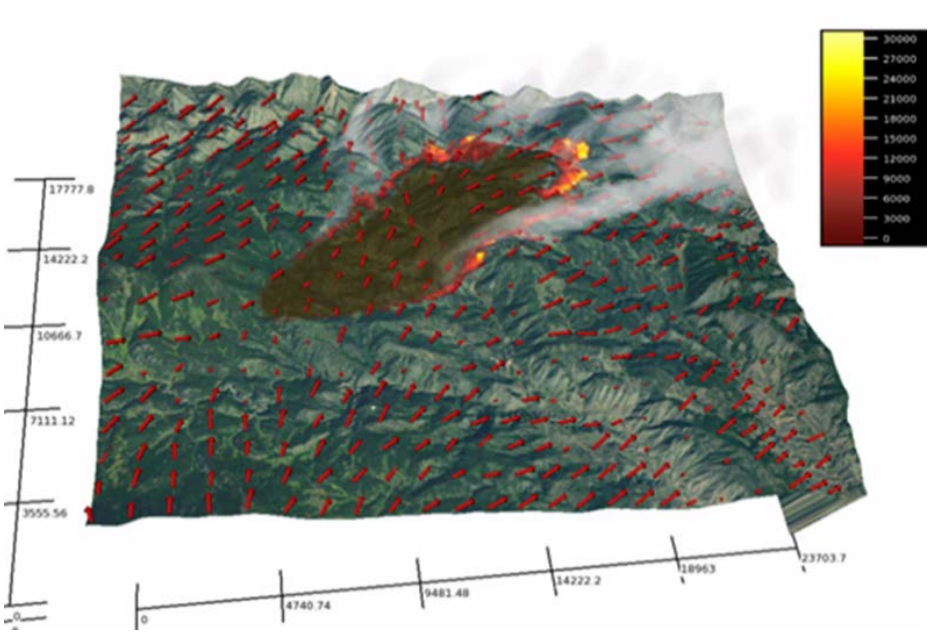
Colorado Decision Support System for Prediction of Wildland Fire Weather, Fire Behavior, and Aircraft Hazards

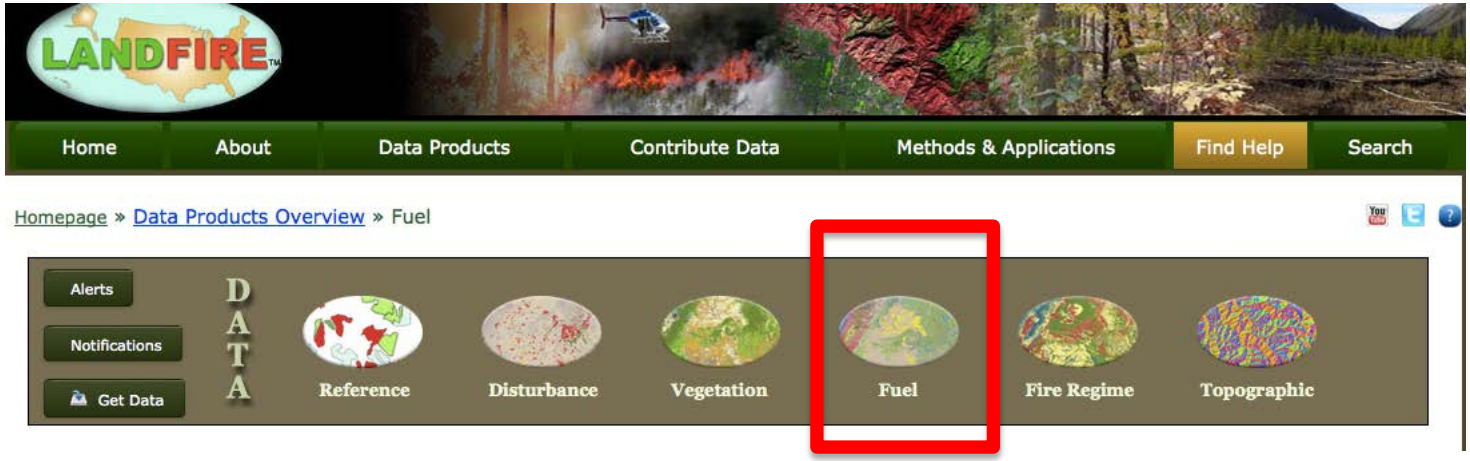


CO-FPS Stakeholder Meeting #3
23 February 2016
Department of Public Safety, Centennial, CO

Use of Fuels Data in CO-FPS

Branko Kosović
Pedro Muñoz Jimenez

CAWFE® Uses LANDFIRE Fuel Data



The fuel data used in CAWFE® are from LANDFIRE fuel data based on Anderson (1982) Fire Behavior Fuel Model including 13 categories.

Any other fuel data set that follows the format of LANDFIRE FBFM13 (Anderson, 1982) can be easily utilized by CAWFE® model.

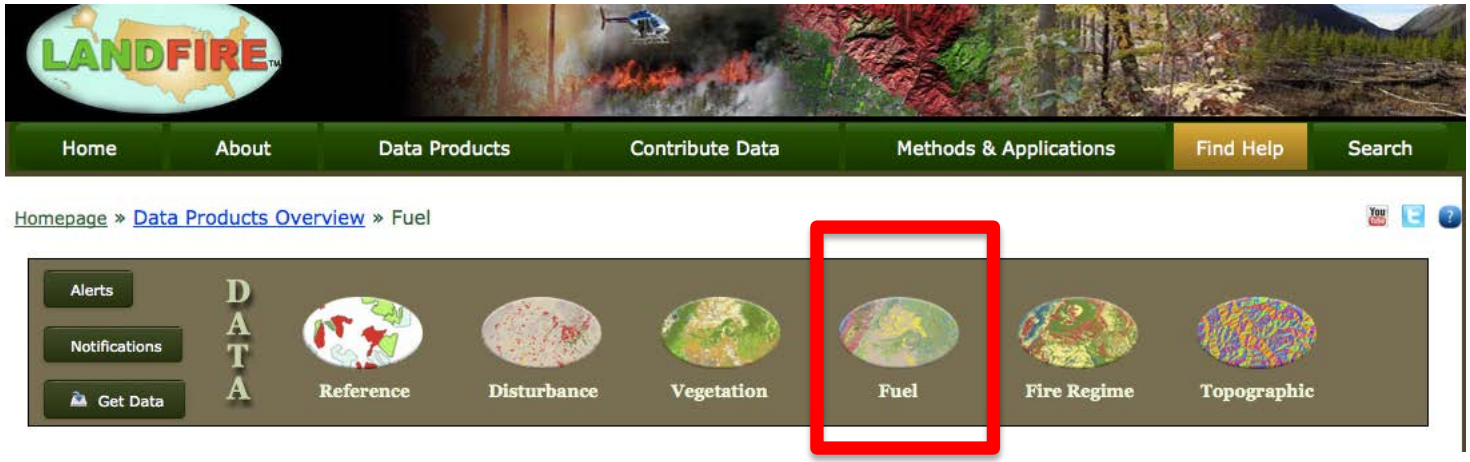
Data sets following different model would potentially require significant development (e.g. CO-WRAP, Scott and Burgan, 2005).

CAWFE® Uses LANDFIRE Fuel Data

FBFM1	Surface fires that burn fine herbaceous fuels, cured and curing fuels, little shrub or timber present, primarily grasslands and savanna
FBFM2	Burns fine, herbaceous fuels, stand is curing or dead, may produce fire brands on oak or pine stands
FBFM3	Most intense fire of grass group, spreads quickly with wind, one third of stand dead or cured, stands average 3 ft tall
FBFM4	Fast spreading fire, continuous overstory, flammable foliage and dead woody material, deep litter layer can inhibit suppression
FBFM5	Low intensity fires, young, green shrubs with little dead material, fuels consist of litter from understory
FBFM6	Broad range of shrubs, fire requires moderate winds to maintain flame at shrub height, or will drop to the ground with low winds
FBFM7	Foliage highly flammable, allowing fire to reach shrub strata levels, shrubs generally 2 to 6 feet high
FBFM8	Slow, ground burning fires, closed canopy stands with short needle conifers or hardwoods, litter consist mainly of needles and leaves, with little undergrowth, occasional flares with concentrated fuels
FBFM9	Longer flames, quicker surface fires, closed canopy stands of long-needles or hardwoods, rolling leaves in fall can cause spotting, dead-down material can cause occasional crowning
FBFM10	Surface and ground fire more intense, dead-down fuels more abundant, frequent crowning and spotting causing fire control to be more difficult
FBFM11	Fairly active fire, fuels consist of slash and herbaceous materials, slash originates from light partial cuts or thinning projects, fire is limited by spacing of fuel load and shade from overstory
FBFM12	Rapid spreading and high intensity fires, dominated by slash resulting from heavy thinning projects and clearcuts, slash is mostly 3 inches or less
FBFM13	Fire spreads quickly through smaller material and intensity builds slowly as large material ignites, continuous layer of slash larger than 3 inches in diameter predominates, resulting from clearcuts and heavy partial cuts, active flames sustained for long periods of time, fire is susceptible to spotting and weather conditions
Urban	Urban
Snow/Ice	Snow/Ice
Agriculture	Agriculture
Water	Water
Barren	Barren

Include canopy

CAWFE® Uses LANDFIRE Fuel Data



Fuel parameters required by CAWFE® are:

- Surface fuel load [kg/m^2]
- Fuel load decrease weighting parameter [s]
- Surface area to volume ratio [1/m]
- Fuel depth [m]
- Fuel moisture content of extinction
- Canopy fuel load [kg/m^2]
- Canopy fuel burnout time [s]

Coupling Between Weather Conditions and Fuel Properties in CAWFE®

- At present meteorological conditions affect the ground (not canopy) moisture content and therefore fuel rate of spread through relative humidity.
- Future developments could include modification of canopy moisture content based on relative humidity (including precipitation) from the weather model and/or observations.
- In CAWFE® burned ground fuel and canopy fuel contribute to sensible heat and moisture flux in the atmosphere.
- Radiative heating by the flame front is not explicitly simulated, but all processes that propagate the fire, including radiational heating, drying, and igniting unburned fuel, convective heating, contact ignition, and the spotting of small flaming embers short distances ahead of the fire line are parameterized following rate of spread model by Rothermel (1972).

CAWFE® Can Handle Crown Fires

- CAWFE® simulates active crown fires but not passive:
  - Firs canopy is dried out by the heat from the ground fire
  - If the remaining heat exceeds a threshold the canopy is ignited
  - Rate of spread of the fire is increased once the canopy is ignited in certain fuel categories (depending on the canopy density)
  - Spotting from the crown fires is not currently explicitly simulated
  - In the case of crown fire, the sensible heat and moisture flux provide feedback to the atmosphere