

Management Case Studies

[Private landowner, Charlotte, VT \(CTRL Click to go to case study\)](#)

Charlotte

Prior to treatment, the wooded areas were very heavily infested with shrub honeysuckles and common buckthorn and a few plants of Japanese barberry. Plants ranged in size from small seedlings/saplings to mature, fruiting plants. Contractors were originally concerned that treatment work on this property might not be feasible or successful due to the heavy level of infestation.

[Marsh-Billings-Rockefeller National Historical Park in Woodstock, Vermont \(CTRL Click to go to case study\)](#)

Woodstock

Area Identification: The entire park has been surveyed for invasive plants and the majority of the park has been treated.

Target Invasive Plant Species: The dominant invasive plant species at the park are bush honeysuckles, common buckthorn, autumn olive, garlic mustard, black swallow-wort, European alder, Japanese barberry, Norway maple, winged euonymus, and black locust. The park hosts several other less common and less aggressive invasive plants, and will likely be tackling some of those over time.

[Equinox Highlands Natural Area, Southern Vermont Arts Center, Manchester, VT \(CTRL Click to go to case study\)](#)

Manchester

Area Identification: The Equinox Highlands Natural Area is 2,276 acres and is owned by The Nature Conservancy. Invasive plant treatment was focused on 312 acres of the SVAC parcel (the parcel was previously owned by the SVAC and purchased by TNC in 2010). On the 312 acres of the SVAC land, invasive plant treatment was concentrated on the lower slopes of the property, between 1100 and 1600 feet in elevation. The area is wooded, bordered by a meadow and adjacent parking lot on the eastern edge. Several hiking trails weave through the property.

[Green Mountain National Forest-Middlebury District Ranger Station \(CTRL Click to go to case study\)](#)

Middlebury

Site Name: Green Mountain National Forest-Middlebury District Ranger Station

Area Identification: Road embankment between the Ranger Station and Route 7A

Target Invasive Plant Species: Bush honeysuckle, common buckthorn, and autumn olive.

Total Acreage: 0.33 acres

[Button Bay State Park \(CTRL Click to go to case study\)](#)

Ferrisburgh

Area Identification: Button Point Natural Area, near the Park's Nature Center.

Target Invasive Plant Species: Glossy buckthorn, honeysuckle, autumn olive

Total Acreage: 0.45 acres

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[Clover Hill Tree Farm in South Strafford, VT](#) (CTRL Click to go to case study)

South Strafford

Area Identification: The property is 200 acres. Approximately 180 acres are wooded, 18.5 acres are open field and 1.5 acres are wetlands.

Target Invasive Plant Species: Autumn olive, common buckthorn, bush honeysuckle, Asiatic bittersweet, Japanese barberry, common barberry, winged euonymus, glossy buckthorn, purple loosestrife

Total Acreage: The entire 200 acre property has been treated for invasive plant infestations.

[East Orange Road in Town of Washington, Vermont](#) (CTRL Click to go to case study)

Washington

Area Identification: Three site locations along the East Orange Road

Target Invasive Plant Species: Giant hogweed

Total Acreage: ~0.1 acre combined for all three locations.

[Mantel Farm, Newfane, VT](#) (CTRL Click to go to case study)

Newfane

Area Identification: The Mantel Farm consists of 250-acres; 35 acres are open fields and the rest is woodland, including a red pine plantation. One large pond and one small pond are within property. One approximately 3 acre wetland seep occurs in a field adjacent to the small pond.

Target Invasive Plant Species: Glossy buckthorn.

Total Acreage of Infestation: 30acres of field grown buckthorn and 22.6-acres forested buckthorn

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Private landowner, Charlotte, VT

Related Invaders:

[Shrub Honeysuckles \(*Lonicera* sp.\)](#)

[Common buckthorn \(*Rhamnus cathartica*\)](#)

[Japanese Barberry \(*Berberis thunbergii*\)](#)

[Garlic mustard \(*Alliaria petiolata*\)](#)

[Goutweed or Bishop's weed \(*Aegopodium podagraria*\)](#)

Property Acres: 40 acres

Infestation Acres: 30 acres

Location

Private Landowner Charlotte, VT

Prior to treatment, the wooded areas were very heavily infested with shrub honeysuckles and common buckthorn and a few plants of Japanese barberry. Plants ranged in size from small seedlings/saplings to mature, fruiting plants. Contractors were originally concerned that treatment work on this property might not be feasible or successful due to the heavy level of infestation. Garlic mustard infestations began in a localized area near the gardens (likely brought in from off site in material used in the garden) and has since spread rapidly on the western half of the property, following a wet river valley to the north. Two small patches of Bishop's goutweed were found near the garden and garage but were not found anywhere else on the property.

Land Management Goals

Overarching Goals/Plan: The landowner would like to completely eradicate invasive plants from the property and would like to restore the property to a more natural example of the local ecosystem. The landowner is committed to eradicating the invasive plant species on this property but understands that this is a very long term vision and will require several years of follow-up treatments in the future. The landowner is also interested in managing the property to become better wildlife habitat.

Site-led or weed-led: Efforts on this property are site-led. The landowner expressed an interest in eventually having this property be free of all invasive plants. The combination of treatment methods have targeted a range of invasive plant species.

Special Features or Conservation Values: The property is especially valuable as a wildlife corridor to a variety of wildlife species in the area.

Management Strategies

Type (manual, mechanical, chemical, other): A variety of treatment methods have occurred on this property. Smaller woody stemmed invasive plants have been mostly hand pulled and hung to dry. Larger woody stemmed invasive plants have been treated with both backpack foliar herbicide applications and cut stump herbicide applications. Garlic mustard has been hand pulled and bagged for disposal and starting in 2011 was treated with a backpack foliar herbicide application. Each year, garlic mustard plants were hand pulled in the spring, to avoid the plant from flowering and setting seed. The herbicide treatment of garlic mustard will treat the plants in the early spring and fall months annually. The two infestations of goutweed were treated with a backpack foliar herbicide application.

Date of Treatment:

- Year 1: Herbicide treatment began with larger, mature woody stemmed invasive plants.
- Year 2: Treatment of smaller woody stemmed invasives. Hand pulling of garlic mustard began.
- Year 3: Garlic mustard was foliar sprayed in the fall. A foliar herbicide application was completed on goutweed for the first time.

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Tools: Backpack foliar sprayer, chain saw, hand held herbicide dispensers.

If Chemical: type and concentration of herbicide: Woody stemmed invasives were treated with Thinvert RTU containing Accord XRT and Habitat brand herbicides. Cut stumped woody stemmed invasive plants were treated with Accord XRT brand herbicide and goutweed and garlic mustard plants were foliar treated with Accord XRT brand herbicide as well. Accord XRT brand herbicide's active ingredient is glyphosate.

Who Completed the Work: Contractors have completed all of the herbicide application treatment work as well as some of the manual treatment. The landowner has also hired local college students for three years to do some manual treatment of smaller woody stemmed invasive plants as well as garlic mustard plants.

Costs

Total Costs: Since 2009, invasive plant treatment on this property has exceeded \$15,000. Every year, treatment work will cost the landowner less money once mature source plants are removed from the property and the need for herbicide application becomes less and less. The intention is to continue to employ local students to keep hand pulling smaller invasive plants as they emerge from the seed bank.

Labor Costs (treatment hours, and number employed): Approximately 90% of the overall costs are associated with labor costs.

Material Costs (herbicides, other tools): Approximately 10% of the overall costs are associated with material costs, such as herbicides.

Funding Sources: The landowner privately funds invasive plant treatment work on this property.

Evaluation

Success of Initial Treatment: Both cut stump and foliar herbicide application treatments of the mature, woody stemmed invasive plants has been very successful. After three years of treatment very few large, mature plants remain on the property. Hand pulling garlic mustard was successful in reducing the number of plants found in one location however the infestation continued to spread rapidly to new areas of the property. The extent of this infestation warranted a change in treatment from hand pulling to foliar herbicide application. The success of the goutweed treatment has yet to be determined but follow-up treatment is expected.

Follow-up Treatment Needed: The need for foliar and cut stump herbicide application on woody stemmed invasives has been significantly reduced (perhaps completely) however follow-up treatment is required for the smaller plants. Hand pulling is expected to continue for several years and should be scheduled for the spring and fall months when the ground is moist and the plants are easy to pull. Foliar herbicide application will be required for goutweed and garlic mustard for at least 2-3 years. Garlic mustard rosettes will be treated in the early spring and late summer to be most effective and avoid targeting surrounding native vegetation.

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Marsh-Billings-Rockefeller National Historical Park in Woodstock, Vermont

Property Acres: 555 acres

Infestation Acres: 555 acres

Location

Marsh-Billings-Rockefeller National Historical Park Woodstock, VT

Area Identification: The entire park has been surveyed for invasive plants and the majority of the park has been treated.

Target Invasive Plant Species: The dominant invasive plant species at the park are bush honeysuckles, common buckthorn, autumn olive, garlic mustard, black swallow-wort, European alder, Japanese barberry, Norway maple, winged euonymus, and black locust. The park hosts several other less common and less aggressive invasive plants, and will likely be tackling some of those over time.

Description and Level of Infestation (prior to treatment): Much of the park has been continuously forested and relatively invasive-free since the early-mid 20th century. Younger forest stands, field edges, and the areas closer to the village and the historic mansion grounds tended to have more and better established invasive plant populations. Now that the National Park Service has been managing invasive plants for several years, the occurrence of large, fruiting invasive trees and shrubs has been greatly reduced. There is still a background population of seedlings and a number of species that have not been managed, such as goutweed and dame's rocket, waiting their turn

Land Management Goals

Overarching Goals: The National Park Service continues to practice forestry on this property, and at the same time makes the park available for tourism, recreation, education, history studies, and more. Invasive species management is one tool that helps to maintain the ecological integrity of the site.

Site-led or weed-led: Invasive plant treatment efforts at the park have been a site-lead approach.

Special Features or Conservation Values: Vermont's only national park is dedicated to telling the story of conservation history and the evolving nature of land stewardship in America. Extensive carriage roads and hiking trails give visitors a window into the scenic and actively managed forest.

Management Strategies

Type (manual, mechanical, chemical, other): Marsh-Billings-Rockefeller National Historical Park uses a combination of manual, mechanical, and chemical treatment methods. Wherever and whenever possible, the National Park Service uses an Integrated Pest Management approach to maximize manual removal of pests and reduce the need for herbicides.

Date of treatment: An invasive plant survey of the property was conducted in 2003 and treatments began in 2005. Monitoring and treatment has continued every year since then.

Tools: For manual methods, the park has used weed wrenches, honeysuckle poppers and hand pulling. For mechanical methods they have used mowers. Chainsaws and squirt bottles are used for cut stump herbicide application methods and backpack sprayers for foliar herbicide application methods.

If chemical: type and concentration of herbicide: The park uses herbicides that contain the active ingredient glyphosate.

Who Completed the Work: Invasive plant treatment at the park has been completed by several groups of people. Park staff conduct some invasive plant treatments annually, and typically hire consultants for large projects. The park has also been fortunate to have three groups of Student Conservation Association interns focus on invasive plant treatment. The Vermont Youth Conservation Corps and several groups of volunteers have completed treatment work as well.

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Further Recommendations/Notes:

Harvest recommendations: In addition to being managed for historical values and aesthetics, the Park is actively managed for conservation values and timber. The Park is committed to treating invasive plants in areas that are scheduled for forest treatment prior to the work commencing. The Park also prioritizes invasive plant follow-up treatment depending on the type of work that was completed. For example, a group selection typically opens up the canopy more than area-wide thinning, creating conditions more favorable to invasive plants. Therefore, this area is a higher priority for invasive plant follow-up.

Costs

Total costs: Labor costs (treatment hours, and number employed): Student Conservation Association Interns provided over 7,500 hours of work in the past primarily aimed at invasive species management in and around the park. The number of other volunteers working on invasive plants in the park fluctuates greatly from year to year depending on interest and availability. Consultants are hired on a project-specific basis, such as a recent European black alder removal project that required a two-person cutting and chipping crew and an applicator for 3 days each at a total cost of approximately \$5,000. National Park Service staff provide oversight, training, and assist with removals and treatment. Consultants also provide the necessary materials (including equipment and herbicide) necessary for each job.

Funding sources: The National Park Service, The American Recovery and Reinvestment Act, and the Marsh-Billings-Rockefeller Fund have been previous sources of funding for invasive plant treatment projects at the Marsh-Billings-Rockefeller National Historical Park.

Evaluation

Success of Initial Treatment: Initial treatment methods on woody stemmed invasives in wooded areas that were hand pulled have been successful, although a persistent seed bed is present and seedlings continue to sprout. The success of other initial treatments will be checked periodically.

Follow-up Treatment Needed: Follow-up treatment is anticipated for all locations in the park. Infestations of garlic mustard, black swallow-wort, and wild chervil require annual follow up treatment.

Visiting Permission

This site is open to the public. See <http://www.nps.gov/mabi/index.htm> for more detailed information and for directions to the park.

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Equinox Highlands Natural Area, Southern Vermont Arts Center, Manchester, VT

Property Acres: 2,276 acres

Infestation Acres: 312 acres

Location

Southern Vermont Arts Center Manchester, VT

Area Identification: The Equinox Highlands Natural Area is 2,276 acres and is owned by The Nature Conservancy. Invasive plant treatment was focused on 312 acres of the SVAC parcel (the parcel was previously owned by the SVAC and purchased by TNC in 2010). On the 312 acres of the SVAC land, invasive plant treatment was concentrated on the lower slopes of the property, between 1100 and 1600 feet in elevation. The area is wooded, bordered by a meadow and adjacent parking lot on the eastern edge. Several hiking trails weave through the property.

Target Invasive Plant Species: Japanese barberry, Asiatic bittersweet, winged euonymus, shrub honeysuckle.

Total Acreage of Infestation: Of the 312 acres of the SVAC property, approximately 127 acres were treated for invasive plants. The remainder of the 312-acre property has little to no invasive plants (elevations above 1600 feet).

Description and Level of Infestation (prior to treatment): Approximately 5 acres of bittersweet & winged euonymus were treated. Japanese barberry and shrub honeysuckles were treated on approximately 107 remaining acres; 7 acres of a high density zone; and approximately 100 acres of very low, low and medium densities.

Land Management Goals

Overarching Goals/Plan: Ecosystem restoration was the primary goal for the invasive plant treatment work. TNC recognized that several of the invasive plant species were still in the early detection stage, and could be more easily controlled now than in a few years. Improving conditions for recreation on the existing trail network was not a primary goal but was a nice side benefit from completing the work. The property is also enrolled in the Use Value Appraisal program in Vermont and does have a forest management plan which commits TNC to annual invasive plant treatment. TNC is aiming to allow no further increase of invasive species on the property. A broader vision for this project was to create a demonstration site for effective invasive plant control in the Equinox Highlands area, and encourage other landowners to take action on their own land.

Site-led or weed-led: This project was a site-led project. The Nature Conservancy wanted to remove as many invasive plants as possible from as large an area as possible while the density of the invasion was still relatively low. TNC also wanted to be sure to reduce the amount of highly invasive species (such as Japanese barberry and Asiatic bittersweet) before they spread to other areas of the preserve. This site has a high biodiversity value and TNC wanted to protect the Rich Northern Hardwood Forest community from being overrun with invasive plants. Complete control still seemed feasible on this site, unlike some other areas TNC owns where invasive plant invasion has advanced much further.

Special Features or Conservation Values: The Equinox Highlands is a forested landscape of approximately 7,000 acres in the Taconic Mountains of southwestern Vermont. Its Rich Northern Hardwood Forest, covering approximately 2,000 acres, is one of the largest and finest examples of this community type in the Northeast. The site has considerable elevational diversity (elevations range from 1,200 feet to 3,840 feet), geological diversity (including marbles and phyllites), and topographical diversity (including springs, wetlands, dry knolls, gentle slopes, steep slopes, cliffs and summits). Hence, its biological diversity is high. At least four significant natural communities and 24 rare species are known from the site. Currently, TNC owns over 2,000 acres at the site and holds an easement on an additional 105 acres. The Equinox Highlands encompass Mount Equinox, the highest Taconic peak at 3,840 feet, and Mother Myrick Mountain, 3,360 feet high.

The Equinox Highlands has long been known to botanists as an area rich in plant diversity. Mount Equinox derives its uniqueness from the occurrence of three natural communities: rich northern hardwood forest, dry warm calcareous outcrop, and boreal outcrop. The latter two communities usually occur at very different altitudes and geographic locations in

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Vermont. According to Jerry Jenkins, Mount Equinox may be the only site in the Northeast on which both communities occur in such close proximity.

The calcium-rich bedrock and warmer climate (relative to northern Vermont) have made the eastern slopes suitable habitat for an almost complete range of species found in rich northern hardwood forests. The dry, warm calcareous outcrop communities at the site, on the other hand, have only five to eight species. While other sites in southern Vermont have more representative examples of the dry, warm calcareous outcrop community, Mount Equinox is the only site in the region where this community is found in close proximity to a boreal outcrop community.

The Equinox Highlands has been studied by professional botanists for decades, including Jerry Jenkins and Liz Thompson from the 1970s through the present.

The Southern Vermont Arts Center Forest parcel was previously owned by the SVAC. It was acquired by The Nature Conservancy in 2010 and added to the Equinox Highlands Natural Area. The property has been carefully managed, with small, select-cut timber harvests occurring approximately every 10 years in various forest compartments. The forest rises from the slope behind the Arts Center all the way to the ridgeline. It has considerable elevational diversity (elevations range from 1100 feet to 3100 feet), geological diversity (including marbles and phyllites), and topographical diversity (including streams, spring seeps, dry knolls, gentle slopes, steep slopes, cliffs and summits). Hence, its biological diversity is high.

The forest contains an excellent example of Rich Northern Hardwood Forest as well as a portion of the state-significant Montane – Yellow Birch – Red Spruce Forest community. At least five rare or threatened plant species have been identified on this parcel. In addition to the significant natural communities, the property is part of a larger area of critical habitat for the federally endangered Indiana bat, the state threatened Small-footed bat, and a number of more common bat species.

Management Strategies

Type (manual, mechanical, chemical, other): Manual treatment (hand pulling of small woody shrubs) was conducted by TNC staff and volunteers beginning in 2010. Chemical treatment (cut stump herbicide application and foliar herbicide application) was completed by contractors in 2011-12.

Date of treatment:

Year 1: Hand pulling of small woody shrubs.

Year 2: The Asiatic bittersweet was treated with a cut stump herbicide application method in February. The backpack foliar spraying herbicide application was conducted in late June and early July.

Tools: backpack sprayers, ATV to carry equipment and herbicide into the woods, hand clippers/saws, squirt bottles for volunteers.

If chemical: type and concentration of herbicide: Bittersweet plants were treated using Garlon 4 Ultra (25%) in methylated seed oil (75%) applied to cut stumps with spray bottles. Japanese barberry and honeysuckle plants were treated with a backpack foliar spray herbicide application using Garlon 3A (2% herbicide solution v/v) with non-ionic surfactant (0.25%) and indicator dye. In Vermont, **Garlon 3A is a restricted herbicide for use by licensed applicators only.** The 7-acre high density zone was completed as follows: Tall common buckthorn saplings (> 7') were treated via basal bark application with the same herbicide configuration mentioned above for bittersweet. Low growing invasive shrubs were foliar sprayed using the Thinvert herbicide application system with Accord Concentrate.

Who Completed the Work: Initial survey and mapping of invasives was completed by The Nature Conservancy staff. Many Japanese barberry shrubs were marked with flagging tape. Invasive control efforts began in the late summer of 2010. TNC staff worked with volunteers including Burr and Burton Academy students, pulling many of the small barberry plants located in the lower elevations and along hiking trails. Chemical treatment by Polatin Ecological Services and Redstart Forestry occurred in 2011 with a follow up scheduled for 2012.

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Costs

Total costs: The total cost for this project was \$23,000.00

Labor costs (treatment hours, and number employed): Approximately 1.5 to 2 weeks of TNC staff time was used to survey the property, create maps, divide property into management zones, put the work out to bid, select contractor, and complete contract paperwork. The labor numbers are as follows: Cut stump bittersweet: 48 hours (4 member crew first day, 2 member crew the second day); 120-acre foliar spray with 7-8 member crew for 5 days = 280 hours. Included within this 280 hours is time for a 4 member crew to perform work within the 7-acre high density zone (24 labor hours).

Material costs (herbicides, other tools): Herbicide cost = \$800.00

Funding sources: Funding for this project was given by a private donor who was concerned about invasive plants in the Equinox area.

Evaluation

Success of Initial Treatment: The success of the initial treatment currently unknown but monitoring and follow-up treatment will occur in 2012.

Follow-up Treatment Needed: The contractor will return in 2012 to follow up in most dense infestations with cut stump herbicide applications and foliar herbicide applications. TNC staff and volunteers will need to complete follow-up in the lighter density infestations to catch any missed plants and keep the areas invasive free.

Visiting Permission

Site Accessibility: This site is assessable to the public and can be accessed via the Southern Vermont Arts Center when they are open to the public. The arts center is located at 930 SVAC Drive, West Road, Manchester, VT 05254. Visit their website for information about when they are open to the public and for directions; <http://www.svac.org/>. Visitors should park in the gravel parking lot and walk west across the meadow via the mowed path the Maidenhair trail. The Maidenhair, Trillium and SVAC Loop trails all cross through the areas treated for invasive plants.

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Green Mountain National Forest-Middlebury District Ranger Station

Related Invaders:

[Common buckthorn \(*Rhamnus cathartica*\)](#)

[Autumn olive \(*Elaeagnus umbellata*\)](#)

[Shrub Honeysuckles \(*Lonicera* sp.\)](#)

Infestation Acres: 1 acre

Location

Green Mountain National Forest-Middlebury District Ranger Station Middlebury, VT

Site Name: Green Mountain National Forest-Middlebury District Ranger Station

Area Identification: Road embankment between the Ranger Station and Route 7A

Target Invasive Plant Species: Bush honeysuckle, common buckthorn, and autumn olive.

Total Acreage: 0.33 acres

Description and Level of Infestation (prior to treatment): Honeysuckle was heavy to moderate along the entire bank area, growing in amongst the rock ledge. Plants were mostly mature and fruiting. Common buckthorn plants were found mostly within the wooded area, extending away from the road into the wooded area behind the ranger station. Several tall (>10') common buckthorn plants were producing fruit and several smaller saplings were also growing in the area. One mature autumn olive plant was growing close to the entrance trail and lawn edge.

Land Management Goals

Overarching Goals: The Green Mountain National Forest has recently completed an environmental assessment for controlling non-native invasive plants (NNIP) Forest-wide using an integrated pest management approach, and they have begun implementation at high priority sites. The goal for this location was to completely eradicate invasive plant species from the embankment and within 30'feet of the Route 7 corridor. Additional invasive plant treatment is expected to happen on the rest of the Ranger Station property in the years to come. The GMNF also wanted to execute treatment on this property because it is a high-visibility area and can serve as a great educational resource for the public. Controlling NNIP at this site also helps prevent their spread onto National Forest System land.

Management Strategies

Site-led or weed-led: This effort was a site-led project; all invasive plants in the 0.33 acres were treated.

Special Features or Conservation Values: This site has educational value because people visit the Ranger Station to acquire information about the National Forest, and because it is so visible from a well-traveled state highway.

Type (manual, mechanical, chemical, other): All mature invasive plants were cut and an herbicide was applied to the cut surface (cut stump). Prior to the cut stump treatment, many branches of mature honeysuckles containing fruits were clipped and disposed of in plastic bags. A few smaller seedlings were hand-pulled where appropriate. All cut stems were chipped on site using a brush chipper.

Date of treatment: Treatment occurred on October 26th, 2011.

Tools: Invasive plants were cut using chainsaws. Herbicides were applied using a pressurized hand-held squirt bottle.

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If chemical: type and concentration of herbicide: Accord XRT Herbicide (trademark) (active ingredient of glyphosate) was used in a 50% water based solution.

Who Completed the Work: Private, consulting, licensed pesticide applicators were hired as the contractors for this work.

Costs

Total costs: Approximately \$1,100.00 was paid to the contractor to complete this work and \$248 was paid for GMNF staff time with a total project cost of \$1348.

Labor costs (treatment hours, and number employed): Approximately \$900 of the total cost was for labor costs. Includes 17.5 hours for 2 professional contractors. Two GMNF employees assisted with the project for approximately 3 hours each, for a total cost of \$248. Three volunteers (two high school students and their mother) spent two hours each (six hours total) clipping and removing fruits from some of the mature honeysuckles; the estimated total value of their labor is \$120.

Material costs (herbicides, other tools): Approximately \$200 was spent on material costs, \$175 for a full day rental of chipper and approximately \$15 for herbicide costs.

Funding sources: GMNF paid for the work out of the annual budget for non-native invasive plant control.

Evaluation

Success of Initial Treatment: The success of initial treatment has not been determined yet.

Follow-up Treatment Needed: Employees from the Green Mountain National Forest have committed to monitoring this site annually in the spring and hand pulling any invasive plants that emerge from seeds and/or developing an ongoing treatment plan.

Visiting Permission

This Ranger Station is open to the public. The treated invasive plant infestation site can be viewed easily from the road.

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Button Bay State Park

Location

Button Bay State Park Ferrisburgh, VT

Area Identification: Button Point Natural Area, near the Park's Nature Center.

Target Invasive Plant Species: Glossy buckthorn, honeysuckle, autumn olive

Total Acreage: 0.45 acres

Description and Level of Infestation (prior to treatment): Prior to treatment, the area was very heavily infested with mature, glossy buckthorn plants. Several of the glossy buckthorn plants had been cut previously by volunteers (but no herbicide was applied) and were re-sprouting heavily with multiple stems. The area was also heavily infested with immature, glossy buckthorn. Several mature honeysuckles were found along the edges of the open areas but the entire area was not as heavily infested with honeysuckle as with glossy buckthorn. Only a few mature plants of Autumn olive were found near the southern most edge of the point.

Land Management Goals

Overarching Goals: The Vermont Department of Forests, Parks and Recreation (VT FPR) has undertaken a large effort to treat invasive plants found growing in many of the Vermont State Parks. The goal for this location was to reduce the population of invasive plants to protect and enhance the vitality of native and rare plants.

Site-led or weed-led: This effort was a site-led project, all invasive plants in the 0.45 acres were treated.

Special Features or Conservation values: The point at Button Bay State Park is within an Oak-Pine-Northern Hardwood Forest Formation natural community. Several Rare, Threatened or Endangered (RTE) plant species are found. Vermont FPR was very concerned about preserving and protecting these species during the invasive plant treatment. Therefore, a targeted, cut-stump herbicide application method was chosen to specifically avoid potential drift of herbicide onto these important plant species.

Management Strategies

Type (manual, mechanical, chemical, other): All mature invasive plants were cut and an herbicide was applied to the cut surface (cut-stump).

Date of treatment: Treatment occurred on August 31st, September 1st and September 23rd, 2011.

Tools: Invasive plants were cut using chainsaws. Herbicides were applied using a pressurized hand-held squirt bottle.

If chemical: type and concentration of herbicide: Accord XRT Herbicide (active ingredient of glyphosate) was used in a 50% water based solution.

Contractors: Private, consulting, licensed pesticide applicators were hired as the contractors for this work.

Costs

Total costs: ~\$3,350

Labor costs, treatment hours, and number employed: Approximately \$3,000 was used for labor costs. This includes 60 hours for 3 professional contractors.

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Material Costs: Approximately \$350 was used towards herbicide costs.

Funding sources: This project was funded by the Vermont Department of Forests, Parks and Recreation through the American Recovery and Reinvestment Act.

Evaluation

Success of Initial Treatment: The success of initial treatment has not been determined yet.

Follow-up Treatment Needed: Seedlings/saplings that were too small to cut-stump were left untreated. With the removal of the over story of glossy buckthorn plants, these plants will likely thrive and take over the area. Follow-up treatment of these plants will likely be necessary and can be accomplished in the following ways: hand pulling, waiting until they grow tall enough to cut-stump and treat with and herbicide or consider a foliar herbicide application.

Visiting Permission

Button Bay State Park is a public campground and is overseen by the Vermont Department of Forests, Parks and Recreation.

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Clover Hill Tree Farm in South Strafford, VT

Location

Clover Hill Tree Farm South Strafford, VT

Area Identification: The property is 200 acres. Approximately 180 acres are wooded, 18.5 acres are open field and 1.5 acres are wetlands.

Target Invasive Plant Species: Autumn olive, common buckthorn, bush honeysuckle, Asiatic bittersweet, Japanese barberry, common barberry, winged euonymus, glossy buckthorn, purple loosestrife

Total Acreage: The entire 200-acre property has been treated for invasive plant infestations.

Description and Level of Infestation (prior to treatment): Approximately 1/3 of the property is lightly infested, 1/3 of the property is moderately infested, and 1/3 of the property is heavily infested. Heavy infestations are concentrated in "high traffic" areas such as near the entrance gate.

Land Management Goals

Overarching Goals: The overarching goal is to treat and manage invasive plants in order to re-establish natural, native plant communities on the property.

Site-led or weed-led: This project is a site-led project where several different invasive plants are treated on the property.

Special Features or Conservation values: The landowner has several interests in this property. The ecological integrity is the principal objective, and the timber value, wildlife habitat, water quality, recreation, aesthetics are all important to the landowner.

Management Strategies

Type (manual, mechanical, chemical, other): A variety of treatment methods have been used for invasive plant treatment. The landowner hand pulls plants whenever and wherever possible. This work is done in May and June each year. Hand pulling is not a desirable treatment method for some of the larger plants thus the landowner has used both cut stump and foliar herbicide application treatment methods. The cut stump treatment methods have been completed in July-October and the foliar spraying in September. 41% glyphosate, and foliar application with 4.1% glyphosate.

Date of treatment: The landowner has been treating this property annually since 2005.

Tools: Hand clippers, loppers, hand saws, chainsaw, squirt bottle (for cut stump herbicide) and Solo backpack sprayer (for foliar spraying herbicide application).

If chemical: type and concentration of herbicide: Herbicides containing the active ingredient of glyphosate are used. For cut surface treatments, 41% glyphosate or (herbicide): cut surface 41% (have also tried 20.5%), foliar spray 4.1%.

Contractors: Contractors have not been hired to do any work on this property. The landowner has completed all the work himself.

Costs

Total costs: A total of \$49,950 has been spent treating this property since 2005.

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Labor costs, treatment hours: Approximately \$39,200 has been spent on labor costs. The landowner spent approximately 70 hours treating invasive plants in 2005 and 150-200 hours each of the next 6 years for a total of 1,120 hours. At an hourly wage of \$35/hour, the landowner has contributed \$39,200 worth of labor treating invasive plants on his property.

Material costs: Roughly \$10,750 has been spent on material costs. This cost includes the initial cost of a backpack sprayer, herbicide costs and travel to the site for 7 field seasons.

Funding sources: The landowner has received a total of \$26,363 from the Natural Resource Conservation Service's (NRCS) Wildlife Habitat Incentive Program (WHIP) to cost-share the invasive plant treatment work. Funding was applied for and granted annually.

Evaluation

Harvest recommendations: The landowner has considered keeping the basal area of his forested areas at a slightly higher level than might otherwise be desired until the invasive plant populations are at manageable levels, since most invasive plants prefer openings and/or sunlight to flourish.

Visiting Permission

Although this land is owned privately, visitors are welcome to this site any time. Directions: From interstate 89, take exit 2 onto Route 132 towards Strafford. Continue on Route 132 for 4.7 miles, and then take a left onto Blanchard Road. The property is located at the end of Blanchard road. There is a gate across the entrance to the property. Please park off to the side as to not block the gate entrance.

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East Orange Road in Town of Washington, Vermont

Location

East Orange Road Washington, VT

Area Identification: Three site locations along the East Orange Road

Target Invasive Plant Species: Giant hogweed

Total Acreage: ~0.1 acre combined for all three locations.

Description and Level of Infestation (prior to treatment): The populations of Giant Hogweed were initially assessed in 2007. All three sites had a combination of mature flowering plants and seedlings. Approximately 400 individual mature plants, not including smaller seedlings, were present the first year of treatment. Approximately the same number of seedlings were present at the time of initial assessment but heavier seedling flushes, and fewer mature plants, were present in subsequent years.

Land Management Goals

Overarching Goals: Members of the Town of Washington's selectboard became aware of and concerned about the giant hogweed populations and expressed an interest in treatment options and eradication of the plant along the East Orange Road. A multiple year (5 year) treatment schedule was proposed to and approved by the selectboard. A multiple year treatment schedule is necessary because of the persistent seed bank.

Site-led or weed-led: This treatment is a weed-led effort to remove a single invasive plant species, giant hogweed.

Special Features or Conservation Values: The initial populations were located in the headwaters of the East Orange branch of the Waits River. Giant hogweed has spread rapidly in riparian areas because the seeds float and can reestablish downstream. A nearby wetland containing a plant of conservation concern is located very close and downstream of the giant hogweed populations.

Management Strategies

Type (manual, mechanical, chemical, other): Manual treatment and herbicide application treatment have been used to treat the giant hogweed populations. Mature plants and seedlings were hand pulled for the first two years. Treatment did not happen in year three, resulting in a seedling flush that produced mid-sized plants in year four. In the fourth year, taller plants (~4') were hand pulled and a dense flush of the mid-sized plants were treated with a foliar herbicide application. Any seed heads that were present were clipped from the plant and disposed of in plastic bags.

Date of treatment: Giant hogweed plants were initially treated in 2008 and have been re-treated in 2009 and 2011. Treatment work is expected to continue until 2013 depending on success of previous treatments.

Tools: Hand pulling and foliar backpack sprayer.

If chemical: type and concentration of herbicide: Thinvert RTU containing herbicides with active ingredients of glyphosate and imazapyr.

Who Completed the Work: A private contractor has completed both the manual and chemical treatment.

Costs

Total costs: The five year treatment proposal anticipated the treatment work costing a total of \$2,208 for the duration of the project.

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Labor costs (treatment hours, and number employed): Approximately \$1920 is expected to cover the costs for labor for five years.

Material costs (herbicides, other tools): Approximately \$288 is expected to cover the costs of herbicides and travel time for five years.

Funding sources: The Town of Washington funded the first two years of treatment. The following three years of treatment will be completed by the contracting company on a pro-bono basis.

Evaluation

Success of Initial Treatment: Manual treatment was effective on mature plants. Experience on this project indicated that a single missed year of treatment allowed heavy seedling flushes to reach considerable size in the following season. The seed bank was persistent and seedling flushes have been heavy in areas where original plants seeded.

Follow-up Treatment Needed: Follow-up treatment is anticipated for two additional years. Treatment methods will be determined based on assessments of the populations. Treatment methods will include both manual and/or chemical treatment methods.

Further Recommendations/Notes:

Erosion control recommendations: A road side planting conservation seed mix was broadcast on roadsides where there were large areas of exposed soil in an attempt to reduce erosion and prevent re-infestation.

Visiting Permission

This is a town maintained class three dirt road and is open to the public.

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Mantel Farm, Newfane, VT

Location

Mantel Farm Newfane, VT

Area Identification: The Mantel Farm consists of 250-acres; 35 acres are open fields and the rest is woodland, including a red pine plantation. One large pond and one small pond are within property. One approximately 3-acre wetland seep occurs in a field adjacent to the small pond.

Target Invasive Plant Species: Glossy buckthorn.

Total Acreage of Infestation: 30acres of field grown buckthorn and 22.6-acres forested buckthorn

Description and Level of Infestation (prior to treatment): Field buckthorn ranged as follows: very high density (8-acres @ >75% cover); high density (4-acres @ 51-75% cover); medium density (12-acres @ 26-50% cover); low density (4-acres @ 5-25% cover; and very low (2-acres @ 0-5% cover). The field buckthorn was multi-stemmed from being mowed many times over the preceding years. Mowing always occurred in the fall so the buckthorn produced plenty of seed. Buckthorn was knee to waist high by mid-July. Buckthorn along field edge was sapling stage at 6-12' height and 1-3" diameter.

Land Management Goals

Overarching Goals/Plan: Goal for field was to preserve agricultural character and to benefit early successional wildlife species.

Site-led or weed-led: This project was a site-led project.

Special Features or Conservation Values: The Mantel Farm is a scenic landscape located on a hilltop directly in the center of Newfane

Management Strategies

Type (manual, mechanical, chemical, other): Chemical treatment and mowing.

Date of treatment: Initial treatment: 7/17/, 7/19, 7/24, & 7/25/2006; Follow-up treatment #1: 7/19/, 7/27, & 7/31/2007; Follow-up treatment #2: 7/12 & 7/13/2008

Tools: Initial treatment consisted of using a 110-gallon tractor mounted boom/hydraulic sprayer for very high, high and medium density areas and hand-pumped backpack foliar sprayers for low/very low density areas. Follow-up treatment consisted of using motorized mist blowers and hand-pumped backpack foliar sprayers.

If chemical: type and concentration of herbicide: Fields and edge were both treated with a 2% volume/volume solution of Garlon 4 (EPA Reg. No. 62719-40). Application was conducted with a 110 gallon tank with 10 foot boom and nozzles (field) and hydraulic spray gun (edge). Garlon 4 was applied to the fields at a rate of 1 gallon per acre as approved by the product label. A 0.5% solution of the surfactant Clean Cut was included in the mixture along with indicator dye. A total of 27 gallons of Garlon 4 was applied for the project.

Who Completed the Work: Initial site mapping of invasives was completed by NRCS staff. Chemical treatment by Polatin Ecological Services (Chris Polatin) and Heritage Fields (Bruce Scherer) occurred in 2006, 2007 & 2008.

Costs

Total costs: The initial treatment cost \$7,920. The first follow-up treatment cost \$2,962.00

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Labor costs (treatment hours, and number employed): Approximately 1.5 to 2 weeks of TNC staff time was used to survey the property, create maps, divide property into management zones, put the work out to bid, select contractor, and complete contract paperwork. Approximately \$4,000 was spent towards labor costs.

Material costs (herbicides, other tools): The herbicide cost for the initial treatment was \$3,000.00.

Funding sources: Funding for this project was NRCS (Wildlife Habitat Incentives Program).

Evaluation

Success of Initial Treatment: The initial treatment resulted in 90% reduction in buckthorn recorded from monitoring plots and transects.

Follow-up Treatment Needed: The NRCS funds for the project are spent. Follow-up treatments are needed to prevent plants from recovering to pre-treatment levels but additional funding will be needed.

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