Sampling the Moisture Content of Dead Grass-Like Plants

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Sampling Grass-like Fuel Moisture Content

Grass is a prominent fuel type with fire behavior distinct from other carrier fuels, burning quickly and with sometimes surprising intensity. At its most specific level grass-like fuels include not just grass but also sedges and, more uncommonly, rushes. In Alaska grass-like fuels include tall grasses such as bluejoint (*Calamagrostis*) and wideleaf polargrass (*Arctagrostis*) or short grasses such as fescue. Tundra fires may be carried by tussockgrass (which is not a grass at all but a sedge).

In terms of fuel models and fire behavior modelling live grass-like plants are grouped with forbs in the category of “Live Herbaceous” fuels. For the purposes of fuel moisture sampling the term grass refers to any grass-like plant. In Alaska, dead, overwintered grass is most susceptible to burning during the window between snow-melt and green-up or hardwood leaf-out. After green-up the high moisture content of new grass culms (>200%) tends to retard fire spread although dry underlying thatch or “skirts” of dead grass may be sufficient to carry fire. Unlike other areas of the continental U.S. senescense has little effect on fire behavior in Alaska. Senescense, or curing, marks a late season decline in foliar moisture. Below 30% moisture content foliage is considered dead. In Alaska grass may not reach a cured state before fire behavior is inhibited by declining day length, increasing time below the dew point temperature, and snow fall.

Fire is primarily driven by dead grass conditions. During spring prescribed burn windows on military training ranges dead grass moisture content ranged between 7.4% - 15.8%. Probability of ignition was determined to be 50% at 12.4% moisture content in Alaska (Miller, unpublished data). The probability drops to 5% at about 22.5% moisture content. Since grass leaves are dead, moisture content is subject solely to atmospheric factors, including temperature, dew point, air pressure, wind speed, and solar insolation.

Sampling Methods

Standards and protocols for sampling grass moisture content are still in development for Alaska and we expect that they will evolve from field experience. This guide addresses dead grass moisture content but ovelaps somewhat with the protocol for live grass sampling because they often must be collected together as a mixed “grab sample” depending on species. Some grasses such as bluejoint lend themselves to easy separation of live and dead foliage. Other species such as tussockgrasses are impractical to separate.

Moisture Determination

In general, there are two needs for the moisture content of dead grass. If there is a need for accuracy, as in a research situation, then drying ovens are required. If an estimate is needed immediately, as in a fireline situation, then tables based on weather observations are quicker.

Sampling Method: Drying Ovens

Note that dead grass may wick moisture up from the ground. For an unbiased sample, cut the grass several inches above the ground and seal it in an air-tight container. Matted grass is more subject to humidity from the undelying soil. Sample standing grass, if possible. Fill a container with sample and proceed with drying as for any other sample. Since the moisture content of dead grass changes at an hourly scale, it is helpful to note the time and weather conditions. If a grab sample is collected it is helpful to know the approximate ratio of live to dead foliage. It may also be helpful to describe the degree of curing, especially later in the season if it has frosted. If there has been frost, rainfall, or dew then wait until surface moisture is gone before sampling.

Sampling Method: Dead Fuel Moisture Tables

The use of tables to estimate fine dead fuel moisture content requires various combinations of weather measurements, usually temperature, dew point, relative humidity, and/or windspeed.

Appendix B Tables: Moisture contents from Appendix B of the NWFCG Fireline Handbook are for generic "Fine Dead Fuels" which may include timber-litter, 1-hr twigs, needle-cast, leaf litter, dead herbaceous foliage, etc. The tables are familiar and widely used in the U.S. and are a core input to many Rothermel-based fire behavior models but may not be appropriate for all fine dead fuels in all geographic areas. Complete instructions are included in Appendix B. In summary: Using dry bulb temperature and relative humidity, enter Table 2 to find the reference fuel moisture content. Then enter either Table 3, 4, or 5 (depending on the month) and obtain a fuel moisture content correction based on shading, slope, aspect, projection, and time of day. Add the reference fuel moisture and the correction to estimate the fine dead fuel moisture content.

Custom DGFM Tables: Tables for over-wintered dead grass in Alaska are in development from empirically derived data from two years of prescribed burning on military ranges near Anchorage, Delta, and Fairbanks (E.A. Miller, Unpublished data). Provisional tables were issued in 2010. New tables incorporating four years of data are anticipated in 2014. The tables are based on eye-level windspeed (mph), temperature (°F), and dewpoint temperature (°F). Best estimates are obtained by using three weather factors, however relative humidity by itself is a fair predictor. **Rule of Thumb**: Divide the relative humidity by 7 and add 6. For example, a relative humidity of 30% divided by 7 is approximately 4. Adding 4 and 6 yields 10% fuel moisture content. These tables do not consider fuels other than dead, over-wintered, unshaded grass and may not apply south of 60° latitude.