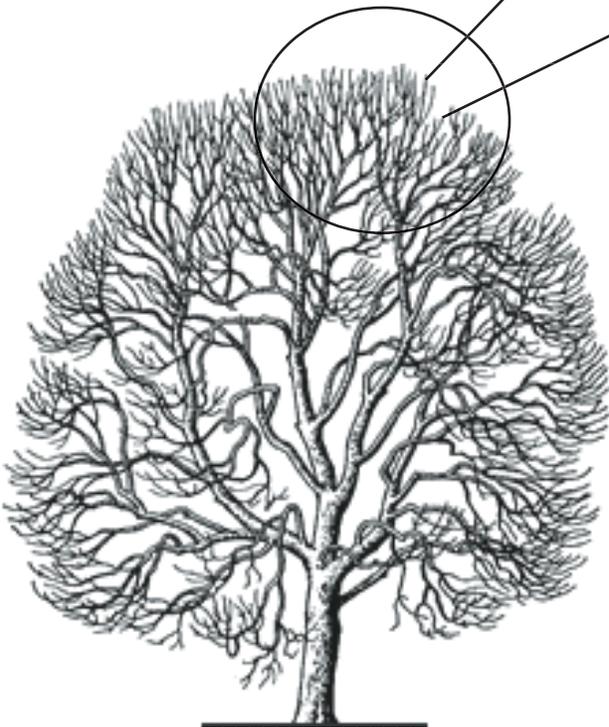


Trees For Kids

Invasive Species Awareness

Emerald Ash Borer
Agrilus planipennis



Ash Tree
Fraxinus

2007

Table of Contents

Trees for Kids 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
Do you have invasives in your backyard?.....	8
Alien Lingo.....	10
Alien Invaders Crossword.....	11
Alien Invaders Word Search.....	12
A Really Boring Game.....	13
Invasive Insect.....	14
Invading the Internet.....	16
Invasive Math.....	18
Bio-control Graph.....	19
Emerald Ash Borer Origami.....	20
A green carpet that smells like garlic- YUCK.....	21
Coloring Page.....	22
Reading Rangers.....	23
A Night at the Victors.....	25
Saga of the Emerald Ash Borer.....	26
Aquatic Roots.....	28
What Can You Learn From A Map?.....	29
Videos and Booklist.....	30
Answers to Puzzles.....	31

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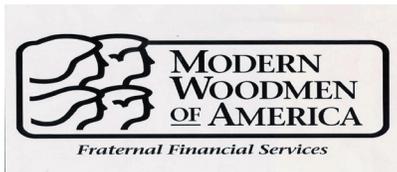
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For more information on selecting and planting native trees, visit <http://www.iowatreeplanting.com>

Trees For Kids 2007

The Program

Trees For Kids 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 Kids 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 Kids* 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 Kids* 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 Kids* 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.

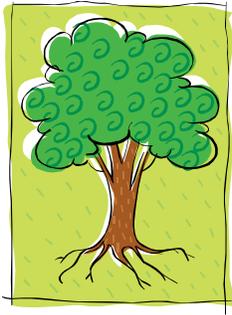
To reduce these problems, it is important to select a tree that best fits the planting site. Before planting, envision how the mature tree will fit into the site. Will it interfere with buildings, utilities, sidewalks, playground equipment, or block the view of traffic near corners? Will the tree selected 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 have been 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.

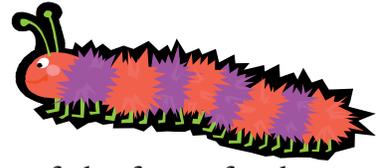
WHAT'S AT RISK IN IOWA: EAB kills ash trees of various sizes and vigor. EAB larvae have developed in trees and branches ranging from 1 inch to 55 inches in diameter. Stressed trees growing in tight spaces such as between the sidewalk and curb are most vulnerable and are attacked first. At the present 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>.

Invasives Going Berserk!



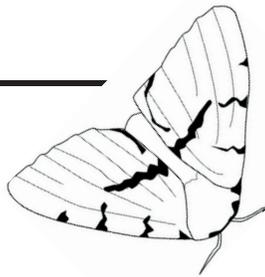
Insects that recycle wood and nibble on leaves are vital parts of the forest food web, but the forest doesn't need millions of them! Native forest pests are eaten by predators, weakened by parasites, and killed by diseases. Their populations are usually kept under control.

History Repeats

Emerald ash borers aren't the first invaders to threaten our forests, and you can bet they won't be the last. We are a nation on the go! We work in foreign countries, take vacations to exotic places, and ship things around the globe. A step back into the past might help us to remember to be more careful in the future.

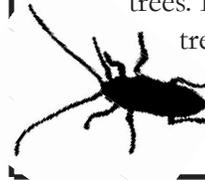
Gypsy Moth

In 1869, an amateur entomologist brought some gypsy moth egg masses to Massachusetts. He was apparently trying to cross gypsy moths with silkworms to produce a new heartier breed of silk-producing insects. Several gypsy moth larvae escaped, and it wasn't long before they were defoliating trees. They have invaded most of the northeastern United States.



Asian Longhorned Beetle

In 1996, a homeowner in Brooklyn, New York reported the first infestation of the invasive Asian Longhorn Beetle (ALB). Since then, the beetle has shown up in Illinois and New Jersey. ALB larvae feed on the cambium and the wood of the trees. Extensive efforts, including tree cutting and chipping, have successfully eliminated the beetle in some areas.



Emerald Ash Borer

In 2002, the Emerald Ash Borer (EAB) was identified in Detroit, Michigan. The EAB probably arrived in packing containers from China six to ten years earlier. EAB is an exotic, wood-boring beetle that feeds on the inner bark of ash trees. They are responsible for killing millions of ash trees annually and forcing quarantines on firewood and nursery trees in several states.



Garlic Mustard

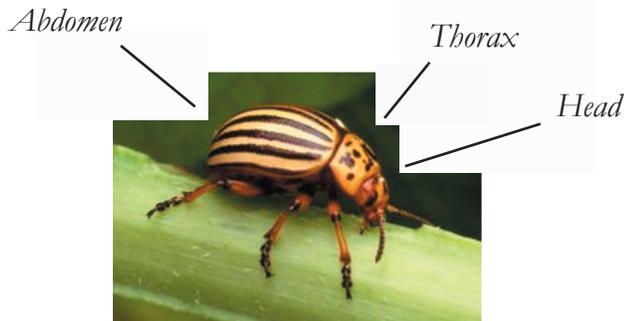
Garlic mustard was first introduced in 1868, into upland or floodplain forests, savannas, roadsides, trail edges, and disturbed areas. Many wild native flowers that complete their life cycle in the spring share the same habitat as garlic mustard. Garlic mustard will outcompete native plants by taking over light, moisture, nutrients, soil and space.



Have you ever found an insect in your back yard and wondered what it was? Was it a beetle, a moth, larva, or a spider? How do you tell the difference between each of these? Here is a quick guide to identification of insects in your backyard!

What is a Beetle?

A beetle has three distinct body parts. The three parts include a head, thorax, and abdomen. The head contains the mouthparts, antennae, and eyes. There are three pairs of legs that are attached to the thorax. The segmented abdomen is behind the last pair of legs. All beetles have mouthparts for chewing. The form of the antennae differs for each species.



Colorado Potato Beetle

What is larvae?

A larva is a young form of an animal that will undergo metamorphosis to change into the adult form. Metamorphosis is a change in form from one stage to the next in the life of an animal. Many times the larva look completely different from the adult. Larvae will have special larval organs that will change when it undergoes metamorphosis.



caterpillar of Emperor Gum Moth

Now What?

Now that you know some of the common invasives from “Invasives Going Berserk,” and how to identify your insect, you are one step closer to being able to tell if your insect is invasive. The next step is to identify what species you have and if it is invasive. To do this, visit this website: <http://www.invasivespeciesinfo.gov/resources/images.shtml>.

What is the difference between a moth and a butterfly?

- *Butterflies will rest with their wings closed and moths will rest with their wings open.
- *Butterflies have long, thin antenna, while moths have short, feathery antenna.
- *Butterflies gather food during the day (diurnal), while moths gather food during the nighttime (nocturnal).
- *Butterflies will make a shiny chrysalis, and most moths make a silky cocoon.



Viceroy Butterfly



Emperor Gum Moth

Is a spider an insect?

A spider is part of the class known as Arachnids. The Arachnids have the following characteristics: two body parts, eight legs, no chewing mouth parts, and no wings. The two body parts included a fused head and thorax, and an abdomen. All spiders produce silk which helps in climbing, forming smooth walls for burrows, building eggs sacs, and wrapping prey.



Wolf Spider



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

conservation- the careful management and wise usage of natural resources

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

deciduous- tree that loses its leaves in autumn

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

extinct- a species no longer found on earth

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

honeysuckle (*Lonicera spp.*)- an invasive Eurasian plant that shades out native woodland understory plants, causing erosion

invasive species- an alien species whose introduction could harm the environment, 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 prairie 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

natural resources- raw materials provided by the earth, such as water, plants, and minerals

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

preservation- the belief that natural resources in certain places should not be used

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

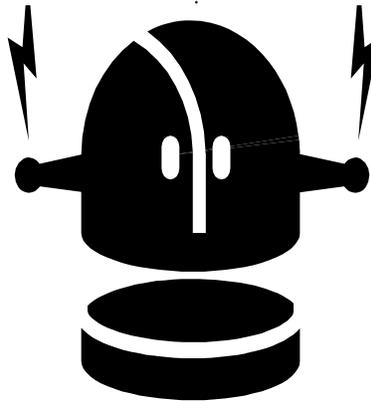
savanna- a park-like area with an open understory of native grasses and wildflowers, dotted with large oak trees

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

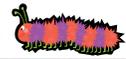
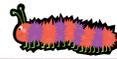
spotted knapweed (*Centaurea maculosa*)- an invasive Eurasian prairie plant that often spreads via hay transport during a drought

understory- plants growing close to the ground in a forest

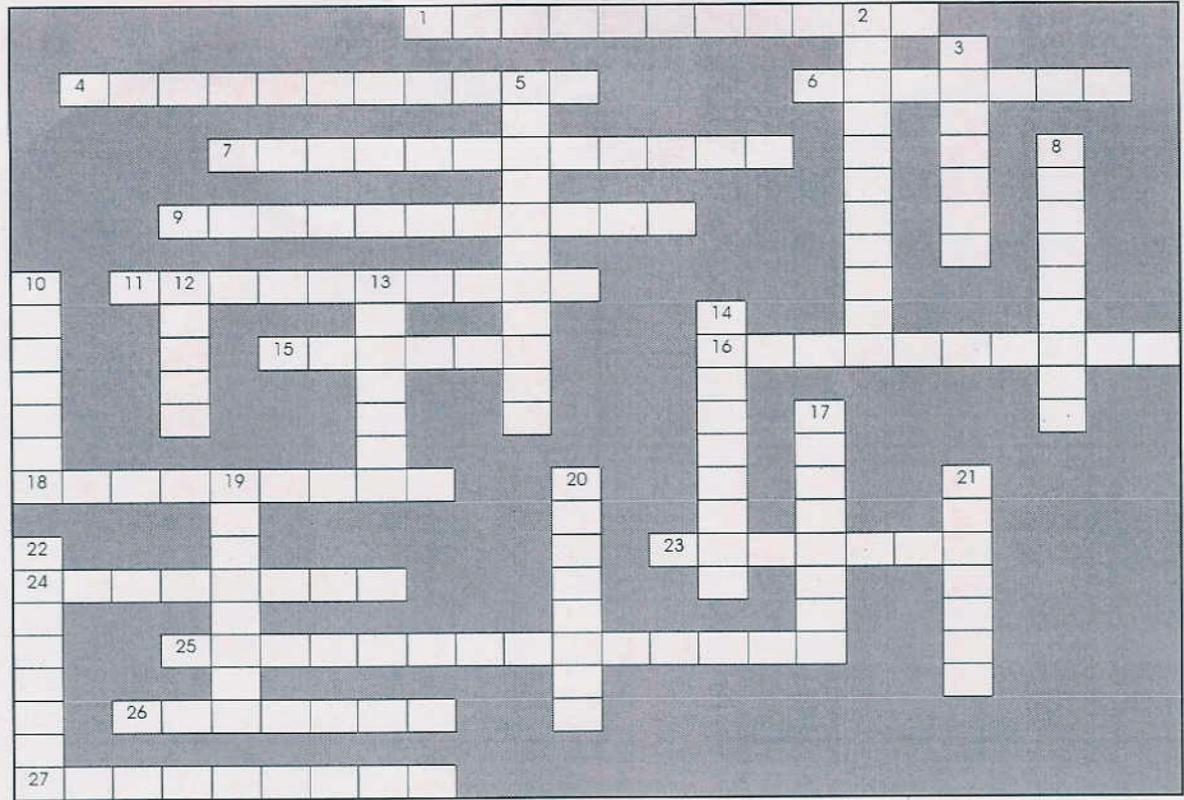
zebra mussel (*Dreissena polymorpha*)- an invasive Asian aquatic animal that grows in thick mats on hard surfaces



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



E P K N A P W E E D L D N A T I V E
 N R M T E S A V A N N A C S S S L R
 S E E R O S I O N S N O O R Y O O E
 E S R E N V I R O N M E N T E L O E
 G C L G C O N S E R V A T I O N S D
 A R D Y H O Z L M I M A R T R J E T
 R I I P B P E E U E O L O S D A T U
 L B V S U M B A G X A I L P I P R N
 I E E Y C A R F E T A E P E O A I D
 C D R M K N A Y I I O N A C T N F E
 M F S O T A M S I N V A S I V E E R
 U I I T H G U P T C I E M E M S E S
 S R T H O E S U I T M H A S O E I T
 T E Y H R M S R E A S H B O R E R O
 A E A F N E E G A N E B T H S T P R
 R N S O E N L E H A B I T A T A S Y
 D A L R I T E C O S Y S T E M H C U
 H R S Y E E D H O N E Y S U C K L E

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

Math Decoder



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

_____ ,
 (5 x 4) - 1 (3-2) x 1 11 x 2 10 - 5 18 ÷ 2 3 x 5 (3 x 8) - 1 (6-7) + 2 (6 x 3) + 1



 7 x 2 (3 x 4) - 11 (3 x 9) - 7 15 - 6 13 + 9 (10 x 4) ÷ 8



 (7 x 2) + 5 12 + 4 25 ÷ 5 (6 x 3) - 15 (30 ÷ 5) + 3 (8 + 7) ÷ 3 18 + 1



 (27 ÷ 3) + 10 (7 x 6) - 22 9 + 6 (6 x 4) - 8 40 ÷ 2 (12 + 4) ÷ 2 (4 x 3) - 7



 7 ÷ 7 (3 x 6) - 6 90 ÷ 10 43-38 (3 x 4) + 2 (2 x 5) - 1 (39 ÷ 3) + 1 13 + 9 (7 x 3) - 20 (8 x 4) - 13 (24 ÷ 6) + 5 60 ÷ 4 (3 x 4) + 2

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

!

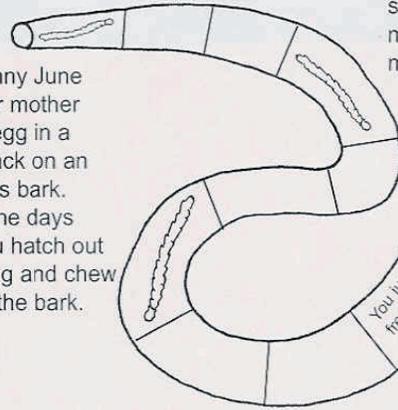


A Really Boring Game

You are an emerald ash borer (EAB) trying to complete your life cycle. Fortunately, you have invaded America, and you have a lot of advantages in your new homeland. You have few predators, diseases, or parasites. All you have to do is hatch, eat your way through an ash tree's cambium, pupate, and fly away to spread the invasion. What could possibly go wrong?

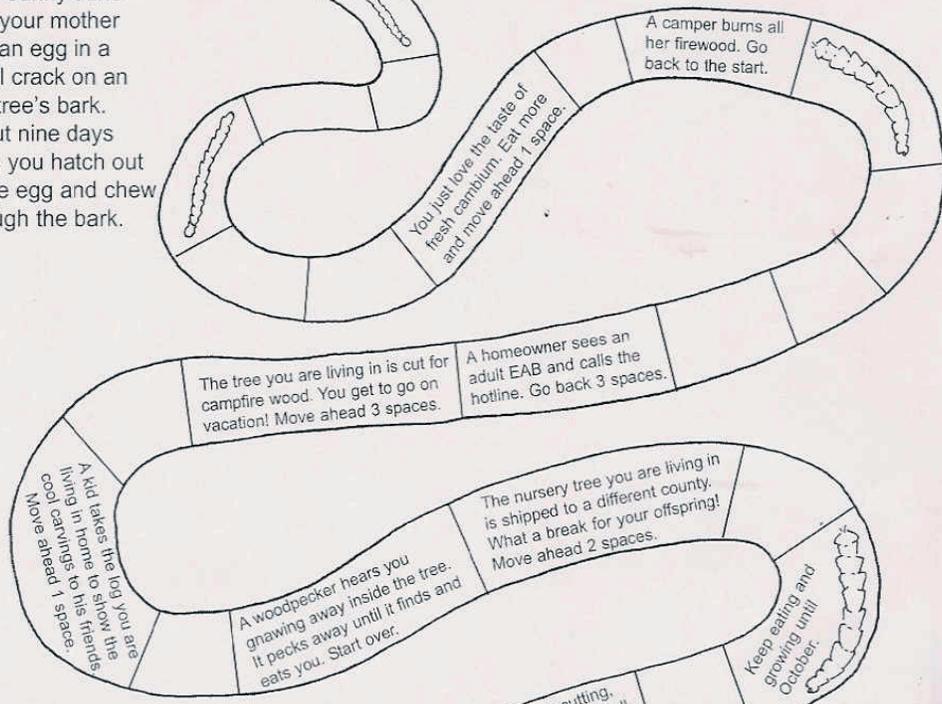
Start

On a sunny June day, your mother lays an egg in a small crack on an ash tree's bark. About nine days later, you hatch out of the egg and chew through the bark.

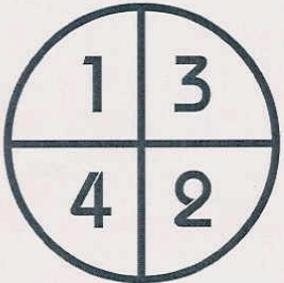


Play

You'll need someone to play with, an ash or maple seed for a spinner, and a couple of pebbles for markers. If you land on a picture of an EAB larva, move ahead one more space.



Place an ash or maple seed in the center of the spinner. Spin it to see how far you can travel.



You Made It!

Now, as an adult EAB, you can invade more ash trees!



Lurkers Going Berserk PUBL-FR-365 2006

10





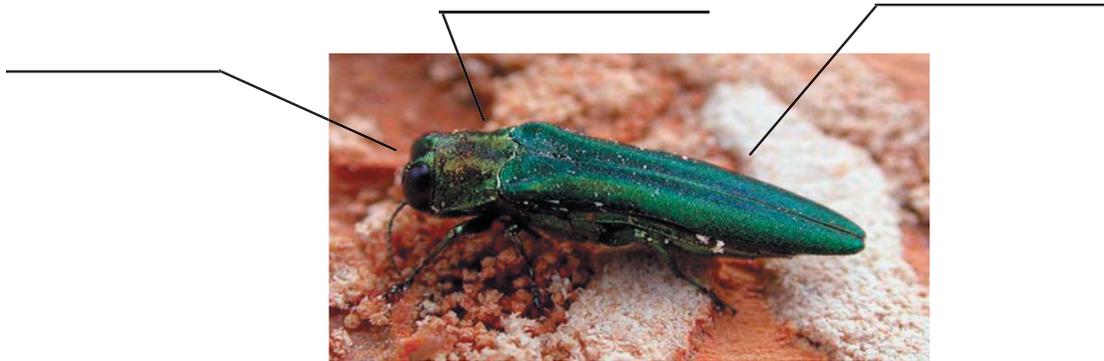
Invasive Insects



What is an insect?

According to the Entomological Society of America, there are over one million insects that have been identified, and it is estimated that there are over thirty million unidentified insects. An insect has three pairs of legs, a three regioned body (head, thorax, and abdomen), one pair of antennae, and usually has wings. The head contains a pair of eyes and antennae. The thorax contains three pairs of legs and usually a pair of wings. The abdomen contains the living organs and reproductive organs of the insect.

Label the three insect parts of the Emerald Ash Borer.



What is an Invasive Insect?

An invasive insect is an insect that is not native to an ecosystem that can or is likely to cause harm to the environment, economy, or human health. These insects thrive because their new environments lack both the predators that eat them, and the other animals that they had to compete with for food in their native homes.

The Asian Longhorned Beetle is an invasive insect that came into the United States in the 1990's in untreated wooden packages and pallets from China. The beetle largely affects maple trees. The larvae will burrow into the tree to feed on food and vessels that transport water. Adult beetles burrow out of the tree and leave holes about the size of a ball-point pen.

The Gypsy Moth is an invasive insect that is threatening Iowa, in which a few have been found. In 1869, a French scientist brought the moth to Massachusetts from Europe to breed it with a silk worm to make an "improved" silk producing insect. His project failed, and many of the insects escaped. The moths spread on recreational vehicles, household items such as picnic tables, and plant material. Gypsy moth caterpillars eat the leaves of many trees, especially Oak, weakening them so they die. The most common control method is spraying them with Bt, (*Bacillus thuringiensis*), a bacteria in nature that kills certain kinds of caterpillars.

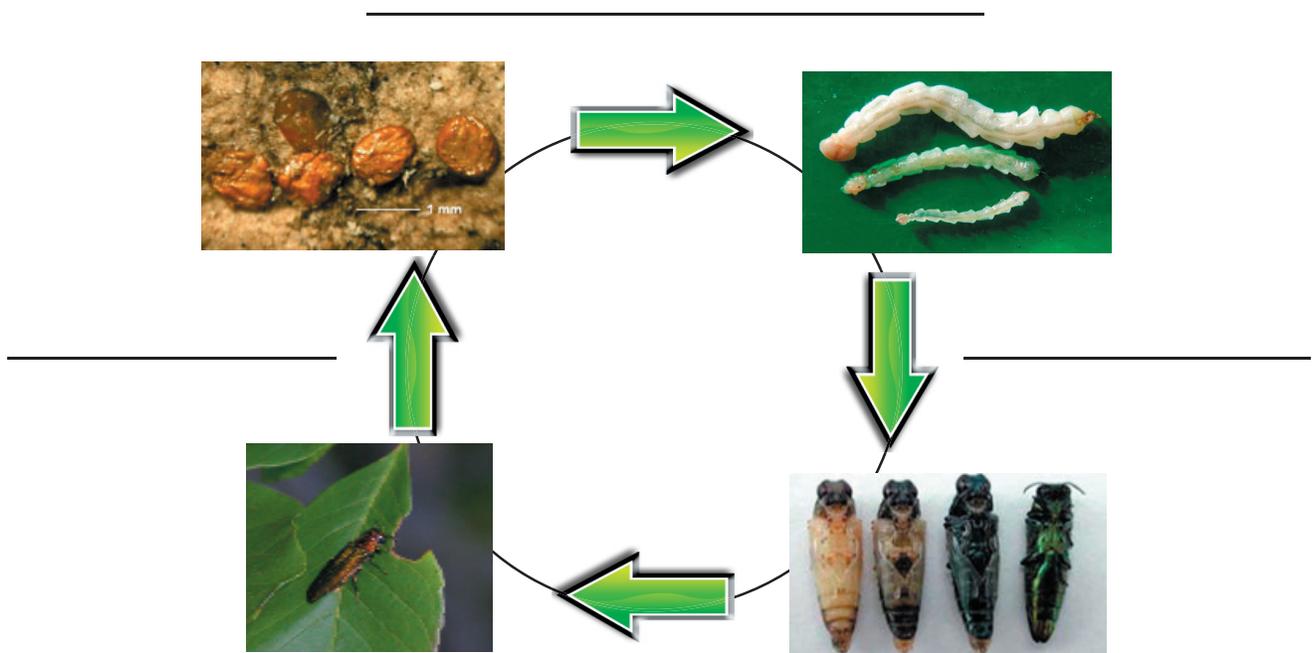
The Emerald Ash Borer (EAB) is an invasive beetle that was discovered in southeastern Michigan during the summer of 2002. The larvae feed on the inner bark of the tree which disrupts the tree's ability to transport water and nutrients. The adult beetles cause very little damage to the tree. EAB attacks only ash trees, and has killed over 20 million trees in Michigan, Ohio, and Indiana. Currently, research is being done on ways to detect EAB, controlling larvae and adults, and containing infestations. To help prevent the spread of EAB, wood should not be transported from infested areas to uninfested areas.

Insect Life Cycles

Insects go through three life stages after they emerge from eggs. The first stage, the insect is called a larvae. Larvae look like short, yellow or brown worms. The hairy larvae of moths and butterflies are called caterpillars. A larva eats, grows, and sheds skin about five times before becoming a hard-cased pupa. The pupa does not move, but inside, the larva's body is changing into an adult.

The Emerald Ash Borer life cycle has four distinct parts to it. From May to August, eggs will hatch into larvae and start tunneling into the ash tree. From August to October, the larvae will feed under the bark, which creates S-shaped tunnels. From the months of May to June, the adults will emerge and leave D-Shaped exit holes. The last stage occurs from about mid-May to mid-August in which the adults will lay the eggs in the crevices of the ash bark. This cycle continues with the end product being the death of an ash tree.

Fill in each of the four parts and time periods of the EAB life cycle on the diagram below.



D-Shaped Exit Holes created by adult EAB

S-Shaped Tunnels created by EAB larvae



Pictures courtesy of Purdue Entomology Extension



“Going Invasive” On The Net (TFK) 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/invasive 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.

Section I. Emerald Ash Borer

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



Questions

- 1) The Emerald ash borer attacks ash trees and was first found near _____, Michigan in _____.
- 2) The adult Emerald ash borer is _____ green and about _____ inch long.
- 3) This pest has caused at least _____ million ash trees to die in Michigan, Ohio, and Indiana.
- 4) YES or NO Could this pest travel to Iowa inside ash firewood, logs, or nursery trees.
- 5) This pest has already cost cities, property owners, nurseries, and others _____ of millions of dollars.
- 6) When the adult beetle leaves a tree they create a _____-shaped exit hole in the bark.





Section II.

Nuisance Species - Zebra Mussel and Purple Loosestrife

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

Nuisance Species

- 1) Nuisance species are usually organisms that are introduced into habitats where they are not _____ .
- 2) True or False Nuisance species are often considered biological pollutants.
- 3) True or False All introduced fish species are bad.
- 4) Bighead carp, _____ carp, _____ , and zebra mussels threaten Iowa waters. These aquatic invaders do not occur _____ in our lakes and rivers.
- 5) Some fish species introduced into Iowa waters that do not cause problems include rainbow trout, _____ , _____ bass, redear sunfish, _____ , and _____ musky.

Zebra Mussel

- 1) The Zebra mussel was first discovered in North America in Lake _____ in 19____.
- 2) Zebra mussels are small _____ that are _____ to _____ inches in size.
- 3) These mussels are native to the Caspian Sea region of _____ .
- 4) Are these mussels found in Iowa? Yes or No (Circle Correct Answer)
- 5) These mussels attach to solid objects with tufts of fiber called “ _____ .”
- 6) One female mussel can produce over _____ eggs. In one square yard colonies may have between _____ and _____ mussels. In Iowa as many as _____ mussels per square meter have been found near _____ .
- 7) There is a concern about this pest because it takes microscopic _____ life from the water. This plant life is needed as a food source by _____ organisms.
- 8) Can people that boat, fish, canoe, sail, and water ski help prevent the spread of the zebra mussel? Yes or No (Circle Correct Answer)





< Knapweed Math >



Spotted knapweed is an aggressive, invasive plant that grows in pasture, rangeland, and fallow land. 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 5 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		

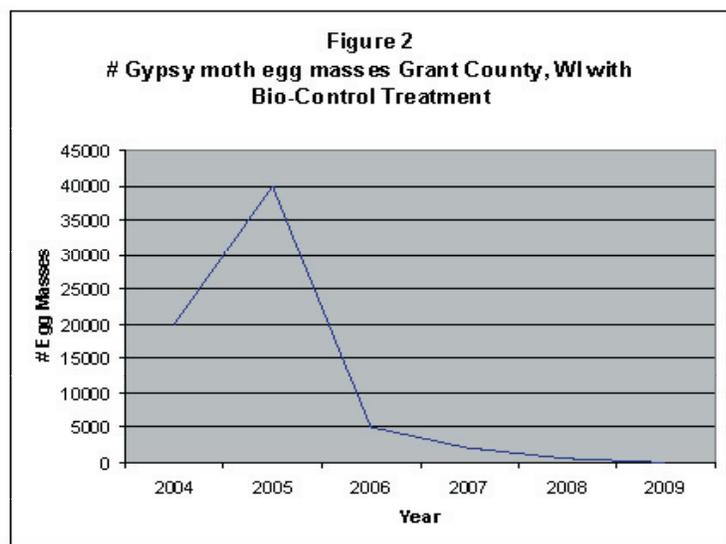
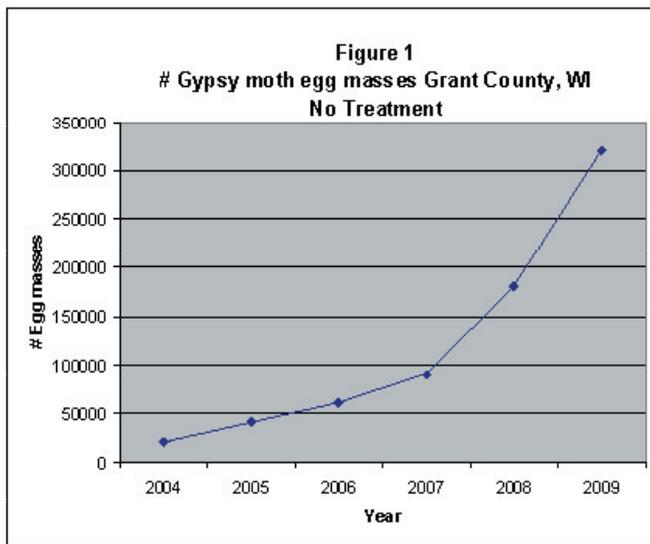
**What types of natural factors may keep an invasive species from overpopulating an area?

**What type of growth pattern does the spotted knapweed represent?

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 stressed 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 a biological control using an bacteria called *Bacillus thuringiensis* known as Bt 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. Figure 2 shows the number of gypsy moth egg masses that are predicted to be found from 2007-2009 in Grant County, WI after treatment with the bio-control Bt.

Wisconsin is asking for financial assistance in the amount of \$50,000 from Iowa State Forestry to fund ½ of the biological control costs of 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, Wisconsin trees in 2007 and 2009? How about the trees in the City of Dubuque, Iowa?
- (3) What decision do you believe Iowa State Forestry should do involving gypsy moth populations in Grant County, WI? Please provide reasons for your decision.

Emerald Ash Borer Origami

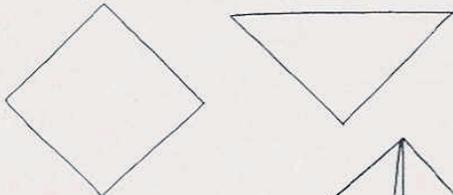
Emerald ash borers have lived in Japan, Taiwan, North Korea, South Korea, and China for a long time. Recently, they invaded North America's forests. They probably got here hidden in wooden packing materials. Without predators and diseases to keep their populations in check, emerald ash borers are rapidly killing all the ash trees in their path. Learn to recognize these beetles and don't give them a free ride anywhere!

Here's what you'll need!

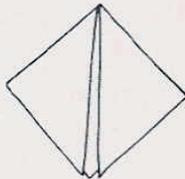
You can fold an emerald ash borer from any paper, but green metallic paper will look the best. Green foil wrapping paper looks very cool! Start with an exact square. The larger the square, the larger the beetle *and* the easier to fold. Try at least a six inch square of scrap paper for your first attempt.

Here's what you'll do!

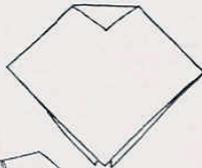
1. Place the paper shiny side down. Fold it in half, bringing the top point down to meet the bottom point. Make a sharp crease.



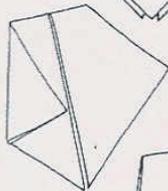
2. Now fold the left and right points down. Leave a slight gap in between the two triangles. These triangles will become the wings.



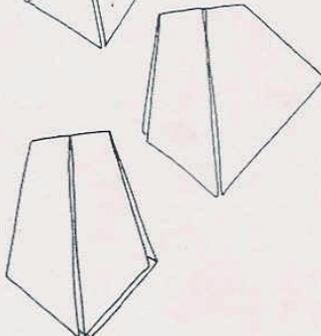
3. Turn the paper over and fold the top point down as shown. Make a sharp crease.



4. Turn the paper over. Make a fold on the lines shown and crease sharply.



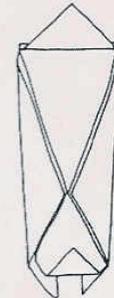
5. Lift up the left side. Reverse the fold and push it almost to the center of the beetle. Press down so the beetle lays flat. Repeat with the right wing.



6. Turn the paper over. Fold the left side in at an angle as shown. Repeat with the right.

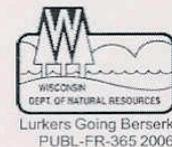
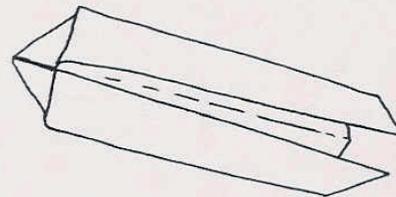


7. To make the beetle's head, fold the top point back up, making a second crease just below the first crease.



8. To make the tip of the beetle's abdomen, fold the bottom point up.

9. Turn the beetle over. Fold the body in half, then open the paper until it is not quite flat.

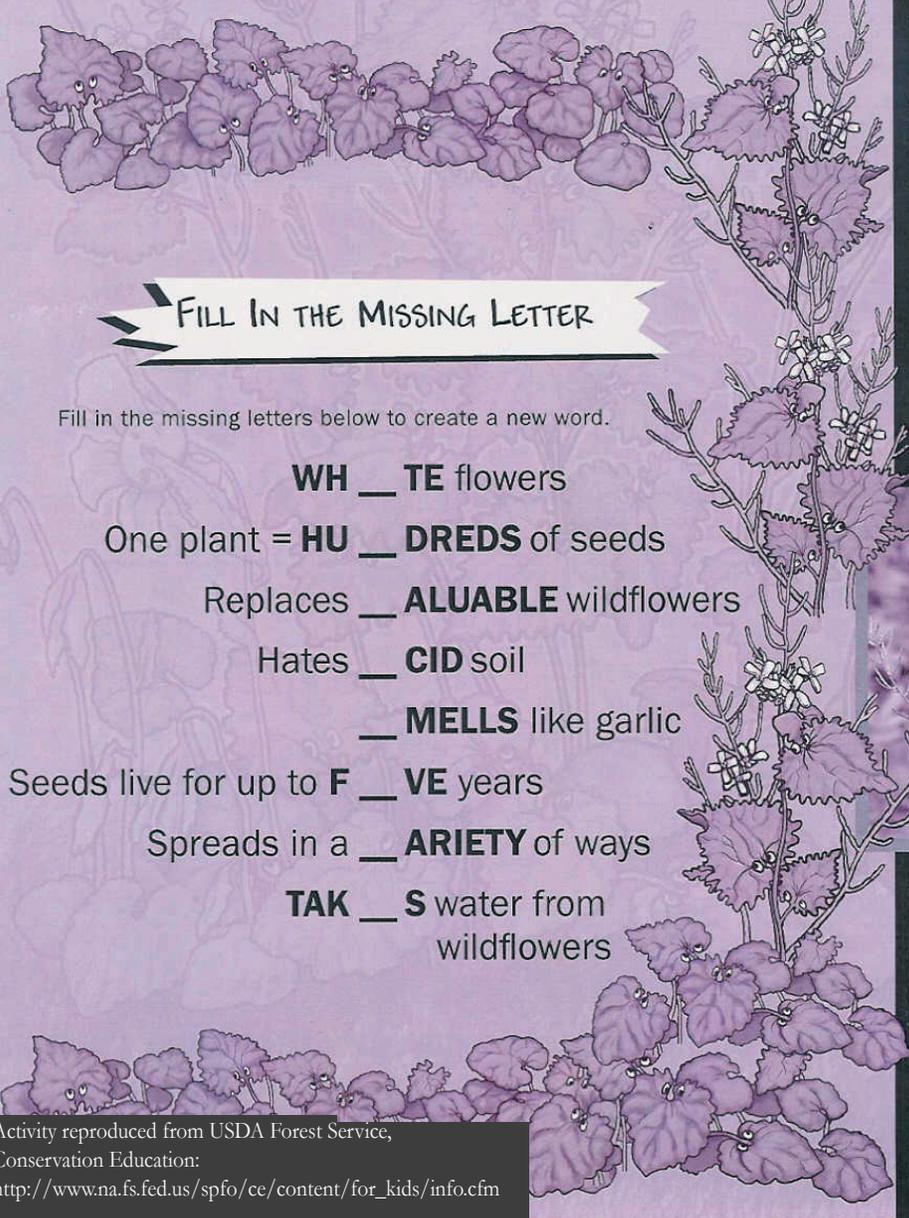


Lurkers Going Berserk
PUBL-FR-365 2006

8

A GREEN CARPET THAT SMELLS LIKE GARLIC—YUCK!

DO YOU LIKE THOSE PRETTY SPRING WILDFLOWERS? Hey, hey you won't see many once I get going. I spread all over, taking water and sunlight so those wildflowers cannot survive. Just one of me can produce hundreds of seeds that can live for at least five years in the soil, waiting for just the right time to start growing. A green capsule called a silique busts open, shooting my many seeds for several meters. My name comes from the fact that when you crush my stem or leaves, ouch!, I smell like garlic and my leaves look like those of the mustard plant.



FILL IN THE MISSING LETTER

Fill in the missing letters below to create a new word.

WH _ TE flowers

One plant = **HU _ DREDS** of seeds

Replaces **_ ALUABLE** wildflowers

Hates **_ CID** soil

_ MELLEs like garlic

Seeds live for up to **F _ VE** years

Spreads in a **_ ARIETY** of ways

TAK _ S water from wildflowers

DID YOU KNOW?

Origin: Europe; brought to North America by early settlers who thought the plant had medicinal uses; for use in cooking.

Scientific Name: *Alliaria petiolata*

Habitat: Field and forests from northeastern and midwestern United States. From Canada to South Carolina and as far west as Colorado and Utah.

Description: Garlic mustard grows to about 12 to 48 inches tall. When crushed, the leaves and stems smell like onions or garlic.

Amazing Adaptation: Garlic mustard seeds travel from place to place on humans and on the fur of animals such as deer, horses, and squirrels. This invasive weed is replacing native woodland wildflowers and endangering the animals that use native plants for food.



PREVENTING THE SPREAD

Avoid walking through infested areas. If you do notice weed seeds, remove from clothing, shoes, car, tires, and hiking gear. Mowing in the spring when the flowers are in bloom will stop seeds from forming and prevent the spread of garlic mustard.

Activity reproduced from USDA Forest Service, Conservation Education:
http://www.na.fs.fed.us/spfo/ce/content/for_kids/info.cfm

GARLIC MUSTARD





Reading Rangers

Read a book and plant a tree with the Iowa Department of Natural Resources for Earth Week 37 & Arbor Day 2007!

We know that planting trees is a lot of fun for kids and teachers alike, yet it may not be possible for your class to plant a tree this Earth/Arbor Day due to space limitations on school grounds, or time constraints for classroom activities. In response to the need for new trees, and the knowledge that classes may not have enough time to plant their own trees personally, the Forestry Bureau of the Iowa Department of Natural Resources (DNR) has developed a program called Reading Rangers.

The Reading Rangers program offers trees to be planted by DNR foresters in state forest and wildlife areas in exchange for students reading nature related resource publications. These nature publications may be either books or magazines, as long as their subject matter relates to our natural environment. The DNR will plant a tree for each student who reads a minimum of 20 pages of a nature-related resource publication during Earth Week (April 21-28). That's right! If someone reads 200 pages, we'll plant ten trees in return! You may read one 200-page book or ten 20-page books, but as long as you meet that challenge, the DNR will meet your pages with a freshly planted tree!

Send us the names of your students (see form opposite) who read nature related publications during Earth Week and the number of pages they each read, and we'll plant the trees and send the class a Reading Rangers certificate of appreciation. Check out a listing of books and other resources on the inside cover of this booklet.

Thank you for your support of the Trees for Kids and Reading Rangers programs! We hope you and your students enjoy learning the value of trees in our environment!

Please mail your record sheets to:



Trees For Kids - Reading Rangers
IDNR - Forestry Bureau
Wallace State Office Building
Des Moines, IA 50319-0034

Are you curious to how Emerald Ash Borer was introduced into the United States. Use your imagination with this fun, interactive play, and learn how Emerald Ash Borer became famous!



A Night at the Victors!



Characters

Announcer: If possible, dress up in suit and tie or evening dress. Try to talk with a “Hollywood” voice.

Emerald Ash Borer (EAB): Wear cape and headpiece over black pants and either black, magenta, or purple top. At the beginning, speak very timidly, but gain confidence as the speech progresses.

Setting

An “Oscar-like” stage with a podium and microphone would be ideal. Do what you can with what you have! You’ll need an envelope with a slip of paper inside. Use the included trophy as the “Victor.”

Script

Announcer: Ladies and gentlemen, boys and girls, welcome to the Victors, a night of glamour and glitz, an event to remember! Tonight we will honor the most successful plants and animals in North America. Living species that have demonstrated their abilities to outcompete, outlive, and outlast all others!

Without further adieu, let us commence.

In the category of *Most Invasive Forest Insect Pest*, the nominees are....

*Gypsy Mother for its role in defoliating trees since 1869.

*Emerald Ash Borer for its role in turning ash trees into firewood in Michigan, Ohio, and Ontario and threatening ash trees across the Midwest.

*and Asian Longhorn Beetle for its inspiring New York comeback after being ushered off the stage in the Midwest.

(open the envelope)

And the winner is.....Emerald Ash Borer!

(pause)

And the winner is.....Emerald Ash Borer!

(pause, look around)

Where is that EAB hiding now? Maybe a drum roll will draw him out of the woodwork!

The Emerald Ash Borer!

(EAB peeks from around corner and sheepishly approaches the podium.)

EAB: I just really don’t know what to say. I really never expected (or wanted) this kind of recognition.

But since I’m here...(chuckles nervously), I’d like to thank my mother, Emmy. She did a great job of picking a delicious healthy ash tree to nourish me and my other 75 siblings. But to be honest it really wasn’t that hard of a job. This country is full of ash trees. Why, chances are good you have a beautiful ash tree right in your own yard. And, of course, I’d like to thank the ash tree that nourished my brother and sisters and me. What a sacrifice for my future that tree made! May her soul rest in peace....(bow head reverently).

But most of all, I’d like to thank *people!* Without people, emerald ash borers would still be stuck in Asia plagued by natural predators and diseases. But you brought us here to America, the land of opportunity. I know, I know, you didn’t *mean* to bring us, but I just want to say a big thank you on behalf of myself and emerald ash borers everywhere. And now that we are here, you folks are just being great about helping us advance our careers. You’ve given us free rides to Ontario, Ohio, and Illinois. We’re really looking forward to moving into Iowa. We hear that Iowa has ash trees everywhere-backyards, front yards, streets, parks, forests. We’ll be waiting for the big break, but in the meantime thank you for this wonderful award.

Announcer: Well, it looks like we are out of time. The rest of the awards will have to wait until next week when we will be honoring the most successful plant. It looks to be a close contest between garlic mustard and buckthorn, but there are some recent starts appearing in their first forests that might take the prize. Until then, good luck and good night.

Saga of the Emerald Ash Borer

Basketmaking is a very traditional Native American craft. However, over many years, this popular craft is facing many issues that may cause it to no longer be in existence. Native Americans create many different artworks including beadwork, clothing, and jewelry which are all part of dress and decoration. However, basketmaking was a tool of living for many Native Americans. There are various uses for basketmaking: transporting food or other items, cooking, serving food, containers for gathering and harvesting, and storing. Many of these baskets were lightweight and easy to transport from one place to another. With today's growing technology, the availability of cheap kitchen and storage containers have taken the place of many of the baskets created by Native Americans.

In order to make a basket, there is a traditional process that is followed. First, plant materials are gathered at specific times of the year, depending on what plant is being used. This helps to ensure that the quality of the product being used will be the greatest. Each of the materials must be prepared in a traditional manner using natural materials for patterns and dye. For southwestern and California baskets, the natural materials require the Native Americans to travel long distances. After traveling the long distances, they dig the plants roots, cut shoots, branches, canes, and seed pods. Sometimes it takes just as long if not longer to grow the needed materials for the baskets as it does to make the baskets. There are some places where the Native Americans are not allowed to go to get their materials. To become a traditional basketmaker you need many years of learning technical skills as well as learning where the plants grow, how to identify them, what parts to take when, and preparation of plants.

“I was born in the north woods of northern Michigan, raised in lumber camps, where my father worked and our family stayed all winter, so I got very little education except nature. When my mother put me off her lap, so she could work at her baskets, she gave me some scap material to play with--that's how I learned to make baskets. I make only authentic Indian baskets, as my ancestors made. I work in my kitchen, after the splints are off the log, using only a sharp knife and a pair of scissors. I used black ash only. This is more of a hobby for me, I do not make a lot of baskets, perhaps 15 a year, and I only make them on order, which I never catch up with.” --Edith Bonde, 1975 letter Smithsonian Institution



Many of the places where these plants once grew in great abundance are now are very hard to find. They are plowed under, built over, or fighting for space and area to survive. Many of the plants are also battling pollution problems. An issue that is becoming of an increasing problem is invasive species. One invasive specie that is becoming a threat to ash trees in North America is Emerald Ash Borer. Ash trees, especially Black Ash, are used by northern Native wood-splint basket weavers. The Ash is useful for making baskets because it is lightweight but sturdy to carry and store various items in. Many basketweavers can no longer continue to make their baskets due decrease in land where plants can be found, pollution, and invasive species.

If you were a Native American who depended on this species of tree to make a living? How would it affect your daily life? What would you do in order to make sure that these trees are protected so that your way of life can be protected?

Visit the following website to learn how to paper weave to understand the process of weaving. Be creative, and make the paper weaving represent who you are!!

<http://www.teachervision.fen.com/american-colonies/lesson-plan/3259.html>

1. Read “Unwanted Pest! Emerald Ash Borer Alert!”

2. Visit the following websites to help answer the questions below:

- <http://www.kstrom.net/isk/art/basket/baskmenu.html#buttons>
- <http://emeraldashborer.info>

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 Native American communities?*

4. *Will all Native American 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 Europe 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 a few cases that have been found in Michigan's lower peninsula and northeastern Indiana and northwestern 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 it 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.

Trees for Kids 2007, Iowa DNR



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

1) Investigate how humans have reintroduced some wildlife species into their original habitat where the species have previously become extinct. Have them distinguish some differences and similarities between re-introductions and non-native species.

Evaluation

Identify three native aquatic plants and animals in your area. Identify three exotic aquatic plans and animals that exist in your area.

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

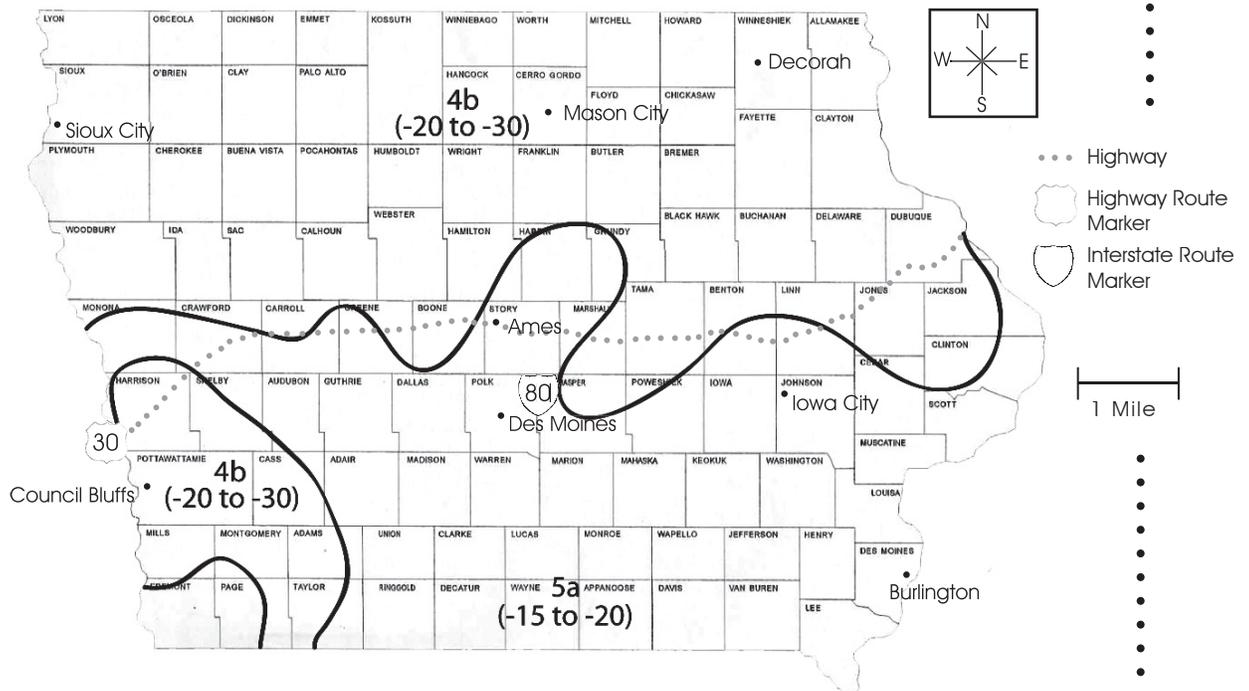
What You Can Learn From A Map!

Maps represent the earth's surface and are one of the primary tools used in geography for recording, interpretation and analysis. The formal definition of a map is a two-dimensional graphic representation of the spatial distribution of selected phenomenon.

Maps bring clarity to reading a large amount of information. A road map shows people how they can travel from one place to another. It also shows some physical boundaries, such as mountains and rivers; political features, such as States and counties; and populated places, such as cities, towns and villages.

Foresters use what is called a Hardiness Zone map. It shows the difference in extreme cold winter temperatures that determines whether a plant can survive in a given place.

Use this Iowa road map to answer the following questions.



1. What direction are you traveling if you go from Des Moines to Mason City?
2. Traveling from Council Bluffs to Des Moines takes you in what direction?
3. Can you find the scale of the map?
4. Can you find the symbol for an interstate route marker?
5. Can you find the symbol for a State highway route marker?

Recognizing that Highway 30 South/North is the line differentiating hardiness zones makes it possible for you to determine whether or not a tree or plant could survive the extreme cold temperatures. South of Highway 30 is 5A that is 15-20 degrees F below zero and north of Highway 30 is 4B that is 20 to 30 degree F below zero.

Once you have determined where Highway 30 is you can answer the following questions.

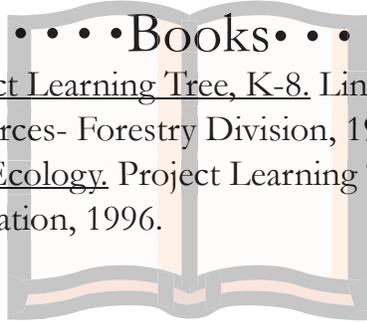
1. Can you plant a Red Bud a 5A tree in Decorah?
2. Why won't Shingle Oak a 5A tree grow in Sioux City?
3. Burlington is known for its diversity of trees. Why can 4B and 5A trees grow there?

1) no, because it will not be able to handle the extreme cold
 2) It is a 5A plant and the temperatures are too cold
 3) Burlington is in Zone 5A it can grow both Zone 4B and 5A plants/temperatures

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:

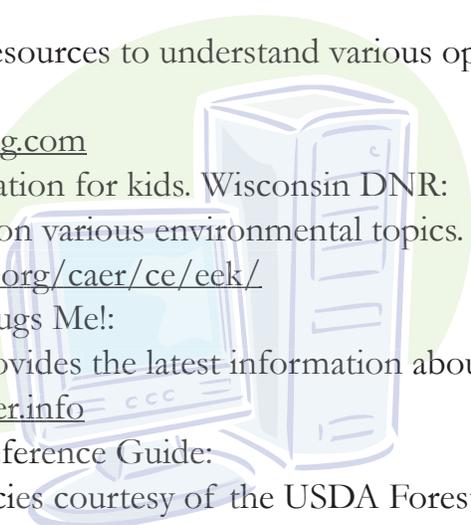
A free guide to invasive species courtesy of the USDA Forest Service.

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 (page 16-17)

Answers:

Section I.

- 1) Detroit, 2002 2) metallic, 1/2 3) 20 4) YES
5) tens 6) D

Section II.

Nuisance Species

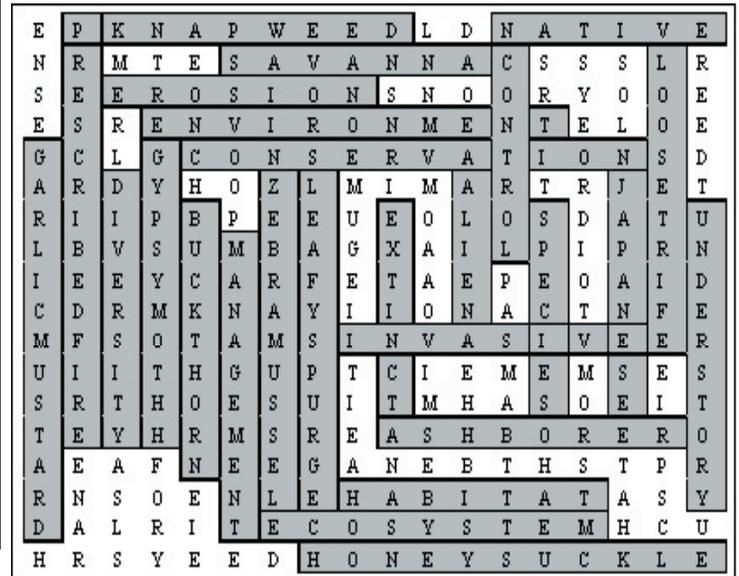
- 1) native 2) True 3) False 4) silver, Eurasian watermilfoil, naturally

- 5) brown trout, spotted, wipers, tiger

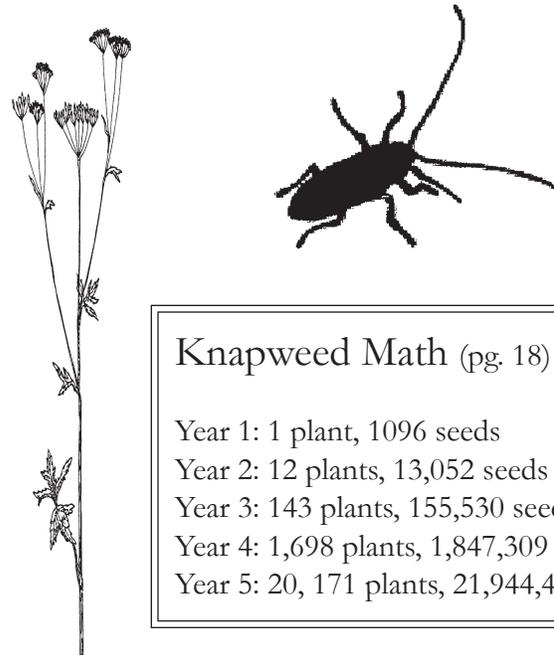
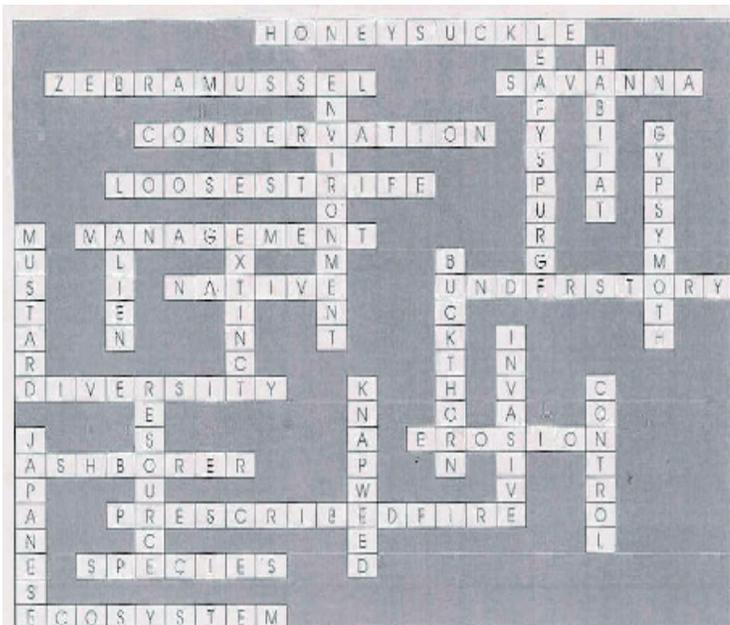
Zebra Mussel

- 1) Erie, 88 2) clam shells, 1/2 to 2
3) Asia 4) Yes 5) byssal threads 6) 30,000 , 70,000 , 700,000 11,432 , Davenport 7) plant, native 8) Yes

Invaders Word Search (pg. 12)



Invaders Crossword Answers (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

Start A Living Legacy



<http://www.iowatreeplanting.com>

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