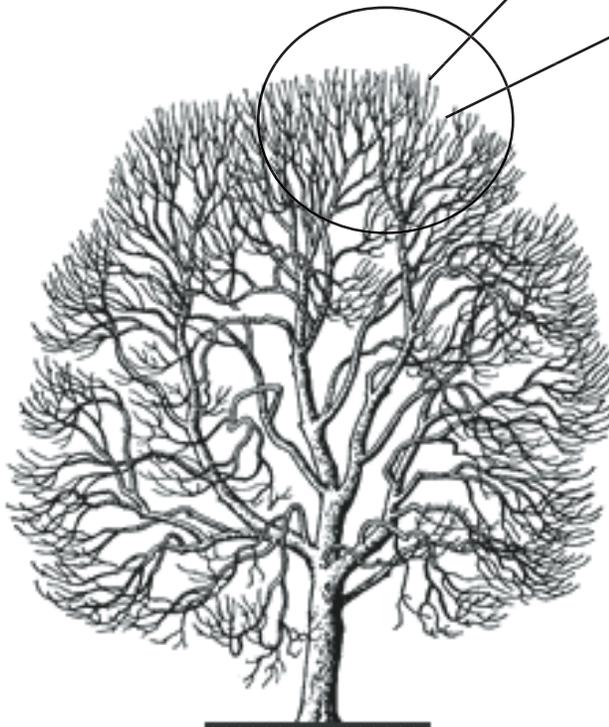


Trees For Teens

Invasive Species Awareness

Emerald Ash Borer
Agrilus planipennis



Ash Tree
Fraxinus

2007

Table of Contents

Trees for Teens 2007: Invasive Species Awareness

Program Introduction.....	3
What tree is right for your school?.....	4
Planting and caring for new and existing trees.....	5
Strangers in Iowa.....	6
Woodland Plant Survey.....	8
Alien Lingo.....	10
Alien Invaders Crossword.....	11
Alien Invaders Word Search.....	12
Aliens Spotted: Run For Cover.....	13
Saga of the Emerald Ash Borer.....	14
Bio Control Graph.....	16
Invasive Math.....	17
Invading the Internet.....	18
Are we having FUNgi yet?.....	20
Keep A Lookout- New Invasives.....	22
Are all the Neotropical Birds Disappearing?.....	23
If I am a hiker, why should I care?.....	25
Ash Tree Identification.....	26
Aquatic Roots.....	27
What's in the forest?.....	28
Debating the Issue of Invasive Species.....	29
Videos and Booklist.....	30
Answers to puzzles.....	31

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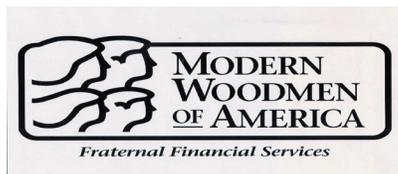
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For more information on selecting and planting native trees, visit <http://www.iowatreeplanting.com>

Trees For Teens 2007

The Program

Trees For Teens is a tree education and planting program that targets Iowa's elementary and secondary school students. Its goals are to educate students about the values of trees and to encourage tree planting projects at schools or other public areas around the state of Iowa. In 2006, 14,520 packets were distributed to teachers and their students whom were involved with the Trees For Kids/Teens programs, which resulted in an estimated planting of approximately 92,144 trees.

This unique program is sponsored by the Iowa Department of Natural Resources (DNR), the Iowa Nursery and Landscape Association (INLA), the Iowa Banker's Association (IBA), MidAmerican Energy, Aquila, Alliant Energy, Iowa State University Extension Forestry, the Iowa Tree Farm Committee, the USDA Forest Service, Trees Forever, the Iowa Society of American Foresters, Iowa Woodland Owners Association, Modern Woodmen of America, and Quad City Bank and Trust.

This teacher's packet of tree information and classroom activities is designed to complement science, reading, math, geography, computer skills, history and other subjects. Feel free to utilize any or all of the packet and/or to photocopy specific activities and lesson plans. Should you need more copies of the materials, please contact the DNR at (515)281-4915 or download individual activities off the web at <http://www.iowadnr.gov/forestry/>.

*Teaching Teens the Value of
Trees for 17 Years*



*To plant trees is to give body
and life to one's dreams of a
better world.*

~ Russel Page

The Trees

A landscape tree is available "free" to your class to plant in celebration of Iowa's Earth/Arbor Day in the spring of 2007. Contact *Trees For Teens* Coordinator Jessica Russ at (515)281-4915 or e-mail tfkids@dnr.state.ia.us (after May 15 contact John Walkowiak at john.walkowiak@dnr.state.ia.us), for the names of participating Iowa nurseries (INLA members) who will sell trees at reduced or wholesale costs to participating Trees For Teens teachers. Jessica can give you local funding source contacts from the Iowa Bankers Association (IBA) and local Tree Committees who will assist you in getting the remaining funds to pay for your trees. In the end, there is no cost to your school!

We suggest that you do the following in preparation for planting your tree. Discuss planting trees with your principal and grounds keeper, locate a site, and contact a local INLA nursery. Next, contact a funding source at your local IBA bank or Tree Committee and explain that you are working on a *Trees For Teens* project for Earth Week/Arbor Day 2007 that needs funding. When sponsors agree to fund the project, have the nursery bill the bank or committee directly for the tree. Once you have secured funding, make arrangements for delivery with the nursery and set a planting date. Now you're ready to plant a tree with your students!

Trees in the schoolyard provide beauty, shade, and can serve as visual screens. Unfortunately, it can be difficult to get a shade tree established in the tough growing conditions of schoolyards. The soils in the schoolyard are often poorly drained and compacted, making it difficult for a shade tree to survive and thrive.

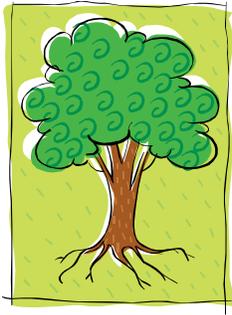
To reduce these problems, it is important to select a tree that best fits the planting site. Before planting, envision how the mature tree will fit into the site. Will it interfere with buildings, utilities, sidewalks, playground equipment, or block the view of traffic near corners? Will the tree selected produce maintenance problems due to unwanted fruit or messy leaf litter? Selecting a durable tree that best fits the planting site can reduce these problems.

During the planning, match the soil drainage on the property to the tree species, making sure that the tree will not outgrow the site. Diversify the species of trees you are planting to maximize the protection against diseases, insects, and environmental stresses. Proper planting and post planting care will help insure a healthy tree. Below is a list of trees and their growing requirements. Use this list to help determine what tree is right for your school grounds.

Shade, Low-growing, and Landscape Trees:

Species	Life span	Growth rate	Shade tolerance	*Soil drainage	Height (ft)
Alder, Black	short	fast	intolerant	mp, mw, well	40-60
Aspen, Bigtooth	short	fast	very intolerant	mp, mw	20-40
Aspen, Quaking	short	fast	intolerant	mp, mw, well	40-50
Basswood, Amer.	long	medium	tolerant	mw, well	60-80
Boxelder	short	fast	very intolerant	poor-well	15-20
Cedar White	long	medium	tolerant	poor-well	40-60
Cherry, Black	long	medium	intermediate	mw, well	50-60
Cherry, Choke	long	medium	intermediate	poor-well	20-30
Coffeetree, Kent.	long	medium	intermediate	mp, mw	60-75
Cottonwood	short	fast	intermediate	poor-well	50-75
Hackberry	long	medium	intolerant	mp, mw, well	40-60
Hawthorn	short	slow	intolerant	mw, well	15-30
Hickory, Shagbark	long	slow	intermediate	mp, mw, well	60-80
Larch, European	long	medium	intermediate	mp, mw, well	40-80
Locust, Honey	short	fast	intolerant	mw, well	50-70
Maple, Amur	long	medium	intermediate	mw, well	15-20
Maple, Red	long	medium	intermediate	poor-well	40-60
Maple, Silver	short	fast	intermediate	poor-well	50-70
Maple, Sugar	long	slow	intolerant	mw, well	60-75
Mulberry, Red	short	fast	intolerant	poor, mp, mw	40-50
Oak, Bur	long	slow	intermediate	mp, mw, well	70-80
Oak, Pin	long	medium	intermediate	poor, mp, mw	60-70
Oak, Red & Black	long	medium	intermediate	mw, well	60-75
Oak, Shingle	long	slow	intolerant	mp, mw, well	50-60
Oak, Swamp White	long	fast	very intolerant	poor, mp, mw	50-60
Oak, White	long	slow	intermediate	mw, well	50-80
Pine, Jack	short	medium	very intolerant	poor, mp, mw	35-50
Pine, Red	long	medium	intermediate	mw, well	60-80
Pine, White	long	medium	intolerant	well	50-80
Poplar, White & Hybrid	short	fast	intolerant	mw, well	50-80
Red Cedar, Eastern	long	slow	very tolerant	mp, mw, well	40-50
Spruce, Black Hills	long	slow	intolerant	mw, well	20-40
Spruce, Norway	long	medium	tolerant	poor-well	40-60
Spruce, White	long	slow	tolerant	mp, mw, well	40-60
Sycamore	long	fast	intermediate	poor-well	70-100
Walnut, Black	long	fast	intolerant	mw, well	50-75
Willow, Austree	short	fast	very intolerant	poor-well	30-50
Willow, Black	short	fast	very intolerant	poor, mp	30-50

*Poor, Moderately Poor, Moderately Well, and Well. Shade intolerant trees require full sunlight, intermediate trees can handle some shade, and shade tolerant trees can handle low, partial, or full sunlight. A short-lived tree has an average life span of less than 65 years of age. Trees with a long life span averages more than 70 years of age. As always, there are exceptions to these general rules.



Planting and Caring for New and Existing Trees



Shade and Landscape Tree Selection

Each year millions of trees are planted throughout Iowa. Many of these trees will be planted in urban communities. There are a few basic guidelines that should be considered to help insure a successful planting, including planning/site selection, species selection, and proper planting.

Planning/Species Selection

- Consider where the above and below ground utilities are located (i.e. electric wires, phone and television cables, sewer and water pipes). Call Iowa One Call at 1-800-292-8989 at least two days before you start digging to find the exact location of underground utilities.
- Examine the soils in the selected site to make sure they match the tree species you will be considering. Does the soil stay wet or saturated for an extended period of time after rains? Or does the soil seem dry and somewhat sandy? Is this a high traffic area such as a playground that will have compacted, poorly drained soils?
- Pick a species that will fit in the site selected. The site should be a minimum of 40 feet away from electrical power lines and light poles, and 20 to 30 feet away from buildings for large shade trees.
- Consider low-growing trees for planting areas that are closer to power lines and light poles. Utility companies recommend keeping the vegetation at least 10 feet away from existing lines. Keep in mind that most power lines are 30 to 35 feet above the ground.
- Avoid planting low-growing trees near signs, street corners, and other areas where they could block people's view. Is the planting site in full sun, partial sun, or full shade?

Proper Planting

- Dig the planting hole 2 to 3 times wider and no deeper than the root ball.
- Do not plant the tree too deep or too shallow, the root collar, (swelling where the trunk meets the roots), should be at or slightly above ground level.
- Lower the tree by the root ball, (not the trunk), carefully into the hole to avoid damaging the trunk or root system.
- Remove the twine and plastic labels from the branches and trunk, and at least the top one-third of the burlap and wire from the root ball. If the tree is container grown, remove it from the container.
- Fill the hole with the original soil, and do not use amendments such as moss or potting soil.
- Gently settle the soil in around the roots by hand when filling the hole, making sure that air pockets are not created.
- Slowly water the area to remove any air pockets that remain. Mulch around the tree with wood chips to keep the site moist.
- Add organic mulch around the tree being sure that the mulch is not piled up against the tree trunk. The mulch depth should be four to six inches deep and out as far as the branches spread.

Strangers in Iowa :

An Introduction to the Issue of Invasive Species

Background: Over the past several hundred years, humans have intentionally and unintentionally transported thousands of different plants and animals far beyond their natural ranges to other parts of the world. Many of these “introduced” species such as the ring-necked pheasant or soybeans both introduced to North America from Eastern Asia, have provided beneficial results to society. However, hundreds of introduced species such as Kudzu or Emerald Ash Borer have become invasive spreading beyond desired ranges causing serious problems in natural ecosystems within the United States. An “invasive species” is one that alien to a natural ecosystem, once that causes economic or environmental harm or harm to humans and spreads rapidly displacing native species.

While change and disruption in ecosystems have occurred throughout history, the biological invasion of invasive plants and animals now resulting from worldwide trade and commerce is increasing the rates of introduction, the types of organisms, and more serious environmental and economic impacts to the United States.

Typically invasive species receive little attention until they become a major problem. For example, invasive insects tend to be small in size and it takes time for their populations to grow and impact native species. By time the invasive species problem is recognized, environmental documentation is prepared, funding is obtained – eradication/control of the invasive species often becomes impractical, meaning that the invasive species becomes a permanent, expanding and detrimental environmental and economic problem, such as fire ants in the southeastern US.

Why are Invasive Species successful in a new ecosystem? Invasive species have several characteristics that allow them to succeed in a new natural ecosystem: (1) Adaptability, (2) Aggressive and highly competitive, (3) Quick methods of reproduction, (4) Rapid growth, and (5) No natural enemies. In the absence of co-evolved predators and parasites that usually keep them in check, invasive species find suitable habitats, thrive and out compete or displace native species. For example, Garlic mustard an invasive herb that now occupies thousands of acres of the ground floor of Iowa forests is native to Europe but has adapted to our climate extremes, it starts growing and flowers long before our native plants and stay green and growing long after our native plants have gone dormant. Garlic mustard produces thousands of new seeds that are easily spread by the wind, rain and even animals.

Economic Impacts: Invasive species cause billions of dollars of losses annually in the United States by competition with crops and by reducing the quality of food, feed and fiber. Invasive insects and plants require expensive insecticides and herbicides that are not only costly to develop and apply, but impact natural ecosystems. The total economic impact on the US economy of invasive species control and management exceeds \$20 billion annually – corresponding to higher costs at the grocery store to the lumber that builds our homes.

Strategies for reducing impact of invasive species: Federal and state scientists from entomologists (insects) to botanists (plants) to foresters and businesses have invested millions of dollars into prevention, control and management to reduce the impacts of invasive species in the United States. Strategies that are used include: (1) prevention through governmental requirements between countries, for example heat treating wooden pallets from China, (2) Inspection of items exported and imported, making sure that they are pest-free before leaving ports of entry, (3) Detection by conducting surveys to locate possible populations of invasive species, (4) Containment, once an invasive species population is discovered work to prevent its spread, (5) Eradicate or wipe out small populations of invasive species through destruction, spraying or other means, and (6) Manage, use biological controls or environmentally sound methods and procedures that minimize impacts of the invasive species. Coordinating a national, regional and local strategy for controlling invasive species is a long term affair– requiring regular investment of dollars and people to achieve long term success.

Emerald Ash Borer – An Emerald That Iowa Does Not Want

The emerald ash borer *Agrilus planipennis* is a new pest and threat to ash trees in Iowa and across North America. First found in the Detroit area in 2002, this invasive insect pest has caused the death of over 25 million black, green and white ash trees in the Upper Midwestern states of Michigan, Ohio, Indiana, Illinois and parts of Ontario, Canada. The larvae of the emerald ash borer, or EAB, feed in the cambium between the bark and wood, producing galleries that eventually girdle and kill branches and entire ash trees. Emerald ash borer is native to Asia and is known to occur in China, Korea, Japan and Mongolia, eastern Russian, and Taiwan is believed to be brought to the United States via solid wood packing crates or pallets used to transport goods from Asia.

EAB adult beetles are generally larger and a brighter green or emerald green color than the native species of ash borers in Iowa. EAB adults are slender (1/16 inch wide) and are approximately 1/4 to 1/2 inch in length. Color varies but beetles are a unique bronze to golden green overall, with darker, metallic emerald green wing covers. Beetles begin emerging in late May throughout the summer and are present into mid-August. EAB females can mate several times producing 60-80 eggs which are deposited individually in bark crevices on the trunk and branches. After 7 to 10 days, EAB larvae chew through the bark and into the cambial region of ash trees. The larvae (which is a 10 segmented cream colored worm) feed on phloem and the outer sapwood. The S-shaped feeding galleries produced by the larva wind back and forth, becoming progressively wider as the larva grows. Larva feeding is completed in the fall and they over winter in shallow chambers in the outer sapwood. Pupation begins in late April into May. Adult EAB beetles emerge head first through a D-shaped exit hole that is 1/8 inch in diameter.

Damage by EAB populations typically goes undetected until ash trees show characteristic symptoms. Larval feeding interrupts the transport of nutrients and water within the tree during the growing season. Leaves wilt and the canopy thins as branches die. EAB-infested trees lose more than 30% of the canopy after 2 years and trees often die after 3-4 years of EAB activity. Symptoms to look for in EAB infested trees:

- Jagged holes excavated by woodpeckers.
- D-shaped exit holes left by the emerging adult beetles.
- Vertical bark splits above larval feeding galleries.
- S-shaped, frass-filled larval tunnels etching the sapwood when bark is removed from an infested tree,
- Epitomic sprouts along the tree's trunk below larval feeding.
- Dense root sprouting can occur after trees die.



Adult



Larvae

HOW IS EMERALD ASH BORER SPREAD? Emerald Ash Borer adult beetles can only fly between 1/2 to 1 mile in distance; it is the movement of ash wood or tree products such as firewood that allows the EAB to spread into new areas. In areas where there are a lot of dead and dying ash trees, firewood is a common use of the dead trees. People take the firewood with them camping, not knowing that the larva of EAB is living under the bark of firewood and if the firewood is not completely burned, EAB infests a new area such as state or county parks, neighborhoods and forests.

WHAT'S AT RISK IN IOWA: EAB kills ash trees of various sizes and vigor. EAB larvae have developed in trees and branches ranging from 1 inch to 55 inches in diameter. Stressed trees growing in tight spaces such as between the sidewalk and curb are most vulnerable and are attacked first. At the present time, control of EAB consists of complete tree removal and chipping. The effort to contain EAB in the state of Michigan alone has cost more than \$550 million (early 2006 estimate) and could exceed \$20 billion. Iowa has 2.7 million acres of forests, with green ash being a regular component of floodplain areas, and white ash being found in our upland forests. A recent inventory indicates there are 50 million ash trees in Iowa's forests, plus an additional 12-20 million in urban settings. One of our every 5 urban trees is an ash tree. Every county in Iowa has ash trees that are at risk from EAB.

IS THERE EMERALD ASH BORER IN IOWA? EAB has not been detected in Iowa to date. However, EAB should be considered the most serious threat to Iowa's native forest and urban ash tree population in Iowa since the Dutch elm infestation 30+ years ago.

WHAT IS BEING DONE TO KEEP IOWA FREE OF EMERALD ASH BORER? Currently the Federal government has quarantine (means a restraint on the transport of goods designed to prevent the spread of pests) on ash wood products, including hardwood firewood from leaving the states of MI, OH, IN and IL but it is difficult to enforce due to our interstate transportation system. Public and professional awareness and education efforts are occurring ranging from posters and ID cards to training and workshops for tree care people. Detection trees are being set up and monitored for EAB in high risk areas where out of state firewood may have come into Iowa. State officials are encouraging people to stop planting ash trees and use different native species. Finally, when and if EAB is found in Iowa, government officials will cooperate to contain EAB through tree cutting and use of new methods as they become available.

Emerald ash borer is a real threat to Iowa's native ash trees, and with your help we can find EAB populations when small in order to contain the damage of this invasive pest. For more information visit: <http://www.emeraldashborer.info>.



Common Buckthorn

We Need Your Help!

A scientific survey to locate woodland invasive plants.



Garlic Mustard

There are several ways to locate populations of woodland invasive plants in Iowa. One way would be to walk every foot and acre of the 2.1 million acres of forest in Iowa and map out each group or population of garlic mustard or honeysuckle you find. This would be the most precise method, since every known population would be recorded- but it would take many years and lots of money to complete.

Foresters use measuring techniques called sample surveys which consist of making observations on portions of the forest. Since fewer measurements are needed, sample surveys can provide the necessary information in less time and at a lower cost than the method described above. In sample surveys it is critical to obtain observations that are accurately identified, properly located, and representative of the forest in order to estimate the populations of woodland invasive plants in our forests.

Accurate identification of the woodland invasive plants is extremely important in sample with surveys. Use weed identification books, posters, or brochures that are supplied to help with positive identification. If you have questions, check with your teacher, your local county extension office or even your local county weed commissioner.

Proper location is critical to sample surveys. Foresters carefully note their specific locations through the use of maps noting the specific street address if it is known or even the legal descriptions (township, range, and section) shown on the map. Sometimes, maps are photocopied with the exact locations circled and sent in with the sample survey. New technology known as global positioning systems (GPS) involves a small electronic device that uses satellites to get very exact readings on location. The key to location is to provide enough information to enable another person to find the site of the woodland invasive plant.

In general terms, you need to take your sample surveys in representative areas of a larger area. For example, if the forest that you are sampling is mainly composed of oak trees, but one small area is maple trees, you should take your sample survey in the oak area since it better represents the whole forest.

Exercise: On the next page we need your help to sample survey Iowa woodlands for the woodland invasive plants: buckthorn, garlic mustard, honeysuckle, multiflora rose, and wild parsnip. If you find any of the woodland invasive plants listed on the form on the next page, determine how severe the population is by counting the number of plants (1-10 (low), 10-100 (moderate), 100 or more (high)). Then determine the exact location where you found the woodland invasive plants by filling in the street address and/or the legal description of the land. Give your best effort in describing the location, so that another person could confirm it. Do not touch or remove any plants unless permission is given by the property owner.

Thanks for your help! We will post our results on our web page at www.iowadnr.gov/forestry/.

Woodland Invasive Plants Survey

Your Name _____ Date _____

Landowner's Name _____ Street Address _____

County _____ City _____ State _____ Zip _____

Legal Description of Location (township, range and section if available) _____

Approximate Size of Area _____

Description of Area (Ex. yard, ditch, woods) _____

Plant	Number of Plants		
	1-10	10-100	100 or more
Garlic Mustard			
Wild Parsnip			
Bull Thistle			
Purple Loosestrife			
Buckthorn			
<i>Ex. Buckthorn</i>		X	

*The example in the bottom row of the chart shows how you would complete the chart if you found 15 buckthorn plants in your grandpa's field.

Feel free to photocopy this form. Please submit one form per student per location.

Please send your completed survey to:
 Trees for Teens Invasive Survey
 Department of Natural Resources
 Wallace State Office Building
 502 East 9th St.
 Des Moines, IA 50319-0034



Bull Thistle



Garlic Mustard

Alien Lingo

alien (exotic) species- a species that is brought from its native environment to another place

biological diversity- a combination of different species that make up a healthy environment

buckthorn (*Rhamnus spp.*)- an invasive Eurasian plant that shades out native understory

conifer- a tree that bears cones and keeps its needle- or scale-like leaves throughout the year

control- a method used to decrease or eliminate an invasive population

deciduous- tree that loses its leaves in autumn

ecological restoration- a systems approach that brings natural processes into balance and evaluates the ecosystem's current condition

ecosystem- a community of plants, animals, and other organisms with its environment

Emerald Ash Borer: EAB (*Agilus planipennis*)- an exotic beetle that feeds on the inner bark of ash trees, which keeps the tree from transporting nutrients and water

environment- all the living and non-living things that surround and affect a living thing

erosion- the wearing away of sand or soil by wind or water

Eurasian watermilfoil (*Myriophyllum spicatum*)- an invasive aquatic plant that crowds out native plants in lakes and streams

garlic mustard (*Alliaria petiolata*)- an invasive European plant that shades out native plants

gypsy moth (*Lymantria dispar*)- an invasive European insect that feeds on deciduous leaves

habitat- a place that provides food, water, shelter and other needs for an organism

integrated pest management- a management strategy that selects pest control based on predicted consequences and maximizes use of natural pest controls

invasive species- an alien species whose introduction could harm the environment, the economy, or human health

Japanese beetle (*Popillia japonica*)- an invasive insect that feeds on 400 plant species

leafy spurge (*Euphorbia esula*)- an invasive Eurasian prairie plant that damages animal digestive systems

management- preventing the growth of an invasive population that can't be eliminated

multiflora rose (*Rosa multiflora*)- an invasive Asian grassland and forest plant

native- occurs naturally in an area

natural resource manager- professional who makes decisions about the uses and goals of different types of land and natural resources

prescribed fire- a fire ignited by people to achieve a goal

purple loosestrife (*Lythrum salicaria*)- an invasive Eurasian aquatic and prairie plant that chokes out wetland life

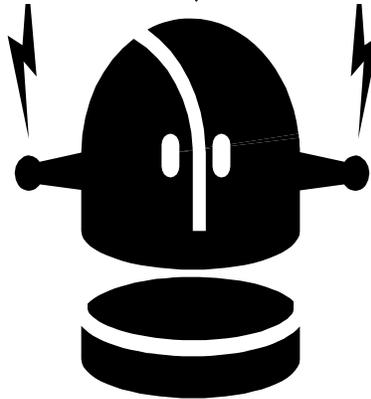
savanna- a park-like area with an open understory of native grasses and wildflowers, dotted with large oak trees

species- a group of living things that are very similar and can reproduce among themselves

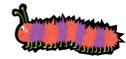
spotted knapweed (*Centaurea maculosa*)- an invasive Eurasian grassland plant that often spreads via hay transport during a drought

understory- plants growing close to the ground in a forest

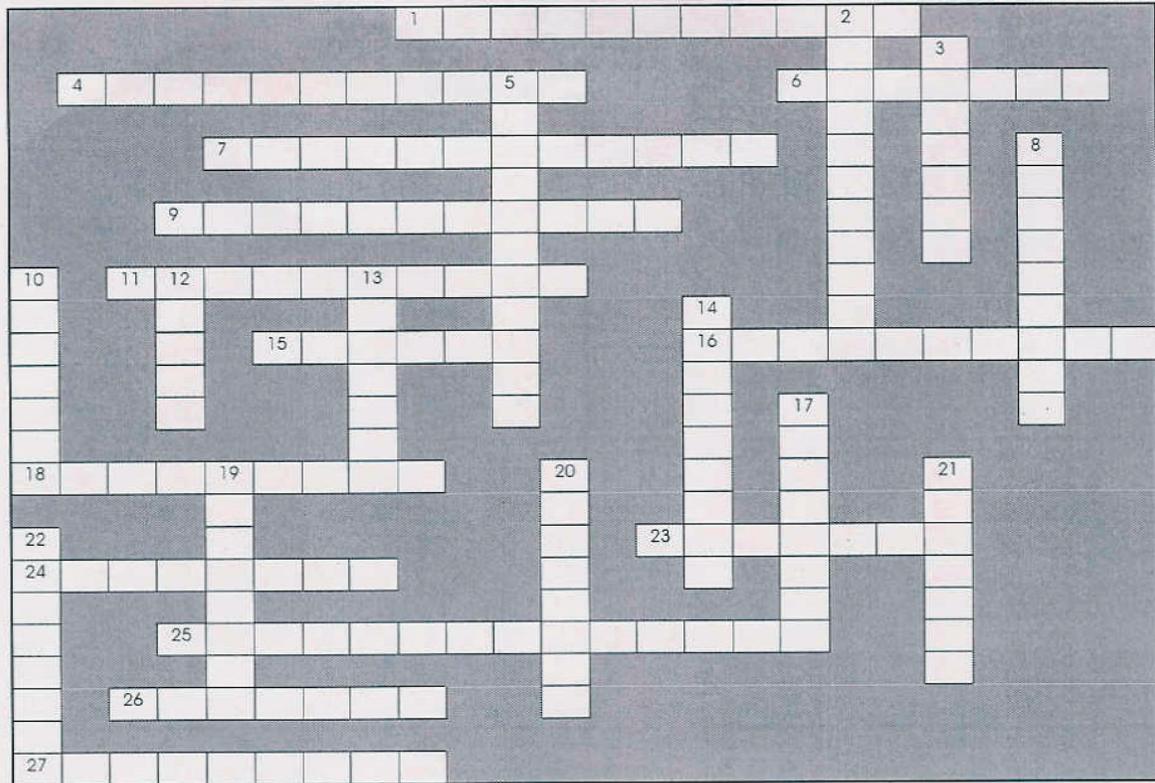
zebra mussel (*Dreissena polymorpha*)- an invasive Asian aquatic animal that grows in thick mats on hard surfaces



Crossword



Invaders



Fill in puzzle using clues and word search word list.

ACROSS

- 1 A non-native shrub commonly planted for windbreaks
- 4 A clam-like animal whose population is growing so quickly it is causing harm in many of the nations lakes and rivers
- 6 A park-like native prairie dotted with oak trees
- 7 The careful management and wise use of natural resources
- 9 Purple _____ is a non-native invasive prairie plant that chokes out wetland life
- 11 The process of manipulating a thing toward a desired goal
- 15 Occurs naturally in an area
- 16 Plants that grow close to the ground in the forest
- 18 Biological _____ is a combination of many different species
- 23 The wearing away of soil by wind and water
- 24 The Emerald _____ is an exotic green beetle that feeds on ash trees
- 25 A fire planned and lit by people to achieve a management goal
- 26 A group of living things that are very similar and can reproduce among themselves
- 27 A community of plants, animals and other organisms working together

DOWN

- 2 An aggressive alien prairie plant that damages animal digestive systems
- 3 A place that provides food, water, shelter and space for a living thing
- 5 All of the living and non-living things that surround and affect us
- 8 An alien insect that is eating the leaves of many eastern deciduous trees, especially oak
- 10 Garlic _____ is a very aggressive, invasive European plant that shades out native plants
- 12 A species brought from its native environment to another place
- 13 A species no longer found alive on earth
- 14 An invasive shrub from Europe that shades out native understory plants
- 17 An _____ species is non-native, generally aggressive and can cause harm
- 19 A natural _____ manager is a professional who makes decisions about the uses and goals of nature's treasure
- 20 A non-native prairie plant that often spreads via hay transport during a drought
- 21 A method used to decrease or eliminate an invasive population
- 22 _____ beetle is an invasive insect that feeds on 400 plant species

Invaders Word Search



- ALIEN
- ASH BORER
- BUCKTHORN
- CONTROL
- DIVERSITY
- ECOSYSTEM
- ENVIRONMENT
- EROSION
- GARLIC MUSTARD
- GYPSY MOTH
- HABITAT
- HONEYSUCKLE
- INTEGRATED PEST
- INVASIVE
- JAPANESE
- KNAPWEED
- LEAFY SPURGE
- LOOSESTRIFE
- MANAGEMENT
- NATIVE
- PRESCRIBED FIRE
- RESOURCE
- RESTORATION
- SAVANNA
- SPECIES
- UNDERSTORY
- ZEBRA MUSSEL



Math Decoder



Solve the problems and fill in the blanks using the decoder key to find the secret message.

Decoder Key

A=1	N=14
B=2	O=15
C=3	P=16
D=4	Q=17
E=5	R=18
F=6	S=19
G=7	T=20
H=8	U=21
I=9	V=22
J=10	W=23
K=11	X=24
L=12	Y=25
M=13	Z=26

_____ , _____

$(5 \times 4) - 1$ $(3 - 2) \times 1$ 11×2 $10 - 5$ $18 \div 2$ 3×5 $(3 \times 8) - 1$ $(6 - 7) + 2$ $(6 \times 3) + 1$



7×2 $(3 \times 4) - 11$ $(3 \times 9) - 7$ $15 - 6$ $13 + 9$ $(10 \times 4) \div 8$



$(7 \times 2) + 5$ $12 + 4$ $25 \div 5$ $(6 \times 3) - 15$ $(30 \div 5) + 3$ $(8 + 7) \div 3$ $18 + 1$



$(27 \div 3) + 10$ $(7 \times 6) - 22$ $9 + 6$ $(6 \times 4) - 8$ $40 \div 2$ $(12 + 4) \div 2$ $(4 \times 3) - 7$



$7 \div 7$ $(3 \times 6) - 6$ $90 \div 10$ $43 - 38$ $(3 \times 4) + 2$ $(2 \times 5) - 1$ $(39 \div 3) + 1$ $13 + 9$ $(7 \times 3) - 20$ $(8 \times 4) - 13$ $(24 \div 6) + 5$ $60 \div 4$ $(3 \times 4) + 2$

!



Aliens Spotted - Run for Cover!

Natural resource professionals might be the experts when it comes to identifying and managing forest pests, but regular people are more likely to find and report them. Take the case of the Asian longhorned beetle. The first beetle was discovered by a man in Brooklyn, New York. When he looked at his maple trees one day, he saw holes in the trunks and sawdust on the ground. He called to report a suspected case of vandalism. Investigators identified the real culprits – Asian longhorned beetles. Two years later, an alert parks department employee in Chicago found a strange beetle in some firewood and looked it up on the Internet. Four years after that, a graphic designer in Jersey City connected a beetle he had seen with one featured in a news report and alerted officials.



Internet search reveals true identity
Graphic designer spots aliens

Exotic vandals drill holes in street trees

Trees quarantined after invasion from China

Imagine you are the one who discovers the next invasive forest pest or the latest outbreak. Where were you? What were you doing? How did you know it was newsworthy? Be a reporter. Make up a sensational news headline. Tell the story.

Vol. 3 Issue 10

Draw a picture here!



Luke & Garry Jensen
 PUBLI-FR-385 2006

===== Saga of the Emerald Ash Borer =====

Native Americans and EAB

The following is a letter regarding Native American's relationship with Ash trees. Read the letter and then answer the questions that follow.

ASH TREES, INDIGENOUS COMMUNITIES AND THE EMERALD ASH BORER

The indigenous peoples of the Great Lakes region (Ho-Chunk, Menominee, Odawa, Ojibwe, Oneida, Potawatomi and others) have long standing relationships with each species of ash tree (*Fraxinus sp.*) found in the regional flora. These trees have been historically and are currently relied upon for multiple uses, most notably the use of black ash (*Fraxinus nigra*) wood splints by traditional basket makers. Here I present a general summary to describe the relationship between the indigenous communities and the natural resources of the Great Lakes region. I also suggest the importance of including Tribal and First Nation communities in local and regional Emerald ash borer abatement projects.

LAND TENURE TRADITIONS

Indigenous people have ecological stewards of the land and natural resources of the Great Lakes region for thousands of years. Traditions vary, but teachings in most communities suggest that the lands and waters of our respective homelands take care of us and we must, therefore, reciprocally take care of our homelands. We are expected to take good care of our homeplace so that our descendants will have the opportunity to live as we live, dependant upon and connected to a diverse set of ecosystems. This land tenure responsibility has existed for thousands of years and continues to this day.

I want to clarify what I mean by dependency. When I say we are dependant upon the ecosystems in our home areas, I mean specifically that many people in Indian communities have physical, financial and spiritual relationships with land and water resources. For example, many of our families eat foods that come from our homelands including fish, deer, moose, wild rice, maple sugar, berries, etc. Many of us also pay our bills from funds that we earn selling arts and crafts, firewood, fish, land lease, and so forth. Finally, many of us rely upon medicinal plants, ceremonial sites, sacred places and teachings that are directly tied to the lands and waters of this region.

Within Indian communities, plants and animals are regarded as much more than just physical resources. They are seen as living, spiritual entities. They are members of our community and they are our relatives.

ASH PRESERVATION IN INDIAN COUNTRY

Within local indigenous communities, the people who carry the most knowledge about black ash are the basket makers. Basket traditions are usually maintained with certain families, and those families often rely on plant materials such as black ash splints, along with their artistic talents, to financially sustain themselves. Members of these families are very knowledgeable about black ash distribution and ecology and many are actively involved in protecting ash from emerald ash borer (EAB). If you are working on a local or regional EAB project, I suggest you connect with traditional basket makers because they hold many generations worth of traditional ecological knowledge that will likely be relevant to your project.

Although the most fervent drive to protect black ash resources might be found within basket making families, most members of Native communities in the Great Lakes recognize the critical importance of protecting all ash for future generations. These community members may currently serve or be interested in serving as volunteers in ash protection and EAB abatement projects and could help to bolster your existing core of volunteers. Additionally, many Native communities in the region have natural resource and environmental departments (along with cultural and historic preservation departments) are working on EAB projects and should be included in EAB management and problem solving teams. These departments are also your best pathways to the aforementioned basket makers and would-be volunteers.

Everyone who is interested in fighting EAB comes to the table with a different set of teachings and a different understanding of what it will take to protect ash into the future. It is critical that Tribes/ First Nations, federal, state, nonprofit and private entities all work together to devise management strategies that will diminish this prolific forest pest.

Nick Reo (Sault Ste. Marie Chippewa)
American Indian Liaison

Questions

1. *How has tradition framed the way Native Americans treat their natural resources?*
2. *Do all cultures treat their Natural Resources the same? What are the differences?*
3. *If the ash forest resource is severely devastated by the emerald ash borer, how will that affect indigenous communities?*
4. *Will all indigenous communities be affected?*
5. *What information about black ash might the basketmakers be able share?*



*****Optional: Find out where Native American Communities exist in your area.*

Unwanted Pest: Emerald Ash Borer Alert!!!

The natural habitat of the EAB is eastern Russia, northern China, Japan, and Korea. In June of 2002, the EAB was first found in North America. The most likely cause of the Emerald Ash Borer being found in the United States was the the transporting of ash wood from Asia to North America. Ash wood was used for stabilizing cargo in ships or for packing or crating heavy consumer products. The Emerald Ash Borer has only been found to attack ash trees. Trees that are found in woodlots as well as in landscaped areas can become affected. There have been larval tunnels that have been found in tree trunks and branches that have been as small as one inch in diameter. So far, it has been found that all species of North American ash can become affected.

The main infestations have been found in six counties in southeast Michigan. Since December of 2006, the infested areas have grown to 15 counties. There have been cases that have been found in Michigan's lower peninsula and Indiana, Illinois and Ohio. It is important to watch for signs and symptoms of EAB in areas that are not quarantined to prevent the EAB from accidentally being spread by the transport of ash wood.

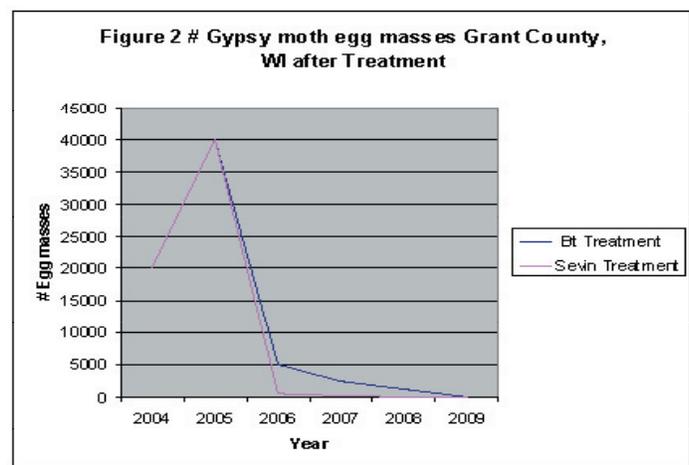
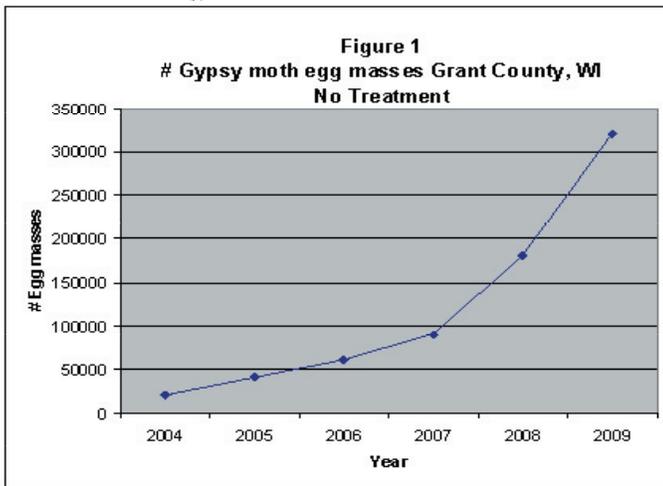
The adult beetle has a dark metallic green color and is about 1/2 inches long and 1/8 inches wide. Research has shown that the beetle can have between a one to three year life cycle. Adults emerge in late May through late June. Females usually lay eggs about 2 weeks after they emerge as adults. Eggs will hatch in about one to two weeks in which the larvae will bore through the bark into the cambium. In the cambium, nutrient levels are extremely high. The larvae will feed on the bark for many weeks from late July through October. In this time, larvae pass through four growth stages. Most will overwinter in the outer bark and pupation will occur in spring. In early May or June, adults will emerge and the cycle will start all over.

This beetle can fly up to 1/2 mile from the tree that is emerged from. Most of the infestations begin by people moving infested ash trees, logs, or firewood into areas that are uninfested. It is essential that you DO NOT move firewood from one area to another. Research is being done to understand the biology of the EAB, spreading rate, detection methods, predators and natural enemies of Emerald Ash Borers, and chemical means of controlling infested areas.

Can we afford to use bio-control?

Background: The gypsy moth *Lymantria dispar* is the most notorious insect pest of eastern United States and now active in Iowa's neighboring state of Wisconsin. In any given year large populations of gypsy moth caterpillars (larva stage) can eat the leaves off of oak and other trees during the late spring to early summer. This causes trees to grow new leaves leaving them in a stresses and weaken condition, repeated defoliation (eating of leaves) over several years causing tree death.

Recently, the State of Wisconsin State Forestry Program has approached the Iowa State Forestry Program with a dilemma: A growing population of gypsy moth egg masses has been found in Grant County, Wisconsin across the Mississippi River from the City of Dubuque, Iowa. Figure 1 shows the number of gypsy moth eggs have been found from 2004-2006 and the number of gypsy moth egg masses that are predicted to be found from 2007-2009 in Grant County, WI.



The City of Dubuque has a large population of older oak trees plus other species of trees that gypsy moth eat. Wisconsin State Forestry has a plan to use either a biological control using an bacteria called *Bacillus thuringiensis* known as Bt or using a non selective insecticide, Sevin for eradicating this growing gypsy moth population in Grant County, Wisconsin. Bt inhibits the feeding of gypsy moth caterpillars and is not harmful to other native insects or wildlife. Where the non selective insecticide, Sevin is predicted to kill gypsy moth more readily but will hurt native honey bee populations for up to 10 years after treatment. Sevin treatment would be 1/4 the cost of the Bt treatment. Figure 2 shows the number of gypsy moth egg masses that are predicted to be found from 2007-2009 in Grant County, WI after Bt treatment and Sevin treatment.

Wisconsin is asking for financial assistance in the amount of either \$50,000 from Iowa State Forestry to either to fund 1/2 of the biological control costs or \$12,500 to fund 1/2 of the Non Selective Sevin Treatment for gypsy moth in Grant County, WI. Iowa State Forestry's budget is limited and in order to assist with this project in Wisconsin, a decision must be made not fund planned improvements to state forest campgrounds and trails that need repairs in 2007.

- (1) What would you predict the result of not using the biological control on gypsy moth population in Grant County, Wisconsin's trees in 2007? How about the impacts of delaying the use of the biological control until 2009 until more monies can be raised? What could be the impacts on the trees in the City of Dubuque, Iowa?
- (2) What would you predict the result of using the biological control on gypsy moth populations in Grant County, WI trees in 2007 and 2009? How about the trees in the City of Dubuque, IA?
- (3) What would you predict the result of using the non selective insecticide Sevin on gypsy moth populations in Grant County, WI in 2007 and 2009?
- (4) What decision do you believe Iowa State Forestry should do involving gypsy moth populations in Grant County, WI? Please provide reasons for your decision.



< Knapweed Math >



Spotted knapweed is an aggressive, invasive plant that grows in pasture, rangeland, and grassland. This plant releases a toxin that causes a reduction in growth of forage species. Records show that spotted knapweed came to North America from Eastern Europe in the early 1900's as a contaminant in crop seed. Several million acres in Northwestern United States and Canada are infested with spotted knapweed. The major cause of spread of knapweed is humans through the transportation of hay and underneath vehicles. The best protection against spotted knapweed is prevention. It is important to learn how to spot the plant and report any infestation. Once an infestation is identified, it can be treated with an herbicide and monitored to prevent any spreading.



One hundred knapweed seeds are inadvertently dropped in an area. A knapweed plant produces 1,000 seeds per plant. Four percent of knapweed seeds in the seedbank germinate (sprout) each year, leaving 96 percent for next year's seedbank. About 25 percent of the seedlings that sprout survive to become mature plants. Knapweed seeds remain viable in the soil for 8 years. It takes 1 year for knapweed to germinate and produce seed. Knapweed plants live for 5 years. How many plants and seeds will be produced in the area over 10 years? After calculating how many plants and seeds are produced, graph your results to show growth over time.

Year	Plants	Seeds
0	0	100
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Mind Boggler: If the site will support three mature knapweed plants per square foot, how many acres would be affected after 10 years? (There are 43,560 square feet in an acre.)



“Going Invasive” On The Net (TFT) In Search of Exotic Pest Information



Background

The internet or World Wide Web has become a tremendous source of information on many different topics including trees, forests, and exotic pests. In general invasive plants and animals are usually exotic (non-native), and they can invade other natural environments and out-compete native organisms because there are no natural organisms such as predators to keep their populations in check. This activity will give students an opportunity to learn that there are a number of exotic pests (plants and animals) that have had, and could have negative impacts on different environments in the United States, and in some cases Iowa. Students will have the opportunity to investigate the origins, life cycles, impacts, and possible management tools for a few specific pests. Some of these pests cause damage to trees and forests, and others cause damage to water bodies such as rivers and lakes.

Procedure

Have the students work in groups to answer the questions below by logging into the homepages associated with each set of questions. Some of the answers will not jump right out at the students, which will encourage them to read and research for their needed information. Have a group discussion on the answers and general topics once the students have completed the sheet. Extension: Give the students a topic such as a specific pest, and have them write a research paper on the history, impacts, and controls of the problem based on information found on the computer. For those interested in a possible forestry education from a college or in the state, have the students search the Iowa State University Natural Resources Ecology and Management Department and the Iowa Department of Natural Resources Forestry Bureau Homepages at <http://www.nrem.iastate.edu> and www.iowadnr.gov/forestry/.

Section I. Emerald Ash Borer

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



Questions

- 1) This pest was discovered in Detroit, Michigan in the summer of _____. This pest most likely arrived in the United States in _____ packing material from Asia.
- 2) This pest has caused at least _____ million ash trees to die in Michigan, Ohio, and Indiana.
- 3) True or False This pest can move into states like Iowa through the movement of ash firewood, logs, and nursery trees.
- 4) True or False Ash trees die from this pest when the larvae disrupt the trees ability to transport water and nutrients when they feed on the inner bark.
- 5) True or False When the adult beetles leave a tree they create a D-shaped exit hole in the bark.
- 6) True or False The Emerald ash borer has already caused municipalities (cities and towns), nurseries, property owners, and forest products companies tens of millions of dollars.





• Section II. Nuisance Species - Zebra Mussel and Purple Loosestrife

• Address: <http://www.iadnr.gov> , click on Fishing, then click on Aquatic Nuisance Species

• Nuisance Species

• 1) Nuisance species can be severe world-wide agents of habitat degradation, and they are often considered “biological _____.”

• 2) True or False It is illegal to possess, introduce, purchase, sell or transport aquatic invasive species in IA.

• 3) True or False All introduced fish species are bad.

• 4) True or False When introduced into new environments populations of nuisance species often explode because there are no natural predators, parasites, competitors, and pathogens to keep their numbers in check.

• 5) True or False Many nuisance species are introduced accidentally into new environments when they are carried on animals, vehicles, ships, commercial goods, produce, and even clothing.

• Zebra Mussel

• 1) The scientific name for the zebra mussel is _____ . The mussel attaches to solid objects with tufts of fibers called “_____.”

• 2) These mussels are native to what sea?

• 3) The zebra mussel was introduced to the entire Illinois and _____ rivers by one _____ .

• 4) In Iowa as many as _____ mussels per square meter have been found at _____ and _____ 13 near _____ , Iowa.

• 5) Zebra mussels can cause severe damage to native species because it breaks a link in the _____ chain. Mussels break this link by filtering out (tiny plants and animals) called _____ that are important food for water animals such as fish.

• 6) True or False Water treatment and power plants on Lake Erie have had their ability to pump reduced 20-30% because the zebra mussels clog intake pipes.

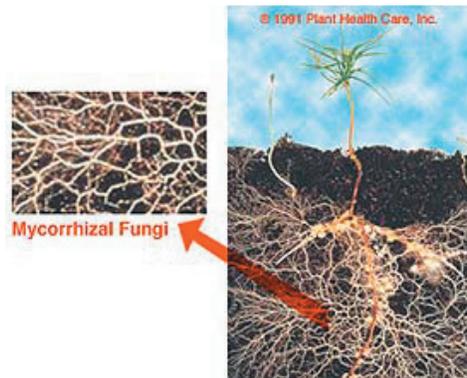
• 7) If you own a boat you can prevent the spread of the zebra mussel by _____ it before you take it to another lake, river, or reservoir.



Are We Having *FUN*gi Yet?

A Scientific Study of FUNGI

Scientists have discovered that certain fungi grow on the roots of plants, to the benefit of both the fungi and the plant. The fungi absorb nutrients from the soil and provide them to the plant. In return, the plant provides nutrients to the fungi. This relationship is called mutually beneficial because both the plant and the fungi are benefiting from each other. The scientific name for this mutually beneficial relationship is mycorrhiza. This relationship works best when the organisms are all native to the area in which they are growing. The scientists in the study were interested in the fungi that grow on the outside of tree roots, called ectomycorrhiza fungi. Ectomycorrhizal fungi can increase the uptake of phosphorus by plant roots and some species of fungi also improve nitrogen uptake. They can decrease the susceptibility of the plant to disease and drought.



Introduction

Some soils are rocky and dry which makes it hard for new trees to grow. The competition between different types of plants and new trees is intense. They are both competing for moisture and nutrients. Some foresters will clear an area of competing plants by setting fires to burn the plants. However, this solution doesn't last long because the plants quickly grow back. The scientists in this study wanted to try a different way of reducing the competition for soil nutrients and moisture.

In order to do this the scientists applied two different types of chemicals. One chemical was applied directly to the soil to kill the plants. The other chemical was applied directly to the seedlings, before the seedlings were planted. This was done to kill the non-native fungi that might be growing on the seedlings' roots. The scientists hypothesized that if they new seedlings were cleared of nonnative fungi before being planted, the ectomycorrhiza fungi would grow on the young seedlings' roots which would help them to grow stronger and faster.



Reflection

- What problem are the scientists trying to solve?
- Why do you think ectomycorrhiza fungi are better for the seedlings than nonnative fungi?

Methods

The scientists applied one kind of chemical to the soil before planting the seedlings. This procedure is called fumigation and involves pouring a liquid chemical onto the ground, then covering the ground with plastic.

The plastic keeps the chemical from escaping into the air.

•Why do you think that it is important to cover the ground with plastic? (Hint: think about your health and loss of chemicals from the ground.)

The scientists also applied a fungicide directly to some of the seedlings in the nursery before planting them outside. This was done to kill the fungi that grow on the seedlings' roots in the nursery. Some of the seedlings were planted in areas that had not been fumigated, so by

applying the fungicide in the nursery, the scientists could figure out if whether fumigation and/or the fungicide affects the seedlings growth.

The seedlings were then measured every year for two years.



Reflection

- Why did the scientists plant some seedlings in areas that had not been fumigated?
- Do you think the ectomycorrhiza fungi were able to begin growing on the seedlings' roots? Why or why not?

Results

The scientists found that when they fumigated the soil in the spring, the seedlings grew more than when they fumigated in the fall. They also found that the seedlings not treated with fungicide grew larger than those that were treated with fungicide.

They found that the use of the fungicide resulted in a greater amount of ectomycorrhiza fungi growing on the seedlings' roots by the second year. Surprisingly, this discovery proved that more ectomycorrhiza fungi does not always mean that seedlings will grow larger.



Reflection

- If you wanted to grow the biggest seedlings, which treatment would you use, fumigation, fungicide or both?
- Why do you think the scientists were surprised to find that ectomycorrhiza fungi did not make the seedlings grow larger?

What did we learn from this?

If foresters want their seedlings to grow successfully and quickly, they should fumigate the soil in the spring before they plant the seedlings.

Because soil fumigation is very expensive, it is only recommended for areas where seedlings have a lot of competition from other plants.

McDonald, Barbara. "Are We Having Fungi Yet?: Helping Young Trees Grow." *Natural Enquirer*. Dec. 1999:p.10-13.

Alert! New Invasives in the Midwest!

Help prevent an invasion through early detection and eradication of possible exotics in your area!



Black Swallow-Wort



Pale Swallow-Wort



Japanese Hops



Kudzu



Mile-A-Minute Weed



Chinese Yam



Asian Bittersweet



Tree of Heaven



Japanese Knotweed



Japanese Stilt Grass



Spotted Knapweed



Cut-Leaved Teasel



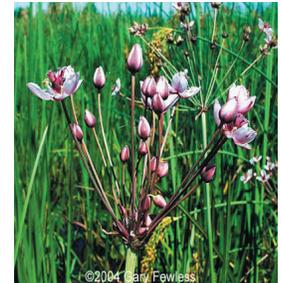
Giant Hogweed



Japanese Hedge Parsley



Leafy Spurge



Flowering Rush

To report a sighting, please contact: <http://www.mipn.org/EDRRContacts.html>

The effects of habitat loss and fragmentation:

- During migration, habitat loss and fragmentation cause birds to have few choices. This concentrates them into the few forest, grassland, or wetland areas that are left. While it is exciting to see thousands of birds in one area, it also leaves them open to disease, predators, or large dieoffs from storms or lack of food.
- During the breeding season, habitat loss and fragmentation mean few nesting areas and often mean that birds are vulnerable to predators and brood parasites.
- During the wintering season, it means fewer and fewer areas in which to find food and to roost.

Test your knowledge of habitat fragmentation. Fill in the blanks to make the sentence complete.

1. Habitat _____ is the breaking up of large blocks of habitat into smaller pieces.
2. _____ birds make up 300 out of 650 bird species that nest in the deciduous forests and prairies in the central and eastern United States.
3. The _____ lays its eggs in the nests of other birds, which has contributed to the decline of some bird populations.
4. _____ provide millions of dollars each year for habitat restoration through the purchase of hunting licenses and taxes they pay on firearms and ammunition.
5. Bird migration follows bird highways known as _____.
6. _____ is the movement of animals from one place to another.
7. During breeding season, _____ loss and fragmentation mean few nesting areas.
8. Loss of habitat mean that birds are vulnerable to _____ and brood parasites.
9. Millions of birds die each year from flying into _____ windows, because they see the reflection of the sky and trees and think they can fly through it.
10. Some states have more than 70 percent fewer _____ than they had 150 years ago.
11. While it is exciting to see thousands of birds in one area, it leaves the birds open to _____, predators or large die off from storms.
12. County roadside managers restore _____ vegetation to provide wildlife habitat.
13. _____ your yard with trees and shrubs and providing water sources invites birds.
14. Planting _____ is a great way to close old agricultural fields among forested areas to encourage more neotropical birds to nest.

What can you do?

- Check out the following websites to learn more about neotropical birds and migration:

<http://www.fws.gov>
<http://www.extension.iastate.edu/wildlife/>
<http://neotropicalbirds.org>
<http://www.audubon.org>
<http://www.iowabirds.org>
<http://www.lhas.org>

- Make a list of the changes that you think are needed for neotropical bird populations to increase in Iowa and share with conservation organizations, conservation leaders and elected officials.
- Find out more about the Partners in Flight Program by writing the National Fish and Wildlife Foundation at 1120 Connecticut Ave NW Washington DC 20036
- Encourage your parents and other Iowa taxpayers to make contributions through their State of Iowa Income Tax form to the Chickadee Checkoff to help Iowa's bird populations or visit www.iowadnr.com/wildlife/
- Work with your teacher and other students to landscape the areas around the school with native trees, shrubs and grasses to attract birds.
- Consider constructing bird nesting boxes.



Why Should I Care About Invasives?

Do you enjoy being outdoors? Do you like to hike, go boating, or hunt? How do invasive species affect these outdoor recreational activities? Learn about why you should care about invasives in order to allow others to enjoy these outdoor activities just as you do!

If I am a hiker, why should I care?

Many people enjoy the outdoors by hiking, cycling and riding horses. These activities mainly take place along maintained trails. Invasive plants, however, can grow over trails to the point where the path can no longer be followed or difficult to navigate through. Many plants can catch in the wheels of bicycle chains. The natural scenery can be disguised or overtaken by invasive plants that overcome an area. Invasives can also make it difficult to find a good place to put up a tent. Some invasives can also have negative effects on your health. For example, wild parsnip and giant hogweed sap on your skin can cause burns if exposed to sunlight. Some invasive plants such as leafy spurge are toxic to horses. The ability to enjoy nature can be greatly reduced when invasives are present.

If I am a boater, why should I care?

The spread of invasives in an aquatic environment threatens both the beauty and their ability to support fish and aquatic plant populations. A common aquatic exotic is Eurasian watermilfoil. It reduces native plant diversity and degrades fish habitat. It reduces aquatic invertebrates, an essential food source for fish. This leads to fish stress and kills which can clog motors on boats. Invasive plants can increase the risk for flooding. This causes soil erosion which leads to cloudy water, lower water quality, and spawning areas with high amounts of silt. This greatly reduces the overall health of the water which can lead to smaller fish and aquatic plant life populations.

If I am a hunter, why should I care?

Many of the natural areas support a wide range of wildlife that hunters enjoy and rely on. Many invasive plants are degrading and destroying many of these habitats that hunters enjoy. The Russian olive has taken over roadsides and natural areas in the Midwest which has created a habitat that is undesirable for birds and mammals. Invasive plants reduce the number and variety of wildlife by reducing the availability of food and suitable cover. The Asian bush honeysuckle shades out oak tree seedlings and saplings which in time reduces the number of total oak in a forest. This reduces the amount of acorn-producing trees which leads to lower food availability and habitat quality for wildlife for white-tailed deer, squirrel, grouse, and turkey. This is only a few of the examples of what invasives can do to a natural area that reduces suitable area for hunting.

How Do I Identify An Ash Tree?

How do you know if the trees in your yard are Ash trees? Here are a few characteristics to look for when identifying an Ash tree.



Fraxinus americana
White Ash



Fraxinus pennsylvanica
Green Ash



** Leaves:

The leaves are oppositely placed and pinnately compound. There are about five to nine leaflets per leaf.



** Size:

On the average, Ash trees are about 50 to 80 feet in height. They have a spread of about 80 to 120 feet.

Spread



h
e
i
g
h
t

** Bark:

The bark is an ashy gray to gray-brown color with diamond shaped areas that are separated by narrow ridges.



** Leaf Color:

The leaves are medium to dark green and change to a yellow color in the fall. The flower is a green to purple flower that blooms in April.

** Fruit:

The fruit is a samara that is one to two inches long and is very attractive to birds.

** Sun:

Ash trees require full sun to grow properly.

Aquatic Roots

Objective

Students will: 1) Trace the origins of various species of local aquatic animals and/or aquatic plants; 2) categorize them into native and exotic species; and 3) evaluate the appropriateness of introducing new species.

Method

Students use reference materials to research various local aquatic plants and/or animals to find out whether they are natives or exotics and to investigate their impacts on people, other animals and the environment.

Materials

A world map; yard; paper; reference materials; and a list of local non-native plants and animals

Background

A non-native species is a species that does not naturally occur in a specific location. While species have always migrated from one place to another, natural land barriers have prevented their indiscriminate movement. Over time, human modifications has changes these barriers. For example, organisms, seeds and animals can be transported in ships, ballast water, on clothing and boats as people move from one place to another.

Why are invaders successful? While not all non-native species succeed, those that do are aided by their ability to out-compete natives for resources and by the lack of natural predators.

Procedure

1. Provide the students with a list of local non-native species. Ask them to predict which of the plants and animals are “native” and which are introduced or “non-native.” A native species occurs naturally in an area. Any plant or animal not naturally occurring in the ecosystems of the United States becomes non-native once it is introduced.

2. Ask each student or small group of students to research one species known to be “introduced” as a non-native to the area of state. Each student or group of students should prepare a written and oral report. Include in the research information concerning the origin of the plant or animal and the impacts in the area.

3. Using a world map, have the students connect their location with the original location of non-native species. Stretch a strand of yarn from their location to the site of origin of each organism and place a tag on the yarn with the name of the plant or animal.

4. Discuss the importance of laws and regulations that prevent, control and/or allow introductions of species.

Extension

Investigate and compare local, state and federal laws pertaining to introducing exotics into aquatic environments.

Evaluation

1) Give four reasons why an aquatic plant or animal might be introduced in an area. Are these reasons appropriate?

2) A local organization has proposed that a new fish be introduced into a state’s rivers or lakes. List at least five questions that could be answered about the fish and its impact on the state’s watercourses before the proposal is approved or rejected.

This activity adapted with permission from the Project WILD Aquatic K-12 Curriculum and Activity Guide activity, Aquatic Roots, ©2003 Council for Environmental Education.

What's in the Forest?

Students will be given an opportunity to use their creative skills to create a game that can be played by their classmates! They will work in small groups to design a game that will allow the players to test their knowledge of “What’s in the Forest?”

Procedure

- 1) Students will be divided into groups of 4-6.
- 2) Each group will be given a set of cards that have items that correspond to a forest. Such topics may include:
 - 1) Animals found in a forest
 - 2) Plants found in a forest
 - 3) Invasive Species
 - 4) Ways forests are used
 - 5) Students may come up with their own topic ideas
- 3) Each group is given a brown paper sack that has a picture of a forest on the front and back of the sack.
- 4) Students must brainstorm possible items that could be put in the bag to represent their topic cards. Students should be creative in finding items to represent their topic cards.
 - ***For example, a Monarch caterpillar could be found in the forest and represented by a fake worm.
 - ***Poison Ivy is an invasive species that is found in the forest, and a bottle or tube of Calamine lotion or ointment could represent what happens when you encounter poison ivy.
- 5) Students then switch bags with another group. Each student draws a card and reaches into the bag to try to find the item that is representative of their topic card. The player that has the most correct items, WINS!!!

***This activity could be adapted if the students are paired or mentoring younger students. This is a great opportunity to allow the older students to teach younger students about the forest. This would be a great learning experience for both ages!



Debating The Issue Of Invasive Species

Senator Bill Morrismen will be coming to your school to debate the issue of invasive species. In particular, he is interested in Emerald Ash Borer. The class will be split into groups, and the goal of each group is to present to Senator Bill Morrismen a bill that presents a solution for this invasive species. Your group must work together to gather information, brainstorm pros and cons, and present your findings in the format of a bill to Senator Bill Morrismen.



Step 1:

Gather information on Emerald Ash Borer. This information will be presented to Senator Bill Morrismen. Find current information that is informative and reliable. Possible topics of information to look for are description, habitat, damage, prevention, eradication, and education.

Step 2:

Based on the information that you gathered, brainstorm ideas on pros and cons of the Emerald Ash Borer. Brainstorm ideas that concern how it is spread, how does it affect the ecosystem it invades, and are there benefits of having it in a certain ecosystem. Compile a list of the pros and cons, and then decide on one pro or con to write a bill on to present to Senator Bill Morrismen.

Step 3:

Come up with a solution to your pro or con. How will you prevent Emerald Ash Borer from spreading? How will you teach people to identify Emerald Ash Borer in their Ash trees? These are some possible questions from your pros and cons that you can use to help you come up with a solution to the Emerald Ash Borer.

Step 4:

Research on how a bill is written and presented to Congress. Based on your information and the pro or con that your group picked, write a bill to be presented to the senator Your bill should contain the issue that you will talking about with the Emerald Ash Borer and the solution to your problem.

Step 5:

Design a presentation using visuals (Powerpoint, posters, handouts) that supports your solution to Emerald Ash Borer. Be prepared to present your information to the Senator and answer questions about your solution. All group member should participate in the presentation!!

After each group is done presenting, a debate can held to discuss the effectiveness of each solution presented. The senator will pick a group that he feels presents the best, most practical solution to the invasive species, Emerald Ash Borer! Good luck!!

Invasive Species Resources

Books

- An Iowa Supplement to Project Learning Tree, K-8. Linette Riley and Kay Neumann. Iowa Department of Natural Resources- Forestry Division, 1993.
- The Changing Forest: Forest Ecology. Project Learning Tree Secondary Education Program. American Forest Foundation, 1996.

Websites

Project Learning Tree:

Includes sample lessons and describes interdisciplinary environmental education activities.
<http://www.plt.org/>

Iowa Tree Planting:

Provides information and resources to understand various options for planting and managing healthy trees.

<http://www.iowatreeplanting.com>

EEK: Environmental Education for kids. Wisconsin DNR:

Interactive website for kids on various environmental topics.

<http://www.dnr.state.wi.us/org/caer/ce/eek/>

Don't Move Firewood- It Bugs Me!:

Informative website that provides the latest information about the emerald ash borer.

<http://www.emeraldashborer.info>

Invasive Plants Field and Reference Guide:

A free guide to invasive species courtesy of the USDA Forest Service.

http://na.fs.fed.us/fhp/invasive_plants

The Natural Enquirer:

A publication that engages students in science and challenges their processing and scientific method skills.

<http://www.naturalinquirer.usda.gov/educators.cfm>

Videos

A 12-minute invasive species video, *Plants Out of Place: Exotic Pests of Eastern Forests*, has been sent to your school's library or media center. Also, ask your media center specialist or librarian about Iowa forestry videos entitled "Forestry Connections," "Iowa's History Is In Its Trees," "The Community Forest," and "Backyard Conservation" which have been sent to all Iowa schools and public libraries.

Answer Page



“Going Invasive” on the Net (pg. 18-19)

Answers:

Section I.

- 1) 2002, solid wood
- 2) 20
- 3) True
- 4) True
- 5) True
- 6) True

Section II.

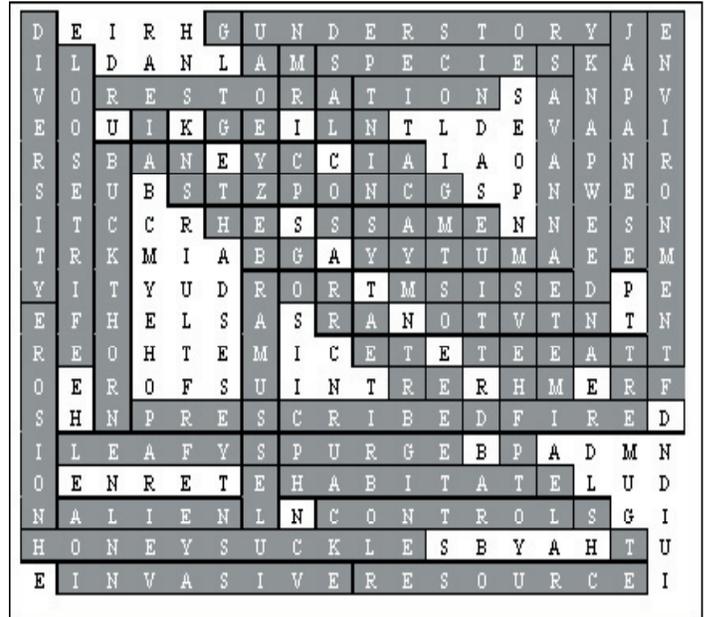
Nuisance Species

- 1) pollutants
- 2) True
- 3) False
- 4) True
- 5) True

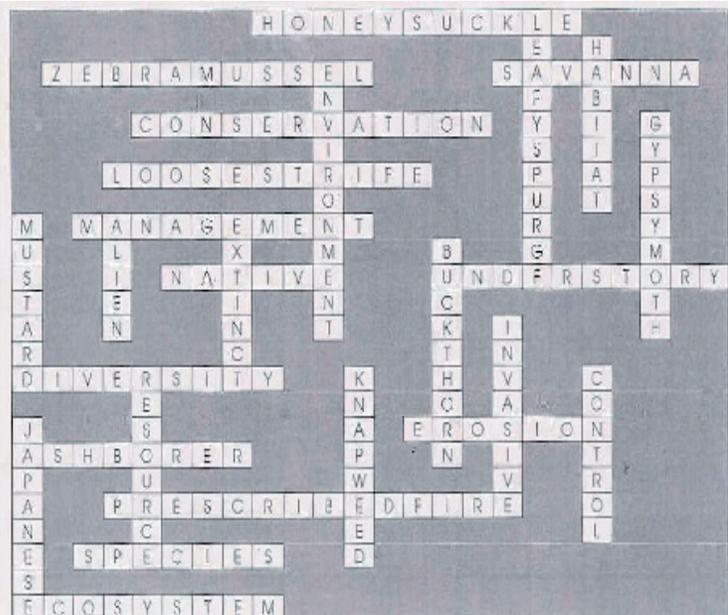
Zebra Mussel

- 1) Dreissena polymorpha, byssal threads
- 2) Caspian
- 3) Mississippi, barge
- 4) 11,432, Lock, Dam, Davenport
- 5) food, plankton
- 6) True
- 7) cleaning

Invaders Word Search (pg. 12)



Invaders Crossword (pg. 11)



Knapweed Math (pg. 18)

- Year 1: 1 plant, 1096 seeds
- Year 2: 12 plants, 13,052 seeds
- Year 3: 143 plants, 155,530 seeds
- Year 4: 1,698 plants, 1,847,309 seeds
- Year 5: 20, 171 plants, 21,944,417 seeds
- Year 6: 239,614 plants, 260,680,640 seeds
- Year 7: 2,846,408 plants, 3,096,661,414 seeds
- Year 8: 33,812,879 plants, 36,785,673,858 seeds
- Year 9: 401,667,920 plants, 436,982,165,807 seeds
- Year 10: 4,771,469,407 plants, 5,190,972,273,123 seeds
- Extra: 36,513 acres after 10 years



Start A Living Legacy



<http://www.iowatreeplanting.com>

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