Section 6: Fire on the Range

Learning Objectives:

- Describe each component of the fire triangle
- Describe the components of the fire behavior triangle
- Determine which types of fuels burn best
- Explain fuel management techniques, including the "Green and Brown" guide
- Identify and compare the effects of slope, woody species arrangement, and understory growth on fire behavior.

Idaho General Education Performance Standards

- ESS2-5-1, PSI-5-3, PSI-MS-2, ESS3-5-1, ESS3-MS-2, ESS3-MS-3, PS3-MS-2, PS3-MS-3, LS2-MS-6

Introduction: The Role of Fire on Rangelands

Fire is an important and natural part of rangelands. Many plant and animal species have adapted to fire and can benefit from it. Fires can clean out diseased or dead forage and trees. However, just like floods and other natural disasters, fire can produce dramatic change in a short period of time.

Beneficial fires in Idaho are relatively small and create a mosaic of age classes of plants (e.g., small areas of shrubs would burn and perennial grasses would grow for several years in the burned areas until shrubs became reestablished). These types of fire create openings that allow seeds to sprout in sunlight creating areas with high plant diversity, which ultimately creates habitat for a diverse mix of mammals, birds, fish, reptiles, and amphibians.

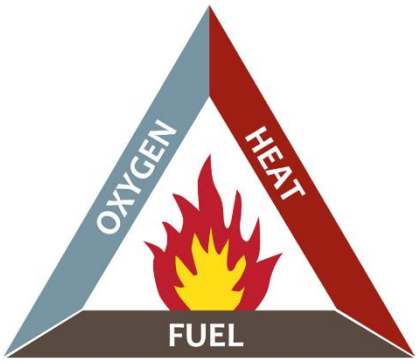
Wildfires over the last few decades, however, have shifted from being small to large. According to the National Interagency Fire Center (NIFC), across the nation the number of fires since 1960 has decreased by 46%, yet, the total acres burned has increased 28% or approximately 1.3 million acres. That means, there are less fires, but when it does burn, it burns a lot!

Fire Triangle, Fire Behavior Triangle, and Fuel Management

Time: 15-20 minutes
Supplies: Fire triangle (2 per student), "Green and Brown" chart

Do:
Ask students to describe what is fire? How does it burn?

- Explain that fire is a result of a chemical reaction that requires the presence of heat, fuel, and oxygen. Have students fill in the fire triangle with the 3 components and discuss each one:
    - **Fuel:** is any material that will burn. Ask team members what will burn on rangelands?
    - **Heat:** is provided by the ignition source (fire's ignition decomposes compounds, releasing the flammable gases that react with oxygen to burn). Ask team members how fire starts? See notes below:
    - **Oxygen:** With intense heat and adequate fuel, fires create their own winds which brings in more oxygen.



Ask students to describe common ignition sources.

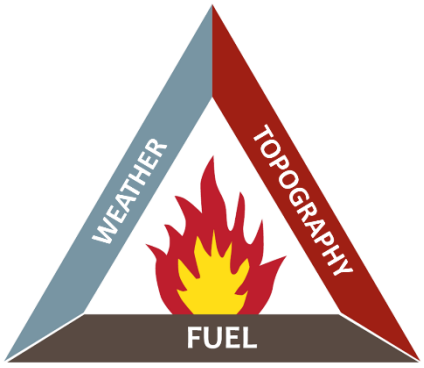
- **Humans**
    - Prescribed fire is an important tool on rangelands; when intentionally ignited and carefully timed and controlled, fire can be used to clean up old, dead trees and brush allowing for new plants to grow, and can also be used to control unwanted plants like junipers which can take over grasslands.
    - Fires that start by accident from fireworks, sparks from vehicles and equipment, target shooting, camp fires, smoking, etc. are not good and destroy a lot of wildlife habitat. Smokey Bear says "Only you can prevent forest fires", and YOU ACTUALLY CAN by being aware of your surroundings and making good choices when you recreate (e.g., if the vegetation is brown and dry, be extra careful of where you are setting off fireworks).
- **Lightening** is the number one, natural cause for wildfires!

Reflect:
If you remove one of the legs of a triangle, will it be a triangle? Just like all three sides are necessary for a triangle, all three components are essential for a fire. Without one of them, a fire will not start.

Fire Behavior Triangle

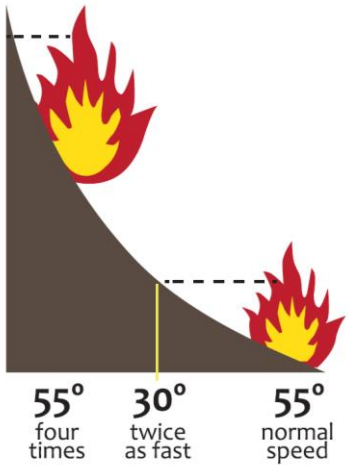
What makes a fire spread fast one day, and slow another day? What makes a wildfire burn "hot" or "cool"? Fuels, weather, and topography all contribute to the behavior of the fire.

Do:
Have students fill in the 3 components of the fire behavior triangle and discuss each component.



- **Fuel:** fuels are any living or dead plant material above the ground's surface that can burn. The amount, arrangement or continuity (e.g., can a flame that is burning one plant, reach another plant?), and fuel moisture (what percentage of the plant is water) all influence fire behavior.
- **Topography:** includes land features like slope and aspect
- (e.g., south/ north side of mountains). Steeper slopes will burn more rapidly, because the fire has more access to oxygen. Fire is further accelerated going uphill because ground fuels are closer to flames as steepness increases (see illustration to the right).
- **Weather:** affects fire because of the humidity (moisture in the air) and temperature of the atmosphere. This affects fuel moistures, which determines how quickly or slowly fuels will ignite and burn. For example, do you sweat more when it is hot or cold? When it is hot and dry, plants lose more water through transpiration than when it's cold and humid.

    Fire also creates its own weather! When the hot air from the fire rises, fresh air rapidly moves in producing wind, bringing more oxygen to the fire.



Apply:

- What is the common component between the two triangles? Fuel.
- As a rangeland manager, what component can you manage? Fuel. On rangelands, you can't change topography and you can't control the weather. Most of the time, you can't influence heat (although helping people be aware of fire risk can help!), and you can't control the oxygen. **You CAN MANAGE the FUELS!**

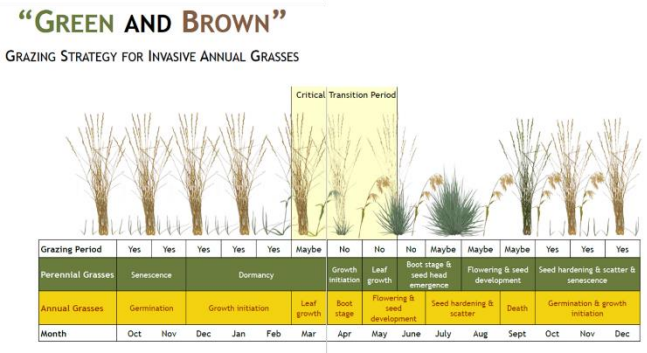
Fuel Management:

Fuel management on rangelands can change fire behavior by affecting the amount of ground fuels and the arrangement (or continuity) of fuels. Some of the different management treatments that can be used to manage fuels include:

- **Prescribed Burning:** this is the intentional application of fire when the weather conditions will not likely lead to an intense fire (often used in the early spring, late fall, or even when there is snow on the ground!). This can change the amount of fuel, and also where fires will or will not burn in the future.
- **Mechanical Treatments:** these treatment involve different mechanized tools to remove plants. Some examples include: tilling, chaining, mowing, and shredding or chipping woody plants. Often times with mechanical treatments, we are not removing fuels, but rather changing the fuel structure. For example, fuels burning on the ground are easier to control than when they are in the canopy of a tree.
- **Herbicides**: chemicals that kill or injure plants.
- **Manual Treatments:** the use of hand tools to remove plants
- **Livestock Grazing:** animals eat plants, which reduces fuel and recycles nutrients as manure. Depending on what your plant community looks like, you can target certain unwanted species (e.g., cheatgrass and medusahead) and have little to no effect on desirable plants like native bunchgrasses.

Do:

More and more research is supporting the use of livestock grazing to reduce fuels (i.e., grasses). One example is the "Grazing Invasive Annual Grasses: The Green and Brown Guide". In this guide, research discuss a simple method for managing livestock to reduce annual grasses while allowing perennial grasses (desired species) to grow. It also illustrates when grazing should be removed. Discuss the "Green and Brown" chart and answer the following questions:



- Annual Grasses should be grazed during what plant growth stages? *Germination and Growth Initiation (the goal is to stop annuals from producing seeds—remember, annuals grow and die the same season).*
- Why is the grazing period a "Maybe" or "No" during certain months? *When Perennial Grasses start to grow (Growth initiation, Leaf growth, Boot stage & seed head emergence, and Flowering & seed development), they are the most vulnerable to damage. Although it's okay to graze plants during those month periodically, you don't want to do it every year. That's one of the reasons we have rotational grazing systems. It allows for perennial grasses to flower and produce seed every few years sustaining the population.*