

Service Learning Summary

The invasion of exotic plants and pests into our natural forest and woodland community is an ever growing real issue that all humans will deal with in some way soon. This study is not currently part of my forestry curriculum but I believe it should be and will soon be required. This unit is an attempt to arm my students with the information, knowledge and skills to educate others and manage exotic invasive species.

Through this study students will become aware of the invasion by Japanese Knotweed, Japanese Barberry, Multiflora Rose, Common Buckthorn, Amur Honeysuckle, Asian Longhorned Beetle, Emerald Ash Borer, and Hemlock Woolly Adelgid and understand the magnitude of the local exotic invasive problem. Students will gain a clear understanding of exotic invasive species, what they are, why they are a major concern and strategies to manage them. It is hoped that students will become local experts in identification, control and eradication methods and develop a sincere concern around exotic invasives and their potential for destroying the natural forest community as we know it.

The methods which seem to work best for my students are hands on activities in real life issues and problems. With this in mind, I was looking for class activities to generate interest and concern on a personal level, offer opportunities to learn skills and create a desire to be proactive with exotic invasive issues. By gaining a general background, identifying species, researching control and eradication methods and working on a local problem, I hoped students would recognize the problems they will face and look for ways to intercede. The Mallory Lot, purchased by the local farmers market is only 1.5 miles from school and has all five of the local invasive plants of concern. I contacted the Farmer's Market Board Chair and volunteered to help with efforts to eradicate the invasives and plant native species along the stream bank of the parking area. They accepted our offer and our service learning project was born.

The service learning plan is to formulate a control management system and eradicate if possible the exotic invasive species present at the Mallory site in the fall of 2009 in preparation for the 2010 spring riparian buffer restoration planting. The project involves a partnership between the Windham Regional Career Center Natural Resources Students, Brattleboro Farmers Market, Windham County Natural Resources Conservation District, Vermont Association of Conservation District's (VACD) Agricultural Resources/Basin Planner and the Watershed Coordinator from the Vermont Agency of Natural Resources, Department of Environmental Conservation (DEC). The Natural Resources Class will inventory the exotic plants at the site and formulate an eradication strategy. They will be assisted by the DEC's Watershed Coordinator and VACD's Agriculture Specialist/Basin Planner and the students will provide the needed manpower for the project. Evaluation of the site will be a cooperative project before planting begins in 2010.

The formative evaluation will consist of work sheets, written summaries of learning, completion of facts sheets and written plans for eradication of specific exotic species. The summative evaluation will require students to use the knowledge and skills gained to predict what and how our natural forest and wild land community will look after twenty years of uncontrolled exotic invasive explosion and to reflect how their lives will be different as a result. They will include what steps they can choose to take now to eradicate or slow down the invasion of exotic species.

Resources

Marie Caduto - Watershed Coordinator, Vermont Agency of Natural Resources,
Department of Environmental Conservation 1-802-885-8958

marie.caduto@state.vt.us

Sylvia Harris - Agricultural Resources/ Basin Planner, Windham County Natural
Resources Conservation District 1-802-254-5323 ext.105

sylvia.harris@vt.nacdnet.net

Jolene Hamilton- District Manager, Windham County Natural Resources
Conservation District 1-802-254-5323 ext. 104

jolene.hamilton@vt.nacdnet.net

William Guenther, Windham County Forester, University of Vermont Extension
Service 1-802-257-7967 ext. 15

bill.guenther@state.vt.us

Barbara Burns, Resource Prot. Reg. Supervisor, Department of Forests, Parks
& Recreation, 1-802-885-8821

barbara.burns@state.vt.us

Vermont Agency of Agriculture, Foods & Markets 1- 802- 828-2341

The Nature Conservancy of Vermont 1-802-229-4425

Vermont Department of Environmental Conservation 1-802-241-3777

Vermont Department of Fish and Wildlife 1-802-241-3715

Vermont Department of Forests Parks and Recreation 1-802-241-3678

Web Sites:

United States Department of Agriculture - [Invasive Plants Field and Reference Guide](#) - www.na.fs.fed.us

www.nps.gov/plants/alien/fact/pope/.htm

www.invasive.org

www.forestryimages.org

www.vtinvasiveplants.org

www.bugguide.net

www.IPAN

Service Learning Description

My service learning component was the eradication of Japanese Knotweed on the Mallory Lot by the Whetstone Brook in Brattleboro. The Mallory Lot had been recently purchased by the Brattleboro Farmers Market to provide additional parking for their customers. The Brattleboro Farmers Market had received grant money to purchase the property, provide additional parking and install a riparian buffer along the streambank of the brook. The eradication of the Japanese Knotweed needed to be completed prior to fall frost in preparation for the buffer planting scheduled for the spring of 2010. The parcel is approximately an acre and a half and borders the Living Memorial Park on the right and the Whetstone Brook on the left. The Living Memorial Park is the Town of Brattleboro's outdoor recreational facility. The Creamery Bridge (Brattleboro's only covered bridge) connects the Park to the Farmers Market site. Currently the Creamery Bridge is closed as construction for a new bridge is in progress. When the new bridge is completed the Creamery Bridge will be used as a walking bridge to the market and the park. The Creamery Bridge draws many tourists to the area along with the Saturday's Farmers Market. The Living Memorial Park, the Creamery Bridge and the Farmers Market are valuable assets to the Town of Brattleboro.

I found out about this project by contacting the Windham County Natural Resources Conservation District (WCNRC) and asking what projects they had planned for 2009-2010 that might fit into our school schedule. I was given a list of potential projects and I chose this activity because I felt there was a real need to educate students and the public about the exploding issue of invasive species. This site hosted all five local invasive plants of concern, was very visible to the public, was only a mile from school and needed to be done early fall of 2009. This seemed a good fit for my class and our schedule.

I communicated with the Farmers Market Chairperson Patricia Austin, Windham County Natural Resources Conservation District manager Jolene Hamilton, and Marie Caduto, Watershed Coordinator from the Vermont Department of Environmental Conservation to make sure this would work for all parties involved. I met with Austin and Caduto in August and formulated the plan of cutting and treating each stem with 40% mixture of Glyphosate found in a product called Remuda and stacking all cut material on plastic to dry in the sun before being burned. The plan was taken to the Farmers Market Board for approval on August 31st. The next step after their approval was State approval and then getting the supplies of chemicals, applicators and plastic. Additionally I needed to find a Certified Herbicide Applicator who would be on site during the project to meet the State requirement. The identification and procedures lesson were to be taught by Marie Caduto on September 16th. I planned the eradication project for September 17th and 18th hoping for good weather and before we had a killing frost. The project came together and was completed with all Knotweed cut, stacked on plastic with stems treated by the end of class on the 18th.

The community will benefit from the installation of a riparian buffer that serves to filter out sediment and pollutants before they enter the brook. The water quality of the brook will be improved, additional shade will be provided for the fish and invertebrates that live in the stream. Native plants can now replace the Japanese Knotweed recreating the natural community. The stream can provide recreational fishing along with the improved scenic value to the Town. Another long range benefit is the skills that the students learned by identifying and then using control methods on the invasives. These skills will be shared with other students, teachers and their families.

**Windham Regional Career Center
Curriculum Guide
Unit Plan**

Class/Program: Forestry and Natural Resources

Unit: Invasive Plants and Animals

Essential Questions & Skills What will be taught?	Competencies What workplace readiness skills/competencies will be met by these objectives? (may include VT standards or GLE's)	Instructional Objectives What will the students be able to do as a result of this instruction?	Lessons What specific lessons will I give to teach this material?	Instructional activities What will the students do to achieve the objective?	Assessment What evidence will I collect that demonstrate that the students have achieved the objective?
<p>What are invasive species and why are they a problem?</p> <p>How will I recognize and identify local invasive plants and animals?</p> <p>How can I eradicate or control invasive species?</p> <p>How might invasive species effect my life?</p>	<p>Vermont Standard 7.16: Students demonstrate an understanding of Natural Resources and Agricultural systems and why and how they are managed.</p> <p>Competencies:</p> <p>D002: Identify tree and invasive species.</p> <p>E002: Identify</p>	<p>Explain/define invasive species and their effect on natural communities.</p> <p>Identify five local invasive plants and two invasive pests by sight, plant keys or fact sheets.</p> <p>Recognize Asian Longhorned Beetle and Emerald Ash Borer, their damage or evidence of</p>	<p>Introduction to invasive exotic species.</p> <p>What makes an invasive an invasive?</p> <p>Invasive identification and control.</p> <p>Knowing local invasive plants and pests.</p> <p>Investigation and</p>	<p>Home work assignment.</p> <p>Lecture, group discussion.</p> <p>Guest speaker.</p> <p>Research and prepare fact sheets.</p> <p>Complete the eradication project.</p> <p>Complete a plot inventory.</p>	<p>Accurate completion of the worksheet for the article <u>At War With Invasive Species</u>.</p> <p>Completed written invasive species definition.</p> <p>A collection of five invasive plant leaves, stems, and or flower samples with site map and location found noted.</p>

	<p>common insects, woodland pests, and animal damage.</p> <p>K014. Apply computer technology.</p> <p>M002. Practice and refine problem-solving skills.</p>	<p>activity.</p> <p>Articulate possible problems, issues and effects of invasive species.</p> <p>Work on an invasive species eradication / control team.</p> <p>Gain an understanding of the scope of the invasive issues.</p> <p>Understand the importance of current actions to eradicate and control invasive species.</p>	<p>inventory of exotic invasive species at the Mallory lot.</p> <p>Eradication plan for the Mallory lot.</p> <p>How might invasive species effect my life?</p>		<p>Accurate completion of five invasive plant and two invasive pest fact sheets.</p> <p>Completed eradication plan.</p> <p>Written summary of how invasive species may impact your life.</p>
--	--	---	--	--	--

Lesson One:

Introduction to Invasive Exotic species

Objective:

Students will become aware of the issues around invasive species including plants, animals, fungi, bacterial and viruses.

Materials:

Article: At War with Invasive Species in Forests by Thom McEvoy

Pointer (pen or pencil)

High lighter

Required Time:

45- 60 minutes

Methods / Procedures:

Group reading of At War with Invasive Species in Forests

Explain how group reading works to improve reading fluency

1. Follow along with reader pointer (pencil or pen)
2. Repeated reading of text for understanding

Reading rules:

1. All follow reader word for word, with pointer.
2. Reader only needs to read one sentence, can read more.
3. Reader chooses next reader.
4. Reread to make sense.
5. Teacher can stop at any time and ask you for the next word. If you don't know it you will read the last sentence.

Assessment:

Complete the question sheet for the article and write a 3-5 sentence article summary.

At War with

Invasive Species

in Forests

by Thom McEvoy

Depending on who you ask, the invasion of nonnative species is one of the most significant threats to biological diversity of all ecosystems, but forests in particular. Couple the impact of invasive organisms with habitat loss from parcelization of forest holdings and the prognosis for forests, especially in settled areas, is not good. Despite annual expenditures on the order of hundreds of millions of dollars to eradicate or control the spread of invasive species in this country alone, it is a threat now rivaled only by terrorism.

The U.S. Congressional Office of Technological Assessment estimates that of the 4,500 plants introduced to North America since colonists first arrived, nearly 700 are considered harmful. In just the past century, 80 of these species have caused nearly \$100 billion in agricultural losses; but the worst is yet to come. Today, about 2,000 of the nearly 7,000 plants recognized worldwide as "weeds" reside in the United States. This leaves 5,000 noxious plants that have yet to cross our borders. Or, some may have already arrived and populations are building to the point where they will become problems.

Noxious plants are not the only threat. Potentially damaging species can include animals, fungi, insects, bacteria, viruses and virus-like particles. Any nonnative organism, often arriving without its natural enemies, with an ability to tolerate a wide range of environmental conditions, is a threat.

As a group, invasive organisms are

usually sexually precocious, prolific and possess highly effective reproduction and dispersal mechanisms. It is their ability to outcompete native species, sometimes displacing them, that results in ecosystem changes for which long-term impacts are unknown. For example, of the forest insects in the United States known to damage trees, only a few are exotics. Yet these few species are responsible for more than half of the damage sustained by forests.

How do nonnative organisms arrive here? Some, like the gypsy moth, because of hubris (an amateur scientist looking to corner the silk market). Others, because of commerce. For example, wood-boring insects will hitch a ride on one of thousands of wooden crates that arrive here each year, only a ridiculously ineffective few of which are inspected—often with an eye for contraband and weapons, not potentially invasive insects.

Some past importations were well-intentioned mistakes, such as Dutch elm disease, American chestnut blight and white pine blister rust. For example, in 1906 a nameless person in southern Florida imported a tree called melaleuca from the coast of northern Australia. He intended to market it as a fast-growing landscape plant. Coincidentally, the nearby Everglades were being drained for flood control, water management and for agricultural expansion. Recently exposed wet soils proved the perfect habitat for this prolific and aggressive species. Now, thousands of acres in south Florida are covered with dense stands of melaleuca, seriously threatening the Everglades, and its range is expanding at a

phenomenal rate of 50 acres per day.

Kudzu, the infamous "plant that ate the South," was introduced to the United States by a Japanese delegation to the 1876 Centennial Exposition in Philadelphia. Fragrant purple blooms and a dense climbing vine made it perfect for arbors. But soon after the exposition, USDA scientists explored the forage value of kudzu, recognizing its fast growth and aggressiveness as positive traits. During agricultural land abandonment in the South at the time of the Great Depression, thousands of men planted tens of thousands of acres with kudzu. After that initial planting, and for the next 20 years, the USDA continued to advocate kudzu as a cover crop, but not before it had established virtually impenetrable mats of vines on more than 7 million acres. The forest industry has spent millions to reclaim kudzu lands for pine, often to no avail, and in 1978 it was finally declared a weed.

Autumn olive is another species that the USDA once encouraged eastern forest owners to plant for wildlife; until it became apparent it is highly aggressive and can interfere with natural regeneration of valuable forest species. Multiflora rose, Japanese honeysuckle, barberry, lespedeza and privet are other examples of invasive plants that forest owners and managers were encouraged to plant by state and federal agencies, usually as food sources for wildlife.

Buckthorn, wisteria, chinaberry, talloftree and mimosa are species that escaped from landscape plantings. Generally, escaped landscape species are more common in subtropical climates where developers use exotic plants to accentuate development. Little thought is given to the reproductive habits of these species, or to the prospects of plants escaping to become a nuisance.

Invasive plants tend to grow fast and mature quickly, producing large quantities of easily dispersed seed. Some species are allelopathic (capable of excreting substances toxic to other plants), which limits

competition from native species. When invasive organisms with these characteristics become established in forest stands, it is almost impossible to reproduce stands using natural methods without first incurring the expense and hassle of eliminating or controlling the offending plants.

So, given the fact that many invasive organisms seem to have the upper hand in forests, what are some strategies for dealing with them?

Trees are more susceptible to insect and disease depredations during or immediately following environmental stresses; such as excessively dry or wet conditions or following silvicultural treatments, as discussed earlier. If risks from invasive insects or diseases are pending, managers may want to consider postponing, or at least delaying, treatments. If risks are subsequent to a treatment, keep a close eye on areas where work has already been done. Invasive plants favor disturbed soils: landings, skid trails and other areas where mineral soil has been exposed. Learn to identify locally invasive plants in the field. Those collected for positive ID in the office should be gathered in Ziploc bags, carefully noting the location. A handheld global positioning system (GPS) will come handy if a location is off the trail.

On stands that are infested with invasive plants, delay all silvicultural disturbances until the invasives have been controlled (or are dormant). Both systemic and contact herbicides (of which there are many to choose from) have proven effective on most forest invaders; check with the state forester for compounds, application methods and guidelines. Fire has also proven an effective tool in some eastern forests, so long as it kills invasive plants without damaging native species.

Use only native grasses and forbs, preferably from local sources, when putting landings and skid roads to bed. Doing so will reduce the chances of introducing exotics that are mixed in with seed. Mulch seeded areas with an artificial mulch (like wet paper pulp) or use mulch-hay from local sources that are known to be free of exotic species. If manure is used as a combination mulch and nutrient source, make sure it is from animals kept in clean pastures. Horse manure usually has a much higher viable seed content than that of

cattle, but horses are more apt to avoid grazing on noxious plants.

Forest dwelling homeowners should be encouraged to plant only native species in landscapes. Most owners have no idea that their landscaping practices can be detrimental to surrounding forest ecosystems and they will comply.

Finally, report invasive plants, or any insect or disease damage that is not immediately recognizable, to the state forester's office. Before calling, make detailed notes that describe the plant, insect, injuries and/or symptoms and the location. With a good description, a specialist can usually diagnose a potentially invasive organism over the phone. If it is an invasive, someone will probably ask to visit the site as soon as possible. Any samples of diseased tissue, insects, plants or any other living tissue should be collected using a Ziploc bag and stored in a refrigerated location. Never carry live samples from place to place outside of an airtight plastic bag or container, and never send unsealed samples by common carrier.

When invasive species take advantage of disturbances and compete for resources



with native species, effecting successful silvicultural practices is much more difficult, if not impossible. Opportunities for benefits are less when invasives reach infestation levels and forest ecosystems change in unpredictable, but probably far less favorable, ways. The best way to deal with invasive organisms is vigilant observation followed by eradication, which is easier said than done. For more information on threats in your area, contact the state forester. Another excellent source is www.invasive.org. **FPE**

INVASIVES SPECIES

1. What two issues make the prognosis for forests in settled areas not very good?

1.

2.

2. In addition to plants, what are some other invasive species?

1.

2.

3.

4.

5.

3. What are the problems with an invasive species?

1.

2.

3.

4. How did the following invasive species get into the US?

Gypsy Moth-----

Woodborers-----

Dutch Elm Disease

American Chestnut Blight-----

White Pine Blister Rust

5. What are some strategies for dealing with invasives plants?

1.

2.

3.

4.

5.

6.

7.

8.

INVASIVES SPECIES

1. What two issues make the prognosis for forests in settled areas not very good?

1. Habitat Loss from Parcelization
2. invasion of nonnative species

2. In addition to plants, what are some other invasive species?

1. animals
2. Fungi
3. bacteria
4. Viruses
5. Virus like particles

3. What are the problems with an invasive species?

1. Prolific Reproduction systems
2. ability to out compete native species
3. Long term ecosystem impacts are unknown

4. How did the following invasive species get into the US?

Gypsy Moth-----amateur Scientist

Woodborers-----hitch a Ride on imported wood products (shipping crates)

Dutch Elm Disease

American Chestnut Blight-----

White Pine Blister Rust

well intentioned mistakes

5. What are some strategies for dealing with invasives plants?

1. Timing Silvicultural Treatments to favor native species
2. monitor (watch closely)
3. learn to identify invasives
4. gather sample in ziplock bags. Take care not to spread
5. herbicides
6. controlled burns
7. Plant only native species
8. Report invasives

Lesson Two:

What Makes an Invasive an Invasive?

Objective:

Students will understand the difference between native plants, exotic plants, exotic invasive plants and how they fit in natural communities.

Materials needed:

Pencil or pen
Collins paper or lined paper

Required Time:

45-60 minutes

Methods/Procedures:

Introduce and explain the following terms:

Exotic plant: A plant species which has been purposefully or accidentally introduced outside its original geographic range.

Native plant: A plant species that can be shown to have been present in the region for at least 100 years and for which there is no evidence that it is an exotic plant.

Natural Communities: Assemblages of plants and animals that are found recurring across the landscape under similar environmental conditions where natural processes, rather than human disturbances, prevail.

Invasive exotic plant: An exotic plant species which is able to proliferate and aggressively alter or displace native biological communities.

Collins level one writing activity

Write 3 things in 2 minutes (grade on number not content.) on Collins or lined paper

The writing prompt is: Write three things you know or questions you have about invasive species.

Discussion/ brainstorming

1. List responses on board. If student doesn't have the listed response on his/her paper they should include it on their paper (Use the below the line activity - draw a line below your list and add any you don't have.)
2. What are the characteristics of an invasive species?
3. Formulate a class definition of an invasive species.
4. Who decides and when, what is natural and what is invasive?

Assessment: Write a 3-5 sentence paragraph defining an invasive plant including the knowledgeable use of the terms native plant, natural community, exotic plant and exotic invasive plant. Place a circle around each of the terms used in your definition.

Example:

An invasive plant is an exotic plant taken from its natural community, then introduced into another community with native plants where the exotic becomes invasive or dominate. This results from the exotic plant winning the competition battle with the native plants and replacing them in the community.

INVASIVE EXOTIC SPECIES

Brook Fox
9/16

An invasive exotic plant is an exotic plant that is originally grown in an exotic natural community. Exotic plants will outcompete the native species and take over their natural community.

FCA'S:

Include all 4 terms: 50pts

Circle the terms: 25pts

Name and title: 25pts

An invasive exotic plant is an exotic plant that is taken from where it is originally grown and will outcompete the native species where it is placed.

Because it has no predators, it can easily thrive and take over the natural communities in local areas.

~~great~~ (100)

Invasive Specie

Kimberly

Invasive exotic plants are plants that
are exotic that come from a different
region ^{and} take over native plants and
changes the Natural Community.

100

FCA include all 4 terms _____ pts. 50 Name Bonnie Brinker

FCA circle the terms _____ pts. 25 Date September 15th, 2009

FCA Name and title _____ pts. 25 _____

100

Title INVASIVE EXOTIC SPECIES

X An invasive exotic plant is an exotic plant that is able to

X out-compete and aggressively alter or displace native

X biological and natural communities, they also out-grow

X the native species (NATIVE PLANTS)

X

X

X

X

X

X

X

Lesson Three:

Invasive Identification and Control

Objective:

Students will be able to identify and explain the difference between exotic species and invasive exotic species.

Students will be able to recognize the following local invasive plants: Japanese Knotweed, Glossy Buckthorn, Japanese Barberry, Multiflora Rose, Garlic Mustard, and Oriental Bittersweet.

Methods/Procedures:

Power point presentation by guest speaker Marie Leveque Caduto Watershed Coordinator, Vermont Department of Environmental Conservation titled: Invasives in Southern Vermont, Identification and Control

Assessment:

Students will identify Japanese Knotweed, Glossy Buckthorn, Japanese Barberry, Multiflora Rose, Garlic Mustard and Oriental Bittersweet from an ending quiz included in the presentation. The students will recognize invasive plants in the field in Lesson 4.

1 Common Invasives In Vermont Identification and Spread

2 Native vs. Exotic

- Native – originated “here” – northern New England
 - Adapted to climate, conditions, local predators, local diseases, etc.
 - Usually in balance with predators, diseases, etc.
- Exotic – originated somewhere else
 - Introduced intentionally or accidentally
 - Not adapted to local conditions – may survive, may not

3 Exotics

- 25 – 30 % of plants in VT are NOT native
- Exotics include:
 - Some earthworms
 - Rainbow & brown trout
 - Red clover – VT state flower
 - Honeybees – VT state insect
- 8 % of these plants are **INVASIVE**

4 What makes a plant “invasive”?

- They produce many small seeds and can begin producing within their first few years.
- They reproduce both by seeds and vegetative growth
- Their seeds are easily dispersed by animals, wind & water
- They leaf out early in the spring and hold their leaves until late in the fall.
- They have no natural controls such as insects or diseases
- They can thrive in many habitats.

5 Invasive or Not?

- Dandelion - exotic
- Crabgrass - exotic
- Red clover – exotic
- Honey Bee - exotic
- Morning Glory (Hedge bindweed) - native
- Cattail – native
- Tent caterpillar – native

6 Why are they a problem?

- Outcompete native species
- Disrupt habitats and wildlife food sources
 - Change make-up of community
 - Poor food supply vs. natives
- Displace native species
 - Shade out new seedlings
- Often thrive in disturbed areas
- Endangered Species
 - 42% of listed ES significantly impacted by invasives.
 - Major cause of decline of ES and significant impediment to recovery.
- **VERY EXPENSIVE**

7 Cost To U.S. Economy

- 79 animal and plant species, 1906 to 1991: \$79 billion
- 15 recent introductions could cost the U.S. \$134 billion by 2050
- Decreased value of sport and commercial fisheries in the Great Lakes due to ruffe population: \$119 million

- Annual zebra mussel control costs to water users in the Great Lakes : \$30 million/year
- BILLIONS PER YEAR

8 Identification – Aquatic Species

- Japanese Knotweed
- Common Reed – Phragmites
- Purple Loosestrife
- Eurasian Watermilfoil
- Water Chestnut
- Rusty Crayfish
- Didymo
- Variable Leaf Milfoil

9 Japanese knotweed / Mexican bamboo

Polygonum cuspidatum

10 Common Reed

Phragmites australis

11 Purple loosestrife

Lythrum salicaria

12(picture)

13 Eurasian Watermilfoil

Myriophyllum spicatum

14

Milfoil Lakes

15 Water Chestnut

Trapa natans

16 Current Distribution

17 Rusty Crayfish

Orconectes rusticus

18 Current Distribution

19(picture)

20 Didymo / Rock Snot

Didymosphenia geminate

21 Current Distribution

22 Variable-leaved watermilfoil *Myriophyllum heterophyllum*

23 Know Before You Act

- Proper ID
- Choose treatment method

- Best potential results
- Least harmful method / safest
- Take proper precautions
 - Clothing, gloves, eye protection, mask
- Use equipment correctly
 - Especially chemicals, more is NOT better

24 Controlling Invasive Exotic Plants:

Spread Prevention

- Avoid contaminated waterbodies, hay, mulch, manure, seed
- Clean equipment – boats, gear, mowers, etc.
- Clean yourself & your pets
- Monitor for invasives in and around area
- Deal with new populations quickly before they can spread
- Do not move or release plants or animals to new areas

25 VIP Program

http://www.anr.state.vt.us/dec/waterq/lakes/htm/ans/lp_VIP.htm

26 Control Methods

3 Categories

- Mechanical – pulling, mowing, barriers
- Biological – insects, diseases, fungi
- Chemical – pesticides

Should be used in this order

27 Controlling Invasive Exotic Plants:

Mechanical Methods

28 Controlling Invasive Exotic Plants:

Herbicides

29 Identification – Terrestrial Species

- Garlic Mustard
- Goutweed
- Japanese Barberry
- Japanese and Shrub Honeysuckles
- Oriental Bittersweet
- Burning Bush
- Glossy & Common Buckthorn
- Russian & Autumn Olive
- Black Swallow-wort
- Giant Hogweed

30 Garlic Mustard

Alliaria petiolata

31 Goutweed / Bishop's Weed

Aegopodium podagraria

32 Japanese Barberry

Berberis thunbergii DC

33 Japanese and Shrub Honeysuckles

Lonicera spp.

34 **Oriental Bittersweet**

Celastrus orbiculatus Thumb.

35 **Careful ID is ESSENTIAL**

36 **Winged Euonymous**

a.k.a. Burning Bush
Euonymus alatus

37

1 **Glossy Buckthorn**

Rhamnus frangula

2 **Common Buckthorn**

Rhamnus cathartica

38

1 **Russian Olive**

Elaeagnus angustifolia L.

2 **Autumn Olive**

Elaeagnus umbellata

39 **Black Swallowwort**

Cynanchum louiseae

40(picture)

41 **Giant Hogweed**

Heracleum mantegazzianum

42 **Wild Chervil**

Anthriscus sylvestris

43 **Giant Hogweed & Wild Chervil**

44 **Asian Longhorned Beetle**

Anoplophora glabripennis

Attacks maple, birch, elm, poplar, horse chestnut and willow.

45 **Emerald Ash Borer**

Agilus planipennis

46 **Hemlock Woolly Adelgid**

Adelges tsugae

47 **ID Quiz !!!**

•Which one is Japanese knotweed?

48 **ID Quiz !!!**

•Which one is Japanese knotweed?

49 **ID Quiz !!!**

•Which one is a Rusty Crayfish?

50 **ID Quiz !!!**

•Which one is Rusty Crayfish?

51 **ID Quiz !!!**

•Which one is Eurasian watermilfoil?

52 **ID Quiz !!!**

•Which one is Eurasian watermilfoil?

53 **ID Quiz !!!**

•Which one is an Asian Longhorn Beetle?

54 **ID Quiz !!!**

•Which one is an Asian Longhorn Beetle?

55 **ID Quiz !!!**

•Which one is the invasive honeysuckle?

56 **ID Quiz !!!**

•Which one is the invasive honeysuckle?

Lesson Four:

Investigation and Inventory of Exotic Invasive Plants at the Mallory Lot

Objective:

Students will collect exotic invasive plants and identify by sight or identification guides and other resources.

Materials:

- Needed for each group (4-5 students/group)
1. 7- 2.5 gallon jumbo freezer locking bags
 2. Permanent marker
 3. Pen or pencil
 4. Clipboard
 5. Digital camera
 6. Site map
 7. Transportation to site (approx 2 miles)

Required Time:

1.5-2 hours

Methods /Procedures:

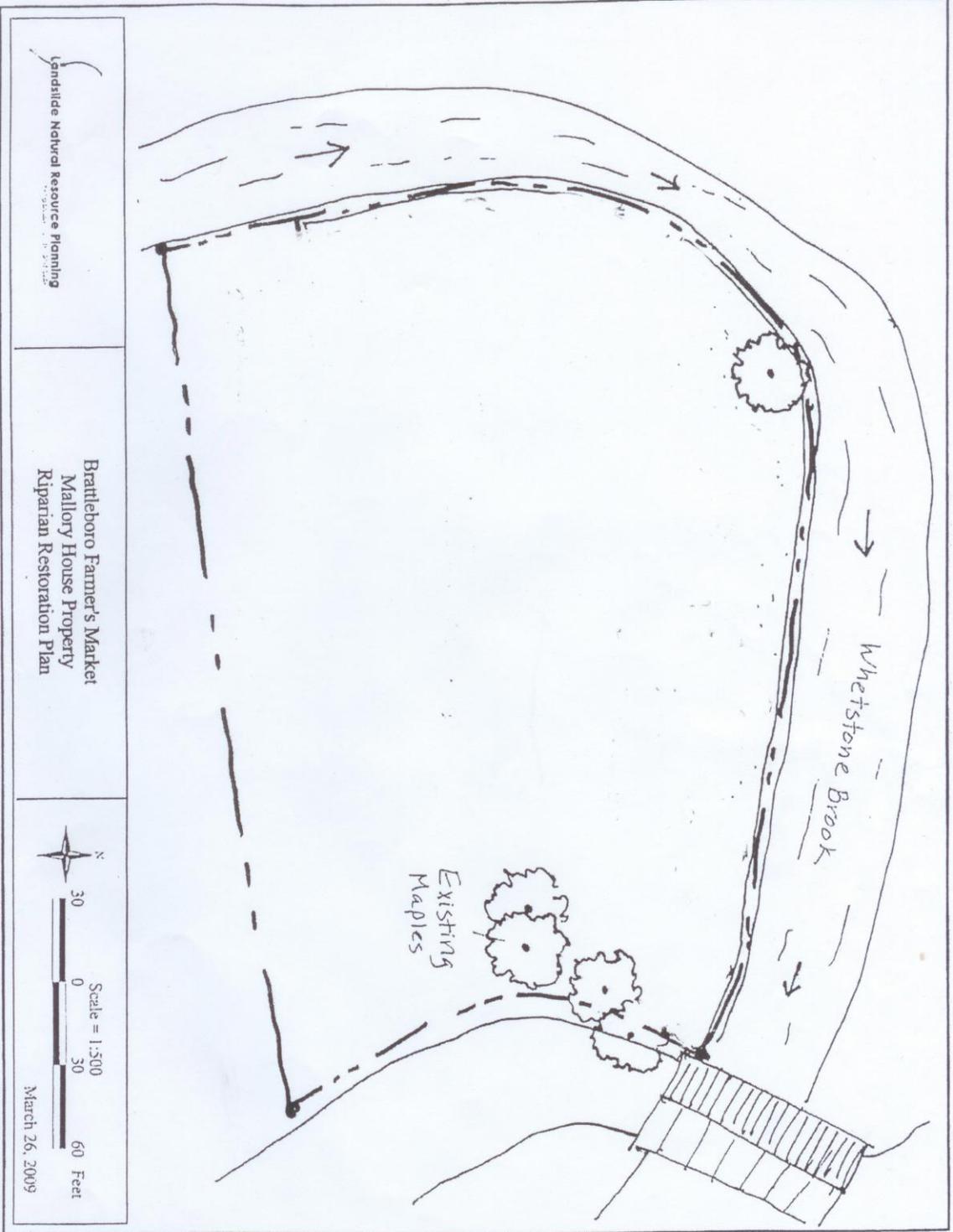
Travel to the Mallory lot, gather as many samples of exotic plants as your group can find and seal them in individual bags. Record the plant location on the site map and number of plants found or area of infestation.

Instructions:

1. Gather only invasive plants
2. Use a separate bag for each plant
3. Each sample should have enough leaves, stems and flowers and or seed for each member of the group.
4. Number each bag and mark the sample number on the map at the location found.
5. Seal bags before leaving the area. **(Do not spread the invasive plants to new locations.)**
6. Identify plants using Weeds of the Northeast, Invasive Plants of Riparian Areas in New England, Vermont Exotic Plant Fact Sheet Series or other resources.
7. Press and dry leaves for fact sheets. Place the leaves between the pages of an old book or catalog to dry and flatten over night. Keep the stems, flowers and or seeds in the sealed plastic bags for future use.

Assessment:

Each student will have samples of leaves, stem and flowers identified, labeled and stored between pages of an old book/catalog or in plastic bags for later use in fact sheet construction.



Landslide Natural Resource Planning
 10000
 10000

Brattleboro Farmer's Market
 Mallory House Property
 Riparian Restoration Plan

Scale = 1:500
 0 30 60 Feet
 March 26, 2009

Lesson Five:

Knowing Local Invasive Plants and Pests

Objective:

Students will become familiar with five local invasive plants including: Japanese Knotweed, Japanese Barberry, Multiflora Rose, Common Buckthorn, Amur Honeysuckle and exotic pests such as Asian Longhorned Beetle, Emerald Ash Borer and Hemlock Woolly Adelgid. They will gather information and construct fact sheets for each species.

Materials:

1. Computer with internet access
2. Weeds of the Northeast by Richard Uva
3. Vermont Invasive Exotic Plant Fact Sheet Series
4. Telephone access
5. Resource guide

Required Time:

1-1.5 hours for each sheet

Methods / Procedures:

Students will use the resources available to research, organize information and construct a fact sheet for 5 local invasive plants and 2 invasive pests. Sheets will include:

1. Common name
2. Latin name
3. History of infestation (where it came from, when and how)
4. Natural local enemies
5. Diagnostic characteristics (how do I identify, pictures clues)
6. Reproduction (how does it spread?)
7. Habitat (where does it grow?)
8. Eradication / control (how can I get rid of it?)
9. Resources for help or reporting infestations

Assessment:

The students will complete fact sheets on five plants and two pests. See attached grading guide.

Fact Sheet Requirements

5pts. Plant Names

Common

Latin

10pts. Ecological Threat (what are the problems this invasive causes?)

10pts. History of infestation (when did the invasive species get here, from where, how and by whom?)

10pts. Local enemies (what are the local natural enemies?)

10pts. Diagnostic characteristics (how do I identify this species?)

10pts. Reproduction systems (what ways does this species reproduce and spread to new locations?)

10pts. Habitat requirements (what are the conditions this species needs to do well?)

10pts. Eradication or control methods (what can be done to get rid of or control this species?)

10pts. Who to inform/where to get help (local and state name and phone # and web site)

10pts. Samples and or pictures

5pts. Sources Listed (where did you get your information?)

** Suggested Newsletter Format

Microsoft Office – Microsoft Publisher – Newsletter

Resources

Marie Caduto - Watershed Coordinator, Vermont Agency of Natural Resources,
Department of Environmental Conservation 1-802-885-8958

marie.caduto@state.vt.us

Sylvia Harris - Agricultural Resources/ Basin Planner, Windham County Natural
Resources Conservation District 1-802-254-5323 ext.105

sylvia.harris@vt.nacdnet.net

Jolene Hamilton- District Manager, Windham County Natural Resources
Conservation District 1-802-254-5323 ext. 104

jolene.hamilton@vt.nacdnet.net

William Guenther, Windham County Forester, University of Vermont Extension
Service 1-802-257-7967 ext. 15

bill.guenther@state.vt.us

Barbara Burns, Resource Prot. Reg. Supervisor, Department of Forests, Parks
& Recreation, 1-802-885-8821

barbara.burns@state.vt.us

Vermont Agency of Agriculture, Foods & Markets 1- 802- 828-2341

The Nature Conservancy of Vermont 1-802-229-4425

Vermont Department of Environmental Conservation 1-802-241-3777

Vermont Department of Fish and Wildlife 1-802-241-3715

Vermont Department of Forests Parks and Recreation 1-802-241-3678

Web Sites:

United States Department of Agriculture - [Invasive Plants Field and Reference Guide](#) - www.na.fs.fed.us

www.nps.gov/plants/alien/fact/pope/.htm

www.invasive.org

www.forestryimages.org

www.vtinvasiveplants.org

www.bugguide.net

www.IPAN

Asian Longhorn Beetle



Kaitlin Stone



Names:

Common: Asian Long Horn Beetle, Starry Sky Beetle.

Latin: *Anoplophora glabripennis* (motschulsky)

History of Infestation:

This beetle came to the United States in 1996 in shipping crates. Its currently found in, N.Y. City, Chicago, and Worcester, MA.

Habitat Requirements:

Asian Longhorn Beetles favorite food is the maple but will also attack and kill other hardwood trees if maples are not available.

Reproduction:

Asian Longhorn Beetles lay eggs in notches they chew into the bark. The eggs hatch and the larvae tunnel into the tree overwintering to lay eggs in the spring.

Enemies:

No natural enemies in the U.S.A.

Characteristics:

The adult beetle is about 1 1/4 inches in body length. The antennae are longer than their body and each antennal has alternating between white and black colors all the way to the tip.

Whom To Inform:

Barbara Burns
1-802-885-8821

State Sightings:

Worcester, Massachusetts
New York City
Chicago Illinois

Eradication/Control Methods:

Current control methods include cutting and chipping all infested trees. The chips are burned locally. Wood movement is the major way the beetles move to new locations.

DO NOT MOVE FIREWOOD OR LOGS FROM KNOWN INFESTATION AREA.

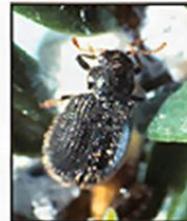


Oct. -20-2009

Web sites
[http://
www.na.fs.fed.us/spfo/
pubs/pest_al/hemlock/
hwa05.htm](http://www.na.fs.fed.us/spfo/pubs/pest_al/hemlock/hwa05.htm)


[http://
www.dcnr.state.pa.us/
forestry/woollyadelgid/
index.aspx](http://www.dcnr.state.pa.us/forestry/woollyadelgid/index.aspx)

Hemlock woolly Adelgin *Adelges Tsugae*



Chemical control :such as foliar sprays using horticultural oils and insecticidal soaps, are effective when trees can be saturated to ensure that the insecticide comes in contact with the adelgid. Several systemic insecticides have also proven effective on large trees when applied to the soil around the base of the tree or injected directly into the stem.

biological control :The best option for managing Hemlock Woolly Adelgid in forests is biological control. Although there are natural enemies native to Eastern North America that feed on hemlock woolly adelgid, they are not effective at reducing populations enough to prevent tree mortality.

Local enemies

No local enemies

Reproduction systems

Hemlock Woolly Adelgid has two generations per year in Pennsylvania. All populations are made up of females that reproduce asexually. In early spring, overwintering females lay between 100 and 300 eggs in the woolly egg sacs beneath the branches. Mobile larvae, known as crawlers, emerge from the eggs in April or May to search for suitable feeding sites.

Contacts

Bill Gunethier at (802)257-7967
Barbara burns at (802)885-8821 or @
State.vt.us
Jim Esden at (802)855-8821 or @ state.vt.us

Descriptions

The Hemlock Woolly Adelgid is tiny, less than 1/16-inch (1.5-mm) long, and varies from dark reddish-brown to purplish-black in color. As it matures, it produces a covering of wool-like wax filaments to protect itself and its eggs from natural enemies and prevent them from drying out. This "wool" (ovisac) is most conspicuous when the adelgid is mature and laying eggs. Ovisacs can be readily observed from late fall to early summer on the underside of the outermost branch tips of hemlock trees (figure 1).

Habitat

Hemlock trees found in forest and residential land.

history

The Hemlock Woolly Adelgid is parthenogenetic and has six stages of development: the egg, four nymphal instars, and the adult. The adelgid completes two generations a year on hemlock. The winter generation, the sistens, develops from early summer to midspring of the following year (June–March). The spring generation, the progrediens, develops from spring to early summer (March–June). The generations overlap in mid to late spring.

The Hemlock Woolly Adelgid is unusual in that it enters a period of dormancy during the hot summer months. The nymphs during this time period have a tiny halo of woolly wax surrounding their bodies. The adelgids begin to feed once cooler temperatures prevail, usually in October, and continue throughout the winter months.

The ovisacs of the winter generation contain up to 300 eggs, while the spring generation ovisacs contain between 20 and 75 eggs. When hatched, the first instar nymphs, called crawlers, search for suitable feeding sites on the twigs at the base of hemlock needles. Once settled, the nymphs begin feeding on the young twig tissue and remain at that location throughout the remainder of their development. Unlike closely related insects that feed on nutrients in sap, the Hemlock Woolly Adelgid feeds on stored starches. These starch reserves are critical to the tree's growth and long-term survival.

Dispersal and movement of Hemlock Woolly adelgid occur primarily during the first instar crawler stage as a result of wind and by birds, deer, and other forest-dwelling mammals that come in contact with the sticky ovisacs and crawlers. Isolated infestations and long-distance movement of Hemlock Woolly Adelgid, though, most often occur as the result of people transporting infested nursery stock.

Common Name: Amur Honeysuckle

Latin Name: *Lonicera Maackii*

Origin: Eurasia, Japan, China, Korea, Manchuria, Turkey, and Southern Russia

History of Infestation: Exotic honeysuckle has been used for wildlife cover and erosion control, as well as ornamentals. It has outcompeted the native species for pollinators, light, soil moisture, and nutrients, and as a result, there is reduced seed set for native plants.

Local Enemies: There are no known local enemies.

Diagnostic Characteristics: Most native species of honeysuckles have solid stems and exotic species have hollow stems. They have flowers and fruits that are very sweet and smell nice. The exotic species have leaves that appear early in the spring and remain until late fall. The Amur honeysuckle has simple, opposite leaves with long, tapered tips

EXOTIC EXAMPLES:



NATIVE EXAMPLES:



Reproductive Systems: Prolific fruits are highly attractive to birds because they are very sweet. The fruits are high in carbohydrates and birds love it. Over twenty different species feed on it and the seeds are easily spread that way. They also rapidly reproduce and there is a high dispersing rate. It is also said to contain an allelopathic chemical to suppress the growth of surrounding vegetation.

Habitat Requirements: Exotic honeysuckle thrive in full sunlight, but can tolerate partial sun and some shade. Some species thrive in shady habitats and forest understory. It requires moderate watering unless it is very dry out. Since it requires high amounts of sun, it grows on forest edges, abandoned fields, pastures, roadsides, and upland habitats. It can also grow in bogs and other uncommon habitats.

Eradication or Control Methods: There are no biological control agents that are currently available, but mechanical and chemical control agents will help to slow it down. Hand removal of seedlings and small plants are useful for light infestations. Honeysuckle can also be controlled through annual applications of glyphosate which thoroughly soak the leaves, or through grubbing of the shallowly rooted young plants. Both of these methods are only practical if high labor costs and soil damage are not of concern. It can also be controlled by cutting or burning the plant to root level and repeating it on two-week increments until the nutrient reserves in the roots are depleted.

Whom to inform/Where to get help: It is best to inform the Vermont Department of Environmental Conservation (1-802-241-3777) or the United States Department of Agriculture, Invasive Plants Field and Reference Guide at www.na.fs.fed.us

Ecological Threats: Exotic honeysuckle outcompetes native plants and creates a denser than the native shrubs and reduces plant diversity and nest sites for many species. That results in a decline in bird populations.



Figure 1: Exotic Honeysuckle Stem (Hollow)

Bibliography:

1. <http://www.nps.gov/plants/alien/pubs/midatlantic/loni.htm>
2. <http://www.clayandlimestone.blogspot.com/2008/12/last-days-of-bush.html>

COMMON NAME: HEMLOCK WOOLY ADELGID

Latin Name: *Adelges Tsugae*

Hemlock Woolly Adelgid (HWA) was first found in the western United States in 1924 and first found in the east in 1951. HWA is believed to have originated from southern Japan and China.

Several different insects feed on HWA only. They are found in China, Japan, and western North America. In the north east there are no known natural enemies.

HWA is an extremely small insect. It's about 1.5mm and usually is dark reddish-brown to purplish-black. HWA, however, is seen as a white cottony material on the underside of hemlock needles.

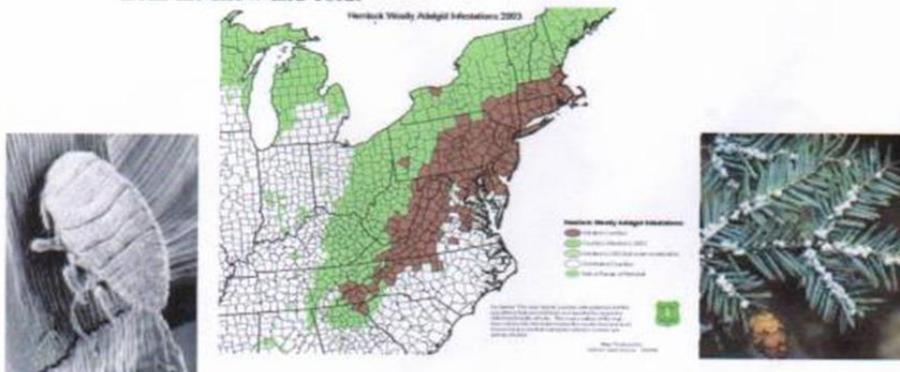
HWA are all females and produce asexually. In the springtime they lay between 100-300 eggs beneath the branches of hemlock trees. The larva hatch around April or May.

Drought and fungi like *fubrella* or *korfia tsugae* can weaken hemlocks which makes them more susceptible to HWA. However, any hemlock tree can be affected. Cold winters, cold snaps and heavy thunder storms can weaken HWA.

To control HWA regular chemical and biological controls can reduce the spreading. Sprays, oils, and soaps are most effective. Introducing enemy insects is also an option but needs to be studied further.

If HWA is found local foresters and biologist should be informed. Barbara Burns by phone at 1-802-885-8821 or e-mail barbara_burns@state.vt.us or Jim Esden at 1-802-885- 8822 or e-mail Jim.Esden@vt.us.

HWA threatens hemlocks in all parts of the United States which in turn threatens deer in the northeast, especially because deer need hemlock during the hard winter for shelter from the snow and cold.



Jason Matuszewski

Common Name: Emerald Ash Borer

Latin Name: *Agrilus planipennis*

Origin: Eastern Russia, Northern China, Japan, and Korea

History of Infestation: Emerald ash borer arrived in the U.S. on wooden crates and cargo from ships and airplanes from Asia. Its first confirmed North American detection was in June 2002 in Canton, Michigan.

Local Enemies: There is no local enemy.

Diagnostic Characteristics: The adult emerald ash borer beetle is a dark green, almost metallic in color. It can be up to ½ inch in length and 1/8 inch wide. It can be found by the entry holes and tunnels within the tree. It can be found a few years after it enters the tree.

Reproductive Systems: “Eggs hatch in 1-2 weeks, and the tiny larvae bore through the bark and into the cambium - the area between the bark and wood where nutrient levels are high. The larvae feed under the bark for several weeks, usually from late July or early August through October.” (1)

Habitat Requirements: Since they live in ash trees, they need healthy or diseased ash trees. Ash trees require sunny areas that aren't that overcrowded. They burrow underneath the bark to let their larvae thrive in the tree.

Eradication or Control Methods: There has been eradication attempts of the insect, but the funds required is lacking, and it is spreading too fast. Quarantine zones are still set up from which unprocessed raw hardwood material cannot be removed.

Whom to inform/Where to get help: Barbara Burns (885-8821), barbara.burns@state.vt.us

Ecological Threats: It has killed at least 50 million ash trees so far and threatens to kill most of the ash trees throughout North America. Blue ash has some resistance to the emerald ash borer by forming callous tissue; however, they are usually killed eventually as well.



ADULT ASH BORER



TUNNELS CAUSE BY EAB

Bibliography:

1. <http://www.emeraldashborer.info/>
2. <http://insects.about.com/od/beetles/p/emeraldashborer.htm>

SOURCES

- <http://www.nps.gov/plants/ALIEN/fact/beth1.htm>
- <http://kerry.jlauser.net/gallery2/d/383-1/japanese+barberry+small.jpg>



Common Name- Japanese Barberry

Latin Name- Berberis Thunberry

History of infestation- Japanese Barberry was introduced to the United States as an ornamental plant in 1875 in the form of seeds sent from Russia to Boston. In 1896, barberry shrubs were planted in the New York Botanic Garden. Japanese Barberry was later promoted as a substitute for common barberry. Common barberry had been used by settlers for hedgerows, dye and jam.

Local Enemies- None

Diagnostic Characteristics- Japanese Barberry is a dense, deciduous, spiny shrub that grows 2 to 8 ft. high. The branches are brown, deeply grooved, somewhat zig-zag in form and have a single very sharp spine at the end of each node. The leaves are ½

to 1 ½ inches long, oval to spatula-shaped, green, bluish-green, or dark reddish purple. The flowers bloom mid-April to May in the northeastern U.S. Pale yellow flowers bloom to about ¼ inches across in umbrella-shaped clusters of 2-4 flowers each along the end of the stem. The fruits are bright red berries about 1/3 inches long that are on narrow stalks. They mature during late summer and fall and persist through winter.

Reproduction Systems- Japanese Barberry spreads by seed. Barberry produces large numbers of seed which have a high germination rate, estimated as high as 90%. Barberry is transported with the help of birds and small animals that eat it. Vegetative spread is when branches touching the ground that can root to form new plants, as well as root fragments that sprout in the soil.

Habitat Requirements-

Barberry is shade tolerant, drought resistant, and adaptable to a variety of open and wooded habitats, wetlands, and disturbed areas. It prefers to grow in full sun and part shade, but will flower and fruit even in heavy shade. It can be found in dense stands in natural habitats including canopy forests, open woodlands, wetlands, pastures, and meadows and alters soil pH, nitrogen levels, and the biological activity in the soil.

Eradication and control methods- Barberry can not be removed by hand

Chemical: Systemic herbicides (glyphosate), apply 2% solution mixed with water and surfactant. You want to apply early in the season before native vegetation had matured, however application in the late summer during fruiting may be most effective. Put the solution on the cut stumps.

Mechanical: You can remove barberry by using a hoe or weed wrench. This may pose the least threat to the non-target species and the general environment site. Tools like these are helpful for uprooting larger or older shrubs. Shrubs can also be mowed or cut repeatedly.

Whom to inform/ where to get help: To help manage barberry, if you find it you should inform your local forester or wildlife management center.

Bill Gunther
University of Vermont
Extension Forester
1-(802)-257-7967



Barberry Leaves



Emerald Ash Borer

Overview:

The Emerald Ash Borer

History

Enemies

Diagnostic Characteristics

Reproduction Systems

Habitat Requirements

Eradication or control methods

Whom to inform/ where to get help

Latin name: *Agrilus planipennis* Fairmaire

English name: Emerald ash borer

French name: Agrile du frêne

Order: Coleoptera

Family: Buprestidae

History: The Emerald Ash Borer was discovered in southeastern Michigan in the summer of 2002. It is believed that the Ash Borer arrived in the U.S. on solid wood packing material carried in cargo ships or airplanes originating in Asia.

Local Enemies: None

Diagnostic Characteristics:

The Emerald Ash Borer is a small, shiny, green beetle. The adult beetle eats ash foliage but causes little damage. The larvae feed on the inner bark of ash trees, which disrupts the trees ability to transport water and nutrients. So far the borer has killed tens of millions of ash trees in southeastern Michigan alone, with tens of millions more lost in Illinois, Indiana, Kentucky, Minnesota,

Missouri, New York, Ohio, Ontario, Pennsylvania, Quebec, Virginia, West Virginia, and Wisconsin. It has caused regulatory agencies and the USDA to enforce quarantines and fines to prevent potentially infested ash trees, logs or hardwood firewood from moving out of areas where EAB occurs. The borer has also cost municipalities, property owners, nursery operators and forest products industries tens of millions of dollars.

Habitat Requirements: So far, the Emerald Ash Borer has been found to infest ash trees. For the most part, trees greater than 2 inches in diameter and larger can become infested, and these can occur in woodlots as well as landscaped areas. While many trees affected by borers have been stressed or diseased, they will also infest healthy trees.



Reproduction Systems: Most adult beetles live for 2 to 4 weeks. Eggs are laid individually on the bark of branches or trunks of ash trees. On average, each female beetle lays roughly 75 eggs. The eggs hatch in about a week. Larvae tunnel under the bark and feed in the cambium area, between the inner bark and outer ring of wood. The larval feeding galleries are distinctively S-shaped and packed with powdery frass.

Bill Gunther
University of Vermont
Extension Forester
1-(802)-257-7967

Sources:

<http://www.pestid.msu.edu/LinkClick.aspx?link=Factsheets%2fD4page429.pdf&tabid=218&mid=834>

<http://infe.cfl.scf.mcan.gc.ca/insecte-insect-eng.asp?gcID=1000101>

http://www.michigan.gov/dnr/0,1607,7-153-10370_12145_12204-69875--,00.html

<http://www.emeraldashborer.info/>

Lesson Six:

Eradication Plan for Mallory Lot

Objective:

Student will demonstrate the ability to analyze data and formulate a logical response to control / eradicate one exotic plant found at the Mallory lot.

Materials:

1. Species fact sheet
2. Computer with internet access
3. Resources guide sheet

Required Time:

90 minutes

Methods /Procedure:

Students will choose an invasive plant species, research and analyze possible control / eradication options, consider issues and concerns of the land owner, determine the best course of action and design an eradication plan with follow up assessment activity. Use the attached assessment sheet as a guide

Assessment:

The student will provide an accurate completion of the eradication plan grade sheet.

Eradication plan for invasive species at the Mallory lot

5pts.____ List species

5pts____ Land owner issues and concerns.

10pts.____ List the different possible eradication methods for this plant.

- 1.
- 2.
- 3.
- 4.

35pts.____ List the advantages and disadvantages of each eradication method listed above.

Eradication method 1:

Advantages

Disadvantages

Eradication method 2:

Advantages

Disadvantages

Eradication method 3:

Advantages

Disadvantages

Eradication method 4:

Advantages

Disadvantages

15pts.____ Explain what procedure you recommend to eradicate this species at the Mallory lot and why.

20pts____ Give a detailed description of the eradication activity including when the work will be done, who will do it and all special precautions, situations, concerns and issues.

10pts.____ Describe the follow up procedure accessing the results of the eradication procedure including who will do it, when and how often.

Eradication plan for the Mallory lot

Japanese knotweed is an invasive species that can take over property like fields and pastures. It will also take over stream and river banks destroying habitat for fish and insects. Roots spread 25-30' from the parent plant and 3-10' deep. Root fragments as small as ½" can sprout a new colony. Knotweed resprouts vigorously following cutting, mowing/pulling and some herbicide treatments until August. Cutting, spraying, digging, tilling, mowing all stimulate plants to make new shoots from latent buds dispersed on the rhizomes. This plant should be eradicated because of the speed of which it spreads and the damage that it can do.

There are many different ways to try to control or get rid of knotweed such as:

1. In small infestations knotweed can be pulled out by the roots
2. Herbicides can be sprayed on the plant leaves
3. Mowing down every 2 weeks and bag the pieces of plant for 4-5 years
4. Cutting down the stocks and dripping herbicides into the stock

All approaches need monitoring and might need repeat treatments

To each method there are many advantages and disadvantages.

1. Pulling out knotweed by the roots.

Advantages:

- Knotweed would be killed easily and not be able to come back

Disadvantages:

- In large amounts it would be very time consuming.
- Roots could be left behind and resprout. So more pulling will be needed every two weeks or so before plants reach 6" high over 2-3 years
- Roots have to be dried out completely or they could come back and begin a new colony.
- Roots and soil taken to new locations could start a new infestation.

2. Spraying herbicides on plant (foliar spray)

Advantages:

- can kill the plant fast and easily in most instances, but may need retreatment

Disadvantages:

- This will only work while the plant is growing, timing is critical, re-spraying may need to be done
- It can be very expensive and can't be used near water.
- A pesticide applicator license is needed.
- Over spraying may kill native plants

3. Mowing down every 2 weeks and bagging plant parts. Cutting and mowing knotweed plants 2 times a month from April to fall for about 3-5 years

Advantages:

- Can be done quickly and easily with proper equipment on smooth terrain

Disadvantages:

- All plant parts have to be bagged, dried and burned
- Can only be done where mowing equipment can be used.
- Long term 4-5 year commitment is needed

- Fragments left on moist areas will resprout
4. Cutting off stocks and dripping drops of herbicides into each stock. (glyphosate at 18-27%)

Advantages:

- Kills knotweed completely and can be used near rivers and streams.

Disadvantages:

- It takes a long time in large infestations
- one stalk is missed it can grow back
- Pieces could be left behind and resprout.

For the Mallory lot the method we chose was to cut down the stocks and drip herbicides into each stock and put the cut down stocks on plastic to dry and later be burned.

We chose this method because the land owner needs the knotweed gone for a spring 2010 buffer planting, the terrain was not flat for mowing and foliar spraying could not be used next to the stream. There was concern about using the herbicide by the stream, but when the farmer's market board learned it will break down into ammonia and water in 3-6 weeks, they agreed to the plan.

To kill Japanese knotweed we cut down each stem a few inches above the node of the stem, and then put the plants on plastic for them to dry out and die. Then each stem in the ground was treated with 5 drops of herbicides for absorption into the root systems killing the plant completely. This process should be done in late summer before seeds mature and it's dry and brittle. The herbicides need to be absorbed before frost to kill the roots. Plants absorb the herbicide best in late summer and early fall because that's when plants are storing nutrients in their roots. It's very important to insure that no pieces of stem are left behind on the ground because they can resprout and begin a new colony.

The follow up procedure should be for the forestry class to go back in the spring and see if any more knotweed is growing. If more is growing in small amounts then it can be pulled out by the roots and dried to kill it. But if there is a large amount of knotweed growing back then in the fall the same procedure should be done, to cut the stalks and herbicide should be put in the stalk to kill it. Over all controlling knotweed is timely, tenacious, tough and thorough.

Lesson Seven

Eradication of Japanese Knotweed

Objective:

To remove the Japanese Knotweed in a manner that will kill the plants currently growing and not cause another infestation on site, down stream or at any other locations.

Required time:

5 hours

Materials:

Transportation to site
Remuda – 41% Glyphosate (diluted in half)
Dye coloring
Application tools (dropper bottles)
Plastic 20 x 40 6 mil
Loppers and or sickle

Supervision: A Certificated Licensed Herbicide Applicator must be on site during the eradication of the Japanese Knotweed

Methods/Procedures:

1. Lay plastic (blackside up) and secure edges with stones from the site.
2. Set up work crews of: 1 cutter, 1 herbicide applier, 1 cutter helper and 5or 6 haulers.
3. Cut plants should not touch the ground but be handed directly to haulers then taken directly to the plastic to dry in the sun.
4. All parts of every cut plant must go directly to the plastic and be dried to prevent growth of new plants.
6. **No material can get into the stream.**
7. Appliers will apply herbicide (4-5 drops) to all cut stumps left in the ground. The colored dye will indicate what stems have been treated.
8. Proceed until all Knotweed plants are cut and placed on the plastic and every stem is treated with herbicide.
9. Fold plastic and secure to contain cut plants until they are dried. (a month or so depending on the weather)

Assessment:

A visual check to be sure all plants are cut, all plant material is contained in the plastic and all stems are treated and show the colored dye.

Wrap Up:

1. How did it go?
2. What could we improve/do better?
3. What did you learn from this project?



**Our Work
Crew in front
of the
Creamery
Bridge**



**No room
for native
species**



**Knotweed
infestation
encroaching on
the Whetstone
Brook**



**Cutting the
knotweed
with loppers**



Stacking the knotweed on plastic to dry



Treating stems with five drops of herbicide



Close up
of the
treated
stems



A team of two
working along
the bank



Day 1
We have a long way to go!



Day 2
Making good progress



**We are finished!
Picking up all the pieces left
behind and checking all
stems for herbicide**



Lesson Eight:

How Might Invasives Affect My Life

Objective:

Students will think about the long term effects of invasive species and how our lives may change as a result.

Materials:

1. Species fact sheet
2. Computer with internet access
3. Resources guide sheet
4. Collins writing paper

Required Time:

90 minutes

Methods /Procedure:

1. Student will choose one of the following invasive species:
 - Asian Longhorned Beetle
 - Hemlock Woolly Adelgid
 - Japanese Knotweed
2. Collins writing assignment: Write/ list three possible life changing effects of the invasive species of your choice.
3. Expand the list to include all students input through discussion.
4. Research your choice from your fact sheet, the internet, and the attached resources guide, answer the attached questions, and then make a prediction of how your life will be different in 20 years.
5. Answer the following questions:
 1. How fast do you expect this species to spread and how large is the problem area?
 2. What and how will current industry be affected?
 3. What new industries will be needed to deal with this species?
 4. What are the costs of this species to you, to industry, to towns, state and federal agencies?
 5. How will recreation be affected? (Hunting, fishing, hiking, camping, skiing etc.)
 6. How will native wildlife be affected?
 7. How will tourism be affected?
 8. What other aspects of your life will be affected?
6. Using the information gathered write a summary of how life will be different and what you feel needs to be done now to avoid this change. Include at least 3 major changes in your life. (See attached grading sheet)

Invasives and my life work sheet

Thinking about the invasive issue in the future, say twenty years, answer these questions about the species you choose.

1. How large is the problem area for your species, is it still spreading, if so how fast?
2. What current industries will be affected and how?
3. What new industries will be needed to deal with this species?
4. What are the costs of this species to you, to industry, to towns, to state and federal agencies?
5. How will recreation be affected? (Hunting, fishing, hiking, camping, skiing etc.)
6. How will native wildlife be affected?
7. How will tourism be affected?
8. What other aspects of your life will be affected?

Lesson Eight Grading Summary

10 points _____ Introduce the topic.

20 points _____ Provide a clear, complete description of the size and scope of the problem/
invasive issue.

40 points _____ Includes three major effects or changes of my life. What things have you lost
as a result of this invasive species?

10 points _____ Are there any things I / we can do to prevent this situation from occurring?

10 points _____ Conclusion

10 points _____ Grammar, Usage, Mechanics, Spelling

- a. Accurate spelling and use of invasive terms
- b. No run on sentences
- c. Clear concise sentences and phrases
- d. Punctuation

Lesson Eight Summary Work Sheet Revision Guide

1. Before the sentence /paragraph that clearly describes the size and scope of the invasive problem, write size and circle it.
2. Number the three ways your life will be changed. Place a number at the beginning of each sentence / paragraph for the three ways your life will be affected by this invasive pest or plant.
3. For each solution/ preventive action you suggest, place a number before each sentence and put a triangle around it.
4. Who did you have read over your paper for suggestions?
5. What are the suggestion they made?
6. Make the changes, proof read it and complete numbers 1,2and 3.
7. Turn it in with all drafts before the party.

Asian Long Horn Beetle

The Asian Long Horn Beetle is an invasive species from Asia that can kill our sugar maples. Its favorite food is the sugar maple but it will eat other hardwoods. This invasive species has no local enemies, so there is nothing to keep it from spreading anywhere around our country or continent. Right now the Asian Long Horn Beetle (ALHB) is in Worcester, Massachusetts. All it would take is for an ALHB to get into a pallet or a load of logs that goes through Brattleboro and get off here. Then it is free to eat all the sugar maples in Brattleboro, Vermont.

In twenty years I envision a world with out any sugar maples or hardwoods. The ALHB will be everywhere. First all of the sugar makers in Vermont would be out of business because there are no maples to produce the sap. There won't be a huge crowd of tourists coming to Vermont in the fall because there are no colored leaves. This will drop the amount of money coming into Brattleboro. The logging industry will be hurt and most loggers will be out of business. No one will be able to burn fire wood because the ALHB will have killed all the hardwoods. Some people won't be able to afford the high oil prices to heat their homes.

I am a third generation farmer and sugarmaker. With no maple trees, my family and I will not be able to continue sugaring. We own a small gift shop that sells mainly maple products. We count on the fall tourists to be profitable. At my Dad's dairy farm we use the maple syrup money to pay taxes. We heat our home with wood like many Vermonters. Myself, I want to be a logger, sell fire wood and take over the family business. All of these things won't happen because of the Asian Long Horn Beetle eating and killing the sugar maples and the other hardwood trees. If this happens I wonder if I can make enough money working at McDonalds to pay taxes on our property and buy the fuel to heat our home.

As a community we need to put a stop to this pest. We need to educate the community and make people aware of this pest and what it looks like. We need to make sure if someone spots it they know what to do and who to call. Our state needs to make an eradication plan to chip all of the infested trees. There are more precautions that we can take like buying firewood locally and not importing it from Massachusetts. This goes along with not buying logs or lumber from there also.

We need to stop this pest before it gets out of hand. This pest will affect the whole sugaring industry and much of our economy. Sugar makers, loggers and firewood providers will be out of business. Imagine a world with out maples or hardwood trees because that may be what it's going to be like in twenty years.

Japanese Knotweed Invasion in Twenty Years

Japanese Knotweed has already become a major problem in the United States, but it is growing out of control. If it continues the way it has, in twenty years, there will be several problems for my generation that might be impossible to fix. First of all, the Knotweed will crowd out and will outcompete the native plants, especially on river banks. Japanese Knotweed was originally brought to the United States because the plant supposedly had a large root system that could easily hold the soil on river banks. However, the roots were weak and did not hold soil well but the plant just kept spreading until it is nearly impossible to control or stop. If the Knotweed crowds out the native plants, there will be a chain reaction.

Native plants will die because of the lack of sun. If the native trees that surround the river banks die due to the Japanese Knotweed, rivers will be in critical condition. Sediments from the soil that the roots no longer hold, will cement in between the rocks and stones in the river bed where fish eggs are usually laid. Fry will have no place to hide and these events will greatly hurt fish populations. The fish will have no food because of the lack of decomposing leaves that nourish the flies fish eat. If the woods of the United States aren't as populated with fish and wildlife, the Fish and Game Departments might cease to exist, along with hunting and fishing outfitters and sporting goods stores.

Japanese Knotweed is very costly to remove and with the current economy, there are no funds to remove it. Because it is labor-intensive, we need volunteers all over the United States. It has been found in thirty-nine of the fifty states and in six provinces in Canada. Since Japanese Knotweed is spreading rapidly, we need to try to control it now. Controlling the Knotweed could also be jobs for the unemployed. We need people who care about our environment, our native species of plants, and our wildlife, to be involved. We need

extensive research on Knotweed and an adequate eradication plan, such as controlled burning, using chemicals like glyphosate to destroy the roots systems, or floral spray if possible.

If we don't find ways to control Japanese Knotweed, rivers will be in trouble, fish and wildlife populations will be dangerously low, or nonexistent, and native plants will die . This would personally affect me because I am studying to become a fish and wildlife conservation officer. Since game wardens thrive to manage and conserve wildlife, if there aren't any left, my job will be useless. I strive to protect the fish and wildlife in my country and I believe that this would be awful to every hunter, fisherman, and trapper. As a hunter, I would also have no game left to hunt because of the destructive nature of Knotweed. Since I also fish, if fish populations are low or extinct, myself and all fisherman wouldn't have fishing as a pastime. There will also be a significant loss of native plants and trees. Fish and wildlife habitats will be destroyed by this immense catastrophe. There is no way to tell if these important aspects of our natural ecosystem can be revived. I believe we need to educate the public. By learning about Japanese Knotweed, how to manage it, and the dangers that it causes, we can all understand how Japanese Knotweed could change our world and how to avoid this disaster.

Bibliography:

1. <http://www.invasive.org/weedus/whereinvasive.html?sub=3075>

Asian Longhorn Beetle

I worry for our generation in the next twenty years. I envision a world void of sugar maple trees. Why? The Asian Longhorn Beetle is an invasive species that has been slowly wiping out these majestic trees. I like to wake up every Sunday morning and make pancakes. I normally put butter and maple syrup on them. You need Sugar Maples in order to make Vermont maple syrup. If this insect has the next twenty years to kill Maple trees I think this will endanger our native ecosystem and way of life. This insect has no predators to slow its spread. People who sugar won't be able to without Sugar Maple trees. I think it would be a shame to let these insects run across Vermont unchecked. When maple trees are gone what tree will it turn to next? It thrives on destroying hard woods. Maple just happens to be its favorite snack. I don't think it will just stop at maple trees. Also Tourists come to Vermont every year to see the leaves change colors. Some times they stop on the side of the road get out and take pictures. If the maple trees are dead no tourists will come and Vermonters will lose business. I have an eradication idea for the Asian Longhorn Beetle. I think if we can engineer a virus targeting only the beetle this might solve a major issue. I also think that cutting down and burning any infested areas of maple trees might keep the uninfected ones healthy. If the Asian Longhorn Beetle is monitored by every one, and reported when seen, we might be able to prevent it from spreading. Hopefully our generation can come up with a plan to completely remove this insect from our forests forever.

If not our future in Vermont doesn't look all that colorful. I am going to be very angry when I wake up one Sunday and remember there is no maple syrup! I know we all want our sugar maples to be healthy, and business to thrive. But I worry that no one will find a solution and in return our community, State and country will lose a valuable tree and maple syrup. So let's put our heads together and come up with a solution to this invasive pest.

Invasive Unit Reflections

My plan was to complete the invasive removal project as the first unit of study in September before the knotweed matured dropping its seeds and a killing frost so the stems would absorb the herbicide. Timing was critical if we were to accomplish control and hopefully eradication of the knotweed. We received approval to use herbicide on August 31st from the Farmers Market Board but had to wait for Marie Caduto and her identification presentation until September 16th when she returned from vacation. Jolene Hamilton, District Manager of Windham County Natural Resources Conservation District (WCNRCD) spent many hours checking with the State of Vermont to be sure we had the proper herbicide and their approval to use it. Other problems she solved included: finding a licensed supplier for the herbicide, finding a substitute for Rodeo as it only comes in a 5 gallon pail when we needed only one quart and arranging for delivery to her office. I appreciated the work of the WCNRCD office for handling these important but time consuming details.

I arranged for the licensed application supervisor to work with us on September 17th and 18th hoping for good weather and no frost. I took the class out on Tuesday with loppers and herbicide to lay the plastic cutting a few plants to be sure our plan would work. We found we needed a darker dye in the herbicide so we could tell what stems had been treated.

The manual cutting with loppers, carrying the cut stems to the plastic drying area and treating cut stems with herbicide was accomplished by fifteen students, two instructors and the Herbicide Supervisor in two days of class time. That equates to about six hours. The students did a great job being very careful to get every piece of the plants on the plastic and treating every stem with five drops of herbicide. We were all happy to get the job done.

The next time I would start earlier, involve the students in choosing the project, have them meet with the different groups and be involved with all steps of the planning process.

I think the project was very successful in educating students as well as the interpreters and my paraprofessional. Adult comments include "I see knotweed everywhere now" and "I saw it all along the roads in New Hampshire last weekend." One student said "This plant is by our mail box and we all wondered what it was." Another student said his backyard is full of this stuff. Weeks later a student came in telling his class mates he found invasives we studied all over when camping and another said he saw an add on television for the Asian Longhorned Beetle. Student can identify invasives, are pointing them out to others and talking about them. We were commended on our efforts at the Mallory Lot and told there are many similar projects and grants available if we want to do more. I plan to include local invasive plants and pests identification and fact sheet construction in my fall tree identification unit next year. This has been a powerful learning experience with many possibilities for continued work along the Whetstone Brook as well as other local sites. The student's fact sheets are displayed in the classroom windows and at the local WCNRCD office. The project received publicity in the local newspaper. Included is a copy of the article. The writing component has been very challenging because I am not an English teacher and the students writing skills were very weak.

Forestry students study ways to control invasive plant species:

It's invasive, it grows fast and spreads fast, and if you cut it down it can grow back from the cut pieces. It's Japanese knotweed, and the Forestry and Natural Resources program at the Windham Regional Career Center recently completed a project to eradicate it from the bank of the Whetstone Brook near the Farmers' Market. Last week six of the students in the class talked about their work.

"You cut it four inches about the ground, and then you drip five drops of an herbicide in the stalk," explained Ryan McGrath, of Newfane. "You have to make sure that none of the stalk or anything gets left behind, because it will spout new plants."

Dennis Hamilton, the teacher in the program, explained that the herbicide is called Remuda; its active ingredient, 41% Glyphosate, is diluted with water to 21%. Kim Franklin, a senior from Vernon, explained that at first the herbicide was nearly invisible.

"We had to figure out to get a color so we could see it," she said.

"We dyed the herbicide two different colors," Corey Hale, of Halifax, added. "The first color was red and it didn't show up at all. Then we dyed it blue, and that seemed to do the trick."

Junior Conner Hamilton, who lives in West Brattleboro, explained that it was essential to put herbicide in every single cut stalk.

"Even if we missed just one stalk, it could start all over again and spread," he said.

Conner Hamilton said that the students put the cut stalks on a plastic tarp so that they could be dried, carried away, and, eventually burned.

"We had a stack probably 30 feet long and maybe 8 feet high," he said.

"You don't want to take them to another place and dispose of them," added Travis Franklin, "because they will just grow back too and start a new colony." Franklin is Kim Franklin's twin brother.

"The hardest part was making sure it doesn't get into the water," Kim Franklin said, "because if it goes downstream, it can seed there."

Jason Matuszewski, of Hinsdale, explained that even piling up the cut knotweed was a painstaking procedure.

"It breaks off really easily," he said. "You have to be careful when you pick it up. If you pick up the wrong part, or it breaks off, you have to pick up that piece or it will grow back."

Japanese knotweed can grow eight to 10 feet tall. It has small white flowers and hollow stems that resemble bamboo. It grows unchecked along Interstate 91 in Connecticut. Once it gets out of control, it can choke out native plants. It is tough: according to Travis Franklin, it has been known to go through four inches of concrete.

As the students discovered, eradicating it takes patience and perseverance: cutting down the weed and applying herbicide to an area 25 feet wide and 500 feet long took the whole class four days.

All the students plan to use their experience at the Career Center when they leave school. Kim Franklin is planning to go into landscaping or floral design, while her brother is hoping to go to college at either Vermont Technical College or Paul Smith's College, in New York. Hale, Hamilton and McGrath plan to do excavation work, perhaps combined with logging or landscaping, while Matuszewski hopes to combine farming and logging -- after college.

“I want to go to UNH, and then after that I want to go into the army for four years,” he said. “I’m hoping to do ROTC [Reserve Officers’ Training Corps] at college.”

The students were proud of what they had accomplished in the knotweed project.

“It was really successful so far,” Kim Franklin commented. “I liked it because we gave back to the community a parking area for the Farmers’ Market.”

“It’s good to see that we can all work together,” Matuszewski added. “It’s a good test for later projects to see that we can do it.”

“A big part of it was seeing what we had accomplished,” Hale concluded. “You wouldn’t even see the river when we started, and afterward the bank looked pretty nice.”

Maggie Cassidy teaches French at Brattleboro Union High School.

HOME GROWN ~ HAND MADE ~ HAND CRAFTED
Brattleboro Area Farmers' Market

PO Box 1057, Brattleboro, Vermont 05302 (802) 254-8885
email: farmersmarket05301@yahoo.com website: brattleborofarmersmarket.com

December 7, 2009

Board of Directors

Patricia Austin, President

Chris Vincent, Vice Pres.

Beth-Ann Betz, Secretary

Susan Dunning, Treasurer

Jerry Smith

Malah Miller

Robin Scudder

Chris Zappala

Martha Miller

Dennis Hamilton and Students
Windham Regional Career Center
45 Career Circle
Brattleboro, Vermont 05301

Dear Dennis and Students,

The Brattleboro Area Farmers' Market would like to express a hearty thank you to Dennis Hamilton and his students at the Windham Regional Career Center in Brattleboro for their excellent work on BAFM's riparian buffer project.

This fall Dennis and his students spent days in the field, identifying and removing invasive plants at BAFM's new parking area that is situated in the former Creamery lot next to the Creamery Bridge. The students worked hard removing 5 different types of invasive species as an essential first step towards the creation of a riparian buffer along the Whetstone Brook. The work required was extensive and the students did a great job preparing the site for the next phase of the project which is scheduled for the spring.

The help the Farmer's Market received from Dennis and his students was tremendous - thank you for your generosity and hands-on support!

Patricia Austin
For the Brattleboro Area Farmers' Market