



A national fire effects prediction model

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Problem

First order fire effects are those that concern the direct or immediate consequences of fire. First order fire effects form an important basis for predicting secondary effects such as tree regeneration, plant succession, and changes in site productivity. Assisting resource managers, planners, and analysts in predicting and planning for fire effects is the focus of this project.

Approach

The approach taken was to develop a computer program that can be used by analysts to help predict first order fire effects. The program is called FOFEM 5.0 (**F**irst **O**rders **F**ire **E**ffects **M**odel) and can be run on a personal computer. Currently, FOFEM provides quantitative fire effects information for tree mortality, fuel consumption, mineral soil exposure, smoke, and soil heating. FOFEM predicts tree mortality from surface fire, based on flame length or scorch height, and tree species and size. It predicts consumption of down woody fuels by size class, and the resultant fire intensity over time using the BURNUP model. It predicts emissions (and emission rate) of PM10, PM2.5, CO, CO2, CH4, NOX and SO2 by flaming and smoldering combustion. It also predicts soil heating at a range of soil depths over time since ignition.

FOFEM is national in scope. It uses four geographical regions: Pacific West, Interior West, North East, and South East. Forest cover types provide an additional level of resolution within each region. Geographic regions and cover types are used both as part of the algorithm selection key, and also as a key to default input values.

Project Findings

No findings or conclusions. Resulting end-state was development of the FOFEM program.

Application by Land Managers

Potential uses for FOFEM include setting acceptable upper and lower fuel moistures for conducting prescribed burns, determining the number of acres that may be burned on a given day without exceeding particulate emission limits, assessing effects of wildfire, developing timber salvage guidelines following wildfire, comparing expected outcomes of alternative actions, and fire management planning.

FOFEM predicts fuel consumption, soil heating, smoke production, and tree mortality. The model contains a planning mode for prescription development. It is primarily useful for stand scale applications, but can also be used for smaller watersheds (e.g., 6th-field HUC). It is non-spatial, so an inexperienced analyst can learn to run FOFEM in a relatively short amount of time. Tutorials, help manuals, and other support are available that allow users to become proficient through self-study.

Deliverables and Technology Transfer

FOFEM 5.0 was the direct deliverable from this project and the program has been updated now to version 5.21. All programs, documentation, news, updates, etc., can be found at <http://www.fire.org>.

No formal training is available but self-directed tutorials can be downloaded from the <http://www.fire.org> site.

No current linkages to other tools, but a possible linkage to Fuel models/tools Characteristic Classification System may be added in the future. BehavePlus and FOFEM may also merge into a single tool in the future.