What Burns Best?

(Adapted from BLM's Fuels-What Burns Best? lesson)

THIS IS A TEACHER DEMONSTRATION ACTIVITY ONLY, WHEN WORKING WITH FIRE BE AWARE OF YOUR SURROUNDINGS AND HAVE WATER AVAILABLE.

For additional safety precautions, review the Safety Tips below.

Time: 20-25 minutes (plus time to gather plant materials)

Supplies:

- Metal bucket (you can do this activity with 1 bucket or with up to 4)
- Wooden matches (~28; 7 for each bucket)
- Plant materials placed inside labeled bags or boxes (you can also have students gather plant materials)
    - Green grasses and plants
    - Dead/dry grasses and plants (e.g., cheatgrass)
    - Sagebrush
- Large bucket of water
- Spray bottle filled with water
- Access to a hose
- Metal trash can

Background:

In the last section, you learned that immature plants can be made up of 75% water (page 47; FYI: a watermelon is about 92% water!). That's a lot of water! As the summer progresses, plants lose water through transpiration (which is the evaporation of water from plants primarily through pores on the leaves). As plants lose water, they turn from green to brown.

Do: In teams, assemble a mixture of fuels according to one of the recipes below.

ALL FUELS MUST FIT INSIDE THE BUCKETS, WITH NOTHING HANGING OUT OVER THE EDGES.

Use only the fuels included in each recipe, nothing else should be added.

Recipes:

1. Green grasses or plants (if these are gathered more than a day before the experiment takes place, they should be stored in a plastic bag in the refrigerator).
2. Dead and dry plants
3. Sagebrush
4. Dead and dry plants, but sprayed lightly with water.

- Have students write a hypothesis (what they think will happen when you drop the match in the bucket) for each recipe in a notebook (or lab book). *Hypothesis are not guesses, instead, students should use what they have learned so far to make an "educated guess" based on that material.*

- One approach to writing a hypothesis is to use this statement: "If ____ [I do this]_____, then__[this]__will happen."
    - Example: If I never water my plant, it will dry out and die.
    - Example: If a plant is green (has high fuel moisture), then it will not burn.

- Using the seven matches provided for each bucket, the TEACHER should attempt to light the fuels, one bucket at a time to allow the students to see how each fuel burns.
- Students should write observations in their notebook for each recipe.
- Questions to consider:
    - Did the fuel burn slowly or quickly?
    - Were there big or small flames?
    - Did it just smolder?
    - How much smoke was produced?

Apply:

Students will most likely note that it was difficult to ignite the "green" fuels and the fuels that had been sprayed with water.

- Challenge students to explain why, potential answers:
    - They had more moisture than the other fuels; the heat from the flame first has to evaporate the moisture before it can ignite the fuel.
    - Once the green fuels started burning, they actually burn quite well, why? *They have plenty of stored energy—more, in fact, than dead plant materials. Pine needles also contain oils and other compounds that burn well.*
- Have students compare and contrast the ability of large and small materials to burn.
    - Why would the smaller pieces ignite more easily? *The smaller pieces have more surface areas exposed to the heat of the flame and to oxygen).*

Safety Procedures:

- Notify, in advance, any individual or agencies (principal, local fire protection unit, and/or maintenance staff) that would want to know that your activities involve fire.
- BE AWARE OF YOUR SURROUNDINGS!
- Choose open, well ventilated, debris and vegetation free location for this activity to reduce the chances of fire alarms being triggered.
- Be aware of wind direction and force. Postpone this activity if it is too windy and you will be working outdoors.
- Instruct students on the use of the spray bottles and fully charged fire extinguishers that must be in the activity area. Assign 1-2 students with firefighting duty—they should have spray bottles/hose in hand prior to lighting anything on fire.
- Instruct all students to NOT attempt this activity without an adult present.
- Student and teacher should wear safety goggles; tuck in loose clothes and tie back long hair.
- Have emergency phone numbers readily available
- Inform the students that they should never use fire without an adult present.