



Determining live fuel moisture in junipers (*Juniperus spp.*)

Adapted from Texas Dept. of Agriculture Prescribed Burn Manual

INTRODUCTION

Fuel moisture is often listed as an important criteria for ignition in burn plans. Why does fuel moisture matter? Dryer fuels ignite at lower fire temperatures and burn more rapidly and more completely. Non resprouting cedars (*Juniperus spp.*), like eastern Redcedar or Ashe juniper may be more susceptible to fire at lower fuel moistures. Cedar with a live fuel moisture below 70% can burn intensely depending on the surrounding fuel load and the tree size.

Fuel moisture can be assessed periodically or in conjunction with a planned burn window. Measuring fuel moisture is relatively easy and can be done by any landowner.

PRESCRIBED FIRE GUIDELINES FOR JUNIPER MOISTURE

The fire conditions that are likely to be present at each percentage moisture range are defined below. (Hinnant and Taylor).

- <60%** Drought and/or summer conditions will result in high fire intensity.
- 60-75%** Relatively dry conditions with high fire intensity present. This moisture range is often used for headfires, adequate fine fuel (>1200 lbs./ac) is needed for successful fire.
- 76-85%** Moderate conditions with moderate fire intensity present This range often used for burning blacklines, adequate fine fuel (>2000 lbs./ac) needed for successful fire.
- >85%** Relatively moist conditions with moderate to low fine intensity present. Burners will often experience poor topkill of juniper. Adequate fine fuel (>3000 lbs./ac.) may produce successful headfire.



Figure 1. Collect cedar leaves by hand, avoiding any woody stems or branches when measuring fuel moisture.

METHODS

You will need:

- ◆ **200-300 gram scale** (these can be found for food preparation or from lab and outdoor research companies.
- ◆ **Small paper lunch bags** (about 8-12" tall)
- ◆ **Black marker**
- ◆ **Microwave oven**
- ◆ **Calculator**

Collecting the samples:

It is always best to collect more than one sample if you can. Three or more is ideal so that you can calculate an average moisture value to refer to.

1. For each sample you plan to collect, pre-weigh a small paper bag in the field using a spring scale. Record weight on bag.

2. Collect several samples from different trees of similar size throughout the burn unit (Figure 1). For each sample, strip green leaves (the needles of cedar trees are actually considered leaves) from the ends of branches at waist-to chest height and from all sides of the tree. Using your hands instead of shears to strip the leaves will ensure that only leaves are collected. Do not collect any woody material (branches, stems). Collect about 100 grams (about 4 ounces) of leaves for each sample and place in a paper bag you have weighed.



Figure 2. Sample bag with label being weighed with a spring scale in the field.

3. Label your sample bag with the location, date, and time (Figure 2).
4. Weigh the sample in the paper bag in the field. This is the *Sample Weight*. Add the sample weight to your bag label.
5. Transport sample back to your processing facility/ area.
6. Dry the samples. Place the sample (including bag) in a microwave oven and dry for 30 seconds on high setting (Figure 3).



Figure 3. Sample drying in a microwave oven.

7. Remove bag from oven and weigh. Record the weight.
8. Let the sample cool, then microwave the bag again

- for 30 seconds. If the sample gets too hot (smoke, smoldering, fire), then it is ruined.
9. Remove bag from oven and reweigh.
10. Repeat steps 3 and 4 until the weight does not change after drying. Record the final weight.

Calculations:

11. Before drying:

Green weight = undried sample weight — bag weight.

12. After drying:

Dry weight = dried sample weight — bag weight

13. Percent live fuel moisture (**LFM**)

$$= \frac{(\text{Green weight} - \text{Dry weight})}{\text{Dry weight}} \times 100$$

*Note: LFM can exceed 100%

CONCLUSION

Both live and dead fuel moistures are often considered in burn planning. Although dead fuels like grass or leaf litter may require different collection methods, both can be processed in the same way. For cedars, however, live fuel moisture is the most relevant. Keeping a record of fuel moistures throughout a prescribed fire window or during times of wildfire risk, can be helpful for planning and making burning safer and more effective.

GETTING HELP

The Great Plains Fire Science Exchange has resources on fire, fire effects, monitoring, and more at <http://GPFireScience.org>. We can also locate experts to address your fuels questions.

REFERENCES

- Hinnant, R. and B. Taylor, Jr. Edwards Plateau Prescribed Burning Association Handbook.
- USDI National Park Service. 2003. Fire Monitoring Handbook. Boise (ID): Fire Management Program Center, National Interagency Fire Center. 274p.

For more information:

<http://GPFireScience.org>