

Lesson 6: Making Broader Connections

NUTSHELL

In this classroom lesson, students make connections between forests of Wisconsin and forests worldwide. Students discover how forestry and forest products affect the economy, society, and environment of Wisconsin by tracing the life cycle of a forest product and playing Forestry Jeopardy. Through a sustainability simulation, students learn how demand for forest products in Wisconsin affects forests worldwide. Finally, students examine challenges to Wisconsin's forests and discuss broader implications they may have.

ENDURING UNDERSTANDINGS

- Our worldwide economic system is based on resources — both natural and human. Wisconsin forests are part of this system. Changes in the use of Wisconsin forests may affect forests worldwide.
- As the human population continues to grow, demands on forest resources will increase. Maintaining forest ecosystems through sustainable forestry can help perpetuate ecological systems and ensure the delivery of goods and services to society over time.
- Challenges related to forestry will change over time. As new challenges arise, forestry professionals will need to respond. Examples of current challenges include fragmentation of forest lands, non-native species, threatened species, and endangered species.

ESSENTIAL QUESTIONS

- How does demand for forest products impact Wisconsin's forests?
- What challenges to Wisconsin's forests are also challenges worldwide?

OBJECTIVES

Upon completion of this lesson, students will be able to:

- Evaluate the impact of forestry and forest products on Wisconsin's economy, society, and environment.
- Predict how changes in the demand for and use of forests and forest products of Wisconsin may affect forests worldwide.
- Explain some of the current challenges in forestry and summarize how they will impact Wisconsin and world forests.

SUBJECT AREAS

Language Arts, Mathematics, Science, Social Studies

LESSON/ACTIVITY TIME

Total Lesson Time: 120 minutes (or 100 minutes and a homework assignment)

- Introduction.....10 minutes
- Activity 125 minutes
- Activity 220 minutes
- Activity 345 minutes
- Conclusion.....20 minutes

STANDARDS CONNECTIONS

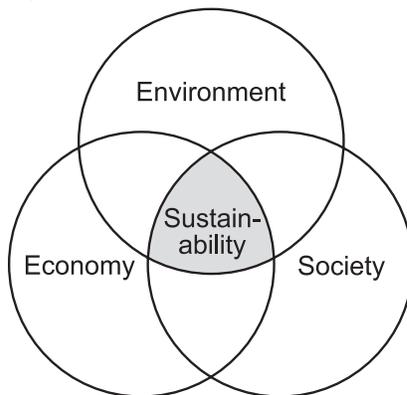
Standards for this lesson can be viewed online at the LEAF website (www.leafprogram.org).

BACKGROUND INFORMATION

Forestry practices and products in Wisconsin are closely tied to our state's economy, society, and environment. The economy is enhanced with jobs in the forest products industry, such as lumber and paper mills, and with related jobs in areas such as manufacturing, transportation, and sales. The sale of forest products such as furniture and lumber supports the economy; as does forest-based recreation and tourism. Society benefits from the forest industry in Wisconsin through economic inputs, jobs, recreational opportunities, and a forest-based culture. In many areas of Wisconsin, that includes activities such as hunting and making maple syrup.

Healthy, well-managed forests have environmental benefits such as wildlife habitat, water/air purification, erosion prevention, and wind/noise

barriers. Sustainable forestry is based on finding a balance between these three factors: economy, society, and environment.



Forests currently cover 47 percent of Wisconsin and contribute to a significant portion of our economy. Forest industries employ more than 65,000 people. This means that more than 13 percent of Wisconsin manufacturing jobs are in the forest products industry. In fact, forest industries are the largest manufacturing employer in 28 counties (of Wisconsin's 72) and second or third in an additional 14 counties. Since the early 1950s, Wisconsin has been the number-one papermaking state in the nation. Wisconsin also produces a significant amount of lumber and other wood products. These companies generate 20 billion dollars in products annually!

MATERIALS LIST

For Each Student

- Copy of Student Pages ✍️ **1A-B**

For the Class

- Two copies of each Student Pages ✍️ **2A1-2C2, Issues Mix-up (A-C)**
- Marker board or chart paper

For the Teacher

- Copy of Teacher Page 🎯 **1, Forestry Jeopardy**
- Copy of Teacher Key 🎯 **2, Issues Mix-up Key**
- One pound bag of M&M's, Skittles, or similar candy for Activity 2.
- Medium-size bowl for the candy

Our worldwide economy is affected by the state and supply of natural resources. As our population increases worldwide, the demand for forest products and the pressure placed on forests will increase. The demands placed on forests change over time in response to changes in society's needs. New trends in forest-based recreation or demand for products made from certain types of wood can and do alter how our forests are managed. If society favors certain types of wood that are not found in Wisconsin (mahogany, for example), the demand shifts to other areas of the world. If restricting tree harvest on large areas of forest became a priority in Wisconsin, we would need to get our raw material (trees) for paper and products from other areas of the world. Basically, we all use forest products, and they have to come from somewhere. The way forests are managed in Wisconsin has impacts not only on our state, but also in other regions of the world. Sustainable forestry will be key to maintaining forest resources worldwide.

VOCABULARY TERMS

Biotechnology: The use of living organisms, or parts of living organisms, to provide new methods of production, alter disease resistance, make new products, and find new ways to improve our quality of life.

Disease: An abnormal condition in a plant that affects its health, longevity, or economic value.

Endangered Species: A species that is in danger of becoming extinct.

Exotic Species: A species from a specific geographic region that has been introduced into an area outside of that region.

Forestry: The practice of creating, managing, using, and conserving forests for human benefit.

Fragmentation: The process of dividing forest into smaller patches of forest and non-forest land.

Invasive Species: A species that enters an area and causes harm by out-competing species that are already there.

Sustainability: The ability of natural resources to provide ecological, economic, and social benefits for present and future generations.

Threatened Species: A species that is likely to become endangered.

Many companies and individuals involved with forest-related products are making a commitment to sustainable forestry. They are using sound harvesting practices that yield a continuous supply of timber and protect ecological, social, and environmental values for the present and the future. New technologies also stretch the supply by chipping smaller trees and branches to produce pulp and engineered wood products (e.g., particleboard), burning sawdust at sawmills as a source of energy, and shaving large trees into thin sheets to make valuable veneers.

No one knows for sure what changes and challenges await us in the future, but science, technology, and education can help us prepare. Some of the issues and challenges facing forests today include biotechnology, disease, endangered/threatened species, fragmentation, invasive exotic species, and a large deer herd. All of these challenges affect the forests of Wisconsin and are factored into management decisions made about forests. As forest managers respond to these challenges, they must consider the implications for the economy, society, and environment. They also must be conscious that their actions will impact forests in other regions of the country and world.

The following six topics are explored by students in Activity 3. Background information is included here to serve as an additional reference.

Biotechnology

Biotechnology is the scientific manipulation of living organisms and includes cloning and genetic modification. Genetic modification changes traits of an organism by splicing a specific gene into the DNA of an individual. Biotechnology is used in many fields of science from agriculture to human health. Biotechnology is a controversial topic. It is a growing field of study that has potential benefits for humankind and our environment. Tree improvements from biotechnology can include increased growth rates, straighter trunks and fewer branches, higher wood quality, and disease resistance. There could be economic benefits from the introduction of biotechnology to forestry, including lower costs and increased availability of wood and wood products. Some people are concerned that trees engineered for faster growth or resistance to pests and disease will out-compete other plants and trees in the race for sunlight, water, and nutrients. In response, some scientists say genetically modified trees are not meant to be planted in natural forests; they're designed for use only in intensively managed plantations. Others believe that genetically modified plantations will replace natural forests. This could decrease biodiversity, watershed services, natural animal

habitat, and local resources for wood, food, and medicine. Cellulose from trees is increasingly being used as filler in food products. One concern is that modified material could affect humans negatively.

Three agencies are primarily responsible for regulation in the United States — the United States Department of Agriculture (USDA), the Environmental Protection Agency (EPA), and the Food and Drug Administration (FDA).

Disease

The study of forest **disease** is called forest pathology and is one of about 40 scientific disciplines that make up forestry. Viruses, bacteria, fungi, parasitic seed plants, or nematodes can cause disease. Disease in trees can be triggered by stress to trees from too much or too little water, heat, light, minerals, soil compaction, cutting or breaking of branches or roots, etc. Disease can be spread in a variety of ways. Oak wilt, for example, can spread to new locations by sap-feeding insects that are attracted to wounds on oak trees. It can also be spread by contact among root systems of adjacent trees. Different oak trees are affected in different ways. Some noticeable symptoms include wilting or discolored leaves, leaves falling off early in the growing season, portions of the tree dying off, and abnormal growths called galls or cankers.

Trees don't always die from the effects of disease; sometimes tree growth is stunted because of reduced photosynthesis, inhibited water uptake and transport, and interference with mineral absorption. The effects of disease can affect entire populations of trees. Exotic invasive diseases such as Dutch elm disease and butternut canker have devastated their host tree species because native tree species lack genetic resistance to these diseases. Healthy forests are maintained through genetic, species, and ecosystem diversity. A large area containing trees of the same species can be completely wiped out by disease. Elm and butternut are no longer available as raw product for the timber industry because they have been nearly eliminated by disease. Diversity ensures there are resistant species that can survive.

Reducing the impact of disease is important to ensure the supply of economically important trees. Although disease has always been a natural agent in forests, new diseases have spread faster due to the introduction of pests from other parts of the world by humans.

Endangered/Threatened Species

An **endangered species** is any species of plant or animal defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range. A **threatened species** is a species likely to become endangered. As of 2005, there were 58 endangered or threatened species in Wisconsin, with an additional 94 considered at risk. The loss of a forest species can affect ecosystem functions such as pollination and nutrient cycling and result in changes in forest composition.

The exact role of any given species is usually not known. Though some threatened and endangered species do not live in the forest, forests may indirectly affect them. For example, if trees are unable to hold soil and prevent erosion, soil can wash into a stream or river and affect the species that live there. Altering the way forests are managed can provide species extra protection. Avoiding logging in sensitive areas or using cutting practices that favor certain habitat types can benefit certain species. Some endangered species, like the Karner blue butterfly, benefit from openings created by logging. They feed on wild lupine flowers that grow in grassy, partly shaded areas. Although extinction is a natural process, current and projected rates of extinction worldwide have accelerated in recent years due to human impact. Not everyone agrees on the importance of endangered species. Some are concerned about potential consequences, including the failure of ecological systems to function properly. Others are not very concerned about the potential loss of species, reasoning that many of species are of little importance to humans. They also feel that protection measures interfere with human resource use and are expensive to maintain.

Fragmentation

Fragmentation describes the effect of a large area being broken into small islands of forest. For example, a large forested area could be interspersed with agriculture, development, and/or roads. There are varying degrees of severity. A hiking trail is an example of forest fragmentation, yet impact is minimal. Higher impact comes from a paved road or highway. Fragmentation occurs when new areas are developed for human use. Another typical example of fragmentation occurs when a landowner subdivides a larger tract of land into a number of smaller parcels. In Wisconsin, the average size of forest land ownership has decreased over time. When forested areas become divided, pieces are owned and managed by different people. Not all people want the same outcome for their piece of the forest. This affects the natural ecosystem and cycles that occur in forests. There is also concern because animal migration and habitat is affected when large forest areas are broken into smaller pieces. It is possible that genetic diversity can decrease when areas become fragmented. If seeds no longer move between areas because of barriers like roads and fields, certain populations may become isolated. A loss of genetic diversity could mean lowered resistance to disease and pests. Bird biologists suspect that many woodland birds are harmed by increasing their susceptibility to predation. Predators such as jays, crows, raccoons, and cats typically are not abundant in extensive forests. But when a forest is fragmented, predators gain more access to the woodland. Fragmentation also decreases the area that can be harvested for timber use because more land is developed and used for other purposes. Extreme fragmentation may limit the resources available to meet the demands of a growing population.

Invasive/Exotic Species

An **invasive species** is one that enters an area and causes harm by out-competing the species already there. An **exotic species** is one that has been introduced from another country or geographic region to an area outside its natural range. Exotics are not inherently harmful to native species, but some can become invasive.

Invasive species can include insects, diseases, and plants. Human activities such as trade (with other countries and states), travel, gardening, and recreation have resulted in the accidental and intentional introduction of many species that are damaging to forests. Exotic insects and plants (gypsy moth and garlic mustard, for example) sometimes have the advantages of few competitors and natural enemies; their populations build to very high levels that kill and displace native tree and plant species.

The loss of native species has changed the structure and reduced diversity of many of Wisconsin's forest ecosystems. The loss of shrubs and herbaceous plant species causes a reduction or loss of many insects, birds, rodents and the predators that feed on them. Recreational opportunities are lost and the commercial camping industry loses money due to high gypsy moth populations that many people find unattractive. Gypsy moth defoliation also reduces the oak acorn crop for several subsequent years. Consequently, natural reproduction is reduced, and animals that depend on acorns for food decrease in number. The loss of oak shade trees also reduces residential property values. Millions of dollars are spent annually by government and private sectors to control gypsy moths, garlic mustard, buckthorn, and other invasive species.

Large Deer Herd

Deer are large herbivores that eat large quantities of plants and browse on woody vegetation. They primarily eat the leaves, twigs, and shoots of young trees, shrubs, and wildflowers. When foliage gets nipped back, the plant's energy reserves are cut into, and successful reproduction is reduced. Too many deer can strip forests of entire species of plants. In many areas, the forest has been over-browsed and the diverse layers are gone. Where browsing is heavy enough to alter or eliminate forest floor vegetation, a variety of plants, ground-dwelling animals, and soil organisms are affected. Animals that depend on certain plants for habitat and food that are affected by deer include small mammals, insects, reptiles and amphibians, and birds. There has been significant impact on rare, threatened, and endangered plant species as well. Rare orchid and lily populations have been documented casualties of deer herbivory. The deer population is limiting the re-establishment of some forest species, drastically changing the composition of the forest. In urban areas, deer eat plants and ornamental shrubs. As a herd approaches the habitat's carrying capacity (the maximum population of a species that can be supported in a given environment over time), deer mortality increases, reproductive rates decrease, and herd health suffers.

PROCEDURE

Introduction - Forest Product Connections

1. Have students name some things in the classroom that are forest products. (*Wooden desks, tables or chairs, pencils, paper, books, boxes, etc.*)
2. Choose one product and ask students to try to think of all the steps involved in turning it from a tree to the product we have today. Write these on the board or chart paper.

(Some very basic ideas they may suggest are that the tree needs to be cut down, cut into pieces, hauled to a mill, processed at the mill, packaged, shipped to a distributor, shipped to a retail store, put on a shelf and sold by someone working at the store.)

3. Go back through the list and have students identify jobs associated with each of those steps (*e.g., truck driver, logger, sawmill operator, plant manager, sales associate*).
4. Next, have students name jobs/industries supported by each of the jobs they just named (*e.g., the truck driver supports gas stations, mechanics, road construction workers; the sawmill operator supports machinery sales, transport, maintenance, etc.*). Ask if any resources besides forest resources are involved. (*Yes; water, petroleum, electricity, etc.*) Remind students that there are jobs associated with each of those resource industries as well. The jobs that were discussed are examples of the way the forest products industry in Wisconsin is tied to the economy and society.
5. Take the discussion one step further and have students think of any environmental impacts that may come from the creation of your product example. Be sure to focus on what could be considered both positive and negative impacts. (*Animals may have lost their home when the tree was cut. Animals may have found a home or food source with the new plant growth that replaced the tree cut down. Trucking may cause pollution due to the burning of fossil fuels. Byproducts from the mill (e.g., wood chips, sawdust) can be used as biofuel.*) Tell students that in this lesson, they will do a series of activities to help them understand how the use of Wisconsin forests affects forests worldwide.

Activity 1 - Forest Jeopardy

- Write the words “economy,” “society,” and “environment” across the top of the board as headings. (Later, you will be writing dollar amounts under the headings for the Forestry Jeopardy game.)
- Hand out Student Pages  **1A-B** to each student, and have them study the collages. Tell them that they will be playing Forestry Jeopardy, and that all of the answers come from the collages. Their time to look at the collages is limited, and they will be asked to put them away when the game starts. Remind them as they are reading to focus on parts of the collages that relate to the headings you wrote on the board.
- While students are studying the collages, create the Forestry Jeopardy game on the board. Under each heading, write \$200, \$400, \$800, \$1,000 in a vertical row. Create a place to keep score for teams A, B, C, and D.
- After about 10 minutes, have students put Student Pages  **1A-B** away so they can no longer be seen. Divide the class into four equal groups. They will be teams A, B, C, and D.
- Explain the rules as follows: A question will be read to determine which team goes first. The team with a guess closest to the correct answer will go first. That team then gets to choose a category. The teacher will read a question (from Teacher Page , **Forestry Jeopardy**) under the lowest dollar amount available. Unlike Jeopardy on television, the dollar amounts cannot be chosen randomly; they must be chosen from smallest to largest. (Don't forget to cross off or erase the dollar amounts as they are used up.) The teacher will then read the answer under the correct heading and dollar amount. The first person on any team to raise a hand should give the answer in the form of a question. Once a hand goes up, an answer must be given immediately. If teams want to discuss their answers, they must do this before someone raises a hand. An example answer and question might be “(Teacher:) ‘The process that occurs in the chloroplasts of a plant using the sun’s energy.’ (Student:) ‘What is photosynthesis?’” If correct, the team scores the dollar amount. That same team then gets to choose another heading. Incorrect answers lose the dollar amount and other teams get to answer. Continue until all of the dollar amounts have been used up. The team with the highest dollar amount at the end wins.
- The question to determine which team goes first is, “Approximately how many acres of urban forests are in Wisconsin?” The answer is 2.2 million. Each team should give an answer, and the one with the closest guess goes first.
- After the game of Forestry Jeopardy, tell students that they have just had a great review of the effects of the forest industry and forestry products on Wisconsin’s economy, society, and environment. Remind students that these effects can and will change over time. One reason for this change is due to shifts in demand. Ask someone to define demand. (*Demand is the state of being wanted or sought for purchase or use.*) Tell students that the next activity will help to illustrate how changes in demand might affect Wisconsin’s forests.

Activity 2 - Sustainability

- Place 30 M&M's (or Skittles or something else relatively small) in a bowl in the front of the classroom. Non-edible items like plastic chips or marbles could be substituted as long as you have two different colors. Make sure all of the candy pieces are green for the first few rounds. Choose five volunteers. Have them stand about one giant step away from the bowl of candy. Explain that when you say "GO," they may step forward and take one piece of candy. They must then step back and transfer that piece to the other hand before stepping forward to take another piece. The goal is to take as many pieces as they can in a five-second period.
- On the board/chart paper, make a table to keep track of data from the activity. List the number of pieces of candy in the bowl at the beginning and end of each round across the top and the number of the round (1, 2, 3, etc.) going down. For Round 1, the starting number is 30.
- Explain that the demand for candy can be compared to the demand for trees in Wisconsin. Ask how this activity was like the early logging days in Wisconsin. (*Lumber at that time was in high demand and in many cases loggers just kept cutting until all the trees were gone.*) Ask what could have been done differently to keep the trees and candy from running out so soon. (*Everyone could take fewer pieces of candy. Fewer trees could have been cut each year and more replanted as they were cut.*)
- Ask students to calculate the ideal number of pieces each student should take to maintain the supply at its starting level. To start, give students the following equation:

$$\frac{30 - X}{2} + (30 - X) = ?$$

Tell students that "X" equals the total number of pieces that all five students can take.

Explain that inserting a number for "X" will give them an answer for "?," which is the starting number for each round. Have students write down the equation and insert the total number they think the five students can take for "X" and solve the equation. Now remind students that the ideal number they want for the start of each round (?) is 30. If the answer they came up with was higher than 30, they need to choose a smaller number for "X" and try it in the equation. If the number they came up with was smaller than 30, they need to choose a larger number for "X" and try it in the equation. Encourage students to try different numbers for "X" until they come up with 30 for "?" (*The answer students should come up with is 10.*)

Sample Diagram

Round Number	Beginning Number	Ending Number
1	30	
2		
3		
4		
5		

- Time the first group of students for five seconds. Count the number of pieces of candy remaining in the bowl. Write this as the ending number for Round 1. For every two pieces of candy that remain, place one more in the bowl (e.g., if 10 are left, add 5 for a total of 15. This will be the starting number for Round 2.) Now select five more volunteers, and repeat the procedure. Continue until no candy remains or until all students have had a turn to grab for candy. (It's more likely the candy will run out first!)

Now ask how many pieces each of the five students can take. (*Two pieces — if each of the five students takes two from the original bowl of 30, 20 would remain. You would add 10 to this, so the starting number for the next round would again be 30.*) Explain that doing it this way means that there would be a constant supply for as long as you kept the activity up. If you manage forests in a similar way, it is called “sustainable forestry.” With sustainable forestry, the annual harvest of trees should not exceed the annual growth of trees present.

6. Ask students if they want more candy. (*Most likely they will say, “Yes!”*) Have five new volunteers stand about one giant step from the bowl. Make sure there are 30 green pieces of candy in the bowl. Tell them that they can have more candy, but the green pieces must only be used in a sustainable way. That means only two per person. Add 30 red pieces of candy to the bowl. Begin the activity as before, with students stepping up, taking a piece, stepping back, transferring to the other hand, and so on for five seconds.
7. Write the number of green pieces and red pieces on the board. (Green should be 20 if everyone followed directions.) Explain that since the demand for candy continued, and you wanted to ensure the green was used sustainably, a new color of candy had to be used. Relate this to forests. Explain that the green candy represents forests in Wisconsin and the red candy represents forests in other parts of the country or world. Ask students if they think the use of forests and demand for forest products in Wisconsin will increase or decrease over time. If students have trouble with this, remind them that population

is increasing over time. (*Demand will likely increase.*) Tell students that even with increasing demand, we can manage forests of Wisconsin sustainably, but it might mean using trees from other areas of the country and world. Also, remind students that not all forest products we use are made from Wisconsin trees. Some kinds of trees, like the cork oak that cork comes from, do not grow in this region of the world. That means even if we manage Wisconsin forests sustainably, we still depend on other forests of the world. There are also people outside of Wisconsin dependent on the types of trees and products (like paper) that come from Wisconsin.

Activity 3 - Issues Mix-up

1. Ask students if they think demand for products is the only factor that affects the sustainability and growth of Wisconsin forests. (*No.*) Have students suggest other factors that affect Wisconsin forests. (*Recreation use, storms, wild animal populations, growth/sprawl of development, disease, pests/insects, etc.*) Explain that there are many issues facing forest managers today and that through the next activity they will learn more about them.
2. Divide students into six equal groups. Give two groups Student Pages **2A1-2, Issues Mix-up (A)**, two groups Student Pages **2B1-2, Issues Mix-up (B)**, and two groups Student Pages **2C1-2, Issues Mix-up (C)**. Tell students that they are to read the facts and place them under the appropriate topic. As each group finishes, have them bring their Student Pages to you to correct using Teacher Key **2, Issues Mix-up Key**. Any incorrect answers should be placed under the correct topic.

3. Re-assign each group a different topic and have them write a paragraph about the topic using all of the facts. Encourage students to be creative in arranging the facts and adding to the sentences as needed so the paragraph makes sense. (It is not intended that students simply rewrite the sentences in the order they appear.) Make sure students are aware that when all the groups are finished writing their paragraphs, they will be reading them to the rest of the class.
4. Have each group read their paragraph to the rest of the class.

EXTENSION: Have the groups do further research on their topic via the Internet or library before presenting to the rest of the class. Students could be encouraged to present their information in a creative way (e.g., poem, story, collage, PowerPoint presentation, skit).

Conclusion - Issues Writing

Have each student choose one of the topics from Activity 3 and write out answers to the following questions to be handed in (this could also be given as a homework assignment):

- How does (topic) affect the economy of Wisconsin?
- How does (topic) affect Wisconsin's society (people)?
- How does (topic) affect the environment in Wisconsin?
- How might other forests in the United States and world be impacted due to (topic)?

You may want to have copies of the answer key with facts about each topic available or post them in the room for student reference.

Acceptable answers should be based on the facts for each topic in the answer key and class discussion. Encourage students to think creatively and use the forestry knowledge they learned in other lessons.

CAREERS

The career profile in this lesson features Dave Kazmierczak, Product Developer at Marion Plywood, and is found on page 121. A careers lesson that uses this information begins on page 170.

SUMMATIVE ASSESSMENT

1. As an alternative homework assignment for the Conclusion, have students research other challenges affecting Wisconsin's forests. Have students explain the economic, social, and environmental connections involved with the challenge they choose, and also have them relate it to forests worldwide.
2. Explore challenges facing forests worldwide by doing a research project and explaining why they do or do not affect Wisconsin forests.
3. Have students explain how sustainable forestry can help meet the challenges affecting Wisconsin forests. This could be done in a creative presentation such as a collage, PowerPoint presentation, report, song, etc.

**"A nation that destroys
its soils destroys itself.
Forests are the lungs of our land,
purifying the air
and giving fresh strength
to our people."**

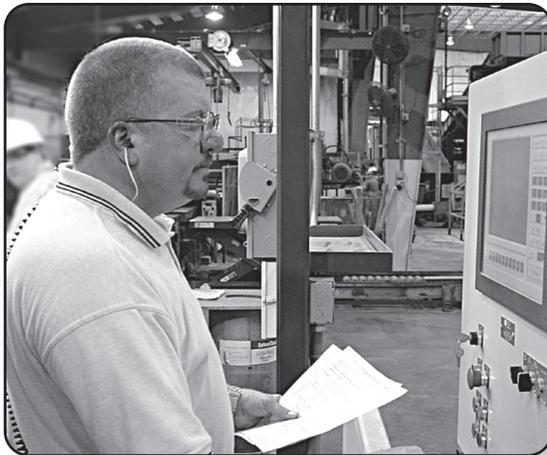
★ *Franklin D. Roosevelt* ★

Career Profile

Dave Kazmierczak, Product Developer

Meet Dave Kazmierczak. He works in product development at Marion Plywood Corporation in Marion, Wisconsin.

Dave works with customers to develop veneer and/or plywood products to meet their needs. The customers include companies that produce items such as hardwood flooring, skateboards, musical instruments, and even crutches. Once a product is agreed upon, Dave must teach the employees of Marion Plywood how to manufacture the veneer and plywood to the customer's specifications.



Dave uses computers to help him create new products.

Dave has a Bachelor's degree from the University of Wisconsin-Stevens Point. He majored in Forestry Administration and Business Administration and minored in Sales and Marketing.

An internship doing forestry fieldwork while Dave was in college also helped him gain valuable experience. Dave began working for Marion Plywood as a supervisor of the logyard. In that position, Dave worked to sort logs and prepare them for cutting in the mill. For his current position, Dave received on-the-job training and attended classes at UW-Madison.

Dave says his favorite part of his job is "meeting new customers and helping them find a product that best meets their needs. I also enjoy working with the employees and teaching them about veneer and the products that will be made from the veneer."

Dave recommends a strong background in science, mathematics, business, and accounting if you are interested in a job like his.

FORESTRY JEOPARDY

ECONOMY	SOCIETY	ENVIRONMENT
\$200	\$200	\$200
\$400	\$400	\$400
\$800	\$800	\$800
\$1,000	\$1,000	\$1,000

Economy Answers & Questions

- \$200**..... A: Wisconsin is number one in this industry in the nation for production.
Q: What is paper?
- \$400**..... A: A product made from the sap of Wisconsin trees.
Q: What is maple syrup?
- \$800**..... A: The number of people the paper industry employs in Wisconsin.
Q: What is over 60,000?
- \$1,000**..... A: A forest-based industry, other than products, that is important to Wisconsin's economy.
Q: What is recreation/tourism?

Society Answers & Questions

- \$200**..... A: The forest-based recreation that has increased in popularity recently.
Q: What is camping?
- \$400**..... A: At least two types of degrees that would help you get a job as a nursery manager.
Q: What is forestry or agriculture or horticulture?
- \$800**..... A: A way to manage forests and meet social, economic, and environmental needs.
Q: What is sustainable forest management?
- \$1,000**..... A: A forest pest you can help slow the spread of in Wisconsin.
Q: What is the emerald ash borer?

Environment Answers & Questions

- \$200**..... A: Relief that forests provide in the summer.
Q: What is shade?
- \$400**..... A: The gas that trees take in and convert.
Q: What is CO₂?
- \$800**..... A: Percent of forest land in Wisconsin today.
Q: What is 47%?
- \$1,000**..... A: A unique forest ecosystem found in cities in all parts of Wisconsin.
Q: What is an urban forest?

ISSUES MIX-UP KEY

ISSUES MIX-UP (A)

ENDANGERED/THREATENED SPECIES
1, 3, 5, 6, 8, 9, 10, 13, 16, 18

DISEASE
2, 4, 7, 11, 12, 14, 15, 17, 19, 20

ISSUES MIX-UP (B)

BIOTECHNOLOGY
3, 5, 7, 8, 10, 12, 15, 16, 17, 19

INVASIVE/EXOTIC SPECIES
1, 2, 4, 6, 9, 11, 13, 14, 18, 20

ISSUES MIX-UP (C)

LARGE DEER HERD
1, 3, 6, 9, 10, 12, 14, 16, 17, 20

FRAGMENTATION
2, 4, 5, 7, 8, 11, 13, 15, 18, 19

sustainable forest management, n.

1. the practice of meeting the forest resource needs and values of the present without compromising the similar capability of future generations.
2. the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality, and potential to fulfill, now and in the future, relevant ecological, economic, and social functions at local, national, and global levels.

Camping, a forest-based recreation activity, has shown an increase in popularity in recent years.

HELP WANTED

Logging Manager for Hartwood Industries

PURPOSE: To coordinate harvesting of raw materials for mill use. Ensures contract specifications are met, sets prices and regulates inventory.

- Plan and schedule production.

HELP WANTED

Nursery Manager for Tree Lion Corporation

PURPOSE: To manage nursery and seed orchard facilities for producing quality tree seedlings for reforestation.

DUTIES:

- Plan and schedule production.
- Hire, train, and manage performance of staff.
- Manage budget.
- Schedule and oversee agricultural practices (applying pesticides and fertilizer).
- Ensure compliance with environmental regulations.

QUALIFICATIONS:

- Extensive knowledge of nursery management.
- Knowledge of plant physiology, pesticides, and environmental regulations.
- Strong communication and interpersonal skills.

EDUCATION:

- Bachelor's degree in forestry/agriculture/horticulture or equivalent experience.

EXPERIENCE:

- 2 years supervisory experience
- 5 years agriculture experience

WORK ENVIRONMENT:

- Outdoor and greenhouse environment subject to elements of nature.

SALARY:

\$38,000 year w/benefits

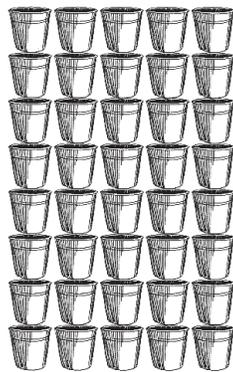
SLOW THE SPREAD!

The larvae of the invasive emerald ash borer kill ash trees! Any ash tree will do.

The borer can be spread by people moving infested firewood. Please purchase your firewood near where you plan to use it. Use all of your wood or leave it behind.

Help slow the spread of the emerald ash borer!

It Takes About 40 Gallons of Sap to Make Just One Gallon of Pure Maple Syrup!



April 23, 2002

Journal Sentinel

SPLINTER-FREE AND THE WORLD'S LARGEST ROLL

Green Bay, WI – Northern Toilet Paper, It's Splinter-free! was a major sales pitch for Northern Quilted Tissue in 1935. Would it have gotten your attention? It is more than likely this advancement in toilet paper technology raised a few eyebrows. You can learn more about the history of toilet paper and see the world's largest roll, standing five feet

high and seven feet wide and weighing 2,000 pounds, at a new exhibit in the Neville Museum. Why all the fuss? Northern Quilted is celebrating its 100th anniversary.

This is just another reason for Wisconsin to applaud its paper industry, which has been number one in the nation for 50 years. Why Wisconsin? It has the resources needed

for making paper. This includes not only the trees, but also rivers supplying water necessary for the papermaking process.

The paper industry employs over 60,000 people in Wisconsin and produces \$13.8 billion of paper annually — so why not celebrate one of the products we use every day — toilet paper!

"Wisconsin's forests are ecological, economic, and social treasures. Wisconsin's forests provide the raw materials for the forest products industry and the setting for the recreation/tourism industry, both important elements of our state's economy...."

~ Gene Francisco ~
Former Wisconsin Chief State Forester

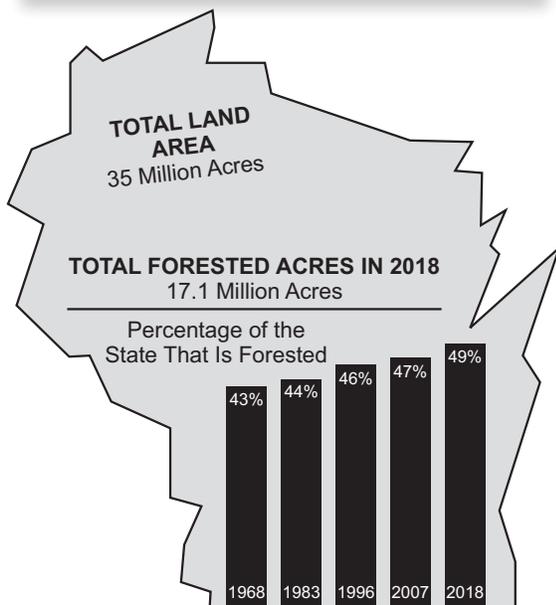


\$139.99

Coronado Bench

Seat Lifts for Additional Storage
Solid Pine • 47½"W x 20¾"D x 35½"H
While Supplies Last

Whittle Wood Products
Hayman, Wisconsin



WHAT IS AN URBAN FOREST? It is all of the trees and other vegetation in and around a town, village, or city. It includes trees in home landscapes, schoolyards, parks, riverbanks, cemeteries, vacant lots, and anywhere else trees can grow. Shrubs, flowers, vines, ground covers, grass, and a variety of wild plants and animals are also part of the urban forest. Streets, sidewalks, buildings, soil, topography and, most importantly, people, are an integral part of the urban forest. The urban forest is, in fact, an ecosystem.

Student Page 1B

ISSUES MIX-UP (A)

INSTRUCTIONS:

- A) Read the numbered statements below.
- B) Decide which topic (endangered/threatened species or disease) applies to each statement.
- C) Write the number of the statement in the correct topic box.

ENDANGERED/THREATENED SPECIES

DISEASE

1. Though some threatened and endangered species do not live in the forest, forests may indirectly affect them. For example, if trees are unable to hold soil and prevent erosion, soil can wash into a stream or river and affect the species that live there.
2. To meet the increasing demand for timber supply, intensive forest management is practiced. One aspect of intensive forest management is the reduction of impact caused by disease.
3. As of 2005, there were 58 endangered or threatened species in Wisconsin. Many are forest species that live in or depend on forests for food and shelter.
4. Healthy forests are maintained through genetic, species, and ecosystem diversity. For example, a large area containing trees of the same species can be completely wiped out by disease. Diversity ensures there are resistant species that can survive.
5. Some people are not very concerned about the potential loss of species, reasoning that many of the species are of little importance to humans. They may also feel that protection measures interfere with human resource use and are too expensive to maintain.
6. Although the exact role of any given species may be unknown, the loss of species could affect ecosystem functions like pollination and nutrient cycling.
7. Different trees are affected in different ways. Some noticeable symptoms include wilting or discolored leaves, leaves falling off early in the growing season, portions of the tree dying off, and galls or cankers.
8. Although not on the threatened and endangered species list, there are some forest ecosystems that can be considered rare in Wisconsin. These include oak savannahs and pine barrens that once existed in greater abundance.

ISSUES MIX-UP (A)

9. Any species of plant or animal defined through the Endangered Species Act as being in danger of extinction.
10. Altering the way forests are managed can provide species extra protection. For example, avoiding logging in sensitive areas or using cutting practices that favor certain habitat types can benefit certain species.
11. The study of forest disease is called forest pathology and is one of about 40 scientific disciplines that make up forestry.
12. Although it has always been a natural agent in forests, new ones have spread faster due to the introduction of pests from other parts of the world by humans.
13. Some endangered species, like the Karner blue butterfly, benefit from openings created by logging. They depend on wild lupine flowers that grow in grassy, partly shaded areas.
14. Elm and butternut are no longer available as raw product for the timber industry.
15. Diseases come from viruses, bacteria, fungi, parasitic seed plants, or nematodes. Problems can be triggered by stress to trees from too much or too little water, heat, light, minerals, soil compaction, etc.
16. Many people do not want species to become extinct. They are concerned about potential consequences, including the failure of ecological systems to function properly.
17. Trees don't always die from the effects. Often their growth is stunted because of reduced photosynthesis, inhibited water uptake and transport, and interference with mineral absorption.
18. Although extinction is a natural process, worldwide current and projected rates of extinction are much greater than would be expected without the effects of humans.
19. Exotic invasive diseases such as Dutch elm disease and butternut canker have devastated their host tree species because the native tree species lack genetic resistance.
20. Oak wilt can be spread to new locations by sap-feeding insects that are attracted to wounds on oak trees. It can also be spread by contact among root systems of adjacent trees.

ISSUES MIX-UP (B)

INSTRUCTIONS:

- A) Read the numbered statements below.
- B) Decide which topic (biotechnology or invasive/exotic species) applies to each statement.
- C) Write the number of the statement in the correct topic box.

BIOTECHNOLOGY

INVASIVE/EXOTIC SPECIES

1. Recreational opportunities and tourism dollars are lost due to the defoliation of trees by high gypsy moth populations. Many people find defoliated trees unattractive.
2. An exotic species is one that has been introduced from another country or geographic region to an area outside its natural range. Exotics are not inherently harmful to native species but those that are invasive can be.
3. Biotechnology is used in many fields of science from agriculture to human health and is a controversial topic.
4. The loss of native species has changed the structure and reduced diversity of many of Wisconsin's forest ecosystems.
5. Biotechnology is the scientific manipulation of living organisms including cloning and genetic modification.
6. Gypsy moth defoliation reduces the oak acorn crop for several subsequent years; consequently, natural reproduction is reduced and animals that depend on acorns for food decrease in number. The loss of oak shade trees also reduces residential property values.
7. Some people are concerned that trees engineered for faster growth or resistance to pests and disease will out-compete other plants and trees in the race for sunlight, water, and nutrients. In response, some scientists say genetically modified trees are not meant to be planted in natural forests; they're designed for use only in intensively managed plantations.
8. This is a growing field of study that has potential benefits for humankind and our environment. In addition to the traditional uses of wood products, cellulose from trees is being used in the chemical and pharmaceutical industries.

ISSUES MIX-UP (B)

9. Human activities such as trade (with other countries and states), travel, gardening, and recreation have resulted in the accidental and intentional introduction of many species that damage forests.
10. Three agencies are primarily responsible for regulation in the United States — the United States Department of Agriculture (USDA), the Environmental Protection Agency (EPA), and the Food and Drug Administration (FDA).
11. These species have been introduced to an area outside their natural range and cause harm by out-competing species present. Examples include insects, diseases, and plants.
12. There could be economic benefits from the introduction of biotechnology to forestry, including lower costs and increased availability of wood and wood products.
13. The loss of shrubs and herbaceous plant species causes a reduction or loss of many insects, birds, rodents, and the predators that feed on them.
14. Millions of dollars are spent annually by government and private sector to control gypsy moths, garlic mustard, buckthorn, and other invasive species.
15. Tree improvements from biotechnology can include increased growth rates, straighter trunks, fewer branches, higher wood quality, and disease resistance.
16. Cellulose from trees is increasingly being used as filler in food products. One concern is that modified material could affect humans negatively.
17. Genetic modification changes traits of an organism by splicing specific genes into the DNA of an individual.
18. An invasive species is one that enters an area and causes harm by out-competing native species.
19. Some people believe that genetically modified plantations will replace or reduce natural forests. This could decrease biodiversity, watershed services, natural animal habitat, and local resources for wood, food, and medicine.
20. Exotic insects and plants (gypsy moth and garlic mustard, for example) sometimes have the advantage of few competitors and natural enemies; their populations build to high levels that out-compete and displace native tree and plant species.

ISSUES MIX-UP (C)

INSTRUCTIONS:

- A) Read the numbered statements below.
- B) Decide which topic (large deer herd or fragmentation) applies to each statement.
- C) Write the number of the statement in the correct topic box.

LARGE DEER HERD

FRAGMENTATION

1. Small mammals, insects, reptiles, amphibians, and birds depend on certain plants for cover and food that are affected by deer.
2. A large area is broken into small islands of forest. For example, a large forested area could be interspersed with agriculture, development, and/or roads.
3. As the herd approaches the habitat's carrying capacity (the maximum population of a species that can be supported in a given environment over time), deer mortality increases, reproductive rates decrease, and herd health suffers.
4. Bird biologists suspect that many woodland birds are harmed by increasing their susceptibility to predation. Predators such as jays, crows, raccoons, and cats typically are not abundant in extensive forests. When a forest is fragmented, predators gain more access to the woodland.
5. There is concern because animal migration and habitat is affected when large forest areas are broken into smaller pieces.
6. Too many deer can strip forests of entire species of plants.
7. When forested areas become divided, pieces may be owned and managed by different people. Not all people will use or want the same outcome for their piece of the forest. This affects the natural ecosystem and cycles that occur in forests.
8. Fragmentation decreases the area that can be harvested for timber because more land is developed and used for other purposes. Eventually, this could have an effect on the supply of forest products.
9. In urban areas, deer eat plants and ornamental shrubs.

ISSUES MIX-UP (C)

10. Deer are large herbivores that eat large quantities of plants.
11. Fragmentation occurs when new areas are developed for human use.
12. In many areas, the forest has been over-browsed and the diverse layers are gone.
13. In Wisconsin, the average size of forest land ownership has decreased over time.
14. Where browsing is heavy enough to alter or eliminate forest floor vegetation, a variety of plants, ground-dwelling animals, and soil organisms are affected.
15. Typically, fragmentation occurs when a landowner subdivides a larger tract of land into a number of smaller parcels.
16. There has been significant impact on rare, threatened, and endangered plant species. Rare orchid and lily populations have been documented casualties of deer herbivory.
17. When foliage gets nipped back, the plant's energy reserves are cut into and successful reproduction is reduced.
18. There are various degrees of severity. A hiking trail is an example of forest fragmentation, yet impact is minimal. Higher impact comes from a paved road or highway.
19. It is possible that genetic diversity can decrease when areas become fragmented. If seeds no longer move between areas because of barriers like roads and fields, certain populations may become isolated. A loss of genetic diversity could mean lowered resistance to disease and pests.
20. Deer are browsers. They primarily eat the leaves, twigs, and shoots of young trees, shrubs, and wildflowers.