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Broad Cove Invasive Species Recommendations

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Map of Broad Cove, with trails highlighted by the blue line and property border highlighted by the green line

Introduction

Broad Cove, located in the Town of Riverhead, Suffolk County, New York, is a 100-acre waterfront parcel on Flanders Bay that was once a duck farm. The site was purchased by the Peconic Land Trust in December 2021. The site is protected in perpetuity for wildlife habitat, passive recreation, water quality protection, and climate change resiliency. Interest has been expressed by the New York State Department of Environmental Conservation to partner in protecting the property.

The site is adjacent to Indian Island, a Suffolk County Park that has known nesting populations of long-eared bats (*Myotis septentrionalis*; S1, G2G3). Due to its proximity to Indian Island, Broad Cove is considered a potential nesting habitat for these state and globally rare bats.

On August 2, 2022, the LIISMA team of Bill Jacobs, Abby Bezrutczyk, Haley Gladitsch, Melody Penny, and Katharine Stirber conducted an invasive species rapid assessment of Broad Cove, accompanied by Josh Halsey and Jessie McSwane-Marcus of the Peconic Land Trust and Jade Blennau of the Peconic Estuary Partnership.

For effective and economical invasive species management, LIISMA prioritizes:

- conserving and restoring species and communities of highest ecological importance and quality, AND
- managing high-impact invasive species where their abundance is low, and management is feasible.

Ecological Communities at Broad Cove

Referring to Ecological Communities of New York (Edinger et al. 2014), LIISMA observed several ecological communities at Broad Cove, including successional southern hardwoods (variant), successional old field, successional maritime forest, maritime red cedar forest, and a mosaic of estuarine intertidal communities. These communities often transition into one another. Much of the area shows signs of human disturbance from past land uses. This year, several buildings on the site were demolished and immediately cover-cropped with winter rye.

The *successional southern hardwoods* community is a variant dominated by non-native Siberian elm (*Ulmus pumila*) rather than the characteristic native American elm (*U. americana*) and slippery elm (*U. rubra*). Characteristic species observed include box elder (*Acer negundo*), silver maple (*Acer saccharinum*), and eastern red cedar (*Juniperus virginiana*). Several introduced species were observed, including black locust (*Robinia pseudoacacia*), tree-of-heaven (*Ailanthus altissima*), Norway maple (*Acer platanoides*), and white mulberry (*Morus alba*).

The *successional old fields* are dominated by a variety of forbs and grasses, including goldenrods (*Solidago* spp.), common milkweed (*Asclepias syriaca*), Queen Anne's lace (*Daucus carota*), invasive Canada thistle (*Cirsium arvense*), and non-native grasses. A small patch of native little bluestem (*Schizachyrium scoparium*) and switch grass (*Panicum virgatum*) was observed. Trees, shrubs, and vines include staghorn sumac (*Rhus typhina*), eastern red cedar, and round-leaved bittersweet (*Celastrus orbiculatus*). Eastern tailed blue (*Everes comyntas*) and monarch (*Danaus plexippus*) butterflies were observed.

Successional maritime forest was observed along coastal marsh areas. Overstory trees include black oak (*Quercus velutina*), post oak (*Quercus stellata*), and black cherry (*Prunus serotina*). Eastern red cedar is present. Native vines include wild grape (*Vitis* spp.), poison ivy (*Toxicodendron radicans*), Virginia creeper (*Parthenocissus quinquefolia*), and greenbrier (*Smilax* spp.). Bayberry (*Morella caroliniensis*) is a commonly observed understory shrub. Introduced species include black locust, tree of heaven, round-leaved bittersweet, honeysuckle

vine (*Lonicera japonica*), multiflora rose (*Rosa multiflora*), and wineberry (*Rubus phoenicolasius*). Invasive Bohemian knotweed (*Reynoutria* × *bohemica*) was observed in the vicinity of this and other communities.

Maritime red cedar forest was observed, including an area across a creek which is thought to be part of the property or possibly adjoining the property and observed from a distance. Eastern red cedar is the dominant tree, with other trees including post oak and black cherry. Shrubs and vines include bayberry, groundsel tree (*Baccharis halimifolia*), poison ivy, and Virginia creeper. Eastern prickly pear (*Opuntia humifusa*) is common, including in open grassy areas that have been maintained by mowing. Remnant areas of maritime red cedar forest may occur in locations that have been impacted by past land uses.

The *estuarine intertidal communities* observed form a complex mosaic along the coastline and within the surrounding creeks and bays. Ecological communities here include salt shrub, high salt marsh, low salt marsh, and estuarine common reed marsh. Salt shrub species include groundsel tree, saltmarsh elder (*Iva frutescens*), and salt-meadow cord grass (*Sporobolus pumilus*). High salt marsh species include salt-meadow cord grass and sea lavender (*Limonium carolinianum*). Low salt marsh is dominated by smooth cord grass (*Sporobolus alterniflorus*). These communities are often invaded by invasive common reed (*Phragmites australis*). Dense stands of common reed form their own ecological community: estuarine common reed marsh.

Assessment of Existing Conditions

Broad Cove appears to be well-suited for the stated purposes of wildlife habitat, passive recreation, water quality protection, and climate change resiliency. The site features an array of valuable ecological communities, from estuarine intertidal communities to successional old fields. The site's past land use as a duck farm has left some areas negatively impacted by invasive species, with the most notable species being Siberian elm, Norway maple, tree-of-heaven, autumn olive (*Elaeagnus umbellata*), bush honeysuckle (*Lonicera* spp.), round-leaved bittersweet , invasive common reed, Bohemian knotweed, silvergrass (*Miscanthus sinensis*), mile-a-minute weed (*Persicaria perfoliata*), Canada thistle, and mugwort (*Artemisia vulgaris).* The LIISMA team looked for southern pine beetle (*Dendroctonus frontalis*) and spotted lanternfly (*Lycorma delicatula*); none were observed. Broad Cove is of such significant regional importance that invasive species should be managed, and natural areas should be conserved and restored.

Below is a list of species observed (in random order).

Species Observed 8/2/2022

Invasive	Non-native	Native
- Multiflora rose (*Rosa multiflora*) - Porcelain berry (*Ampelopsis brevipedunculata*) - Vine honeysuckle (*Lonicera japonica*) - Round-leaved bittersweet (*Celastrus orbiculatus*) - Black locust (*Robinia pseudoacacia*) - Bush honeysuckle (*Lonicera* spp.) - Wineberry (*Rubus phoenicolasius*) - White mulberry (*Morus alba)* - Mugwort (*Artemisia vulgaris)* - Tree-of-heaven (*Ailanthus altissima)* - Norway maple (*Acer platanoides)* - Garlic mustard (*Alliaria petiolata)* - Bohemian knotweed (*Reynoutria × bohemica*) - Common reed (*Phragmites australis*) - Siberian elm (*Ulmus pumila*) - Silvergrass (*Miscanthus sinensis*) - Autumn olive (*Elaeagnus umbellata*) - Mute swan (*Cygnus olor*) - Canada thistle (*Cirsium arvense*) - Mile-a-minute weed (*Persicaria perfoliata*)	- Non-native grasses* - *Malus* spp. - Wild lettuce (*Lactuca* spp.) - Queen Anne's lace - Rye (*Secale cereale*) - Crab apple (*Malus* spp.) - Deptford pink (*Dianthus armeria*) - Common mullein (*Verbascum thapsus*) - Hoary alyssum (*Berteroa incana*) - Broad leaf plantain (*Plantago major*) - Narrow leaf plantain *(Plantago lanceolata*) *Some non-native grasses may be invasive. Grasses were generally not part of this assessment and should be inventoried.	- Virginia creeper (*Parthenocissus quinquefolia*) - Poison ivy (*Toxicodendron radicans*) - Pokeweed (*Phytoloccia americana*) - Deer tongue grass *(Dichanthelium clandestinum)* - Goldenrods (*Solidago* spp.) - Black cherry (*Prunus serotina*) - Grape (*Vitis* spp.) - Staghorn sumac (*Rhus typhina*) - Winged sumac (*Rhus copallinum)* - Common milkweed (*Asclepias syriaca)* - Ragweed (*Ambrosia artemisiifolia*) - Black oak (*Quercus velutina)* - Scrub oak (*Quercus ilicifolia*) - Post oak (*Quercus stellata*) - Pitch pine (*Pinus rigida*) - Pokeweed (*Phytolacca americana*) - Ash-leaved maple (*Acer negundo*) - Virginia creeper (*Parthenocissus quinquefolia*) - Green heron (*Butorides virescens*) - Belted kingfisher (*Megaceryle alcyon*) - Wild turkey (*Meleagris gallopavo*) - Osprey (*Pandion haliaetus*) - Spicebush swallowtail (*Papilio troilus*) - Monarch (*Danaus plexippus*) - Eastern red cedar (*Juniperus virginiana*)

		- Smooth cord grass (*Sporobolus alterniflorus*) - Saltmarsh elder (*Iva frutescens*) - Sea lavender (*Limonium carolinianum*) - Silver maple (*Acer saccharinum*) - Hemp dogbane (*Apocynum cannabinum*) - Hawthorn (*Crataegus* spp.) - Bayberry (*Morella caroliniensis*) - Switch grass (*Panicum virgatum*) - Common yarrow (*Achillea millefolium*) - Common greenbrier (*Smilax rotundifolia*) - Eastern prickly pear (*Opuntia humifusa*) - Eastern tailed blue (*Everes comyntas*)

Invasive Species Management Strategies

In general, successful invasive species management requires a variety of integrated and adaptive management approaches, including the following:

Prevention and Early Detection and Rapid Response (EDRR)
Preventing new infestations from becoming established is the most cost-effective method of invasive plant management. This means identifying and conserving high-priority conservation targets before they are degraded and damaged by invasive species. Prevention includes education and outreach, together with managing pathways of invasion, to prevent or minimize the introduction and spread of invasive species.

EDRR focuses management on small infestations of high-impact invasive species that threaten conservation targets (e.g., rare species and ecological communities) and where management is feasible. EDRR for emerging invasive species is more likely to be successful than trying to control large, widespread infestations. (U.S. Department of the Interior, 2022)

Cultural Control
Cultural control involves the establishment of competitive native vegetation that can resist invasion. Invasive plants are more likely to invade disturbed areas where native vegetation is stressed or damaged, or where soil has been disturbed. Restoring resilient native ecosystems that are able to resist invasion, and quickly responding to new invasions before they take hold,

is more effective than managing wide-spread, established infestations. (U.S. Department of Agriculture, 2022)

Manual and Mechanical Controls

Manual and mechanical controls consist of methods that kill or suppress weeds through physical disruption. This includes pulling, digging, cutting, girdling, and mowing. Success of manual and mechanical controls are dependent on the life cycle of the target species.

Hand pulling and digging can sometimes be effective on annual and biennial species; however, it is important to take the potential impacts of soil disturbance into consideration. Repeated pulling and digging may be required to wear out a seed bank. For perennial species, hand pulling and digging can be effective if repeated over several seasons, depending on the species. If the roots and rhizomes of perennial plants cannot be removed without undue harm to native species and communities, herbicide can be an effective alternative.

Manual control includes spading and underwater cutting of phragmites, which can be very effective at controlling small patches.

Properly timed mowing can be used to suppress invasive plants by preventing or decreasing seed production. Mowed perennial invasive plants will likely resprout and mowing will need to be repeated. Some invasive plants will set seed at a reduced height so that combining mowing with herbicide application may be effective (spot treat the lower resprouts).

The repeated mowing of invasive perennial plants can cause the plants to weaken over time, although some may continue to resprout. This can sometimes be more effective when combined with herbicide application (e.g., controlling mugwort). Mowing, if timed and located properly, can help native plants gain a competitive advantage. Note that when native grasses are present or desired, it is important to not cut native grasses lower than 6 to 10 inches in height. Low mowing native grasses, for example at typical lawn height, can be very damaging and often result in weed invasion. It is more difficult for invasive plants to invade and survive in native plant meadows if they are *not* mowed with any regularity. (The Nature Conservancy, 2001)

Chemical Control

Herbicide application can provide the most effective and efficient method of managing invasive plants with the least harmful disturbance. Perennial invasive plants may resprout vigorously when cut (e.g., invasive knotweed). Herbicide application methods include foliar (applied to leaves), cut stem, and stem injection. Selective spot treatments of herbicide can control perennial invasive plants while minimizing adverse impacts to non-target organisms and soil disturbance. Wicking or wiping herbicide (with a wand or sponge applicator) can be used to target individual plants.

Cut stumps and stems of perennial and woody invasive species can be treated with herbicide immediately after cutting so the plant does not grow back. This is known as “cut stump treatment.” Additionally, hollow-stemmed plants like invasive knotweed can be treated with a

stem injector that injects herbicide directly into each stem, thereby transferring herbicide to underground rhizomes. (UNH Extension, 2021)

Biological Control
Biological control is the introduction of natural predators for the purpose of controlling invasive species. This includes the use of animals, fungi, or diseases typically from the targeted species' home range to control invasive populations. These are often co-evolved herbivores (e.g., insects) from the area of origin of the invasive plant. (University of Rhode Island, 2017)

High-Priority Management Targets

Small infestations of high impact invasive species on otherwise healthy sites should be given high priority for treatment, including common reed, Canada thistle, silver grass, and Bohemian knotweed. In this section, key areas to protect are highlighted alongside the target species.

Common Reed

Protect this area: While phragmites is in high abundance in some areas of this property, care should be taken to prevent its further spread in areas where it is not yet established. This is particularly important for the eastern shoreline of the upper peninsula, where phragmites grow concurrently with several native species, and are present in a low enough abundance to manage manually. In this area, a spading method can be used to carefully sever the rhizome underground. In mid-summer (late July - early August) with a sharp spade or shovel, cut the rhizome of phragmites at the base of the stem at a 45˚ angle. Avoid disturbing the soil; simply insert, cut, and remove the spade, rather than levering or digging. Collect phragmites stems and dispose of them in garbage bags offsite. As stems regrow, this method can be repeated 3 times in a season for several years. This activity can be suitable for volunteers.

Red outline: protect area from phragmites

Phragmites is present in high abundance elsewhere on the property, forming a phragmites marsh. As the sizes and densities of these populations are not feasible to eradicate at this time, they may be left alone. If anything, consider keeping some windows clear of phragmites to create viewing areas. (Connecticut Agricultural Experiment Station - Valley Laboratory, 2015)

Canada thistle

A 20-foot-long patch of Canada thistle *(Cirsium arvense)* was found along the trail in the successional old fields. This species can spread rapidly by seed and should be a target for management. Mowing when this species flowers, but before it sets seed to avoid spreading seeds, will be important. The optimal window for mowing this species is May to early June. (U.S. Department of Agriculture, 2022)

Protect this area: The westernmost corner of the old field hosts a variety of native species, including milkweed, switchgrass, and little bluestem, making the area a high priority for protection from invasive species. To accomplish this, mow this area first, and areas with higher abundance of invasive species second. This limits the potential for the spread of invasive seed or plant parts that can happen accidentally with mowing.

Red outline: control Canada thistle
White outline: quality area to protect

Silver grass

At the southern tip of the central island/peninsula (40.933, -72.623), an individual of silver grass, also known as miscanthus, is present. As this species can readily reproduce in both high-light and forested environments, especially successional fields, this individual is an important target for removal. Digging this species up, being sure to remove the root crown, and disposing of the species off site, can be effective in managing it. Monitor this area for other resprouts and manage accordingly. (U.S. Department of Agriculture, 2019)

Protect this area: The disturbed grounds of the recently removed building on the island/peninsula can be an ideal location for early-colonizing invasive species. Planting native

Red outline: protect disturbed area from encroaching species; control miscanthus at southern tip.

grasses, and monitoring for invasive species spread can help protect this open area.

Bohemian knotweed

An approximately 300 square-foot stand of bohemian knotweed is present on the southwest facing shore of the property. Being one of the only stands on the property, this area should be targeted for management. While knotweed can be mowed, this method is not highly recommended as it can easily spread the invasive plant, and knotweed can regenerate from stem or rhizome fragments.

Injecting herbicide into knotweed stems with a diameter larger than a penny (~0.5-0.75" diameter minimum), at the base of the stem (second node) during August–September can directly target the persistent rhizome system. This is because energy storage in the plant is moving from the shoots to the rhizomes at this time, and any applied herbicide follows this flow. This method eliminates herbicide drift. Dead canes can be discarded, and re-emerging shoots can be mowed, or re-injected (depending on diameter). However, this method requires letting the knotweed grow to a suitable diameter before treatment, so you should stop mowing from July onwards in preparation for this method. Herbicide use will require permitting and a licensed applicator. (Minnesota Department of Agriculture, 2022)

Medium-Priority Management Targets

These species, including Siberian elm, tree of heaven, mile-a-minute vine, bittersweet, porcelain berry, and vine honeysuckle may be candidates for management as resources allow. Preventing the spread of these species into higher quality areas remains important.

Bittersweet, Porcelain Berry, and Vine Honeysuckle

Invasive woody vines present on the property, such as bittersweet, porcelain berry, and vine honeysuckle, can cause irreparable damage to native trees and shrubs. Trees and shrubs maintain shade, which can help decrease the presence of invasive species. Vines can increase the weight of individual trees and promote increased moisture on the bark and branches, both of which can increase stress. Additionally, competing root systems work alongside girdled bark layers to prevent nutrients from flowing through the tree, thus increasing their susceptibility to disease, which can lead to total mortality. Vines can cause trees to become trailside hazards as this increased weight on the tree can cause branches to break during heavy weather-related events.

Manage bittersweet by cutting the vine at its base. Older, larger vines may die back more rapidly than younger vines, which may require repeated cutting, and/or cut stump treatment with a 20% solution of glyphosate. Do not attempt to remove vines from tree trunks or up in the branches by pulling on the end of the vine. This may damage the bark and reveal damaged branches that may fall and cause injury.

Chemical control of vines may also include a basal bark treatment in autumn by applying a 20% solution of triclopyr mixed in bark oil all around the base of the stem, in a band about six inches wide near the ground. Another method would be to spray the leaves during the growing season, using a broadleaf herbicide to retain grasses and avoid creating large dead zones. Herbicide use will require permitting and a licensed applicator. (Mitchell, 2022)

Siberian Elm

The Siberian elm is a dominant tree species found in the eastern portion of Broad Cove. The species is native to northern China, eastern Siberia, and Korea. It is an aggressive invasive species that can out-compete desirable native vegetation. Siberian elm can hybridize with our native slippery elm (*Ulmus rubra*).

Siberian elm grows to 70 feet in height and has an open crown. Leaves are alternate, elliptical, smooth, singly toothed, and approximately ½ to 2 ½ inches in length. The leaves look similar to native elms except they are smaller and have a single tooth margin. This is a fast-growing tree that is very adaptable, often growing under adverse conditions, such as poor soils, low moisture, cold winters, droughts, and windy conditions. Siberian elm reproduces aggressively by windborne seeds (samaras) and sprouting from roots. It typically establishes in pastures, grasslands, and along roadsides.

Siberian elm is shade intolerant and moderately salt tolerant. It is resistant to Dutch elm disease; however, it is highly susceptible to damage from many other insects, parasites, and diseases. It has brittle wood which is easily damaged by high winds and winter storms. Trees often display dead limbs and branches. Large limbs are subject to splitting from the crotches of older trees. Large limbs on older trees can easily break off and seriously injure people or property.

Once established, Siberian elm can be difficult to control. Newly emerged seedlings can be mowed or hand pulled. Small trees with stem diameters less than 2 ½ inches can be hand grubbed with a hoe or pulled with a weed wrench. Larger trees can be cut close to the ground but expect resprouting from the stump and roots. Cutting is more effective if followed immediately by herbicide treatment (i.e., cut stump treatment). Cut stump treatment can be conducted during most of the year; however, it should not be conducted during heavy sap flow in early spring. Late summer through fall is often the optimal time for cut stump treatment. Herbicide use will require permitting and a licensed applicator.

Controlling young seedlings and saplings of Siberian elm may be preferable over attempting to control mature trees. Controlling mature trees may not be a high priority at Broad Cove, relatively speaking, as long as they are away from trails and areas frequented by visitors. Check to see if mature Siberian elms are providing habitat for northern long-eared bat (*Myotis septentrionalis*) prior to any control work.

Planting native trees or maintaining an open grassland while leaving some mature Siberian elms (where it is safe to do so) will gradually phase out Siberian elm over time. Care should be

taken to protect native tree seedlings or saplings from deer and rabbit herbivory. (Gilman & Watson, 2015)

Tree of heaven

Tree of heaven is abundant on the central island/peninsula and western portion of the property, including along the margin of the successional old fields. As this tree is the primary host for another invasive species, spotted lanternfly, these trees can be important monitoring locations for the leafhopper (discussed in further detail below).

It is not recommended to control tree of heaven by cutting or other means of manual control, as this can result in resprouting that is very attractive to spotted lanternfly. Applying a basal bark treatment of herbicide is a best management practice for this species. Herbicide use will require permitting and a licensed applicator. (Wurzbacher, Jackson, & Gover, 2020)

Mile-a-Minute Vine

Mile-a-minute vine was found on the western shore of the property. As an herbaceous annual vine, mile-a-minute dies back each year and grows back in the spring via seed. Mile-a-minute blankets and smothers native plants and can easily spread to new locations through dispersal of its numerous fruits and vigorous seeds. Seeds can remain viable in the soil for up to six years, which can make eradication more challenging, and in some cases, impossible. Long term management of mile-a-minute is required to suppress the plant in order to give native species an opportunity to compete with this invasive vine.

While mile-a-minute can be controlled through repeated pulling, protective gear such as leather gloves, and long sleeves/pants are required to prevent injury. Pull mile-a-minute before June and leave on site to dry. Cutting at ground level using a string trimmer may be effective, however if stem nodes remain after cutting, the vine will likely regrow. Chemical treatment using pre-emergent herbicides can help prevent the germination of mile-a-minute on site and should be applied two to three weeks before expected germination. While this can vary year to year, a general guideline is to apply such an herbicide mid-March. Post emergence herbicides such as aquaneat or garlon 3A may be used May-September where grasses are present as it does not harm these species. Herbicide use will require permitting and a licensed applicator.

Biological control of mile-a-minute may be used for this infestation, as the mile-a-minute weevil (*Rhinoncomimus latipes*) has been found to have success in mile-a-minute management. The weevil lays its eggs on the leaves, stems, and buds of the plant, and after hatching, the larvae will feed on the plant until they pupate and fall into the soil. The weevil will not eradicate mile-a-minute, but it can stunt the plant growth.

Avoid moving soil contaminated with mile-a-minute to prevent novel infestations. As well, do not mow areas with mile-a-minute after June when fruit may have already set. (CCE, 2019)

Low-Priority Management Targets

These species, including garlic mustard, mugwort, Norway maple, autumn olive, and bush honeysuckle are common invasive species on Long Island. Focus on preventing the spread of these species by monitoring and managing their spread into new, quality areas. Control recommendations are included for reference.

Garlic mustard

While garlic mustard is present in some forested areas of the property, its management should not be a high priority. Recent research out of the Blossey Lab from Cornell suggests that over time, populations of garlic mustard decline on their own, potentially through negative interactions with soil biota. (Blossey, 2020)

Mugwort

While mugwort is present on the property, it is important to limit its spread into high-quality areas such as the successional fields. Suppressing mugwort populations can help towards this goal. Do not mow or till mugwort, as root pieces can propagate new plants. Mugwort can be smothered by using black plastic or layers of newspapers covered with mulch. Though difficult, it is also possible to suppress populations by continuous pulling or removal of the leaves. A systemic herbicide can also be applied to target the root system; herbicide use will require permitting and a licensed applicator. (CCE, 2019)

Norway maple

Norway maple is present near the entrance of the property. To prevent its spread into higher quality areas, seedlings of Norway maple found in other areas can be pulled from moist soil before they get too large. Should managers want to control larger trees, other types of manual removal include digging out saplings and root systems or cutting down large trees. Girdling the trees by removing the bark layer (including the cambium) can also be performed but is most effective in the spring. Leftover stumps can be ground out or new growth that develops from old stumps can be cut in future years. (CCE, 2019)

Autumn olive

Autumn olive was detected near the footbridge joining the island/peninsula (40.933, -72.622) and is likely present in other areas. Preventing the spread of this species into higher quality areas, or from colonizing newly disturbed areas, may be a priority.

Manual control: Seedlings and sprouts of this species can be pulled by hand when the soil is moist enough to insure removal of the root system. Root fragments may resprout if left in the ground. Cutting is most effective after trees have begun to flower, but before they produce seeds. Because autumn olive spreads by suckering, re-sprouts are common after cutting. Cutting is an initial control measure and success will require either herbicide application or repeated cutting. Dispose plant parts in a black plastic bag.

Chemical options: Foliar applications may be adequate for small patches; glyphosate, triclopyr and dicamba have all been used with positive results. The recommended dilution of glyphosate in this case is a 1-2% solution. Research has shown that the best time for this application is in late August or September when the plant is actively translocating materials to the roots. Dicamba should be applied in late June at a rate of 4 lbs./gal. (2 qts./100 gal./acre) with a surfactant. This prescription provided 90% mortality. Cut-stump treatment is accomplished by cutting the main stem of the plant and then painting the herbicide on the stump. Glyphosate is effective and commonly used. A 10- 20% dilution is recommended for painting on stumps. Reports have demonstrated that stem injections applied in March of triclopyr alone or in combination with 2,4-D provided excellent control of autumn olive even at very low concentrations. Herbicide use will require permitting and a licensed applicator. (NRCS, 2022)

Bush honeysuckle

Mechanical Control: Pulling seedlings and mature shrubs, and repeated clipping of shrubs. Effective mechanical management requires a commitment to cut or pull plants at least twice a year for a period of three to five years. Cuttings should be done in the growing season (spring and fall). Manual control using a Weed Wrench is appropriate for small populations or where herbicides cannot be used. Any portions of the root system not removed can resprout. Disturbed, open soil can support rapid re-invasion; managers must monitor their efforts at least once per year and repeat control measures as needed. Limit soil disturbance whenever possible. Winter clipping should be avoided as it encourages vigorous re-sprouting.

Chemical Control: Most managers report that treatment with herbicides is necessary for large shrub honeysuckle populations. Formulations of glyphosate and triclopyr have been used as foliar sprays or cut stump sprays and paints with varying degrees of success. Treatment may include applying a 25% solution of glyphosate or triclopyr to the stump, being sure to cover the outer, top 20% of the cut stem. Herbicide must be applied immediately following the cutting. This treatment is best applied late in the growing season when the plant is transporting nutrients to its root system (August-October). For foliar treatments a 2% solution of glyphosate or triclopyr can be used. Both glyphosate and triclopyr should be applied to the foliage late in the growing season. Do not cut down treated plants for at least a full growing season. A basal bark method may be effective throughout the year as long as snow cover does not prevent spraying to the ground level. Apply a mixture of 25% triclopyr and 75% horticultural oil to the basal parts of the shrub to a height of 12-15 inches from the ground. Be sure to treat the entire circumference of the stem in a band at least 12 inches wide. Thorough wetting is necessary for effective control; spray until runoff is noticeable at the ground line. Do not apply to bark that’s wet from heavy dews and rain. Herbicide use will require permitting and a licensed applicator.

Disposal: Small, pulled shrubs should be disposed of in garbage bags. Larger, pulled shrubs may be piled or piled and burned, roots up, to prevent reestablishment. Cut stems may be piled or piled and burned. (NRCS, 2022)

Monitoring for Emerging Invasive Species

Some species in the vicinity of the broad cove property have the potential to spread to the site and cause detrimental impacts.

Tree of heaven is an important host species for the invasive planthopper, **spotted lanternfly.** Monitoring for spotted lanternfly can be accomplished in a few ways: a) searching for adults on tree of heaven in late August through September, b) searching for egg masses on tree of heaven trunks from November to April, and/or c) installing a spotted lanternfly trap from the Department of Agriculture and Markets, monitored every two weeks from May-October. (Bezrutczyk, 2022)

Southern pine beetle, an insect originating in the Southern U.S, has the potential to damage and kill pitch pine trees located within the property. To monitor for this insect, look for signs of browning/reddening of the tree crown, and pitch tubes 10ft and higher on the tree trunk. (NYSDEC, 2022)

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