

The role of wildland fires in an ecosystem

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TOP: Flames scorch the area in California's Santa Cruz Mountains on September 27, 2016. BELOW: The fire triangle shows the three elements that must combine to start a fire. Photo by Tayfun Coskun/Anadolu Agency/Getty Images

What Role Does Fire Play In Different Ecosystems?

Fire is a chemical reaction that starts with lightning, lava or a match. How it burns depends upon three key things. What it leaves behind can be surprising.

Fire is the combination of heat, oxygen, fuel and an ignition source — known as the fire triangle. Fuels include grasses, needles, leaves, brush and trees. Natural ignition sources include lightning and lava. Fire management staff sometimes start fires to improve habitat or restore natural systems. However, sometimes people also start unwanted wildland fires through carelessness or arson.

Where and how quickly a fire moves depends on the terrain, weather and types of fuel. Fires burn faster up hillsides than they do on flat ground. The heat rising from the flames pre-heats the grasses, shrubs or trees on upslope. Like sheets of paper, grasses burn quickly, up to several miles per hour under extreme conditions. Larger fuels, such as logs, may take hours or even days to burn completely. While windswept flames can leap into the crowns of trees and burn entire trees in seconds, many fires merely creep along the ground slowly burning brush and forest litter.

The diversity of plants and animals you enjoy in many national parks can depend upon fire. What may look at first like devastation soon becomes a panorama of new life. Fire starts critical natural processes by breaking down organic matter into soil nutrients. Soil, rejuvenated with nitrogen from ash, provides a fertile seedbed for plants. With less competition and more sunlight, certain seedlings grow quickly.

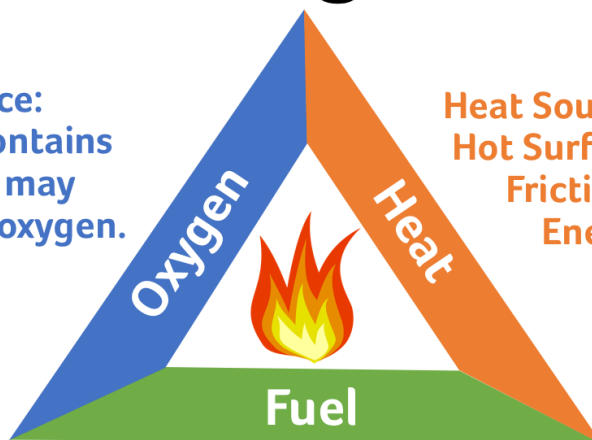
Fire Facts: The Triangle

Each year more than 100,000 wildland fires occur in the United States. One is probably burning somewhere while you read this.

All fires need three things to burn: heat, fuel and oxygen. These three elements make up the fire triangle. Remove any one of them and the fire will not burn. Heat first comes from the ignition source that in nature is lightning or lava. Fuel is any material that will burn. Some fuels are more likely to burn than others. For instance, dead trees, leaves, needles and grasses have far less water in them than living ones. Dead plants usually burn sooner and hotter than live ones. If you have ever built a campfire you know this. At least 16 percent of oxygen must be in the air for a fire to start. The air we breathe has 21 percent oxygen, more than enough to allow a fire to burn.

The Fire Triangle

Oxygen Source:
Normal air contains 21% O₂. Fuel may also contain oxygen.



Heat Sources: Sun, Hot Surfaces, Sparks, Friction, Electrical Energy, others

Fuel Sources: Can be a solid, liquid, or gas. Here are some examples.

Solids: Coal, Wood, Paper, Leather, Plastic, Sugar, Grain

Liquids: Gasoline, Alcohol, Paint, Olive Oil

Gases: Natural gas, Propane, Hydrogen, Carbon Monoxide,

Firefighting is based on the fire triangle. Tactics and equipment are designed to remove heat, fuel or oxygen. That even applies to you! If your clothing catches on fire, be sure to stop, drop and roll. Rolling on the ground smothers oxygen and the fire goes out.

Hot Fire Facts

Fires have burned across the earth for millions of years and continue to do so today. Evidence of fires that burned in the past exists in petrified trees that lived long ago and have, over many years, turned hard like a rock. Some petrified trees have fossilized charcoal called fusain in their trunks. Fusain shows that the trees were once in the path of a fire. On a living tree, burn marks are called fire scars.

Fires occur naturally with the help of lightning and lava, but people start most fires. Humans start approximately 90 percent of wildland fires! Most times, they start fires accidentally. In some cases, people light fires to harm others or commit fraud. This is called arson. Lightning and lava start the remaining 10 percent of wildland fires.

Did you know that lightning strikes the Earth about 100 times each second or that lightning temperatures can sometimes reach more than 50,000 Fahrenheit (28,000 Celsius)? That's more than five times hotter than the sun's surface! Imagine what happens when lightning strikes a field of dry grass.

Dangers Of Fire

Although fire can benefit an ecosystem, it may threaten human life or property. If the weather conditions are very dry or windy, fire burns much faster. Also, a fire burning near homes may damage those houses. Smoke can also be a cause of damage to homes. In a building, smoke smells unpleasant, leaves ashes and affects human health. In addition, smoke can make it difficult to see when driving.

Remember that fire is a powerful force. Only trained professionals should decide when and where a prescribed fire is to be started or permitted to burn.

Campfires or the burning of garbage should only be done after reviewing important rules and regulations and after careful consideration of the chances that the fire will not burn out of control. High winds, hot days and lots of dry materials in the area are dangerous conditions for starting a fire.

Fire As A Natural Resources Management Technique

People have long recognized fire's dual nature, a fact reflected in many stories. A classic example is the Greek myth of the Phoenix, a bird that lived for hundreds of years. At the end of its life the Phoenix burst into flames and then was born anew from its own ashes.

As the Phoenix used fire to renew itself, resource managers use fire to renew certain natural and historical environments. These are prescribed fires. Similar to the way that a doctor may write a prescription for medication to help a person feel better, resource managers study places and develop prescriptions or, burn plans. Prescribed fires transform habitats to support or protect native species. They can also help re-create historic landscapes that were burned regularly by people or naturally in the past, but have not been burned in recent decades. A prescription also tells the conditions under which a fire will be ignited by trained professionals.

Watch And Learn

Another way that resource managers use fire is by closely monitoring a naturally started fire, one ignited by lightning or lava, and allowing it to burn to meet specific resource objectives. All fires, prescribed and wildland, have risks and are potentially dangerous. Protecting human life is always the first priority and burn plans always look at the best ways to keep people safe.

Quiz

- 1 Which of the following statements accurately represents the relationship between the article's central ideas?
- (A) Heat, oxygen and fuel are three components that can ignite a fire; the presence of any of these three things indicates excellent conditions for lighting a fire.
 - (B) Several components are required in order for a fire to start; while accidental fires often cause damage, other planned fires can benefit nature.
 - (C) Firefighters have studied the best way to control fires for many years; the fire triangle allows firefighters to implement plans for extinguishing wildfires.
 - (D) Fires have fascinated mankind since early history; the legend of the phoenix has influenced the development of the modern fire triangle.
- 2 Which of the following selections from the article would be MOST important to include in an accurate and objective summary of the article?
- (A) The heat rising from the flames pre-heats the grasses, shrubs or trees on upslope. Like sheets of paper, grasses burn quickly, up to several miles per hour under extreme conditions.
 - (B) What may look at first like devastation soon becomes a panorama of new life. Fire starts critical natural processes by breaking down organic matter into soil nutrients.
 - (C) Each year more than 100,000 wildland fires occur in the United States. One is probably burning somewhere while you read this.
 - (D) Evidence of fires that burned in the past exists in petrified trees that lived long ago and have, over many years, turned hard like a rock.
- 3 The chart shows various heat sources that can ignite fires.
Based on information in the article and chart, what is the BEST explanation of this detail?
- (A) Multiple heat sources account for the 100,000 wildfires the United States experiences each year.
 - (B) Due to the unreliability of heat sources as ignition, fire management staff sometimes start fires to renew nature.
 - (C) Different heat sources are directly related to different types of terrain on Earth, thus affecting the movement of wildfires.
 - (D) Fires can be started by natural processes or by humans, and can have positive and negative effects.

- 4 Who would find the chart MOST helpful?
- (A) a natural resource manager trying to avoid dangerous fires
 - (B) a scientist testing combustible substances
 - (C) a student studying the causes of fire
 - (D) researchers interested in facts about the phoenix