TOWN OF SPENCER, MASSACHUSETTS
OFFICE OF THE
WATER DEPARTMENT

NORMAN C. LETENDRE, JR.
EBEN J. BUTLER

3 OLD MEADOW ROAD
SPENCER, MA. 01562

SUPERINTENDENT
STEVEN J. TYLER, P.E.

TEL. 508-885-7525
FAX: 508-885-9416
TTY: 508-885-7525

July 13, 2018

Mr. Michael Downey
Forest Stewardship Program
355 West Boylston St.
Clinton, MA 01510

Re: NOTICE OF COMPLETION – FINAL GRANT REPORT
Community Forest Stewardship Implementation Grant
Spencer Water Department - Shaw Pond Woodland Located in Leicester, MA

Dear Mr. Downey,

The purpose of this letter is to announce our successful implementation of the Forest Stewardship Plan for our 229-acre Shaw Pond property in the neighboring town of Leicester, Massachusetts and to provide you with the following Final Grant Report. Thank you for your assistance and the DCR Forest Stewardship Implementation Grant that allowed us to complete this important first step.

This project consisted of four major components, including:

1. To provide an interactive, community field workshop for Water Department Staff and landowners looking to control invasive species on their property.

2. To implement invasive species control tactics on Shaw Pond.

3. To develop in-house capacities within the Water Department to engage in these invasive species control tactics on the Shaw Pond property, as well as other properties in town.

4. To conduct water sampling that tests for the potential of damaging effects on Shaw Pond from invasive treatments.

Further information regarding each of the above steps is provided below and within the referenced Appendices attached.

Community Outreach

A brochure, provided in Appendix A, was created and mailed to invite nearly 300 landowners in Spencer inviting them all to an Invasive Species Workshop. The workshop outreach mailing was directed to landowners that own more than twenty acres of land because their land is more likely at risk of developing invasive species.

On May 26, 2018, the Spencer Water Department held an Invasive Species Control Field Workshop at David Prouty High School. The thirteen people in attendance were prompted to use a sign-in sheet, provided in Appendix B. Led by Christopher Polatin, Principal and Land Ecologist, the mystery of controlling invasive species was solved. The objective of this workshop, outlined in Appendix C, was to encourage landowners to take action against invasive species using simple, safe, and effective techniques that were provided within the course itself. Christopher Polatin provided several resources to identify and treat species that threaten the native habitats through his main presentation and Identification and Control Techniques for Common Upland Invasive Plants in Massachusetts handout. These resources can be found in Appendix D and Appendix E, respectively.

Immediately following the workshop, Broad Arrow Forestry sent a letter to all attendees encouraging them to take advantage of a complimentary site visit to Sibley Farm. Refer to the June 9, 2018 letter from Broad Arrow Forestry, provided in Appendix F. This hands-on experience, directed by Robert Plourde Jr., Licensed Forester, allowed attendees to utilize their newly obtained knowledge through the identification of invasive species and proposition of treatments.

In mid-June of 2018, a web page was added to the Town of Spencer website for information regarding Forestry and Land Management as well as the Invasive Species Workshop. Resources from the course itself, along with pictures and contact information for the presenters were provided for the general public's convenience. Refer to the printable version of the website in Appendix G, or use the link provided below.

Forestry and Land Management Resources Web page address:
http://www.spencerma.gov/Pages/SpencerMA_Water/ForestryAndLandManagement

Treatments to Shaw Pond Property

The invasive species were treated using two separate methods. In May of 2018, Land Stewardship Inc. performed cut stem treatment in areas invaded with moderate sized Norway Maple and Glossy Buckthorn.

In late June of 2018, any resurgent or missed woody invasive plants were treated for a second time with a foliar invasive treatment. Seedlings were also targeted in the second application.

Employee Development and Sustainability

Two Spencer Water Department employees have extended our in-house capacity by attending an applicator license training workshop at UMASS Springfield. Both employees took the Core Licensing Exam, one of which passed and is now a licensed applicator. The other employee plans to retake this exam in the near future. Results of the exam and the official license can be found in Appendix H. After attending the training course, and taking the licensing exam, both employees participated in or observed, respectively, the invasive treatments at the Shaw Pond property described above.

The Town of Spencer has also obtained spraying equipment, as recommended by our invasive species treatment specialist, for future use in town. See Appendix H for a list of materials and equipment that have been purchased.

We are grateful for the opportunities the Community Forest Stewardship Implementation Grant has provided to our office. These funds were both beneficial to the Water Department's learning and implementation of sustainable skills, while also providing excellent resources to the general public.

Water Sampling Program

First, we contacted the Drinking Water Section of MassDEP to determine whether there were any applicable testing or reporting requirements relative to the drinking water supply at Shaw Pond. MassDEP stated that because Shaw Pond is classified as a secondary, or emergency backup, water supply that is also inactive, that there were not any permitting, testing, or reporting requirements applicable to invasive species treatments on the Shaw Pond property. Even though testing was not required by MassDEP, the Water Department implemented a before and after invasive treatment sampling and laboratory testing program, as described below, to determine if there were potential water quality impacts to be aware of.

In order to evaluate whether treatments had a negative effect on Shaw Pond, we performed two inspections that would detect harmful residues. One sample was taken at the immediate outflow of Shaw Pond Dam, and the other was approximately 1000 feet from this outflow.

The laboratory analysis of the samples from Shaw Pond tested for harmful quantities of Glyphosate, Total Coliform, and E. Coli. An inspection was completed pre-treatment on May 14, 2018, and post-treatment on June 7, 2018 to compare the presence of these substances before and after invasive treatments.

The reportable limit of Glyphosate is 5 micrograms per liter, and, according to the laboratory findings, Shaw Pond tested for less than 5 micrograms per liter. Similarly, the inspection revealed that the Total Coliform and E. Coli were at quantities below 1 micrograms per liter, with a reportable limit of 1 micrograms per liter. The before and after laboratory results were all below analytical reportable limits and are therefore considered non-detectable. Refer to Appendix H for a visual representation of the locations that were tested and for lab results from the inspections.

The water quality sampling program confirmed that the method of treatment should not pose any adverse risk to Shaw Pond.

Thank you for this grant opportunity that allowed the Spencer Water Department to kick-start our program that we having been working closely with the Common Ground Land Trust to develop over the past couple of years. Further, in order to ensure the long-term success and sustainability of this program, beginning in FY 2018 the Spencer Water Department has programmed $10,000.00 per year into our annual operating expenses budget dedicated to meeting the needs of the Shaw Pond Forestry Stewardship Program and the Shaw Pond watershed.

Should you have any questions regarding the enclosed information please contact our Superintendent of Utilities and Facilities Steven J. Tyler, P.E., directly at (508) 885-7525 or styler@spencerma.gov.

Sincerely,

Steven J. Tyler, P.E.
Superintendent

Enclosures

List of Appendices

APPENDIX A – INVASIVE PLANT WORKSHOP BROCHURE

APPENDIX B – INVASIVE PLANT WORKSHOP ATTENDEE SHEET

APPENDIX C – INVASIVE PLANT WORKSHOP AGENDA

APPENDIX D – INVASIVE PLANT WORKSHOP PRESENTATION

APPENDIX E – IDENTIFICATION AND CONTROL TECHNIQUES FOR COMMON UPLAND INVASIVE PLANTS IN MASSACHUSETTS

APPENDIX F – BROAD ARROW FORESTRY LETTER: INVITATION TO SITE VISIT

APPENDIX G – FORESTRY & LAND MANAGEMENT WEB PAGE

APPENDIX H – INVOICE FOR SPRAYING MATERIALS & EQUIPMENT AND APPLICATOR LICENSE

APPENDIX I – SHAW POND SAMPLING LOCATION MAP & LABORATORY RESULTS

APPENDIX A

Invasive Plant Workshop Brochure

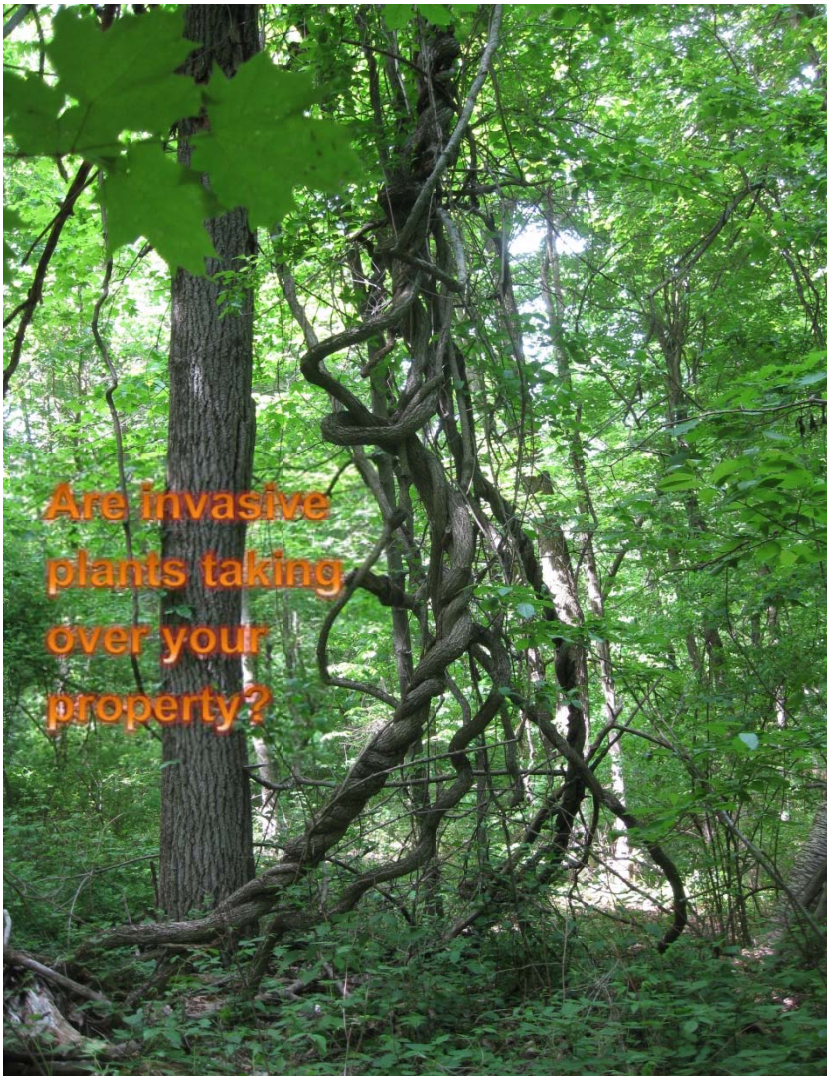
INVASIVE PLANT WORKSHOP

CONTROLLING INVASIVE PLANTS ON YOUR FARM AND WOODLOT

MAY 26, 2018 | SATURDAY

8:30 AM – 1:00 PM

DAVID PROUTY HIGH SCHOOL



What? Learn more about the threat these plants pose to open spaces in Spencer and how you can take action on your own property in a safe and ecological way by coming to this Spencer Water Department and Mass DCR sponsored workshop. Workshop is free and open to all Spencer residents and invited friends and neighbors based upon available seats.

Why? The goal of this workshop is to demystify invasive plant control using herbicides and to leave landowners with simple, safe and effective techniques that they will feel confident using on their own land. We will discuss equipment and chemical costs as well as funding sources for larger projects. Other topics include timber harvesting considerations, wildlife habitat issues, and non-chemical options.

Where? The workshop will include a classroom session in the Innovation Lab at David Prouty High School and a field component at nearby Sibley Farm Conservation Area. Attendees will also qualify for a free site visit by a licensed forester/ invasive plant expert.

When? Saturday May 26, 2018 8:30 AM – 1:00 PM

How to I Sign Up? To reserve your spot, please use the registration form on the reverse side of this notice.

Registration Form

Controlling Invasive Plants on your farm and woodlot workshop. May 26, 2018 - 8:30am-1:00pm

Coffee breaks will be provided but we recommend bringing a lunch as will be going through the noon hour.

Name _____

Address _____

Town_____ State _____ Zip _____

Phone _____

Email _____

Tell us a little about the invasive plant problems you are encountering:

_____

_____

_____

Mail, fax or email this form to :

Spencer Water Department
3 Old Meadow Road
Spencer, MA 01562
Attn: Steven Tyler
Fax: (508) 885-9416
styler@spencerma.gov

For questions or late registrations, contact:

Town of Spencer
Spencer Water Department
Tel: 508-885-7525

Or you can call the Spencer Water Department at (508) 885-7525 or email your request including your name, address, telephone number and list invasive plant problems you are encountering to styler@spencerma.gov. Please put "Invasive Species Workshop" in the subject line of your email.

APPENDIX B

Invasive Plant Workshop Attendee Sheet

INVASIVE PLANT WORKSHOP - MAY 26, 2018

PARTICIPANT SIGN-IN

NAME	ADDRESS	EMAIL	INTEREST IN FREE SITE VISIT? y/n
TANYA McAULEY	P.O. Box 575	tk2p2pe@gmail.com	✓
Alan Podbelski	4 Woodside Rd		✓
? Jan Parke	207 Greenville St	parke207@charter.net	?
? Janet McCish	16 Thompson Pond Rd	JanOMCCish.com	
? Michael O'Coin	11 Thompson Pond	mcoinG33.charter.net	?
John & Faith Barbato	166 S. Spencer Rd	faith.barbato2@gmail	y
Lee George Will George	35 Gold Nugget Rd.	leegrmsc@aol.com wgeorge79@aol.com	✓
N Heidi B-Marcum	128 Mechanic St	hbrenkie@hotmail.com	N
Bob Moschini	30 Howe Rd Spencer	robert.moschini@yahoo.com	Yes
N Colin Novick	4 Ash St Worc MA 01608	colin@gulton	
Steven Tyler	8 Jones Rd Spencer	stevenjames.tyler@~~spencerma.gov~~ gmail.com	✓

APPENDIX C

Invasive Plant Workshop Agenda

SPENCER WATER DEPARTMENT INVASIVE SPECIES CONTROL FIELD WORKSHOP

DATE: SATURDAY MAY 26, 2018, 8:30AM – 1:00PM

LOCATION: DAVID PROUTY HIGH SCHOOL (INNOVATION LAB) AND SIBLEY FARM

INVITEES: SPENCER LANDOWNERS (10AC+) & LEICESTER ABUTTORS TO SHAW POND PROPERTY

WORKSHOP OBJECTIVE: To demystify invasive plant control using herbicides and to leave landowners with simple, safe and effective techniques that they will feel confident using on their own land.

OUTLINE

8:30-9:00 SIGN IN & COFFEE, PLANT ID STATIONS, SIGN UP FOR SITE VISITS

9:00-9:15 Welcome and intro, Goals for workshop, Background on Sibley Farm management

9:15-10:00 Topics to cover

- Provide context (why bother?-ecological and practical reasons)
- Plant ID-interactive, what are you likely to find in Spencer, what should you be on the lookout for
- Mechanical vs. Chemical control (i.e. which plants can be pulled and which cannot)
  Cursory review of pulling techniques
- Chemical Approaches (foliar vs cut-stem) minimal attention to mist blowers and basal spraying

10:00-10:15 BREAK/ SNACKS

10:15-11:00 Topics to cover

- Basic palette of non-restricted herbicides available to landowners
- Safety concerns
- Proper use (dilutions, surfactant, dye, etc)
- Concentration vs. Ready-mix
- Costs & Suppliers
- Regulations
- Funding sources (e.g. NRCS)

11:00-11:20 RELOCATE EVERYONE TO FIELD TRAINING SITE AT TOP OF HILL/SNACK BREAK/HANDOUTS

11:20-12:35 Topics to cover

- How to prioritize treatment areas (discuss field edges and woodlands)
- Plant ID
- Equipment options, other tools needed, costs & suppliers
- Demo of herbicide application techniques (Cut-stem and foliar)
  (Backpack sprayer, Handheld sprayers, weed wrench, saws and pruners)
- Follow-up and monitoring
- High density infestations (Sibley Farm example)-will need hike to treatment area
- Value of Ch.61 and Forest Stewardship Plans

12:45-1:00 WRAP-UP, ACTION STEPS FOR LANDOWNERS, SIGN UP FOR SITE VISITS

- Handouts, On-site visit sign-up, Spray package ordering

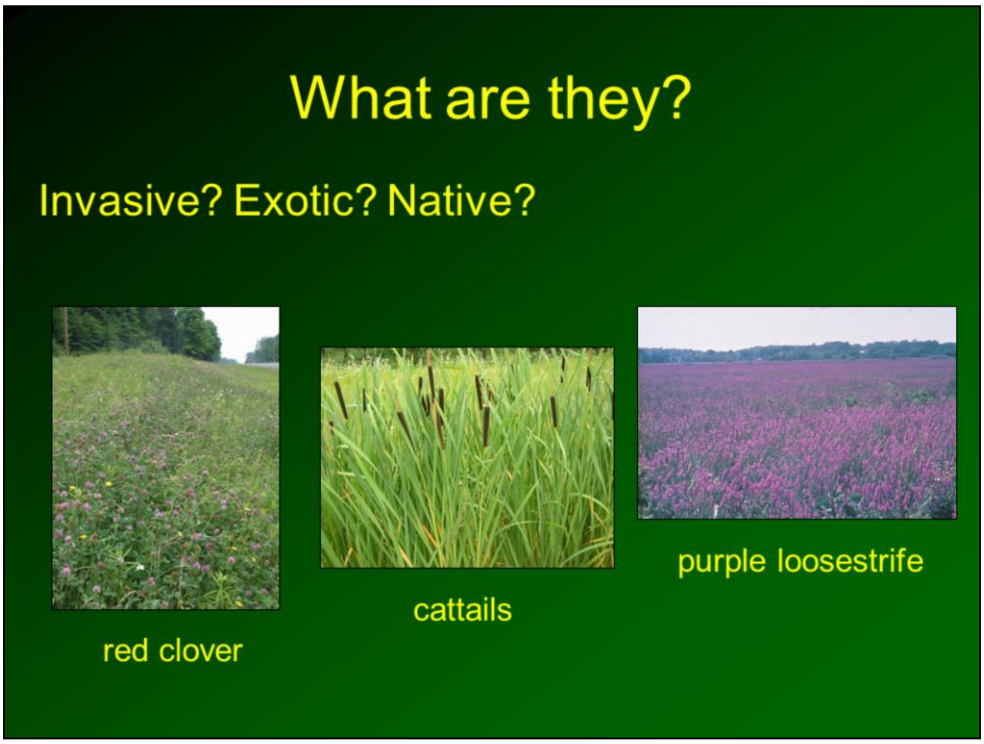
APPENDIX D

Invasive Plant Workshop Presentation

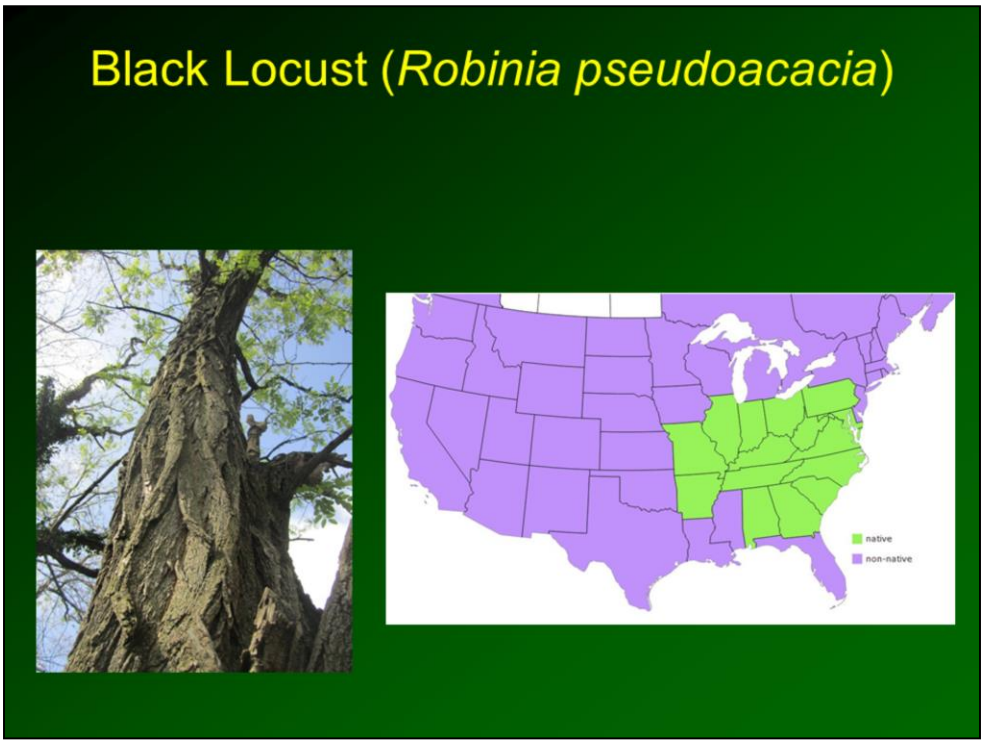
In this presentation I am seeking to provide you with an overview

"One of the penalties of an ecological education is that one lives alone in a world of wounds. Much of the damage inflicted on land is quite invisible to laymen. An ecologist must either harden his shell and make believe that the consequences of science are none of his business, or he must be the doctor who sees the marks of death in a community that believes itself well and does not want to be told otherwise."

— Aldo Leopold, *A Sand County Almanac*



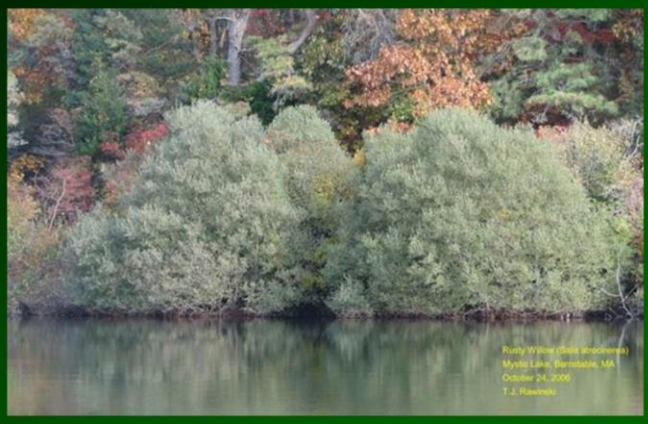
Go one by one and ask the audience each time: Do you think this is an invasive plant? Cattails often grow rapidly and spread in wetlands, they become a nuisance in some people's ponds, other people want to have them there, but assure the audience that the cattails don't have the serious ecological impacts that nonnative invasive plants do. They are sometimes considered a nuisance, that's all. Red clover: it's the VT state flower, it is nonnative, but is it invasive? Assure audience that this is a valuable agricultural plant, used in hay mixes, doesn't invade natural habitats. Purple loosestrife: it is nonnative and it invades wetland habitats, takes over native plants, inhibits growth of larval amphibians like tadpoles when it is dense, this is an invasive plant.



John: range maps: pay attention to North-South limits – stretch a range limit if you can justify it….

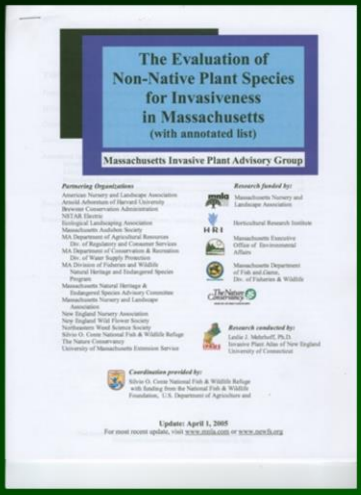
Work in near term to plant what's here and what has been here a long time.

Hybridization



MIPAG

Massachusetts Invasive Plant Advisory Group



The Evaluation of
Non-Native Plant Species
for Invasiveness
in Massachusetts
(with annotated list)

Massachusetts Invasive Plant Advisory Group

Partnering Organizations

American Nursery and Landscape Association
Arnold Arboretum of Harvard University
Brewster Conservation Administration
NSTAR Electric
Ecological Landscaping Association
Massachusetts Audubon Society
MA Department of Agricultural Resources
Div. of Regulatory and Consumer Services
MA Department of Conservation & Recreation
Div. of Water Supply Protection
MA Division of Fisheries and Wildlife
Natural Heritage and Endangered Species Program
Massachusetts Natural Heritage & Endangered Species Advisory Committee
Massachusetts Nursery and Landscape Association
New England Nursery Association
New England Wild Flower Society
Northeastern Weed Science Society
Silvio O. Conte National Fish & Wildlife Refuge
The Nature Conservancy
University of Massachusetts Extension Service

Research funded by:

Massachusetts Nursery and Landscape Association
Horticultural Research Institute
Massachusetts Executive Office of Environmental Affairs
Massachusetts Department of Fish and Game, Div. of Fisheries & Wildlife

Research conducted by:

Leslie J. Mehrhoff, Ph.D.
Invasive Plant Atlas of New England
University of Connecticut

Coordination provided by:

Silvio O. Conte National Fish & Wildlife Refuge
with funding from the National Fish & Wildlife Foundation, U.S. Department of Agriculture and

Update: April 1, 2005
For most recent update, visit www.mipa.com or www.newfs.org

- Categorizes plants that are *Invasive*, *Likely Invasive* and *Potentially Invasive* in Massachusetts

MIPAG Definition

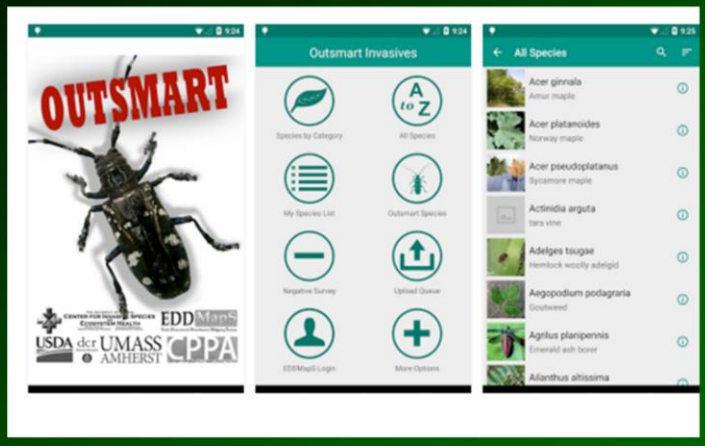
Invasive Plants

Non-native species that have spread into native or minimally managed plant systems in Massachusetts. These plants cause economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems.

IPANE also maintains lists of invasive plants in New England. Wealth of resources, plant images, etc.

MIPAG Representatives

- Federal Agencies: USFWS, USFS
- State Agencies: DOT, DCR, Mass Wildlife, DAR
- Non-Profit: Mass Audubon, TTOR, TNC, MACC, NEWFS
- Municipal: conservation commission
- Landscape/Nursery Industry
- Private: consulting & landscaping companies
- Education: Universities


OUTSMART
EDDMapS
USDA
UMASS AMHERST
CPPA
Outsmart Invasives
Species by Category
All Species
My Species List
Outsmart Species
Negative Survey
Upload Queue
EDDMapS Login
More Options
All Species
Acer ginnala
Amur maple
Acer platanoides
Norway maple
Acer pseudoplatanus
Sycamore maple
Actinidia arguta
tara vine
Adelges tsugae
Hemlock woolly adelgid
Aegopodium podagraria
Goutweed
Agrilus planipennis
Emerald ash borer
Ailanthus altissima

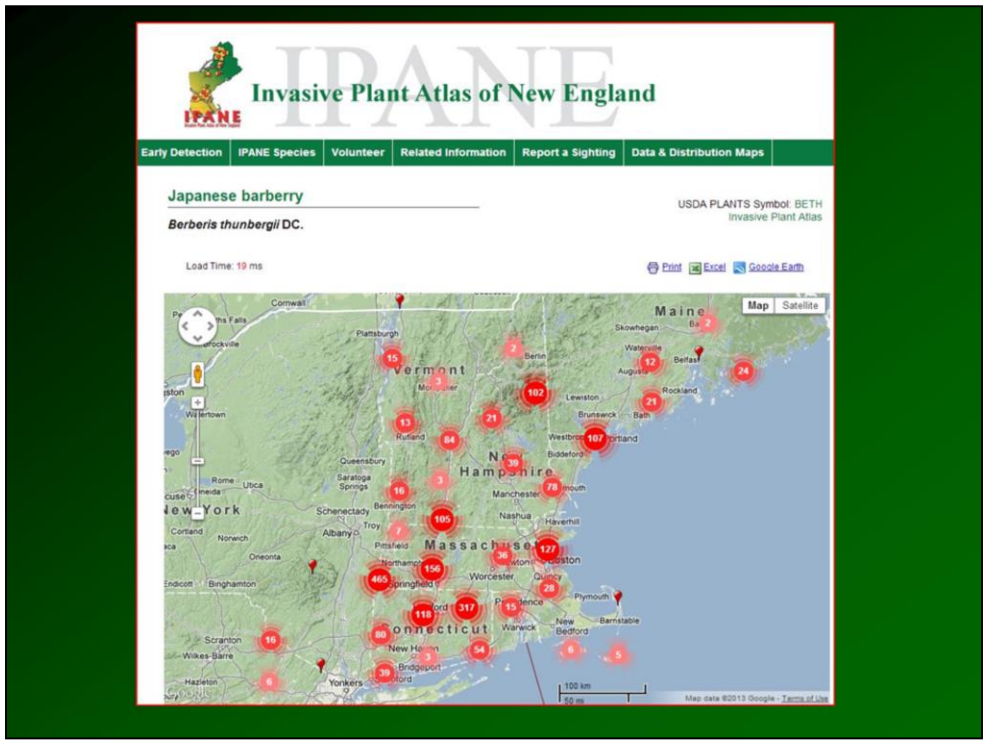
Barberries

Japanese barberry
(*Berberis thunbergii*)

common barberry
(*Berberis vulgaris*)

Here’s a bad infestation. They have even found rates of lyme disease to be higher in areas of high infestations. Mice are hosts for the deer tick. They are well protected in the barberry thickets, so their populations increase and there are more of them to host ticks.

The barberry is also at the perfect height for ticks to hang out and wait for deer, people, dogs, etc.


Invasive Plant Atlas of New England
Early Detection
IPANE Species
Volunteer
Related Information
Report a Sighting
Data & Distribution Maps
Japanese barberry
Berberis thunbergii DC.
USDA PLANTS Symbol: BETH
Invasive Plant Atlas
Load Time: 19 ms
Print
Excel
Google Earth
Map
Satellite
Maine
Vermont
New Hampshire
New York
Massachusetts
Connecticut
Map data ©2013 Google - Terms of Use

Northampton, MA reservoir on left

Cut stump woody vines, foliar low growing plants, hand pull seedling.

Burning Bush (Winged Euonymus)

Here’s a bad infestation in Littleton, MA. You can see how it is taking over the forest floor. This may be a pretty plant in our yards, but it has no or poor ecological function in our forests.

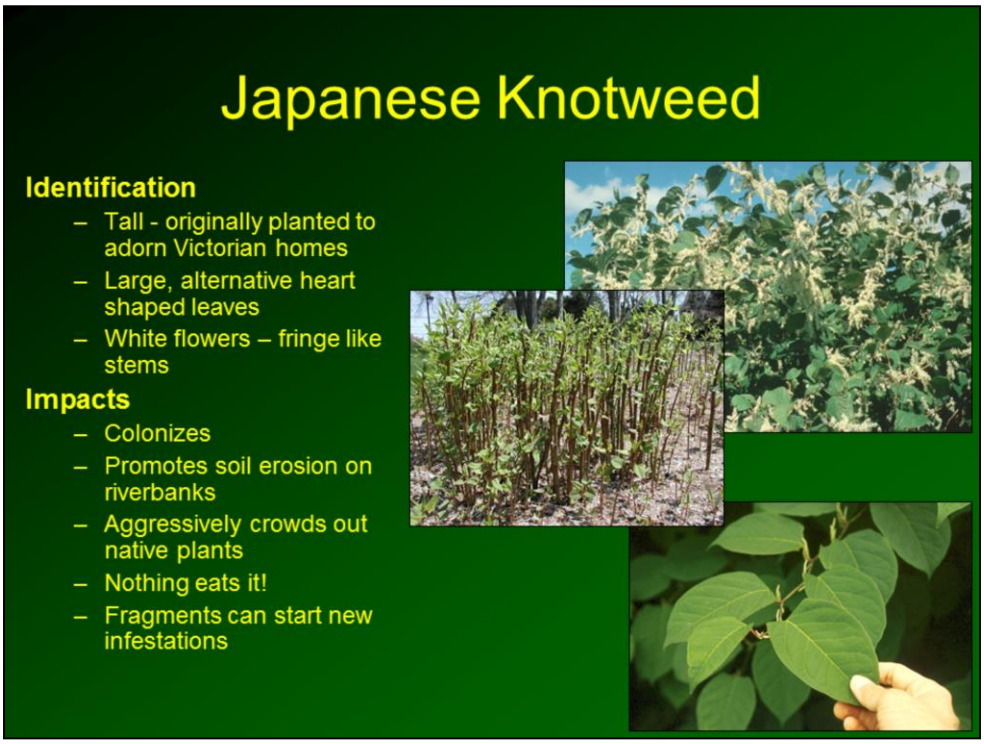
Buckthorn especially is junkfood for birds, the berries pass quickly through their system, the plant is using the birds as dispersal agents. Honeysuckle is an ecological sink for songbirds such as robins, see notes in Slide 13. Buckthorn changes soil nitrogen, increasing it beyond what it would normally be, and this changes the soil insect species that would normally be found there. Invasives can cause a cascade of ecological effects, we need to know more about impacts.

Upper left, all woodies beyond the ferns are GB – wetland area at Fiske in Dover, MA; below right, HD GB forms uniform understory in upland forest in Newfane, VT. Regeneration of native forest is compromised severely.

Cut stump, foliar, hand pulling small plants; best to do before fruiting, basal bark.

Common Buckthorn

Honeysuckle has largely overtaken many of the abandoned fields throughout the Champlain Valley, CT River Valley, Central VT and Southern VT. It is a scrappy shrub that can grow 10 -15 feet high. Check out the hollow pith. There ARE native honeysuckles, but most of what you'll find out there is the invasive.



Japanese knotweed is found among the all of Vermont's primary rivers and many of their tributaries. A lot of people call it bamboo.

It grows quickly - - easily 5 feet tall by the end of May.

Small stem fragments can start new colonies.

When it takes over, there are fewer insects to drop into the river and feed fish.

This is a great way to get the attention of fiserhrmen.

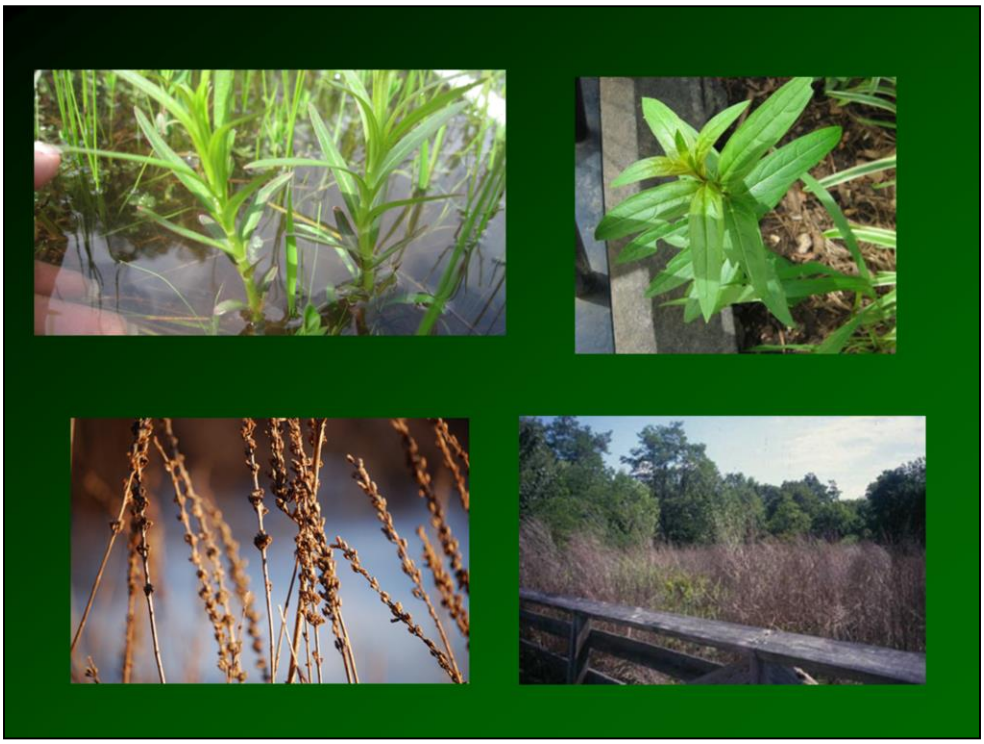
Photos, Joan Deely

Familiar sight along rivers, streams and water bodies in Mass., but also crops up in variety of other settings. Spreads by rhizomes, will sprout from root fragments. Best controlled with foliar spray after flowering. Repeated cutting/mowing can deplete plants sufficient to kill, but must be consistently done. Digging not recommended.

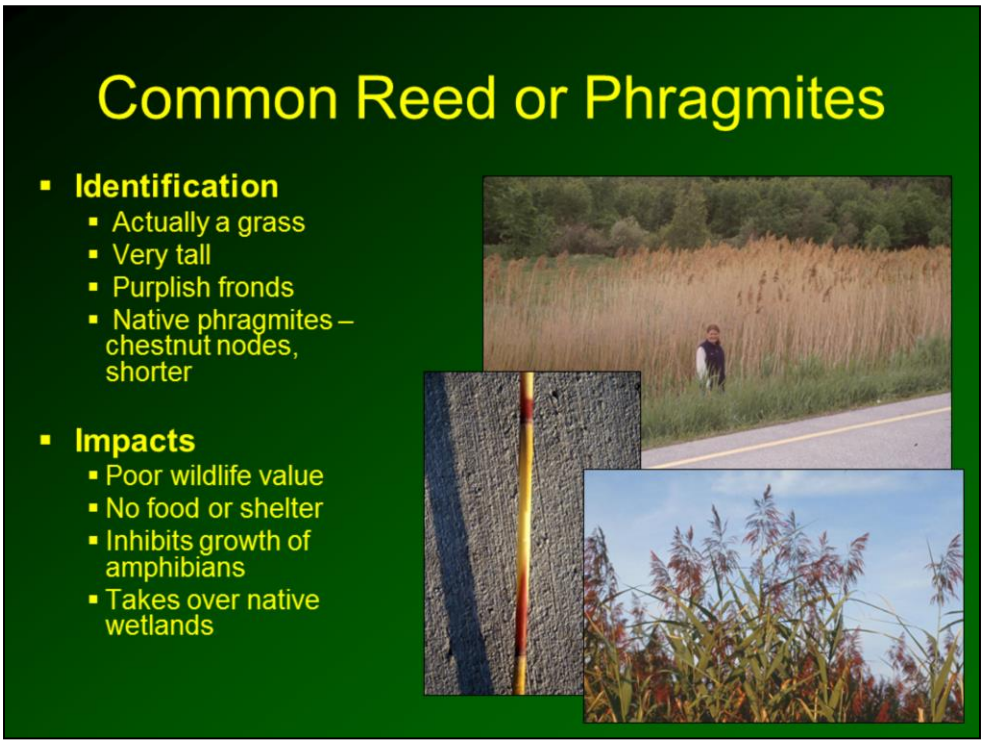
Young plants; rhizome

Two rare cabbage butterflies in the genus Pieris usually lay their eggs and mature their larvae in native mustards such as toothwort (Dentaria.) However, eggs laid in garlic mustard, which will attract the butterflies, will result in larvae unable to mature. Also garlic mustard is allelopathic, meaning they exude a chemical from their roots into the soil that prevents other plants from growing; like a natural herbicide to our native plants; walnuts do this too. The mechanism for this may be an interference with soil mycorhizae or soil bacteria that other plants depend on through symbiotic relationships.

A recent Cornell study shows that tadpoles and larval salamanders grown in water in which dense purple loosestrife and/or common reed are growing, have stunted growth compared to tadpoles and salamanders growing in cattails. The nonnatives apparently leach greater concentrations of tannins which interfere with oxygen uptake at the gills and through the skin.



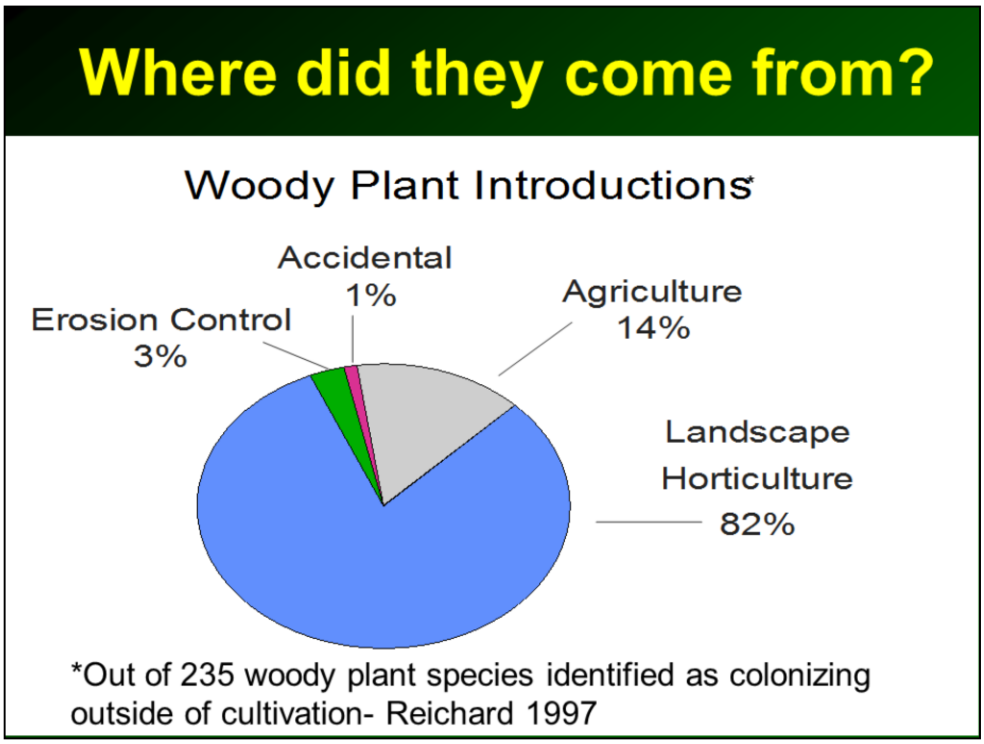
Young plants, prior to flowering (top); seed heads (lower left); stand of seed heads in wetland (lower right)



Phragmites has become a ubiquitous problem in roadside ditches, swamps, wetland edges.

Does not offer the food value and habitat that native plants do

Notice the purplish feathery fronds



A study conducted on woody invasives traced them back to their point of introduction. The majority of woody invasive plants in the United States were introduced for horticultural purposes— 82% of 235 inavsive woody plant species identified as colonizing outside of cultivation had been used in landscaping (Reichard, 1997),

No native predators: purple loosestrife (mention that the invasives have been shown in scientific studies, to leave most of their native predators and diseases behind, and the predators and pests in the new country aren't adapted so don't eat them…they have an ecological release, leave their baggage behind.)

Abundant seed production: buckthorn, honeysuckle (fruits), purple loosestrife (one million highly viable seeds per plant)

Effective dispersal mechanisms: birds disperse the seeds of buckthorn and honeysuckle, an emetic property makes them go right through their system

Rapid growth: Japanese knotweed shoots up in spring; by June 1 it is 6 feet tall in Vermont

Efficient use of light and nutrients: Japanese knotweed and black swallowwort wil grow in sun or shade. They don't have particular soil nutrient requirements, such as needing high calcium, high or low pH, etc. Many of the invasive species can tolerate shade, thus can grow in the VT woodlands.

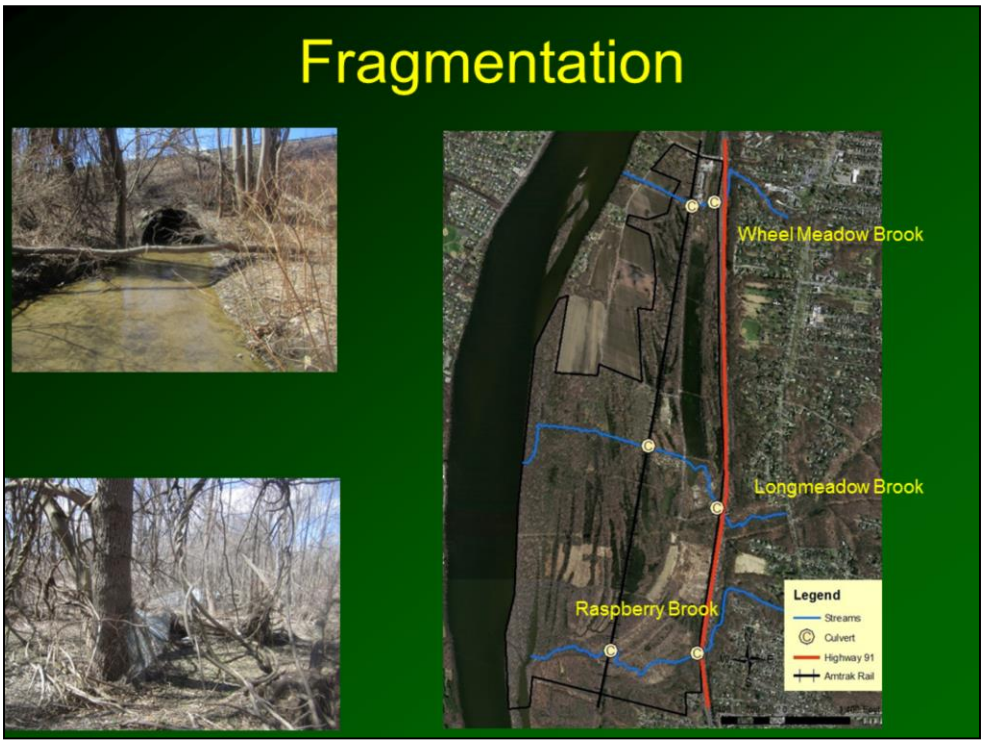
What makes them so successful?

Reason #3:
They thrive in disturbed anthropogenically modified environments

Phragmites at Scituate Marine Park

Invadable Communities

- anthropogenically disturbed
- early successional
- low diversity of native species
- lack of “complexity”
- absence of predators of invaders
- absence of ecologically similar native species
- simple food webs



Stream fragmentation/discontinuity is a huge issue within Longmeadow Flats brought about when Route 91 was built.

There are numerous culverts in place to slowly circulate the water under the highway, roads, and rail line. I'm happy to report that two of the three stream culverts under 91 appear to be functioning well for wildlife. Dozens of others appear to be undersized, perched, eroding or choked with silt.

Land Use History

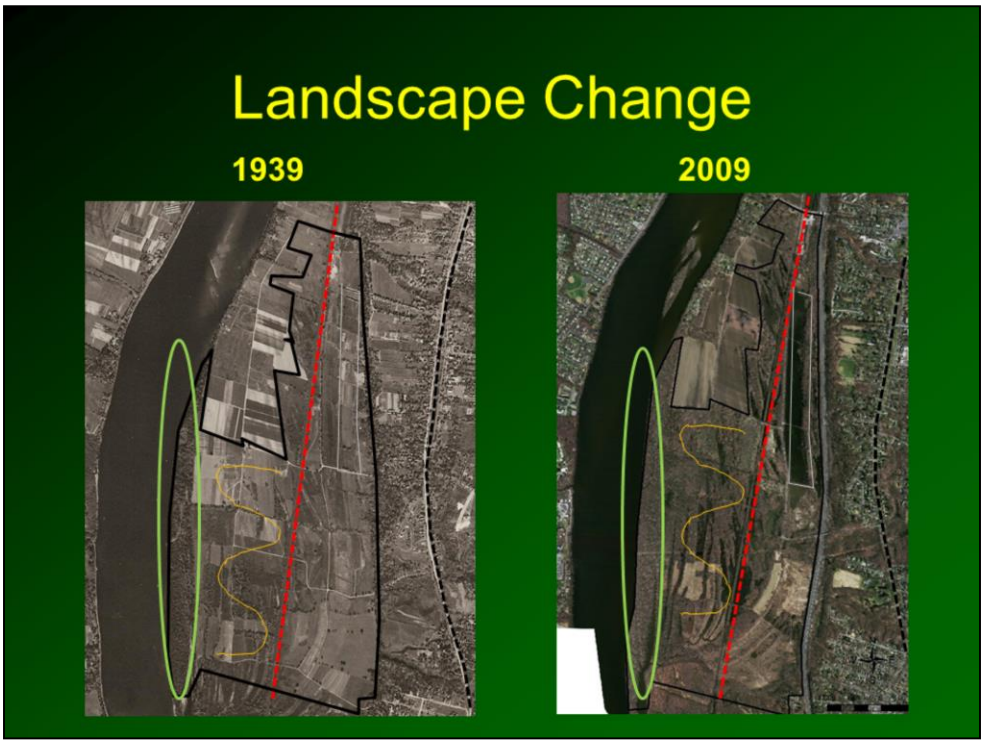
Photo credit: Brian DeGasperis

IP Soil Legacy Effects

Glossy buckthorn

Garlic mustard

Potential Seedbank



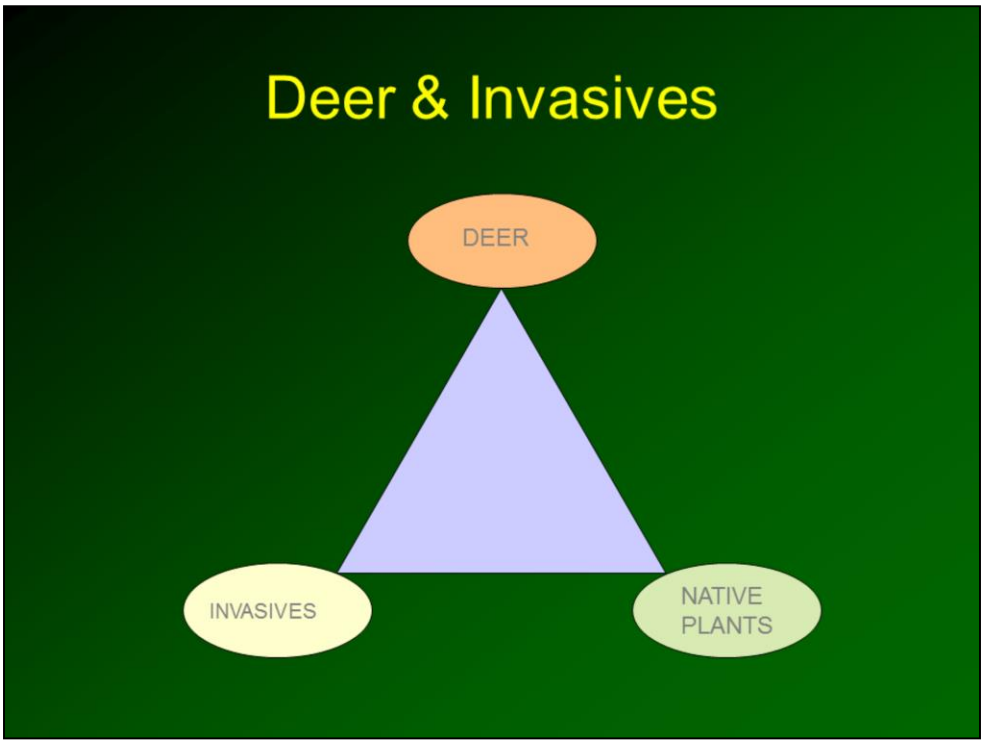
An important component of the Inventory was looking at the landscape changes from the 1939 aerials to present day.

Here we gathered some interesting information.

We learned that the floodplain forest section closest to the CT river hadn't been cleared for agriculture such as the lands around it as seen in the orange squiggly line.

We can also see the landscape patterns before Highway 91 was built and see how the stream hydrology was slowed and diverted by the creation of a string of ponds in the northeast section of the property.

Understanding historical changes on your land is key to your ability to see potential stressors and decide how to ameliorate their effects.



Deer avoid: Black cherry, American beech, Spicebush, White snakeroot, Mayapple, Blue cohosh, Eastern Hay-scented fern

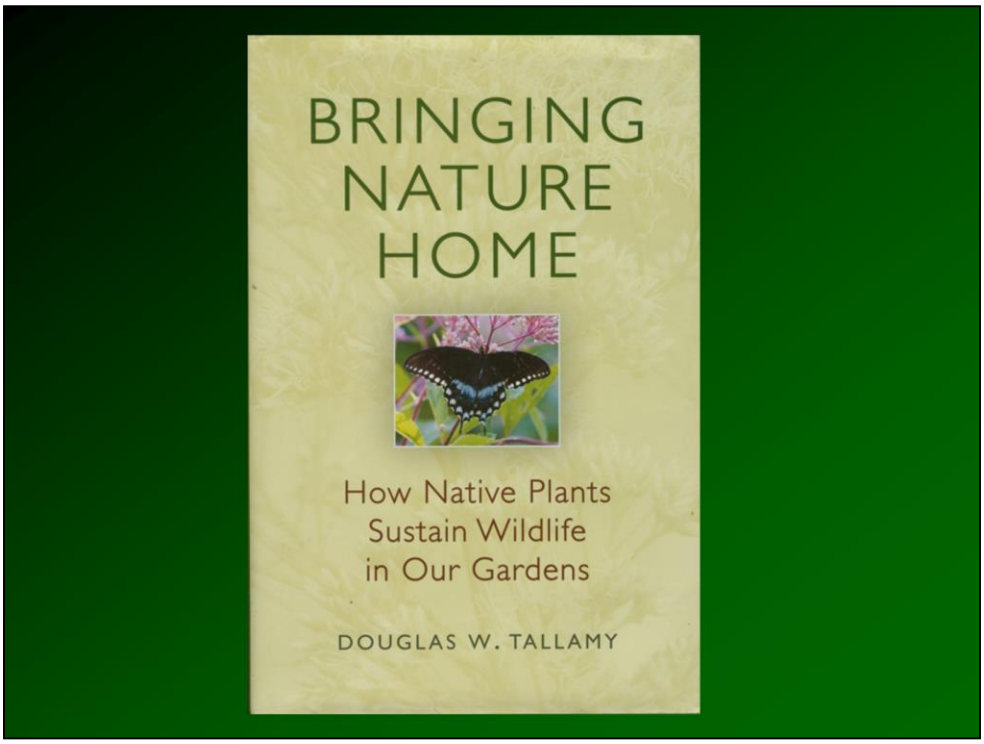
Deer will feed on and spread many invasives

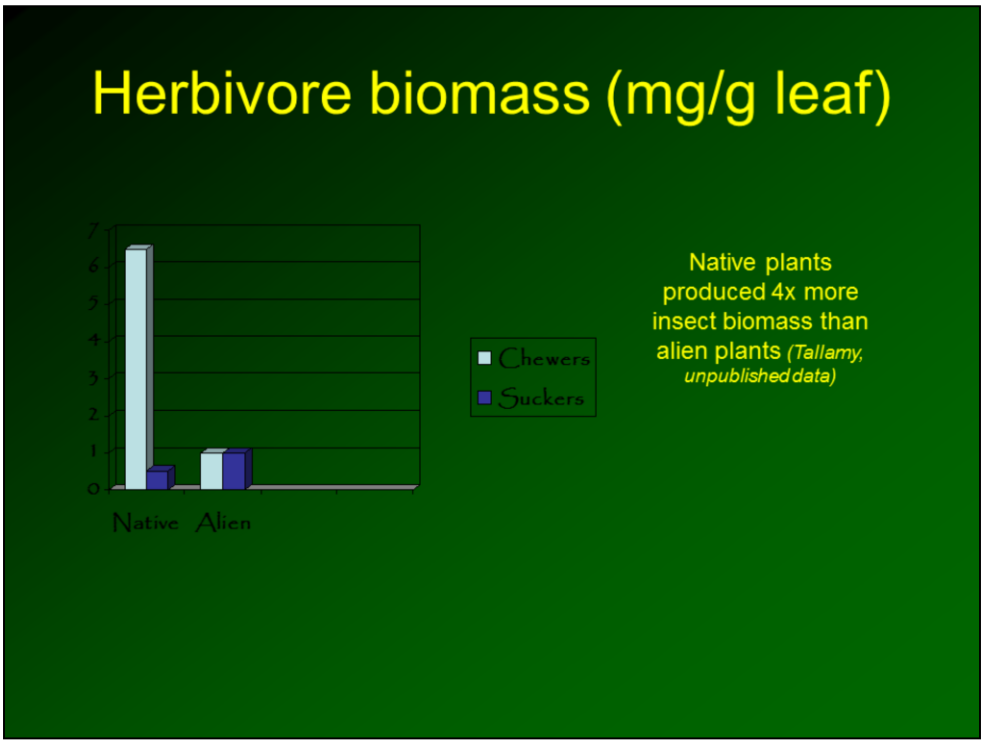
Invasives are disproportionately resistant to deer

Japanese stilt grass, garlic mustard, dame's rocket, black swallowwort, chervil, goutweed, buckthorn, barberry..

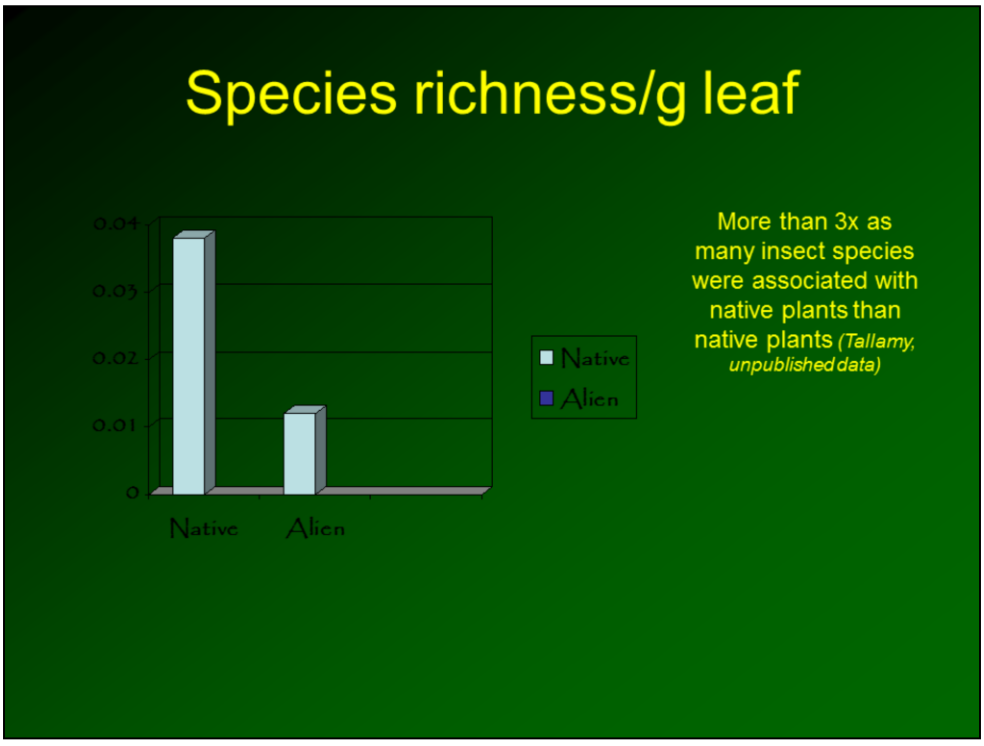
Why are we concerned? Ecological Impacts

- Homogenization
- Replace native species
- Interrupt natural succession and forest regeneration
- Disrupt food chain
- Degrade wildlife habitat
- Hasten erosion (in some cases)

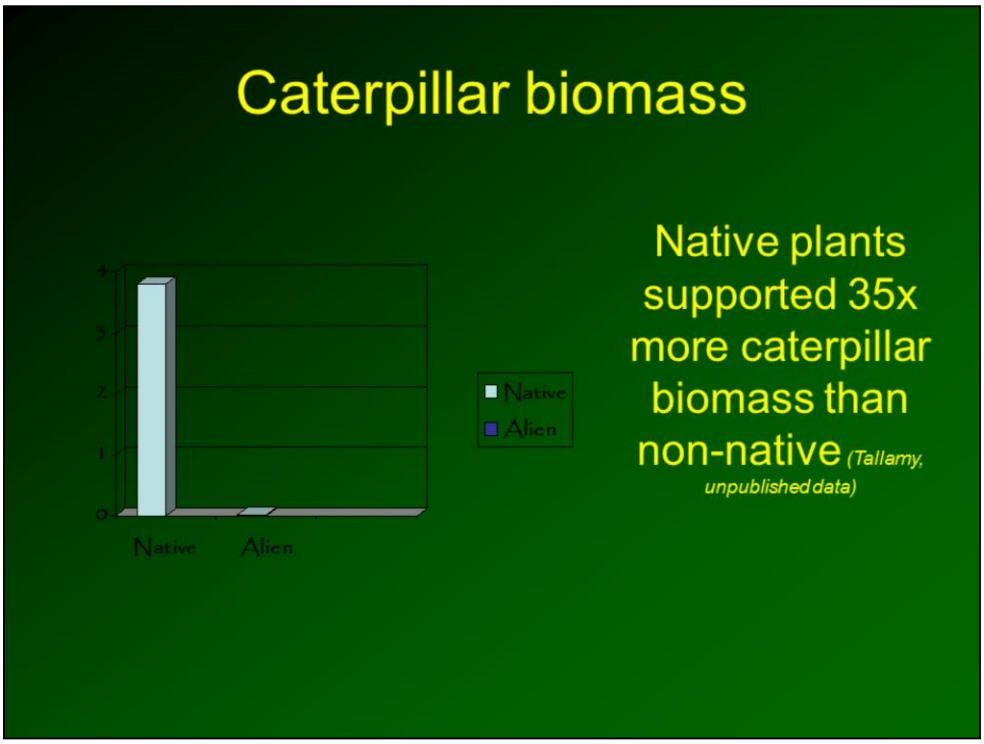

BRINGING
NATURE
HOME
How Native Plants
Sustain Wildlife
in Our Gardens
DOUGLAS W. TALLAMY



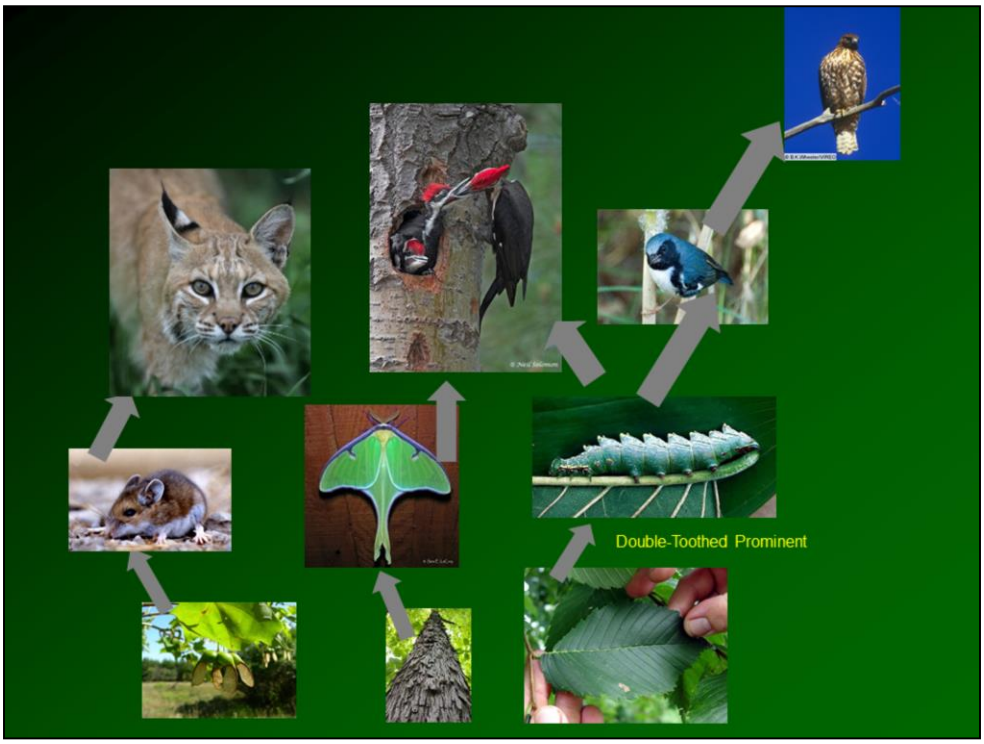
In a survey of insect herbivores found eating woody native and alien species in Oxford, PA, native plants produced over four times more insect biomass than alien plants produced. The difference resulted entirely from the inability of insects with chewing mouthparts to eat alien plants.



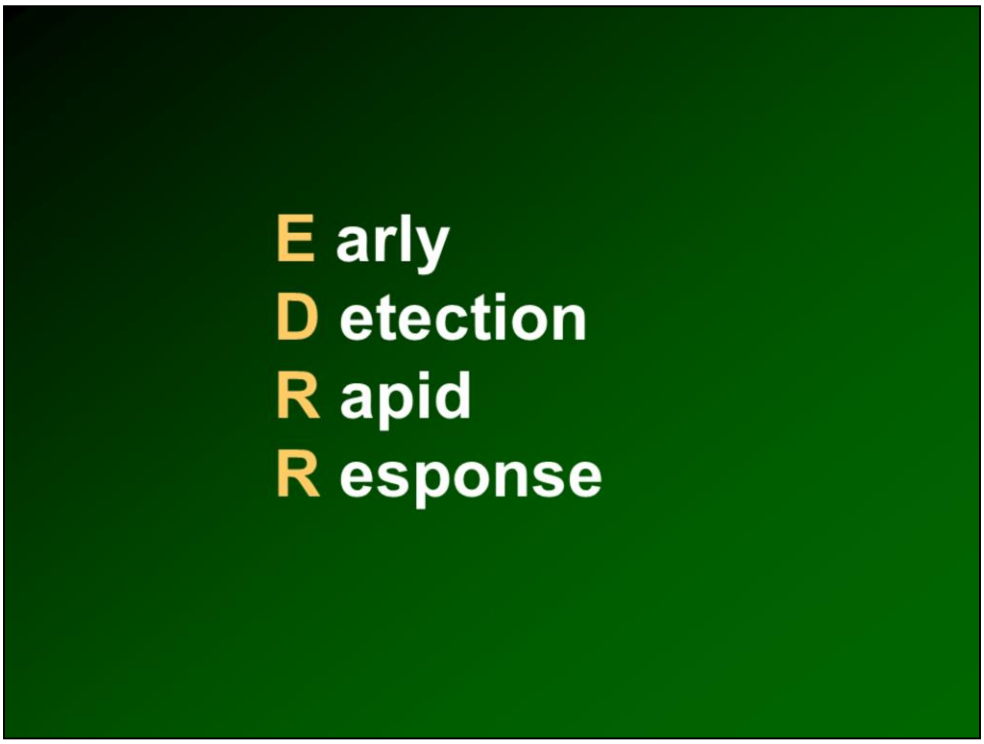
In a comparison of the diversity of herbivorous insects on native and alien woody plants in Oxford, PA, more than three times as many insect species were associated with native plants as with alien plants.



In a comparison of Lepidoptera larvae produced on native and alien woody plants in Oxford, PA, native plants supported 35 times more caterpillar biomass, the preferred source of protein for most bird nestlings, than alien plants supported.

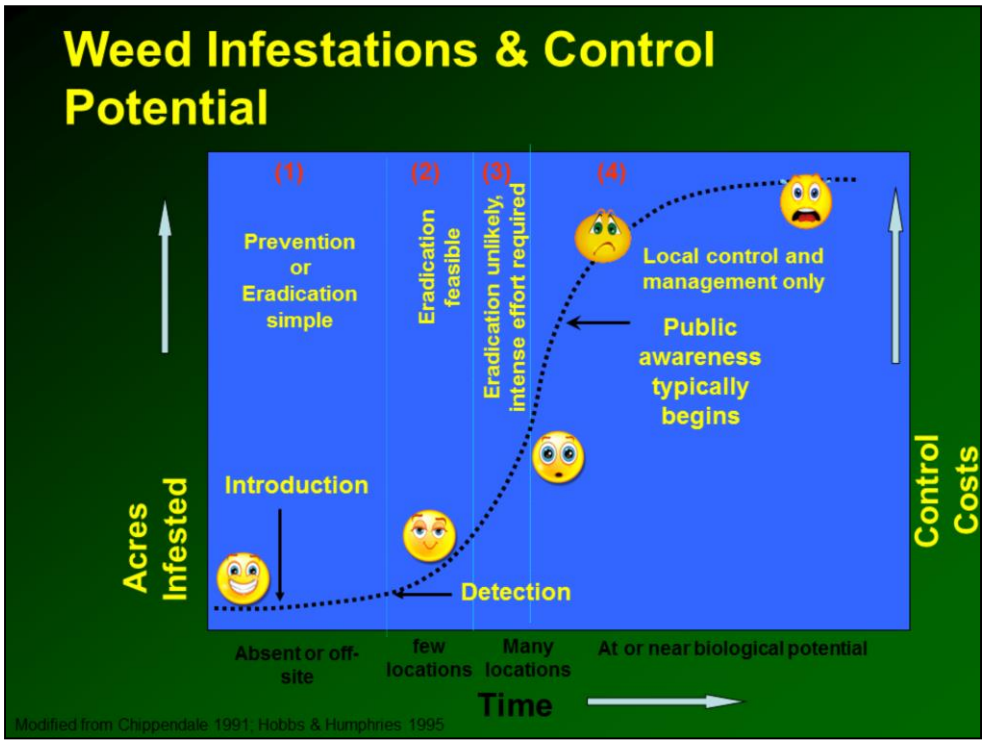


The ripple effects are found throughout the food chain.



In much the same way that a farmer monitors croplands for potential weed trouble, so to must we monitor our natural areas, parks and

Open spaces for trouble from invasives.

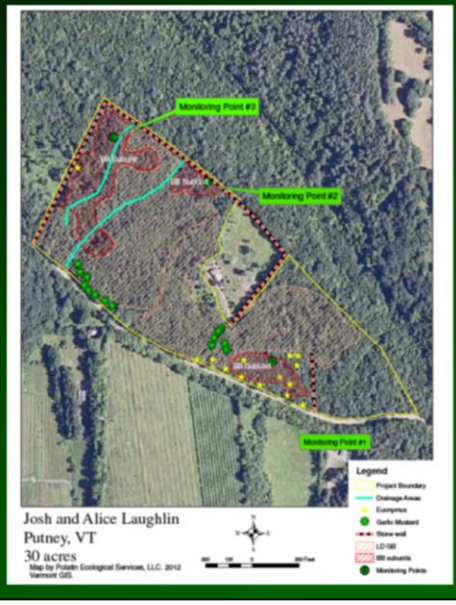


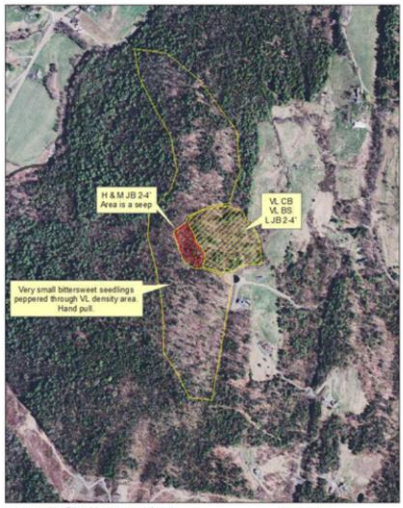
There are many factors that allow exotic plants to be more competitive than native plants, for instance lack of natural predator or climate change. If a land manager, staff that work for parks or other natural areas, discovers the invasive plant quickly and removes it, the cost/time/energy spent will be minimum (well within budget). Unfortunately, the number of staff in the field is very low, and by the time they find these invading plants, the population may have risen to higher numbers, requiring much more work. Our governments are slow to respond to reports of established invasive plants, and educating the public is difficult until they can see a large extent of area invaded. By the time the public is aware of the problem and governments can move to act, the invasive problem is out of hand and is beyond eradicating.

Site-led versus Weed-led

	Weed-led	Site-led
Purpose	Prevent new weed species from becoming entrenched in natural areas.	Protect threatened species and valuable places.
Scale	Greater than one reservation. Look at entire region or statewide.	A defined area within a reservation or management unit.
Species focus	Species that are newly naturalized in or newly invading the region/state; or with very confined populations	Those necessary to protect the place. Often widespread weeds.
Sites	All infestations within a region, on sites of any quality and ownership	Infestations within the place; plus buffers and seed sources outside of it.
Success when.....	The species is eradicated or contained within the region.	The native species or natural community responds in a desired way (e.g., regeneration).
Other activities	Public awareness Control on sale/spread Surveillance	Public awareness Integrate control with other threat management Survey places with high biodiversity value

EDRR Approach
Site-Led





Proposed Invasive Plant Management Areas
Griffith Property 1076 Melendy Hill Road Guilford, VT
Map prepared by C. Polatin, Polatin Ecological Services, LLC 1/13/2015 based on field assessment with forester Lynn Levine 5/29/2015.

700 350 0 700 Feet

N
W E
S

Legend

- Very Low Density
- Moderate
- High Density Japanese Barberry

Seedlings

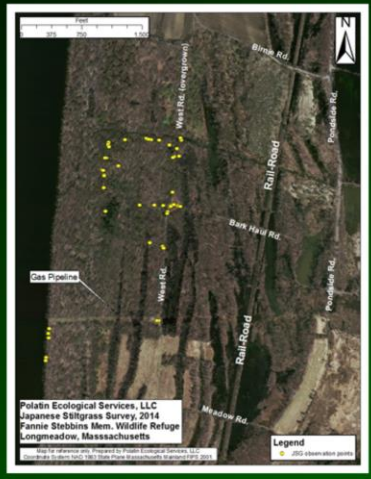
Common buckthorn

Japanese barberry

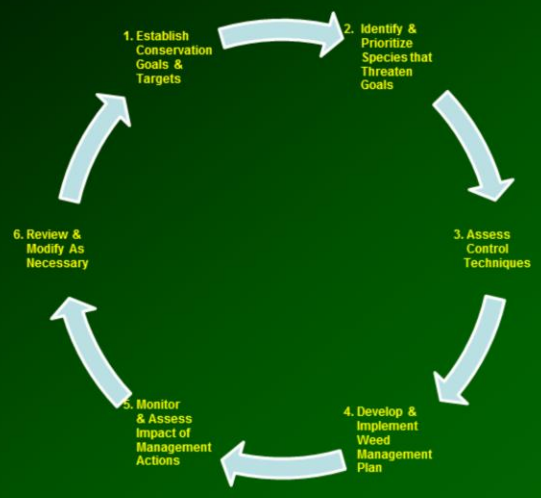
Bittersweet

Japanese knotweed

EDRR Approach
Weed-Led



Adaptive Management Approach



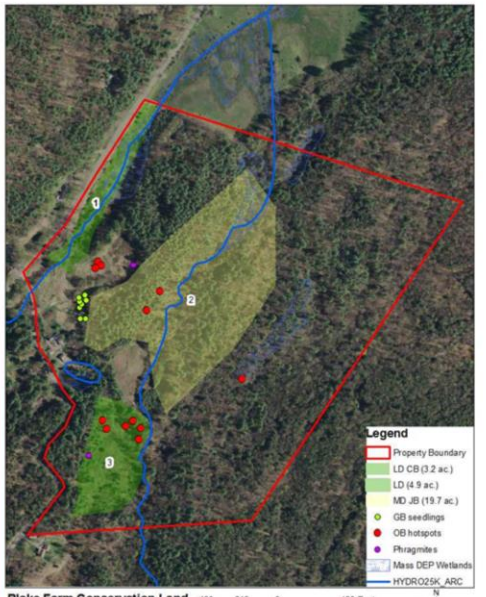
Elements of a Successful Project

Planning Framework

- Goals- articulate intention for site
- Planning (Management Plan)
- Site Analysis
- **Mapping**
- **Prioritization**
- Initial, Follow-ups, ongoing Stewardship program
- Early Detection
- Success Criteria
- Monitoring
- Management Documentation
- Revegetation & Ecological Restoration Considerations

Mapping

- Invasive species
- Distribution
- Area (acres or square footage)
- Density (cover class)
- Size: diameter & height (plant type/age: seeding, sapling, etc.)
- Non-target/native vegetation
- Sensitive resource areas (wetlands/NHESP)

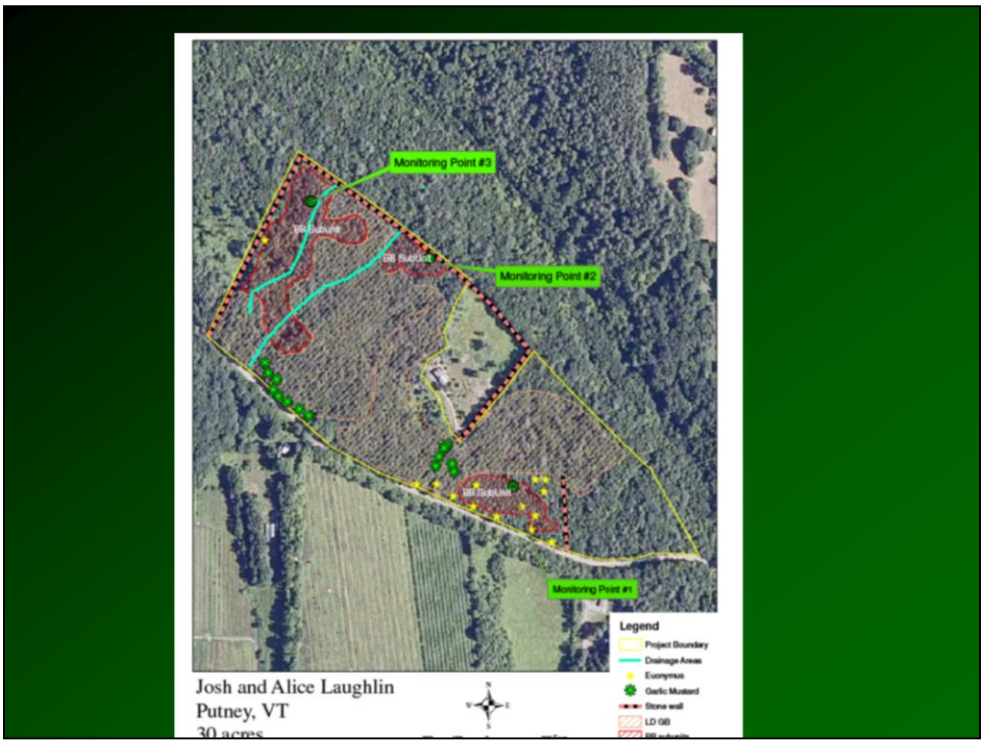


Blake Farm Conservation Land
Invasive Plant Inventory Map
Map prepared by C. Polatin 3/19/2016

Glossy Buckthorn
Small tree (> 7 ’ tall)

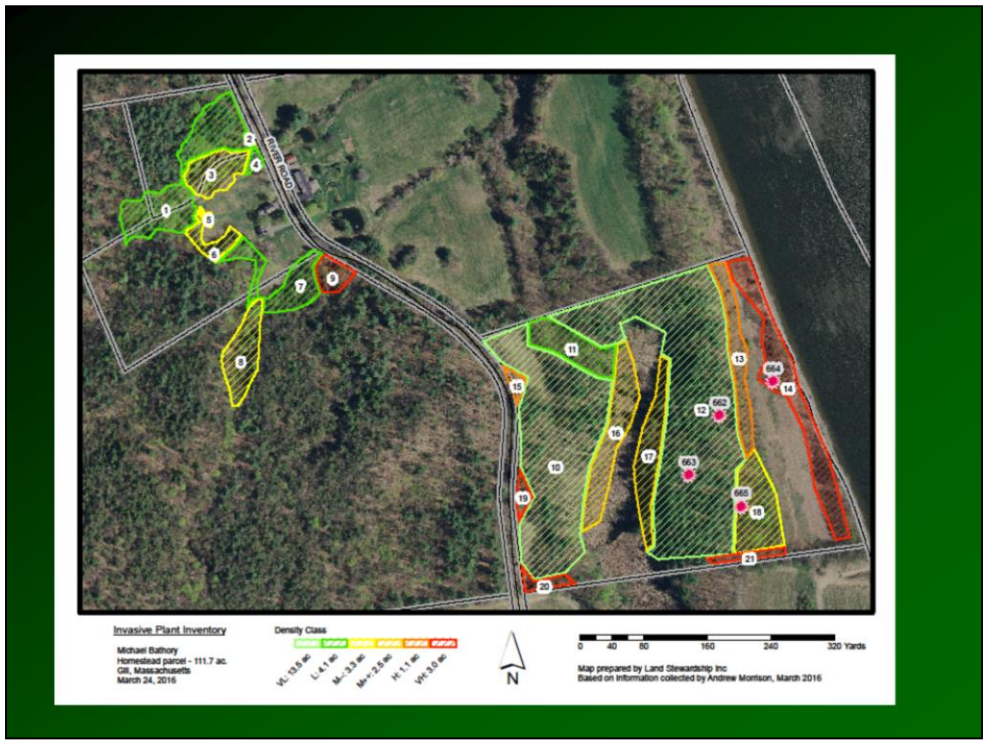
Glossy Buckthorn
Shrub (< 7')

Glossy Buckthorn Seedling (< 2')



Total cost for 3 treatments = $15,900 ($9,000 for first treatment)

Funded through NRCS WHIP


River Road
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
662
663
664
665
Invasive Plant Inventory
Michael Bathory
Homestead parcel - 111.7 ac.
Gill, Massachusetts
March 24, 2016
Density Class
VL: 13.5 ac
L: 4.1 ac
M: 3.3 ac
MH: 2.5 ac
H: 1.1 ac
VH: 3.0 ac
N
0
40
80
160
240
320 Yards
Map prepared by Land Stewardship Inc
Based on information collected by Andrew Morrison, March 2016

Summary Figures

Michael Bathory
Homestead Parcel
Intended to accompany parcel map from April 5, 2014

UNIT	SPEC	DENS	SIZE	AREA
1	JB	2	3	2.04
	HS	1	3	
2	OB	3	6	0.03
	OB	2	3	
3	JB	3	3	0.73
	HS	2	3	
	MR	1	4	
4	OB	2	3	0.11
5	HS	3	4	0.06
	OB	2	3	
6	HS	3	4	0.37
	JB	2	3	
7	JB	2	3	1.00
	WE	1	1	
8	JB	3	3	0.87
9	JB	3	3	0.36
	OB	5	3	
	OB	3	7	
	WE	3	4	
10	JB	1	2	5.48
	HS	1	2	
11	JB	2	3	0.91
12	JB	1	2	8.03
	GB	1	4	
13	MR	5	5	0.94

UNIT	SPEC	DENS	SIZE	AREA
14	OB	4	7	2.02
	MR	4	4	
15	OB	4	4	0.15
	OB	3	7	
	JB	2	3	
16	GB	3	5	1.37
	HS	3	5	
	OB	2	3	
	MR	2	4	
17	GB	3	5	1.09
	MR	2	4	
18	JB	3	3	1.25
	OB	2	2	
	GB	1	4	
19	OB	2	7	0.17
	OB	6	5	
	GM	*	*	
20	OB	5	4	0.22
	OB	4	7	
	MR	3	4	
	HS	3	5	
21	HS	4	4	0.21
	OB	5	3	
	OB	3	7	
	JB	3	3	
		total acreage		27.40

PTN	SPEC	SIZE	AREA
662	OB	4	single *
663	OB	2	cluster
664	JK	5	0.15 ac
665	GB	4	single

SPEC - Species Abbreviation Codes

code	common name	scientific name
AO	autumn olive	*Elaeagnus umbellata*
CB	common buckthorn	*Rhamnus cathartica*
CX	common barberry	*Berberis vulgaris*
GB	glossy buckthorn	*Frangula alnus*
GM	garlic mustard	*Alliaria petiolata*
HS	honey suckle	*Lonicera spp.*
JB	Japanese barberry	*Berberis thunbergii*
JK	Japanese knotweed	*Polygonum cuspidatum*
MR	multiflora rose	*Rosa multiflora*
OB	oriental bittersweet	*Celastrus orbiculatus*
WE	winged euonymus	*Euonymus alatus*

DENS - Density Categories

#	code	density range
1	VL	0 - 5%
2	L	6 - 25%
3	M-	26 - 50%
4	M+	51 - 75%
5	H	76 - 95%
6	VH	96 - 100%

SIZE - size categories

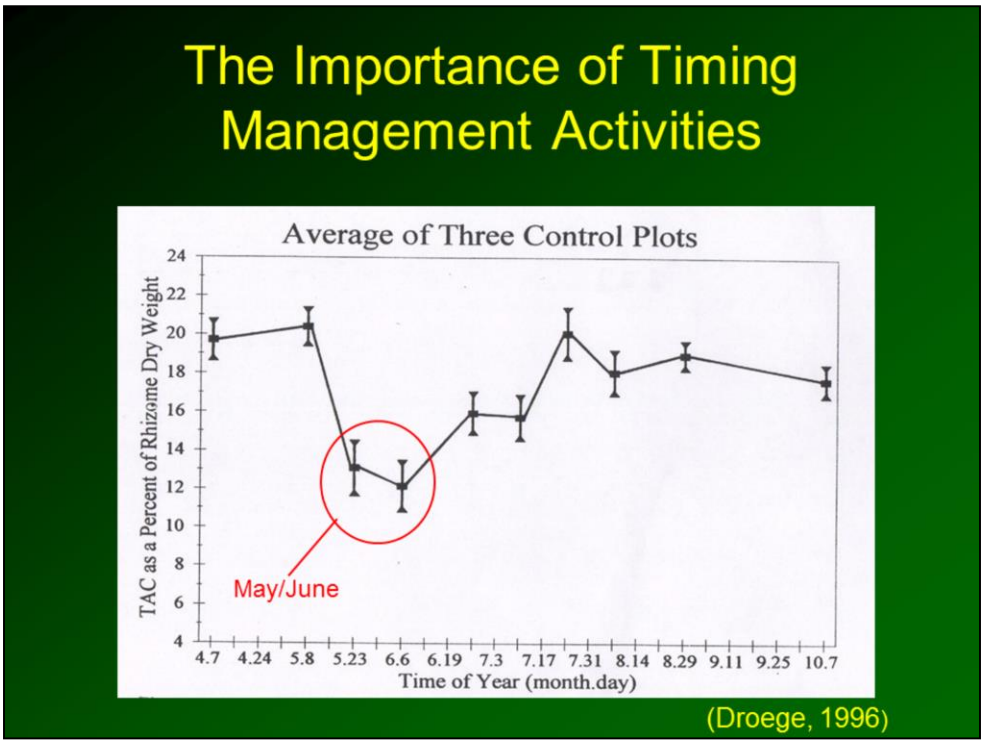
code	size category
1	0 - 1' seedling
2	1 - 2' immature
3	2 - 4'
4	4 - 6'
5	6 - 8'
6	8 - 12'
7	12' +

Management & Control

Elements of a Successful Project

Management

- Integrated Management
- Timing
- Tools & Techniques
- Multiple management visits
- Persistence & Thoroughness



Integral to this second question is an understanding of the seasonal fluctuation in the carbohydrate reserves of woody plants. Basically, a woody plant's carbohydrate reserves are highest in the spring around May. As the plant grows leaves it spends much of its reserves. The return on this investment is the ability to photosynthesize, thus produce more energy reserves which woody plants do from early June through August. The dip in August represents the energy expended to produce seed. The plants go dormant in October.

The land management theory says that to have the greatest success at reducing woody stems, a treatment should be conducted during periods of low below-ground carbohydrate storage such as immediately after spring flushing and growth. This should be followed by a

second growing season treatment before these reserves are replenished.

Black Swallowwort

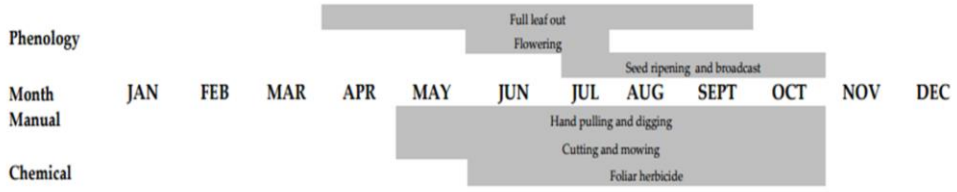
Know Biology of Invasive Plant Black Swallowwort

- Reproductive Strategy: Shoots of black swallow-wort emerge in spring and the plant flowers in June and July. Flowers remain open for 6 to 8 days and smell similar to rotting fruit. The plant forms seed pods in July and early August, sometimes continuing through October. Although the shoots die to the ground each winter, the plant has a very strong, fibrous central rhizome which helps the plant survive the winter. The life span of individual plants is somewhat unknown, but some plants have been reported to live more than 70 years. Seeds also remain viable through the winter. A healthy stand of black swallow-wort can produce between 1000-2000 seeds per square meter per year. Abundance of sunlight promotes earlier and more prolific seed production. Black swallow-wort primarily reproduces by seed however cut plants can quickly replace the cut shoot from buds on the rhizome.
- Dispersal: Dispersal of black swallow-wort is primarily by wind, which carries and disperses the parachute-shaped seeds.

www.vtinvasives.org

Management Timing
Black Swallowwort

Species Phenology and Treatment Options:



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Treatment Methods
Black Swallowwort

Treatment Methods:

Category	Method	Method Description	Considerations
MANUAL	• Manual treatment is not typically recommended for treatment of black swallow-wort		
	Hand Pulling	• Pull entire plant by the base of the stem • Be sure to remove entire root system • If feasible and fruit is present, bag and dispose of fruits to prevent seed dispersal • Put all pulled vegetation in plastic garbage bags and let plants fully decompose and dispose of in a landfill	• Effective on small sized plants and small infestations • Most effective if done when soil is wet • Remaining portions of roots system not removed can re-sprout
	Mowing/ Cutting	• Use weed whacker/brush saw or mower to cut the stem as close to the ground as possible • Cut at least 1 times during growing season (mid April-mid October) • Repeat for 3-5 years	• Cutting/mowing can help slow the spread of black swallow-wort but will not eradicate it • Most effective if followed up with foliar herbicide application
CHEMICAL	• Active ingredients commonly used in herbicides: glyphosate or triclopyr		
	Foliar Application	• Foliar spray when plant is fully leafed out but preferably before the plants develop seeds • Spray leaf surfaces with low volume backpack sprayer, or high volume mist blower *If foliar wiping:* • Foliar wipe when plant is fully leafed out • Wear a heavy, chemical resistant rubber glove with a cloth glove over the rubber glove • Apply the herbicide to coat the surface of the leaves	*Low Volume Backpack Sprayer* • Herbicides (active ingredient): glyphosate or triclopyr with surfactant • Used to target plants and minimize drift to desirable species *Foliar Wipe* • Herbicides (active ingredient): tricolpyr or glyphosate with surfactant • Used for infestations that have desirable, native vegetation that will be damaged by drift of a foliar spray or for small infestations

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Level 1:
Manual Methods

Hand-pulling

Seedlings

Common buckthorn

Japanese barberry

Bittersweet

Japanese knotweed

Insert original photos: NMH & FSMWR

Buckthorn Baggies

Propane Torching Technique

Jeffrey Ward & Thomas Worthley
The Connecticut Agricultural Experiment Station

Other Notable Methods

Soil Solarization

Cover Crops

Other Notable Methods

Stump Grinding

Bio-Control Methods

Currently Available

- Purple loosestrife
- Knapweeds
- Cypress spurge

Potential for Future release

- Garlic mustard
- Common reed
- Japanese knotweed
- Water chestnut

Conservation Grazing

Grazing Effects

Level 2

07/22/2014

07/22/2014

Judicious Herbicide Use

- **Integrate** management activities (cutting, mowing, etc.)
- Use **targeted** herbicide methods that minimize amount used
- **Timing** to maximize effectiveness of treatment

Glyphosate (Roundup, Rodeo, etc.)

- Derivation of glycine, an amino acid
- Inhibits an essential plant enzyme (EPSP synthase).
- Blocks production of aromatic amino acids: phenylalanine, tryptophan, tyrosine
- Non-selective herbicide
- Systemic – translocates to meristems/roots.
- Gradual yellowing (chlorosis) – newest leaves first.
- Non-volatile, but still need to avoid spray drift.

Glyphosate – Environmental Fate

- Very stong adsorption (binding) to soil particles:
  - No herbicidal activity in soil (inactivated).
  - Not mobile in soil.
- Minimal potential for leaching into groundwater or contamination of surface waters via runoff.
- Readily biodegraded by bacteria, fungi
- Half life in soil: generally short, but variable.
- Very low toxicity to most non-target organisms.
- Due to surfactants in most glyphosate products – Not approved for aquatic sites.
- Rodeo, AquaPro formulations approved for water.

Triclopyr
(Garlon, Renovate, Tahoe)

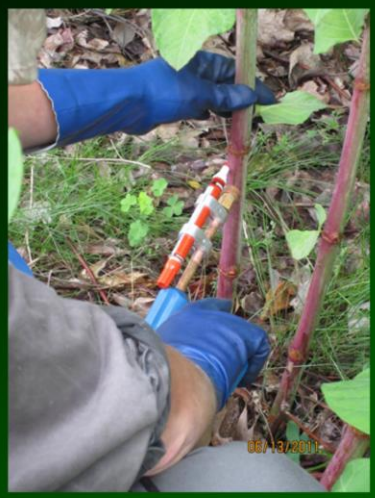
- Disrupts normal plant hormone (auxin) function – abnormal elongation & division of plant cells.
- Selective herbicide – most grasses, sedges tolerant.
- Controls broadleaf weeds, woody plants.
- Systemic –translocates to meristems/roots.
- Initial symptoms appear rapidly – distorted growth (leaf cupping, stem twisting).
- Formulations: Ester (Garlon 4) more volatile than amine (Garlon 3A).

Cut Stem/Stump Application

- 20%-50% glyphosate product in water (apply immediately after cutting).
- Timing: Anytime, but sap season. Wait till late spring/early summer

Girdle & Squirt

Stem Injection—Japanese Knotweed (Yellow Iris & Giant Hogweed, too)



JK Injection System

Glove Technique

Mechanical Methods
Small-Medium Scale

Level 3

06/21/2011

Mechanical Methods
Field Edge

Mechanical Methods Large Scale

Excavator with Brontosaurus Mower

MassAudubon Drumlin Farm
Lincoln, MA

Mechanical removal of whole plants

Photo credit: Seth Wilkinson

Hiring a Contractor

- Liability insurance & state pesticide applicator licenses
- Qualifications
- References
- Success Criteria/Performance Guarantee
- Management Documentation
- Ask for chemical product information (Specimen Label & MSDS)
- Safety/Spill Prevention Plan

IP Success Criteria

1. Year 1. Initial treatments (combination of mechanical and chemical) results in 90% control.
2. Year 2. The first follow-up treatment (targeted chemical) results in 95% control.
3. Year 3. The second follow-up (manual or targeted chemical) results in 99% control.
4. Annual Stewardship and Maintenance (primarily manual) maintains 99% control.

Upland IP Management

2011

2012

2013

2014

Active Revegetation

Wetland IP Management

2008

2009

2010

2011

2012

APPENDIX E

Identification and Control Techniques for Common Upland Invasive Plants in Massachusetts

Identification and Control Techniques for Common Upland Invasive Plants in Massachusetts

Prepared by:
Chris Polatin
Land Stewardship, Inc.

LSI

Management

- We will emphasize manual, mechanical and chemical techniques because their uses individually and combined will yield substantial results.
- Established populations of invasive plants are difficult to control without use of herbicides
  (And not easy to control *with* herbicides, either!)
- Selective and proper use of herbicides is usually less environmentally disruptive than allowing invasive plants to spread unchecked
  -"Biological pollutant" will increase over time
  -"Chemical pollutant" dissipates over time
- This workshop will instruct you to conduct two types of herbicide applications within upland areas only: 1) cut stem treatment (CST) and 2) foliar treatment.

❖ The CST technique involves cutting tall plants (>6') within 6" of the ground with a suitable cutting tool and applying herbicide to the freshly cut stem within 1 hour of cutting. This technique may be used from April through December when temperatures are above freezing. Don't cut during sap season (late February through early April because sap will push herbicide out of stems. We recommend using Roudup Pro Concentrate at full strength or Rodeo herbicide at 50% with 50% water and indicator dye.

❖ A foliar treatment should moisten all of the leaves of the small (<6') target species, but not to the point of runoff. Practice using water with indicator dye so you are sure to not over or under apply. Most invasive plant species can be controlled with a 2% volume/volume solution of Rodeo herbicide (glyphosate). An exception to this is bittersweet which is more effectively treated with the triclopyr based herbicide Garlon 3A or Garlon 4. These herbicides are also used at a 2% solution. Foliar treatments may be conducted from mid-May (after threat of frost) through the end of September (before frost).

❖ All foliar herbicide solutions need to be mixed with a non-ionic surfactant at 0.25% early season and 0.50% late season (mid-July cut off date). A surfactant is essential for the treatment to be effective. The surfactant helps the herbicide penetrate and adhere to the leaves.

❖ I recommend also using a blue indicator dye so that you can really see the applied herbicide. The dye will remain on the leaves for several days before it dissipates. Using the dye helps train your eye to cover the whole plant. It also helps you see areas of overspray or if it is getting on your clothing.

❖ Please be sure to take the proper precautions for protecting yourself from herbicide exposure by wearing the labeled personal protective equipment (PPE) which consists of a long sleeved shirt, chemical resistant gloves, eye protection (when mixing), and shoes with socks.

ALWAYS READ & FOLLOW THE LABEL DIRECTIONS, SAFETY, & ENVIRONMENTAL

Recommended General Use Herbicides

Triclopyr (*Garlon 3A, Garlon 4 Ultra, Vastlan)*

- Chlorinated pyridine compound
- Disrupts normal plant function → Abnormal elongation & division of cells
- Selective – most grasses and sedges are tolerant
- Controls broadleaf weeds and woody plants
- Systemic – moves through the root system
- Initial symptoms appear rapidly → Distorted growth, leaf cupping, stem twisting
- Formulations: *Garlon 4 (*Ester) more volatile than *Garlon 3A* (Amine) can be used in proximity to wetlands

Glyphosate *(Round Up, Rodeo, Accord)*

- Strong bond to soil → Inactive in soil and does not migrate through soil
- Minimal potential for leaching into groundwater or runoff
- Readily biodegraded by bacteria and fungi
- Generally short half-life in soil (6 weeks)
- Very low toxicity to non-target organisms
- Roundup not approved for wetland sites due to surfactant → *Rodeo* approved for wetland resource areas
- Derivative of glycine, an amino acid
- Inhibits an essential plant enzyme (EPSP Synthase)
- Blocks production of aromatic amino acids
- Non-selective herbicide – will kill grasses and other non-target plants if sprayed
- Systemic – moves through root system
- Gradual yellowing of leaves with the newest leaves first
- Non-volatile, but avoid spray drift

Asiatic Bittersweet

An aggressive, fast growing vine that grows into trees, overtopping and girdling them. Look for oval leaves, yellowish-orange outer skin covering scarlet red berries , and vines wrapping around trees. Can grow up to 10 ft. per year and up to 60 ft. high into the tree canopy.

Management Techniques

As Seedlings

Hand pulling

- Pull plant by the base of the stem, removing all roots
- Bag and dispose or place in paper leaf bags for brush burning of any fruit to prevent seed dispersal
- If no fruit then you can hang them on tree branches to keep them off the ground.

  Equipment: Gloves

Growing into Trees

Cut-Stem Treatment

- Cut stems in fall or winter to make work more manageable. One can more readily find the vines in the dormant season.
- Cut high & low to help distinguish what has been cut.
- Apply herbicide to cut surface within 1 hour of cutting.

Equipment: Buckthorn blaster, Extra applicator tips, glyphosate concentrate, and blue dye

Application Rate: 100% Roundup Concentrate or 50% Rodeo

Growing on the ground

Foliar Treatment

- Spray leaves with low volume backpack sprayer.
- Return every 2 weeks to treat any missed or leaves still looking green and vital.

Equipment: Solo backpack sprayer, Triclopyr concentrate, indicator dye

April to May	June to September	September to January
Hand pull young plants & Cut stem	Foliar Treatment & Cut-stem	Cut-stem treatment

Multiflora Rose

Once used as a natural fence in agricultural fields, multiflora rose often grows in sunny, forest and field edges but can grow in a variety of areas. Look for compound leaves with 5-11 sharply toothed leaflets, alternate leaf pattern, curved thorns, fringes (fringed stipule) at the leaf stem, and white flowers in late spring.

Management Techniques

Mowing

- Rose mows very well with a brush hog or walk behind mower. I highly recommend reducing it with mowing followed by foliar application after it resurges.

Hand pulling Seedlings

- Pull plant by the base of the stem, removing all roots
- Bag and dispose of any fruit to prevent seed dispersal

Equipment: Gloves and contractor bags or leaf bags for burning

Cut-Stem Treatment

- Cut stems in fall or winter to make work more manageable (Should not be cut during sap season – February / March)
- Cut with a brush saw with steel brush knife blade for best result. Wear a Filson Tin Cloth Suit!
- Apply herbicide to cut surface within 1 hour of cutting

Equipment: Buckthorn blaster, Extra applicator tips, glyphosate concentrate, and blue dye
Application Rate:

Foliar Treatment

- Spray leaves with low volume backpack sprayer

Equipment: Solo backpack sprayer, glyphosate concentrate, blue dye

March to June	July to September	October to January
Hand pull young plants & cut-stem treatment	Foliar application & cut-stem treatment	Cut-stem treatment

Japanese barberry

A low growing shrub that thrives in shady areas, wetlands, and pastures. Look for small, oval shaped leaves, thin and sharp spines at the leaf nodes, and red berries remain through winter. It does not resemble any species native to Massachusetts. When cut, stems are bright yellow.
Deer ticks prefer areas with high density barberry so take precautions!

Management Techniques

Hand pulling Seedlings

- Pull plant by the base of the stem, removing all roots
- Bag and dispose of any fruit to prevent seed dispersal

Equipment: Gloves and contractor bags or leaf bags for disposal

Propane Torching

- More info: http://www.ct.gov/caes/lib/caes/documents/publications/special_bulletins/special_bulletin_feb_2013_ward.pdf

Cut-Stem Treatment

- Only recommended for sensitive areas. Very tedious and thorny!

Foliar Treatment

- Spray leaves with low volume backpack sprayer

Equipment: Solo backpack sprayer, glyphosate concentrate, blue dye

March to May	June to August	September to January
Hand pull young plants & cut stem treatment	Foliar and cut-stem treatment	Cut-stem treatment

Common Buckthorn

Common buckthorn is a small deciduous shrub-tree that grows between 6 and 20 ft. tall and is often found in meadows and forest edges. Leaves are oval shaped in opposite pairs with sharp spines near the shoots. Dark purple to black berries appear in the fall through the winter. It can be confused with apple trees or glossy buckthorn, another invasive. To be sure, scrape the bark to check for an orange inner bark.

Management Techniques

Hand pulling Seedlings

- Pull plant by the base of the stem, removing all roots
- Bag and dispose of any fruit to prevent seed dispersal

Equipment: Gloves and contractor bags or leaf bags for disposal

Cut-Stem Treatment

- Cut stems in fall or winter to make work more manageable
  (Cannot be cut during sap season – February / March)
- Apply herbicide to cut surface within 1 hour of cutting

Equipment: Buckthorn blaster, Extra applicator tips, glyphosate concentrate, and blue dye

Hack and Squirt

- Large stems (>4”diameter) can be girdled with a saw and the CST solution sprayed into the cuts for control. Saves the trouble and mess of cutting down the whole tree.

Foliar Treatment

- Spray leaves with low volume backpack sprayer

Equipment: Solo backpack sprayer, glyphosate concentrate, blue dye

Application Rate: Use a higher solution rate than written in the general recommendations. 5% Rodeo and 1% surfactant may be needed for adequate control of this hard to control species.

March to June	July to September	October to November
Hand pull young plants	Foliar and cut-stem treatment	Cut-stem treatment

Glossy Buckthorn

A small deciduous tree that can grow up to 20 ft. tall. Glossy buckthorn can be found in a variety of habitats but prefers sunny conditions. Look for shiny, dark green leaves opposite near branch tips. Leaf margins are untoothed. Larger stems have a hollow fissure through the center of the stem and the roots are bright red. Glossy buckthorn seedlings are easy to hand pull in the spring. Berries appear in late summer and ripen from red to black.

Management Techniques

Hand pulling Seedlings

- Pull plant by the base of the stem, removing all roots
- Bag and dispose of any fruit to prevent seed dispersal

Equipment: Gloves and contractor bags or leaf bags for disposal

Cut-Stem Treatment

- Cut stems in fall or winter to make work more manageable
  (Cannot be cut during sap season – February / March)
- Apply herbicide to cut surface within 5 minutes of cutting

Equipment: Buckthorn blaster, Extra applicator tips, glyphosate concentrate, and blue dye

Application Rate:

Foliar Treatment

- Spray leaves with low volume backpack sprayer

Equipment: Solo backpack sprayer, glyphosate concentrate, blue dye

Application Rate:

March to June	July to August	September to December
Hand pull small- medium plants	Foliar and cut-stem treatment	Cut-stem treatment

Winged Euonymus (Burning Bush)

Burning bush gets its name from its bright red foliage that occurs in the fall. It is a shrub that can grow up to 10 ft. tall and is most easily identifiable by the prominent tan ridges that grow along dark green stems and branches. It prefers habitats with moist and well-drained soils. Leaves are tapered on both ends and grow in opposite pairs. It can be confused with some blueberry species.

Management Techniques

Hand pulling Seedlings

- Pull plant by the base of the stem, removing all roots
- Bag and dispose of any fruit to prevent seed dispersal

Equipment: Gloves and contractor bags or leaf bags for disposal

Cut-Stem Treatment

- Cut stems in fall or winter to make work more manageable (Cannot be cut during sap season – February / March)
- Apply herbicide to cut surface within 5 minutes of cutting

Equipment: Buckthorn blaster, Extra applicator tips, glyphosate concentrate, and blue dye

Application Rate:

Foliar Treatment

- Spray leaves with low volume backpack sprayer

Equipment: Solo backpack sprayer, glyphosate concentrate, blue dye

Application Rate:

March to June	July to September	October to November
Hand pull young plants	Foliar and cut-stem treatment	Cut-stem treatment

Garlic Mustard

Garlic mustard is a biennial herbaceous plant that grows in moist, disturbed soils and prefers shaded areas. It often spreads to roadsides and drainage ditches. First-year plants are short and nonflowering while second-year plants can grow up to 3 ft. tall and produce white flowers at the top of the stem in late spring and early summer. Leaves are dark green and heart shaped. Crushed leaves produce a pungent garlic odor. Garlic mustard changes the soil chemistry around it to outcompete native plants and produces thousands of seeds per plant. Garlic mustard can be used to make homemade pesto.

Management Techniques

The best treatment for garlic mustard is hand pulling. To ensure the entire plant is removed, grab the plant by the root stalk, which forms a distinct 'J' shape. First-year plants do not produce seeds, so it is unproductive to pull small seedlings.

Hand pulling Seedlings

- Pull plant by the base of the stem, removing all roots
- Bag and dispose of any fruit to prevent seed dispersal

Equipment: Gloves and contractor bags or leaf bags for disposal

March to May
Hand pull second year plants

Black Swallowwort

Black swallowwort is a perennial herbaceous vine that can grow up to 6 ft. long. It prefers sunny fields and roadsides but can also grow on forest edges. Leaves are narrowly oval shaped, dark green, and grow in opposite pairs. In late summer, black swallowwort develops dark purple flowers with 5 triangular petals that form a star shape. Black swallowwort does not resemble any native plants, but does resemble pale swallowwort, a similar invasive vine with pink or yellowish flowers. Seeds are formed in pods.

Black swallowwort is toxic to livestock and insects such as the monarch butterfly.

March to June	July and August	September
Hand pull young plants	Foliar Treatment	Carefully collect and destroy seed pods

Management Techniques

Hand pulling Seedlings

- Pull plant by the base of the stem, removing all roots
- Bag and dispose of any fruit to prevent seed dispersal
- Seed pods can be carefully collected in late summer

Equipment: Gloves and contractor bags or leaf bags for disposal

Foliar Treatment

- Spray leaves with low volume backpack sprayer

Equipment: Solo backpack sprayer, glyphosate concentrate, blue dye

Application Rate:

Small infestations can be smothered with plastic

Japanese Knotweed

Knotweed is one of the most well adapted invasive plants. It prefers sunny and moist areas, but can survive in full shade, high salinity, dry conditions, and can grow up to 10 ft. tall. It often grows along river banks but can also grow in forested and field areas. It has hollow, bamboo-like stems that turn red to green with maturity. Leaves are broad, oval shaped that grow in an alternate pattern. In late summer, distinctive white flowers can be seen growing above the leaves.

Management Techniques

Hand pulling Seedlings

- Pull plants when soil is moist
- Pull plant by the base of the stem, removing all roots
- Bag and dispose of any fruit to prevent seed dispersal
- Collect and dispose of any root material from previous treatments

Equipment: Gloves and contractor bags or leaf bags for disposal

Foliar Treatment

- Spray leaves with low volume backpack sprayer

Equipment: Solo backpack sprayer, glyphosate concentrate, blue dye

Application Rate:

Stem Injection is preferred over cut-stem treatment

- Mark each stem and inject with herbicide

Equipment: Stem injector, glyphosate herbicide, nitrile gloves

Application rate:

March to May	August and September
Hand pull young plants and remove left over root material from previous treatments	Foliar and stem injection treatments

Knotweed is similar in flavor to rhubarb and can be used to create a variety of recipes including pie, wine, sushi, and muffins.

Japanese Honeysuckle

Japanese honeysuckle is a perennial climbing vine that grows in a variety of sunny conditions including roadsides, fields, and forest edges. Leaves are light green, oval shaped and grow in opposite pairs. Flowers are tube shaped and yellowish white in color and bloom in late spring. Dark blue berries are present in the fall. Japanese honeysuckle is similar to native honeysuckle but can be differentiated by the leaves, which grow on the tips of native vines rather than throughout the entire stem.

Management Techniques

Hand pulling Seedlings

- Pull plant by the base of the stem, removing all roots
- Bag and dispose of any fruit to prevent seed dispersal

Equipment: Gloves and contractor bags or leaf bags for disposal

Foliar Treatment

- Spray leaves with low volume backpack sprayer

Equipment: Solo backpack sprayer, glyphosate concentrate, blue dye

Application Rate:

Mechanical Treatment

- Mow close to the ground twice annually during the summer

May to July	August to October
Hand pull small plants or mow low to the ground	Foliar treatment and mowing

Autumn Olive

Autumn olive is a deciduous shrub that can grow up to 20 ft. tall and 30 ft. wide in the right conditions. It is a drought-tolerant shrub that prefers sunny conditions. Leaves are narrow and wavy, almost shriveled in appearance. The top of the leaves are green with a silver bottom. The stems of young plants are a distinct, shiny orange color while older stems are grey. Light colored tubular flowers bloom in spring and red, olive shaped fruit appears in the fall. It is similar in appearance to Russian Olive, which is also invasive.

Management Techniques

Hand pulling Seedlings

- Pull plant by the base of the stem, removing all roots
- Bag and dispose of any fruit to prevent seed dispersal

Equipment: Gloves and contractor bags or leaf bags for disposal

Cut-Stem Treatment

- Cut stems in fall or winter to make work more manageable (Cannot be cut during sap season – February / March)
- Apply herbicide to cut surface within 5 minutes of cutting

Equipment: Buckthorn blaster, Extra applicator tips, glyphosate concentrate, and blue dye

Application Rate:

Foliar Treatment

- Spray leaves with low volume backpack sprayer

Equipment: Solo backpack sprayer, glyphosate concentrate, blue dye

Application Rate:

March to June	July to September	October and November
Hand pull young plants	Foliar and cut-stem treatment	Cut-stem treatment

Equipment packages

Manual Removal – Weed Wrenches

- Puller Bear - $125 to $170
  www.pullerbear.com
- Extractigator - $115 to $225
  www.extractigator.com

Mechanical Removal

- Chainsaw
- Brush saw
- Tractor with brush hog
- Walk behind brush mower
- Rental options – Taylor Rental

Chemical Application Equipment

- Buckthorn Blaster - $6.50 from *Landscape Restoration*
  https://landscape-restoration.com/product/buckthorn-blaster/
- Applicator tips - $2.50 from *Landscape Restoration*
  https://landscape-restoration.com/product/buckthorn-blaster-replacement-applicator-tips/
- *Solo* backpack sprayer from Home Depot - $126.44
  https://www.homedepot.com/p/SOLO-4-gal-Backpack-Sprayer-425/205184749

Herbicides

- Glyphosate (*Roundup Concentrate Plus - $25/quart, Rodeo - $21.00/gallon)*
- Triclopyr (*Garlon 3A - $59/gallon, Garlon 4 - $84/gallon)*
- Surfactant (non-ionic) for foliar applications using products above (Aquachem 90 from Arborchem - $12.75/gallon or Agridex from Helena Chemical)
- Blue indicator dye

Herbicide Sources:
Helena Chemical – Phone: (413) 247-3126 Address: 101 Elm St, Hatfield, MA 01038
Arborchem – www.arborchem.com
Crop Production Services – Phone: (413) 665-2115 address: 25 Elm Street, S. Deerfield, MA 01373, www.cpsagu.com
Forestry Suppliers – www.forestry-suppliers.com

Personal Protective Equipment

- Goggles / Glasses
- Nitrile Gloves (Chemical resistant)
- Tyvek Coveralls (optional)

PPE Sources: Gemplers – www.gemplers.com

APPENDIX F

Broad Arrow Forestry Letter: Invitation to Site Visit

BROAD ARROW FORESTRY

Post Office Box 322 Hubbardston, MA 01452 tel. 508-792-2414 e-mail: baf@rcn.com

Steve Tyler
59 R Jones Road
Spencer, MA 01562

June 9, 2018

Dear Steve,

On behalf of the course sponsors, the Department of Conservation and Recreation (DCR) and the Spencer Water Department, thank you for attending last month's Invasive Plant Workshop. Our goal was for you to be inspired and more confident in taking on an invasive species project on your own property. I hope that you are! Still, I understand that you likely have more questions which is why we designed free follow-up site visits into the program. The visit is intended to give you an opportunity to discuss your specific challenges and sketch out a custom management strategy. Depending on the size of your property, I would expect the visit to last 1-1.5 hours. Please contact me at the number or email above to schedule a visit in June or July.

Best regards,

Roger P. Plourde, Jr. C.F.

APPENDIX G

Forestry & Land Management Web Page

Forestry and Land Management Resources

Printer-Friendly Version

Attachments:

SuggestedResources.pdf	Size: 417K Last Updated: 2018/6/8
InvasiveSpeciesWorkshopPhotos.pdf	Size: 1.1M Last Updated: 2018/6/8
Chapter61-61A.pdf	Size: 3.8M Last Updated: 2018/6/11
Identification&ControlTechniques.pdf	Size: 2.3M Last Updated: 2018/6/8
InvasiveSpeciesWorkshop.pdf	Size: 10M Last Updated: 2018/6/8
Agenda.pdf	Size: 224K Last Updated: 2018/6/8

Welcome to the Spencer Water Department's Forestry, Land Management, and Invasive Species Information Resources Web Page!

INTRODUCTION:

This web page is made possible thanks to a Community Forest Stewardship Grant from the Department of Conservation and Recreation (DCR). The purpose of this web page is to provide relevant easy to use references and resources for Forestry and Land Management for all land owners and residents.

Invasive Plant Species Workshop May 2018 at David Prouty High School Innovation Lab

Objective: To demystify invasive plant control using herbicides and to leave landowners with simple, safe, and effective techniques that they will feel confident using on their own land.

ACCESS TO PRESENTATION AND OTHER RESOURCES:

May 2018 Invasive Species Workshop Agenda

May 2018 Invasive Species Workshop Presentation

Identification and Control Techniques for Common Upland Invasive Plants in Massachusetts

Chapter 61-61A Programs -- Property Tax Breaks for Maintaining Undeveloped Land / Agricultural & Horticultural Commitments

Massachusetts Invasive Plant Advisory Group (MIPAG) Website

Invasive Plant Atlas of New England (IPANE) Website

Conservation Programs & Practices for Forest Land

Photos from May 2018 Invasive Species Workshop

Suggested Resources for Further Information

CONTACT INFORMATION FOR CLASS PRESENTERS:

Licensed Restoration Ecologist & Invasive Species Control

Christopher Polatin, M.S.
413-262-9102 (cell)
chris@landstewardshipinc.com

Land Stewardship, INC.
PO Box 511
Turners Falls, MA
01376
413-367-5292 (office)

Licensed Forester

Roger Plourde, Jr.
baf@rcn.com

Broad Arrow Forestry
PO Box 322
Hubbardston, MA
01452
508-792-2414 (office)

Town of Spencer, 157 Main Street, Spencer, MA 01562 (508) 885-7500
Website Disclaimer & Privacy Policy | Virtual Towns & Schools Website

APPENDIX H

Invoice for Spraying Materials & Equipment and Applicator License

GEMPLER'S
Commercial-Grade Outdoor Work Gear

PO Box 5175
Janesville, WI 53547−5175
FEI #:81−4406382

Order By phone: 800−382−8473
Order Online: gemplers.com
Order By Fax: 800−551−1128
Order By Email: customerservice@gemplers.com

Invoice No: **SI04231861**
Invoice Date: 6/26/2018
Payment Terms: Net 30 Days

Thank you for your order!

Invoice to:
BROAD ARROW FORESTRY
3 Old Meadow Rd
Spencer, MA 01562−2065

Ship to:
TOWN OF SPENCER−SPENCER WATER DEPT
3 Old Meadow Rd
ATTN: STEVEN TYLER
Spencer, MA 01562−2065

Order No.	PO No.	Buyer	Carrier	Ship Date	Due Date
SO3852715		ROGER PLOURDE	FedExGrd	6/26/2018	7/26/2018

Item No.	Description	Qty BO	Qty Ship	UOM	Unit Price	Extended Price
97211	Absorbent Pads,Medium Weight,PK 100 2212	0	1	pk	81.49	81.49
122040−10	Chemical Resistant Glove,14" L,Sz 10,PR	0	2	pr	4.99	9.98
219577	Hand Cleaner,Waterless,1 pt. 219577	0	2	ea	7.49	14.98
147479L	Coated Gloves,L,Black/Red,PR	0	4	pr	5.49	21.96
224891	MP Degreaser Wet Wipes,10x12−1/4In,72 90	0	2	ea	14.99	29.98
E608	Replacement Eye Wash Bottle,16 oz. 4503	0	1	ea	11.99	11.99
160340	MEASURING PITCHER 32 OZ 130033	0	1	ea	8.29	8.29
184561	Safety Glasses,Clear,Antifog 77452	0	2	ea	11.79	23.58
197946	Zubat Saw 330Mm 27033	0	1	ea	76.95	76.95
197948	Pocketboy 130 LG Teeth 346135	0	1	ea	36.95	36.95
109816	Eye Wash Belt Pack,16 oz.	0	1	ea	19.99	19.99
163849	Bypass Hand Pruner,8 1/2 In. 00830	0	2	ea	35.99	71.98

GEMPLER'S
Commercial-Grade Outdoor Work Gear

PO Box 5175
Janesville, WI 53547−5175
FEI #:81−4406382

Order By phone: 800−382−8473
Order Online: gemplers.com
Order By Fax: 800−551−1128
Order By Email: customerservice@gemplers.com

Invoice No: **SI04231861**
Invoice Date: 6/26/2018
Payment Terms: Net 30 Days

Thank you for your order!

Invoice to:
BROAD ARROW FORESTRY
3 Old Meadow Rd
Spencer, MA 01562−2065

Ship to:
TOWN OF SPENCER−SPENCER WATER DEPT
3 Old Meadow Rd
ATTN: STEVEN TYLER
Spencer, MA 01562−2065

Order No.	PO No.	Buyer	Carrier	Ship Date	Due Date
SO3852715		ROGER PLOURDE	FedExGrd	6/26/2018	7/26/2018

Item No.	Description	Qty BO	Qty Ship	UOM	Unit Price	Extended Price

Tracking Number(s)
443629603050

Subtotal:	408.12
Freight:	16.99
Tax:	0.00
Total:	425.11
Balance Due (USD):	425.11

These items are sold for domestic consumption in the United States. If exported, purchasers assume full responsibility for compliance with US export controls. For terms & conditions visit us at gemplers.com.

PLEASE DETACH THIS PORTION AND RETURN WITH YOUR PAYMENT (DO NOT STAPLE)

Invoice to:
BROAD ARROW FORESTRY
3 Old Meadow Rd
Spencer, MA 01562−2065

Remit to:
Gempler's
PO Box 74771
Chicago, IL 60694−4771

Order No.	Invoice No.	Invoice Acct.	Amount Due
SO3852715	SI04231861	7770324	425.11 (USD)

ARBORCHEM PRODUCTS

941 NIXON DR
MECHANICSBURG, PA 17055
717-766-6661
www.arborchem.com

Quote

Date	Quote #
6/25/2018	12931

Name / Address
TOWN OF SPENCER ATTN: STEVEN TYLER

Rep	Project

Description	Qty	Cost	Total
15K (3.5GAL) W/WAND (BIR15K)	2	270.00	540.00
VASTLAN (2X.25)	2.5	89.00	222.50
RODEO	2.5	21.00	52.50
HI-LIGHT BLUE (12X1QT)	1	23.48	23.48
CLEAN CUT (2X2.5)	2.5	10.50	26.25
FREIGHT	1	50.00	50.00

Total $914.73

COMMONWEALTH OF MASSACHUSETTS

Department of Agricultural Resources

PESTICIDE CERTIFICATION/LICENSE

Greg J Karpowicz

54 Borkum Rd.
Spencer, MA 01562

Sign Here

License Type
Applicator (Core)

Date Issued
4/12/2018

License Number
AL-0048574

Expiration Date
12/31/2018

Debra Graves

From:	Greg Karpowicz
Sent:	Monday, July 09, 2018 8:17 AM
To:	Debra Graves
Subject:	FW: Congratulation! You have passed the exam 18-EXAM-000595

Deb, here is my pesticide exam results. I will get you a copy of my license.

Thanks,

Greg Karpowicz
Chief Operator
Spencer Water Department
Spencer, Ma 01562
P-508-885-7525
F-508-885-9416

Please be advised that all email messages and any attachments sent to and from this email account are subject to the Public Records Law, M.G.L. c. 66, Section 10, unless qualified as an exemption.

The Town of Spencer is an equal opportunity provider and employer.

From: EIPAS (ENV) <eipas@state.ma.us>
Sent: Tuesday, April 03, 2018 1:02 AM
To: Greg Karpowicz <gkarpowicz@spencerma.gov>
Subject: Congratulation! You have passed the exam 18-EXAM-000595

NOTICE DATE: 4/3/2018

Greg Karpowicz
54 Borkum Rd.
Spencer, MA 01562

Dear **Greg Karpowicz**,

The Massachusetts Pesticide Program is pleased to inform you that you have received a **PASSING** score of **89** for 18-EXAM-000595 on the **Applicator (Core) License** exam given on **3/29/2018**.

Please login into your EIPAS account to pay for your credential and provide the proof of insurance as may be required if you are seeking a Commercial Credential. Using the online ePayment option is the most efficient way to complete this process.

In order to receive your license, please login into your ePLACE Portal Account at https://permitting.state.ma.us/citizenaccess/ and fill out the Pesticide License Application form that is provided. You will need this **exam reference number 18-EXAM-000595** to apply for a Pesticide License. You will also need to submit an additional licensing fee and proof of insurance in order to obtain your license if you are seeking a Commercial Credential.

You must complete this process within one year of the exam date, i.e., by 3/29/2019.

Please email any questions or concerns about this notification or this application to: steve.kenyon@state.ma.us

Sincerely,
Pesticides Certification Coordinator

NOTE: THIS NOTICE IS NOT A CREDENTIAL TO PURCHASE OR USE PESTICIDES.

APPENDIX I

Shaw Pond Sampling Location Map &
Laboratory Results

Shaw Pond, Leicester, MA - Water Quality Sampling Locations

Pre-Test Date: 5/14/2018
Post-Test Date: 6/7/2018

Refer to attachments for test results.

MAP FOR REFERENCE ONLY
NOT A LEGAL DOCUMENT

Town of Spencer, MA makes no claims and no warranties, expressed or implied, concerning the validity or accuracy of the GIS data presented on this map.

Parcels updated 10/1/2017
Properties updated 10/1/2017

Refer to attached lab reports for Pre-Test & Post-Test invasive land management species treatment sampling results.

Pre

MICROBAC

Microbac Laboratories, Inc. - Dayville

CERTIFICATE OF ANALYSIS

D8E1608

Town of Spencer

Greg Karpowicz
3 Old Meadow Road
Spencer, MA 01562

Project Name: 2280000

Project / PO Number: N/A
Received: 05/16/2018
Reported: 05/18/2018

Project Special Information

2280000
Spencer Water Department
COM

Analytical Testing Parameters

Client Sample ID: Spencer Water/Pond
Sample Matrix: Drinking Water
Lab Sample ID: D8E1608-01
Collected By: Customer
Collection Date: 05/14/2018 7:00

Semi-Volatile Organic Compounds - HPLC	Result	RL	Units	Note	Prepared	Analyzed	Analyst
Method: EPA 547 (1990)							
Glyphosate	<5.00	5.00	ug/L	Y	05/17/18 1041	05/17/18 1520	RSD

Client Sample ID: Spencer Water/Brook
Sample Matrix: Drinking Water
Lab Sample ID: D8E1608-02
Collected By: Customer
Collection Date: 05/14/2018 8:00

Semi-Volatile Organic Compounds - HPLC	Result	RL	Units	Note	Prepared	Analyzed	Analyst
Method: EPA 547 (1990)							
Glyphosate	<5.00	5.00	ug/L	Y	05/17/18 1041	05/17/18 1531	RSD

Client Sample ID: Spencer/Timberyard Brewery
Sample Matrix: Drinking Water
Lab Sample ID: D8E1608-03
Collected By: Customer
Collection Date: 05/16/2018 9:30

Microbiology	Result	RL	Units	Note	Prepared	Analyzed	Analyst
Method: SM9223 B-1997							
Total Coliform	<1	1	MPN/100 mL		05/16/18 1815	05/17/18 1928	ARM
Escherichia coli	<1	1	MPN/100 mL		05/16/18 1815	05/17/18 1928	ARM

Definitions

MCL: US EPA Maximum Contaminant Level
RL: Reporting Limit
Y: This analyte is not on the laboratory's current scope of accreditation.

Project Requested Certification(s)

Microbac Laboratories, Inc. - Dayville
M-CT008 Massachusetts Department of Environmental Protection

MICROBAC®

Microbac Laboratories, Inc. - Dayville

CERTIFICATE OF ANALYSIS

D8E1608

Report Comments

Samples were received in proper condition and the reported results conform to applicable accreditation standard unless otherwise noted.

The data and information on this, and other accompanying documents, represents only the sample(s) analyzed. This report is incomplete unless all pages indicated in the footnote are present and an authorized signature is included.

Reviewed and Approved By:

M Montgomery

Melisa L. Montgomery
QA Officer
Reported: 05/18/2018 15:43

MICROBAC

D8E1608

Spencer, Town of

CHAIN OF CUSTODY RECORD

Number _____

Instructions on back

TO BE COMPLETED BY MICROBAC

Temperature Upon Receipt (°C)

Therm ID

Holding Time

Samples Received on Ice? ☐ Yes ☐ No ☐ N/A

Custody Seals Intact? ☐ Yes ☐ No ☐ N/A

Lab Report Address

Client Name: Spencer Water Dept.

Address: 3 Old Meadow Rd.

City, State, Zip: Spencer, Ma. 01562

Contact: Greg Karpowicz

Telephone No.: (508) 847-3449

Invoice Ad.

Client Name: Spencer Water Dept.

Address: 3 Old Meadow Rd.

City, State, Zip: Spencer, Ma. 01562

Contact: Greg Karpowicz

Telephone No.: (508) 847-3449

☒ Routine (5 to 7 business days)
☐ RUSH* (notify lab)

(needed by)

Report Type

☒ Results Only ☐ Level 1 ☐ Level 2 ☐ Level 3 ☐ Level 4 ☐ EDD

Send Report via: ☒ Mail ☐ Fax ☐ e-mail (address)

Send Invoice via: ☒ Mail ☐ Fax ☐ e-mail (address)

Project: Drinking Water Testing

Location: Spencer, Ma.

PO No.:

Compliance Monitoring? ☒ Yes ☐ No
☒ Agency/Program MassDEP

Sampled by (PRINT): Greg Karpowicz

Sampler Signature:

Sampler Phone No.: (508) 847-3449

* Matrix Types: Soil/Solid (S), Sludge, Oil, Wipe, Drinking Water (DW), Groundwater (GW), Surface Water (SW), Waste Water (WW), Other (specify)

** Preservative Types: (1) HNO3, (2) H2SO4, (3) HCl, (4) NaOH, (5) Zinc Acetate, (6) Methanol, (7) Sodium Bisulfate, (8) Sodium Thiosulfate, (9) Hexane, (U) Unpreserved

REQUESTED ANALYSIS

Lab ID	Client Sample ID	Date Collected	Time Collected	No. of Containers	Matrix	Grab / Comp	Preservative Types **	Glyphosate	Total Coliform									Additional Notes
01	Spencer Water / Pond	05/14/18	7 AM	2	DW			x										
02	Spencer Water / Brook	05/14/18	8 AM	2	DW			x										
03	Spencer / Timberyard Brewery	05/16/18	9:30 Am	1	DW				x									

NO DEP

Possible Hazard Identification ☐ Hazardous ☒ Non-Hazardous ☐ Radioactive

Sample Disposition ☒ Dispose as appropriate ☐ Return ☐ Archive

Comments

3.3°C

Relinquished By (signature)	Date/Time	Received By (signature)	Date/Time
[signature]	5-16-18 12:22	[signature]	5-16-18 12:22
[signature]	5-16-18 14:25	[signature]	5/16/18 1425

rev.12/26/2017

Page ____ of ____

Page 3 of 3

MICROBAC®

INVOICE

Questions? 860.774.6814
Ask for: Krysti M. Skidgell

Invoice Number: DA8E02020
Invoice Date: 05/18/2018
Due Date: 06/18/2018
PO Number:
Client ID: 1G30435

Bill to: Town of Spencer
Debra Graves
3 Old Meadow Road
Spencer, MA 01562

Services for: Town of Spencer
3 Old Meadow Road
Spencer, MA 01562

Work Order: D8E1608

QUANTITY	ANALYSIS	MATRIX	UNIT COST	UNIT SURCHARGE	TOTAL COST
D8E1608	2280000		Received	05/16/2018	
	# of Samples 3	*Dates* 5/14/2018, 5/16/2018			
2	Glyphosate by HPLC	Drinking Water	$150.00		$300.00
1	Total Coliform and E-Coli (Enumeration)	Drinking Water	$35.00		$35.00

separate test

Total Current Charges $335.00

Total charges due by June 18, 2018 **$335.00**

Microbac Laboratories Inc. | Dayville
61 Louisa Viens Drive | Dayville, CT 06241 | 860.774.6814 p | None f | www.microbac.com

MICROBAC®

Invoice Number: DA8E02020
Due Date: 06/18/2018
Client ID: 1G30435

Town of Spencer
Debra Graves
3 Old Meadow Road
Spencer, MA 01562

Total charges due by June 18, 2018 **$335.00**

Make checks payable to: **Microbac Laboratories, Inc.**
Please return this remit slip with payment

Microbac Laboratories, Inc.
ATTN: LOCATOR GB
PO Box 644733
Pittsburgh, PA 15264-4733

Post

MICROBAC

Microbac Laboratories, Inc. - Dayville

CERTIFICATE OF ANALYSIS

D8F0737

Town of Spencer

Greg Karpowicz
3 Old Meadow Road
Spencer, MA 01562

Project Name: 2280000

Project / PO Number: N/A
Received: 06/07/2018
Reported: 06/12/2018

Project Special Information

2280000
Spencer Water Department
COM

Analytical Testing Parameters

Client Sample ID: Earley St.
Sample Matrix: Drinking Water
Lab Sample ID: D8F0737-01
Collected By: Greg Karpowicz
Collection Date: 06/07/2018 9:15

Microbiology	Result	RL	Units	Note	Prepared	Analyzed	Analyst
Method: SM9223 B-1997							
Total Coliform	Absent		in 100mL		06/07/18 1739	06/08/18 1951	ARM
Escherichia coli	Absent		in 100mL		06/07/18 1739	06/08/18 1951	ARM

Client Sample ID: Shaw Pond Spencer
Sample Matrix: Surface Water
Lab Sample ID: D8F0737-02
Collected By: Greg Karpowicz
Collection Date: 06/07/2018 9:40

Semi-Volatile Organic Compounds - HPLC	Result	RL	Units	Note	Prepared	Analyzed	Analyst
Method: EPA 547 (1990)							
Glyphosate	<5.00	5.00	ug/L	Y	06/11/18 1051	06/11/18 1558	RSD

Client Sample ID: Shaw Brook Spencer
Sample Matrix: Surface Water
Lab Sample ID: D8F0737-03
Collected By: Greg Karpowicz
Collection Date: 06/07/2018 9:50

Semi-Volatile Organic Compounds - HPLC	Result	RL	Units	Note	Prepared	Analyzed	Analyst
Method: EPA 547 (1990)							
Glyphosate	<5.00	5.00	ug/L	Y	06/11/18 1051	06/11/18 1610	RSD

Definitions

Absent:	A result of "Absent" for Total Coliform in drinking water indicates the sample is currently IN COMPLIANCE with theTotal Coliform Rule as established under the Safe Drinking Water Act.
MCL:	US EPA Maximum Contaminant Level
RL:	Reporting Limit
Y:	This analyte is not on the laboratory's current scope of accreditation.

Project Requested Certification(s)

Microbac Laboratories, Inc. - Dayville
M-CT008 Massachusetts Department of Environmental Protection

MICROBAC®

Microbac Laboratories, Inc. - Dayville

CERTIFICATE OF ANALYSIS

D8F0737

Report Comments

Samples were received in proper condition and the reported results conform to applicable accreditation standard unless otherwise noted.

The data and information on this, and other accompanying documents, represents only the sample(s) analyzed. This report is incomplete unless all pages indicated in the footnote are present and an authorized signature is included.

Reviewed and Approved By:

M Montgomery

Melisa L. Montgomery
QA Officer
Reported: 06/12/2018 18:05

MICROBAC

D8F0737

Spencer, Town of

CHAIN OF CUSTODY RECORD

Number

Instructions on back

TO BE COMPLETED BY MICROBAC

Temperature Upon Receipt (°C)

Therm ID

Holding Time

Samples Received on Ice? ☐ Yes ☐ No ☐ N/A

Custody Seals Intact? ☐ Yes ☐ No ☐ N/A

Lab Report Address

Client Name: Spencer Water Dept.

Address: 3 Old Meadow Rd.

City, State, Zip: Spencer, Ma. 01562

Contact: Greg Karpowicz

Telephone No.: (508) 847-3449

Invoice

Client Name: Spencer Water Dept.

Address: 3 Old Meadow Rd.

City, State, Zip: Spencer, Ma. 01562

Contact: Greg Karpowicz

Telephone No.: (508) 847-3449

☒ Routine (5 to 7 business days)
☐ RUSH* (notify lab)

(needed by)

Report Type

☐ Results Only ☐ Level 1 ☐ Level 2 ☐ Level 3 ☐ Level 4 ☐ EDD

Send Report via: ☐ Mail ☐ Fax ☐ e-mail (address)

Send Invoice via: ☐ Mail ☐ Fax ☐ e-mail (address)

Project: Drinking Water Testing

Location: Spencer, Ma.

PO No.:

Compliance Monitoring? ☐ Yes ☐ No
☒ Agency/Program MassDEP

Sampled by (PRINT): Greg Karpowicz

Sampler Signature:

Sampler Phone No.: (508) 847-3449

* Matrix Types: Soil/Solid (S), Sludge, Oil, Wipe, Drinking Water (DW), Groundwater (GW), Surface Water (SW), Waste Water (WW), Other (specify)

** Preservative Types: (1) HNO3, (2) H2SO4, (3) HCl, (4) NaOH, (5) Zinc Acetate, (6) Methanol, (7) Sodium Bisulfate, (8) Sodium Thiosulfate, (9) Hexane, (U) Unpreserved

REQUESTED ANALYSIS

Lab ID	Client Sample ID	Date Collected	Time Collected	No. of Containers	Matrix	Grab / Comp	Preservative Types **	Total Coliform	Glyphosate								Additional Notes
	Earley St.	06/07/18	09:15	1	DW			x									
	Shaw Pond Spencer	06/07/18	09:40	2	DW				x								
	Shaw Brook Spencer	06/07/18	09:50	2	DW				x								
					DW												
					DW												
					DW												
					DW												
					DW												
					DW												
					DW												

ND DEP

Possible Hazard Identification ☐ Hazardous ☐ Non-Hazardous ☐ Radioactive

Sample Disposition ☐ Dispose as appropriate ☐ Return ☐ Archive

Comments

4.2°C

Relinquished By (signature)	Date/Time	Received By (signature)	Date/Time
	06/07/18		
Relinquished By (signature)	Date/Time	Received By (signature)	Date/Time 6-7-18 13:20
Relinquished By (signature)	Date/Time 6-7-18 15:00	Received By (signature)	Date/Time 6-7-18 1500

rev.12/26/2017

Page ____ of ____

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INVOICE

Questions? 860.774.6814
Ask for: Krysti M. Skidgell

Invoice Number: DA8F01170
Invoice Date: 06/12/2018
Due Date: 07/12/2018
PO Number:
Client ID: 1G30435

Bill to: Town of Spencer
Debra Graves
3 Old Meadow Road
Spencer, MA 01562

Services for: Town of Spencer
3 Old Meadow Road
Spencer, MA 01562

Work Order: D8F0737

QUANTITY	ANALYSIS	MATRIX	UNIT COST	UNIT SURCHARGE	TOTAL COST
D8F0737	2280000		Received	06/07/2018	
	# of Samples 3	*Dates* 6/7/2018			
2	Glyphosate by HPLC	Surface Water	$150.00		$300.00
1	Coliform and Ecoli	Drinking Water	$25.00		$25.00

separate test

Total Current Charges $325.00

Total charges due by July 12, 2018 **$325.00**

MICROBAC®

Invoice Number: DA8F01170
Due Date: 07/12/2018
Client ID: 1G30435

Town of Spencer
Debra Graves
3 Old Meadow Road
Spencer, MA 01562

Total charges due by July 12, 2018 **$325.00**

Make checks payable to: **Microbac Laboratories, Inc.**
Please return this remit slip with payment

Microbac Laboratories, Inc.
ATTN: LOCATOR GB
PO Box 644733
Pittsburgh, PA 15264-4733