



WEED MANAGEMENT PLAN

FOR

Maidstone Bends
(Town of Maidstone, Essex County, Vermont)

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November 2006

The Nature Conservancy
Vermont Field Office

1. Introduction

A. Description and purpose of the site

The Nature Conservancy's Maidstone Bends property is located in Maidstone in Essex County. Just east of Route 102, this property is accessible across a deeded right of way through the Young Farm (Map 1). Purchased in June 2006, the property consists of approximately 70 acres along the western bank of the Upper Connecticut River. The site contains approximately 40 acres of hayfield and wet meadow, 23 acres of floodplain forest, and 6 forested acres on the slope between the farmstead and the lower field.

Maidstone Bends lies in the Northeastern Highlands, a biophysical region of intrusive granites and metasedimentary schists dominated by large lowland areas and surrounding hills, characterized by a cold, wet climate. The site encompasses a series of riverine floodplain forest remnants associated with four meanders and point bars on the west side of the Connecticut River, at roughly 860 feet elevation. These four forest patches total 30 acres in Vermont, with additional acreage on the river's east side in New Hampshire.

The floodplain forests at this site are relatively narrow, and they are developing on soils that have likely been deposited over the past 50 to 100 years as the river continually migrates through its floodplain. At least three floodplain forest types occur within this small area, distributed based on hydrologic regime and soil characteristics: silver maple-ostrich fern forest, silver maple-sensitive fern-false nettle forest, and sugar maple-basswood-ostrich fern forest.

Numerous dams exist along tributaries to the Connecticut River above Maidstone Bends, and the Northumberland dam (built between 1910 and 1920 by the Wyoming Valley Paper Company) lies just downstream of the site. In addition, the mainstem navigates at least one dam upstream of Maidstone Bends in Canaan (built in 1927) as well as headwater dams at First and Second Connecticut Lakes. Despite these sources of alteration to the site's hydrologic regime and sediment budget, these small floodplain forest examples remain in relatively good condition.

Our main goals for this site are to:

1. Maintain this riverine floodplain forest in its current size and prevent further degradation. Allow key ecological processes to continue (e.g., seasonal flooding) within a natural range of variation.
2. Restore biological and hydrological connections between the four remnant floodplain forest patches.
3. Maintain the site as a functioning ecological system, with connections to remnant floodplain patches on the opposite side of the river in New Hampshire.

B . Description of how invasive plants interfere with management goals

Our primary conservation goal at the Maidstone Bends site is to protect the targeted natural communities, and invasive exotic species are a potential threat. Spread of invasive species such as bush honeysuckles (*Lonicera spp*) and moneywort (*Lysmachia nummularia*) degrade the natural communities by displacing native species, altering community structure, inhibiting recruitment of select native tree species, and reducing habitat quality for wildlife.

C. Invasive species inventory

In the Fall of 2006, the Maidstone Bends property was surveyed for invasive exotic plants. To ensure that all invasive species on the property are accounted for, further inventory of the property should continue in the spring and early summer of 2007.

The most common invasive species noted throughout the property are bush honeysuckles (*Lonicera spp.*). Scattered individuals were found in the forested bank between the farmstead and the lower fields, as well as in the floodplain forests at the tip of the peninsula and at the southern end of the property (Map 2). Most of the individuals were of moderate to large size, with few seedlings noted.

Moneywort (*Lysmachia nummularia*) followed a similar distribution pattern, with patches scattered throughout the floodplain forests.

Two other species, common buckthorn (*Rhamnus cathartica*) and Japanese knotweed (*Polygonum cuspidatum*), were not noted on the property but were seen along roadsides within several miles of the site.

2. OVERVIEW OF WEED MANAGEMENT PLAN

A. General Management Philosophy

Invasive plant management is an integral part of preserve management for the Nature Conservancy because our focus is on protecting special species or native communities. Accordingly, our weed management philosophy follows this goal: new infestations are prevented and current invasive plant populations that threaten or have the potential to threaten target communities are controlled or eliminated. Always, the focus is protecting the native plant communities, not simply eliminating weeds.

Our approach to invasive plant control utilizes an adaptive management strategy. First, we establish and record goals for a site. Second we identify species that prevent us from reaching these goals and assign them priorities based on the severity of their impacts. Third, we consider control methods, and, if necessary, adjust priorities based on likely impacts on target and non-target species. Fourth we develop weed control plans based on this information, and implement the plans. Fifth, we monitor the results of our management strategy and evaluate them based on the site goals. This information is used to modify or improve control priorities, methods, and plans.

B. Prioritization

Priorities for management of each species are set according to four major factors:

1. Value of the natural communities of a site that are currently infested or at risk of infestation in the future.
2. Current extent of invasive plant populations on the site and within the surrounding landscape.
3. Difficulty of control based on site conditions and species characteristics.
4. Current and potential impacts of each invasive species.

Priorities are set to attempt to minimize the control effort required for each species while maintaining the integrity of our conservation goals. Consequently, we aim to prevent new infestations and assign highest priority to species that have the potential to spread rapidly, cause significant disruption to native species, and affect the target natural communities on the site. We also consider the difficulty of controlling each species, giving higher priority to species that are more easily controlled.

Our highest priorities at the Maidstone Bends preserve are managing weeds in the target community: Riverine Floodplain Forest. To this end, invasive plant management will focus on the floodplain forest communities. Invasives within the forested area between the farmstead and the lower field will be managed secondarily to prevent further spread of seeds into the floodplain forests.

C. Summary of Specific Actions Planned

The work plan detailed below will guide our efforts at Maidstone Bends for the next five years (2007-2012). In 2012, we will conduct a follow-up inventory of the property to assess how well we are meeting our invasive plant management goals. We estimate invasive plant management at the property will require a commitment of 1-2 days of work per year. Due to the relatively low level of infestation, elimination of invasive plants on the property is feasible. However, future monitoring will be necessary to prevent the re-establishment of invasive plant populations.

Invasive plant control will be timed to have the greatest impact on each target species. Populations of honeysuckle will be controlled using both mechanical pulling and chemical applications (herbicide application using the cut stump methods). Herbicide application will occur during late summer and early autumn, when individuals are transporting carbohydrates for storage to their roots. Moneywort will be controlled through mechanical methods by pulling and removing all parts of the plants.

1. Action Plan by Area

Refer to Map 2 for area delineation.

Area A: High priority. Area A consists of the floodplain forests at the tip of the peninsula and at the southern end of the property. Currently, it is lightly infested with honeysuckle and moneywort.

This area should be targeted first, removing all individuals of honeysuckle and in the late summer and early fall of 2007. Small honeysuckles can be pulled, while larger individuals should be cut and the stems painted with herbicide.

In subsequent years, any germinating honeysuckle seedlings can be hand pulled relatively easily. The populations are not very dense or well established at this time and could be eradicated within one to two years. Further monitoring should continue every five years to remove individuals that may have been missed or regenerated from the seed bank.

Because moneywort is known to be difficult to eradicate, we will attempt eradication in several pilot study plots. Moneywort will be removed from these plots in late summer and early fall of 2007 and then monitored in subsequent years.

The Connecticut River is a potential propagule source for this property and may influence our ability to eradicate invasives within the floodplain forests. Once current individuals are removed, this area will require regular monitoring to prevent the reestablishment of these and other invasive plant species.

Objective for Area A: Eradication of all honeysuckle by the end of the 2008 field season with future monitoring to prevent re-infestation. This area will be monitored regularly to prevent the establishment of Japanese knotweed and common buckthorn.

Area B: Low Priority. Area B consists of the forested bank between the farmstead and the lower field. This is not a target community, but has the potential to be a seed source, contributing to the spread of invasives in the target communities.

Because the infestation in this area is not very extensive, as that of the floodplain forest, control of these invasives will begin in 2008, using mechanical and

chemical control methods to remove all honeysuckle plants. Monitoring will continue every five years to remove regenerating plants.

Objective for Area B: Eradication of all invasive species by the end of 2008 with future monitoring to prevent re-infestation.

2. Action Plan Timeline

May 2007: Survey the property for herbaceous invasive species.

August-December 2007: Honeysuckle control in the floodplain forests for a total of 1-2 days. Smaller plants can be hand pulled and placed in locations where the roots will not contact the ground. Depending on conditions, larger plants will be treated with herbicide using the cut stump application methods. Fruits will not be removed from the cut plants. Banks will be surveyed for any signs of Japanese knotweed infestation. Pilot study plots will be established to test moneywort control feasibility, with all moneywort removed within the designated areas.

August-December 2008: Honeysuckle control in the forested bank between the farmstead and the lower field for a total of 1 control day. Riverbanks will be surveyed for Japanese knotweed.

August 2010: Survey the property for signs of re-infestation.

2012: Survey the property for signs of re-infestation. Evaluate the success of invasive plant control efforts. Revise the weed management plan accordingly.

3. SPECIFIC CONTROL PLANS FOR HIGH PRIORITY SPECIES

A. Species Descriptions

a. Shrub Honeysuckles (*Lonicera spp.*)

- i. Priority: A (high)
- ii. Description: Shrub honeysuckle species include: Tatarian honeysuckle (*Lonicera tatarica*), Morrow's honeysuckle (*L. morrowii*), pretty honeysuckle (*L. bella*), Amur honeysuckle (*L. maackii*), and dwarf honeysuckle (*L. xylosteum*). Many species hybridize readily. They are deciduous shrubs that reach heights of up to 16 feet, with small, simple, opposite leaves. Unlike native honeysuckles, non-native honeysuckles have a hollow stem. Shrub honeysuckles can occur in abandoned fields and pastures, wetland edges, and in forests, particularly where soils are limey. They tolerate a wide range of light and soil conditions.

- iii. Current Distribution at Maidstone Bends: Honeysuckles are present in moderate densities in the floodplain forests at the end of the peninsula and the southern end of the property, as well as on the slope between the farmstead and the lower field.
- iv. Damage & Threats: Shrub honeysuckles can rapidly invade natural communities. They form a dense shrub layer that decreases light availability and prevents the regeneration of many native woody and herbaceous plants. Although they thrive in full or partial sun, honeysuckles are able to grow and persist beneath a closed forest canopy. Honeysuckles can spread vegetatively or sexually through fruits that are readily spread by birds and small mammals. Songbird nests built in honeysuckle experience higher predation than those in native shrubs. Honeysuckles inhibit tree regeneration and reduce the diversity and cover of herbaceous species.
- v. Goal: Eradicate honeysuckle in the target community, the floodplain forests, as well as from the forested slope between the farmstead and the lower field.
- vi. Objectives (Measurable): Eradicate all mature honeysuckle in areas A and B, and periodically monitor in the future to prevent re-establishment.

b. Moneywort (*Lysmachia nummularia*)

- i. Priority: B (moderate)
- ii. Description: Moneywort is an herbaceous perennial that forms a low, ground-covering mat. Its creeping stems are smooth with opposite, round leaves that are 1-3 cm long. In mid-summer, it forms solitary flowers in the leaf axils that are yellow with red spots. Though it produces small seeds borne in capsules, the seeds are not viable. It spreads vegetatively. Native to Europe and Southwest Asia, it is found in eastern Canada and the United States, as well as several western States. It prefers, and poses the biggest threat to, wet meadows and floodplain forests.
- iii. Current distribution at Maidstone Bends: Moneywort is scattered throughout both floodplain forest patches, at the tip of the peninsula and at the southern end of the property.
- iv. Damage & Threats: Moneywort forms dense, ground-covering mats that have the ability to prevent the recruitment of native seedlings and herbaceous species.

- v. Goal for Moneywort: Test the feasibility of eradication of moneywort through a pilot study.
- vi. Objectives (Measurable): Based on pilot study, determine if moneywort eradication is possible at this site and if so, modify the weed management plan to include moneywort control in the future.

c. Japanese knotweed (*Polygonum cuspidatum*)

- i. Priority: A (high)
- ii. Description: Japanese knotweed is a fast-growing, herbaceous perennial that grows three to six feet high and forms large, dense patches where it invades. The plant has distinctive stout, hollow bamboo-like stems and large (three to six inch long) broadly ovate leaves. Tiny white or greenish-white flowers develop in August and September and grow in numerous linear clusters. The plant is insect-pollinated and the seeds are wind-dispersed, though often unviable. The dispersal and spread of Japanese knotweed occurs largely through the spread and growth of rhizomes, which may reach up to 45-50 feet in length.
- iii. Current distribution at Maidstone Bends: Japanese knotweed is not currently growing at this property.
- iv. Damage & Threats: Japanese knotweed readily invades natural areas, establishing dense, even-aged stands that crowd or shade out native plants. Its large roots do not hold soil very well and can contribute to bank erosion. Once established, it is very difficult to control.
- v. Goal for Japanese knotweed: Prevent the establishment of knotweed at the Maidstone Bends preserve.
- vi. Objectives (measurable): Survey the property every two years to detect any infestations of knotweed quickly.

d. Common buckthorn (*Rhamnus cathartica*)

- i. Priority: A (high)
- ii. Description: Common buckthorn is a sub-deciduous shrub or small tree that can reach up to 20 feet in height. Smooth, dull green, oppositely arranged leaves persist well into fall and twigs are often tipped with thorns. Native to Eurasia, buckthorn occurs in a variety of North American habitats

including pastures, exposed rocky sites, woodland borders, and wet areas. It prefers neutral or alkaline soils and does not grow well in dense shade.

- iii. Current distribution at Maidstone Bends: Buckthorn is not currently growing at this property.
- iv. Damage & Threats: Common buckthorn readily invades natural areas, forming dense, even-aged thickets that crowd or shade out the native plants. Buckthorn produces prolific fruits that are spread by birds and small mammals. Songbird nests in buckthorn experience higher predation than those in native shrubs. Buckthorn is documented to increase nitrogen in soils resulting in a change of species making up the characteristic soil microfauna.
- v. Goal for Buckthorn: Prevent the establishment of buckthorn in the Maidstone Bends preserve.
- vi. Objectives (measurable): Survey the property every two years to detect an infestations of buckthorn quickly

B. Management Options for Invasive Plants

Maidstone Bends is located in Northeastern Vermont, over one hour's drive from TNC's headquarters in Montpelier. For the sake of efficiency, management options requiring repeated visits by preserve managers will not be chosen. It is for this reason that treatments such as girdling or cutting that do not kill the plants but may encourage root-sprouting will not be used. Acceptable control options are listed below and managers may choose any of them or use a combination that they feel is most effective and efficient.

1. Whole Plant Removal: Whole plant removal will only be undertaken when it is both time efficient and creates a minimum of soil disturbance. It will be limited to woody seedlings that can be pulled by hand without other tools. Plants removed in this manner will be place so that their roots cannot touch the soil to prevent re-rooting. In the case of moneywort, all pieces of the plant will be bagged and removed from the site to prevent regeneration.

2. Stem Cutting Followed by Herbicide Application: Stem cutting followed by the application of a glyphosate herbicide (25% active ingredient in solution) causes high mortality among woody invasive plants. For best results, this treatment should be performed in late summer and early fall when woody plants are sending carbohydrates to their roots for storage over winter. This method creates minimal soil disturbance.

3. Stem Injection: Hollow-stemmed species, such as Japanese knotweed, can be treated by injecting the stem with a 50% glyphosate solution using the J.K. International stem injector. The same application can also be used following stem cutting, with the herbicide dripped directly into the remaining stem. All stems that are cut will be placed so that they do not come in contact with the soil to prevent reestablishment.

C. Actions Planned (Treatments and monitoring)

Actions will be implemented annually for the next five years (2007-2012)

July-December: Woody invasive plant control days will focus on protecting the target community: Riverine Floodplain Forest. Areas A and B should be treated according to the Action Plans listed by area above. A total of one to two control days per year will be spent at the preserve and should be planned based on volunteer availability and staff convenience.

D. Measure of Success

The control methods implemented will be deemed a success if, in 2012, areas A and B contain no woody invasive plants. Areas should be monitored in that year to find any new plants.

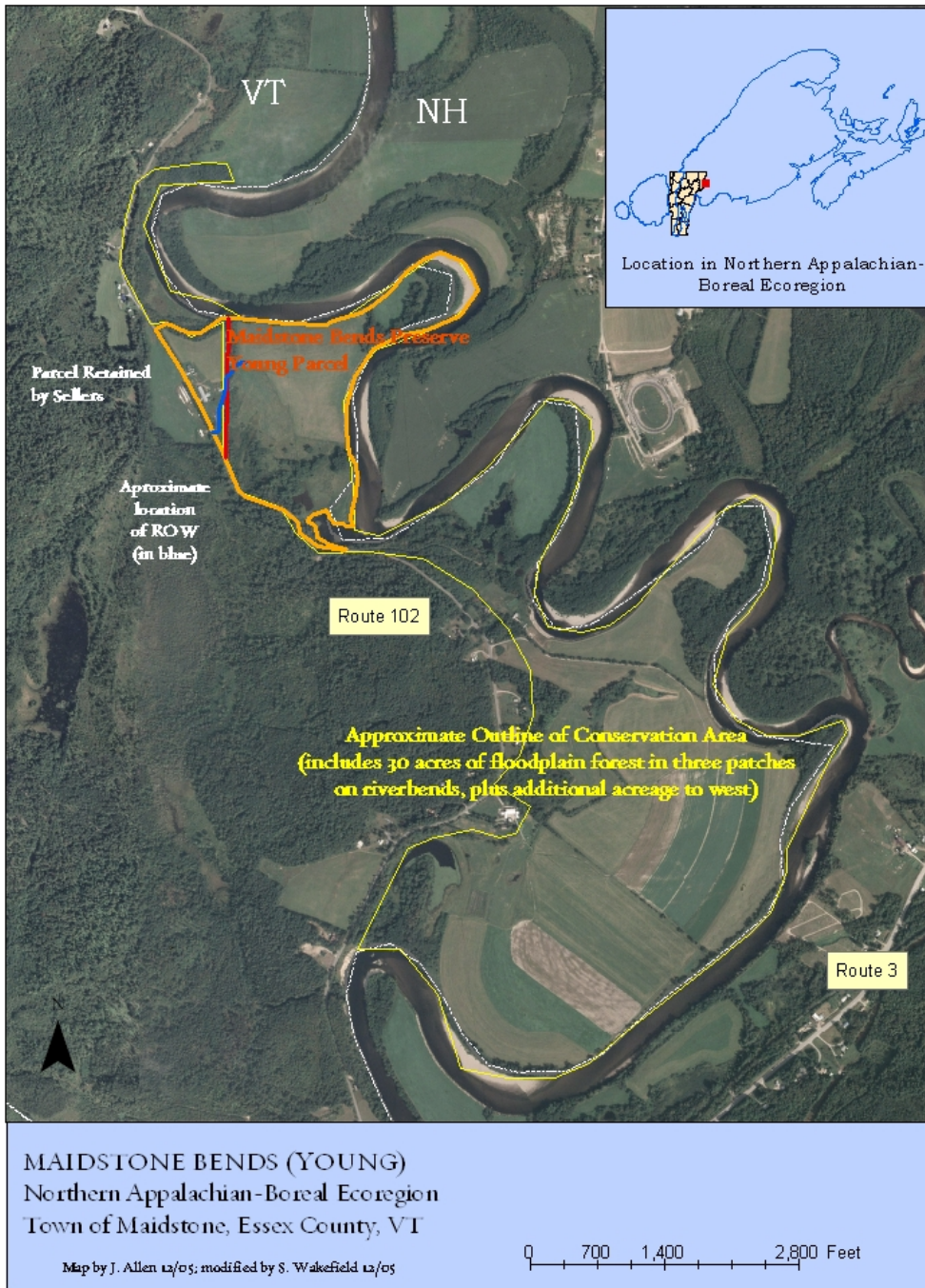
E. Resources Needed

Equipment will be shared with other TNC projects. Equipment costs listed below are a one-time cost, while labor costs are annual.

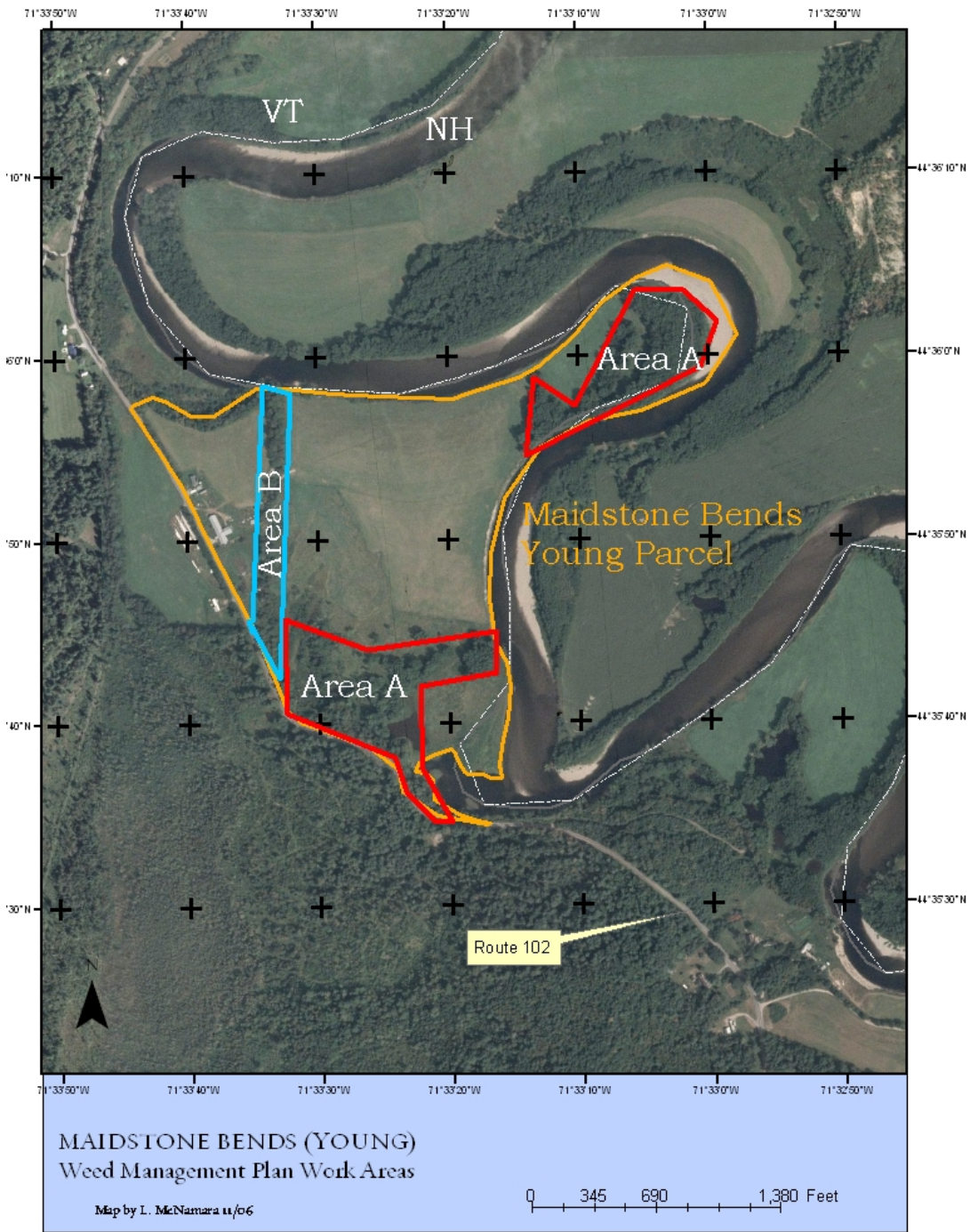
Time: 2 days with a TNC staff supervisor and volunteers per year.

Herbicide: ~\$20 for entire period depending on method used

Nitrile gloves: ~\$10 for entire period



Map 1: Location of the Maidstone Bends property.



Map 2: Delineation of work Areas at the Maidstone Bends property.

5. References

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Converse, Carmen. 1984. Element Stewardship Abstract for *Rhamnus cathartica*, *Rhamnus frangula*. The Nature Conservancy.

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Thompson, Liz. 2004.