Texas Fire Fuel Model Mapping Project
Summary Report
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The Texas Forest Service (TFS) entered into a cooperative contract with the Missouri Resource Assessment Partnership (MoRAP) in order to improve fuel model mapping and associated wildfire behavior outputs for Texas. MoRAP is working under contract with the Texas Parks and Wildlife Department (TPWD) to provide fine-resolution maps of the vegetation of Texas. MoRAP's expertise in ecological systems definitions and mapping, and the distribution of vegetation in Texas, was used to help interpret and refine LANDFIRE map products. These products included Existing Vegetation Type (EVT), Existing Vegetation Cover (EVC), Existing Vegetation Height (EVH), and Environmental Site Potential (ESP). Better interpretations of these data layers were used, in turn, to better assign Fire Behavior Fuel Models (FBFM 40).

Review and Improvement of Fuel Model Maps

Staff from TFS, MoRAP, and partner agencies met in College Station on January 25 - 27, 2010, to explore existing data and provide input to improve geographic attribution of FBFM 40 models provided by LANDFIRE. TFS organized and provided LANDFIRE data to MoRAP prior to the meeting, thereby facilitating meeting activities and allowing preliminary review. During the meeting, the process involved viewing multiple data layers on-screen, starting with FBFM 40 models attributed by LANDFIRE, and working backwards through data layers in order to unearth possible sources of errors and improve results.

Input data layers and assignments for FBFM 40 models were initially developed by LANDFIRE and partners within the broad map zones used by the U. S. Geological Survey and others (http://landcover.usgs.gov/pdf/homer.pdf). Work by map zone was often done independently and at different times, such that limited effort was made to ensure uniformity across map zones. The EVT data layer was most problematic in terms of consistency, resulting in some noticeable seam lines in model assignments at borders between map zones. These issues tend to multiply across large regions, such that changes made to provide better uniformity at a given border between map zones will result in new problems at a different border. Map zone mismatches, caused by the way the maps were created, cannot be effectively resolved across the conterminous USA. However, it is possible to significantly improve results for the state of Texas.

The composition, density, and structure of EVT, though described in a general way, is quite variable and field experience is needed to interpret EVT in order to check FBFM 40 models and make new assignments as needed. The field experience of MoRAP staff, and the new TPWD vegetation mapping results (including 2900 quantitative vegetation sampling points), were helpful when changing FBFM 40 model assignments.

While the LANDFIRE EVT was generally useful, some obvious issues were observed during the exercise. Some Ecological Systems were mapped in Texas that do not occur there, including Colorado Plateau Mixed Low Sagebrush Shrubland, Inter-Mountain Basins Greaswood Flat, Inter-Mountain Basins Mixed Salt Desert Scrub, Inter-Mountain Basins Semi-Desert Grassland, Inter-Mountain Basins Semi-Desert Shrub-Steppe, Mogollon Chaparral, Ozark-Ouachita Dry-Mesic Oak Forest, Ozark-Ouachita Mesic Hardwood Forest, Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland, Sonora-Mojave Mixed Salt Desert Scrub, and Sonoran Paloverde-Mixed Cacti Desert Scrub. However, even taken together these systems were mapped over a tiny fraction of the land area of Texas, and may have been assigned appropriate fuel models even though the EVT attribution is incorrect. In addition, several systems appeared to be mapped incorrectly. For instance, Crosstimbers Oak Forest and Woodland, Llano Uplift Acidic Forest-

Woodland-Glade, and East-Central Texas Plains Pine Forest and Woodland are mapped well outside of the known distribution of these systems. Different systems sharing the characteristic of mesquite dominance (Apahcerian-Chihuahuan Mesquite Upland Scrub, Tamaulipan Mesquite Upland Scrub, and Western Great Plains Mesquite Woodland and Shrubland) appeared to be distinguished on the basis of map zone boundaries. The importance of this simplification relative to fuel models is unknown, but fire behavior in each of these three systems may be similar. A detailed EVT by EVT review of the product is beyond the scope of this contract. However, some EVT mapping issues were suggested and discussed during the exercise, particularly if they had the potential of impacting fuel model assignment. With respect to EVC, map zone boundaries were conspicuous along the western and particularly southern edge of map zone 35. Here, shrub canopy in map zone 35 was mapped as less dense than shrub canopy to the west and south, and these differences are not consistent with field experience. The transition reflected in the EVH is not as abrupt at the boundary of map zone 35, however shrublands near the western boundary of map zone 35 are generally more juniper dominated, and juniper decreases in the shrub layer to the west of the boundary.

Essentially all existing FBFM 40 model assignments were checked for west and central Texas during the January workshop. Of these, about 20 fuel model assignments were changed based on knowledge of the EVT vegetation composition, density, and structure, including data from the TPWD vegetation mapping project. Both the models themselves and consistency among map zones were vastly improved.

Use of TPWD Vegetation Mapping Products

The TPWD land cover mapping project results were complete for central Texas, and were used to help improve models. Estimated height and FBFM 40 models were assigned to all TPWD mapped vegetation types for central Texas. Canopy cover was also assigned to shrub and forest types. The TPWD live oak and Ashe juniper cover classes were used to help improve estimates of crown fire potential in central Texas.

The TPWD existing vegetation data layer will be complete for the state within two to three years, and may be quite useful for future FBFM 40 up-dates since it has the following advantages:

1. It will be consistent across the state, which will enable the production of a seamless fire fuel model.

2. It is finer scale both in terms of vegetation types mapped (109 in central Texas versus 12 for LANDFIRE) and spatial resolution (10 meter pixels versus 30 meter pixels), and more accurate overall. For example, forest and shrubland types appeared less extensive and are more accurately mapped in the TPWD data layer versus the LANDFIRE data layer (e.g. less forest in the southern Edwards Plateau; more shrub and less forest in the area of the Lost Pines).

3. Differentiation of broadleaf evergreen woodlands and forests (primarily live oak) from coniferous woodlands and forests is being accomplished for the TPWD data layer, and this differentiation is lacking in the LANDFIRE product. Fire behavior is thought to be significantly different between the cover types.

4. Thousands of quantitative, on-the-ground points are used to help develop the data layer and describe the final mapped vegetation types.

5. TPWD and many other partners are helping develop the data layer, and it will become the statewide standard.

6. TPWD produces some additional DEM-based landform data layers that might be useful for modeling fuel and/or suppression difficulty.

The primary disadvantage of the TPWD data layer is that it is not being produced with fire fuel modeling in mind. For example, no attempt has been made to separate grassland based on type (e.g. pasture/short/greener versus natural/taller/drier), and no attempt has been made to estimate percent canopy for woody species. However, shrub types (mesquite/open versus blackbrush/more dense versus evergreen live oak shrubland) are being differentiated as part of Phase 3 and Phase 4 of the project, which should improve fuel models for the South Texas Plains. Woodlands and forests mapped as mixed evergreen/deciduous canopy cover also proved to be problematic, and would be enhanced by an estimate of percent evergreen canopy to facilitate assignment of appropriate fuel models and risk of canopy fires. In short, additional processing would expand the utility of the TPWD land cover results.