Assessments of Treatments for the Control of Invasive Plants

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With support from:

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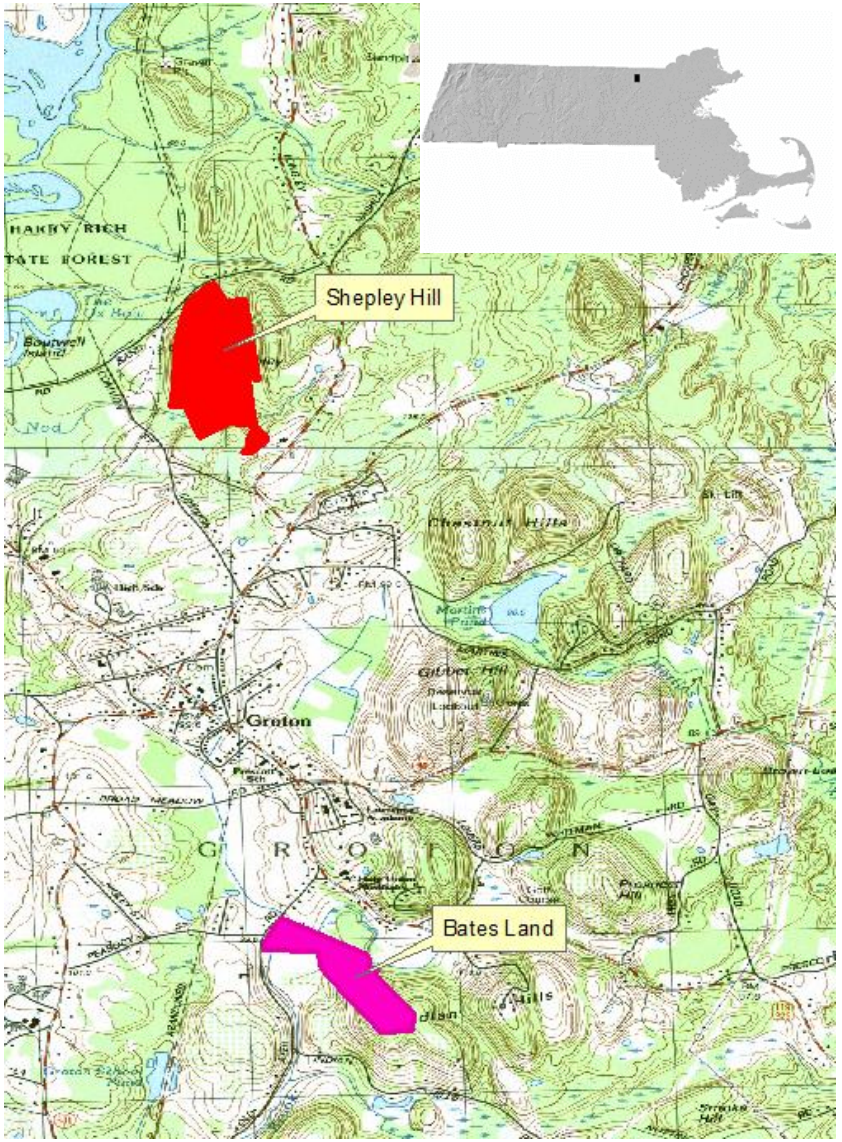
Study Sites

Both support populations of invasive species

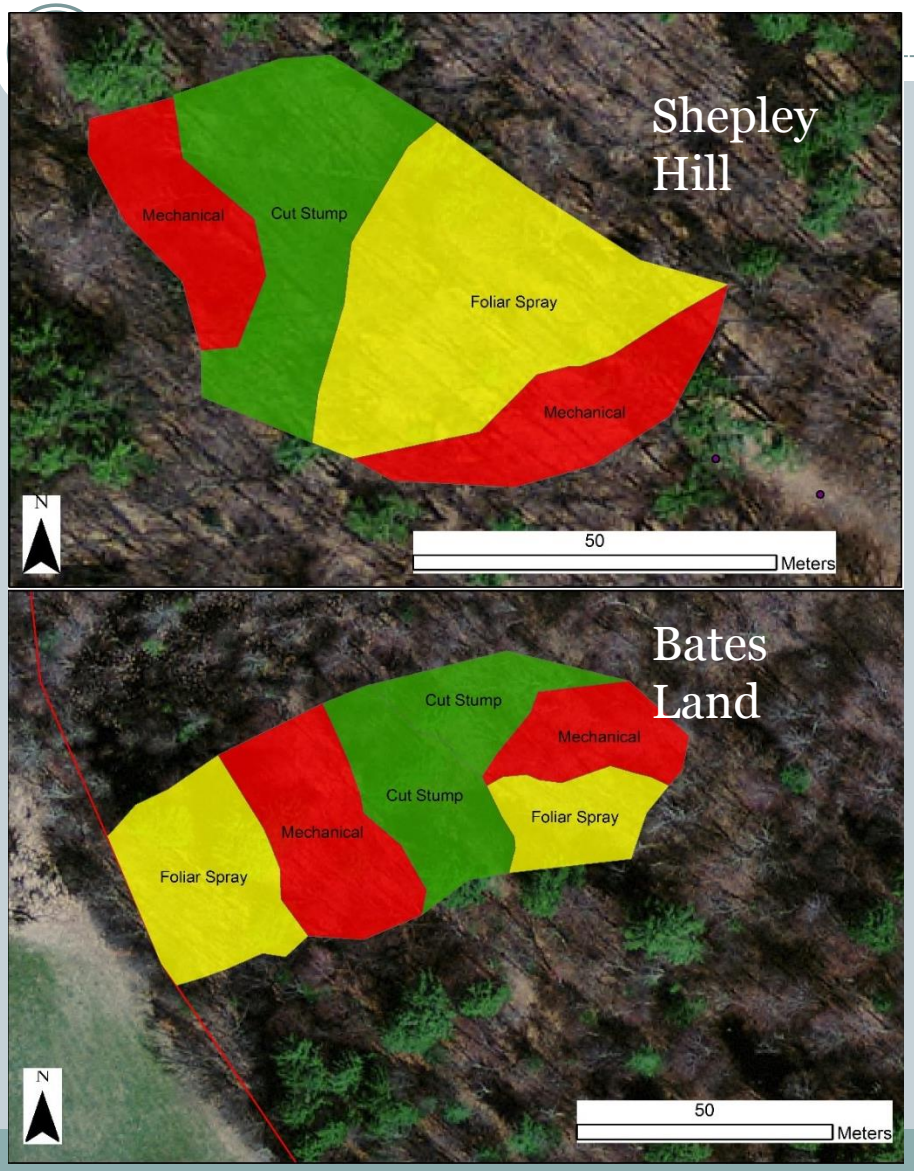
Bates Land: 2011 mechanical removal of honeysuckle by Boy Scouts (0.7 acres)

Shepley Hill: 2013 cut-stem removal of Japanese barberry (0.4 acres)



Methods

- 9 treatment areas
- 15 5-meter radius study plots
- Bates Land: 1.1 acres treated; Shepley Hill 0.8 acres treated
- 3 treatment types:
  - Mechanical
  - Cut stem herbicide application (8.0% triclopyr)
  - Foliar spray herbicide application (2.2% glyphosate)



Bates Land Before & After

Before (Plot 5)

After Mechanical Treatment

Shepley Hill

Before Treatment (Plot 5)

After Cut Stem (Plot 5)

Results – Mechanical Removal

- Took most time (~60% of the 310 man-hr total)
- Reduced density of target species (avg: 91.7%, range: 88.1%-95.6%)
- Some resprouting seen after 1 year
- Native species persisted
- Soil disturbance a concern

Bates Land, Plot 4

Shepley Hill, Plot 4

Results – Cut Stem

- Less time intensive (~20% of the 310 total man-hours)
- More effective for moderate stems (young honeysuckle, buckthorn), less for small stems (Japanese barberry, multiflora rose) and very large stems (large honeysuckle) (avg: 73.6%, range: 50-88.9%)
- Mixed effects on native species
- Follow-up treatment (mechanical or herbicide) necessary

Shepley Hill

Results – Foliar Spray

- Least time consuming (~10% of 310 man-hrs)
- Reduces invasive density (avg: 92.3%, range: 85.0-100%)
- Some loss of native plants
- Some species appear somewhat resistant (common buckthorn)
- Some recolonization by native herbaceous plants

Shepley Hill

Results – Secondary Treatment

- 2013 project – limited efficacy of cut stump on small stems
- 2014 – mechanical removal of regeneration
- Limited success: reduced density in 2015, but invasives not eliminated

Conclusions

- Approach must be flexible
- Repeated treatments of a targeted area necessary
- Eradication impossible; goal is reduced invasive density to give natives opportunity to thrive

Conclusions cont'd

- Initial treatment most labor & cost intensive
  - Foliar spray most efficient; trained people working with herbicide applicator critical
  - Cut stem most effective for stems >1" diameter
  - Mechanical removal leads to soil disruption, up to 160 man-hours to clear 1 acre of heavily infested shrubs
- Subsequent treatments easier
  - Trained volunteers could cover upwards of 1 acre/day with mechanical treatment

Conclusions cont'd

- Hybrid strategy probably best
  - Specific techniques dependent on structure & composition of community
  - Minimize herbicide use in environment
  - Limit soil disturbance in sensitive areas

Data – Mechanical Removal

	7/2/2014	7/7/2015
Ground Cover	*	*
Canada Mayflower	*	*
Dewberry	*	*
False Solomons Seal		*
Lily of the Valley		*
Poison Ivy	*	*
Wild Geranium	*	
Invasives > 1 meter		
Common Buckthorn	4	
Common Privet	3	
Tatarian Honeysuckle	2	
Winged Euonymous	5	
Invasives < 1 meter		
Common Buckthorn	4	10
Common Privet	6	
Norway Maple	1	
Tatarian Honeysuckle	335	30
Winged Euonymous	12	4
Native Species > 1 meter		
Hickory		2
Maple Leaf Viburnum	13	5
Red Maple		1
Native Species < 1 meter		
Alt. Leaf Dogwood	1	1
Beaked Hazelnut		1
Gray Birch	1	
Green Ash	2	1
Hickory	5	5
Lindera Benzoin		4
Low Bush Blueberry	2	
Maple Leaf Viburnum	37	27
Pin Cherry	3	3
Red Oak	1	3
White Oak	9	3
White Pine	1	

Bates Plot 5 (first treatment)
94.6% removal

	7/9/2014	7/7/2015
Ground Cover		
Aster		*
Jack in the Pulpit	*	*
Jewelweed	*	*
Poison Ivy	*	*
Invasives > 1 meter		
Common Buckthorn	2	
Tatarian Honeysuckle	108	
Invasives < 1 meter		
Bittersweet	1	
Common Privet	3	
Multiflora Rose		4
Tatarian Honeysuckle	168	11
Winged Euonymous	1	
Native Species > 1 meter		
Viburnum	1	
Native Species < 1 meter		
Pyrola	1	
Red Maple		3

Bates Plot 2
(previously cleared mechanically)
88.2% removal

Data – Mechanical Removal (cont'd)

Shepley Hill Plot 1
95.6% removal

	7/1/2014	7/9/2015
Groundcover		
Aster		*
Canada Mayflower	*	*
Doll's Eyes	*	*
Jack in the Pulpit		*
Partridgeberry	*	*
Invasives < 1 m		
Bittersweet	18	4
Common Buckthorn	406	15
Glossy Buckthorn	1	
Japanese Barberry	8	
Tatarian Honeysuckle	1	
Native < 1 m		
American Elm	6	5
Green Ash	62	12
Hickory		4
Lindera Benzoin	2	3
Sugar Maple	100	100
Native > 1 m		
Green Ash		5
Lindera Benzoin	4	1
Sugar Maple	1	1

Shepley Hill Plot 4
88.4% removal

	7/7/2014	7/9/2015
Groundcover		
Aster	*	*
Canada Mayflower	*	*
Doll's Eyes	*	
False Solomons Seal	*	
Jack in the Pulpit	*	*
Legume		*
Partridgeberry	*	*
Invasives < 1 m		
Bittersweet	9	1
Common Buckthorn	30	
Japanese Barberry	30	6
Winged Euonymous		1
Native < 1 m		
Alternate Leaf Dogwood	8	12
Green Ash	12	4
Hawthorn	1	
Lindera Benzoin	9	8
Maple Leaf Viburnum	9	7
Red Oak	3	
Sugar Maple	100	100
White Pine	1	
Yellow Birch	1	
Native > 1 m		
Lindera Benzoin	2	1

Data – Cut Stem Application

Bates Plot 3 (previously cleared mechanically) 88.9% removal

	7/2/2014	7/7/2015
Ground Cover		
Aster		*
Dewberry	*	*
False Solomons Seal	*	
Interrupted Fern	*	
Partridgeberry	*	*
Poison Ivy	*	*
Sensitive Fern	*	
Invasives > 1 meter		
Common Buckthorn	2	
Multiflora Rose	2	
Tatarian Honeysuckle	2	
Winged Euonymous	3	
Invasives < 1 meter		
Common Buckthorn	1	
Multiflora Rose		2
Tatarian Honeysuckle	8	
Native Species > 1 meter		
Green Ash	1	1
Hawthorn	1	2
Hickory	2	3
Lindera Benzoin		1
Pin Cherry	2	
Red Oak	1	
White Oak		1
White Pine	1	
Winterberry	1	

Table 4 cont.

Native Species < 1 meter	7/2/2014	7/7/2015
Amelanchier	*3*	
Arrowwood	*1*	
Black Birch	*1*	
Green Ash	*3*	
Green Brier	*1*	*1*
Hawthorn	*1*	
Hickory	*1*	
Lindera Benzoin		*3*
Maple Leaf Viburnum	*1*	
Mulberry		*1*
Pin Cherry	*4*	*2*
Red Maple	*1*	
Sugar Maple		*1*
White Oak	*1*	

Bates Plot 6 (first treatment)

		7/7/2015
Ground Cover	Conditions in Plot 6 were similar to those of plot 5: almost 100% coverage by large invasive species. Because of the considerable time required, no sampling was done prior to treatment	
Aster		*
False Solomons Seal		*
Jack in the Pulpit		*
Poison Ivy		*
Violet		*
Invasives < 1 meter		
Tatarian Honeysuckle		42
Native Species > 1 meter		
Hawthorn		1

Data – Cut Stem cont'd

Shepley Hill Plot 3 (first treatment) 82.0% removal

	7/3/2014	7/9/2015
Groundcover	*	*
Canada Mayflower	*	*
Doll's Eyes		*
False Solomons Seal		*
Jack in the Pulpit	*	*
Partridgeberry	*	*
Poison Ivy	*	*
Invasives < 1 m		
Bittersweet	5	1
Common Buckthorn	113	20
Japanese Barberry	27	8
Tatarian Honeysuckle	13	
Winged Euonymous	3	
Native < 1 m		
Green Ash	12	8
Hickory		2
Lindera Benzoin	8	
Maple Leaf Viburnum	1	
Red Oak	4	3
Sugar Maple	100	100
Native > 1 m		
Black Birch		1
Hickory		2
Lindera Benzoin		1
Sugar Maple		1
Winterberry		1

Shepley Hill Plot 5 (first treatment) 50% removal

	7/3/2014	7/9/2015
Groundcover		
Dewberry		*
Doll's Eyes		*
Goldenrod		*
Jack in the Pulpit	*	*
Legume		*
Partridgeberry	*	*
Poison Ivy	*	*
Invasives < 1 m		
Bittersweet	2	1
Common Buckthorn	2	1
Japanese Barberry	6	3
Native < 1 m		
Alternate Leaf Dogwood	2	6
Black Birch	5	4
Lindera Benzoin	12	15
Red Oak		1
Sugar Maple	100	100
Native > 1 m		
American Chestnut	1	1
Black Birch	3	1
Carpinus		1
Hickory	1	
Lindera Benzoin	4	4
Sugar Maple	3	

Data - Foliar Spray

Bates Plot 1 (previously treated mechanically) 85% removal

	Pretreatment	Post Treatment
Ground Cover	**0**	**0**
Canada Mayflower	*	
Dewberry		*
False Solomons Seal		*
Partridgeberry		*
Poison Ivy	*	*
Pyrola	*	*
Virginia Creeper		*
Wintergreen	*	
Invasive Species > 1 meter		
Common Buckthorn	1	
Norway Maple	1	
Invasive Species < 1 meter		
Common Buckthorn	12	1
Common Privet	1	
Glossy Buckthorn		1
Tatarian Honeysuckle	24	4
Winged Euonymus	1	
Native Species > 1 meter		
Beaked Hazelnut	1	2
Crabapple	1	
Hickory		4
High Bush Blueberry		1
Maple Leaf Viburnum	22	24
Mulberry	1	
Pin Cherry		1
Red Maple	1	
Sugar Maple		1
White Oak		1

Table 2 cont.

Native Species < 1 meter		
Alternate Leaf Dogwood	1	2
Arrowwood	2	
Hawthorn		1
Hickory	1	
Low Bush Blueberry	50	45
Maple Leaf Viburnum	50	22
Mulberry	1	2
Pin Cherry		2
Red Maple	5	
Red Oak	1	3
White Oak	16	19
White Pine	2	2

Bates Plot 4 → (first treatment) 100% removal

	7/21/2014	7/7/2015
Ground Cover		
Jack in the Pulpit		*
Jewelweed		*
Wild Geranium		*
Invasives > 1 meter		
Common Buckthorn	2	
Common Privet	6	
Multiflora Rose	5	
Tatarian Honeysuckle	96	
Invasives < 1 meter		
Bittersweet	6	
Common Buckthorn	3	
Common Privet	29	
Multiflora Rose	34	
Tatarian Honeysuckle	249	
Winged Euonymous	3	
Native Species > 1 meter		
Red Maple	1	

Data – Foliar Spray cont'd

Shepley Plot 2 (first treatment)
91.0% removal

	7/3/2014	7/9/2015
Groundcover		
Aster	*	*
Canada Mayflower	*	*
Jack in the Pulpit		*
Poison Ivy	*	*
Unknown		*
Virginia Creeper		*
Invasives < 1 m		
Common Buckthorn	142	15
Japanese Barberry	35	1
Winged Euonymous	1	
Native < 1 m		
Alternate Leaf Dogwood	4	
Elm		3
Green Ash	56	
Lindera Benzoin	3	2
Maple Leaf Viburnum	4	12
Pin Cherry	1	
Sugar Maple	50	100
Virginia Creeper	4	
White Pine	1	
Native > 1 m		
Green Ash	4	2
Hickory		1
Lindera Benzoin	3	
Maple Leaf Viburnum	1	3
White Pine	1	

Shepley Plot 6 (first treatment)
93.3% removal

	7/3/2014	7/8/2015
Groundcover		
Canada Mayflower	*	*
Doll's Eyes	*	*
False Solomons Seal		*
Jack in the Pulpit	*	*
Partridgeberry	*	
Poison Ivy	*	*
Wild Geranium	*	
Invasives < 1 m		
Bittersweet	4	
Common Buckthorn	24	3
Japanese Barberry	12	
Tatarian Honeysuckle	4	
Invasives > 1 m		
Common Buckthorn	1	
Native < 1 m		
Beaked Hazelnut	2	
Elm	1	
Green Ash	24	17
Lindera Benzoin		1
Maple Leaf Viburnum	9	
Pin Cherry		1
Sugar Maple	100	100
Yellow Birch	1	
Native > 1 m		
Green Ash	1	3
Lindera Benzoin	5	3
Maple Leaf Viburnum	2	
Sugar Maple	1	1

Secondary Treatment Data

Shepley Plot 7 (86.1%)

	7/7/2014	7/8/2015
Groundcover		
Aster		*
Canada Mayflower	*	*
False Solomons Seal		*
Jack in the Pulpit	*	*
Partridgeberry	*	*
Poison Ivy		*
Virginia Creeper	*	*
Invasives < 1 m		
Bittersweet	3	
Common Buckthorn	9	1
Common Privet	1	
Glossy Buckthorn	2	
Japanese Barberry	16	3
Tatarian Honeysuckle	2	
Winged Euonymous		1
Native < 1 m		
Beaked Hazelnut		1
Green Ash	11	5
Hickory	1	
Lindera Benzoin	6	1
Maple Leaf Viburnum	1	
Red Oak		1
Sugar Maple	100	100
Tupelo		2
Native > 1 m		
Alternate Leaf Dogwood	1	
American Elm	1	
Green Ash		1
Hickory	2	
Sugar Maple	1	2

Shepley Plot 8 (76.1%)

	7/7/2014	7/8/2015
Groundcover		
Aster		*
Canada Mayflower	*	*
Jack in the Pulpit		*
Poison Ivy	*	*
Starflower		*
Virginia Creeper		*
Wintergreen	*	
Invasives < 1 m		
Bittersweet	29	7
Common Buckthorn	60	16
Glossy Buckthorn	7	
Japanese Barberry	12	
Winged Euonymous	1	2
Invasives > 1 m		
Common Buckthorn		1
Native < 1 m		
Green Ash	13	22
Hawthorn	1	1
Hickory	4	
Lindera Benzoin	9	2
Maple Leaf Viburnum	6	4
Pin Cherry	3	2
Red Oak		2
Sugar Maple	100	100
Viburnum		1
Native > 1 m		
Hickory	1	2
Sugar Maple	1	1
Tilia		1

Shepley Plot 9 (80.3%)

	7/7/2014	7/8/2015
Groundcover		
Canada Mayflower	*	*
Jack in the Pulpit	*	*
Partridgeberry	*	*
Poison Ivy		*
Virginia Creeper		*
Winterberry	*	
Invasives < 1 m		
Bittersweet	38	15
Common Buckthorn	76	6
Japanese Barberry	5	2
Multiflora Rose		1
Tatarian Honeysuckle	2	
Winged Euonymous	1	
Native < 1 m		
Alternate Leaf Dogwood		2
Green Ash	10	32
Hickory	2	
Lindera Benzoin	1	4
Maple Leaf Viburnum	4	4
Pin Cherry	3	
Sugar Maple	100	100
White Oak		3
Native > 1 m		
Black Birch		5
Green Ash		1
Hickory		4
Sugar Maple		1