MoD-FIS: An innovative approach to capture seasonal fuel changes

By Kurtis Nelson, LANDFIRE USGS Technical Lead and Julia Deis, LANDFIRE Operations Lead (SGT)

The LANDFIRE (LF) team at the USGS EROS Center recently released new provisional products for the Great Basin and Southwest regions of the United States that capture the seasonal nature of fuels in this region. This is the second region where Modeling Dynamic Fuels with an Index System (MoD-FIS) are being developed.

- In the Great Basin and Southwest U.S., MoD-FIS incorporates seasonal variability of herbaceous cover (i.e. cheatgrass) to capture changes to fire behavior fuel models based on the current fire season herbaceous production.
- In the Southeast U.S., MoD-FIS data are produced based on changes in drought level and are currently available operationally through the Wildland Fire Decision Support System (map, p. 2). Note: These data will be made available through the LF website in the future.

MoD-FIS development

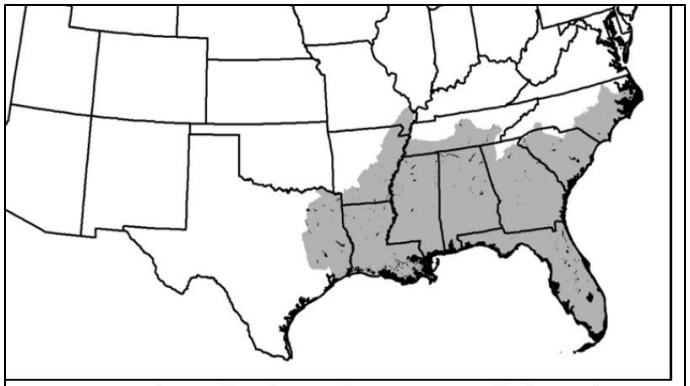
Static fuel model layers representing average fire conditions have limited utility in areas where seasonal conditions have profound impacts on available fuels. Feedback like this from LF fuels data end users led the LF team to develop MoD-FIS. MoD-FIS is defined regionally to represent the dynamic nature of fuel changes based on local conditions.

Seasonal fuel changes brought on by varying levels of precipitation affect the resultant herbaceous production and growing season trends from year to year. MoD-FIS correlates 10 years of 30-meter resolution Landsat Normalized Difference Vegetation Index (NDVI) to LF herbaceous and shrub Existing Vegetation Cover (EVC). The corresponding relationship is then used to evaluate current year NDVI to the average and maximum of the 10-year period in terms of herbaceous and shrub cover. From this

evaluation, surface fuel models are assigned in the herbaceous areas based on the maximum NDVI for the current growing season. In addition to varying the fuel models in a particular area, this process also successfully transitions previously non-burnable areas to burnable and previously burnable areas to non-burnable based on the seasonal herbaceous production of those areas.

Data process steps

The Great Basin/Southwest MoD-FIS process has several components to it. The data for the arid non-forested lands of the Western U.S. are based on LF attributes of vegetation cover and height in herbaceous and shrublands. Many of the data processing steps have been automated including generation of the maximum NDVI image composites, conversion of NDVI to herbaceous and shrub cover, and assignment of surface fuel models based on these attributes. Validation efforts have included modeling current and historical fires using the current LF fuels data and the MoD-FIS data which have showed an overall improvement in the ability of the MoD-FIS fuels data to represent actual fire behavior over the static fuels data.



LANDFIRE Drought-Based Fuel Dynamic prototype area in the Southeast U.S.

MoD-FIS in the Southeast is based on principles of the National Fire Danger Rating System (revision of 1988) for additional fuel availability (weight and depth) due to drought as expressed by the Keetch-Byram Drought Index (KBDI). These data have been used to model current and historic fires in the Southeastern U.S. with improved results over using static fuels layers.

Status of process

Currently, the LF team is producing MoD-FIS products for a large portion of the Western U.S. over three fire seasons - spring, summer, and fall. This region covers southern

Washington to mid-Texas for different time periods, depending on the fire season. Those products are currently considered to be in a provisional status.

The spring and summer products have been released and, in order to facilitate broader analysis and review, are available for download from the LF Data Distribution System (user defined area of interest) and the MoD-FIS mosaics web page (entire study area). Full documentation of the algorithms and processes used to develop these products are provided on the LF website to support these reviews.

MoD-FIS products for other regions of the country are expected to be developed in the future.

What's ahead

The next step in development of the Great Basin/Southwest MoD-FIS process will be to expand into additional non-forested areas of the Northwest U.S. and Great Plains. Time series analysis of Landsat NDVI over the expanded areas will be completed in order to develop adjusted relationships between NDVI and vegetation cover for the new areas. Once the new relationships are developed and the desired time periods of data production defined, the expanded MoD-FIS process will use the existing operational system to produce data for the entire area. Additionally, annual review and adjustments to the fuel model assignment rules will continue with local fuels experts to ensure these data are accurately representing fuel conditions. A timeline for this expansion of the Great Basin/Southwest MoD-FIS is not currently available, but will be accomplished as time and priorities allow.

Further details about the MoD-FIS process and plans for developing products for other regions are available in the MoD-FIS Comprehensive Plan.

Contact: LANDFIRE@tnc.org.