Problem

In our everyday lives, we may be unknowingly contributing to the introduction and spread of invasive alien plants. This accidental movement of plant material contributes to the larger problems posed to our environment, economy, and society by introduced species. It is widely accepted that invasive species are the second greatest threat to native biodiversity worldwide. In Canada alone, more than 20% of our "species at risk" are threatened with extinction by invasive alien species. Sadly, losses caused by invaders do not stop at plants and animals (Environment Canada 2004). The estimated annual cost of damage caused to forestry and agricultural crops in Canada is $7.5 billion (Environment Canada 2004). While it's true that most introduced species do not become aggressive invaders, the few that do can cause serious damage.

Across the country, approximately 24% of vascular plant species are not native. Nova Scotia has one of the highest proportions of exotic plants, making up 36% of our total plants (CESCC 2006). By reducing the natural diversity of plants and animals that Nova Scotians enjoy, and by lowering the value of aquatic and terrestrial wildlife habitats, invasive alien plants may have a serious impact on outdoor recreation and tourism.

Canada's cool climate may work in our favor to prevent the establishment and spread of some of the world's most invasive species. However, as climates change with global warming, our region may become more susceptible to

biological invasion. Canadians need to be vigilant about monitoring the introduction of new species. By raising awareness now, we may be able to prevent future biological invasions.

You can Make a Difference

Everyone

1 — Learn to identify invasive alien plants in your area.
2 — Remove invasive alien plants from your property, and practice proper disposal.
3 — Do not transport organic material into or out of Canada.
4 — Do not transport plant material or wood/wood products (unfinished) into or out of Nova Scotia.
5 — Be sure to clean off clothing, gear, and vehicles before and after exploring a new area.
6 — Know where products that you purchase come from, and beware of Internet sources.
6 — Spread the word about weeds.

Gardeners

1 — Learn to identify local problem plants.
2 — Consider native plants, especially if your garden borders a natural area.
3 — Contain creeping plants.
4 — Do not let invasive plants go to seed.
5 — Do not use mixed seed packets as they may be improperly labeled or not labeled at all.
6 — Practice proper plant and plant material disposal techniques — do not compost invasive plant material, and never dump garden waste in a natural area.
7 — Be careful when purchasing mail-order plants. Some websites still sell known invasives, and plants names may be incorrect.
8 — Take precautions when transporting soil, sod, mulch, fill, wood, and wood products off of your property. They may contain seed or plant parts.
9 — Ensure that any soil, sod, mulch, or fill that you acquire is weed free (know your source).
10 — If you cannot contain a spreading plant, please consider removal — we all have a responsibility to not damage our local ecosystems.
11 — Keep your eyes open for invasive tendencies exhibited by your plants — a good rule of thumb is "if you don't know it, don't grow it".
12 — Spread the word about weeds.

Anglers and Recreational Boaters

1 — Learn to identify local problem invasive species, including aquatic plants and animals.
2 — Find out about the occurrence of known invaders in waters that you visit, and follow local rules and recommendations where highly invasive species occur (eg. zebra mussel).
3 — Never transport water from one waterbody to another.
4 — Never release live animals, including bait, into a waterbody.
5 — If you use live bait, use only native species, in case of escape.
6 — Remove all plants and other material from your boat, motor, trailer, and all gear before leaving an area.
7 — Drain all water from your boat and boating supplies before leaving an area.
8 — Spread the word about weeds.

IMPORTANT NOTICE FOR ANGLERS & BOATERS: In addition to plants, anglers and recreational boaters have the potential to knowingly or unknowingly introduce or spread other aquatic organisms. In the Annapolis Valley, two species of invasive alien freshwater fish are of particular concern. Chain pickerel (*Esox niger*) and smallmouth bass (*Micropterus dolomieui*) are known to be present and spreading in the Mersey and Annapolis Watersheds due to intentional introductions. For more information on these species, see the Mersey Tobeatic Research Institute (MTRI) website at www.merseytobeatic.ca.

Hikers/Mountain Bikers/Horseback Riders

1 — Learn to identify local problem plants.
2 — If you see an invasive plant, or infestation, report it to the land manager, if known.
3 — Clean off your shoes, clothing, bicycle, and animals before going to a new area, and when leaving an area. Unwanted seeds are often "hitchhiking" on these items.
4 — Do not create new trails. Disturbances may encourage invasion by exotic species.
5 — Do not collect wild plants.
6 — Use weed-free feed for your animals.
7 — Spread the word about weeds.

Hunters

1 — Learn to identify local problem plants.
2 — Do not plant invasive plants for wildlife.
3 — Do not use invasive or unknown plant material to construct a blind.
4 — If you see an invasive plant, or infestation, report it to the land manager, if known.
5 — Clean off your shoes and clothing before going to a new area, and when leaving an area. Unwanted seeds are often "hitchhiking" with you.
6 — Do not create new trails. Disturbances may encourage invasion by exotic species.
7 — Spread the word about weeds.

Land Managers

1 — Know how to identify local problematic invasive alien plants, how they affect your resource, and where they are likely to occur (habitats).
2 — Know what you are trying to protect. Woodlots, wetlands, parks, agricultural areas, etc., all have different values, and may be susceptible to invasion by different species.
3 — Minimize soil disturbance. Invasive plants can quickly colonize disturbed areas.
4 — Cover soil and gravel piles with heavy plastic.
5 — Inventory and map populations of invasive plants on your property. Use this information to track new occurrences and monitor spread.
6 — Remember that prevention and early detection are key.
7 — Have a management plan in place. That way you will be equipped and prepared to deal with invasions.
8 — Spread the word about weeds.

Nursery/Landscape Professionals

1 — Know what you're growing. Do your research on the invasive potential of plants that you propagate.
2 — Inspect imported plants and soil for "hitchhikers" in the form of weeds, seeds, or fungi.

3 – Know what you're supplying to your customers. Be informed about all of your products so that you may answer questions from clients.
4 – Label plants clearly. Be sure to use Latin names, in addition to common names, to avoid confusion about species and origin.
5 – Avoid selling or recommending any publications/literature that promote the use of known invasive alien plants.
6 – Practice proper disposal of garden waste including plants, plant material, soil, sod, mulch, wood products, and all other organic materials.
7 – Encourage gardeners to consider the use of native plants, or to contain non-native plants to minimize spread.
8 – Be familiar with local invasive alien plants.
9 – Spread the word about weeds.

Get to Know Your Plants

There are a number or things you should know about your invasive plant before you attempt any type of control. Knowing the following things will make a choosing a control method easier, and more effective.

First, know the proper Latin name of the plant in question. Common names are many, and can be very confusing. For example, if you type the common name "creeping jenny" into the Google search engine on the Internet, you will gets hits for 3 different plants. These include *Lysimachia nummularia*, *Glechoma hederacea*, and *Convolvulus arvensis*. Although all 3 are invasive alien plants, the most effective control will result from proper identification.

Second, know what type of plant you are dealing with. Is it an annual, a biennial, or a perennial? Different plant types have different reproductive methods, and these methods are what you have to target to initiate control. For example, annuals spread solely by seed. If you know that your weedy plant is an annual, then your management objective will be to prevent the plant from going to seed. As you would expect, perennials that spread by both seed and spreading rootstock are the most complex and difficult plants to control.

Third, timing is everything. Know when the invasive plant starts growing, flowers, produces seed, and dies or goes dormant. The effectiveness of your control method will vary depending on when it is applied. For example, if you cut the flowering stalk of garlic mustard (*Alliaria petiolata*) before peak flowering, the root may send up a second stalk. The effect of many herbicides is heavily dependent on seasons. In general, greater success is achieved when the plant is translocating nutrients to the roots in preparation for dormancy.

Finally, do your research. It is a good precaution to know all of this information for any plant that you acquire. The Internet is a great resource for information about plants, and their potential invasive properties. For example, a garden club was wondering whether to exclude the plant garden loosestrife (*Lysimachia vulgaris*) from their flower show list, not knowing whether or not it was an invasive alien. Although this plant was not familiar to CARP, a quick Internet search revealed that it is known to have invasive properties, and is listed as a noxious weed in some US counties. If you do not have Internet access, contact CARP with your invasive plant inquiries.

Cultural Control Practices for Lawns and Gardens

Cultural control refers to making an area less suitable for the establishment of invasive species. Weedy plants are often associated with disturbed areas, and exposed soil. There are a number of steps you can take to reduce the likelihood that invasive alien plants will take hold in your lawn or garden. If you already have weedy or invasive species present, they may be indicators of a problem.

Lawns

- Mow high! Keep your grass at least 3 inches tall, to give it a chance to out-compete weeds.
- Reduce soil compaction. Walk on pathways or trails, and repair compacted areas.
- Avoid bare spots. Exposed soil attracts weed seeds. Sow grass seed in early spring to repair bare areas.
- Improve grass density. If you have a thin lawn, fertilize to make it thicker. Thicker grass will be better able to compete against weeds.
- Hand weed individual plants in your lawn. Pulling weeds is easier when the soil is moist.
- Follow the signs — presence of weeds means presence of problems with the lawn.

Gardens

- Don't plant weeds! This may seem obvious, but to avoid invasive plant problems, you must know what an invasive plant is. Goutweed (*Aegopodium podagraria*), moneywort (*Lysimachia nummularia*), and purple loosestrife are all escaped ornamental plants.
- Minimize bare soil. Use mulch, or plant cover crops (but beware or spreading/creeping groundcovers).
- Keep all soil amendment piles and gravel stock piles covered with heavy plastic to keep seed contamination to a minimum.
- Try delayed seeding. If planting a large area, prepare the seedbed, then wait 5-10 days for the first crop of weed seeds present in the soil to germinate. Shallowly till the weed crop, then plant your garden. Shallow tilling will dig up fewer seeds than deep tilling.
- Grow an early ground cover. To prevent bare soil until planting, sow a cover crop in the fall, which can later be tilled into the soil.
- Follow the signs — presence of weeds means presence of problems with the garden.

Notes on Soil Management

When working on your property, certain practices may create disturbed environments that are conducive to the establishment of invasive alien plants. Exposed soil is very attractive to weed seeds looking for a place to germinate. The following are some recommendations for soil management that can help to reduce the occurrence of invasive alien plants on your property.

- Wherever possible, minimize soil disturbance.
- Limit fertilizer use, as it may encourage the growth of weedy or invasive species.
- Use only weed-free topsoil (know your source).
- Do not move weed-infested soil off your property.
- If storing soil, cover it with heavy plastic to reduce amount of exposed bare soil (see Figures 1 and 2).

- Thoroughly clean vehicles and equipment that have been in contact with invasive alien plants, plant parts, or infested soil.
- Remember that the seed of some invasive alien plants can persist, and remain viable in the soil for decades.
- Conduct an invasive plant inventory before initiating ground disturbance.
- Invasive plant populations explode after disturbance to forest canopies and soils. If possible, initiate control of existing invasive plants prior to disturbance.
- When working in areas with invasive plants, work from uninfested areas to infested areas, to minimize spread.
- If you must disturb soil or work in areas where invasive plants are present, do it at the time of year when spread is least likely

Figure 1. An uncovered pile of bare soil is being colonized by Japanese knotweed (*Polygonum cuspidatum*) and field bindweed (*Convolvulus arvensis*). Photo: Marika Godwin.

Figure 2. The same uncovered pile of bare soil seen approximately 3 months after photo in Figure 1. Continued colonization by invasive alien plants is evident. This soil pile will act as a source of weed seed for the surrounding property. Photo: Marika Godwin.

Priority Invasive Plants in the Annapolis Valley – the Top Eight

The eight plants identified below are not the only invasive alien plants in Nova Scotia. In fact, the list of invasive plants is quite long, and continuously changing as new plants are introduced or new populations are discovered. A complete list of invasive alien plants, including problematic garden plants, can be seen in Appendix A. In 2006, CARP identified these eight as the plants that pose the greatest threat to natural areas of the Annapolis Valley. Factsheets for each of the top eight invasive plants are located in Appendix B.

1 – glossy & common buckthorn (*Rhamnus frangula* & *Rhamnus cathartica*)
2 – Japanese knotweed (*Polygonum cuspidatum*)
3 – purple loosestrife (*Lythrum salicaria*)
4 – common reed (*Phragmites australis*)
* NOTE: There is also a native common reed, and they are very difficult to distinguish
5 – garlic mustard (*Alliaria petiolata*)
6 – Scotch broom (*Cytisus scoparius*)
7 – multiflora rose (*Rosa multiflora*)
8 – Canada thistle (*Cirsium arvense*)

And One More

In April 2007, CARP received a report of an "out of control" vine. Upon closer investigation, with the expertise of botanist Heather Stewart (Applied Geomatics Research Group, AGRG), the woody vine was identified as Oriental or Asiatic bittersweet (*Celastrus orbiculatus*). Though it had not previously been reported for this area, some specimens were close to 30 years old. This plant has the potential to negatively impact forest ecosystems, yet is still widely available for sale at Annapolis Valley garden centres. As such, CARP felt it should be included on the list of plants that pose a threat to local natural areas. Due to its late inclusion on the list, a factsheet for Oriental bittersweet had not yet been generated. As such, it is pictured in Figures 3 and 4.

Figure 3. Oriental bittersweet overtopping trees and shrubs along Highway 201, West Paradise, NS. Photo: Heather Stewart, AGRG.

Figure 4. Oriental bittersweet vine girdling adult tree within closed canopy forest, Upper Clements, NS. Photo: Heather Stewart, AGRG.

Woodlot Concerns

Many invasive plants remain weeds of human-disturbed landscapes, including roadsides, trails, abandoned lots, etc. However, invasions can also occur after natural disturbances, such as animal trails, floods, forest fires, etc. This relationship between invasive species and disturbance gives us an idea of where we are likely to locate invasions. For example, invasive plants may colonize areas of natural regeneration, and plantation establishment. The reason for this association is that most invasive plants are not shade-tolerant, and cannot survive in natural, closed-canopy forested areas. Unfortunately, there are some that can, and these have the potential to threaten the integrity of forest ecosystems.

If you are a woodlot owner, certain species have the potential to impact your resource. Learning to identify them is a good way to prevent their spread. If you have any of the species listed in Appendix C on your property, you may want to consider removing them before they have the opportunity to spread.

Control and Eradication

Recommended control methods for the eight high-priority invasive alien plants identified by CARP, and Oriental bittersweet, are located in a table format in Appendix D. These recommendations are based on current literature, anecdotal evidence from Annapolis Valley residents, and the results of experiments conducted by CARP. Literature sources are listed below the table.

Notes on Herbicide Use

- Non-selective herbicides (such as Roundup) will harm or kill any growing plant. As such, they are often recommended for control of unwanted plant species, including invasive alien plants.
- Always read and follow directions on any pesticide label.
- Be sure that the pesticide you are using is registered for your intended use (eg. to use a herbicide in a riparian area, it must be registered specifically for that use). It is illegal to use a pesticide in any way that is not specified on the product label.
- There are no pesticides currently licensed for use in riparian areas in Canada.
- Most herbicides will have a maximum application rate per unit area. Do not exceed these maximum rates when applying large quantities of herbicide. Pay particular attention when pouring chemical directly into cut stems of Japanese knotweed (*Polygonum cuspidatum*), as the amount required for this type of control accumulates quickly.
- CARP does not endorse the use of herbicides, but is aware that under certain circumstances they may be the only realistic control option for some invasive alien plants.

Disposal of Invasive Alien Plants and Plant Material

A common question is "How do I dispose of my invasive alien plant material once I have removed it from my property?" Ideally, all plant material could be composted. Composting recycles nutrients, and reduces waste in landfills. However, in the case of invasive plants, the answer is not that simple. Most backyard composters do not reach high enough temperatures to completely decompose all plant material. As such, persistent seeds, pieces of roots, and other plant parts may remain viable throughout the composting process. Because complete decomposition does not occur, using this compost may then actually contribute to the spread of alien invaders.

Results from a British study (Ward 2003) suggest that in order to prevent regeneration of Japanese knotweed (*Polygonum cuspidatum*), plant material must be composted at a temperature greater than 55ºC for a minimum of 1 week. Even after high-temperature commercial composting, Ward (2003) suggests that there would be a small risk of spread.

Northridge Farms in Aylesford, NS, who are contracted to compost all green-cart material for Valley Waste Resource Management (VWRM), in the Annapolis Valley, have a 3-fold composting process (Dwight Horsnell, personal communication 2006). The first cycle involves heating the compost to 140ºF (just over 60ºC) for 1 day, during which the compost is also exposed to air. The second cycle includes 7 days at a temperature of 130ºF (approximately 55ºC). The final cycle is a lengthy process during which the organic material is left outdoors and turned regularly. The complete composting process takes 3 months, from start to finish.

Although it is likely that the Northridge Farms composting process is hot enough and lengthy enough to kill plant material, there can be no guarantee. Japanese knotweed, purple loosestrife, glossy and common buckthorn, and garlic mustard can be especially persistent. Therefore, it is recommended that highly invasive plants and highly invasive plant material not be composted.

There is also always a risk of spread associated with transporting invasive plant material. By disposing of plant material on the property from which it was removed, risk of spread is minimized. In cases where this is not possible (eg. too much plant material, fire ban, etc), green invasive material should be double-bagged in a regular garbage bag for transportation to an alternate disposal site.

The first step to responsible disposal of invasive plants is drying them out. Some plants, such as knotweed, can take root from any part of the plant stem or root coming in contact with bare mineral soil. Drying should be done on a tarp, or other inorganic material (eg. concrete, wood, etc) to prevent rooting or sprouting from seed. Removing plants before they produce seed is a good way to minimize the risk of spread. Once the plant material is completely dry, it can then be burned, or put in a garbage bag for disposal in a landfill.

It is possible to try composting after the invasive plant material has been dried, but it is imperative that there are no living parts. Even then, it is recommended that use of the compost be tracked to see if any invasive alien plants spring up where it has been spread. Never move the compost off the property from which it originated.

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Appendix A

List of terrestrial invasive alien plants for the Annapolis Valley, NS, including problematic garden plants.

(N) = native plant

High Priority

1 – glossy & common buckthorn (*Rhamnus frangula* & *Rhamnus cathartica*)
2 – Japanese knotweed (*Polygonum cuspidatum*)
3 – purple loosestrife (*Lythrum salicaria*)
4 – common reed (*Phragmites australis*)
* NOTE: There is also a native Common Reed, and they are very difficult to distinguish
5 – garlic mustard (*Alliaria petiolata*)
6 – Scotch broom (*Cytisus scoparius*)
7 – multiflora rose (*Rosa multiflora*)
8 – Canada thistle (*Cirsium arvense*)
9 – Oriental/Asiatic bittersweet (*Celastrus orbiculatus*) *NEW ADDITION*

Other Known Invasives

10 – Manitoba Maple (*Acer negundo*)
11 – Norway Maple (*Acer platanoides*)
12 – Goutweed (*Aegopodium podagraria*)
13 – Flowering-Rush (*Butomus umbellatus*)
14 – Cuckoo Flower (*Cardamine pratensis*)
15 – Spotted Knapweed (*Centaurea maculosa*)
16 – Celandine (*Chelidonium majus*)
17 – Leafy Spurge (*Euphorbia esula*)
18 – Dame's-Rocket (*Hesperis matronalis*)
19 – St.John's-Wort (*Hypericum perforatum*)
20 – Tartarian Honeysuckle (*Lonicera tatarica*)
* NOTE: All of the exotic shrub honeysuckles (*Lonicera sp.*) should be considered potentially invasive
21 – Moneywort (*Lysimachia nummularia*)
22 – Sweet Clover (*Melilotus sp.*)
23 – Wild Marjoram (*Origanum vulgare*)
24 – Scots Pine (*Pinus sylvestris*)
25 – White Poplar (*Populus alba*)
26 – Black Locust (*Robinia pseudo-acacia*)
27 – Coltsfoot (*Tussilago farfara*)
28 – Valerian (*Valeriana officinalis*)

Plants to Keep an Eye On

29 – (N) common (annual) ragweed (*Ambrosia artemisiifolia*)
30 – lesser burdock (*Arcticum minus*)
31 – hairy crabgrass (*Digitaria sanguinalis*)
32 – false baby's breath/bedstraw/cleavers (*Galium mollugo*)
33 – ornamental jewelweed/Himalayan Balsam (*Impatiens glandulifera*)
34 – Common Nipplewort (*Lapsana communis*)
35 – Wild Parsnip (*Pastinaca sativa*)

Problems in the Garden

A — Already Listed

Goutweed (*Aegopodium podagraria*)
Spotted Knapweed (*Centaurea maculosa*)
Crabgrass (*Digitaria sanguinalis*)
Moneywort/Creeping Jennie (*Lysimachia nummularia*)
Purple Loosestrife (*Lythrum salicaria*)
Wild Parsnip (*Pastinaca sativa*)
Common Reed/Giant Reed (*Phragmites australis*)
Japanese Knotweed (*Polygonum cuspidatum*)

B — Other

Yarrow (*Achillea millefolium*)
Lady Bells/Ladybells (*Adenophora confusa*)
Creeping Bellflower/Rapion Bellflower/Rover Bellflower (*Campanula Rapunculoides*)
Field Bindweed (*Convolvulus arvensis*)
Couch Grass (*Elymus repens*)
(N) Field Horsetail/Western Horsetail/Scouring Rush (*Equisetum arvense*)
Cypress Spurge (*Euphorbia cyparissias*)
Creeping Charlie/Ground Ivy (*Glechoma hederacea*)
Scotch Thistle (*Onopordum acanthium*)
Japanese Lantern (*Physalis franchetii*)
(N) Choke Cherry (*Prunus virginiana*)
Sheep Sorrel/Field Sorrel/Red Sorrel/Dock (*Rumex acetosella*)
Dandelion (*Taraxicum officinale*)
Red Clover (*Trifolium pratense*)
Comfrey (*Symphytum officinale*)
(N) Stinging Nettle (*Urtica diocia*)

Appendix B

Factsheets for eight high-priority invasive alien plants in the Annapolis Valley, NS.

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CARP Factsheet

INVASIVE ALIEN PLANT: The Showy Shrubs

COMMON NAME: Glossy Buckthorn & Common Buckthorn
SCIENTIFIC NAME: *Rhamnus frangula* & *Rhamnus cathartica*
PLANT TYPE: Woody Shrub or Small Tree
PHYSICAL DESCRIPTION:

Form – shrub or small tree
Height – up to 7m
Leaves – simple, alternate, oval, smooth (Glossy) or finely toothed (Common)
Flowers – in clusters, greenish-yellow, small regular flowers, 5 petals (Glossy) or 4 petals (Common)
Fruit – berries, red turning to black when ripe, each containing 3-4 seeds
Blooms in – spring through fall
Other Features – Common Buckthorn may have small spines at twig tips; keeps foliage, flowers, and berries longer than most native shrubs (long growing season)

ORIGIN: Europe and Asia
INTRODUCED (before 1800) FOR: ornamental, hedgerows
HABITAT: many habitat types, both will occur in forest understories - Glossy in wetter, less shaded areas than Common
MEANS OF SPREAD: bird-dispersed seed, and re-sprouting of cut stumps
PROBLEMS:

- very prolific seed has potential for long-range spread by birds, making control difficult
- potential to invade forest understories, and prevent regeneration of native species

IF YOU HAVE THIS PLANT ON YOUR PROPERTY:

- remove it promptly, and do not put it in your back yard composter (dry and burn, or regular garbage)
- cut or dig individual plants before they go to seed; cut stumps will re-sprout in the same growing season
- prolific seed production means you'll be pulling out seedlings for years to come!

Photos: Plant with Fruit (*R. frangula*) – Heather Stewart, Applied Geomatics Research Group (AGRG), Plant with Flower (*R. cathartica*) – Chris Evans, River to River CWMA, www.forestryimages.org

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INVASIVE ALIEN PLANT: The Killer Bamboo

COMMON NAME: Japanese Knotweed, Japanese Bamboo, Mexican Bamboo
SCIENTIFIC NAME: *Polygonum cuspidatum*
PLANT TYPE: Herbaceous Perrenial
PHYSICAL DESCRIPTION:

Form – upright, usually in clumps (shrublike)
Height – may be taller than 3m
Leaves – large, simple, alternate, smooth, oval with pointed tip
Flowers – in linear clusters, greenish-white, very small
Fruit – small, winged, containing tiny, triangular seeds
Blooms in - August and September
Other Features – very extensive, creeping roots; large, hollow stems with pronounced nodes resemble bamboo

ORIGIN: East Asia
INTRODUCED (1800's) FOR: ornamental, erosion control, screening
HABITAT: adverse habitat types, but common along stream banks
MEANS OF SPREAD: vegetative, and possibly seed
PROBLEMS:

- virtually impossible to eradicate, once established
- successful in riparian areas
- dense shade prevents anything from growing up underneath it

IF YOU HAVE THIS PLANT ON YOUR PROPERTY:

- remove it promptly, and do not compost material from this plant (dry and burn, or regular garbage)
- *keep plant material on site if possible, to minimize spread
- do your research before attempting removal; extensive roots make this plant very hard to control

Photos: Leaves – UAF Cooperative Extension Archives, University of Alaska – Fairbanks, www.forestryimages.com,
Winter Stems – Marika Godwin, Clean Annapolis River Project (CARP)

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INVASIVE ALIEN PLANT: The Poster Child

COMMON NAME: Purple Loosestrife
SCIENTIFIC NAME: *Lythrum salicaria*
PLANT TYPE: Perennial Herb
PHYSICAL DESCRIPTION:

Form – upright, stout, branched stem
Height – 50cm to 150cm
Leaves – simple, opposite, or in whorls of 3, smooth, no stalks, downy
Flowers – in spikes, magenta, small regular flowers, 5-7 petals
Fruit – small capsule (6mm long) containing many dark seeds
Blooms in – July through September (and later)
Other Features – stem feels square, whole plant usually covered in downy hairs, may have many stems (up to 50) on one plant

ORIGIN: Eurasia
INTODUCED (early 1800s) FOR: ornamental, medicinal
HABITAT: numerous wetland habitat types
MEANS OF SPREAD: wind-dispersed seed, and vegetative
PROBLEMS:

- outcompetes native plants in wetlands
- prolific seed production creates an enormous seed bank
- eradication of large populations is very difficult

IF YOU HAVE THIS PLANT ON YOUR PROPERTY:

- remove it promptly, and do not compost material from this plant (dry and burn, or regular garbage)
- hand pull individual plants before they go to seed

Photos: Flowering Plant – John D. Byrd, Mississippi State University, www.forestryimages.com, Flower – Linda Wilson, University of Idaho, www.forestryimages.com, Infestation – Eric Coombs, Oregon Department of Agriculture, www.forestryimages.com

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INVASIVE ALIEN PLANT: The Towering Grass

COMMON NAME: Common Reed
SCIENTIFIC NAME: *Phragmites australis*
PLANT TYPE: Perennial Grass
PHYSICAL DESCRIPTION:

Form – very tall, usually in dense, single species stands (monocultures)
Height – can exceed 5ml
Leaves – simple, long, narrow, smooth, wide (up to 4cm)
Flowers – in plume like spikes (up to 30cm long), purple (changing to grey in late summer), individual flowers have long silky hairs
Fruit – flower heads look fluffy as seeds within mature
Blooms in – late July and August
Other Features – extensive, creeping roots
NOTE: There is also a native Common Reed, and they may be difficult to distinguish

ORIGIN: Europe (but there is a native variety too)
INTRODUCED (late 1700s or early 1800s) FOR: accidental – possibly seed in animal feed
HABITAT: wetland fringes, including salt marshes
MEANS OF SPREAD: spreading rhizomes (vegetative), and sometimes wind-dispersed seed
PROBLEMS:

- may outcompete native wetland species
- dense monocultures prevent anything from growing underneath it
- eradication is very difficult

IF YOU HAVE THIS PLANT ON YOUR PROPERTY:

- fortunately, this plant is restricted to a few areas in the valley
- if you do have it, remove it promptly, and do not compost (dry and burn, or regular garbage)
- hand pull or dig individual plants; be prepared to follow up on new plants produced by any roots left behind (extensive roots make this plant hard to control)

Photos: Flower – James R. Allison, Georgia Department of Natural Resources, www.forestryimages.com,
Infestation – Marika Godwin, Clean Annapolis River Project (CARP)

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INVASIVE ALIEN PLANT: The Mustard

COMMON NAME: Garlic Mustard
SCIENTIFIC NAME: *Alliaria petiolata*
PLANT TYPE: Biennial Herb
PHYSICAL DESCRIPTION:

Form – first year plant is a rosette, second year plant is an erect stem
Height – 60cm to 105cm
Leaves – simple, alternate, triangular, serrated (toothed)
NOTE: on the first year rosette, leaves are more kidney shaped, and round-toothed (less serrate) than on the second year plant
Flowers – in clusters, white, small regular flowers, 4 petals in cross shape
Fruit – oblong pod (up to 10cm long) containing seeds
Blooms in – spring, plants dead by late June
Other Features – crushed stem and leaves have garlic odour

ORIGIN: Europe
INTRODUCED (1868) FOR: food, medicinal purposes
HABITAT: moist, shaded soils – forest understories!
MEANS OF SPREAD: seed
PROBLEMS:

- potential to invade forest undertsories, and prevent regeneration of native species
- some studies indicate that this plant may actually produce chemicals that suppress the growth of other plants (allelopathic)

IF YOU HAVE THIS PLANT ON YOUR PROPERTY:

- this plant is currently restricted to one known location in the Valley
- learn to identify this plant: if you see it on your property remove it promptly
- if plants have seeds, do not compost (dry and burn, or regular garbage)
- hand cut or dig plants before they go to seed
- report any sightings of this plant to CARP right away

Photos: First-year Rosette – Chris Evans, University of Georgia, www.forestryimages.com, Infestation – Victoria Nuzzo, Natural Area Consultants, www.forestryimages.org, Second-year Plant – Chris Evans, University of Georgia, www.forestryimages.org

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INVASIVE ALIEN PLANT: The Broom

COMMON NAME: Scotch Broom
SCIENTIFIC NAME: *Cytisus scoparius*
PLANT TYPE: Perennial Shrub
PHYSICAL DESCRIPTION:

Form – stiff, bushy, usually in clumps
Height – 2m to 3m
Leaves – small, lower have 3 leaflets, upper may be simple
Flowers – bright yellow, regular, pea-like
Fruit – pod (4-5cm long) with long hairs along seam
Blooms in – June and July
Other Features – up to 3500 seeds explode out of each seed pod when ripe, and can survive in the soil for decades!

ORIGIN: Europe and Africa
INTRODUCED (1800s) FOR: ornamental, dye, medicinal purposes
HABITAT: disturbed areas, and open woodlands
MEANS OF SPREAD: seed, and roots will sucker
PROBLEMS:

- potential to invade open forest understories, and prevent regeneration of native plants
- this plant is a major threat to endangered ecosystems in Western Canada

IF YOU HAVE THIS PLANT ON YOUR PROPERTY:

- remove it promptly, and do not put it in your back yard composter (dry and burn, or regular garbage)
- dig entire plant before it goes to seed; any remaining roots will sucker
- very limited distribution in the Valley, but is more common on the South Shore
- know what you have in your garden; many varieties of broom are sold as popular ornamentals

Photos: Green Plant – Steve Dewey, Utah State University, www.forestryimages.com, Infestation – Eric Coombs, Oregon Department of Agriculture, www.forestryimages.com, Flowering Plant – Mike Townsend, Applied Geomatics Research Group (AGRG)

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INVASIVE ALIEN PLANT: The Bird Buffet

COMMON NAME: Multiflora Rose, Rambler Rose
SCIENTIFIC NAME: *Rosa multiflora*
PLANT TYPE: Perennial Shrub
PHYSICAL DESCRIPTION:

Form – shrub, forms dense thickets, arching stems
Height – generally forms a 1m to 2m thicket, but can climb trees, attaining great heights
Leaves – compound, alternate, finely toothed, 5-11 leaflets (generally 7 or 9)
Flowers – in clusters, white, small regular flowers, 5 petals
Fruit – rose hips, small, red, remaining on plant through winter
Blooms in – June and July
Other Features – can be distinguished from native roses by fringed bracts at base of each leaf stalk, and by arching stems

ORIGIN: Japan, Korea, and East China
INTRODUCED (1866) FOR: ornamental, erosion control, livestock fencing
HABITAT: wide tolerance of habitat types
MEANS OF SPREAD: bird-dispersed seed, and rooting of bent stems
PROBLEMS:

- very prolific seed has potential for long-range spread by birds, making control difficult
- difficult to eradicate thickets because it's hard to handle

IF YOU HAVE THIS PLANT ON YOUR PROPERTY:

- remove it promptly, and do not put it in your back yard composter (dry and burn, or regular garbage)
- hand cut or dig individual plants before they go to seed; larger infestations may require mechanized removal
- prolific seed production means you'll be pulling out seedlings for years to come!

Photos: Leaf – Chris Evans, University of Georgia, www.forestryimages.com, Fruit – Marika Godwin, Clean Annapolis River Project (CARP), Infestation – James H. Miller, USDA Forest Service, www.forestryimages.com

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INVASIVE ALIEN PLANT: The Prickly Imposter

(not really Canadian)

COMMON NAME: Canada Thistle, Creeping Thistle
SCIENTIFIC NAME: *Cirsium arvense*
PLANT TYPE: Herbaceous Perennial
PHYSICAL DESCRIPTION:

Form – erect, branched stem
Height – 30cm to 150cm
Leaves – simple, alternate, lance-shaped, deeply lobed, spiny, may clasp stem
Flowers – generally in rounded or umbrella shaped clusters, purple or pink
Fruit – small, dry, single-seeded (up to 4cm long), feathery structure attached to seed base
Blooms in – June through October
Other Features – extensive, creeping roots
NOTE: thistles may be difficult to distinguish from one another – if you're not sure, ask for help

ORIGIN: Eurasia
INTODUCED (early 1600s) FOR: accidental
HABITAT: waste areas, agricultural crops, fields, and meadows
MEANS OF SPREAD: wind-dispersed seed, and spreading roots
PROBLEMS:

- major agricultural weed
- outcompetes native plants in open areas
- some studies indicate that this plant may actually produce chemicals that suppress the growth of other plants (allelopathic)
- large populations are difficult to eradicate

IF YOU HAVE THIS PLANT ON YOUR PROPERTY:

- remove it promptly, and do not put it in your back yard composter (dry and burn, or regular garbage)
- hand-cut plants before they go to seed; repeated cutting will deplete root stocks

Photos: Flower – Chris Evans, University of Georgia, www.forestryimages.com, Infestation – UAF Cooperative Extension Archives, University of Alaska – Fairbanks, www.forestryimages.com, Plant – Mike Townsend, Applied Geomatics Research Group (AGRG)

Appendix C

List of terrestrial invasive alien plants affecting Canadian forests, including the Acadian Forest.

This species list was adapted from Table 1.2e (p.46) of the publication *Criteria and Indicators of Sustainable Forest Management in Canada, National Status 2005*, Canadian Council of Forest Ministers, 2006, Canadian Forest Service, Natural Resources Canada, Ottawa, ON, 154p.

May Impact Forest Ecosystem Integrity

Norway maple (*Acer negundo*) — NS
garlic mustard (*Alliaria petiolata*) — NS
Scotch broom (*Cytisus scoparius*) — NS
tartarian honeysuckle (*Lonicera tatarica*) — NS
white mulberry (*Morus alba*)
Norway spruce (*Picea abies*) — NS
Scots/Scotch pine (*Pinus sylvestris*) — NS
glossy buckthorn (*Rhamnus frangula*) — NS
English ivy (*Hedera helix*)
common gorse (*Ulex europaeus*)

May Impact Natural Regeneration or Plantations

silver birch/European white birch (*Betula pendula*) — NS
diffuse knapweed (*Centaurea diffusa*)
spotted knapweed (*Centaurea maculosa* or *C. biebersteinii*)
bull thistle (*Cirsium vulgare*)

May Impact Urban Forests or Open Areas

wild chervil (*Anthriscus sylvestris*) — NS
ground ivy (*Glechoma hederacea*) — NS
English holly (*Ilex aquifolium*)
privet (*Ligustrum* sp.) — NS
white poplar (*Populus alba*) — NS
European/common buckthorn (*Rhamnus cathartica*) — NS
black locust/false acacia (*Robinia pseudo-acacia*) — NS
Siberian elm (*Ulmus pumila*)

NS = known to be present in Nova Scotia

Appendix D

Control methods for priority invasive alien plants in Nova Scotia's Annapolis Valley.

Control Methods for Priority Invasive Alien Plants in Nova Scotia's Annapolis Valley

Compiled by Marika Godwin, Clean Annapolis River Project (CARP)

1 – glossy & common buckthorn (*Rhamnus frangula & R. cathartica*)

Threats to: forest understories, and wetlands – ACADIAN FOREST

Plant Habitat	Plant Reproduction and Dispersal	Recommended Control Methods (literature)	Additional Control Information (CARP)
▪ Many habitat types: open areas, pastures, wetlands, forests ▪ Both species will occur in forest understories (shade tolerant) ▪ Glossy occurs in wetter, less shaded areas than common ▪ Germination possible in full sun or shade ▪ Throughout Annapolis Valley	▪ Woody shrubs or small trees ▪ Female plants are prolific seed producers ▪ Seed eaten & dispersed by birds ▪ Build up enormous, persistent seedbank in soil ▪ Cut stumps re-sprout vigorously	▪ Identify females for priority removal in large populations (George Alliston, pers. com. 2007) ▪ Hand-pull or dig small plants ▪ Larger plants (up to 6.5cm diameter) can be pulled using a "Weed Wrench" or similar tool (George Alliston, pers. com. 2007) ▪ Cut large plants at base, and paint stump with glyphosate-based herbicide (eg. Roundup) to prevent re-sprouting ▪ Girdle stems at base with a 2-3cm wide cut ▪ Repeated cutting or mowing reduces vigour and prevents seedling establishment ▪ Long-term commitment required to deplete seedbank	▪ Salt water treatments applied to glossy buckthorn seeds had no effect on germination ▪ A single (painted) application of glyphosate-based herbicide (eg. Roundup) to 2 glossy buckthorn cut stumps was 100% effective in preventing re-sprouting

2 – Japanese knotweed (*Polygonum cuspidatum*)
Threat to: riparian areas

Plant Habitat	Plant Reproduction and Dispersal	Recommended Control Methods (literature)	Additional Control Information (CARP)
▪ Adverse habitat types: waste areas, old homesteads, gardens, roadsides ▪ Most commonly occurs in riparian areas, along streambanks ▪ Prefers sun, but germination will occur in complete darkness ▪ Throughout Annapolis Valley	▪ Herbaceous perennial ▪ Extensive creeping rhizomes reach 18m long and 3m deep (possibly more) ▪ Viability of seed unknown, but not a significant means of reproduction ▪ Piece of rhizome or stem as small as 1.27cm can produce a new plant ▪ Rhizome fragments transported in water or fill	▪ Complete eradication of this plant is very unlikely without the use of herbicides ▪ Digging is not recommended as it may spread root fragments and stimulate growth of new shoots ▪ Frequent mowing (every 2-3 weeks during the growing season, and monthly into late fall) may prevent spread, and will weaken the plant over time ▪ 5% acetic acid (vinegar) and salt applications have been ineffective for long-term control ▪ Glyphosate-based herbicides (eg. Roundup) are most effective ▪ Foliar applications may require 2-3 seasons of follow-up treatments ▪ Cut stem applications of glyphosate herbicide (pouring 20-40ml into the well of a cut stem) have been 95% effective ▪ Stem injection methods (injecting 5ml into stem base) have been	▪ A landowner in the Annapolis Valley reported successfully eliminating knotweed by repeatedly mowing over 10 years ▪ Several landowners have reported lack of success using tarps to cover and inhibit knotweed ▪ One landowner reported successfully killing stems by pouring table salt into cut stems ▪ One landowner reported successfully eliminating a small patch of knotweed by repeated cutting and digging of roots over several years ▪ One landowner attempted control by injecting stems with consumer grade herbicides Roundup and Killex, but had no success in killing knotweed

		100% effective ▪ **NOTE:** It is illegal to use a pesticide in any way that is not specified on the product label. ▪ Long-term commitment required	

3 – purple loosestrife (*Lythrum salicaria*)

Threat to: wetlands

Plant Habitat	Plant Reproduction and Dispersal	Recommended Control Methods (literature)	Additional Control Information (CARP)
▪ Preferred habitat is wetlands, and other low wet ground, including ditches ▪ Still planted in gardens ▪ Throughout Annapolis Valley, but more common at western end	▪ Perennial herb ▪ Prolific seed producer (millions per plant per year) ▪ Build up enormous, persistent seedbank in soil ▪ Main dispersal mechanism is wind, but may also be aided by waterfowl, other wetland animals, and water ▪ "Sterile" ornamental varieties are known to produce viable seed when fertilized by naturalized plants ▪ Reproduces vegetatively by adventitious shoots and from root fragments	▪ Individual plants or small populations can be hand-pulled or dug, entire rootstock must be removed ▪ Glyphosate-based herbicides (eg. Roundup) are effective ▪ Follow-up may be required to deplete seedbank ▪ Preventing spread of large populations has been achieved with biological control (European *Galerucella* sp. beetles) ▪ NOTE: It is illegal to use a pesticide in any way that is not specified on the product label. ▪ Long-term commitment required	NA

4 – common reed (*Phragmites australis*)

Threat to: wetlands

NOTE: There is a native variety of common reed, and the native and invasive varieties are difficult to distinguish.

Plant Habitat	Plant Reproduction and Dispersal	Recommended Control Methods (literature)	Additional Control Information (CARP)
▪ Grows in wet areas: marsh and lake edges, floodplains, ditches ▪ Tolerates brackish water, occurs on salt marsh edges ▪ Populations from Middleton west in the Annapolis Valley ▪ Several Valley populations have been confirmed as the non-native variety	▪ Perennial grass ▪ Seed dispersed by wind or birds, but viability is typically low ▪ Spread is mostly vegetative, by growth of rhizomes (up to 10m per year on rich sites) and stolons ▪ Moving water transports rhizome fragments to new sites	▪ Cutting in late summer for several years may be effective ▪ Winter cutting of stalks reduces spring growth, but requires many years of follow-up cutting (Pierre Martel, pers. com. 2007) ▪ Long-term commitment required	▪ Interestingly, the cut stalks of this plant are used for thatching roofs (see the Historic Gardens in Annapolis Royal for an example)

5 – garlic mustard (*Alliaria petiolata*)

Threat to: forest understories – ACADIAN FOREST

Plant Habitat	Plant Reproduction and Dispersal	Recommended Control Methods (literature)	Additional Control Information (CARP)
▪ Often establishes in disturbed habitats, then moves into undisturbed habitats ▪ Shade tolerant, but will also succeed in full sun ▪ Threatens forest understories (upland sites) ▪ Only known location in the Annapolis Valley (and in all of NS) is in Grand Pré, with some satellite occurrences in lower Wolfville and Hantsport	▪ Biennial herb ▪ Reproduces by seed only ▪ 1st year plant is a rosette ▪ 2nd year plant is an erect stem that flowers, produces seed, then dies by late summer ▪ May produce thousands of seeds per plant ▪ Most seed falls close to parent plant ▪ Main dispersal mechanism is humans ▪ Dispersal may be aided by birds, rodents, deer, wind, and flooding ▪ Seed may remain viable for up to 5 years in the soil	▪ Target seed prevention ▪ Cut 2nd year plants after flowering ▪ Hand-digging will work, but entire rootstock must be removed (easiest in moist soil) ▪ Cut or pulled plants must be bagged and disposed of to prevent seed production (ie. do not leave cut flowering stems on the ground) ▪ Regular mowing will prevent seed production ▪ Glyphosate-based herbicides (eg. Roundup) are effective ▪ 5 years (or more) of follow-up required to deplete seedbank	NA

6 – Scotch Broom (*Cytisus scoparius*)

Threat to: open woodlands

Plant Habitat	Plant Reproduction and Dispersal	Recommended Control Methods (literature)	Additional Control Information (CARP)
▪ Succeeds in open areas: ditches, embankments, open woods ▪ Serious invader of open woodlands in western Canada and the US ▪ Popular ornamental plant, seen in Christmas arrangements ▪ Common along roadsides in Shelburne County ▪ Only two known locations in the Annapolis Valley are in Lawrencetown and New Albany	▪ Perennial woody shrub ▪ Reproduces primarily by seed ▪ Exploding seed pods spread seed (up to 10,000 per plant per year) up to 6m from the parent plant ▪ Additional dispersal mechanisms include water and insects ▪ Cut stems will re-sprout ▪ Seed may remain viable for up to 60 years in the soil	▪ Target seed prevention ▪ Hand-pull or dig small plants, removing as much of root mass as possible ▪ Deep roots make manual removal labour intensive ▪ Larger plants can be pulled using a "Weed Wrench" or similar tool ▪ Repeated mowing will deplete root stores ▪ Repeated grazing by goats may eliminate plants ▪ Cut stem applications of triclopyr—based herbicides (eg. Garlon) are effective ▪ Long-term follow-up required to deplete seedbank	NA

7 – multiflora rose (*Rosa multiflora*)

Threat to: open woodlands, and agricultural areas (fields, pasture)

Plant Habitat	Plant Reproduction and Dispersal	Recommended Control Methods (literature)	Additional Control Information (CARP)
▪ Several habitat types: forest openings, forest edges, fields, and prairies ▪ Problematic along fencelines and in pastures ▪ Will tolerate shade, but is more prolific in full sun ▪ May be intentionally planted for ornamental roses, attracting birds, or fencerows ▪ Common throughout the Annapolis Valley	▪ Perennial woody shrub ▪ Reproduces by seed and vegetatively by rooting of arched canes ▪ Prolific seed producer (average of one million per plant per year) ▪ Birds are primary seed dispersal mechanism ▪ Germination is enhanced by passing through the digestive tract of a bird ▪ Seed may remain viable for up to 20 years in the soil	▪ Frequent, repeated mowing throughout the growing season (3-6 times) may cause high mortality over several years ▪ Individual plants may be cut at the base, and rootstock dug out ▪ Foliar applications of glyphosate-based herbicides (eg. Roundup) have been effective ▪ Painting freshly-cut stumps with glyphosate or triclopyr-based herbicides is effective at preventing re-sprouting ▪ Long-term commitment required to deplete seedbank	NA

8 – Canada thistle (*Cirsium arvense*)

Threat to: major agricultural weed (fields, pasture), prairies, and meadows

Plant Habitat	Plant Reproduction and Dispersal	Recommended Control Methods (literature)	Additional Control Information (CARP)
▪ Many habitat types: fields, pasture, roadsides, ditches, floodplains, forest openings, prairies, and disturbed areas ▪ Common throughout the Annapolis Valley	▪ Herbaceous perennial ▪ Extensive spreading root system reaches 6m long and 7m deep ▪ Rapid vegetative expansion in one growing season ▪ Also reproduces by wind-blown, and bird-dispersed seed ▪ Seed may remain viable for more than 20 years in the soil	▪ Frequent mowing may prevent spread, and will weaken the plant over time (effective over several years) ▪ Small plants can be pulled with a hand-weeding tool (fork) ▪ Foliar applications of herbicide (glyphosate or acetic acid) will top-kill the plant, but may not be effective at killing roots ▪ Prevent seed production by cutting flower heads before they go to seed	NA

9 – Oriental/Asiatic bittersweet (*Celastrus orbiculatus*)

Threat to: forest understories – ACADIAN FOREST

Plant Habitat	Plant Reproduction and Dispersal	Recommended Control Methods (literature)	Additional Control Information (CARP)
▪ Several habitat types: forests, forest edges, fields, fencerows, old homesteads, coastal areas, and salt marsh edges ▪ Seedlings can establish in dense shade ▪ Still planted in gardens ▪ Fruit commonly used in Christmas and dried flower arrangements ▪ West Paradise, Upper Clements, and coastal areas along the Bay of Fundy (possibly other locations)	▪ Perennial, deciduous woody vine ▪ Female plants are prolific seed producers ▪ Seed eaten & dispersed by birds ▪ Build up large, persistent seedbank in soil ▪ Expand vegetatively by root suckering ▪ Cut plants will send up root suckers	▪ Frequent mowing (weekly) will discourage growth ▪ Small plants are easily hand-pulled ▪ Vines climbing into trees should be cut at 1-2m height, and ground level ▪ Cut stumps will sucker prolifically ▪ Suckers can be eliminated with foliar applications of triclopyr-based herbicide (eg. Garlon) ▪ Foliar applications of glyphostae-based herbicides (eg. Roundup) have been ineffective in killing roots ▪ Long-term commitment required to deplete seedbank	NA

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