OREGON FOREST LITERACY PLAN

Oregon Forest Resources Institute

A K-12 CONCEPTUAL GUIDE TO TEACHING AND LEARNING ABOUT OREGON'S FORESTS

"Time spent amongst trees is never wasted time."

Katrina Mayer

Contents

Why teach about forests?

All life, including our own, depends on forests. Forests help filter fresh water, supply oxygen, modulate temperatures and rainfall, provide habitat for diverse animal and plant species, and store atmospheric carbon.

In Oregon, nearly 50 percent of our state's 61 million acres is forestland. Our forests supply renewable resources for lumber, paper and heating, along with jobs that support families and communities. They also provide us with an active playground and a quiet retreat.

Because we depend so profoundly on our forests, being knowledgeable about them is crucial for all Oregonians. We need to understand not only how they work, but also how we are connected to them environmentally, economically and socially.

Using forests as a context for teaching can enrich student learning and extend it beyond the classroom walls. Studies have found that direct experiences in nature – with students actively involved in their own learning – can improve students' overall academic performance, self-esteem, community involvement and personal health.

Young people in Oregon, as in other parts of the United States, are spending more time indoors with technology and less time connecting with nature. We must find ways to engage them with the natural world. A good place to start is with the forests in our own backyard.

The Oregon Forest Literacy Plan presents a conceptual framework for educating Oregon's K-12 students about forests. Its goal is to help students become forest-literate, so that they:

- **appreciate the importance of forests**
- **understand concepts related to the forests of Oregon**
- **can communicate about forests in a meaningful way**
- **are able to make informed and responsible decisions about Oregon's forests and forest resources**

Because we depend on forests in many different ways, Oregonians must play an active role in ensuring the long-term sustainability of our forests. To do this, we need the knowledge and skills to make decisions and understand the impact of our choices. This guide is designed to help K-12 educators provide Oregon students with a comprehensive education about Oregon's forests.

Conceptual framework for forest literacy

The following conceptual framework represents a common vision of forest literacy for K-12 students, held by Oregon educators, academic professionals and natural resource specialists in our state. It embodies our shared aspiration for what every student should know about Oregon's forests by the end of high school. First developed in 2011, it was extensively updated in 2016 and again in 2022 by educators and natural resource professionals.

Designed as a tool for educators, the conceptual framework presents concepts that help students understand the importance of Oregon's forests and the role we all play in sustaining them. It recognizes and builds on the fact that Oregon's ecology, history and economy are deeply rooted in forests.

The conceptual framework is organized around four themes:

- What is a forest?
- Why are forests important?
- How do we sustain our forests?
- What is our responsibility to Oregon's forests?

Each theme is followed by topics and concepts that address the question posed by the theme. The conceptual framework themes and concepts are arranged so they build upon each other, enabling students to progress from a basic awareness to a deeper understanding of forests. Definitions for forest-related terms used in the framework may be found in the Glossary of Terms.

Individually and collectively, the themes and related concepts help students and educators explore Oregon's forests and their connections to them.

THEME 1

The concepts within this theme provide students with a fundamental knowledge of Oregon's forests as ecosystems. Comprehending these concepts will lead to an understanding of the relationship between forests and humans.

What is a forest?

A. FOREST DEFINITION AND CLASSIFICATION

Identifying what constitutes a forest and classifying forests by biomes and types helps students make connections among the forests in their community, the forests in Oregon and other forests in the world.

Concepts:

1. A forest is an ecosystem dominated by trees, and includes a variety of other organisms. The trees in a forest may differ in species, age and size.
2. Different forest biomes exist around the world. Examples include tropical forests, temperate forests and boreal forests. Oregon is in the temperate forest biome.
3. Many different forest types exist within a biome, typically named by their dominant tree species. Common forest types in Oregon include spruce-hemlock, Douglas-fir, ponderosa pine, mixed conifer, and juniper.
4. Woodlands, such as oak savannas, are areas with trees that are less dense than forests but function similarly.
5. An urban forest is a type of forest that includes all the publicly and privately owned trees within a city, town or suburb, working together as an ecosystem.

B. TREES AS PART OF THE FOREST

One of a forest's defining characteristics is the trees within it. The following concepts help students appreciate the uniqueness of trees and comprehend how individual trees function and interact in a forest ecosystem.

Concepts:

1. A tree is a woody perennial plant, usually more than 12 feet (4 meters) tall at maturity, with a single main stem and a more or less distinct crown of leaves or needles.
2. Trees can be identified based on seeds, leaves, flowers, bark, shape and other parts. They are classified into family, genus and species groups.
3. Trees are generally categorized as broadleaf (having broad, flat leaves and producing seeds in fruits, flowers or nuts) or conifer (having needle-like or scale-like leaves and producing seeds in cones).
4. Trees have life stages that include seed germination, growth, maturity, reproduction, decline and death.
5. As part of the forest ecosystem, trees have many roles (e.g., supplying oxygen, providing habitat and food, holding soil, moderating temperature, capturing and storing carbon, and cycling water and nutrients). They may have different roles at different life stages.
6. Trees have complex relationships with other organisms. They may compete or cooperate with each other and with other organisms for nutrients, sunlight, space and water.

7. Tree health is affected by many factors, including competition (for space, light, water and nutrients), climate, weather, natural and human-caused disturbances, pests and disease, as well as human interventions.

C. FORESTS AS ECOSYSTEMS

Trees and forests influence and are influenced by their surrounding environment. Understanding basic ecological principles and how they apply to forests helps students appreciate the characteristics of forest ecosystems.

Concepts:

1. Forest ecosystems consist of different types of living organisms and nonliving components, both above and below ground, interacting within a given environment, space and time.

2. Forest ecosystems include processes such as photosynthesis, energy flow and the cycling of nutrients, water, carbon and other matter. Energy and matter are transferred between producers, consumers and decomposers.

3. Forest ecosystems are complex and dynamic, and continuously undergo change or adaptation, ranging from gradual change (e.g., succession and climate) to abrupt change (e.g., fire and disease).

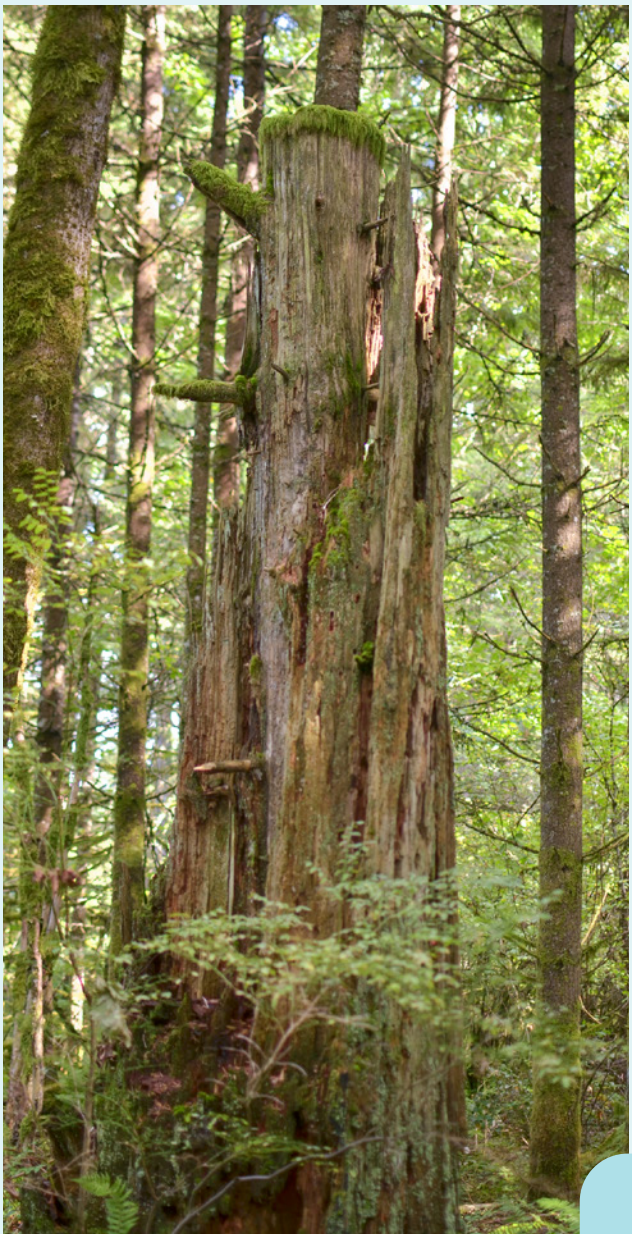
4. Disturbance events are a part of forest ecosystems. These events may be natural (e.g., wind and disease outbreaks), human-caused (e.g., harvesting timber and development) or a combination of both (e.g., fire). Disturbance events can change the makeup of the forest because different tree species respond differently to different types of events.

5. Wildfire plays major roles in Oregon's forest ecosystems, including opening the forest canopy to sunlight and creating new habitat. Many forest plants and trees have adapted to wildfire, and some species cannot survive without it.

6. Forests are interconnected with other terrestrial ecosystems (e.g., grasslands, meadows and agricultural lands) and aquatic ecosystems (e.g., estuaries, riparian areas and wetlands).

7. Oregon's regions vary in soil types, elevation, topography, temperature, wind and rainfall patterns. These variations create the different forest types and species composition that, together with disturbance histories, contribute to the region's biodiversity.

8. Climate change may affect Oregon's forest ecosystems in many ways, such as more frequent and intense fires, severe weather events, increased insect outbreaks, and changes in species composition.



THEME 2

The concepts within this theme help students investigate the connection between Oregon's forests and their own lives. Recognizing these connections increases students' awareness and understanding of how important sustainable forests are to humans, and the forces that have shaped today's forests.

Why are forests important?

A. ENVIRONMENTAL IMPORTANCE

Examining the ecological services forests provide helps students understand that forests are one of Earth's major life-support systems, along with fresh waters, oceans and grasslands.

Concepts:

1. Forests improve air and water quality, and help stabilize soil.
2. Forests provide habitat for fish and wildlife. Many species depend on forest habitats for their survival.
3. Forests sequester carbon from the atmosphere and are an essential component of the global carbon cycle.
4. Forests help mitigate the effects of climate change by storing carbon and regulating air temperature and water flow.
5. Oregon's forests are important ecological systems that are interconnected with other ecosystems.

B. ECONOMIC IMPORTANCE

By exploring the products, jobs, government revenue and investment opportunities the forest sector provides, students understand how important working forests are for Oregon's economic livelihood.

Concepts:

1 Forests provide multiple economic benefits, including jobs, a source of forest products and business opportunities (e.g., recreation and tourism).

2. Oregon's forest sector is one of the state's largest economic sectors. It provides living-wage employment that is important for all communities, particularly in rural areas of Oregon.
3. Forests and forest products are important components of Oregon's green economy, which supports sustainable and efficient resource use. Forests are a renewable resource, and forest products store carbon and are also reusable and recyclable.

4 Financial gains, economic benefits and returns on investment help incentivize forest landowners to keep their land as forestlands and prevent the loss of forests to other uses.

5. Oregon's forest sector is innovative and changing, contributing to scientific research and new product development (e.g., mass timber, medical products and nanotechnology).

C. SOCIAL IMPORTANCE *Understanding the ways communities have relied on forests throughout time helps students recognize forests' value to society.*

THEME 2

Concepts:

1. Forests have been central to the region's history and are an integral part of Oregon as we know it today.
2. Forests have always been – and continue to be – important to people who live on the land and within forest-dependent communities, including Indigenous peoples.
3. Forests provide many valuable benefits for Oregon communities, including clean water, fresh air, forest products, wildlife habitat and employment.
4. Forests provide a variety of foods through hunting or foraging, including deer, elk, salmon, berries and nuts. These traditional forest foods are known as "first foods" by Indigenous people.
5. Forests provide places for people to socialize, learn and recreate, and enhance both physical and mental well-being.
6. Forests have religious, spiritual and cultural significance for many groups and individuals.

THEME 3

How do we sustain our forests?

The concepts within this theme help students understand that Oregon's forests are sustained by forest managers and forest workers through a rich variety of decisions, actions, agreements and partnerships that span private and public sectors as well as all levels of government. For students to become participating members of a society that works to sustain forests, they must be able to comprehend the role forest management plays in meeting society's needs.

A. FOREST OWNERSHIP

Understanding who owns Oregon's forests helps students identify the basis for different forest management decisions.

Concepts:

1. For thousands of years, all Oregon forests were Indigenous lands. Federal laws and policies led to the displacement of the Indigenous peoples from much of these lands.
2. The history of forest ownership in Oregon shapes our forests and how they are managed.
3. Today, the size and scale of forest ownership can vary from hundreds of thousands of acres in a national forest to an individual patch of trees in an urban forest.
4. Oregon's forests are managed under private (e.g., family and industrial), public (e.g., state and federal) and tribal ownership. Each type of ownership may have different management objectives, and is subject to different protection laws and policies. Management objectives may even differ within classes of ownership.
5. Many forest landscapes are made up of a variety of ownerships, a mix of management objectives and a blend of forest ecosystems.
6. Oregon's forestlands cross natural boundaries (e.g., watersheds) and human-designed boundaries (e.g., property lines), as do disturbances that affect the forest, such as fire.

B. FOREST MANAGEMENT

People manage forests for a variety of environmental, economic and social outcomes. Understanding the reasons forests are managed helps students think critically about forest management methods.

Concepts:

1. Forest management is a long-term process that can lead to changes in tree species composition, size and age, as well as in forest health and resilience.
2. From time immemorial, Indigenous people of Oregon have used fire and other practices such as girdling trees and land clearing to manage the forest. Their traditional ecological knowledge of Oregon's forests informs forest management practices that sustain forests.
3. Forest management ranges from active management (e.g., planting, thinning and harvesting) to passive management (e.g., reserves and wilderness areas) to grow, restore, maintain, conserve or alter forests.
4. Forest management includes using natural processes and goal-oriented decisions and actions to achieve a variety of desired outcomes, including environmental (e.g., wildlife habitat and carbon sequestration), economic (e.g., timber production) and social (e.g., recreation) outcomes. Many of these outcomes are interrelated and can be managed for simultaneously, while others may be incompatible.

5. In Oregon, forest management is regulated by both state and federal laws. Private and state forests must comply with the Oregon Forest Practices Act, which aims to sustain forestland for timber production and the other benefits forests provide, including clean water, stable soil and wildlife habitat.

6. Many private landowners participate in third-party forest certification to demonstrate that their forests are managed sustainably and meet criteria for environmental, economic and social outcomes.

7. As human populations and global demand for forest resources increase, forest management and advances in research and technological systems can help ensure forest resources are maintained or improved to produce the desired values and products.

C. FOREST MANAGEMENT DECISIONS

Understanding why and how forests are managed helps prepare students to participate in forest management decisions. By understanding that many individuals and groups are involved in forest management, students will recognize that the responsibility of forest management is shared.

Concepts:

1. A variety of individuals, companies, organizations, governments and agencies manage forests. Forest management decisions may involve some or all these entities working collaboratively to ensure mutually beneficial outcomes.

2. Forest resource professionals aim to meet environmental, economic and social needs. They use scientific data and traditional ecological knowledge to inform their management decisions.

3. The type and intensity of forest management, including harvest, is dependent on the purposes for which the forest is managed, as well as forest type, ownership, size and location.

4. Oregon foresters and forest managers prepare forest management plans based on landowner goals and objectives, capacities of the forest site, laws and available management tools (e.g., planting, harvesting and using prescribed fire). The plans guide management decisions, and are often required for funding applications or documentation for forest certification.

5. The public empowers governments to conserve, maintain and sustain forest resources by enacting laws, creating policies, establishing agencies, creating public lands, and providing management guidelines and continuing education for forest landowners.

6. Government has a role in actively engaging organizations, businesses, communities and individuals in forest management and policy decisions for publicly owned forests. Collaboratives (partnerships among forest stakeholders) are increasingly used in making public land management decisions.

7. Sustainable forest management takes into account environmental, economic and social dimensions of sustainability. It includes maintaining forest health, productivity and diversity, and maintaining a forested land base for the needs of present and future generations.

8. Forest management decisions that both respect Indigenous peoples' rights and incorporate their traditional ecological knowledge can help ensure a sustainable future for forests.

9. Changing public demands and expectations for the forest, as well as unanticipated events, affect decisions about forest resource use. This requires sound management based on scientific research, economic analysis and public involvement.

10. Climate change is an increasing factor in forest management decisions. Some forest types and tree species are particularly vulnerable to changes in climate, and considerations include species to grow, harvest method to use, and spacing of trees and competing vegetation. Managing forests for increased carbon sequestration is also becoming more prevalent.

D. FOREST MANAGEMENT PERSPECTIVES *Examining the different perspectives involved in forest management helps students understand the complexity of forest management decisions.*

Concepts:

1. People have differing perspectives on forests and forest management, which can be affected by cultural background and personal experiences, as well as by values, politics, science and economics. Their perspectives can change over time.

2. Forestry practices can be controversial, because of diverse perspectives as well as the complex nature of forest ecosystems.

3. Oregon has had a history of conflict over forest management issues. For example, conflicts have arisen over the preservation of ancient or old-growth forests, the protection of endangered species, and whether logging is appropriate on public lands.

4. Current issues related to forest management include the effects of timber harvest, wildfire, climate change and land uses, as well as the perception of these effects.

5. Making sure to involve multiple perspectives in decision-making, especially with regard to Oregon's public forest lands, can lead to more effective problem-solving and result in more sustainable outcomes.

What is our responsibility to Oregon's forests?

THEME 4

The concepts within this theme help students identify ways to develop personal relationships with Oregon's forests, and things they can do to help sustain forest ecosystems for present and future generations. Students can be active participants in promoting forest sustainability by studying, observing and experiencing forests firsthand, and by taking appropriate action in their communities.

A. OUR RELATIONSHIP WITH OREGON'S FORESTS

Building students' personal relationships with forests helps them understand how their actions impact forests, and how forests impact them.

Concepts:

1. People have a reciprocal and complex relationship with forests: We both affect and are affected by forests.
2. Everyone should have the opportunity to identify and explore their personal and cultural relationships with forests, and to spend time in forests. Accommodations such as paved paths, multi-language signage, and proximity to public transportation help to ensure access to forests for all.
3. There are many ways we can deepen our relationship with forests, including learning about forests, recreating in forests, volunteering for projects in and around forests, and recognizing the ways forests enhance our lives.
4. We can look to forests to help us address some of the challenges our society faces, including climate change, biodiversity loss, wildfire and human health issues.

B. WORKING FOR THE FUTURE OF OREGON'S FORESTS

Learning to take action to support Oregon's forests in a variety of ways gives students pathways to involvement now and in the future.

Concepts:

1. Everyone has a responsibility to treat forests with respect, and to be a conscientious steward of forests and forest resources.
2. Personal behaviors and actions directly impact the health and resiliency of our forests. Our consumer choices and investments, how we interact with the land (e.g., trails, campgrounds and forest habitat), how we use or conserve water, and how we use fire can either harm or help forests.
3. As individuals or as members of groups, we influence laws and policies affecting Oregon's forests. Individuals can have their say by voting, working with community officials, joining organizations that advocate for forests and weighing in when public opinion is sought.
4. By learning about forest management at local, national and global levels, individuals can better engage in conversations and actions to sustain forests.
5. We need a variety of professionals and skilled workers to sustain our forests, including foresters, scientists, engineers, lawyers, information technology professionals, land managers, investors, educators, communications specialists, firefighters, loggers, tree planters, truck drivers, mechanics and wood products manufacturers. Resources are available to learn about these valuable and rewarding careers.

Forest literacy by grade level

The conceptual framework for forest literacy offers educators guidance for developing curriculum or classroom lessons related to forests. It is designed to be flexible and to be used in a wide range of situations, including K-12 classroom instruction, nonformal education programs and the development of curriculum materials on forest topics.

This framework may also be used in a variety of content areas. Students may explore forest concepts through the lenses of science, social sciences, mathematics, English language arts or the visual and performing arts.

Following are grade-specific ideas for implementing forest literacy with your students. They identify guiding questions, and connections between the Oregon content standards and the conceptual framework, as well as sample activities. In addition, they offer a "hot topic" for each grade level, which is a current issue related to Oregon's forests that you can explore with your students.

We hope these suggestions will inspire you to incorporate forest literacy into your teaching in other ways. We encourage you to peruse the framework for concepts that fit your instructional goals, and to craft instructional activities that suit your students and your setting.

In addition, be sure to check out LearnForests.org for more resources and classroom ideas, as well as for detailed standards connections.

GRADES K–2

Primary students are active explorers and naturally curious about their world. Forest literacy activities at this grade level should aim to introduce students to trees and forests through hands-on activities that invite them to be keen observers and critical thinkers.

On the opposite page are select Oregon Forest Literacy Plan concepts that align particularly well with content standards for this grade level band. We recommend focusing Grades K–2 forest literacy activities around these topic areas, using the guiding questions and sample activities provided to help plan and lead instruction. In addition, the "hot topic" below is a current forest issue you can explore with students this age.

hot topic:

HUMAN HEALTH

Forests and trees provide a number of benefits to people's health. They purify water and air, reduce noise, and offer shade. They also give us places to play, to relax, to enjoy beauty and to connect with nature. Forests and trees are vital for our well-being.

Oregon Forest Literacy Plan Concepts:

2.C.5. Forests provide places for people to socialize, learn and recreate, and enhance both physical and mental well-being.

4.A.4. We can look to forests to help us address some of the challenges our society faces, including climate change, biodiversity loss, wildfire and human health issues.

Sample Forest Literacy Activities:

Take students to two different areas on the school grounds or in a nearby nature area: one with trees and one without trees. Have them use their senses of sight, hearing and smell in each place, and draw or communicate what they observe. Encourage them to describe how each of the areas made them feel.

Invite students to play physical games outside involving trees. Possibilities include using the tree as "home base" for a game of tag, or Hide-and-Seek with Trees, where everyone but the student who's "it" hides behind a tree. Discuss how moving outside and playing with the tree or trees can enhance health.

Guiding Question: What is a forest?

OFLP Concept	Oregon Standard	Sample Forest Literacy Activity
1.A.1. A forest is an ecosystem dominated by trees, and includes a variety of other organisms. The trees in a forest may differ in species, age and size.	**Science: 2-LS4-1.** Make observations of plants and animals to compare the diversity of life in different habitats.	Read aloud *More Than Trees* or *Sounds of the Forest* by the Oregon Forest Resources Institute (available at LearnForests.org). Use a felt board to create a model of a forest. Start by building a tree from various tree parts (trunk, branches, leaves) and then add pictures of different forest animals. Encourage students to tell a story about the forest.

Guiding Question: Who needs forests?

2.A.2. Forests provide habitat for fish and wildlife. Many species depend on forest habitats for their survival.	**Science: K-ESS3-1.** Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.	Invite students to look for evidence of wildlife in and around the school grounds. Even in urban and suburban areas, students may find bird nests, chewed leaves or nuts, webs or tracks. Discuss what might have left each of these clues and how these animals get what they need to live. Read *B is for Beaver: An Oregon Alphabet Book* by Marie and Roland Smith. Challenge students to identify key features of each Oregon place mentioned in the book, and an animal or plant that might live there.
2.B.1. Forests provide multiple economic benefits, including jobs, a source of forest products and business opportunities (e.g., recreation and tourism).	**Social Studies: 1.8.** Give examples of local natural resources and describe how people use them.	Count the number of objects in the classroom made from trees. Challenge students to sort the objects into different categories, such as Food, Paper, Wood, and Other Good Things. For dramatic play, provide costumes such as hard hats, boots, vests, cardboard "saws" and tree-planting tools for students to act out different forest jobs.

Guiding Question: What can we do to help forests?

4.A.1. People have a reciprocal and complex relationship with forests: We both affect and are affected by forests. **4.B.1.** Everyone has a responsibility to treat forests with respect, and to be a conscientious steward of forests and forest resources.	**Science: K-ESS3-3.** Communicate solutions that will reduce the impact of humans on the land, water, air and/or living things in the local environment. **Social Studies: 1.21.** Identify ways that students can take informed action to help address issues and problems at school and/or in the community.	"Adopt" a tree on your school grounds to observe at different times of the year. At each visit, direct students to sketch or describe the tree in their science journal and record other observations. Invite students to list or draw pictures of things they could do to care for their adopted tree.

Science · Mathematics · Social Studies · English Language Arts · Health · Art

GRADES 3–5

Students in the intermediate years are interested in the natural world and in how things work. Forest literacy activities at this grade level should involve students in investigations that enable them to problem-solve, think abstractly, and deepen their understanding of the forest ecosystem on which we all depend.

The following are select Oregon Forest Literacy Plan concepts that align particularly well with content standards for this grade level band. We recommend focusing Grades 3–5 forest literacy activities around these topic areas, using the guiding questions and sample activities provided to help plan and lead instruction. In addition, the "hot topic" on the opposite page is a current forest issue you might explore with students this age.

Guiding Question: What do forest organisms need to survive?

OFLP Concept	Oregon Standard	Sample Forest Literacy Activity
1.B.4. Trees have life stages that include seed germination, growth, maturity, reproduction, decline and death. 	**Science: 3-LS1-1.** Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction and death.	Challenge students to look on the school grounds or at a nearby nature area for trees at various stages in their life cycle. For example, students may find acorns or cones, seedlings, saplings, and adult trees. Encourage them to create a drawing or other 2- or 3-D model depicting the life cycle of a tree. Read *Explore the Forest* by the Oregon Forest Resources Institute (available at LearnForests.org), a publication for third- and fourth-grade students about Oregon's forests, with an accompanying teacher's guide. Invite students to count the growth rings in a tree stump to learn the tree's age and to look for changes in growth over its life.
1.B.5. As part of the forest ecosystem, trees have various roles (e.g., supplying oxygen, providing habitat, holding soil, moderating temperature, capturing and storing carbon, and cycling water and nutrients). They may have different roles at different life stages.	**Science: 4-LS1-1.** Support an argument that plants get the materials they need for growth chiefly from air and water. **Science: 5-LS2-1.** Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.	Create a food-web model of the forest ecosystem by having students choose a forest animal, draw a picture of it on an index card, then do some research and write on the card what that animal eats and what eats it. Arrange the completed cards on a bulletin board display, connecting them with yarn or string to show the food web.

Guiding Question: How are forests and forest organisms adapted to Oregon's climate and landscape?

1.C.7. Oregon's regions vary in soil types, elevation, topography, temperature, wind and rainfall patterns. These variations create the different forest types and species composition that, together with disturbance histories, contribute to the region's biodiversity.	**Science: 3-LS4-3.** Construct an argument with evidence that in a particular habitat, some organisms can survive well, some survive less well, and some cannot survive at all. **Social Studies: 3.9.** Describe and compare physical and human characteristics of regions in Oregon (tribal, cultural, agricultural, industrial, etc.).	Do a simple plot investigation to find the differences between a shady and a sunny location in the schoolyard or a nearby park. Use hula hoops or lengths of string tied together at the ends to create evenly sized plots. In each plot, students count the number of plants, and measure the soil temperature and moisture. Use the *Forests of Oregon* poster (available at LearnForests.org) as an informational text for examining how forests are adapted to Oregon's climate and landscape. Direct students to compare the map to physical and political maps of Oregon.

Science · Mathematics · Social Studies · English Language Arts · Health · Art

Guiding Question: In what ways are forests important to Oregon's environment, economy and people?

OFLP Concept	Oregon Standard	Sample Forest Literacy Activity
2.B.1. Forests provide multiple economic benefits, including jobs, a source of forest products and business opportunities (e.g., recreation and tourism). **4.B.5.** We need a variety of professionals and skilled workers to sustain our forests, including foresters, scientists, engineers, lawyers, information technology professionals, land managers, investors, educators, communications specialists, firefighters, loggers, tree planters, truck drivers, mechanics and wood products manufacturers. Resources are available to learn about these valuable and rewarding careers.	**Science: 4-ESS3-1.** Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. **Social Studies: 3.10.** Identify and analyze Oregon's natural resources and describe how people in Oregon and other parts of the world use them. **Social Studies: 5.8.** Analyze career choices through the return on investment (qualifications, education, and income potential).	Make a list of items in the classroom. Challenge students to categorize each item by the raw material it is made from (wood, plastic, metal, etc.). Have them determine which items could be recycled. Read aloud a book about life on the Oregon Trail, such as *Voices from the Oregon Trail* by Kay Winters and Larry Day. Ask students to write responses to these questions: How did people depend on forests and other ecosystems then? How do people depend on them today? Introduce students to a variety of forest-related careers by reading the booklet *Find Your Path* (available at LearnForests.org). Encourage students to identify how each career may help Oregon's environment, economy and people.

hot topic: FOREST CAREERS

Many different individuals in a variety of forest careers help to sustain our forests. In Oregon, approximately one out of 20 jobs is related to forests – from planting trees to harvesting them; from making lumber to building houses and furniture; from studying fish and wildlife to leading recreation experiences. The people who work in the forest sector help to make sure our forests meet our needs now and in the future.

Oregon Forest Literacy Plan Concepts:

2.B.1. Forests provide multiple economic benefits, including jobs, a source of forest products and business opportunities (e.g., recreation and tourism).

4.B.5. We need a variety of professionals and skilled workers to sustain our forests, including foresters, scientists, engineers, lawyers, information technology professionals, land managers, investors, educators, communications specialists, firefighters, loggers, tree planters, truck drivers, mechanics and wood products manufacturers. Resources are available to learn about these valuable and rewarding careers.

Sample Forest Literacy Activities:

Invite members of the community to talk with your students about their forest career. Encourage students to ask questions about what the job entails and how it helps to sustain forests or provide important benefits to people. In preparation, share the six-minute video *Forest Team GO!* at oregonforests.org/forest-team-go, which introduces a span of careers in the forest sector.

Challenge students to list what they would and wouldn't like about working outside. Depending on their responses, encourage them to learn about a forest career that is mostly outside (such as field forester, logging crew member, recreation manager, or wildland firefighter) or mostly inside (such as electrician, forestry teacher, or mill operator). For two-minute videos on each career listed here, see youtube.com/oregonforests (under Playlists, select Careers in Forestry: Find Your Path).

GRADES 6–8

Middle school students are gaining a deeper sense of themselves as members of both human and natural communities. Forest literacy activities at this grade level should involve students in conducting investigations and analyzing results using evidence to gain a deeper understanding of the interconnected relationships between people and the environment.

The following are select Oregon Forest Literacy Plan concepts that align particularly well with content standards for this grade level band. We recommend focusing Grades 6–8 forest literacy activities around these topic areas, using the guiding questions and sample activities provided to help plan and lead instruction. In addition, the "hot topic" on the opposite page is a current forest issue you might explore with students this age.

Guiding Question: What processes and components characterize forest ecosystems?

OFLP Concept	Oregon Standard	Sample Forest Literacy Activity
1.C.2. Forest ecosystems include processes such as photosynthesis, energy flow and the cycling of nutrients, water, carbon and other matter. Energy and matter are transferred between producers, consumers and decomposers. **2.A.3.** Forests sequester carbon from the atmosphere and are an essential component of the global carbon cycle.	**Science: MS-LS2-2.** Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. **Science: MS-LS2-3.** Develop a model to describe the cycle of matter and flow of energy among living and non-living parts of an ecosystem.	Read *Into the Forest*, from the Oregon Forest Resources Institute (available at LearnForests.org). Challenge students to design a board game that highlights the components and processes of Oregon's forests, following a format similar to a game they know (such as Life). Conduct an inventory of the trees on the school property and make a detailed map showing each tree's location and any plants or animals that interact with it. Help students identify the scientific name of each tree using a tree identification book or internet resource. Invite students to write a recommendation about the number and location of trees based on their findings.

hot topic: WILDFIRE

Wildfires are a natural occurrence in Oregon's forests and can even benefit the forest ecosystem. But Oregon's wildfire seasons are getting longer and more intense. They threaten human lives and structures, impact air quality and hurt our economy.

Several factors contribute to this greater occurrence of wildfire. Fire suppression over the past one hundred years have created overly dense forests, fueling bigger and more destructive wildfires. In addition, warmer air temperatures from climate change are causing drier forest conditions that are more susceptible to fire.

Oregon Forest Literacy Plan Concepts:

1.C.5. Wildfire plays major roles in Oregon's forest ecosystems, including opening the forest canopy to sunlight and creating new habitat. Many forest plants and trees have adapted to wildfire, and some species cannot survive without it.

3.A.6. Oregon's forestlands cross natural boundaries (e.g., watersheds) and human-designed boundaries (e.g., property lines), as do disturbances that affect the forest, such as fire.

Sample Forest Literacy Activities:

Invite students to peruse OFRI's Fire in Oregon Forests webpage (see oregonforests.org/content/fire). Have them create a T-chart showing the benefits and negative impacts of fire in forest ecosystems. Discuss what people can do to prevent destructive wildfires.

Conduct a wildfire safety assessment of students' homes or the school, and have students make recommendations for increasing wildfire safety.

Science · Mathematics · Social Studies · English Language Arts · Health · Art

Guiding Question: What social, economic and environmental benefits do forests provide?

OFLP Concept	Oregon Standard	Sample Forest Literacy Activity
2.B.1. Forests provide multiple economic benefits, including jobs, a source of forest products and business opportunities (e.g., recreation and tourism).	**Social Studies: 6.8.** Evaluate alternative approaches or solutions to economic issues in terms of benefits and costs for different groups and society as a whole.	Have students select a native Oregon tree and write a research paper about it, including any economic benefits. The report should include the region in which the tree grows, its growth habits and its commercial uses. Introduce students to different forest careers by showing several *Find Your Path* videos (available at LearnForests.org). Direct students to research a forest-related career that interests them, finding out how this career helps to sustain forests and what education, skills, experience and personal interests are required or helpful.

Guiding Question: How do human activities affect forests?

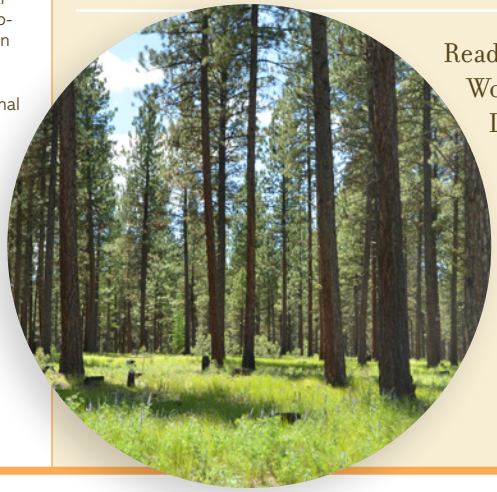
1.C.4. Disturbance events are a part of forest ecosystems. These events may be natural (e.g., wind and disease outbreaks), human-caused (e.g., harvesting timber and development) or a combination of both (e.g., fire). Disturbance events can change the makeup of the forest because different tree species respond differently to different types of events.

3.B.4. Forest management includes using natural processes and goal-oriented decisions and actions to achieve a variety of desired outcomes, including environmental (e.g., wildlife habitat and carbon sequestration), economic (e.g., timber production) and social (e.g., recreation) outcomes. Many of these outcomes are interrelated and can be managed for simultaneously, while others may be incompatible.

Science: MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical and biological components of an ecosystem affect populations.

Social Studies: 8.21. Explain how historical technological developments (such as cotton gin, roads, railroads, canals, etc.), societal decisions, and personal practices interact with the physical environment in the United States (e.g., sustainability, economics ecosystems).

Challenge students to design an investigation to learn about the impacts of a change on an ecosystem's populations. As an example, you might show the 17-minute video *Inquiry at Hinkle Creek* (available at LearnForests.org), which describes a real-world investigation using paired watersheds in Southern Oregon to examine possible impacts of forest operations.



Read *New Found Land* by Allan Wolf or another book on the Lewis and Clark expedition. Examine the impact the expedition and subsequent western migration had on the Indigenous peoples and on forests and other ecosystems.

Guiding Question: What can we do to protect Oregon's forests?

4.B.2. Personal behaviors and actions directly impact the health and resiliency of our forests. Our consumer choices and investments, how we interact with the land (e.g., trails, campgrounds and forest habitat), how we use or conserve water, and how we use fire can either harm or help forests.

Science: MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

Social Studies: 6.16. Explain how technological developments, societal decisions, and personal practices influence sustainability.

Show the two-minute videos *Forest Fact Break: Green Building* and *Forest Fact Break: Sustainability* (available at LearnForests.org). Discuss the relationship between buildings, sustainability and the forest. Identify some of the criteria for green building, then have students design a home that meets those criteria. Ask: What would happen if you couldn't use any wood products in your building?

Visit a nearby forest or park and encourage students to look for evidence of human impact. Discuss what students could do to reduce the impact, and then develop a service-learning project around one of the ideas. For example, you might partner with a local organization to have students plant trees, remove invasive species, collect litter, repair trails or make interpretive signs.

GRADES 9–12

High school students benefit when forests are used as a context for learning, as it provides them with a "real world" basis for applying new knowledge. Forest literacy activities at this grade level should provide opportunities for students to collect evidence and develop explanations based on evidence and to examine the implications of forest-related issues on a variety of levels.

The following are select Oregon Forest Literacy Plan concepts that align particularly well with content standards for this grade level band. We recommend focusing Grades 9–12 forest literacy activities around these topic areas, using the guiding questions and sample activities provided to help plan and lead instruction. In addition, the suggested "hot topic" is a current forest issue you might explore with students this age.

Guiding Question: What factors contribute to the biodiversity of Oregon's forests?

OFLP Concept	Oregon Standard	Sample Forest Literacy Activity*
1.C.3. Forest ecosystems are complex and dynamic, and continuously undergo change or adaptation, ranging from gradual change (e.g., succession and climate) to abrupt change (e.g., fire and disease).	**Science: HS-LS2-2.** Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. **Science: HS-LS2-6.** Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.	Challenge students to conduct a tree survey of the school grounds, identifying the genus and measuring the diameter at breast height (DBH) and total height of each tree, and researching to learn about the specific environmental conditions needed for each tree. Invite students to investigate the rate at which water is absorbed into various types of soil, and the amount and quantity of water that runs off the soil. Plan and conduct the investigation using a soil filtration model made from a two-liter plastic bottle (one side cut out, to resemble a canoe), a block or board to raise one end, and various soil materials.

Guiding Question: How do people manage forests to achieve desired forest outcomes and ensure the sustainability of our forests?

3.B.4. Forest management includes using natural processes and goal-oriented decisions and actions to achieve a variety of desired outcomes, including environmental (e.g., wildlife habitat and carbon sequestration), economic (e.g., timber production) and social (e.g., recreation) outcomes. Many of these outcomes are interrelated and can be managed for simultaneously, while others may be incompatible.	**Science: HS-ESS3-1.** Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.	Have students interview forest landowners to learn about the choices they must make in managing their forests, as well as any changes and challenges they face. Show the video *Forest Fact Break: Forest Management* (available at LearnForests.org) and have students make a list of goals people might have for forests. Possibilities include timber production, watershed protection, wildlife habitat, recreation or sequestering carbon. In small groups, have students identify how they might manage a 100-acre forest based on one of these goals. Compare strategies across groups and discuss how forest management relates to forest sustainability.

Guiding Question: What role do governments, private companies and individuals play in managing Oregon's forests?

3.C.6. Government has a role in actively engaging organizations, businesses, communities and individuals in forest management and policy decisions for publicly owned forests. Collaboratives (partnerships among forest stakeholders) are increasingly used in making public land management decisions. **3.D.5.** Making sure to involve multiple perspectives in decision-making, especially with regard to Oregon's public forest lands, can lead to more effective problem-solving and result in more sustainable outcomes.	**Social Studies: HS.76.** Propose, compare, and evaluate multiple responses, alternatives, or solutions to issues or problems; then reach an informed, defensible, supported conclusion. **Science: HS-ESS3-3.** Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.	Challenge students to develop and conduct an opinion survey to determine the community's views on forest and forest management issues, and then tally and analyze the results. Invite students to examine forest certification as one approach to ensuring that forests are managed in a sustainable way. Have students create a list of criteria they would include in a forest certification program, and then compare their list to actual forest certification systems.

Science · Mathematics · Social Studies · English Language Arts · Health · Art

*For more information about these and other high school activities, see *Inside Oregon's Forests: A High School Forestry Curriculum*, Oregon Forest Resources Institute; available at LearnForests.org.

Guiding Question: What can individuals do to help sustain forests?

OFLP Concept	Oregon Standard	Sample Forest Literacy Activity*
4.B.2. Personal behaviors and actions directly impact the health and resiliency of our forests. Our consumer choices and investments, how we interact with the land (e.g., trails, campgrounds and forest habitat), how we use or conserve water, and how we use fire can either harm or help forests.	**Science: HS-LS2-7.** Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. **Science: HS-ETS1-1.** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. **Social Studies: HS.44.** Assess how changes in the environmental and cultural characteristics of a place or region influence spatial patterns of trade, land use, and issues of sustainability.	Propose that students design and develop an interpretive trail for the community that goes through a local forest. Through this project, they learn about the local ecosystem, research interesting facts about plants, animals or historical figures, work with government agencies and businesses, and create signs or a brochure for the trail. Guide students in monitoring a nearby forest stream and riparian zone for the local watershed council. Challenge students to map the area using GPS units, take ongoing water quality samples, keep photo journals, analyze their results and develop a multimedia presentation of findings. Conduct a wildfire safety assessment of students' homes or the school, and have students make recommendations for increasing wildfire safety.

hot topic: CLIMATE CHANGE

Rising temperatures and changing weather patterns are affecting forests in many ways, including more intense fire seasons, disease and harmful insects. Active forest management, such as forest thinning and fuels reduction, can lessen the impacts of climate change.

Because trees absorb and store carbon through photosynthesis, forests also serve a vital biological role in lessening climate change. By removing carbon from the atmosphere, trees help reduce atmospheric carbon dioxide, a primary cause of climate change. Carbon continues to be sequestered even after a tree is harvested and manufactured into wood products.

Oregon Forest Literacy Plan Concepts:

1.C.8. Climate change may affect Oregon's forest ecosystems in many ways, such as more frequent and intense fires, severe weather events, increased insect outbreaks, and changes in species composition.

2.A.3. Forests sequester carbon from the atmosphere and are an essential component of the global carbon cycle.

Sample Forest Literacy Activities:

Direct students to study the *Carbon and Climate Fact Sheet* (available at *LearnForests.org*). Have them design an infographic that shows both how forests are impacted by climate change and how forests can help lessen it.

Work with students to develop a service-learning project that addresses forests and climate change. For example, they might identify an area that could benefit from more trees and organize a tree-planting project to increase the carbon sequestered, or learn how an issue like wildfire or invasive species is related to climate change and plan a community work day in a local public forest to both raise awareness and help reduce wildfire risk or invasive plants.

*For more information about these and other high school activities, see *Inside Oregon's Forests: A High School Forestry Curriculum*, Oregon Forest Resources Institute; available at LearnForests.org.

Glossary of terms

Active management – attaining desired forest objectives and future conditions using silvicultural operations and forest management practices.

Aquatic ecosystem – all living and non-living elements of a water-based environment, and the relationship between them.

Biodiversity – the variety of life on Earth, reflected in the variety of ecosystems and species, their processes and interactions, and the genetic diversity within and among species.*

Biome – a complex of communities characterized by a distinctive type of vegetation and maintained under the climatic conditions of the region.*

Biotic (adj.) – an environmental factor related to or produced by living organisms.*

Boreal forest – the northernmost broad band of mixed coniferous and deciduous trees that stretches across northern North America, Europe and Asia.

Carbon sequestration – the long-term storage of carbon in trees and other organisms, soil and oceans.

Climate change – a change in global or regional climate patterns. In particular, the term refers to a change apparent from the mid-twentieth century onward and attributed largely to the increased levels of atmospheric CO2 from the burning of fossil fuels.*

Consumer – an organism that obtains energy by feeding on other organisms and their remains.*

Crown – the top branches of a tree.*

Decomposer – a plant or organism that feeds on dead material and causes its mechanical or chemical breakdown.*

Ecosystem – the interacting system of a biological community and its nonliving environment; also, the place where these interactions occur.*

Energy flow – the one-way passage or transfer of energy through an ecosystem according to the laws of thermodynamics.*

Forest management – the practical application of scientific, economic and social principles to the administration of a forest.*

Forest product – any item or material derived from forests for commercial use, such as lumber, paper, mushrooms and forage for livestock.

Girdling – a traditional forest management technique of removing a strip of bark around the circumference of a tree's trunk, which kills the part above the strip and often the entire tree.

Habitat – an area that provides an animal or plant with adequate food, water, shelter and living space in a suitable arrangement.*

Harvest – see "Timber harvest."

Natural boundaries – borders of an area that follow natural geographic features such as a river or ridge.

Passive management – managing a forest area by letting nature take its course.

Perennial – a plant that lives for several years, and when mature usually produces seeds each year.*

Photosynthesis – the process by which green plants manufacture simple sugars in the presence of sunlight, carbon dioxide and water.*

Producer – an organism that synthesizes organic compounds from inorganic substances via photosynthesis (by green plants) or chemosynthesis (by anaerobic bacteria).*

Renewable resource – a naturally occurring raw material or form of energy that has the capacity to replenish itself through ecological cycles and sound management practices.*

Return – income or profit from an investment or the sale of land, timber or other property.

Succession – the gradual replacement of one community by another.*

Sustainable – able to meet the needs of the present without compromising the ability of future generations to meet their needs.

Temperate forest – a forest with moderate year-round temperatures and distinct seasons that is characterized by both conifers and broadleaf evergreens.

Terrestrial ecosystem – all living and nonliving elements of a land-based environment, and the relationship between them.

Timber – a forest stand containing trees of commercial size and quality suitable for sawing into lumber.*

Timber harvest – removal of trees from a forest to restore ecological health or to obtain income from the wood products.

Topography – the arrangement of landforms and land features of an area.

Tropical forest – a forest that grows in tropical climates with high year-round temperatures and generally high annual rainfall.

Wilderness – (1) a natural environment that has not been significantly modified by human activities; (2) land designated by the U.S. Congress for preservation and protection in its natural condition.

Definitions marked with an asterisk (*) came from Project Learning Tree's online glossary at www.plt.org/glossary and are used with permission from the Sustainable Forestry Initiative. To learn more about Project Learning Tree, see www.plt.org or contact the Oregon Natural Resource Education Program at 541-737-2128 or onrep@oregonstate.edu.

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