NFDRS2016 OVERVIEW

Contents

OBJECTIVE(S)

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

1. Provide an update of the NFDRS2016

NARRATIVE

I. INTRODUCTION

The NFDRS 2016 model has been updated to a more automated system to aid fire managers and agency administrators with fire management related decisions. The NFDRS 2016 model upgrade is designed to eliminate personal bias from being introduced into the calculations and the resulting NFDRS indices portray an appropriate representation of fire potential. Current enhancements to the system are ongoing to eliminate the need for extensive user interaction. These enhancements include how the fine dead fuel moistures and live fuel moisture is calculated as well as reducing the number of fuel models from 20 (1978/1988 NFDRS) to five: grass, grass-shrub, brush, timber and slash.

NFDRS 2016 is designed to provide an objective evaluation of fire danger but the original system required several user-defined values to operate properly such as daily state-of-the-weather (SOW) and seasonal live vegetation characteristics such as green-up, curing and freeze dates. The 1988 updates to NFDRS added more user interaction through the addition of season codes and greenness factors. These inputs were added to help users better depict the seasonality of fuel moistures. Without these values the system does not operate properly, so the models must be 'managed' on a regular basis to ensure that they are adequately depicting the fire potential of a given area.

Fuel moistures are a vital component to the National Fire Danger Rating System but the original fuel moisture calculations in NFDRS lacked the ability to depict seasonal changes in live and dead fuels without substantial user interaction. New enhancements to the NFDRS 2016 model are intended to alleviate some of these limitations.

II. BACKGROUND

A. National System

1. **VIDEO: NFDRS2016_Lesson4-Part1a**

In 1922 Harry Gisborne (also known as the "Father of Forest Fire Research") was assigned to the Priest River Experiment Station located near Priest River, Idaho. Gisborne identified the need for a "common language" tool to communicate fire weather conditions. Gisborne developed a fire danger meter that combined weather variables in daily indices of fire potential. The use of this tool was widely accepted but the creation of local variants resulted in as many as eight different versions and the concept of

"common language" was diminished.

By 1968 the National Fire-Danger-Rating Research Work Unit was formed in Fort Collins, CO where researchers worked towards leveraging Dick Rothermel's new fire spread model as a fire behavior "engine" for a fire danger rating system. These efforts resulted in the first release of the National Fire Danger Rating System in 1972. In 1978, a subsequent version was released adding more fuel models and incorporating live and heavy dead fuels. In 1988, Bob Burgan provided an updated version to account for the relatively humid conditions of the southeastern United States. Other than the minor changes in the 1988 version, the National Fire Danger Rating System remained scientifically dormant for about four decades.

B. The Evolution and Incorporation of New Science

1. **VIDEO: NFDRS2016_Lesson4-Part1b**

As new technologies have been developed and become available, the ability to improve on the NFDRS model has become apparent and changes have implemented. New technologies included:

1. Solar powe
2. GPS and satellite-telemetry
3. Information Technology (internet, database software, etc.)
4. New and better environmental sensors (following the National Fire Plan in 2000).

Fire danger application improvements began in the late 1980's as Pat Andrews and others started exploring linkages between fire danger and fire business activities. As a result, better fuel moisture models were developed and improved understanding of fire danger application 'best practices' with a more structured application process led to the development of Fire Danger Operating Plans. A need was also recognized to be able to utilize fire danger outputs as a firefighter safety/situational awareness tool (i.e. Pocket Cards).

Lessons learned have provided a foundation for moving forward. In order to have a dynamic, viable system that can keep up with technology the components of a fire danger rating system need to be:

1. **Modular**: New science can be easily added.
2. **Integrative**: Fire danger indices integrated over both space (FDRA) and multiple time horizons (i.e. today – season – inter-annual).
3. **Generalized**: Same system performs across a range of climates; it should work everywhere.

4. **Applicable**: Normalize index scales and apply indices across a spectrum of fire management decisions. Maintain a 'common language' across all agencies.

Revisions to the 2016 version of the National Fire Danger Rating System have been ongoing since 2000:

1. 2000 – New dead fuel moisture model (R. Nelson)
2. 2004 – New phenology model developed (WM Jolley)
3. 2006 – NFDRS revision discussions begin
4. 2007 – Nelson model expanded to all size classes
5. 2011 – Many stations had a decade of hourly weather data with solar radiation
6. 2011 – New sub-models were implemented and tested in WIMS and WFDSS
7. 2014 – Proposed NFDRS changes to the NWCG FENC Fire Danger Subcommittee and the NWCG Executive Board; receive approval to change the system
8. Fall of 2017 and winter 2018, the new model and tools were released to users and rollout is underway nationwide.

III. SUMMARY

Over the last four decades the NFDRS has been used extensively to support fire management decisions nationwide. During that time, several system deficiencies have been identified and many lessons have been learned. In order to address these identified needs, three major changes are being implemented in the NFDRS: replacing the dead fuel moisture model, replacing the live fuel moisture model and reducing the number of fuel models.

The NFDRS 2016 model has been updated to a more automated system to aid fire managers and agency administrators with fire management related decisions. The NFDRS 2016 model upgrade is designed to eliminate personal bias from being introduced into the calculations and the resulting NFDRS indices portray an appropriate representation of fire potential. In summary, there is no longer a need for:

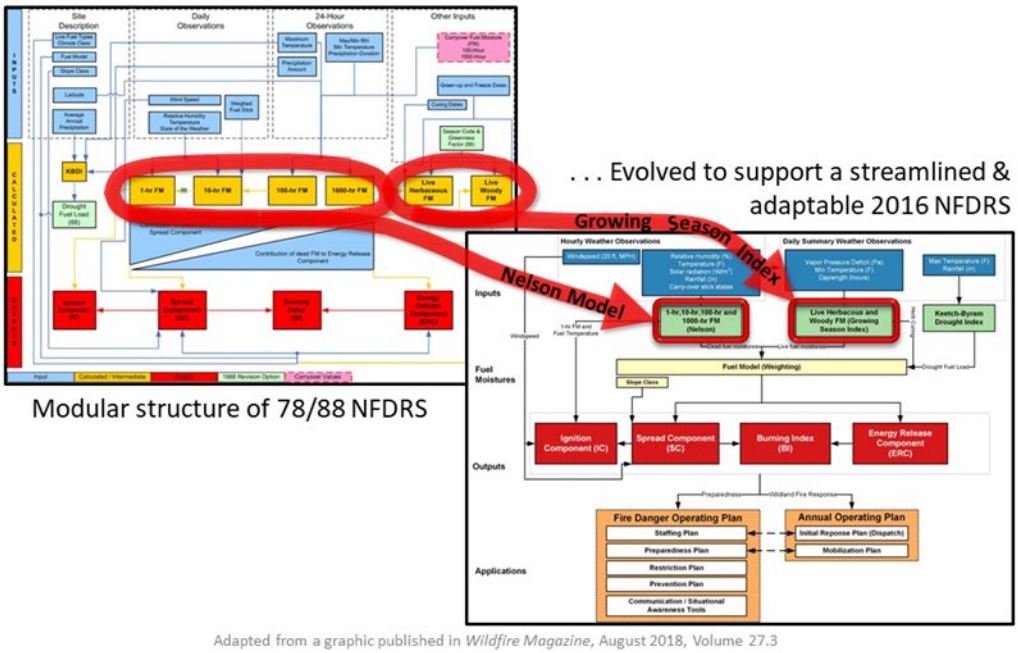
- Climate Class
- No required manual entries (i.e. green-up, freeze, dormant dates, and state-of-the weather)

- All revisions in the 1988 system (i.e. deciduous WAF, season codes, greenness factors, 1hr=10hr)
- Weighted sticks
- Fosberg 1- and 10-hour fuel moisture model
- 100- and 1000-hour dead fuel moisture model
- Burgan live fuel moisture model
- Dynamic Load Transfer
- Total of 35 fuel models eliminated

The new system works just as well, or better than the previous system. What does not change:

- Most of the same weather inputs (solar radiation has been incorporated)
- All of the same output components and indices: we still have ERC, BI, SC, and IC
- The look, feel, and use of both FireFamilyPlus and WIMS

The new system is better in that it is fully automated and more consistent; improved response to drought; more easily applied to gridded weather; and ready for future work.



Adapted from a graphic published in *Wildfire Magazine*, August 2018, Volume 27.3

REVIEW OBJECTIVE(S)

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

1. Provide an update of the NFDRS2016

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