LEAF CONCEPTUAL GUIDE TO K-12 WILDLAND FIRE EDUCATION IN WISCONSIN

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LEAF was created to help promote forestry education in Wisconsin schools. In 2001, Wisconsin K-12 forestry education stakeholders evaluated the current status of and the needs for Wisconsin-based K-12 forestry education. A variety of programs existed, but voids were identified in delivery and dissemination of educational materials and services. To offer a more unified effort, stakeholders supported the development of a comprehensive program that would enhance existing efforts.

During the spring of 2001, legislation was written to establish the LEAF Program as a partnership between the Wisconsin Department of Natural Resources - Division of Forestry and the Wisconsin Center for Environmental Education at the College of Natural Resources, University of Wisconsin-Stevens Point. Funding for the program is provided through a surcharge on the sale of seedlings from Wisconsin Department of Natural Resources - Division of Forestry nurseries.

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CONCEPTUAL FRAMEWORK

PURPOSE OF A CONCEPTUAL GUIDE

A) Identify and present concepts educators can convey to students to help them understand wildland fire in Wisconsin.
B) Guide educators as they incorporate wildland fire education into their curricula and help them meet the Wisconsin Model Academic Standards.
C) Direct the development of LEAF wildland fire educational materials.
D) Serve as a framework for other wildland fire education efforts in Wisconsin.

WHAT IS A CONCEPTUAL FRAMEWORK?

Natural resource topics, such as wildland fire, cover a wide array of information, which could be overwhelming to understand and to teach. This framework divides wildland fire education into teachable concepts, organized in a manner that makes them easy to communicate. The framework is not a curriculum itself, but the structure around which activities and lessons in the *Wisconsin K-12 Wildland Fire Lesson Guide* were built. The framework is designed to evolve as wildland fire education evolves. We encourage educators to modify and add to this framework as curricula are developed to best meet their needs.

Detailed wildland fire principles are not listed in this document because they are beyond the scope of this framework and K-12 education. Specific details related to the concepts in this framework are used in activities to enhance understanding and provide examples.

Many individuals and organizations provided input to develop this conceptual framework. Initially, wildland fire concepts and ideas were gathered from natural resource and wildland fire professionals. Concepts were also gathered from textbooks and from existing state and national wildland fire education materials. Educators and wildland fire professionals then highlighted areas of importance within the information that had been gathered. The existing *LEAF Conceptual Guide to K-12 Forestry Education in Wisconsin* was used as the basis for the structure of this document.

This framework is organized under four themes posed as questions – What Is Wildland Fire? Why Is Wildland Fire Important? How Do We Manage Wildland Fire? What Is the Future? Each theme is followed by concepts that address the question, and the concepts are further divided into numbered subconcepts. The themes are arranged so they build upon each other. Students' progress from a basic understanding of wildland fire to the understanding of wildland fire in a social context. Definitions of some terms relative to use in this document are provided for clarity.

WHAT Is Wildland Fire?

- Definition of Wildland Fire
- Fire Behavior
- Fire Regimes
- Fire Ecology

The concepts in this theme provide students with a fundamental understanding of wildland fire and the factors that determine its ignition and behavior. The concepts help students understand the interrelationships among fire, human populations, and the rural landscape.

DEFINITION OF WILDLAND FIRE

By distinguishing between wildfire and prescribed fire and understanding the causes of each, students develop a context for understanding the difference between destructive and beneficial fires.

1. In Wisconsin, there are two main types of **wildland fire** – **wildfire** and **prescribed fire**. Wildfires start without the intent of the landowner or land manager and are uncontrolled and unwanted. Prescribed fires are contained and are planned to meet the goals of a landowner or land manager.

2. The ignition of wildland fire can be caused by human activity (e.g., **debris burning** and other outdoor burning, machine sparks, children playing with matches, power lines, fireworks) or natural sources (e.g., lightning, spontaneous combustion). Human activity is responsible for most wildland fires in Wisconsin.

FIRE BEHAVIOR

Understanding the factors that influence and determine fire behavior helps students build a foundation for examining the interaction between fire and the environment.

3. Fire requires oxygen, heat, and **fuel** to exist. Collectively these elements are known as the **fire triangle**. Under most conditions, the three elements can be manipulated to slow or stop the spread of fire.

4. Scientific principles that describe the transfer and transformation of energy help us understand and predict **fire behavior**.

GLOSSARY

Debris Burning: The outdoor burning of household and industrial waste; includes the legal burning of materials such as wood and paper, and the illegal burning of materials such as plastic and metal.

Fire Behavior: The manner in which a fire reacts to its environment.

Fire Triangle: The three elements (i.e., fuel, oxygen, heat) necessary for combustion to occur.

Fuel: Any substance that contributes to the growth or spread of fire.

Prescribed Fire: A fire used to deliberately burn wildland fuels under specific conditions to meet desired management goals (e.g., fuel management, disease and pest control, wildlife habitat).

Wildfire: A wildland fire that ignites and spreads without the intent of the landowner.

Wildland Fire: An outdoor fire involving primarily vegetative fuels.

5. Fire behavior is influenced by **topography**, weather, and **fuel characteristics**. The **fire season** is determined by seasonal changes in weather and fuel.

6. The three basic types of fire behavior are named according to the vegetation layer in which the fire is burning – **ground fire**, **surface fire**, and **crown fire**. Wildland fire can be further characterized by the **rate of spread**, **flame length**, and **heat per unit area**.

FIRE REGIMES

The study of fire regimes allows students to examine wildland fire in both a landscape and a historical context.

7. Humans are a fundamental component of **ecosystems**. Earth's **fire regimes** have been shaped by human influences.

8. Regions in Wisconsin and the United States differ in **climate**, topography, **land cover**, and **land use**. These differences create distinct fire regimes.

9. Fire regimes change through time due to factors such as forest **succession**, **climate change**, **species introduction**, **species extirpation,** and human land use.

GLOSSARY

Climate: Weather conditions for a region including temperature, precipitation, and wind.

Climate Change: The long-term fluctuations in precipitation, temperature, and wind caused mainly by variations in earth's orbital rotations, volcanic activity, human land use practices, and the combustion of fossil fuels.

Crown Fire: A fire that spreads across the tops of trees or shrubs.

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

Fire Regime: A cultural and biological system that defines the size, distribution, intensity, and frequency of fire in a given area.

Fire Season: The periods of the year when wildland fires are likely to occur; there are two main fire seasons in Wisconsin – spring (March to June) and fall (September to November).

Flame Length: The distance from the tip of a flame to the base of a fire.

Fuel Characteristics: Properties including quantity, chemistry, compaction, continuity, moisture content, and size.

Ground Fire: A fire that burns the organic material in the soil layer such as peat or duff.

Heat Per Unit Area: The total amount of heat released from a square foot of fuel for the duration of combustion.

Land Cover: The ecological features present across a landscape such as forest, urban, and field.

Land Use: The human activities occurring across a landscape such as forest management, land development, and agriculture.

Rate of Spread: The speed (feet per minute) at which a wildland fire moves into new fuels.

Species Extirpation: The extinction of a species from a specific area.

Species Introduction: The arrival and establishment of organisms that are not native to an ecosystem.

Succession: The gradual change from one biological community to another.

Surface Fire: A fire that burns fuels on the forest floor such as leaf litter and small vegetation.

Topography: The relative elevation and configuration of features in a landscape.

FIRE ECOLOGY

By examining the influence that wildland fire has on the biotic and abiotic components of ecosystems, students begin to understand the important role that fire plays in ecosystem sustainability.

10. Wildland fire is a disturbance common to terrestrial ecosystems. It can alter the **composition**, **structure**, and **function** of biologic communities, influencing succession.

11. Fire has different effects on different ecosystems. The effect of wildland fire on an ecosystem is a function of timing, frequency, and **fire intensity**.

12. Some species have characteristics that help them survive **periodic fire**. Species adaptations to fire evolve in response to the characteristics of the fire regime in the ecosystem with which they are associated.

GLOSSARY

Composition: The species in a community.

Ecosystem Function: A function that supports life including the fixation of energy, cycling of matter, and flow of energy through food webs.

Ecosystem Structure: The interrelationship between organisms and their environment.

Fire Intensity: The amount of heat released per second as a wildland fire burns in a specified area; calculated by measuring the flame length, rate of spread, and heat per unit area.

Periodic Fire: An intermittent fire resulting from natural or human ignition.

WHY Is Wildland Fire Important?

- Wildland Fire and Society
- Wildland Fire and the Environment

The concepts in this theme help students understand the connection between wildland fire and their own lives. Recognition of these connections helps increase awareness of the importance of wildland fire management.

WILDLAND FIRE AND SOCIETY

By describing the interrelationship between wildland fire and human populations, students gain an understanding of the benefits and costs of wildland fire. From this, students form a basis for making decisions about wildland fire management.

13. Current conditions are a result of past events. Decisions about the use of prescribed fire and the suppression of wildland fire affect present and future society.

14. Throughout Wisconsin's history, fire has been understood and used in different ways. Human use of fire is influenced by the knowledge, needs, and goals of individuals and society.

15. Wildland fires have led to the loss of human life, property, and natural resources throughout Wisconsin's history. Destructive fires can cause changes in land use practices, community development trends, and local, state, and federal governance.

16. Wildland fire management has direct and indirect costs and benefits for the economy. Effective wildland fire management requires both financial and human resources.

WILDLAND FIRE AND THE ENVIRONMENT

Ecosystems sustain human populations through the production of food and fiber and the provision of ecological services such as water retention, wildlife, and recreation. By defining the importance of fire in the landscape, students will be able to make connections between themselves, ecosystems, and current and historic fire management practices.

17. Throughout history, fire has played an influential role in determining the composition, structure, and function of many ecosystems. Terrestrial ecosystems in Wisconsin and the United States have been influenced by fire.

18. Fire can play an important role in the **restoration** and **maintenance** of ecosystems. In Wisconsin, periodic fire is an important component of a variety of plant communities.

19. The management of ecosystems is influenced by our understanding of fire history. Understanding fire history can help land managers plan prescribed fire, **silvicultural prescriptions**, and fire suppression activities that help sustain ecosystems.

GLOSSARY

Ecosystem Maintenance: The management of an ecosystem to sustain a desired composition and structure.

Ecosystem Restoration: The management of an ecosystem to achieve a composition and structure that existed historically.

Silvicultural Prescription: A forestry activity (e.g., planting, harvesting, pruning, fertilizing) conducted to satisfy the objectives of a landowner.

- Definition of Wildland Fire Management
- Management Planning

The concepts in this theme help students understand the role humans play in the encouragement or elimination of fire from the landscape. For students to become participating members of a sustainable society, they must be able to understand the goals of different individuals and groups and empathize with people who have differing points of view.

DEFINITION OF WILDLAND FIRE MANAGEMENT

An understanding of the fundamentals of wildland fire management allows students to effectively participate in decision-making processes that affect the use and suppression of wildland fire.

20. Wildland fire management uses the principles of fire behavior and understanding of human fire practices to eliminate unwanted fires and promote beneficial ones. Wildland fire can be managed for cultural, ecological, and economic reasons.

21. Wildland fire management involves four interrelated activities – the **prevention** of accidental fire, **presuppression**, the **suppression** of unwanted fire, and the use of prescribed fire as a management tool.

MANAGEMENT PLANNING

An understanding of the complexity of fire management helps students see the important role planning plays in dealing with complex situations.

22. Decisions about fire management involve land managers, property owners, communities, and governments. The needs of each group should be taken into consideration.

23. The economic, environmental, and social characteristics of the landscape are interrelated. The sustainable management of fire dependent ecosystems requires that both human and ecological needs be met.

24. Fire management is achieved by defining objectives, developing a plan to meet the objectives, and implementing processes and activities in accordance with the plan.

25. Fire management plans must adapt to changing social, economic, and ecological conditions. Management strategies are limited by the resources available (e.g., skilled personnel, money, equipment).

GLOSSARY

Fire Prevention: A variety of actions taken to decrease the risk of ignition of wildland fires; accomplished through education, engineering, and enforcement of laws.

Presuppression: Activities undertaken to prepare for fire suppression; includes the construction of access roads, preparation of suppression strategies, and training of suppression teams.

WHAT Is the Future?

- Responsibility and Safety
- Wildland Fire Issues
- Advances in Wildland Fire Management

The concepts in this theme help students identify ways in which human populations can live compatibly with wildland fire. For students to make constructive decisions, they must have a clear understanding of their responsibility as citizens, the issues at hand, and the changes that may come.

RESPONSIBILITY AND SAFETY

An awareness of the roles of individuals and communities in wildland fire management prepares students to be responsible citizens.

26. Individuals have the responsibility to start and stop fires in safe and effective ways. Citizens who illegally start a fire or carelessly allow a fire to escape may be penalized with fines and even imprisonment.

27. Homeowners have a responsibility to protect their property from wildland fire. The location, landscaping, maintenance, and design of a home can influence the threat of wildland fire to residents and their property.

Suppression: The act of confining and extinguishing a wildland fire.

28. **Community action plans** can help prevent wildland fire, facilitate the control of unwanted fire, and speed the recovery of communities after a destructive wildland fire.

29. Fire management in Wisconsin and the United States involves cooperation between the public and a variety of federal, state, municipal, and private institutions.

WILDLAND FIRE ISSUES

An understanding of the issues surrounding the use and suppression of wildland fire prepares students to make informed judgments on proposed management actions and land use plans. It also allows students to constructively participate in solution-building processes.

30. Due to human land use and historical fire suppression, some of Wisconsin's fire dependent plant communities (e.g., oak savannas, pine barrens, prairies) have been reduced in size. Reintroduction of fire will be important to their existence.

31. Human population expansion and community development trends are causing the **fragmentation** of forest and grassland areas in Wisconsin. As the landscape becomes more fragmented, fire management becomes more difficult.

32. The **wildland/urban interface** is an area where human structures exist among wildland fuels. As people move into fire prone areas, the potential for ignition of wildland fire increases and buildings and other human-made objects become a possible fuel source.

33. The use of some wildland fire management techniques (e.g., prescribed fire, construction of firebreaks, forest thinning) can be controversial because of safety issues and aesthetic impact. The use of these techniques is sometimes misunderstood.

ADVANCES IN WILDLAND FIRE MANAGEMENT

By analyzing trends in the study of wildland fire and related career opportunities, students better understand the efforts involved in wildland fire management and are able to prepare themselves for a future in related career fields.

34. The study of wildland fire is multidisciplinary. A complete understanding of wildland fire requires knowledge from a variety of disciplines such as physics, chemistry, biology, meteorology, ecology, economics, technology, politics, archeology, and history.

35. There are several natural resource career paths related to fire management including forest/range managers, fire suppression specialists, fire supervisors, fire prevention/education specialists, law enforcement officers, meteorologists, foresters, biologists, computer specialists, economists, and ecologists.

36. Science and technology contribute to the understanding of wildland fire, the impacts of human actions, and how fire can best be managed. As knowledge is gained, fire management is adapted.

GLOSSARY

Community Action Plan: An agreement among members of a neighborhood or community to take action to reduce the risk of wildland fire ignition and help community members prepare for and recuperate from destructive wildland fire.

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

Wildland/Urban Interface: An area where human structures are in close proximity to wildland fuels.

SUGGESTED SCOPE AND SEQUENCE

INTRODUCTION

This section provides guidelines showing when and to what extent to integrate wildland fire education concepts into school curricula. LEAF developed this suggested scope and sequence with the help of K-12 teachers. The structure of the following section was developed based on Wisconsin's Model Academic Standards and the *Atlas of Science Literacy*. This section can be used as a guide for when (grade level) and where (subject area) forestry education concepts can be incorporated into a curriculum.

Note that this scope and sequence is not a one-size-fits-all solution to wildland fire education; educators and curriculum designers in each school system will need to determine the best ways to introduce concepts into their curricula. For example, after surveying existing curricula, educators may find that they are already addressing some of these concepts. If educators are not covering a particular concept, then they may revise curriculum to include it. This *Wisconsin K-12 Wildland Fire Lesson Guide* contains interdisciplinary wildland fire related activities that can be used by educators to bring wildland fire education concepts into their curriculum.

WISCONSIN MODEL ACADEMIC STANDARDS

The Wisconsin Model Academic Standards were developed by the Wisconsin Department of Public Instruction. The standards specify what students should know and be able to do by certain points in their K-12 education. School districts may use the academic standards as guides for developing local grade-by-grade curricula. The subconcepts in this framework have been correlated with the standards to enhance ease of use for educators. The four subject areas cited (agriculture education, environmental education, science, and social studies,) have the most direct correlation to the subconcepts. Certainly, other subject areas are covered and listed in this Lesson Guide. Full text of the standards cited in the scope and sequence can be found on page xix.

HOW TO USE THE FOLLOWING DIAGRAMS

All the concepts and subconcepts have been placed on diagrams under the four theme headings. The purpose of this structure is to visually represent at which level (K-4, 5-8, 9-12) each of the subconcepts is introduced and how they spiral to higher grade levels. Some subconcepts are core ideas in wildland fire education that spiral through all levels. Other subconcepts enhance core ideas and may only appear at one or two levels. The levels chosen were based on Bloom's Taxonomy of Cognitive Development and correlated with the levels within Wisconsin's Model Academic Standards. The appropriate standards are listed at each level for reference.

EXAMPLE DIAGRAM

THEME heading and explanation.

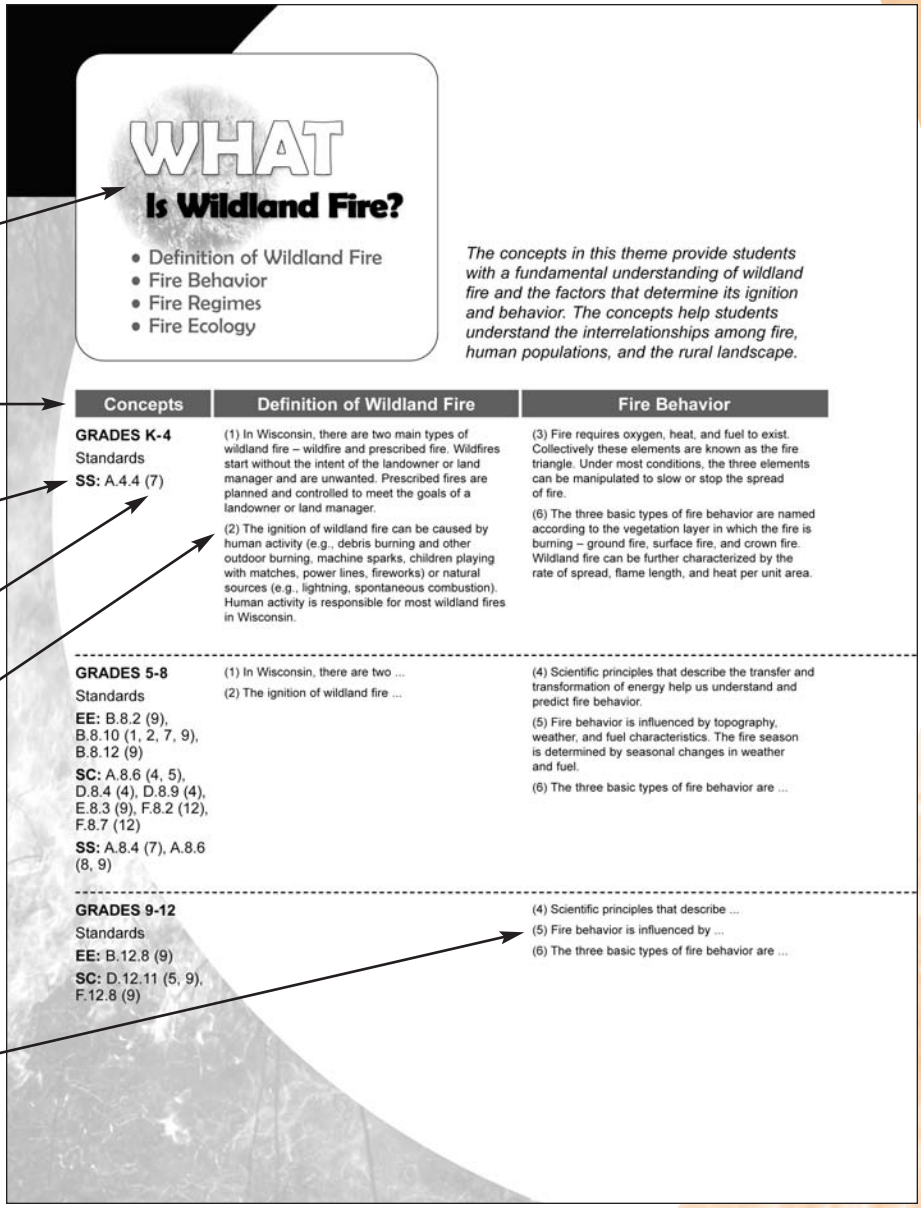
CONCEPTS related to the theme.

STANDARDS addressed.

Numbers in parenthesis are the subconcept(s) correlated with a particular standard.

SUBCONCEPTS related to each concept are placed at the appropriate grade level.

Subconcepts are written out at the lowest grade level they appear. At all successive levels, they are truncated.



WHAT Is Wildland Fire?

- Definition of Wildland Fire
- Fire Behavior
- Fire Regimes
- Fire Ecology

The concepts in this theme provide students with a fundamental understanding of wildland fire and the factors that determine its ignition and behavior. The concepts help students understand the interrelationships among fire, human populations, and the rural landscape.

Concepts	Definition of Wildland Fire	Fire Behavior
GRADES K-4 Standards **SS:** A.4.4 (7)	(1) In Wisconsin, there are two main types of wildland fire – wildfire and prescribed fire. Wildfires start without the intent of the landowner or land manager and are unwanted. Prescribed fires are planned and controlled to meet the goals of a landowner or land manager. (2) The ignition of wildland fire can be caused by human activity (e.g., debris burning and other outdoor burning, machine sparks, children playing with matches, power lines, fireworks) or natural sources (e.g., lightning, spontaneous combustion). Human activity is responsible for most wildland fires in Wisconsin.	(3) Fire requires oxygen, heat, and fuel to exist. Collectively these elements are known as the fire triangle. Under most conditions, the three elements can be manipulated to slow or stop the spread of fire. (6) The three basic types of fire behavior are named according to the vegetation layer in which the fire is burning – ground fire, surface fire, and crown fire. Wildland fire can be further characterized by the rate of spread, flame length, and heat per unit area.
GRADES 5-8 Standards **EE:** B.8.2 (9), B.8.10 (1, 2, 7, 9), B.8.12 (9) **SC:** A.8.6 (4, 5), D.8.4 (4), D.8.9 (4), E.8.3 (9), F.8.2 (12), F.8.7 (12) **SS:** A.8.4 (7), A.8.6 (8, 9)	(1) In Wisconsin, there are two ... (2) The ignition of wildland fire ...	(4) Scientific principles that describe the transfer and transformation of energy help us understand and predict fire behavior. (5) Fire behavior is influenced by topography, weather, and fuel characteristics. The fire season is determined by seasonal changes in weather and fuel. (6) The three basic types of fire behavior are ...
GRADES 9-12 Standards **EE:** B.12.8 (9) **SC:** D.12.11 (5, 9), F.12.8 (9)		(4) Scientific principles that describe ... (5) Fire behavior is influenced by ... (6) The three basic types of fire behavior are ...

KEY TO STANDARDS* ABBREVIATIONS

AG.....Agriculture Education
EE .....Environmental Education
SC .....Science
SS .....Social Studies

* Standards in other subject areas such as English Language Arts, Mathematics, and Visual Arts will be addressed in the lesson guide.

WHAT Is Wildland Fire?

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Concepts	Definition of Wildland Fire	Fire Behavior
GRADES K-4 Standards **SS:** A.4.4 (7)	(1) In Wisconsin, there are two main types of wildland fire – wildfire and prescribed fire. Wildfires start without the intent of the landowner or land manager and are unwanted. Prescribed fires are planned and controlled to meet the goals of a landowner or land manager. (2) The ignition of wildland fire can be caused by human activity (e.g., debris burning and other outdoor burning, machine sparks, children playing with matches, power lines, fireworks) or natural sources (e.g., lightning, spontaneous combustion). Human activity is responsible for most wildland fires in Wisconsin.	(3) Fire requires oxygen, heat, and fuel to exist. Collectively these elements are known as the fire triangle. Under most conditions, the three elements can be manipulated to slow or stop the spread of fire. (6) The three basic types of fire behavior are named according to the vegetation layer in which the fire is burning – ground fire, surface fire, and crown fire. Wildland fire can be further characterized by the rate of spread, flame length, and heat per unit area.
GRADES 5-8 Standards **EE:** B.8.2 (9), B.8.10 (1, 2, 7, 9), B.8.12 (9) **SC:** A.8.6 (4, 5), D.8.4 (4), D.8.9 (4), E.8.3 (9), F.8.2 (12), F.8.7 (12) **SS:** A.8.4 (7), A.8.6 (8, 9)	(1) In Wisconsin, there are two ... (2) The ignition of wildland fire ...	(4) Scientific principles that describe the transfer and transformation of energy help us understand and predict fire behavior. (5) Fire behavior is influenced by topography, weather, and fuel characteristics. The fire season is determined by seasonal changes in weather and fuel. (6) The three basic types of fire behavior are ...
GRADES 9-12 Standards **EE:** B.12.8 (9) **SC:** D.12.11 (5, 9), F.12.8 (9)		(4) Scientific principles that describe ... (5) Fire behavior is influenced by ... (6) The three basic types of fire behavior are ...

Fire Regimes	Fire Ecology
(7) Humans are a fundamental component of ecosystems. Earth's fire regimes have been shaped by human influences. (8) Regions in Wisconsin and the United States differ in climate, topography, land cover, and land use. These differences create distinct fire regimes.	
(7) Humans are a fundamental ... (8) Regions in Wisconsin and the United States differ ... (9) Fire regimes change through time due to factors such as forest succession, climate change, species introduction, species extirpation, and human land use.	(10) Wildland fire is a disturbance common to terrestrial ecosystems. It can alter the composition, structure, and function of biologic communities, influencing succession. (11) Fire has different effects on different ecosystems. The effect of wildland fire on an ecosystem is a function of timing, frequency, and fire intensity. (12) Some species have characteristics that help them survive periodic fire. Species adaptations to fire evolve in response to the characteristics of the fire regime in the ecosystem with which they are associated.
(7) Humans are a fundamental ... (9) Fire regimes change through time ...	(10) Wildland fire is a disturbance ... (11) Fire has different effects on different ecosystems. ... (12) Some species have characteristics ...

WHY Is Wildland Fire Important?

- Wildland Fire and Society
- Wildland Fire and the Environment

The concepts in this theme help students understand the connection between wildland fire and their own lives. Recognition of these connections helps increase awareness of the importance of wildland fire management.

Concepts	Wildland Fire and Society	Wildland Fire and the Environment
GRADES K-4 Standards **SS:** A.4.8 (15), D.4.2 (16)	(13) Current conditions are a result of past events. Decisions about the use of prescribed fire and the suppression of wildland fire affect present and future society. (14) Throughout Wisconsin's history, fire has been understood and used in different ways. Human use of fire is influenced by the knowledge, needs, and goals of individuals and society. (15) Wildland fires have led to the loss of human life, property, and natural resources throughout Wisconsin's history. Destructive fires can cause changes in land use practices, community development trends, and local, state, and federal governance. (16) Wildland fire management has direct and indirect costs and benefits for the economy. Effective wildland fire management requires both financial and human resources.	
GRADES 5-8 Standards **EE:** B.8.9 (14), B.8.10 (13, 14), B.8.12 (14) **SC:** F.8.9 (17) **SS:** A.8.4 (13, 14)	(13) Current conditions are a result of past events ... (14) Throughout Wisconsin's history ... (15) Wildland fires have led to the loss of ... (16) Wildland fire management has ...	(17) Throughout history, fire has played an influential role in determining the composition, structure, and function of many ecosystems. Terrestrial ecosystems in Wisconsin and the United States have been influenced by fire. (18) Fire can play an important role in the restoration and maintenance of ecosystems. In Wisconsin, periodic fire is an important component of a variety of plant communities.
GRADES 9-12 Standards **EE:** B.12.3 (18)	(13) Current conditions are a result of past events ... (16) Wildland fire management has ...	(17) Throughout history, fire has played an influential role ... (18) Fire can play an important role in the restoration and maintenance ... (19) The management of ecosystems is influenced by our understanding of fire history. Understanding fire history can help land managers plan prescribed fire, silvicultural prescriptions, and fire suppression activities that help sustain ecosystems.

- Definition of Wildland Fire Management
- Management Planning

The concepts in this theme help students understand the role humans play in the encouragement or elimination of fire from the landscape. For students to become participating members of a sustainable society, they must be able to understand the goals of different individuals and groups and empathize with people who have differing points of view.

Concepts	Definition of Wildland Fire Management	Management Planning
GRADES K-4 Standards **(None)**	(20) Wildland fire management uses the principles of fire behavior and understanding of human fire practices to eliminate unwanted fires and promote beneficial ones. Wildland fire can be managed for cultural, ecological, and economic reasons.	(22) Decisions about fire management involve land managers, property owners, communities, and governments. The needs of each group should be taken into consideration. (23) The economic, environmental, and social characteristics of the landscape are interrelated. The sustainable management of fire dependent ecosystems requires that both human and ecological needs be met.
GRADES 5-8 Standards **EE:** B.8.23 (22)	(20) Wildland fire management uses the principles of ... (21) Wildland fire management involves four interrelated activities – the prevention of accidental fire, presuppression, the suppression of unwanted fire, and the use of prescribed fire as a management tool.	(22) Decisions about fire management involve ... (23) The economic, environmental, and social characteristics of the landscape ...
GRADES 9-12 Standards **EE:** B.12.12 (23) **SC:** H.12.5 (23), H.12.7 (24) **SS:** A.12.12 (23)	(20) Wildland fire management uses the principles of ... (21) Wildland fire management involves four interrelated activities ...	(22) Decisions about fire management involve ... (23) The economic, environmental, and social characteristics of the landscape ... (24) Fire management is achieved by defining objectives, developing a plan to meet the objectives, and implementing processes and activities in accordance with the plan. (25) Fire management plans must adapt to changing social, economic, and ecological conditions. Management strategies are limited by the resources available (e.g., skilled personnel, money, equipment).

WHAT Is the Future?

- Responsibility and Safety
- Wildland Fire Issues
- Advances in Wildland Fire Management

The concepts in this theme help students identify ways in which human populations can live compatibly with wildland fire. For students to make constructive decisions, they must have a clear understanding of their responsibility as citizens, the issues at hand, and the changes that may come.

Concepts	Responsibility and Safety	Wildland Fire Issues
GRADES K-4 Standards **SS:** A.4.4 (27), A.4.9 (34), C.4.3 (26)	(26) Individuals have the responsibility to start and stop fires in safe and effective ways. Citizens who illegally start a fire or carelessly allow a fire to escape may be penalized with fines and even imprisonment. (27) Homeowners have a responsibility to protect their property from wildland fire. The location, landscaping, maintenance, and design of a home can influence the threat of wildland fire to residents and their property. (28) Community action plans can help prevent wildland fire, facilitate the control of unwanted fire, and speed the recovery of communities after a destructive wildland fire.	
GRADES 5-8 Standards **AG:** E.8.2 (30, 31) **EE:** B.8.10 (30), B.8.22 (36) **SC:** F.8.9 (30), F.8.10 (31), G.8.1 (36)	(26) Individuals have the responsibility to ... (27) Homeowners have a responsibility to ... (28) Community action plans can help prevent wildland fire ...	(30) Due to human land use and historical fire suppression, some of Wisconsin's fire dependent plant communities (e.g., oak savannas, pine barrens, prairies) have been reduced in size. Reintroduction of fire will be important to their existence. (31) Human population expansion and community development trends are causing the fragmentation of forest and grassland areas in Wisconsin. As the landscape becomes more fragmented, fire management becomes more difficult.
GRADES 9-12 Standards **AG:** B.12.5 (36) **EE:** B.12.9 (34), B.12.14 (34), B.12.21 (36), D.12.5 (28) **SC:** B.12.4 (34) **SS:** A.12.12 (31)	(27) Homeowners have a responsibility to ... (28) Community action plans can help prevent wildland fire ... (29) Fire management in Wisconsin and the United States involves cooperation between the public and a variety of federal, state, municipal, and private institutions.	(30) Due to human land use and historical fire suppression ... (31) Human population expansion and community development trends ... (32) The wildland/urban interface is an area where human structures exist among wildland fuels. As people move into fire prone areas, the potential for ignition of wildland fire increases, and buildings and other human-made objects become a possible fuel source. (33) The use of some wildland fire management techniques (e.g., prescribed fire, construction of firebreaks, forest thinning) can be controversial because of safety issues and aesthetic impact. The use of these techniques is sometimes misunderstood.

Advances in Wildland Fire Management

(34) The study of wildland fire is multidisciplinary. A complete understanding of wildland fire requires knowledge from a variety of disciplines such as physics, chemistry, biology, meteorology, ecology, economics, technology, politics, archeology, and history.

(35) There are several natural resource career paths related to fire management including forest/range managers, fire suppression specialists, fire supervisors, fire prevention/ education specialists, law enforcement officers, meteorologists, foresters, biologists, computer specialists, economists, and ecologists.

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(34) The study of wildland fire is multidisciplinary ...

(35) There are several natural resource career paths related to fire management ...

(36) Science and technology contribute to the understanding of wildland fire, the impacts of human actions, and how fire can best be managed. As knowledge is gained, fire management is adapted.

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(34) The study of wildland fire is multidisciplinary ...

(35) There are several natural resource career paths related to fire management ...

(36) Science and technology contribute ...

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APPENDIX:
WISCONSIN'S MODEL ACADEMIC STANDARDS

AGRICULTURE (AG)

B.12.5 Explore various career opportunities in the food, fiber, and natural resources industries using available forms of technology
- seek information from CD-ROMs and the World Wide Web
- interview employers and/or current employees using current technologies (e.g., videoconferencing, e-mail, videophone)
- visit websites of potential employers
- develop a brochure about a career or company to present to the class

E.8.2 Describe and give examples of how land use impacts the environment
- explain how urbanization has impacted native ecosystems
- explain how agricultural use of land has impacted native ecosystems
- explain how urbanization has impacted agricultural land

ENVIRONMENTAL EDUCATION (EE)

B.8.2 Explain how change is a natural process, citing examples of succession, evolution, and extinction

B.8.9 Explain how the environment is perceived differently by various cultures

B.8.10 Explain and cite examples of how humans shape the environment

B.8.12 Provide examples of how different cultures use natural resources reflecting the economic, aesthetic, and other values of that culture

B.8.22 Identify careers related to natural resources and environmental concerns

B.8.23 Identify governmental and private agencies responsible for environmental protection and natural resource management

B.12.3 Evaluate the stability and sustainability of ecosystems in response to changes in environmental conditions

B.12.8 Relate the impact of human activities in ecosystems to the natural process of change, citing examples of succession, evolution, and extinction

B.12.9 Evaluate ways in which technology has expanded our ability to alter the environment and its capacity to support humans and other living organisms

B.12.12 Evaluate the environmental and societal costs and benefits of allocating resources in various ways and identify management strategies to maintain economic and environmental sustainability

B.12.14 Investigate how technological development has influenced human relationships and understanding of the environment

B.12.21 Research the roles of various careers related to natural resource management and other environmental fields

D.12.5 Develop a plan to maintain or improve some part of the local or regional environment, and enlist support for the implementation of that plan

SCIENCE (SC)

A.8.6 Use models and explanations to predict actions and events in the natural world

B.12.4 Show how basic research and applied research contribute to new discoveries, inventions, and applications

D.8.4 While conducting investigations, use the science themes to develop explanations of physical and chemical interactions and energy exchanges

D.8.9 Explain the behaviors of various forms of energy by using the models of energy transmission, both in the laboratory and in real-life situations

D.12.11 Using the science themes, explain common occurrences in the physical world

E.8.3 Using the science themes during investigation, describe climate, weather, ocean currents, soil movements, and changes in the forces acting on the earth

F.8.2 Show how organisms have adapted structures to match their functions, providing means of encouraging individual and group survival within specific environments

F.8.7 Understand that an organism's behavior evolves through adaptation to its environment

F.8.9 Explain how some of the changes on the earth are contributing to changes in the balance of life and affecting the survival or population growth of certain species

F.8.10 Project how current trends in human resource use and population growth will influence the natural environment, and show how current policies affect those trends

F.12.8 Using the science themes, infer changes in ecosystems prompted by the introduction of new species, environmental conditions, chemicals, and air, water, or earth pollution

G.8.1 Identify and investigate the skills people need for a career in science or technology and identify the academic courses that a person pursuing such a career would need

H.12.5 Investigate how current plans or proposals concerning resource management, scientific knowledge, or technological development will have an impact on the environment, ecology, and quality of life in a community or region

H.12.7 When making decisions, construct a plan that includes the use of current scientific knowledge and scientific reasoning

SOCIAL STUDIES (SS)

A.4.4 Describe and give examples of ways in which people interact with the physical environment, including use of land, locations of communities, methods of construction, and design of shelters

A.4.8 Identify major changes in the local community that have been caused by human beings such as a construction project, a new highway, a building torn down, or a fire; discuss reasons for these changes; and explain their probable effects on the community and the environment

A.4.9 Give examples to show how scientific and technological knowledge has led to environmental changes such as pollution prevention measures, air conditioning, and solar heating

A.8.4 Conduct a historical study to analyze the use of the local environment in a Wisconsin community and to explain the effect of this use on the environment

A.8.6 Describe and distinguish between the environmental effects on the earth of short-term physical changes such as those caused by floods, droughts, and snowstorms, and long-term physical changes such as those caused by plate tectonics, erosion, and glaciation

A.12.12 Assess the advantages and disadvantages of selected land use policies in the local community, Wisconsin, the United States, and the world

C.4.3 Explain how families, schools, and other groups develop, enforce, and change rules of behavior and explain how various behaviors promote or hinder cooperation

D.4.2 Identify situations requiring an allocation of limited economic resources and appraise the opportunity cost