

TEXAS FOREST LITERACY PLAN

*A Texans' Guide to Learning and Teaching
About Texas' Forests*



TEXAS A&M
FOREST SERVICE



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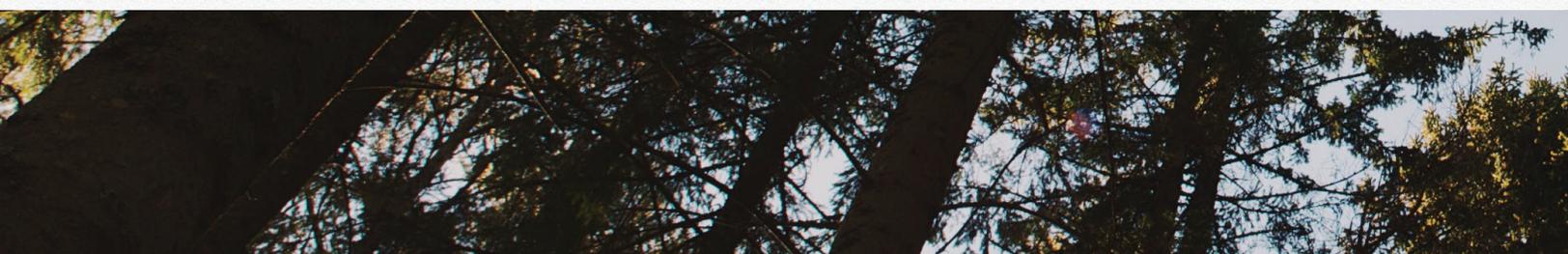
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The Texas Forest Literacy Plan (TFLP) is the result of a concerted effort among state government, universities, natural resource professionals, industry experts, and Texas educators to create a healthier, more sustainable future for Texas' forests and communities. This set of research-based concepts is a supplement to the Texas Natural Resource/Environmental Literacy Plan and serves as a basis for forest literacy education for all Texans.

Many thanks to the Oregon Forest Resource Institute for their inspiration and guidance in the creation of the Texas Forest Literacy Plan and supplemental resources. It is the hope of Texas A&M Forest Service, contributing partners, and the conceptual framework team that these concepts be adopted by other states in order to create their own forest literacy plans, providing a consistent, unified approach to teaching and learning about forests throughout the nation as a whole.

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ABOUT TFS

Texas A&M Forest Service provides statewide leadership to assure the state's trees, forests and related natural resources are protected and sustained for the benefit of all. Since its establishment in 1915 by the Texas Legislature, TFS remains committed to serving all Texans and promotes healthy forests and communities through forest management, incident and wildfire response, stewardship programs, and conservation education.

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WHY LEARN ABOUT FORESTS?

All life on earth, including our own,
depends on forests.



FORESTS PROVIDE MANY INVALUABLE SERVICES

Forests help filter freshwater, supply oxygen, modulate temperatures and rainfall, provide habitat for diverse animal and plant species, store atmospheric carbon, and more.



If our forests are healthy, Texas is healthy. Texas' forested landscapes include commercially viable timberland, recreational forests, **WOODLANDS** and **URBAN FORESTS** throughout the state. With this variety, "forest" written within this plan refers to one or more of these areas.

Healthy forests provide a sustainable flow of economic and environmental benefits affecting generations to come. Our forests supply renewable resources for lumber, paper, other wood projects and heating, along with jobs that support families and communities. Our forests are a critical factor in meeting the growing water needs, quantity and quality, of our Texas communities. They also provide us with an active playground and a quiet retreat.



FOREST LITERACY REFERS TO THE BODY OF KNOWLEDGE AND SKILLS SURROUNDING FOREST CONCEPTS

Every Texan is responsible for this land, its forests, and related natural resources. By becoming forest literate, Texans can ensure the state is adequately prepared to protect and enhance the long-term sustainability of these vital resources. The Texas Forest Literacy Plan presents a concept framework to increase knowledge, skills, and action about Texas forests and sustainable forest management.





UNDERSTAND

Understand concepts related to the forests of Texas



APPRECIATE

Appreciate the importance of forests



COMMUNICATE

Communicate about forests in a meaningful way



DECIDE

Make informed and responsible decisions about
Texas' forests and forest resources

To do this, we need to appreciate the diverse benefits we receive from sustainability managed forests along with the knowledge and skills to make decisions and understand the impact of our choices.



CONCEPTS OF FOREST LITERACY

LEARNING THE FOUR THEMES

This framework document represents a common vision of forest literacy held by foresters, natural resource professionals, industry professionals, educators and academic professionals in our state.



It embodies their shared aspiration for what every Texan should know about Texas' forests. Designed as a universal tool, this plan presents key ideas that Texans should understand to appreciate the importance of our forests and their role in sustaining them. It recognizes and builds on the fact that Texas ecology, history and economy are deeply rooted in forests. The framework is organized around 4 themes below. Each theme is followed by topics and concepts that address the question posed by the theme.

Building upon each other, the themes and concepts enable individuals to progress from a basic awareness to a deeper understanding of forests. Definitions for forest terms used in the framework may be found in the Glossary of Terms. Individually and collectively the themes and related concepts are designed to help Texans explore Texas' forests and their connections to them.

- 1** *theme:* **WHAT IS A FOREST?**
- 2** *theme:* **WHY ARE FORESTS IMPORTANT?**
- 3** *theme:* **HOW DO WE SUSTAIN OUR FORESTS?**
- 4** *theme:* **WHAT IS OUR RESPONSIBILITY TO TEXAS' FORESTS?**

1 | WHAT IS A FOREST?

The concepts within this theme provide us with a fundamental knowledge of Texas' forests as ecosystems. Comprehending these concepts will lead to an understanding of the relationship between forests and people.

1A

DEFINITION OF A FOREST

Identifying what constitutes a forest provides the basis for examining forests in a broader context:

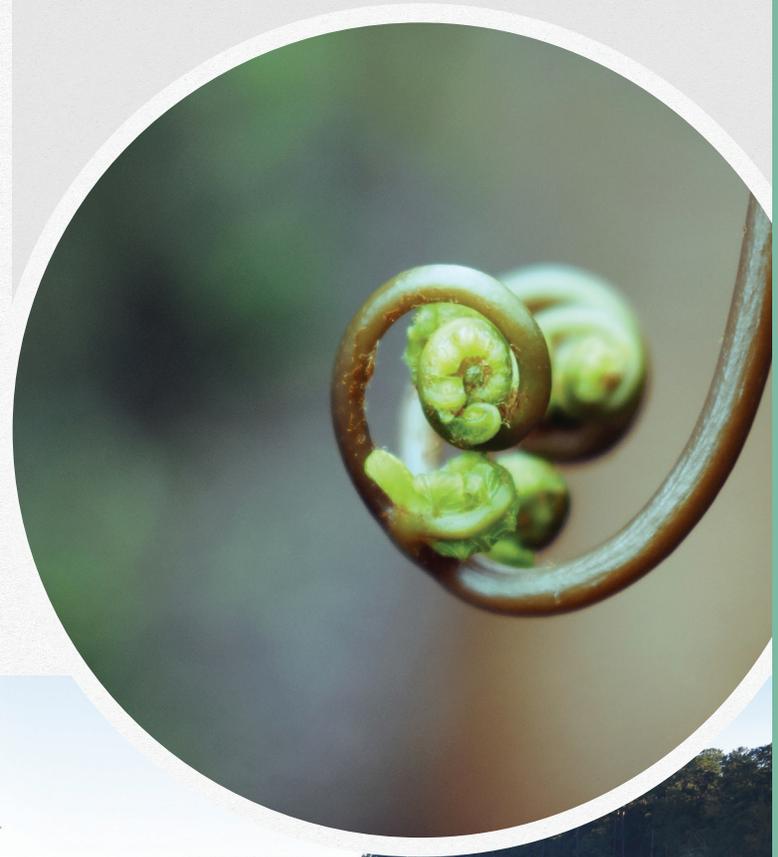
1. The word “forest” has many definitions, but because of varying cultural, political and economic perspectives, no definition is universally recognized. In Texas, forests are ecosystems characterized by tree cover and associated plant and animal communities.
2. Forests are composed of trees that may differ in species, age and size, and that are affected by living/**BIOTIC** factors (e.g., plants, animals and humans) and nonliving/**ABIOTIC**, factors (e.g., soils, nutrients, moisture, sunlight and climate).
3. Urban and community forests include all of the publicly and privately owned trees within a city, town or suburb working together as an **ECOSYSTEM**.

forest

for · est | \ˈfɔr-ə st, ˈfär-\

noun

: a plant community in both urban and rural areas in which the dominant vegetation is trees and woody plants

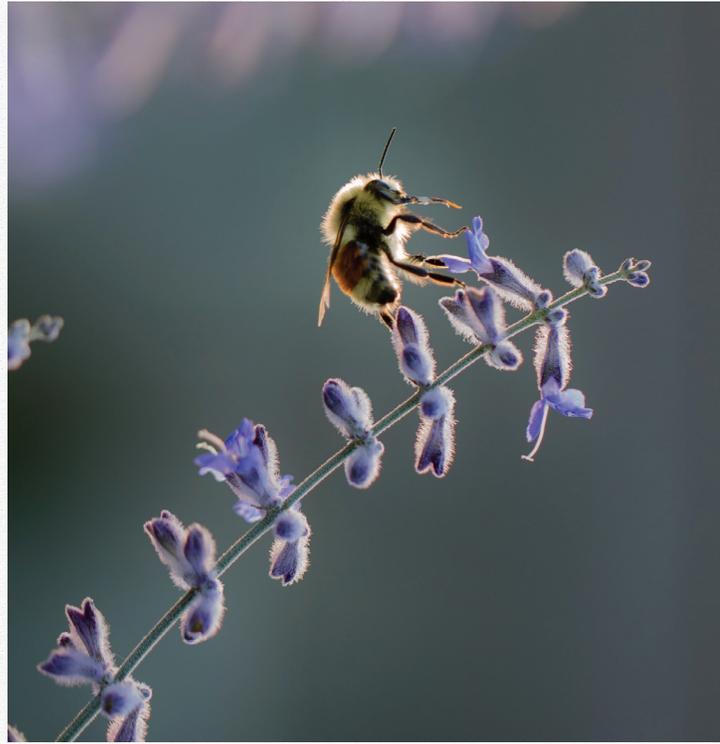


1B TREES AS PART OF A FOREST

One of the defining characteristics of forests is the trees within them.

The following concepts help people appreciate the uniqueness of trees and comprehend how single trees function and interact in a forest ecosystem:

1. A tree is a woody **PERENNIAL PLANT**, typically large, with a well-defined **STEM(s)** that supports a **CROWN** of leaves.
2. Trees have life stages that include germination, growth, maturity, reproduction, decline and death.
3. Trees experience both primary and secondary growth. Primary growth results in an increase in root length and tree height. Secondary growth results in the increasing diameter of roots, branches and stems.
4. As part of the forest ecosystem, trees have various roles. Those roles include supplying oxygen, producing forage, providing habitat, stabilizing soil, moderating temperature, capturing and storing carbon and cycling water and nutrients.
5. Trees compete with each other and with other plants growing near them for nutrients, sunlight, space and water.
6. The health of trees in a forest ecosystem depends on and is affected by many factors (e.g., soil quality, genetics, climate, disease and water availability).





FORESTS AS ECOSYSTEMS

1C

Trees and forests influence and are influenced by their surrounding environment.

Understanding basic ecological principles and how they apply to forests helps people appreciate the characteristics of forest ecosystems:

1. Forest ecosystems consist of different types of biotic organisms (e.g., **PRODUCERS**, **CONSUMERS** and **DECOMPOSERS**) and abiotic components (e.g., sunlight, soil, minerals and water) interacting within a given environment, space and time.
2. Humans depend on and influence forest ecosystems, and are themselves influenced by forest ecosystems.
3. Forest ecosystems include processes such as **PHOTOSYNTHESIS**, **ENERGY FLOW** and the cycling of nutrients, water, carbon and other matter.
4. 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., drought, fire, insect infestations and disease).
5. Natural and human-caused disturbance events are a part of forest ecosystems.

TYPES OF DISTURBANCE EVENTS

NATURAL

HUMAN-CAUSED

Storms

Timber Harvesting

Droughts

Road Construction

Floods

Fire

Fire

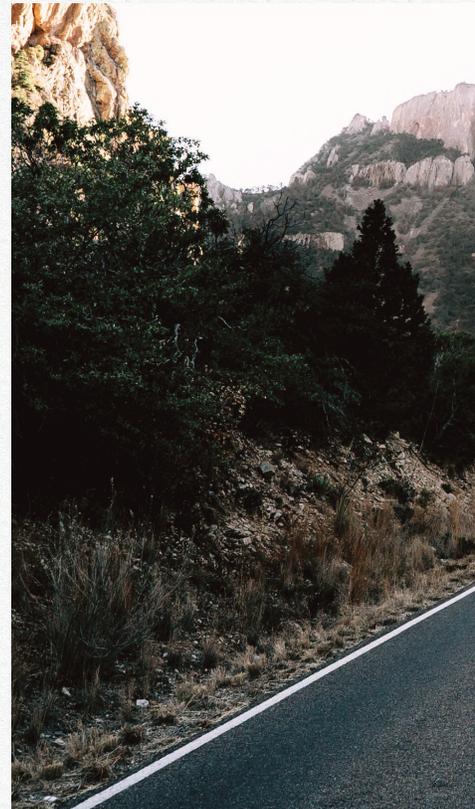
Urban Heat Island Effect

Insects

Development

Disease

6. Texas is a diverse state with many different **ecoregions** and vegetation types.
7. Forests are interconnected with other terrestrial and **AQUATIC ECOSYSTEMS**, forming a larger system.
8. Texas' **ECOREGIONS** vary in soil types, elevation, temperature, wind and rainfall patterns. These variations create the different forest types and residents (plants and animals) that, together with disturbance histories, contribute to that region's biodiversity.



FOREST CLASSIFICATION

1D

Classifying and differentiating forests into biomes and types help people make connections among the forests in the world, the forests in Texas and forests in their community:

1. Different forest **BIOMES** exist around the world. Examples include **TROPICAL FORESTS**, **TEMPERATE FORESTS** or **BOREAL FORESTS**.
Texas is in the temperate forest biome.
2. Different forest types exist within a biome, typically named by their dominant tree species. Texas is home to many different forest types (e.g., pine, oak-hickory, hardwood, mixed).
3. Trees can be classified into family, genus and species based on their seeds, leaves, flowers and other tree parts.



TROPICAL



TEMPERATE



BOREAL



2 | WHY ARE FORESTS IMPORTANT?

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



2A

HISTORICAL IMPORTANCE

Examining historical perspectives about forests provides an understanding of how forests have been important to people throughout time:

1. Forest resources have a major role in the history of Texas. Forests provided essential resources for Native Americans and settlers, jobs for a growing workforce, resources for building the state, products for export and revenue for a new state economy.
2. As multiple demands on forests increased, the practice of forest management evolved to conserve **NATURAL RESOURCES** and to improve society's use of forestlands. **FOREST MANAGEMENT** incorporated scientific principles and conservation measures that took many variables into consideration when formulating management decisions.
3. Historical perspectives, which may include aesthetic, cultural, spiritual, economic, political and educational factors, form our understanding of forests and our personal connections to forests, and guide our decisions to ensure healthy and sustainable forests for future generations.





ENVIRONMENTAL IMPORTANCE

2B

*Examining the benefits of the **ECOSYSTEM SERVICES** provided by forests helps people understand that forests are one of Earth's major life-support systems:*

1. Forests affect air, water and soil quality and provide **HABITAT** for fish and wildlife.
2. Forests provide the opportunity to study ecosystems, conservation strategies and natural resource management in order that future generations may benefit.
3. Forests collect and store carbon from the atmosphere and are an essential component of the global carbon cycle. **FOREST PRODUCTS** made from wood continue to store carbon for their lifetime.
4. Texas' forests, rural and urban, are important ecological systems interconnected with other systems environmentally, socially and economically. Changes in the conditions and uses of Texas' forests may affect the conditions and uses of forests worldwide.



2C

SOCIAL IMPORTANCE

Understanding how forests shape local communities helps people recognize the value of forests and the impacts they have on our society:

1. Texas' forests provide basic resources that people use every day.
2. People hold different values concerning forests and their uses, based on personal experiences and connections with the natural environment.
3. Forests influence the economic, social and cultural composition of both urban and rural communities.





HEALTH IMPORTANCE

2D

By recognizing the ways in which trees and forests enhance our health, we can elevate the importance of maintaining healthy forests, the value of community forestry, and the importance of spending time near trees:

1. Trees in urban spaces promote healthy, active lifestyles and increase the frequency of time spent in nature.
2. Trees positively influence our physical health in a variety of ways, including improving heart health, enhancing brain and lung function, and reducing our risk of skin cancer by providing shade that limits our exposure to harmful UV rays.
3. Time spent around trees can improve mental health and cognitive function, reduce stress levels and promote an overall sense of security and wellbeing.
4. Access to treed spaces can enhance the body's capacity to fight disease, reduce patient recovery time, and can increase patient pain thresholds, ultimately leading to a reduction in the use of pain medications.



2E

ECONOMIC IMPORTANCE

*By exploring the products, jobs, revenue and investment opportunities provided by the forest industry and market, people understand the importance of **WORKING FORESTS** for the economic livelihood of Texas, other parts of the country and the world.*

Forest products are sustainable. They come from a RENEWABLE RESOURCE and are often reusable and recyclable.

1. Forests provide multiple economic benefits, including jobs and forest products, renewable energy, financial returns to owners and investors and ecosystem service benefits such as carbon storage, clean water, biodiversity, recreation and tourism.
2. Forests provide income for local, state, national and international economies. The Texas forest market provides resources and products to the global marketplace including lumber, plywood, paper, engineered wood products and woody biomass.
3. **ECONOMIC RETURNS** to forest landowners are important in preventing the loss of forests to non-forest land uses.





3 | HOW DO WE SUSTAIN OUR FORESTS?

The concepts within this theme help individuals understand that Texas' forests are sustained through a rich variety of partnerships and relationships that span private and public sectors as well as all levels of government. For people to become participating members of a society that works toward sustainable forests, they must be able to comprehend the role of forest management in meeting society's needs.





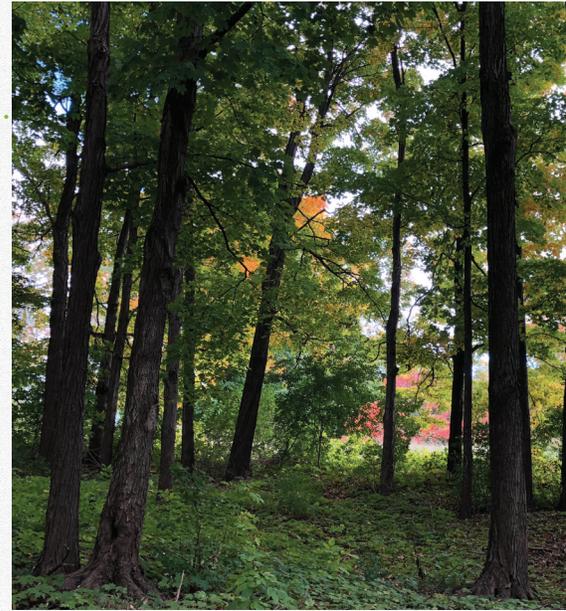
3A FOREST OWNERSHIP

*Understanding who owns Texas' forests helps people identify the basis for different **FOREST MANAGEMENT** decisions:*

1. Texas forestland is 94% privately owned, with 54% of those being owned by family forest landowners. The remaining 6% of Texas' forests are public forests managed primarily by the U.S. Forest Service and National Park Service.
2. The size and scale of ownership can vary from thousands of acres of a publicly or privately owned forest to an individual tree in an urban forest.
3. Forest landscapes are made up of a variety of ownerships, a mixture of management objectives and a blend of forest ecosystems.
4. Forest ownership is dynamic and changes over time. Each landowner may have different management objectives.
5. Regardless of ownership, forest ecosystems cross **NATURAL BOUNDARIES** (e.g., watersheds and mountains) and administrative boundaries (e.g., city limits and property lines).



- 94% PRIVATELY OWNED
- 54% FAMILY FOREST LANDOWNERS
- 6% MANAGED BY U.S. FOREST SERVICE & NATIONAL PARK SERVICE



FOREST MANAGEMENT

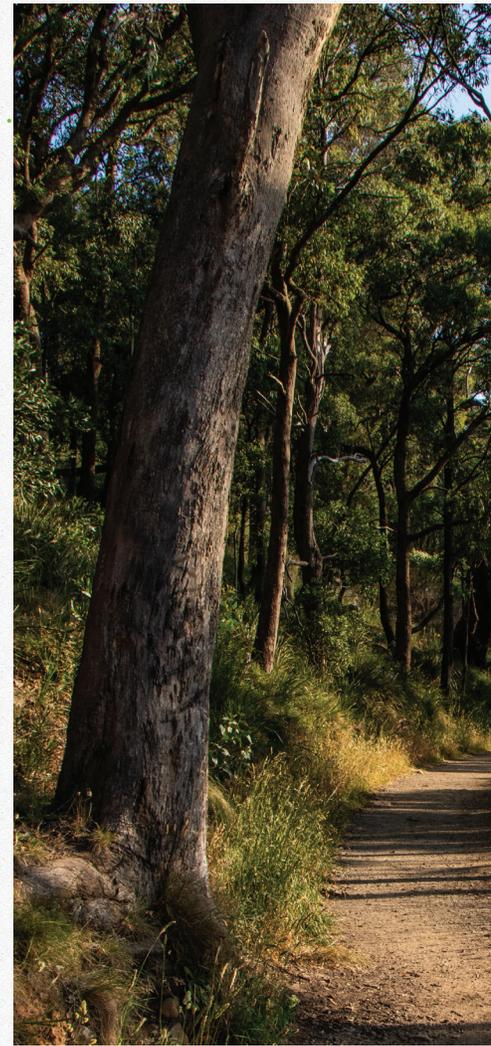
People manage forests for a variety of ecological, economic and social outcomes. Understanding the reasons forests are managed helps individuals think critically about forest management methods:

1. **FOREST MANAGEMENT** is a continuous process that can lead to changes in tree species composition, size and age, as well as in forest health and resilience.
2. Forest management ranges from **ACTIVE MANAGEMENT** (e.g., planting, prescribed burning and harvesting) to **PASSIVE MANAGEMENT** (e.g., set asides and wilderness areas). Both active and passive forest management can be used to grow, restore, maintain or alter forests.
3. Forest management includes the use of natural processes and goal-oriented decisions and actions to achieve a variety of desired outcomes including ecological (e.g., wildlife habitat), economic (e.g., timber production) and social (e.g., recreation). Many of these outcomes are interrelated and can be accomplished simultaneously, while others may be incompatible.
4. In Texas, the use of voluntary **BEST MANAGEMENT PRACTICES** in private and public forests is encouraged to sustain forestland for timber production and the other benefits that forests provide, such as clean water, wildlife habitat, and recreation.
5. 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.



Understanding why and how forests are managed helps prepare people to participate in forest management decisions. By understanding the individuals and groups involved in forest management, people will recognize the benefits and responsibility of sustainable forest management:

1. A variety of individuals, companies, organizations and government agencies assist in managing forests. Forest management decisions may involve some or all of these entities working collaboratively to ensure mutually beneficial outcomes. Forest resource professionals strive to meet economic, social and environmental needs.
2. The type and intensity of forest management is dependent on the purposes for which the forest is managed, the forest composition, ownership, size and location.
3. Texas urban and rural forest managers prepare plans based on goals, objectives, capabilities of the site, laws and available tools (e.g., planting, harvesting and using **PRESCRIBED FIRE**).
4. The public entrusts government to help conserve, maintain and sustain forest resources by enacting laws, creating policies, creating public lands, pursuing scientific research, providing management guidelines and continuing education.
5. Agencies, forest-related associations, professional groups and special interest groups have a responsibility to actively engage organizations, businesses, communities and individuals in forest management and policy decisions.
6. Sustainable management of forests takes into account social, economic and ecological dimensions. It includes maintaining forest health, productivity and diversity and conserving a forested land base for the needs of present and future generations.
7. Changing demands, unanticipated events and expectations for the forest affect decisions about forest resource use. Sound management is based on scientific research, economic analysis, landowner objectives and public involvement.





FOREST MANAGEMENT PERSPECTIVES

3D

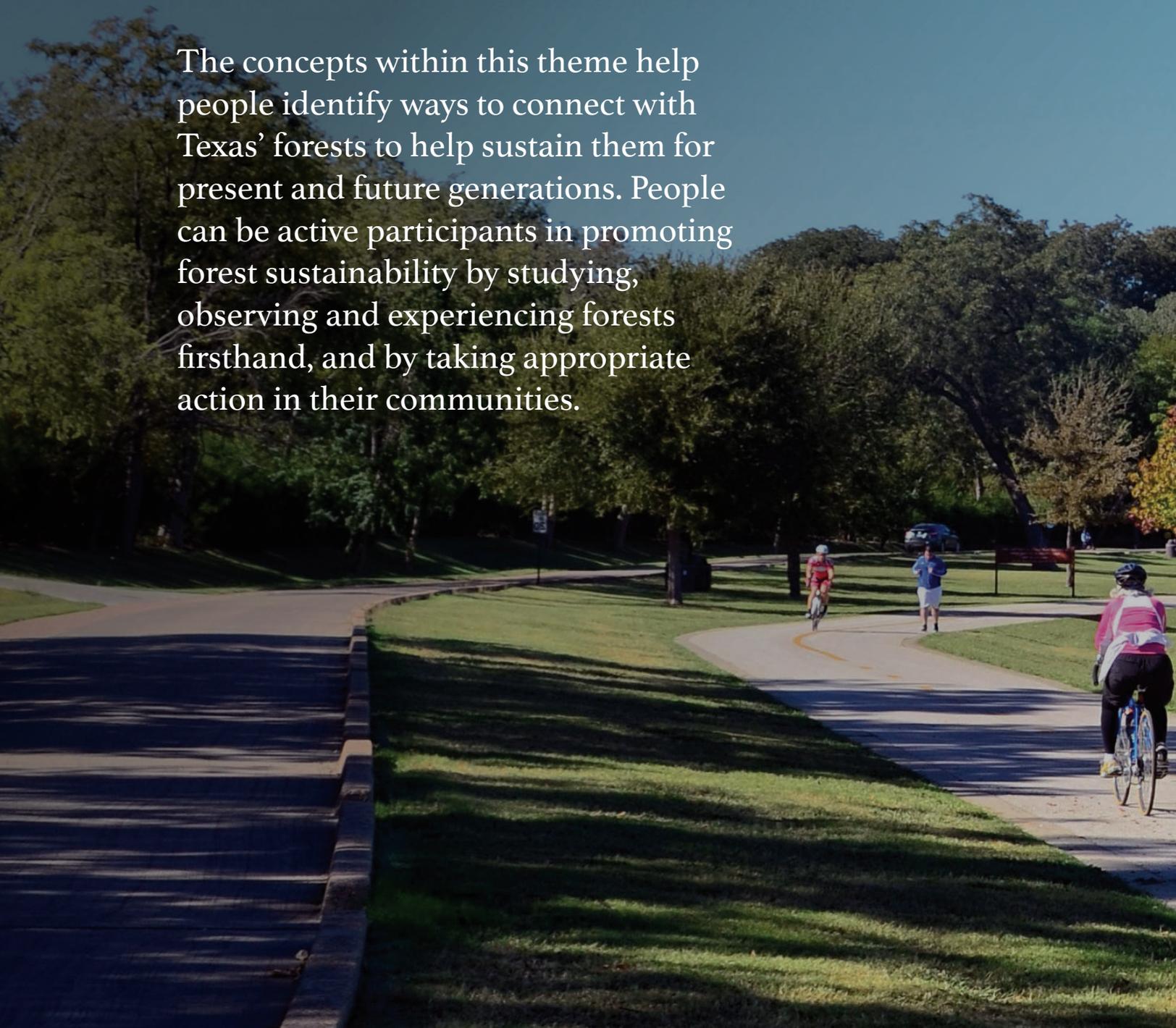
Examining the different perspectives involved in forest management helps people understand the complexity of forest management decisions:

1. People have differing perspectives about forest management, which can be affected by politics, science, economics, values, perceptions, proximity, education and experience.
2. Forest management practices can be controversial, because of **diverse perspectives** as well as the complex nature of forest ecosystems.
3. Issues related to forest management include the effects of timber harvest, **CARBON SEQUESTRATION**, climate change, forestland uses, wildfire, **INVASIVE SPECIES** and others.
4. Making sure that multiple perspectives are considered and respected in decision making can lead to more effective problem-solving and result in more sustainable outcomes for Texas' forests.



4 | WHAT IS OUR RESPONSIBILITY TO TEXAS' FORESTS?

The concepts within this theme help people identify ways to connect with Texas' forests to help sustain them for present and future generations. People can be active participants in promoting forest sustainability by studying, observing and experiencing forests firsthand, and by taking appropriate action in their communities.





4A

OUR CONNECTION TO TEXAS FORESTS

Helping individuals see their personal connections to forest landscapes helps them understand how their actions impact forests:

1. Everyone should have the opportunity to identify and explore their **personal connections with forests**.
2. Individuals can connect with forests in Texas in many ways, including hiking and recreating in forests, volunteering for projects in and around forests, **becoming informed and active voters**, attending public meetings and making wise consumer choices.
3. **Resources we use and consume every day**, and the benefits of improved water quality, air quality and energy savings, are connected to Texas' forests.





WORKING FOR THE FUTURE OF TEXAS' FORESTS

4B

*Learning to take action to support and foster **STEWARDSHIP** of Texas' forests in a variety of ways gives people pathways to involvement now and in the future:*

1. Everyone has a responsibility to treat forests with respect and to become a conscientious steward of Texas' forests and forest resources.
2. **Personal behaviors** directly impact the health and resiliency of our forests. For example, the products we buy, how we plan for growth in our communities, how we treat natural areas and how we hunt or use fire can either harm or help forest ecosystems.
3. Choices made regarding the use of forest resources affect our ability to sustain forest ecosystems into the future.
4. A variety of professionals and skilled trade workers are needed to sustain our forests, including, but not limited to foresters, biologists, soil scientists, geospatial professionals, land managers and planners, investors, educators, communications specialists, harvesting operators, mechanics and wood products manufacturers.
5. As individuals or as members of groups, we can influence laws and policies affecting Texas' forest ecosystems for the benefit of all.





GLOSSARY OF TERMS

Abiotic — a nonliving factor or element in the environment (e.g., light, water, heat, rock and gases).

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

Administrative Boundary — the border of a geographic area under the jurisdiction of a governmental, private or managerial entity.

Aquatic Ecosystem — all living and nonliving elements of a water-based environment, and the relationship between them.

Best Management Practices — voluntary conservation practices that protect soil and water resources, two key elements necessary for growing a healthy, sustainable and productive forest (e.g., leaving trees next to a stream or install culvert to cross a waterway).

Biome — a major ecological community type characterized by a distinctive type of vegetation (e.g., tropical rainforest, grassland or desert).

Biotic — 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 incorporation of carbon dioxide into permanent plant tissues and other organisms, soil and oceans.

Consumer — an organism, human or otherwise, that obtains energy by feeding on other organisms and their remains.

Crown — the part of a tree or woody plant bearing live branches or foliage.

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

Ecological Service — a function of forests and other healthy ecosystems that benefits living organisms, such as purifying air and water, maintaining biodiversity, decomposing wastes, generating soil and pollinating plants.

Economic (or Financial) Return — income or profit from an investment or the sale of land, timber or other property.

Ecoregion — an area of land or water that contains a geographically distinct collection of natural communities Ecoregions differ from one another based on climate, soil, geology, topography, flora, and fauna.

Ecosystem — the interacting system of a biological community and its nonliving environment.

Ecosystem Services — the benefits people obtain from ecosystems; potential direct and indirect services include clean water or air, wildlife or plant diversity, wood products and carbon storage.

Energy Flow — the one-way passage or transfer of energy through an ecosystem according to the laws of thermodynamics.

Forest — a plant community in both urban and rural areas in which the dominant vegetation is trees and woody plants.

Forest Management — the art and science of applying technical forestry principles and practices and business techniques to the management of a forest.

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

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) The process of selecting crops for removal and use.

Invasive Species — a plant, animal or other organism that is typically non-native to a particular ecosystem and whose introduction causes or is likely to cause harm to the economy, environment, or human health.



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

Passive Management – a non-management practice through which a forest is allowed to develop and grow without human intervention and by letting nature take its course.

Perennial Plant – 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 and oxygen in the presence of sunlight, carbon dioxide and water.

Prescribed Fire – the controlled use of fire to achieve landowners' management objectives.

Producer – (1) an organism that synthesizes organic compounds from inorganic substances via photosynthesis (by green plants) or chemosynthesis (by anaerobic bacteria); (2) any individual or firm engaged in using raw materials and converting them into various products.

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.

Silviculture – the science, art and practice of cultivating forest crops based on the study of the life history and general characteristics of forest trees.

Stem – the principal axis of a plant from which buds and shoots develop.

Stewardship – the careful and responsible management of something entrusted to one's care, e.g. stewardship of natural resources.

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

Sustainable Forest Management – managing forests 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 non-living 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 satisfy any or all of the expectations or needs of the forest landowner, which may be to generate income, encourage the growth of desirable flora or fauna, or protect the health of the forest ecosystem.

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

Urban Forest – all of the publicly and privately owned trees within a city, town or suburb.

Urban Heat Island – any urban area that is warmer than nearby rural areas.

Watershed – a region or land drained by a single stream, river or drainage network.

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.

Wildfire – any fire other than a controlled or prescribed burn occurring on wild land.

Working Forest – a forest, either public or private, that is actively and sustainably managed for the production of forest products, ecosystem services and/or natural beauty while conserving natural resources.

Woodland – A subset of forest land where the designated forest type is derived from species that are not usually converted into industrial wood products.



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FOR MORE INFORMATION VISIT
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