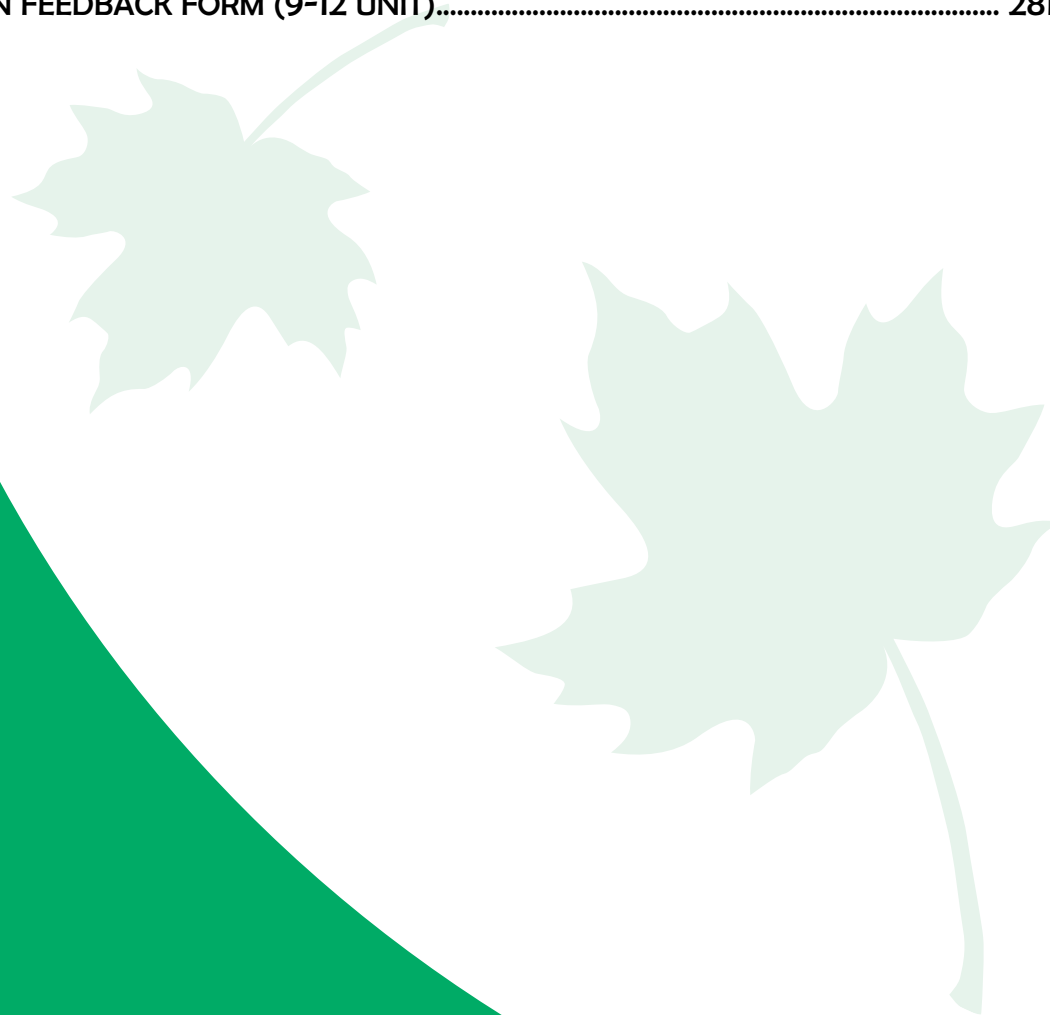




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GLOSSARY

ABIOTIC: Refers to nonliving things.

ADAPTATION: Evolutionary adjustments in structure, form, or function that help individuals, populations, or species fit in their environment.

ASSIMILATION: The incorporation of energy and nutrients into the bodies of plants or animals.

BIODIVERSITY: The variety and complexity of life on earth.

BIOFUEL: A fuel produced from organic matter available on a renewable basis: includes trees, agricultural crops and residues, wood wastes and residues, aquatic plants, animal wastes, and municipal wastes.

BIOTIC: Refers to living things.

BOARD FOOT: Measurement used to describe wood volume in the U.S.; volume equal to one foot by one foot by one inch.

CARBON SEQUESTRATION: The capture and storage of carbon dioxide from the atmosphere into biotic (e.g., trees) or abiotic (e.g., coal) pools of carbon.

CIRCULAR FLOW: A simplified economic model that illustrates the relationships between households, businesses, and government.

CLEARCUTTING: Harvesting all the trees in a given area at the same time. This is sometimes used as a management technique to encourage species that do not tolerate shade during regeneration.

CLINKER: A hard mass of fused material produced in furnaces by the burning of coal.

COKE: Coal from which most of the gases have been removed; burns with intense heat and little smoke and is often used as an industrial fuel.

COMMUNITY: A group of plants and animals interacting with one another in a given area.

COMPETITION (A): The struggle that exists among organisms to acquire finite resources (e.g., light, space, nutrients, water).

COMPETITION (B): An attempt by two or more individuals to buy or sell the same goods or services; competition exists between buyers and between sellers.

COMPOSITION: The species that constitute a plant community.

CONCRETE: A hard, compact building material formed from a mixture of cement, sand, gravel, and water.

CONCRETE MILLING: A concrete manufacturing process in which mined material is mixed to the proper percentages of sand, limestone, iron, and bauxite, then heated and ground.

CONCRETE MINING: Involves the open pit extraction of sand, gravel, and limestone.

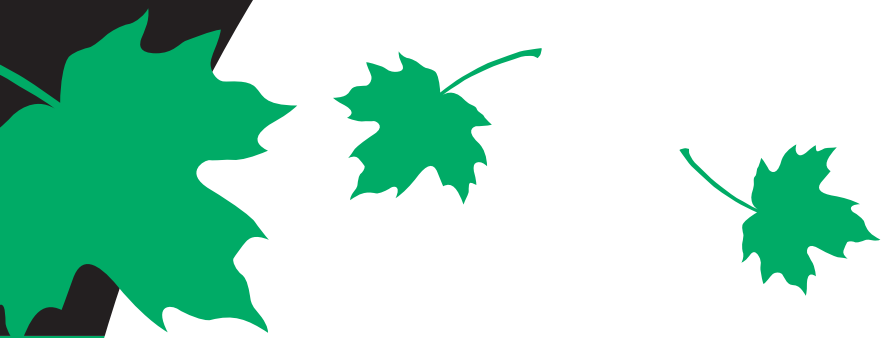
CONIFEROUS: A tree that bears cones and has needles.

CONSUMER: The buyer of goods and services.

COST OF PRODUCTION: The price paid by businesses to produce goods and services and get them to consumer markets.

CYCLING OF MATTER: An ecosystem function in which elements are deposited, used by organisms, and stored or exported.

DECIDUOUS: A tree that sheds its leaves for part of each year.



DECOMPOSITION: The breakdown of organic matter (through a number of interrelated processes) into simple compounds available for use by plants.

DEMAND: The quantity of a good or service that consumers are willing and able to buy at a specific price.

DETRITIVORES: Scavengers (e.g., millipedes, wood lice, slugs, snails, springtails, beetles) that feed on dead plants and animals or their waste; essential for the cycling of nutrients.

DISTURBANCE: A natural or human action that causes change in forest ecosystems by damaging or killing some existing plants (e.g., fire, flooding, logging, insect infestation, wind).

ECOSYSTEM: An area that contains organisms (e.g., plants, animals, bacteria) interacting with one another and their nonliving environment (e.g., climate, soil, topography).

ECOSYSTEM DIVERSITY: The variety of biologic communities or ecosystems in a given area over time.

ECOSYSTEM FUNCTIONS: Functions that support life including the fixation of energy, the cycling of matter, and the flow of energy through food webs.

ENGINEERED WOOD PRODUCT: A product made from wood and wood waste; examples include laminated veneer lumber, medium density fiberboard, oriented strand board (OSB), particleboard, and plywood.

ENVIRONMENTAL CONDITIONS: The climatic, soil, and landscape characteristics of a forested area.

ENVIRONMENTAL IMPACT: The effect that an activity has on the environment; limited environmental impact estimates include energy consumption and pollution emissions, while more comprehensive estimates can include elements such as land cover change and biodiversity.

EROSION: The wearing away of the land surface by water, wind, ice, gravity, or other natural or human forces.

EVEN-AGED MANAGEMENT: A set of forest management techniques used to maintain a stand with trees of uniform age and size; often associated with red pine plantations and aspen stands.

EVENTS: Social or environmental influences that affect disturbance patterns and cause regional changes (e.g., glacial advance, human migrations, social policies).

EXTIRPATION: The extinction of a species from a specific area.

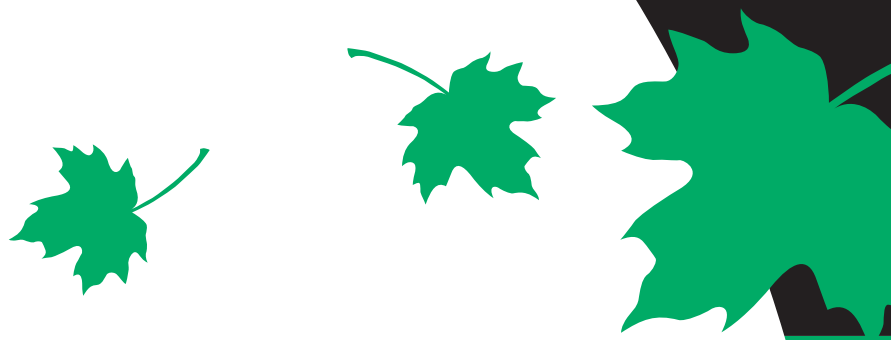
FIXATION OF ENERGY: An ecosystem function in which solar energy is changed into chemical energy (photosynthesis) and assimilated in plants.

FLOW OF ENERGY: An ecosystem function in which chemical energy (found in carbohydrates, protein, and fats) is moved through the food webs of an ecosystem.

FOREST CERTIFICATION: The verification, by a third party, that a forest is being managed by a predetermined set of standards designed to ensure that social, ecological, and economic values of a forest are maintained for current and future generations.

FOREST COMPOSITION: The tree species within a forest.

FOREST ECOSYSTEM: An ecosystem characterized by a dominance of tree cover.



FOREST MANAGEMENT: The use of techniques (e.g., planting, harvesting) to promote, conserve, or alter forests to meet desired outcomes.

FOREST MODELING: A digital representation of a forest that is used to simulate a process and predict an outcome.

FOREST PRODUCT: An object produced from forest resources for sale to a consumer.

FOREST REGENERATION: The process of renewing forest cover through natural or human establishment of trees.

FOREST SERVICES: The social and environmental benefits that forests provide humans.

FOREST STRUCTURE: The vertical and horizontal spacing of trees in a forest. Vertical layers are the overstory and the understory. Horizontal spacing is the density of tree cover across the landscape.

FOREST VALUES: Social, economic, and ecologic worth given to forests.

FREE MARKET: A general term for all the monetary exchanges that take place in a society; each exchange is undertaken as a voluntary (free) agreement between two people.

FUNCTION (MATERIAL): The practical use of a material; depends on the material's characteristics and the application for which the material is needed.

GENETIC DIVERSITY: Genetic variation within a population or species.

GENETIC ENGINEERING (BIOENGINEERING, BIOTECHNOLOGY): The directed modification of an organism's gene sequence to produce a new inheritable trait; accomplished by splicing a specific gene, usually from another organism, into an individual's DNA sequence.

GENOTYPE: An organism's hereditary (genetic) makeup.

GEOGRAPHIC INFORMATION SYSTEM (GIS): A computerized system that gives resource managers the ability to organize and access information (e.g., soil type, watershed, population density) about a specific area.

GLACIAL OUTWASH: Rock material composed mostly of sand-sized particles; transported by a glacier and deposited by meltwater as the glacier retreated.

GLACIAL TILL: Rock material composed of larger rocks and boulders; transported by a glacier and deposited directly by the ice.

GLACIATION: The advance over land of large ice masses from the poles of Earth; occurs in cycles as global temperatures cool.

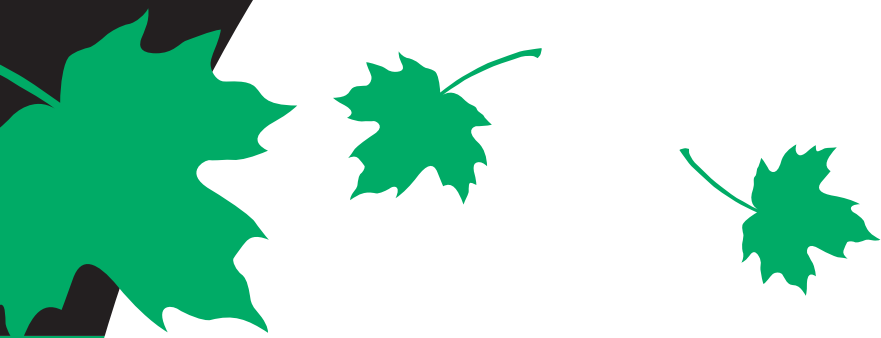
GLOBAL POSITIONING SYSTEM (GPS): A handheld device that collects data from satellites to provide users with the coordinates of their location on the surface of earth.

GOVERNMENT: An elected body of officials and their appointees that works to ensure the economic, social, and environmental welfare of a community; referred to as the public sector.

GRADE: The classification of logs and lumber according to their quality of form, uniformity, soundness, and appearance.

GREENHOUSE GAS: Atmospheric gases that capture heat that is reflected back from earth; include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and chlorofluorocarbons (CFCs).

HARDWOOD: Refers to broadleaf deciduous trees used for wood production (e.g., ash, aspen, basswood, beech, cherry, maple, oak, hickory, walnut).



HEMLOCK WOOLLY ADELGID (*ADELGES TSUGAE*): An introduced species of insect similar to an aphid that is native to Asia. Adult and nymph adelgids damage eastern hemlock trees by sucking sap from twigs, causing the tree to lose its needles.

HERBIVORY: The consumption of living plant material by plant-eating animals (herbivores and omnivores).

HYBRIDIZATION: The natural or controlled reproduction of two individuals with a different genetic makeup.

ICE AGE: The last geologic period, the Quaternary Period, which started 1.8 million years ago and is characterized by the cyclical advance and retreat of glaciers in North America.

INCOME: The amount of money made by an individual; commonly measured as per capita income which describes the average annual income per person in a specific region.

INDIVIDUAL: A single organism.

INTERCONNECTIVITY: The relationships that exist between ecosystems.

INTERDEPENDENCE: A situation in which decisions made by a group of people in one part of the world affect decisions made by groups in other parts of the world; as regions specialize they become more dependent on other regions to meet their needs and wants.

LARGE-SCALE FORCES: Broad social trends or environmental forces that shape events and cause widespread change on the landscape (e.g., climate change, mountain formation, evolution, industrialization, human population growth and expansion).

LIFE CYCLE ANALYSIS (LCA): A detailed accounting of the energy use and pollution outputs caused by the extraction, manufacture, transportation, use, and disposal of materials used to create a consumer product.

LOCATION: The latitude, longitude, and altitude of a forested landscape.

LOG SCANNING: A technique that uses lasers, cameras, and X-rays to examine a log that enters a mill.

LONGEVITY: The length of time a material lasts before it needs to be replaced.

MELTING AND METALLURGY: A steel manufacturing process in which iron is separated from iron ore and mixed with small percentages of other metals to form steel.

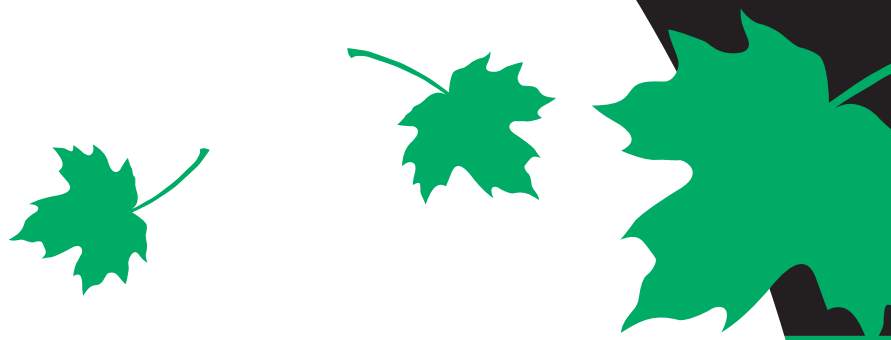
MIGRATION: The repeated movement of a population of organisms from one ecosystem to another.

MINERALIZATION: The conversion of an element from an organic (containing carbon) to an inorganic form; combustion, the act of burning, is a very rapid form of mineralization.

NATURAL PROCESS: A specific biological, chemical, and physical interaction that occurs between the components of an ecosystem (e.g., erosion, decomposition, photosynthesis, predation).

NITROGEN FIXATION: The process by which atmospheric nitrogen is made available for use by plants in an ecosystem.

NORTHERN HARDWOOD FOREST: A type of forest found across much of the north-central and northeastern U.S.; consists of mostly broadleaf, deciduous trees including aspen, birch, basswood, beech, and sugar maple.



NUTRIENT: The chemical elements that contribute to the growth and development of an organism.

ODYSSEY: An extended wandering or journey.

PHOTOSYNTHESIS: The process by which plants convert the electromagnetic energy of the sun into chemical energy usable by other organisms.

PLANING (WOOD LUMBER): A sawmill process in which the surface of a board is shaved straight and smooth after sawing and kiln drying.

POLETIMBER: A tree of a size between a sapling and a mature tree with a minimum diameter at breast height of five inches.

POLLUTION: Harmful substances emitted to the environment that can negatively affect living organisms.

POPULATION: A group of individuals of the same species that share the same reproductive gene pool.

PRESCRIBED FIRE: The controlled application of fire to a predetermined area in attempt to modify the ecosystem to meet management objectives.

PRIMARY SUCCESSION: The establishment of vegetation in an area that lacks biologic communities, soil, and immediate sources for plant reproduction.

PRIMARY WOOD PRODUCT: A minimally processed consumer good that comes from a tree (e.g., lumber, wood chips).

PROFIT: The money earned when a good or service is sold; determined by subtracting investment and cost of production from the money made during sales.

PROGRESSIVE HARVESTING: A tree removal technique in which the landing, the area where logs are processed and stacked for transportation, is moved with the harvest. The technique reduces damage to forest soils, minimizing effects on surface water and vegetation.

PROTECTION (FOREST OR TREE): The variety of techniques used to reduce damage to trees or forested areas; techniques include prescribed fire, pesticide application, fertilization, pruning, and thinning.

REFUGIA: Areas untouched by glaciers that held the plants, animals, and other organisms native to the region before glaciation.

RENEWABILITY: The ability of a resource to regenerate, grow back, or produce more.

REPRODUCTION: The process by which organisms produce offspring.

RESPIRATION (PLANT): A process involving the assimilation of carbon from the atmosphere.

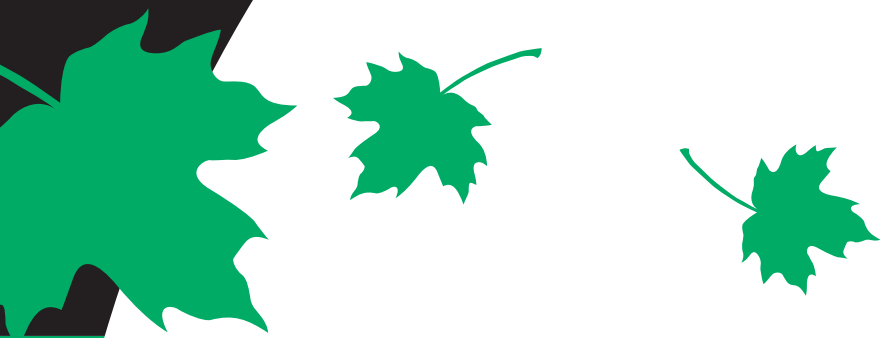
SALE PRICE: The amount of money paid by a consumer for a good or service.

SAWTIMBER: A tree that contains at least one sound, straight log that measures eight feet in length, with the smallest end measuring at least nine inches in diameter.

SECONDARY SUCCESSION: The establishment of vegetation in an area that has some plant remnants capable of reproduction.

SECONDARY WOOD PRODUCT: A consumer good manufactured from a primary wood product (e.g., door, table).

SELECTIVE CUTTING: A management technique in which specific trees in an area are chosen and cut.



SELF-INTEREST: To benefit oneself; motivation for entering into a monetary exchange in the free market.

SERVICE: An activity performed to satisfy the wants and needs of consumers.

SLAG: An inert solid material containing sulfur and oxides that is formed as a byproduct of steel manufacturing; can be sent to landfills or used for road construction, concrete products, or mineral wool.

SOFTWOOD: A reference to coniferous trees used for wood production (e.g., cedar, fir, pine, spruce, tamarack).

SPECIALIZATION: A situation in which a nation or business produces only the goods for which their natural and human resources are best suited.

SPECIES: A group of similar individuals that can produce fertile offspring.

SPECIES DIVERSITY: The variety of different species in a given area.

STEEL: A hard, tough metal made from iron alloyed with small percentages of carbon, nickel, chromium, and manganese.

STEEL CASTING: A steel manufacturing process in which liquid steel alloy is formed and hardened into a near finished product.

STEEL MINING: Involves the open pit extraction of iron ore.

STEEL TREATING/FINISHING: The final steel manufacturing process in which steel is cold rolled or galvanized (plated with zinc) to strengthen and protect the exterior of the product.

STRESS: An environmental factor that gradually weakens organisms (e.g., air pollution, water pollution).

STRUCTURE: The horizontal and vertical distribution of layers in a forest, including height, diameter, and species present.

SUCCESSION: The change from one biologic community to another over time.

SUPPLY: The amount of a good or service that businesses are willing to sell at a given price.

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

SUSTAINABLE: The ability of something to be maintained for use today and in the future.

SUSTAINABLE MANAGEMENT: Maintenance of forests to meet current and future ecological, economic, and social needs.

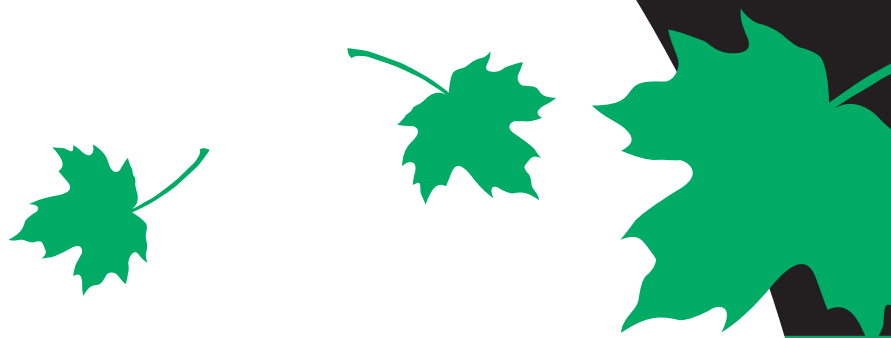
TREE HARVEST: The process of gathering a tree crop; includes felling, skidding, removal of limbs, cutting to length, and material removal.

TREE IMPROVEMENT: The modification of a tree to encourage certain desirable characteristics such as form, growth rate, and resistance to disease (e.g., hybridization, bioengineering).

UNEVEN-AGED MANAGEMENT: A set of forest management techniques used to maintain a stand with trees of different ages and sizes; often associated with the management of mature hardwood species.

VENEER: A thin layer of wood sliced or peeled from a log.

WEATHERING: The process by which rocks are broken down into minerals usable by plants.



WISCONSIN MODEL ACADEMIC STANDARDS

LEAF lessons address Wisconsin Model Academic Standards in Agriculture Education, Environmental Education, Language Arts, Marketing Education, Mathematics, Science, Social Studies, and Visual Arts. On the following pages, you will find the standards listed by lesson along with an explanation of how they are addressed by each lesson.

LESSON 1: FOREST ODYSSEY

ENVIRONMENTAL EDUCATION B.12.1

Energy and Ecosystems

Standard is: Evaluate the relationship of matter and energy and the flow of energy in natural, managed, and built systems.

Students correlate natural processes to the following ecosystem functions: fixation of energy, flow of energy, and cycling of matter. Students study common natural processes, historic changes, and prospects for sustainability of three different forest ecosystems. Students discuss changes in each ecosystem, caused both by human and natural influences.

ENVIRONMENTAL EDUCATION C.12.3

Environmental Issue Investigation Skills

Standard is: Maintain a historical perspective when researching environmental issues; include past, present, and future considerations.

Students study past and present changes in three different forest ecosystems and incorporate historic patterns of change into a science-based creative writing modeled after Aldo Leopold's "Odyssey."

LANGUAGE ARTS A.12.3

Reading and Literature

Standard is: Read and discuss literary and nonliterary texts in order to understand human experience.

- Identify philosophical assumptions and basic beliefs underlying selected texts.

Students read Aldo Leopold's "Odyssey" and use examples from the writing to identify three major themes: interconnectivity, change, and sustainability.

LANGUAGE ARTS B.12.1

Writing

Standard is: Create or produce writing to communicate with different audiences for a variety of purposes.

- Use rhetorical structures that divide complex thoughts into simpler ones, logical transitions from one thought to another, and language appropriate to the intended audience.

Students work in a large group to describe an atom's journey through different forest ecosystems. Students work individually to create a science-based creative writing about the journey of the atom which relates the concepts of change, interconnectivity, and sustainability.



LANGUAGE ARTS C.12.1

Oral Language

Standard is: Prepare and deliver formal oral presentations appropriate to specific purposes and audiences.

- Summarize narrative and numerical information accurately and logically in presentations.
- Participate effectively in question and answer sessions following presentations.

Students work in small groups to develop a presentation that explains the feeding relationships between organisms in a select forest ecosystem. Students answer questions about the food webs, historic changes that have occurred, and current challenges to the sustainability of the ecosystem.

LANGUAGE ARTS F.12.1

Research and Inquiry

Standard is: Conduct research and inquiry on self-selected or assigned topics, issues, or problems and use an appropriate form to communicate their findings.

- Use research tools found in school and college libraries, take notes, collect and classify sources, and develop strategies for finding and recording information.

Students research food webs for a specific forest ecosystem using the internet, school and public libraries, and classroom resources. In small groups, students develop diagrams and descriptions and present them to the class.

SCIENCE E.12.2

Earth and Space Science

Standard is: Analyze the geochemical and physical cycles of the earth and use them to describe movements of matter.

Students discuss how plants and animals acquire and use nutrients. Students describe how a variety of natural processes contribute to the cycling of matter. They create a journey of an atom through a forest ecosystem based on the science-based creative essay “Odyssey” by Aldo Leopold.

SCIENCE F.12.10

Life and Environmental Science

Standard is: Understand the impact of energy on organisms in living systems.

Students analyze the process of photosynthesis and discuss the role of producers in fixing energy in ecosystems. Students are presented with a scenario in which producers are removed from an ecosystem and discuss the impacts it would have on other organisms, including humans.

SCIENCE F.12.9

Life and Environmental Science

Standard is: Using the science themes, investigate energy systems (related to food chains) to show how energy is stored in food (plants and animals) and how energy is released by digestion and metabolism.

Students describe how different natural processes contribute to the flow of energy in ecosystems. Students work in groups to research and create food webs for three different forest ecosystems.

LESSON 2: A HISTORY OF SUCCESSION

ENVIRONMENTAL EDUCATION B.12.6

Energy and Ecosystems

Standard is: Predict population response to changes in environmental conditions.

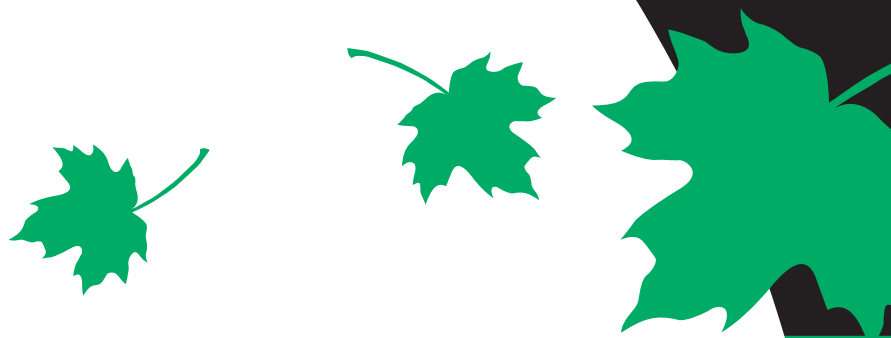
Students predict whether populations of six different Wisconsin tree species will expand or decrease in distribution after disturbances.

ENVIRONMENTAL EDUCATION B.12.8

Energy and Ecosystems

Standard is: Relate the impact of human activities in ecosystems to the natural processes of change, citing examples of succession, evolution, and extinction.

Students relate large-scale social influences to human actions and ultimately to disturbances and stresses that influence plant and animal communities.



ENVIRONMENTAL EDUCATION C.12.3

Environmental Issue Investigation Skills

Standard is: Maintain a historical perspective when researching environmental issues; include past, present, and future considerations.

Students create a disturbance timeline that begins 64 million years before present. They discuss the similarities and differences between past and present forest disturbances.

LANGUAGE ARTS C.12.1

Oral Language

Standard is: Prepare and deliver formal oral presentations appropriate to specific purposes and audiences.

- Summarize narrative and numerical information accurately and logically in presentations.
- Participate effectively in question and answer sessions following presentations.

Students use a variety of media to organize information into a natural history timeline for Wisconsin. Students work in small groups to develop their timeline into a disturbance timeline that explains the changes in distribution of a Wisconsin tree species. Students work together to present their information and answer questions from the class.

SOCIAL STUDIES A.12.1

Geography: People, Places, and Environments

Standard is: Use various types of atlases and appropriate vocabulary to describe the physical attributes of a place or region, employing such concepts as climate, plate tectonics, volcanism, and landforms, and to describe the human attributes, employing such concepts as demographics, birth and death rates, doubling time, emigration, and immigration.

Students are presented with information (maps, lecture, video, and text) about the human and natural influences that caused change on the Wisconsin landscape. Students use the information to describe the landscape and how it has changed through time.

SOCIAL STUDIES B.12.3

History: Time, Continuity, and Change

Standard is: Recall, select, and analyze significant historical periods and the relationships among them.

Students use a timeline to divide Wisconsin's history into four major periods of forest disturbance: Pre-Human, Native American, European Settlement and Exploitation, and Forest Conservation. Students describe the large-scale natural and social forces and the major events of each period and compare and contrast the disturbances in each.

LESSON 3: FOREST BIODIVERSITY: TREE CASE STUDIES

ENVIRONMENTAL EDUCATION A.12.1

Questioning and Analysis

Standard is: Identify questions that require skilled investigation to solve current problems cited in literature, media, or observed through personal observations.

Students work in small groups to analyze case studies of specific tree species in Wisconsin and identify information and insights that help to answer questions about biodiversity and forest health.

ENVIRONMENTAL EDUCATION B.12.2

Energy and Ecosystem

Standard is: Describe the value of ecosystems from a natural and human perspective; e.g., food, shelter, flood control, water purification.

Students describe the role that forest biodiversity plays in meeting human and ecological needs in group discussion and visual presentation.



ENVIRONMENTAL EDUCATION C.12.3

Environmental Issue Investigation Skills

Standard is: Maintain a historical perspective when researching environmental issues; include past, present, and future considerations.

Students analyze case studies that describe how and why the populations of specific Wisconsin tree species have changed through time. Students discuss how populations, and ultimately forest biodiversity, are currently changing, and how they may change in the future.

LANGUAGE ARTS C.12.1

Oral Language

Standard is: Prepare and deliver formal oral presentations appropriate to specific purposes and audiences.

- Participate effectively in question and answer sessions following presentations.
- Summarize narrative and numerical information accurately and logically in presentations.

Students work in groups to outline a tree case study using visual media and present it to fellow classmates. Students identify biodiversity insights that can be gained from their case study and discuss the insights of other groups.

LANGUAGE ARTS F.12.1

Research and Inquiry

Standard is: Conduct research and inquiry on self-selected or assigned topics, issues, or problems and use an appropriate form to communicate their findings.

- Formulate questions addressing issues or problems that can be answered through a well-defined and focused investigation.

Students define forest biodiversity and develop questions about the importance of biodiversity to forest health. Students research their questions by analyzing case studies about specific Wisconsin tree species.

SCIENCE C.12.2

Science Inquiry

Standard is: Identify issues from an area of science study, write questions that could be investigated, review previous research on these questions, and design and conduct responsible and safe investigations to help answer the questions.

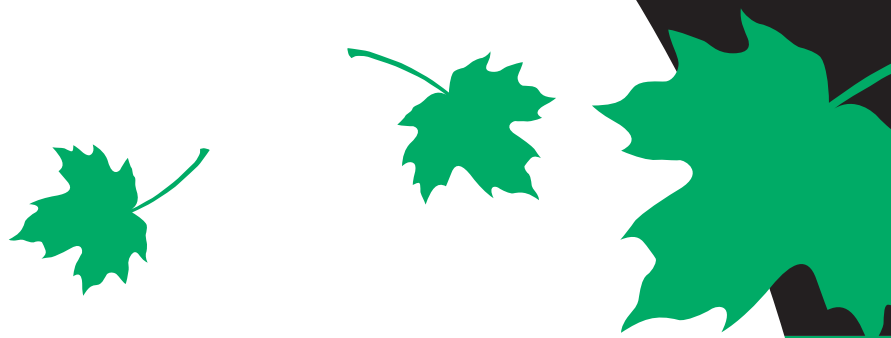
Students discuss and brainstorm questions about biodiversity, review case studies about biodiversity issues and specific Wisconsin trees, develop insights on the importance of biodiversity in forests, and participate with students from other case studies to form an answer to the question, “What is a healthy level of biodiversity?”

SCIENCE F.12.8

Life and Environmental Science

Standard is: Using the science themes, infer changes in ecosystems prompted by the introduction of new species, environmental conditions, chemical, and air, water, or earth pollution.

Students use case studies about Wisconsin tree species to identify the causes of historic changes in tree populations and infer how populations may change in the future.



LESSON 4: THE FOREST MARKETPLACE

AGRICULTURE EDUCATION A.12.1 *Global Agricultural Systems*

Standard is: Identify how political policies and issues shape and influence food and fiber systems.

- Analyze environmental issues that influence the food and fiber system in Wisconsin, the nation, and the world.
- Understand how a country's infrastructure affects food and fiber distribution.
- Be aware of the involvement and influence of government agencies on marketing of food and fiber commodities.

Students describe the role of government in protecting environmental services, assisting businesses, and providing government services and infrastructure. Students compare the size of government in different nations and discuss how this can affect the business climate in each nation.

AGRICULTURE EDUCATION A.12.3 *Global Agricultural Systems*

Standard is: Describe how global interdependence benefits the production and distribution of food and fiber.

- Explain how the interdependence of food and fiber production impacts the price of consumer products.
- Understand the economic advantage of production of food and fiber in one country versus another country.

Students look at the supply of and demand for forest resources in Wisconsin, the Midwest, and the U.S. and identify the big suppliers and consumers of wood products. Students discuss how specialization and trade contribute to the supply of wood products.

AGRICULTURE EDUCATION F.12.1 *Business Management and Marketing*

Standard is: Describe how the production, distribution, and marketing of food and fiber is part of a complex economic system.

- Describe the impact of agriculture/forestry on the economy.
- Describe interrelationships that exist between local businesses that process or distribute food and fiber items used in their daily lives.
- Analyze the way in which supply and demand influence what food and fiber are produced and distributed.
- Discuss how national policy affects agricultural/forestry business management and marketing at the local, regional, national, and international levels.

Students learn the economic fundamentals of trade and describe the forest market in Wisconsin, the Midwest, and the U.S. They describe the supply of and demand for forest resources in each scenario and discuss how decisions by government can influence global forest use.

ENVIRONMENTAL EDUCATION B.12.10 *Natural Resources and Environmental Quality*

Standard is: Identify and evaluate multiple uses of natural resources and how society is influenced by the availability of these resources.

Students differentiate between primary wood products, secondary wood products, nonwood forest products, and forest services. Students then look at how supply and demand determine the price and ultimately the availability of forest resources.



ENVIRONMENTAL EDUCATION B.12.11

Natural Resources and Environmental Quality

Standard is: Assess how changes in the availability and use of natural resources will affect society and human activities; such as, transportation, agricultural systems, manufacturing.

Students predict changes in Wisconsin and global forest use resulting from changes in social and environmental conditions.

ENVIRONMENTAL EDUCATION B.12.16

Natural Resources and Environmental Quality

Standard is: Analyze how natural resource ownership and trade influences relationships in local, national, and global economies.

Students analyze forest ownership in Wisconsin and discuss the objectives of different landowners. Students learn the economic fundamentals of global trade and use their knowledge to determine how free trade and variability in production costs can influence forest use and economic relationships between nations.

LANGUAGE ARTS C.12.3

Oral Language

Standard is: Participate effectively in discussion.

- Consider the ideas and opinions of other speakers thoughtfully before responding.
- Evaluate the validity and adequacy of ideas, arguments, hypotheses, and evidence.
- Be aware of and try to control counterproductive emotional responses to a speaker or ideas conveyed in a discussion.
- Perform various roles in a discussion including leader, participant, and moderator.
- Employ strategies such as summarizing main ideas or identifying areas of agreement to solve problems, resolve conflicts, and conclude discussions.

Students participate in a variety of small group discussions to interpret supply and demand statistics and graphs, discuss factors that influence the purchase and sale of goods, and predict changes in forest use caused by changes in social and environmental conditions.

MARKETING EDUCATION B.12.2

Free Enterprise

Standard is: Explain economic concepts that affect consumers and businesses in a free enterprise system.

Students define economic terms, learn how price is determined by supply and demand, and describe the factors that influence supply, demand, and cost of production.

MARKETING EDUCATION B.12.3

Free Enterprise

Standard is: Analyze the impact of government in a free enterprise system.

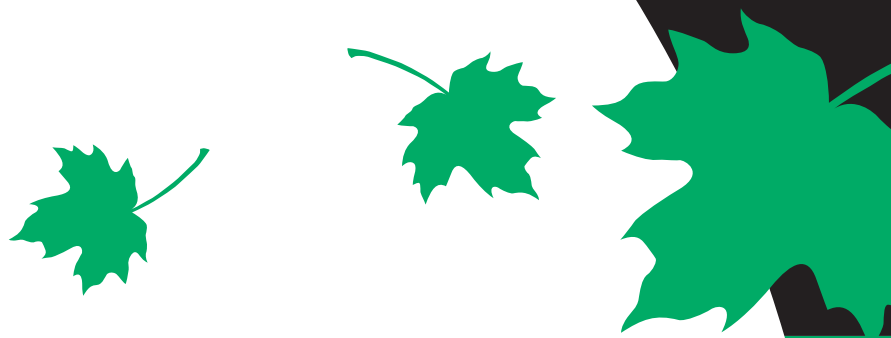
Students describe the role of government by using a circular flow diagram. Students discuss the role of government in protecting environmental services, assisting businesses, and providing government services and infrastructure.

SOCIAL STUDIES A.12.4

Geography: People, Places, and Environments

Standard is: Analyze the short-term and long-term effects that major changes in population in various parts of the world have had or might have on the environment.

Students use economic principles, supply and demand statistics, and global production cost data to discuss how increases in population might affect the use of forests in Wisconsin and other nations.



SOCIAL STUDIES A.12.5

Geography: People, Places, and Environments

Standard is: Use a variety of geographic information and resources to analyze and illustrate the ways in which the unequal global distribution of natural resources influences trade and shapes economic patterns.

Students analyze global supply and demand statistics and production costs and discuss the advantages and disadvantages that countries have in a global system of trade.

SOCIAL STUDIES D.12.3

Economics: Production, Distribution, Exchange, Consumption

Standard is: Analyze and evaluate the role of Wisconsin and the United States in the world economy.

Students use supply and demand statistics and relative production costs to predict how changes in social and environmental conditions will affect the use and trade of forest resource between Wisconsin and the nations of the world.

SOCIAL STUDIES D.12.10

Economics: Production, Distribution, Exchange, Consumption

Standard is: Analyze the ways in which supply and demand, competition, prices, incentives, and profits influence what is produced and distributed in a competitive market system.

Students read a newspaper article describe the economic conditions which determine the price, availability, origin, and type of products being bought and sold.

LESSON 5: FOREST SCIENCE AND TECHNOLOGY

AGRICULTURE EDUCATION E.12.1

Ecology/Environment

Standard is: Understand the application of agricultural/forestry technologies that can sustain production while reducing environmental impact.

Students review current technologies and innovations applied in the management of forests and production of forest products and use them to develop solutions that reduce environmental impacts.

AGRICULTURE EDUCATION E.12.6

Ecology/Environment

Standard is: Analyze benefits, costs, and consequences of processing food and fiber on the environment.

- Identify methods of producing various food or fiber commodities with sensitivity to the use of renewable and nonrenewable resources.

Students use life cycle analyses to analyze the environmental impact of the manufacture and use of wood. They describe the uses and benefits of wood with special emphasis on residential construction. Students propose strategies that use renewable energy sources, technology, and human behavior modification to reduce its environmental impacts.



ENVIRONMENTAL EDUCATION B.12.2

Energy and Ecosystem

Standard is: Describe the value of ecosystems from a natural and human perspective; e.g., food, shelter, flood control, water purification.

Students analyze a land use map for Ashland County, Wisconsin and discuss and identify the services that different land cover types can provide to human populations.

ENVIRONMENTAL EDUCATION B.12.9

Energy and Ecosystem

Standard is: Evaluate ways in which technology has expanded our ability to alter the environment and its capacity to support humans and other living organisms.

Students work in small groups to create a life cycle analysis that details the environmental impact of concrete, steel, and wood production. They look in depth at the technology and innovation used in wood production and write a proposal to use technology to reduce environmental impacts.

ENVIRONMENTAL EDUCATION B.12.14

Natural Resources and Environmental Quality

Standard is: Investigate how technological development has influenced human relationships and understanding of the environment.

Students learn how to develop and use life cycle analyses to evaluate the relative environmental impact of the production and use of materials. Students use a life cycle analysis to diagram production processes, identify areas of high energy demand and high pollution output, and develop solutions using available technologies.

ENVIRONMENTAL EDUCATION D.12.1

Decision and Action Skills

Standard is: Identify a variety of approaches to environmental issues, evaluate the consequences of each, and select and defend a position.

Students identify solutions to reduce the energy required and pollution emitted during a specific process involved in wood manufacture and use after creating a life cycle analysis for wood. Students work to build consensus in small groups and develop a project proposal for a specific solution.

ENVIRONMENTAL EDUCATION D.12.5

Decision and Action Skills

Standard is: Develop a plan to maintain or improve some part of the local or regional environment and enlist support for the implementation of that plan.

Students work in small groups to develop a proposal to reduce the environmental impact of wood manufacture and use. Groups present their proposal to the class to build support for their idea.

LANGUAGE ARTS A.12.4

Reading and Literature

Standard is: Read to acquire information.

- Analyze and synthesize the concepts and details encountered in informational texts such as reports, technical manuals, historical papers, and government documents.
- Draw on and integrate information from multiple sources when acquiring knowledge and developing a position on a topic of interest.

Students use a variety of information sources to develop a project proposal that describes a problem, provides a justification for action, outlines the proposed solution, identifies the target audience, and details opportunities for funding.



MARKETING EDUCATION D.12.2

Marketing Functions

Standard is: Analyze a product's life cycle.

Students develop simple life cycle analyses for concrete, steel, and wood.

MARKETING EDUCATION D.12.5

Marketing Functions

Standard is: Use research procedures and skills to develop an informed position on a consumer or business related issue.

Students study the benefits and costs of different energy sources, types of pollution, and the overall environmental impact of concrete, steel, and wood production. Students describe current challenges to forests and predict future impacts. Students use their knowledge to develop and discuss solutions.

SCIENCE E.12.4

Earth and Space Science

Standard is: Analyze the benefits, costs, and limitations of past, present, projected use of resources and technology and explain the consequences to the environment.

Students analyze the benefits and costs of different sources of energy. The use life cycle analysis to describe the energy use and pollution output of concrete, steel, and wood manufacture and use. They attempt to use technology, forest management activities, and consumer actions to minimize the environmental cost of resource use.

SCIENCE G.12.5

Science Applications

Standard is: Choose a specific problem in our society, identify alternative scientific or technological solutions to that problem and argue its merits.

Students work in small groups to develop a proposal that uses technology to reduce the environmental impact of wood manufacture and use. Students present their proposal to the class.

CAREERS EXPLORATION

ENVIRONMENTAL EDUCATION B.12.21

Natural Resources and Environmental Quality

Standard is: Research the roles of various careers related to natural resource management and other environmental fields.

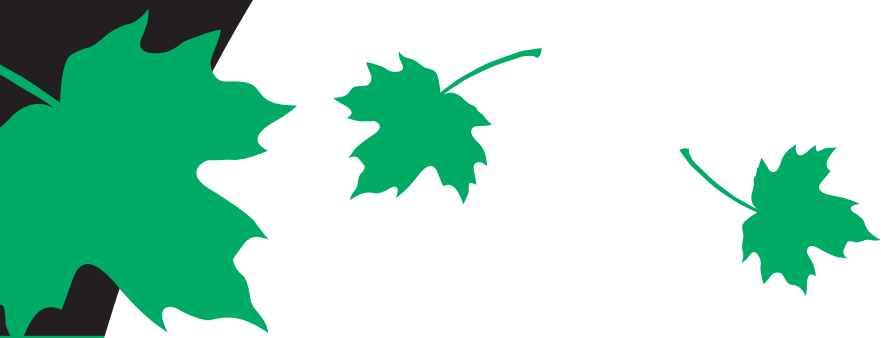
Students work in small groups to describe careers in natural resources. Students use profiles of actual college students to determine the knowledge, skills, and experience they will need to effectively compete for jobs in natural resources.

SCIENCE G.12.1

Science Applications

Standard is: Identify personal interests in science and technology; account for implications that these interests might have for future education, and options to be considered.

Students identify the knowledge, skills, and education that they will need to qualify for careers in natural resources fields. They discuss how they can prepare themselves to get the job that they want.



WISCONSIN MODEL ACADEMIC STANDARDS
















Standard	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Careers
AGRICULTURE EDUCATION						
A.12.1						
A.12.3						
E.12.1						
E.12.6						
F.12.1						
ENVIRONMENTAL EDUCATION						
A.12.1						
B.12.1						
B.12.2						
B.12.6						
B.12.8						
B.12.9						
B.12.10						
B.12.11						
B.12.14						
B.12.16						
B.12.21						
C.12.3						
D.12.1						
D.12.5						
LANGUAGE ARTS						
A.12.3						
A.12.4						
B.12.1						
C.12.1						
C.12.3						
F.12.1						



WISCONSIN MODEL ACADEMIC STANDARDS

Standard	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Careers
MARKETING EDUCATION						
B.12.2						
B.12.3						
D.12.2						
D.12.5						
SCIENCE						
C.12.2						
E.12.2						
E.12.4						
F.12.8						
F.12.9						
F.12.10						
G.12.1						
G.12.5						
SOCIAL STUDIES						
A.12.1						
A.12.4						
A.12.5						
B.12.3						
D.12.3						
D.12.10						

SUBJECT AREAS

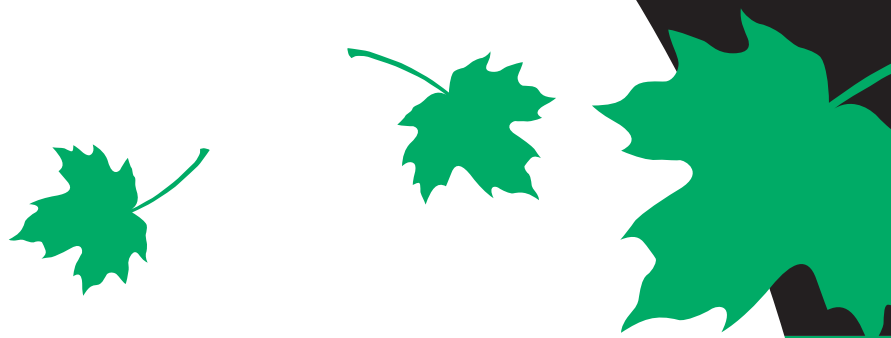
	AGRI-CULTURE EDUCATION	LANGUAGE ARTS	MARKETING EDUCATION	SCIENCE	SOCIAL STUDIES
LESSON 1 The Forest Odyssey					
LESSON 2 A History of Succession					
LESSON 3 Forest Biodiversity: Tree Case Studies					
LESSON 4 The Forest Marketplace					
LESSON 5 Forest Science and Technology					
CAREERS EXPLORATION					

PROCESS SKILLS

Each day in school, at home, and at work students use skills like listening, writing, and speaking to communicate. Process skills combine a variety of such skills into skill sets that are necessary to succeed in many career fields.

Process skills are transferable and help students perform complex tasks. Process skills include such things as oral presentation, proposal development, and map interpretation, each of which is an important aspect of many professions.

	PROCESS SKILLS
LESSON 1: The Forest Odyssey	Large group analysis and consensus building, Research, Science-based creative writing
LESSON 2: A History of Succession	Essay writing, Map interpretation, Multimedia interpretation, Timeline development
LESSON 3: Forest Biodiversity: Tree Case Studies	Case study analysis, Map interpretation, Oral presentation, Poster development
LESSON 4: The Forest Marketplace	Circular flow diagramming, Graph interpretation, Simple market analysis
LESSON 5: Forest Science and Technology	Life cycle analysis, Map interpretation, Proposal development
CAREERS EXPLORATION	Resume building



MULTIPLE INTELLIGENCES

Multiple Intelligences can be thought of as different modes of learning and retaining information. Generally everyone has all the multiple intelligences, but in varying strengths. Students excel when they have an opportunity to express themselves in their preferred intelligences, but also need to have opportunities to strengthen other areas. The table below lists each of the LEAF lessons and the multiple intelligences that are addressed.

V-L: VERBAL-LINGUISTIC 

Using language to express ideas and concepts, thinking symbolically and reasoning abstractly, and the ability to create conceptual verbal patterns.

L-M: LOGICAL-MATHEMATICAL 

Skillfully able to think logically, inductively, categorically; recognize patterns; and work with abstract concepts.

V-S: VISUAL-SPATIAL 

Perceiving images and spatial elements and representing those expressions effectively.

B-K: BODILY-KINESTHETIC 

Creatively using the whole body to illustrate ideas and concepts.

M-R: MUSICAL-RHYTHMIC 

Discriminating among musical components and using instruments or the voice to express understanding.

INTER: INTERPERSONAL 








































Demonstrating empathy toward or appreciating the thoughts and feelings of others.

INTRA: INTRAPERSONAL 

Analyzing one's own thoughts and motivations and expressing understanding of those thoughts and feelings through behavior.

NAT: NATURALISTIC 

Sensing patterns in and making connections with nature and the environment.

	 V-L	 L-M	 V-S	 B-K	 M-R	 Inter	 Intra	 Nat
Lesson 1: The Forest Odyssey								
Lesson 2: A History of Succession								
Lesson 3: Forest Biodiversity: Tree Case Studies								
Lesson 4: The Forest Marketplace								
Lesson 5: Forest Science and Technology								
Careers Exploration								

LESSON CONNECTIONS TO THE LEAF CONCEPTUAL GUIDE

The objectives of each lesson in the *LEAF Wisconsin K-12 Forestry Education Guide* are based on subconcepts outlined in the *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin*.

This chart identifies the subconcepts covered by each lesson in the 9-12 Unit.

		Theme 1: What Is a Forest?										Theme 2: Why Are They Important?																					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
Subconcept:																																	
Lesson 1																																	
Lesson 2																																	
Lesson 3																																	
Lesson 4																																	
Lesson 5																																	
Careers																																	

		Theme 3: How Do We Sustain?										Theme 4: What Is the Future?																						
		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60			
Subconcept:																																		
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Lesson 2																																		
Lesson 3																																		
Lesson 4																																		
Lesson 5																																		
Careers																																		



LESSON FEEDBACK FORM (9-12 UNIT)

We want to hear from you! Your comments and suggestions will contribute to the effectiveness of the *LEAF Wisconsin K-12 Forestry Lesson Guide*.

Subject Areas and/or Grade Levels Taught _____

Name (optional) _____

School Name (optional) _____

School Address (optional) _____

School Phone (optional) _____

School Email (optional) _____

Lesson Number and Title _____

What recommendations do you have to improve the guide/lesson? **If comments relate to a specific part of a particular lesson, please list page numbers for reference.**

Please send comments to: LEAF, WCEE/CNR UWSP, Stevens Point, WI 54481, leaf@uwsp.edu