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An Integrated Fire Ecology Curriculum for the Eastern Slopes of the Cascade Mountain Range For Grades 4-7

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By

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The purpose of this project was to create a curriculum to increase the opportunity for young people in Central Washington to receive fire ecology education which will allow them to gain fundamental knowledge of how the Central Washington forest ecosystems work, as well as develop a sense of stewardship toward our local forests.

An integrated fire ecology curriculum aligned with the Washington State Essential Academic Learning Requirements was created. The curriculum includes teacher and student information, lessons, activities, resources, and recommendations to increase student understanding of the wildfires which impact many communities in Central Washington every summer.

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CHAPTER ONE

BACKGROUND OF THE PROJECT

Introduction

The Washington State Essential Academic Learning Requirements (EALRs) reflect higher standards and clear targets across the curriculum for students and teachers. In addition, the importance of environmental education in the State of Washington is evident by the state law, WAC 180-50-115, which mandates environmental education for kindergarten through twelfth grades. Therefore, a need exists to integrate the EALRs with Washington's environmental education guidelines.

The Office of the Superintendent of Public Instruction (OSPI) (1988) recommends that environmental education be integrated and interdisciplinary. The integrated approach to curriculum planning provides a framework for integrating the EALRs and enables students to explore relationships between local ecology and larger environmental issues.

The intent of the Washington Environmental Education Guidelines (1988) is to suggest directions for educators to foster the development of environmental knowledge and the skills for students to work effectively on behalf of the environment within their communities. Communities on the eastern slopes of the Cascade Mountain Range are affected by forest fires annually. The Wenatchee National Forest averages 173 fire starts annually (National Fire Management Analysis System (NFMAS), 1999). Schools and teachers recognize this ecological process as an

educational opportunity. Ettlin et al. (1997), explain that, "agencies around the Northwest constantly receive requests for education/information on fire especially at the end of a big fire season or when a fire effects a local community" (p.iii). Therefore, a need exists for an environmental education curriculum, which specifically addresses fire as an ecological process of the eastern slopes of the Cascade Mountain Range in Washington.

Purpose of the Project

Fire has long been a natural component of our forests and has played a major role is creating and shaping the forests we enjoy today. In Central Washington, wildfires are common events during the summer months (Walstad, Radosevich, & Sandberg, 1990). The impact of wildfires on communities and their population can vary greatly depending on the size and intensity of the fires. It has been the author's observation that the impressions left by wildfires on people living near fire prone ecosystems can last a lifetime.

Dewey (1916) suggests that when planning curriculum students' experiences should reflect the real world and help students make sense of their world. Young people in Central Washington communities may not have the opportunity to receive fire ecology education due to a lack of curricula that address this issue on a local level and correspond to the Washington State Essential Academic Learning Requirements. Providing an EALRs aligned fire ecology curriculum will allow students the

opportunity gain fundamental knowledge of how the Central Washington forest ecosystems work as well as develop a sense of stewardship toward our local forests.

Significance of the Project

An integrated approach offers the opportunity for students to tackle the fire ecology issue by overlapping the important natural events occurring in their community with the disciplines of the current curriculum. Support for this approach comes from the North American Association for Environmental Education (1999) which suggests a key underpinning to environmental education is that it "works best when infused across the curriculum" (p.3). Beane (1997) also supports an integrated approach in terms of general education and issues of importance to educators and students. He suggests that the intent of integration is to organize the "curriculum around significant problems and issues, collaboratively identified by educators and young people, without regard for subject-area boundaries" (p.xi). Further, curriculum integration provides students with the opportunity to critically inquire into issues that are personally and socially significant to them (Beane, 1997). Living within or near a Central Washington forest can mean living with the threat of wildfires which can significantly impact lives, property and entire communities. As populations continue to expand their habitats into the wildlands more education is needed if the wildlands and humans to live compatibly.

The Commission on Student Learning recognizes that students in Washington schools need skills to become responsible citizens, economically able to provide for

themselves, their families and communities and maintain productive and satisfying lives. The EALRs represent reform by the Commission on Student Learning (1997) to "prepare our students for living, working and learning in the 21st century" (CSL). The EALRs and environmental education will provide the opportunity for all students to be informed about the environmental issues that can affect their lives.

Limitations of the Project

The limitations of the project are as follows:

1) The project is designed for the benchmark two level, grades four to seven. It may be adapted or used partially for other levels.
2) The integration of the EALRs into the curriculum is limited to the July 1998 standards developed by the Commission on Student Learning. The EALRs will continue to be updated, necessitating a revision of the curriculum alignment.
3) The fire ecology is focused on the ecology of the East Slopes of the Cascade Mountain Range in Washington State.

Definition of Terms

Significant terms used in the context of this project are defined as follows:

Benchmarks: The achievement targets for learning evaluated at fourth, eighth, and tenth grades, as determined by the Commission on Student Learning.

Environmental Education Goals: Four goals that make up the framework for environmental education in the state of Washington.

Essential Academic Learning Requirements: (EALRs) A set of statewide standards representing specific academic skills and knowledge students will be required to know.

Fire Ecology: The branch of science concerned with the interrelationship of wildfire and organisms and their environment (Agee, 1993).

Integrated Approach: A curriculum approach that overlaps traditional subject areas and learning occurs by addressing problems and issues significant to the learning population (Beane, 1997; Jacobs, 1989).

Urban Interface: An area within or adjacent to a wildland that has human structures and habitats.

Wildland: An unsettled area of land in a natural, unmanaged state or an area managed to maintain ecological integrity (Pyne, 1984).

Wildland Fire: A fire that occurs in wildlands where the primary fuel component is naturally occurring fuels such as grass, shrubs, trees and forest residue (Pyne, 1984).

Overview of the Remainder of the Project

Chapter Two is a review of related literature and research summaries organized to address the importance of environmental education, justification for fire ecology education and justification for curriculum integration. Chapter Three describes the methodology used to develop the project. Chapter Four consists of an explanation of

the project, unit requirements and the project lesson plans and activities. Chapter Five contains a summary of the project and the author's recommendations and conclusions concerning the project.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

The purpose of the literature review is to present an overview of research pertaining to fire ecology education, environmental education, and curriculum integration. The review of literature and research summaries which will support the statement above have been organized into the following sections:

1. Justification for Fire Ecology Education
2. Justification for Environmental Education
3. Justification for Curriculum Integration
4. History of the EALRs
5. Target Components and Goals for this Project

Justification for Fire Ecology Education

Dewey (1916) recommends that when planning curriculum the student's experiences should reflect the real world and help students make sense of their world. Therefore, it is reasonable and logical to address the role of fire in an ecosystem and the issues surrounding wildland fires in the curriculum if students live in an area which experiences wildland fires.

During the last few decades, wildfires in Eastern Washington have received considerable media attention due to the large numbers of acres burned, the cost of

fighting the blazes, and the properties damaged. Wildfires occur throughout the summer months because of natural events such as lightning and from human causes like abandon campfires and carelessness (Huff, et al., 1995).

Walstad, Radosevich and Sandberg (1990) suggest that public attitudes and perceptions about wildfires have been influenced by the media and information provided by forest managers. Following its inception in 1905, the United States Department of Agriculture (USDA) Forest Service adopted an aggressive fire management policy of extinguishing all forest fires. In 1977, this policy shifted from extinguishing all wildfires to fire as a forest management tool. Public recognition of the benefits of fire effects on forest health has been slow. The effectiveness of the Smokey Bear campaign is clear in the public's attitudes toward wildfires. However, public understanding and acceptance is slowly changing.

Agee (1993) suggests forest health is and will be of increasing concern to the public of Eastern Washington. Forest health is a concern throughout the world, but in the drier forests of Eastern Washington there is a growing concern because of the obvious decline in forest health in that region. Further, Agee stresses that fire is a critical presence in dry site forest ecosystems such as the forest ecosystems common to Eastern Washington, and the management of fire will be influenced by competing values. He writes:

> Consensus on fire management requires the incorporation of human values, and most past fire management policies have been derived from the view of

fire only as a threat, rather than from a broader perspective of values evident in today's society (Agee, 1993, p.387).

Fire suppression on public and private lands began early in the century. The amount of land burned by wildfires in the western United States declined and remained low from about the 1920s to the 1960s. Since then, despite advances in suppression techniques and detection systems, the amount of acreage burned has been increasing and the fire behavior has become more hazardous due to the changes in the fuel conditions. It is likely that fire occurrences will increase in the next century thereby increasing the need for public knowledge of fire ecology. (Huff, et al., 1995).

Specific support for Northwest fire ecology curricula comes from Ettlin, et al., who say "agencies around the Northwest constantly receive requests for education/information on fire especially at the end of a big fire season or when a fire affects a local community" (1997, p. iii). Further supports comes from Tyler (1949) who suggests that when planning a curriculum one should consider the local or regional factors that affect life such as the natural resources of the area. Pate, Homestead, and McGinnis, (1997) stress this issue by citing Meriam, who asserts that "the curriculum of the school should get as close as possible to the lives of children as found in the home and in the larger community" (p. 135). Moreover, the North American Association for Environmental Education (NAAEE) (1999) built its guidelines upon several key principles, one of which is "the importance of where one lives" (p. 3). This important principle supports beginning environmental education

close to home with the immediate surroundings and then connecting that learning with broader issues.

Justification for Environmental Education

"Nature is the greatest teacher." –Leonardo da Vinci

Maser, addressing our current students, purports that "a generation that will need the ecological services of forests more than any previous generation will need a deeper comprehension of how forests work" (quoted in Orr, 1994, p. 68). A sense of forest stewardship must be fostered in the curriculum to conserve this valuable resource. In addition to forests, many important environmental issues need to be addressed throughout the curriculum to prepare students to live on a planet which "operates by the laws of ecology and thermodynamics" (Orr, 1994, p. 27).

Vice President Al Gore (1992) expresses strong concern about the relationship between the earth and humans. He supports changes in the management of resources and in the manner resources are viewed in regard to society's needs. Developing a clear understanding of this complex issue requires environmental education. Simpson (1995) acknowledges this need for environmental education. Simpson points out that environmental issues are a growing concern to children and adults. Further, Simpson acknowledges that the interdisciplinary approach is becoming popular. Therefore, creating an instructional unit that enables students to conduct research, think critically, develop communication skills, while learning about the environment is logical.

Government agencies also recognize the need for environmental education. For example, the U.S Forest Service formed a Conservation Education Task Force, which in a November 1997 Executive Summary stated that current public demand dictates that the Forest Service improves its current educational programs. The summary explains that many of the conservation education programs being provided by the agency are fragmented and lack clear messages. The agency has set the goal of providing quality conservation education by the year 2002. That program will use the NAAEE guidelines.

Justification for Curriculum Integration

Palmer (1998) summarizes a report of the Council for Environmental Education, which supports an integrated approach with an environmental theme, by stating the following "as an educational approach it (environmental education) can permeate a range of disciplines, both traditional and new, as well as form the mainspring of many integrated courses" (p. 9).

Separate subject curricula were the tradition in the factory-model schools of the nineteenth century, which prepared students for life within an industrial society. The curriculum was designed to stress efficiency and compliance (Fiske, 1991). The separate subject approach assumes that important learning occurs when disciplines are studied independently. However, researchers suggests that the traditional mode of curriculum delivery is insufficient given the growing need for greater critical thinking skills, creativity and intellectual breadth (Vars, 1969).

Integrated thematic instruction connects skills to broad concepts and real-world problems. Learning experiences that are based on real-world application and that focus on higher level thinking skills, develop habits that are critical to the development of lifelong learners (Pate, et al., 1997; Randle, 1997). Moreover, Glatthorn (1994) contends that the integrated approach to curriculum design improves retention and the ability to apply knowledge.

Bullough (1999) describes the curriculum design work of Alberty who recommends schools move toward an integrated curriculum to foster learning and citizenship. Consider the following opinion of Alberty: "The demands of democratic citizenship require marshalling, combining, and focusing the strengths of the disciplines for common problem solutions . . . citizens need to understand the complexity of the world they inhabit in order to make effective decisions" (quoted in Bullough, 1999, p. 159).

Integration of subjects is also supported by cognitive development research. Nuthall (1999) affirms that the classroom activities and teaching processes of the integrated approach support the construction of knowledge. However, students must be present in order to construct knowledge. Jacobs (1989) states that dropout estimates are as high as 40 percent in some areas. She suggests that this could be related to the difficulty students experience in understanding the relevance of their course work. The curriculum, Jacobs (1989) suggests, should effectively link learning experiences, and build relevant connections between the curriculum and the world outside of school.

Another advantage of interdisciplinary units, Jacobs (1989) contends, is that the interdisciplinary nature is motivating for students and teachers. The issues that emerge from the ongoing curriculum or community can be planned as a unit for any length of time and flexible to fit needs.

Although the interdisciplinary approach has many advantages, there are many considerations (Jacobs, 1989). Jacobs (1989) recommends using a set of four criteria when evaluating an interdisciplinary unit.

The first criteria is "validity within the disciplines" (Jacobs, 1989, p. 27). The concepts of each discipline to integrated must not only be related to their subject, but important to them.

"Validity for the disciplines is the second criteria" (Jacobs, 1989, p. 27). The interdisciplinary approach should enhance learning of the subjects better than if they were taught separately.

Third, an interdisciplinary approach must have "validity beyond the disciplines" (Jacobs, 1989, p. 29). Increased retention and student motivation is supportive of integration. However, Jacobs (1989) suggests that the unit must "have the power to develop sensibility incorporation and transcending those of component subjects" (p.29). In short, a unit must have value beyond the disciplines.

The final criteria Jacobs (1989) recommends considering is "contribution to broader outcomes" (p.30). The world requires students to consider multiple areas of knowledge to solve problems and address concerns. An interdisciplinary approach may enable students to become more adept at comprehending complex situations.

Jacobs (1989) goes on to suggest that an interdisciplinary approach may contribute to the development of broad intellectual capabilities, such as attitudes toward the construction and value of knowledge.

Jacobs (1989) outlined the many advantages of the interdisciplinary approach. However, the Washington State EARLs must be addressed in all classrooms. Glatthorn (1994) recommends that the development of integrated curricula take place in individual schools to ensure the district and state guidelines are met.

History of the Essential Academic Learning Requirements

Throughout the nation, public education systems have been in the process of reform since the publication of A Nation at Risk in the early 1980s (Fiske, 1991). Throughout the 1980s in Washington State, many reforms were implemented to improve teacher quality and support. In 1991, Governor Booth Gardner issued an Executive Order to create the Governor's Council on Education Reform and Funding. This council provided recommendations to the State Legislature. The critical reform recommendation was a shift to a performance-based system. Upon passage of the Education Reform Act in 1992, the Commission on Student Learning (CSL) was created. The CSL was charged with reforming public education in Washington State. Increasing student achievement and establishing high academic standards was the focus. The identified standards became the EALRs (OSPI, 1999).

Continuing with reform, in 1993 the Legislature added to Substitute House Bill 5953, Substitute House Bill 1209. Section 1 of this bill directed Washington State

student achievement to keep up with changes in society, the workplace, and be competitive in the international economy (OSPI, 1999).

The CSL is striving to raise academic standards for Washington students. The standards are focused on four goals. According to OSPI (1999), each school district in Washington State shall provide opportunities for students to acquire the skills necessary to:

1. Read with comprehension, write with skill, and communicate effectively and responsibly in a variety of ways and settings;
2. Know and apply the core concepts and principles of mathematics; social, physical, and life sciences; civics and history; geography; arts; and health and fitness;
3. Think analytically, logically, and creatively, and to integrate experience and knowledge to form reasoned judgements and solve problems; and
4. Understand the importance of work and how performance, effort, and decisions directly affect future career and educational opportunities. [1993 c 336 § 101; (1992 c 1412 § 501 repealed by 1993 c 336 § 1203); 1977 ex.s c 359 § 2.]

In 1995, the Commission on Student Learning presented EALRs or standards for reading, writing, communication, and math. In 1996, science, social studies, arts, and health and fitness were adopted. The latest update of the EALRs was published in July 1998 (OSPI, 1999).

Target Components and Goals for this Project

According to the EALRs for science, students must be actively engaged in learning science with their hands and minds. This will enable students to develop personal meaning of the physical world and solve problems (OSPI, 1999).

Science

1.2 (systems) recognize the components, structure, and organization of systems and the interconnections within and among them

2.1 develop abilities necessary to do scientific inquiry

The Social Studies EALRs focus on giving students the skills that will enable them to become responsible and effective citizens. Examining the past and present issues in order to prepare for the increasingly complex future is an important focus of the Social Studies EALRs. Other focuses include the interactions of people and the land, economics of society, and civic responsibility and an understanding law.

Social Studies

1.2 analyze the historical development of events, people, places, and patterns of life in the U.S., world and Washington State history

2.1 describe the natural characteristics of places and regions

3.1 identify and examine people's interaction with and impact on the environment

4.1 understand individual rights and their accompanying responsibilities

The communication EALRs are important is an increasingly diverse world. The process of conveying meaning and understanding what is conveyed requires

many complex skills. The development of these skills takes places throughout student's lives.

Communication

2.1 communicate clearly to a range of audiences for different purposes

2.5 effectively use action, sound, and/or images to support presentations

The reading EALRs facilitate development of the ability of students to read in order for students to become constructive member of society. The importance of understanding what is read is critical to the acquisition of knowledge which can enable one to access opportunities.

Reading

2.1 comprehend important ideas and details

The writing EALRs develop thinking skills and literacy. Writing is practical, social, expressive, and essential to a literate society.

Writing

1.2 use style appropriate to the audience and purpose

In Washington State instruction about conservation, natural resources, and the environment shall be provided at all grade levels using an interdisciplinary approach through the curriculum areas as appropriate with emphasis on problem solving in relation to human adaptation to the environment (RCW 28A.230.020,1990, WAC 180-50-115). According to the Environmental Education Guidelines for Washington Schools (1988), there are four environmental education goals with objectives. The goals are as follows:

1. The student will develop knowledge of the components of the environment and their interactions.

2. The student will value the environment as the basis of our physical lives, economy, and emotional well being.

3. The student will apply personal decision-making skills to enhance environmental quality.

4. The student will develop and utilize the knowledge and skills necessary for cooperative action on behalf of the environment.

Summary

Research and literature reviewed support the development of an interdisciplinary thematic fire ecology unit for use in Eastern Washington. Researchers assert it is important for students and the public to connect with their community and understand the interconnectedness of people, the environment, and the use of our public lands. Environmental Education allows students to explore these important issues. Further, researchers assert that environmental education is interdisciplinary by nature and that it should be taught using an interdisciplinary approach. In Washington State, the EALRs and the Environmental Education Goals strongly support the use of local issues and resources as focuses of study. Therefore, development of an interdisciplinary fire ecology curriculum, which is based on specific regions' ecosystem as a focus, is well supported.

CHAPTER THREE

PROCEDURES

The author became interested in this subject while growing up in a town that is surrounded by the Wenatchee National Forest. The area historically has a high frequency fire return interval. Therefore, the author experienced many fires of varying sizes and intensities. In the local public school the author attended, fire education and fire ecology were not formally addressed, although the occurrence of fires and their impact were significant ecologically and personally to community members. The author became a firefighter with the U.S. Forest Service upon graduating from high school and continued to fight fires seasonally for seven years while attending college. Upon graduating from college, the author was hired as a permanent fire crew leader on the Wenatchee National Forest where she continued to fight fires for another four seasons. During that time, the author gained experience fighting fire and received extensive training through fire related courses.

The author has a degree in Elementary Education and Physical Education. The author's background of education and fire experience inspired her to develop a curriculum to enable children to understand fire in their local ecosystem. In addition, the curriculum will correlate the fire ecology of the Eastern Slopes of the Cascade Mountain Range to the Essential Academic Learning Requirements.

The author began researching the need for a fire ecology curriculum by searching for existing curriculums at federal and state agencies. OSPI's environmental

education coordinator was contacted and provided valuable information. Additional research was conducted at the local educational service district (ESD). State and national guidelines were obtained through the local ESD environmental education coordinator. Local libraries and on-line libraries were accessed. ERIC searches were also conducted. Upon discovering that few curriculia focused on or even included fire ecology for the elementary grades, the author determined a need existed for a fire ecology curriculum.

To obtain background information on integrated curriculums a review of literature was conducted. Jacob's (1989) interdisciplinary curriculum design was utilized to develop the curriculum. The four-step process outlined by Jacobs was followed.

The first step was to develop a focus for the curriculum. Fire ecology was the organizing principle. The interests of the target students, grades four through seven, were taken into consideration in this step.

The second step was brainstorming on the focus. According to Jacob's (1989) this step should include instructors and students. For the purposes of this project, this step was limited to the author who solicited feedback from educators and persons with expertise in fire ecology. Conducting a brainstorm prior to instruction allows the instructor to guide students during their brainstorm activities as well as plan and prepare for lessons and possible activities.

The development of curriculum goals and guiding questions was the third step. The scope and sequence evolved from this step. The guiding questions were cross-disciplinary and broad.

The fourth step was planning and designing of the activities and lessons. The instructional activities are the means for investigating the guiding questions.

Historical and current information on the EALRs was located on-line through OSPI's web site. Additional EALR information was located through local schools.

Methods for evaluation of effectiveness of the project included feedback in the form of surveys from Forest Service employees who are involved with the agency's education program, local teachers, and students.

CHAPTER FOUR

THE PROJECT

The following project consists of an integrated curriculum designed to facilitate learning of the fire ecology of the forested lands on the eastern slopes of the Cascade Mountain Range in Washington State. The curriculum is designed to integrate disciplines to enable students to construct a deeper understanding of the concepts and realize the connection of the information to multiple subject areas and to the environment surrounding many communities in Eastern Washington.

The curriculum is designed for grades four through seven. The Essential Academic Learning Requirements (EALRS) addressed represent the benchmark two level. It is the author's opinion that the curriculum can be modified to meet the needs of unique and specific instructional settings at all grade levels.

The curriculum consists of an organizing principle, general goals and essential questions. The lessons and activities develop the knowledge to address the essential questions as well as the EALRS. A reference section is also included to conclude the curriculum.

The length of time required to implement the curriculum is intended to be five days for approximately ninety minutes of instructional/activity time per day. The author recommends implementing the lessons in the order presented for the most effectiveness and to facilitate learning of connections between disciplines. However,

depending on individual educators' needs and availability of time any of the lessons can be used independently or in conjunction with one another in various order.

Central Washington Wildland

F. I. R. E. S.

Fire's Important Role in our Ecosystem

An Integrated Fire Ecology Curriculum for the Eastern Slopes of the Cascade Mountain Range for Grades 4-7

Contents

Acknowledgements

Many ideas were synthesized in the development of this curriculum. I would like to give credit for every borrowed idea and inspiration used in this unit. Many ideas however have evolved over many years and are the result of many different sources. In the constant editing and revising process certain names and titles may have been neglected.

First and foremost, I would like to thank my inspiration and source of constant support my husband, Mike. A special thank you for his patience during the time I spent with this work instead of with him and Bunky dog.

I would also like to thank
Dr. Tim Young
Doug Jenkins
The instructors of all of my fire courses and my trainers
My college professors and instructors

Many curricula were reviewed for the development of this curriculum including the following:

Fire in Pacific Northwest Ecosystem Curriculum for Grades 7-12
(An interagency publication available through the USDA Forest Service)

Washington State Department of Natural Resources Wildfire Classroom Activities for Grades 6-9

USDA Forest Service Investigating Your Environment Teaching Material for Environmental Education for Grades 7-12

Preface

Wildland fire events and fire ecology issues arise on the Eastern Slopes of the Cascade Mountains nearly every summer. Every year thousands of forested acres are burned as a result of lightning and careless humans. Many human caused fires can be prevented with education. The idea that human caused fires are generally not good for our forests is clear. However, we must also educate our students about the good effects of naturally occurring wildland fires. There are many ecological processes and issues that forest fires can help our students learn. Fires are part of the ecosystems that surround many of our cities and towns on the eastern slopes of the Cascades. We have the opportunity to learn about our environment and the dynamic processes that occur in it and address the essential academic learning requirements and Washington State Environmental Education goals.

Thanks!

Introduction

The following unit is designed for benchmark two level students, grades four through seven and is aligned with the Washington State Essential Academic Learning Requirements for that level. It may be adapted for other grades to meets student's and teacher's needs.

This unit focuses on the fire ecology of the eastern slopes of the Cascade Mountain Range in Washington State. However, much of the information may be generalized to other areas. It is the author's intent to have the unit shared with students in May or June prior to fire season in areas and communities that are historically affected by wildland fires throughout the summer. The purpose of which is to responsibly educate students about the ecological processes that occur in the forests surrounding many eastern Washington communities. It is the author's hope that in gaining this knowledge students may develop a greater appreciation for the forests surrounding our communities as well as a sense of responsibility when enjoying our public lands.

Further, the unit is designed to integrate the disciplines in lessons that are intended to connect student's learning to forested lands surrounding many eastern Washington communities.

The activities in this unit are designed for range of learning styles and students may participate as individuals or in cooperative groups. The author suggests planning ninety-minute lessons for five days for the unit as presented. It is highly recommended that teachers seek out additional materials such as videos, tree rounds with fire scars, brochures, and pictures from local educational service districts, ranger districts, and other public land offices. More time per day may need to be allowed for the presentation of such materials.

Organizing Principle

Central Washington Wildland

F. I. R. E. S.

Fire's Important Role in our Ecosystem

Curriculum Goals

1. Understand the fire triangle

2. Understand forest fires are an important part of a natural disturbance pattern in Central Washington forest ecosystems

3. Understand that ecological succession is the concept of changes that occur over time in plant and animal communities

4. Understand that humans may alter the natural fire occurrence interval

5. Understand "Don't play with fire" and "If you see smoke go tell an adult immediately!"

Guiding Questions

1. What determines where a forest fire will start and how big and hot it will get?

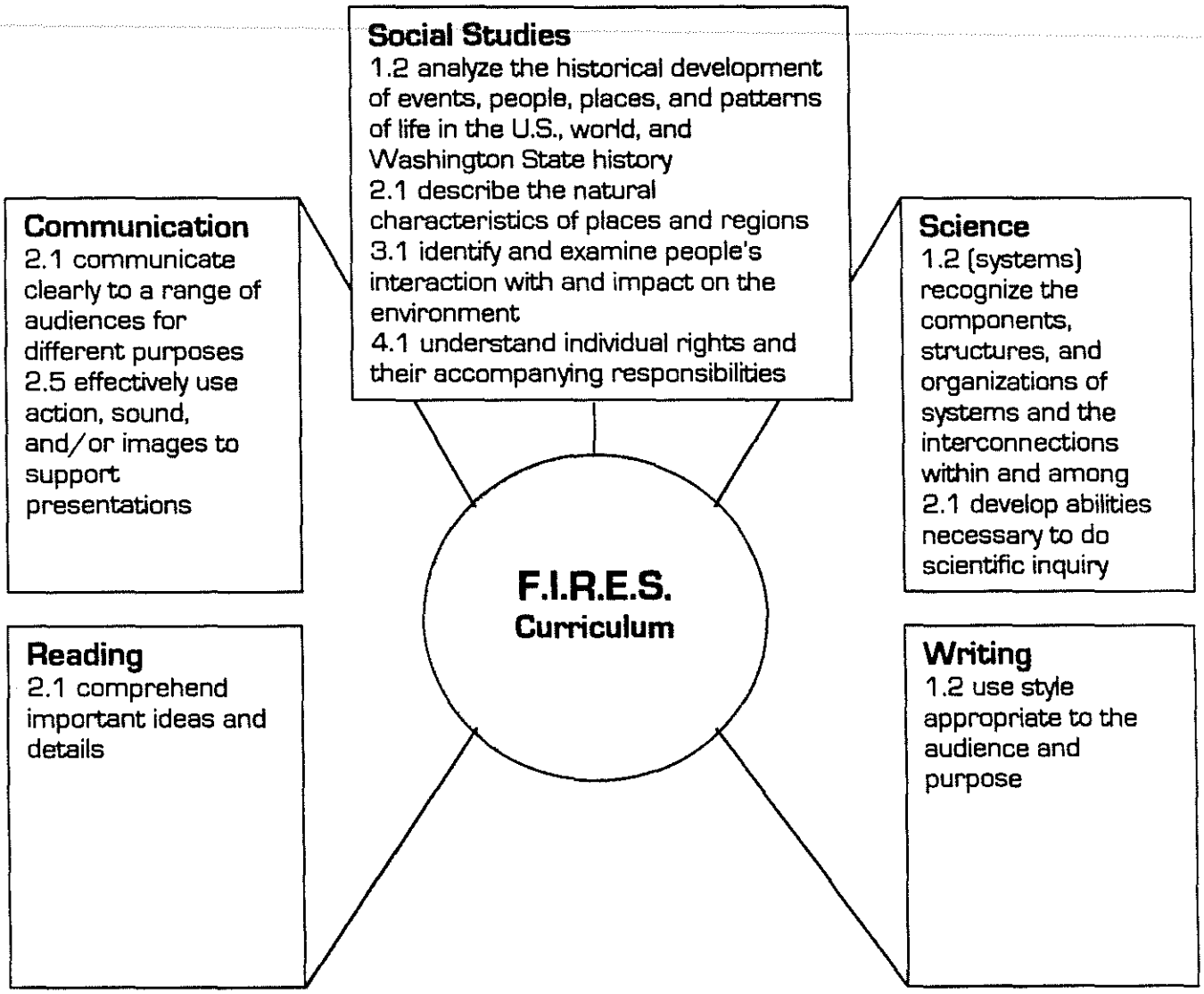
2. What happens to the animals and plants after a wildland fire?

3. How have humans changed fire's role in the forest?

4. What can we do to prevent forest fires and what do we do if we see one?

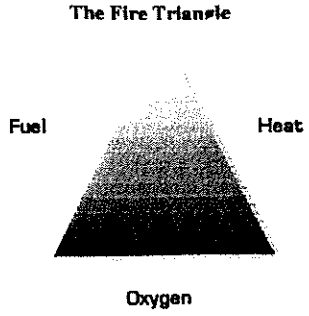
Washington Essential Academic Learning Requirements

Benchmark Two Level EALRs
Interdisciplinary Planning Map



F. I. R. E. S.

Teacher Background Information



The Fire Triangle

There are three components necessary to create fire. They are fuel, heat, and oxygen. These three components make up the Fire Triangle. Fire is a chemical reaction called combustion. Once this chemical reaction takes place energy is released in the form of heat and light. An ignition source must be present to begin the reaction. If any one of the three components is missing or removed, a fire cannot exist. Armed with this basic information one can begin to teach students how to avoid starting a fire, how to recognize potential sources of ignition, and how to extinguish a fire.

Cultural Interpretations

Before the settlement of Washington, fires were largely controlled by controlled by climate and weather events. Since settlement occurred humans have manipulated fuels and ignition sources have increased. Across the country, roughly 80% of wildland fires occur as a result of humans and the majority of the remaining occurrences are the result of **lightning**.

Culturally, fire is often viewed in a negative manner. Wildfires are mistakenly considered as negative, destructive forces. However, if properly managed fire can be an effective tool for resource management. Fires remove dead trees and litter from the forest floor. Trees and shrubs that encroach upon meadows and grasslands are killed by fire. Then new growth occurs. Many species are dependent upon fire for regeneration. Further, fire leaves behind nesting cavities and snags or dead standing trees, for bird perching and nesting. Fire brings about change and renewal in an ecosystem. This is often complicated due to the increasing presence of homes and improvements in the forests where fires historically occurred.

Native Americans used fire as a tool to improve hunting, clear land for grazing animals, and vegetation control and regeneration. Smoke attracted animals such as deer to escape mosquitoes and flies. Once in the appropriate area the game was targeted by hunters. The creation of grasslands through travel corridors was also maintained by fire.

Fire Behavior

The manner, in which fuels ignite, flames develop, and flames spread is referred to as **fire behavior**. There are three influential components to determining fire behavior: 1) the quantity and type of fuels present; 2) the weather conditions; and 3) the topography of the land where the fire is burning.

The fuel moisture level and composition determine flammability. Moisture level is the most critical factor. Living trees and vegetation contain varying levels of moisture but relatively high levels throughout most of the summer. However, dead fuels contain very

little. Therefore, the higher quantity of dead fuels the faster a fire will spread and the drier the fuels the faster fire will spread. Intensity, how hot a fire is, will be determined by fuel moisture and quantity. Further, how the fuels are arranged will affect how a fire will burn. If the fuels are close together, then the fire will burn hot and if they are spread apart, the fire will not burn as hot.

Weather contributes to fire behavior tremendously. Fuels attain their heat by absorbing solar radiation. The temperature of fuels will influence its susceptibility to ignition. The higher the temperature of a fuel the more likely it is to ignite with an ignition source. Humidity, the amount of water in the air, affects the moisture level of fuels. Low humidity increases the likelihood of ignition and rate that fuels will burn.

Common Types of Forest in Central Washington

Ponderosa Pine

Ponderosa Pine forests are made up of a mixture of grass, forbs, and shrubs. Generally, this plant community exists in areas receiving less than 25 inches of rainfall a year. Ponderosa Pine is a fire resistant species. It develops thick bark and deep roots. It also shed its lower limbs as it grows. These characteristics allow it to withstand fire and limit the probability of fire to burn into the crowns of the trees.

Historically, fires in Ponderosa Pine forest burned naturally once every 5 to 25 years. These frequent fires were of low intensity and helped maintain control of the accumulation of dead fuels and allowed the ground to be cleared for new seedlings to grow.

Douglas Fir

Douglas Fir is common to Central Washington. It typically grows in areas that receive more than 25 inches of rain annually and even 50 inches of rain annually. It is generally found among other tree species rather than a single tree species plant community. Douglas Fir are able to survive without fire. However, it does have characteristics that enable it to withstand fire. Douglas Fir regenerates readily on sites that are cleared by fire.

Fire Ecology

Fire ecology is a branch of ecology that focuses on the fire component of an environment. Fire is a natural component of many ecosystems. Fire promotes change within a dynamic ecosystem.

Fire is important to some species of plants and animals. Species that rely on fire effects are called **fire dependent.** For example, fire prepares the soil for seeding by making nutrients more available for plants. Further competition for nutrients and sunlight is reduced after a fire.

Fire history is another part of fire ecology. A fire history of an area is the description of how often fire occurred historically. Trees record fire history. Each year a tree grows, it adds a layer of cells, which increase its circumference. As a fire burns through an area, it scorches the outside layer of growth. The trees may have charcoal on them but they often continue to live and grow more cells the next year. Eventually the charcoal will be covered. Then, we can count the rings of annual growth to determine when and how often fire occurred in that area.

The role fire plays in an ecosystem varies with the characteristics of the ecosystem. The role of fire in an ecosystem is called the **fire regime**. A fire regime is a

function of the **frequency** of fire, the **intensity** with which fire burns, and the amount of fuels consumed by a fire.

Wildfire Causes

Wildland fires are started in several ways. Estimates range from 80% to 90% of wildland fires are caused by humans. Abandoned campfires, debris burning, cigarettes, and arson are some of the ways that humans cause fires. The remaining 20% to 10% of fires are caused by lightning.

There is dry lightning and wet lightning. Dry lightning occurs without the presence or nearly without rain. When fires are started by dry lightning, they often keep burning under the right conditions. If rain accompanies lightning, the fires that are started are often extinguished naturally.

Important Facts for Students

- Wildland fire is a natural process like floods, earthquakes, and others. It cannot always be controlled.

Fire requires three elements – Fuel (a combustible material), Heat (an ignition source), and Oxygen. These three elements make up the fire triangle. Remove any one of them and the fire will go out.

Fires are influenced by many things including humidity, fuel moisture, winds, slope, and temperature.

Humans use fire. We use it for resource management, heat, light, and cooking.

Technology and research have helped control undesirable wildfires. However, not all fires, especially large ones can be controlled.

As a society, we evaluate whether fires are good or bad based on media presentations, our values, social issues, politics, and resource management policies.

- **Important Facts to Remember**
  - Fire moves uphill rapidly, much faster than people can run.
  - Fires can start and grow extremely fast.
  - **You** and your family may be held financially and criminally responsible for damages to resources, property, and life if you start a fire, even if it is an accident.

The Fire Triangle Lesson

Curriculum Goals	* Identifies elements of the fire triangle – fuel, heat, oxygen
Guiding Question	* What determines where a forest fire will start and how big it will get?
Washington State Essential Learnings	* Science 2.1 develop abilities necessary to do scientific inquiry * Communication 2.1 communicate clearly to a range of audiences for different purposes
Environmental Education Guidelines	* The student will develop knowledge of the components of the environment and their interactions

Materials Needed

Decide if experiment will done as a demonstration or in small groups for numbers of supplies necessary.

*** * *Warning-check your facility for smoke detectors or sprinklers. You may need to go outside to complete this experiment.**

Birthday cake candles about 1" high and aluminum pie plates to stand them up in
Clay to hold candles upright
Matches
Glass jars large enough to fit over candles
Spray bottles of water
Soil
Popsicle sticks or small pieces of wood
Tongs
Data recording sheet for recording observations and hypotheses
Fire Extinguisher
Bucket of dirt
Hose with nozzle

Procedures

If possible, obtain a copy of a wildland fire video that demonstrates the potential destruction a wildland fire can cause and watch for a few minutes before beginning lesson. Point out how homes, resources, and habitat can be lost in wildland fires. Be sure to always maintain a strict controlled tone as not to portray fire in a fun or playful manner. Have a fire extinguisher, a hose and nozzle of any kind, a bucket of dirt, and some red and orange construction paper to represent a fire. The investigative nature of this lesson should be emphasized.

Set:

Form three groups of students on sides of paper fire. Assign each group one of the items and ask them to come up with an explanation of how they think their item extinguishes the flame. Each group should decide on a recorder to write their ideas on a piece of butcher paper. Take turns presenting ideas to others.

1. Explain that answers are hypotheses and that we're going to test our hypotheses.

Lesson:

2. Organize for the experiment and set ground rules for proceeding. Explain that *as an adult* you can use matches responsibly. Ask students what they should do if they find matches – give them to an adult.

3. *For this step, you may want to pre-select a student to act out the part of the responsible student to claim that they are going to call 911. Explain to the student and emphasize to the class that this in a scientific experiment and you as an adult have taken all of the necessary precautions to help them learn about the dangers of fire and the factors that control it, but that would be the right thing to do if you were not an adult.*

Light candle one and observe for 1 minute. Have students write or draw what flame observations on the *Fire Triangle Observations* worksheet.

4. Next, slowly lower the glass jar over the candle.

Record observations such as how long did the flame continue to burn? Then, conclude with writing and group sharing about **why** the candle went out. The oxygen inside the jar ran out.

5. Draw the first side of the triangle on the board or butcher paper write the word oxygen next to it.

6. Repeat this process for the candle and the spray bottle of water. Record how long the flame lasted and how it behaved. Hypothesize why the water put the flame out. Conclude that the water cooled the flame and eventually put the flame out. Add a second side to the triangle with the word heat next to it

7. Repeat lighting a candle and now hold the popsicle stick in the flame. Ask, what has been added to the fire? Fuel.

8. Ask what can I do to stop the flame from burning the stick? Remove the fuel from the fire. Break the stick between the burning part and unburned part and record how long the stick continues to burn. Ask why did the burning stop. Conclude it ran out of fuel. Draw the third side to the triangle and write the word fuel next to it.

9. If any of the burned stick remains ask the students what am I removing from the stick by placing it in water to make the fire go out? Heat and oxygen.

10. Discuss the completed Fire Triangle on the board. Discuss and draw conclusions about removing any one of the sides to eliminate a fire.

11. Share pictures from fire related books and discuss the firefighting techniques and which side of the fire triangle they remove. For example firefighters construct fuel breaks to remove fuel so that the fire won't have anymore fuel to burn when it reaches the line or helicopters dropping water onto burning trees to remove the heat form the trees.

12. Conclude with a review of the hypothesizes and a discussion about what was learned about how to put out fires. Emphasize "what should you do first? (Go tell an adult). Review the fire triangle they just learned.

13. Follow-up lesson with a proper example about how to cleanup burned materials by immersing them in water for a length of time and discarding them into a container that does not contain paper. Further, explain that the proper way to discard ashes from fireplaces and woodstoves is to put the ashes into a metal bucket and sprinkle onto dirt. Then mix the ashes into the dirt, making sure that there aren't any burnable materials before dumping ashes.

14. Complete *The Fire Triangle How does a fire start and how do we put it out?* worksheet individually or in groups.

Close:

Share ideas and answers aloud, on overhead or in groups cooperatively after providing adequate completion time to ensure concepts are learned accurately.

Name_____ Date_____

Fire Triangle Observations

1. Flame and Jar Observation
What I observed (what happened to the flame, include length of time it burned and how it burned?) Write or draw your answer.

Why do you think the flame went out?

2. Spray Bottle Observation
What I observed (what happened to the flame, include length of time it burned and how it burned?) Write or draw your answer.

Why do you think the flame went out?

3. Popsicle Stick Observation
What I observed (what happened to the flame, include length of time it burned and how it burned?) Write or draw your answer.

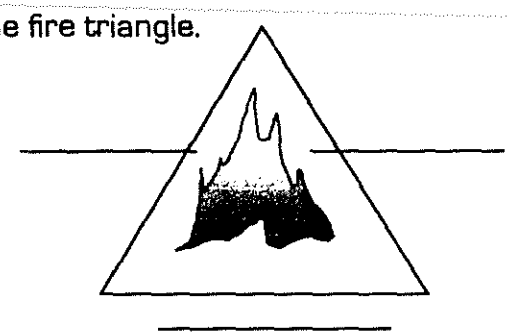
Why do you think the flame went out?

Name_____ Date_____

The Fire Triangle

How does a fire start and how do we put it out?

1. Fill in the sides of the fire triangle.



2. Identify what sides of the fire triangle you see in the picture of the forest. Write the word on the picture.

3. List some ways to eliminate the heat from the forest picture.

4. Can you think of some ways to change the fuels in the forest to prevent or stop a forest fire?

What is the first thing you should you do when you see smoke or a fire?

The Stages of Forest Succession Lesson

Curriculum Goals	* Understand forest fires are an important part of a natural disturbance pattern in Central Washington forest ecosystems * Understand ecological succession is the concept of changes that occur over time in plant and animal communities
Guiding Question	* What happens to the animals and plants after a forest fire?
Washington State Essential Learnings	* Reading 2.1 comprehend important ideas and details * Science 1.2 (systems) recognize the components, structure, and organizations of systems and the interconnections within and among * Social Studies 2.1 describe the natural characteristics of places and regions
Environmental Education Guidelines	* The student will develop knowledge of the components of the environment and their interactions

Materials Needed

Books with pictures of forests, wildlife, plants and forest scenes
Markers, colored pencils, crayons
5 pieces of butcher paper – enough for each group to have a 3' by 3' piece
A tape or CD and player with nature/forest sounds

Procedures

Set:
Share a "Wildland fires change many things" as an overhead or as a handout.
Have students state what changes they notice occurring within the forest picture.
List as students state their observations.
Next, ask students to guess over how many years they think the changes occur.
Then, share the actual years over which the changes occur.

1. Explain that forests are constantly changing. Forests can change slowly or quickly.
Brainstorm aloud, on board or overhead
How could a forest change quickly?
List answers.
2. Lead students to fire caused by lightening.
3. Explain this is a natural event that has occurred throughout time. Following a lighting fire, a forest goes through predictable set of stages.

4. Divide students into five groups and provide each with a piece of butcher paper, markers, and crayons.
5. Explain that each group will receive a description of a forest at a certain stage. They are going to all try to make a picture of their forest from the description. Then label the stage with the name and age. The pictures do not need to be perfect. Emphasize the importance of finding details in the reading and adding them to their picture and paying special attention to spacing within their picture. Explain that this is a rough sketch and that everyone will have 15 minutes to complete their pictures and then they will present their pictures and descriptions.
6. Share the names and ages of the five successional stages then hand out descriptions.
7. Students complete pictures and share.
8. Arrange pictures in order.
9. Share the terms below and relate them to the pictures.'
    1. **Disturbance**: A human or natural event that changes the stage of the forest, such as lightning, volcanoes, floods, insects, winds, mud slides.
    2. **Succession Stage**: A change in the plants and animals of an area that occurs over time naturally.
10. Ask the students what kinds of things are occurring in each stage that leads to the next stage.
11. Complete Forest Succession worksheet.

Close:
Share on overhead the successional stages worksheet and the students disturbance ideas.

Wildland fires change many things.

What do you notice changing?

Overhead for Stages of Forest Succession Lesson Set

Forest Succession Stage Descriptions

Distribute one description to each group.

Forest Succession Stage Description: Forbs Stage 0-5 years

Small plants and mosses begin sprouting on exposed soil. Trees and shrubs begin to grow. Grasses and small plants provide food for insects and small rodents. Small birds feed on the insects and the newly released seeds. Large birds feed on the small rodents feeding on the open ground.

Forest Succession Stage Description: Shrub Stage Description 6-25 years

Many different types of small trees are growing. A variety of shrubs are growing large enough the shade out smaller plants on the forest floor. There are burned logs on the ground provide cover and shelter for birds, rodents, and other small mammals. Larger animals like coyotes and bobcats seeking food are attracted to the area because of the smaller animals. The new green shrubs attract deer.

Forest Succession Stage Description: Young Forest 26-50 years

Trees begin to form a canopy with their limbs. There are fewer types of species. Squirrels, snow shoe hares, and hawks are present. The evergreens grow well in the shade of the forest floor. Fewer animals are present. Less food is now available because fewer shrubs are present and limbs are too high for most animals to reach. Different animals enter the area such as beavers and porcupines to use the young trees.

Forest Succession Stage Descriptions page 2

Distribute one description to each group.

Forest Succession Stage Description: Mature Forest 51- 150 years

A few large evergreen trees dominate the area. Some of the trees that were the largest trees in the last stage have died and fell to the ground leaving openings in the canopy. New plants receive sunlight and begin growing creating another layer below the big trees. The diversity in the ground cover attracts many different animals and birds like cougar, elk and hawks.

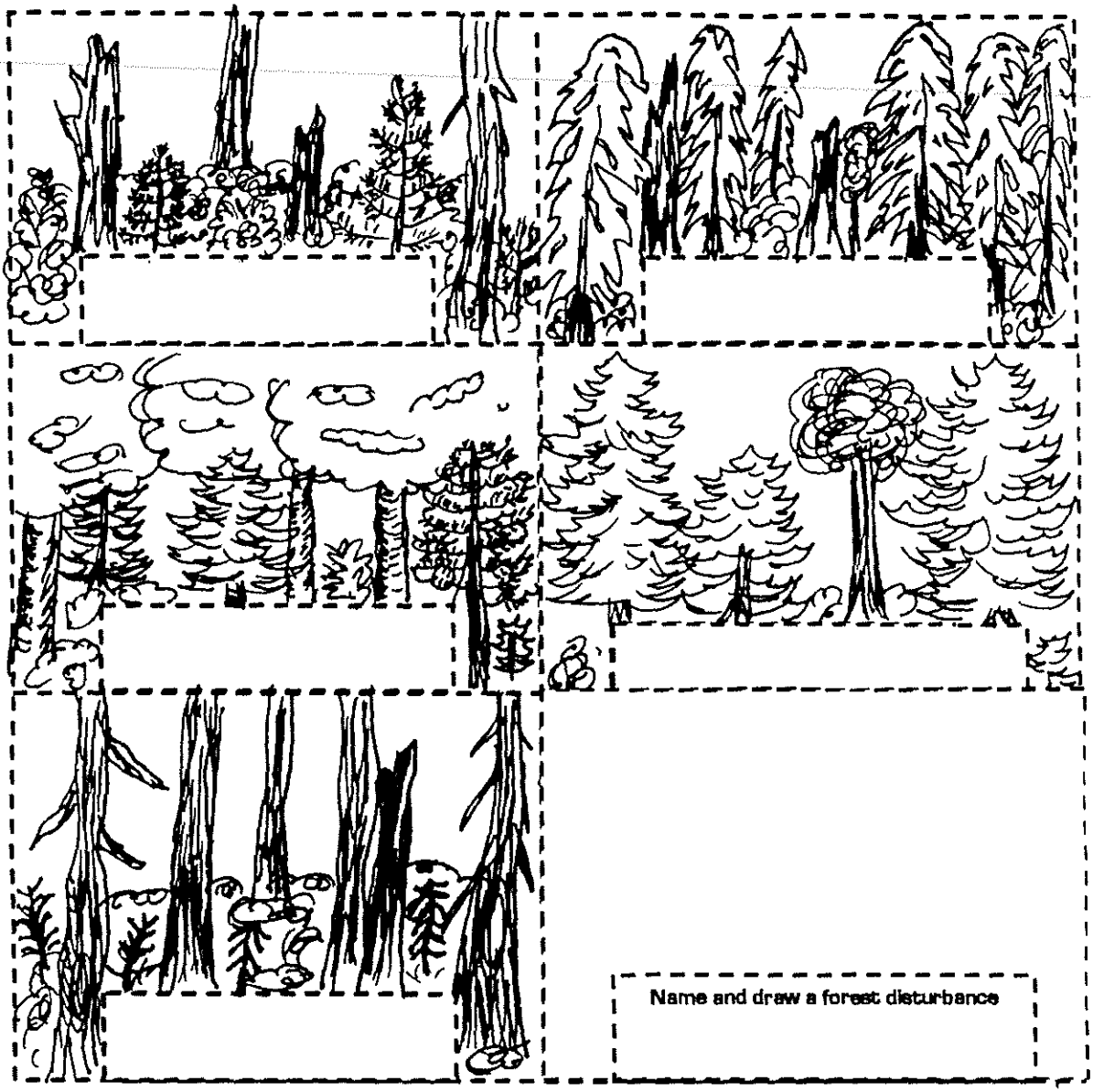
Forest Succession Stage Description: Climax Forest 150-300 years

Large evergreens are growing taller and larger around (diameter). Many smaller evergreens grow in the shade of the big trees. Dead trees are standing and provide nesting sites for birds like woodpeckers and animals. Fallen trees provide habitat to animals on the forest floor and provide nutrients for the soil as they break down. Many different types of animals like bear, elk and squirrels use the are because there are many different types of resources available.

Name_____ Date_____

Forest Succession Stages

Can you match the forest pictures to their stage name?
Cut and paste the correct name and description to the picture.



Name and draw a forest disturbance

Forbe Stage 0-5 years: small plants and animals, exposed soil

Shrub Stage 6-25 years: small trees shade, rodents, deer, and coyotes

Mature forest 51-150 years: few large evergreens, openings, diversity

Climax forest 150-300 years: large trees, shade, dead trees, low, diverse

Young Forest 26-50 years: canopy forms, shade, beaver, few plants

Fire Behavior Lesson

Curriculum Goals	* Understand forest fires are an important part of a natural disturbance pattern in Central Washington forest ecosystems * Understand the fire triangle
Guiding Question	* What determines where a forest fire will start and how big and hot it will get?
Washington State Essential Learnings	* Reading 2.1 comprehend important ideas and details * Science 1.2 (systems) recognize the components, structure, and organizations of systems and the interconnections within and among them * Social Studies 1.2 analyze the historical development of events, people, places, and patterns of life in the U.S., world, and Washington State history
Environmental Education Guidelines	* The student will develop knowledge of the components of the environment and their interactions

Materials Needed

Copy Students of the flames article and determine whether your students can read it in groups or you will need to read it aloud.
Gather articles, brochures, pamphlets, and other items that students could use in conducting research on the factors that contribute to fire behavior and make copies to share with each group of students.
Highlighters to highlight important information on copied handouts.

Procedures

Set:
Read aloud the first three sentences of the article "Students of the flames".
Ask students to guess what the sentences are describing. Share answers.
Now read the fourth paragraph from the end of the article aloud. Share a brief explanation and model the crumpled paper as it relates to the landscape in your area. Conclude that there are many things that determine where a fire will start, and how big and how hot it will get.

1. Explain that we are going to try to determine what kinds of things determine the size and intensity of wildland fires.
2. Pass out the copies of the article to the groups of students.
3. Model that you notice the title and subtitle and make a prediction about what information the article contains. Notice the date and location. You may choose to find the location on a map and correlate to the ecology of your area.

4. Explain that as your groups read through the article you are going to highlight the information that you think makes a fire behave the way it does. Emphasize the highlighting of single important words. You may want to remind students that weather is important.
5. After students have been allowed sufficient time to read and gather information, come together, and summarize the data.
6. As a group, define fire behavior. "The way fuels burn, the flames develop and a fire spreads." Write on summary paper or overhead.
7. Ask what clues did the article give us about what things determines fire behavior.
8. Begin all ideas.
9. Attempt to have students sort the ideas by fuels, weather, and terrain.
10. Ask students to try to do the sorting activity worksheet then share answers and ideas about what each item means.

Close:
Ask students how would they expect a fire to start naturally. Then emphasize that even when the forest is very, very hot and dry that there is often not a fire because nature has not provided a spark such as lightning. That is why it is so important for humans to be careful when they are in the woods in the summer. Nature often does not need unnecessary human caused fires.

Extending this lesson:

1. Invite a person whose career is in the wildland fire field to speak in your class.
2. Ask a local forest service office or other natural resource office if you could borrow a fire weather kit to collect weather data for a day or week.

Language Arts Extensions:

1. Complete a journal writing lesson with a focus on setting by providing the following scenario. It is a clear sunny August day around three o'clock in the afternoon. It's 95 degrees. You and your family decide you would like to take a drive to the lake in the woods. Finally you are at the lake and you notice . . .
2. Make a fire prevention poster with a slogan and pictures depicting what you've learned.

Fire Behavior Article

Students of the flames

Fire behavior analysts work to make job a little safer for Western crews

Corvallis Gazette Times August, 6, 1994
The Associated Press

ENTIAT, Wash. — It crawls. It walks. It lies down at night, then awakens by day to run through the woods. When Bob Walker describes the biggest wildfire in the West, there's a reason it sound like a living thing.

Name_____ Date_____

Sorting Out Fire Behavior

List the fire behavior variables below under the correct heading. They are all important and they all can act upon each other.

moisture in fuels	steepness	wind
size and shape of fuels	elevation	temperature
aspect(direction slope faces)	lightning	type of materials
humidity	rain	shape of the land

Weather	**Topography**	**Fuels**

Now see if you can explain to a friend why each of these variables is so critical to firefighters and fire behavior analysts.

Here is some help:
The types of fuel like grass, logs, or trees and the amount of it along with how it is arranged and the weather determines how firefighters can safely fight the fire. For example, if there are lots of large fuels that will burn hot for a long time as opposed to light grasses that go out quickly, firefighters need to know in order to plan to take the right equipment to put it out safely.

Firefighter's Helper Lesson

Curriculum Goals	* Understand that humans may alter the natural fire occurrence interval. * Understand "Don't play with fire" and "If you see smoke, go tell an adult immediately!"
Guiding Question	* How have humans changed fire's role in the forest? * What can we do to prevent forest fires and what do we do if we see one?
Washington State Essential Learnings	* Communication 2.1 communicate clearly to a range of audiences for different purposes * Communication 2.5 effectively use action, sound, and/or images to support presentations * Writing 1.2 use style appropriate to the audience and purpose
Environmental Education Guidelines	* The student will develop and utilize the knowledge and skills necessary for cooperative action on behalf of the environment.

Materials

Examples of fire prevention posters
Large pieces of construction paper
Markers, pens, colored pencils, crayons, etc.
Butcher paper
Dead tree and lightning overhead

Procedures

Prepare two columns on butcher paper. Label one side good fires and the other bad fires.

Set:
Ask students to share one idea they have with a neighbor about what they think a bad fire is. Then do the same for good fire.

1. Begin a discussion by brainstorming good and bad fires. List each example. Promote the purpose of making a list to remember our ideas.
2. Create a group definition of a good fire and a bad fire. Write at bottom of appropriate column.

    Ideas: Good fires occur naturally in areas that can benefit ecologically from the disturbance. Sometimes fires are started by firefighters to help put out fires. In addition, fires are sometimes started by firefighters to help the forest.

Bad fires are started carelessly. The forest may not need a fire and it may not be good weather to go out naturally or even go out with help from firefighters. The fire may grow beyond what is normal for that area changing a lot of forest habitat.

3. Discuss ways that good and bad fires are started.
4. When lightning comes up under good fires share these facts:
   - There are scars from lightning occurring hundreds of years on some old trees.
   - Approximately 10% to 20% of fires are caused by lightning.
   - Lightning temperatures can reach more that 50,000° F which is five times hotter than the surface of the sun.
   - There is dry lightning that means lightning occurs without rain and there is wet lightning which occurs with rain.
5. Share the dead tree overhead and brainstorm what would happen when lightning strikes the tree and it is a hot summer afternoon and the grass and forest floor is dry below the tree.
6. Now add a smoke column coming up.
7. Ask students to imagine they are camping and they see the smoke from their campsite. What would they do? Go investigate? Ignore it? Assume it is another camper? Brainstorm and share feelings.
8. Lead students to "Go tell an adult immediately!"
9. Ask if they think they could put out the fire if they went there. The answer should be "no". It could be very dangerous to go toward a fire.

*** Most business and sign boards have toll free numbers to call to report fires and always look for the green forest service trucks or red department of natural resource trucks, they have radios to call for help. Always report smokes in question.

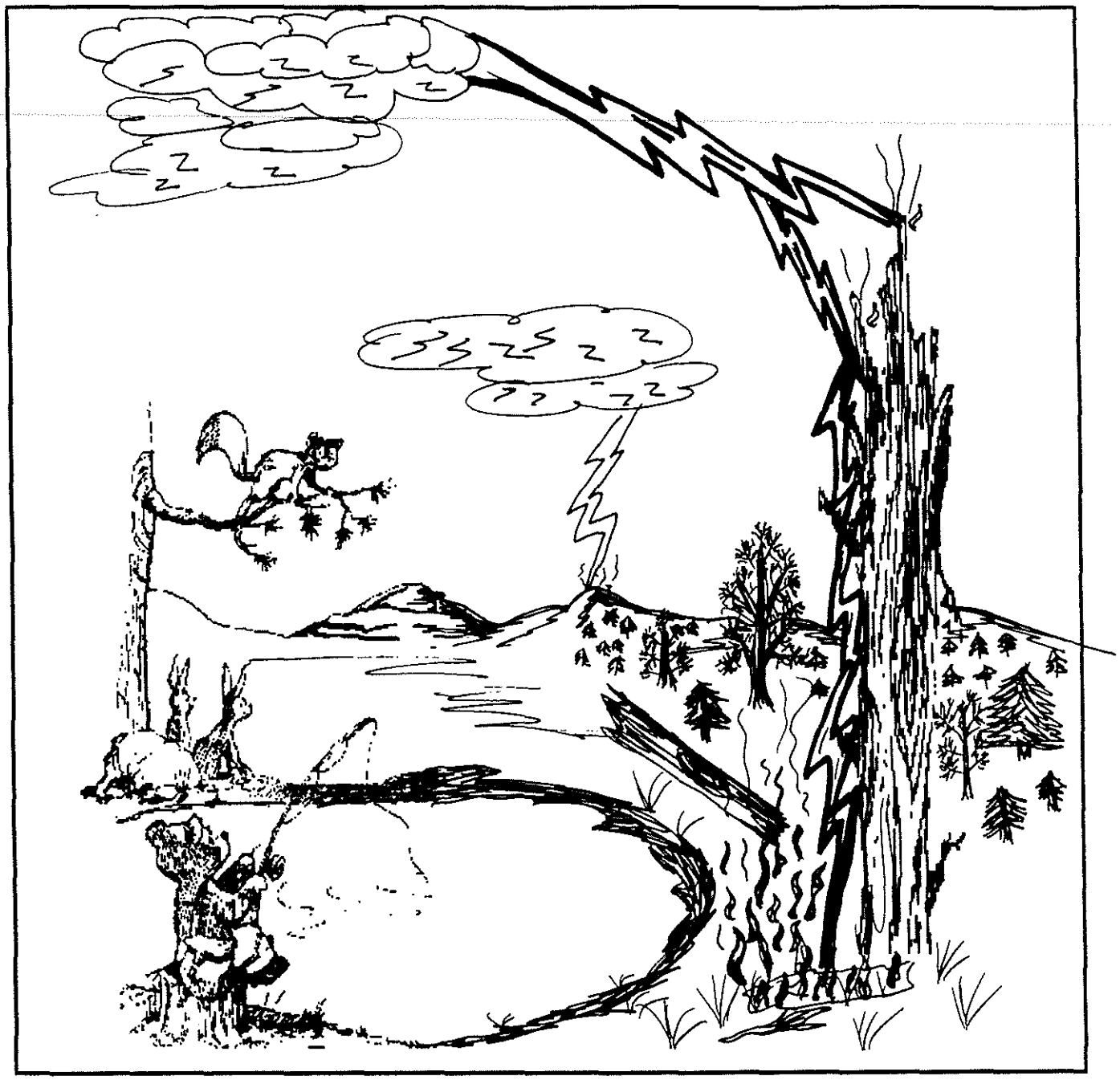
Important component to unit

10. Ask students if they think we could prevent a human caused fire from occurring. Then ask how. Share ideas. Then lead to important message of "Don't play with fire".
11. Generate ideas for messages to share with other students to promote same idea. **Ask if every ecosystem has a natural fire occurrence interval. The answer is yes the fire ecology of an area determines how often, big, and hot fires will be likely to get. Conclude that if humans are careless we change the natural role of fire. That can be very negative.**
12. Share a fire prevention poster like the one below.
13. Students will brainstorm and first draft slogans and then share in editing with others. Then, draft on to a poster and create a picture to reinforce slogan. You may choose to use the reproducible provided for final slogan pictures.

Close

Make a bulletin board of posters and share information with other students through short role-plays applying key phrases learned in lesson.

Lightning Strikes!



When you see smoke-

Go tell an adult immediately!

Overhead for Firefighter's Helper Lesson

My Fire Prevention Sign
by

_____

A Safe Campfire Lesson

Curriculum Goals	* Understand "Don't play with fire" and "If you see smoke, go tell an adult immediately!"
Guiding Question	* What can we do to prevent forest fires and what do we do if we see one?
Washington State Essential Learnings	* Social Studies 3.1 identify and examine people's interaction with and impact on the environment * Social Studies 4.1 understand individual rights and their accompanying responsibilities
Environmental Education Guidelines	* The student will develop and utilize the knowledge and skills necessary for cooperative action on behalf of the environment.

Materials

Enough rocks to make a campfire ring 2 feet in diameter
A lot of dirt, at least a 2'x2'x2' pile
Shovel with a short handle that kids can use
Sticks and wood to serve as fuelsto remove from around the planned campfire
Pieces of wood to simulate campfire wood
Bucket of water
Campfire poster from Forest Service or made with "Drown It, Stir It, Feel It"
A 10' tape measure
A poster that states "Campfires o.k. here"

Procedures

Take a class walk to the location you have designated as a camping area with your "campfires ok here" sign. Share aloud about the weather. Are the fuels dry? Is it windy? Share with the kids that you would like to help them help their families when they go camping by teaching them how not to accidentally start a fire. Share that they and their families will be help financially and criminally responsible for all damages resulting from a fire, even if it is an accident. Fires often costs millions of dollars just to put out and then there are the costs of the lost timber, homes and cabins if any and sometimes humans even lose their lives.

1. How can you tell whether or not a campfire is allowed in an area.
It must be designated a campfire ok area.
2. Ask if this area is ok.
3. Brainstorm some ideas for a safe campfire.
4. Introduce campfire rules.

1. **Select a safe place and clear 10 feet out from the campfire ring.** Make sure you have taught kids that the 10 feet must be around all sides of the campfire, but also make sure there is not anything above that may burn if heated. Allow kids to guess and decide how big a 10 foot radius is. Have students clear all debris with the shovel and their feet and hands.
2. **The circle should be down to bare soil.**
3. **Construct a small 2 foot in diameter circle of rocks for the campfire ring.**
4. **Emphasize only adults should make the fire and never handle matches!**
Only adults should add small pieces of wood to the campfire.
Explain only a bit is needed at a time to keep the fire under control. Flames should never be more than about 2 feet high.
5. Simulate enjoying the fire and discuss how we as humans use fire.
***Explain with emphasis that a campfire should never be left unattended or without an adult present.
Ask if they can think of some things that could happen.
6. When simulation is done go through how to put out the campfire and rehabilitate the area.

5. Putting out the campfire. Discuss the fire triangle throughout process.
1. Always have water ready.
2. Sprinkle the fire with water.
3. Stir it with a shovel.
4. Add dirt to the fire to prevent oxygen from reaching the fuel.
5. Stir in the dirt.
6. Repeat this process until everything in the campfire is cold to the touch.
7. Break apart the campfire ring (only if it is not a permanent campfire ring) and always make sure the rocks are very cold before dispersing them about.
8. Spread the dirt and try to recreate a natural appearance to the area.

Close

6. Discuss how responsible one must be to have a campfire and how important it is to take care of the forest that we get to enjoy.
7. Discuss whether they have ever gone camping and had a campfire. Did they know how to put it out properly?
8. Relate the experience to responsibility and enjoyment.

Always double check to make sure nothing was left warm. Embers can smolder for days and rekindle with warmth and wind.

Be a responsible camper for everyone's sake!

Lesson Extensions

Create a large timeline with years and pictures to correspond to the fire ecology of your area. Use the information learned in the Forest Successional Stage Lesson.

Invite a professional firefighter to come to your room and speak with their equipment.

Create tri-fold brochures with a cover, inside include information on how to make a safe campfire ring, what to do if you see smoke, and fire ecology information. Grade on a rubric with a point for each page with accurate writing to explain graphics.

Make quality fire prevention posters for submission to the regional natural resources offices for possible use in production.

Conduct interviews of students to collect data on how many have been camping and had a campfire. Then, how many helped put it out when they left and if they followed all or at least some of the procedures. Then graph data and display in school next to actual procedures.

Locate all the national forests and parks on a United States map. Make copies of the map and have the students write directions from one to the other until they make it across the United States. You may simply have the students color all the forests onto a blank map and label them.

Do research on line into a national forest and take virtual tours of a forest!

Volunteer to plant trees. Contact your local agency and arrange a come with you family day to plant trees in a local campground or forested area. Planting is in the early spring.

Resources

There are many fire education and prevention materials available to educators. Many are free of charge and checked out as loan materials through government agencies. Check your local phone book under state and federal government for locations of your local natural resource managers.

U.S. Department of Agriculture, Forest Service
Naches Ranger Station
100061 Hwy 12
Naches, WA 98937
509-653-2205
Check for your local Ranger Station in the phone book

Washington State Department of Natural Resources
1-800-526-6010 and 1-800-527-3305
The Ellensburg office is located at the Airport in Ellensburg.

Online resources include nearly all agencies by their abbreviation followed by ".gov"
www.nifc.gov
www.usfs.gov

At most Wenatchee National Forest Ranger Stations materials that will greatly enhance your unit such as fire scarred tree rounds, posters, and curriculum materials are available.

Your local Educational Service District may also have Fire Ecology materials available or can help you access them through local agencies. Check your phone book under schools for the location and phone number of your Educational Service District.

Glossary

Environmental Education Goals: Four goals that make up the framework for environmental education in the state of Washington.

Essential Academic Learning Requirements: (EALRs) A set of statewide standards representing specific academic skills and knowledge students will be required to know.

Fire Behavior: The manner is which fuels ignite, flames develop, and flames spread.

Fire Dependent: Species that rely upon the effects of wildland fire to continue or enhance conditions for that species.

Fire Ecology: The branch of science concerned with the interrelationship of wildfire and organisms and their environment.

Fire History: A history of an area as indicated by trees fire scars indicating how often and how intense fires burned in that area.

Fire Regime: A fire regime is a function of the **frequency** of fire, the **intensity** with which fire burns, and the amount of fuels consumed by a fire historically within an ecosystem.

Integrated Approach: A curriculum approach that overlaps traditional subject areas and learning occurs by addressing problems and issues significant to the learning population.

Urban Interface: An area within or adjacent to a wildland that has human structures and habitats.

Wildland: An unsettled area of land in a natural, unmanaged state or an area managed to maintain ecological integrity.

Wildland Fire: A fire that occurs in wildlands where the primary fuel component is naturally occurring fuels such as grass, shrubs, trees and forest residue.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this project was to increase the knowledge and awareness of the role of wildland fire in the Central Washington forests. In Central Washington, wildland fires are a significant influence on the communities and populations they affect. The need of children to understand their surroundings and explain natural occurrences is important. A wildland fire curriculum allows children to formulate meaningful connections between themselves and their experiences and their world.

In the literature examined, development of fire curriculum was supported. Wildland fire information is requested regularly by schools and teachers following a high fire occurrence fire season indicating an important issue. Research indicated that when exploring subjects of personal and social significance to students the integration of disciplines is appropriate. Literature also recommended an integrated approach to explore environmental issues in Washington State.

Therefore, an interdisciplinary fire ecology curriculum correlating the wildland fire issues of the eastern slopes of the Cascade Mountain Range and the disciplines of the traditional curriculum was developed.

Conclusions

Conclusions reached as a result of this project are as follows:

1. Implementing integrated curriculum will create opportunities for students to gain skills and apply knowledge in a meaningful context.
2. Environmental education is strongly suited for an integrated approach
3. Wildland fire should be explored in a responsible, accurate, timely manner due to the significance and potential significance to life in Central Washington.
4. There is a connection between the Washington Essential Academic Learning Requirements (EALRs) and Eastern Washington wildland fire issues.

Recommendations

Recommendations developed as a result of this project are as follows:

1. Additional research should be conducted by the educator in order to provide an appropriate tone for the delivery of any educational materials involving fire.
2. Assessment procedures and resources to evaluate curriculum effectiveness should be created and used in conjunction with curriculum.

3. Schools and teachers should strongly consider the coordination of professionals in the field to speak and supply accurate and focused information to children about the seriousness of fire and the liability potential.
4. Integrated curriculum should be considered as an alternative to individual subject instruction for meeting the educational needs of students.
5. Parents and families should be informed of the instructional content of this curriculum.

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