Contents

OBJECTIVE(S)

Upon completion of this lesson, participants will be able to:

1. Provide an update of the NFDRS2016

NARRATIVE

I. INTRODUCTION

Dead Fuels are those naturally occurring fuels whose moisture content is controlled by external environmental conditions such as temperature, humidity and precipitation. Dead fuels do not have a life cycle, so they don't green up or cure out; they are only affected by changes in weather conditions. Dead fuels are continually exchanging moisture with the surrounding atmosphere. When moisture leaves the fuel at the same rate at which it enters, the fuel is said to be in equilibrium with the surrounding atmosphere. When fuels are not in equilibrium with the atmosphere, which is nearly all the time, they will either extract moisture from it or release moisture to it, depending on whether they are relatively dry or relatively wet.

The NFDRS 78/88 model requires direct user input of state-of-the-weather (SOW) and changing R (raw weather data from automated stations) to O (observed weather data for calculated NFDRS indices) in WIMS to calculate fine dead fuel moisture before any indices are produced. It also requires a separate models for calculating 1-, 10-hour dead fuels moistures, as well as the 100- and 1000-hour dead fuel moistures. The old 1-hour – 1000-hour fuel moisture models will be replaced by the scalable Nelson Dead Fuel Moisture Model.

In contrast, the Nelson Dead Fuel Model:

- More accurately models diurnal and seasonal dead fuel moisture using hourly fire weather observations.
- Requires no daily human intervention (i.e. No state-of-the-weather).
- Has been running in WIMS since December 2011 and has been part of fire behavior prediction tools (FARSITE, FlamMap) for over a decade.

II. NELSON DEAD FUEL MOISTURE MODEL

The Nelson Dead Fuel Model uses physically-based models to describe the relationship of several meteorological variables to the temperature and moisture content of fuels. It quantifies the moisture gain or loss due to diffusive and capillary processes. NFDRS 2016 provides hourly inputs to the Nelson model that include: temperature, relative humidity, hourly precipitation and solar radiation. There are no user inputs to run the model and the model can be configured to estimate the moisture content of any size of fuel particle, from the smallest one-hour fuels to the largest 1000-hour fuels.

A. Nelson Model Inputs

The Nelson model is a physically-based fuel moisture model. It accounts for two modes of moisture transport: diffusion and capillary flow. It has a direct rainfall input, making it more sensitive to rainfall that occurs before observation time and it accounts for dew formation on fuels during periods of high RH. A great benefit of the Nelson model is that it uses hourly rainfall to wet fuels at times other than observation time. For example, it will reflect rainfall at any time during the day. The relationship is asymptotic, meaning that above ~1.0 mm of captured rainfall, increases in rainfall have little effect.

The Nelson model uses a full energy balance to determine the stick surface temperature. The primary inputs to this sub-model are temperature, solar radiation and stick diameter. Stick diameter sets the physical properties of the stick, particularly how well the stick heats or cools through convection.

REVIEW OBJECTIVE(S)

Upon completion of this lesson, participants will be able to:

1. Provide an update of the NFDRS2016

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