

¹Michigan Tech Research Institute (MTRI)
Michigan Technological University
3600 Green Court, Suite 100 • Ann Arbor, MI 48105
(734) 913-6840 – Phone • (734) 913-6880 – Fax • www.mtri.org

Collaborators
Roger Ottmar
Ernesto Alvarado
USFS, FERA

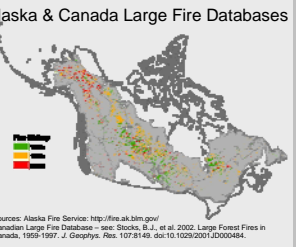
Bill de Groot,
Canadian Forest Service
Eric Kasischke
University of Maryland

²Fire and Environmental Research Applications (FERA)
USDA Forest Service, Pacific Wildland Fire Science Laboratory
400 N 34th Street, Suite 201 – Seattle, WA 98103
(206) 732-7800 Phone – www.fs.fed.us/pnw/fera



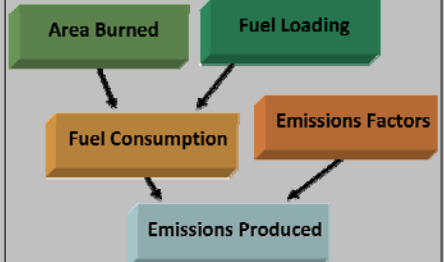
Data to estimate fire emissions is being assembled, improved, and served out via an open-source web application so information users will have the latest and most accurate data for use in models and emissions estimations. The information will be provided at a 1 km spatial resolution and have relevance for mapping emissions at regional scales for North America. Data products for estimating emissions are rapidly improving, both within and outside of this activity. Fine-scale data sets are now available to use the emissions estimation approach developed under this project to assess fire impacts at local scales, as in the newly funded project to assess wildland fire emissions impacts on respiratory health in San Diego. Also, new data on fire activity in croplands and rangeland means improved ability to quantify emissions from these sources, as is underway in a related NASA Applied Sciences project. Recently, a new study to improve data on fire occurrence in the tundra regions of North America was funded through the NASA TE program. Quantification of emissions from tundra regions will be a part of that activity using data and knowledge gained under the current NASA research activity.

AREA BURNED:
Remote sensing or historic fire polygon records



Sources: Alaska Fire Service: <http://fire.ak.bim.gov/>
Canadian Large Fire Database – see: Stocks, B. J., et al 2002. Large Forest Fires in Canada, 1959-1997. J. Geophys. Res. 107:8149. doi:10.1029/2001JD000484

Four factors needed to estimate fire emissions

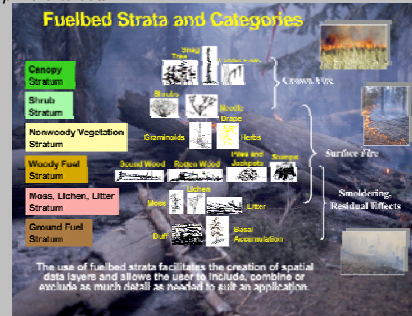


FUEL LOADING: Fuel Characterization Classification System (FCCS)

FCCS 2.0 provides an comprehensive description of fuel layers, as shown above. FCCS fuelbeds represent fuels across North America, including Alaska, Hawaii, Canada, and Mexico. They were compiled from scientific literature, fuels photo series, fuels inventories, and expert opinion, and represent fuel conditions at multiple scales, from single plots to 1-km cells or larger. Fuelbeds are mapped via crosswalks to satellite-derived vegetation and land cover, at scales from < 25 m (landscape applications) to >36 km (continental and global applications). Allometric equations in the FCCS calculator produce fuel loadings, other plot-level metrics, and fire-hazard potential. <http://www.fs.fed.us/pnw/fera/fccs/>



Total available fuel from FCCS fuelbeds across the conterminous USA.

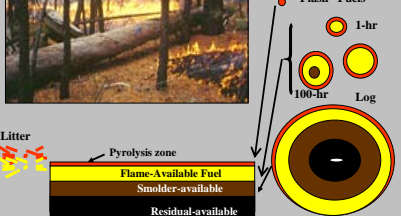


FUEL CONSUMPTION & EMISSIONS FACTORS: CONSUME 3.0

Consume 3.0 estimates fuel consumption and emissions for prescribed and wildland fire. It imports fuelbed data directly from the FCCS. Consume can be used for all forest, shrub, and grassland types in North America. <http://www.fs.fed.us/pnw/fera/research/smoke/consume/>

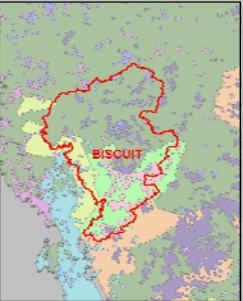


Estimation of combustible biomass of woody fuels under oven-dry moisture conditions in each of the 3 stages of combustion.



Low-intensity prescribed fire and high-intensity crown fire consume different proportions of each stratum in each combustion phase.

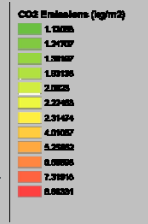
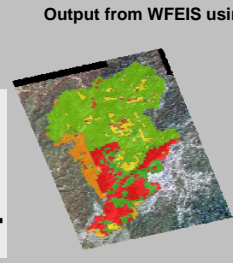
EMISSIONS EXAMPLE: Computation of CO₂ Emissions from the Biscuit Fire using WFEIS



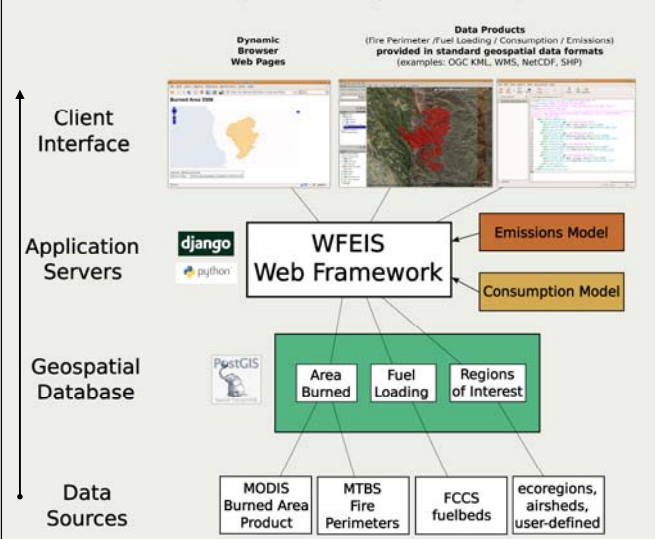
Input to WFEIS includes Fire Perimeter & Fuelbed map

Legend

- Fire Perimeter
- FOV Fuelbed
- Shrub
- Woody
- Moss, Lichen, Litter
- Ground Fuel

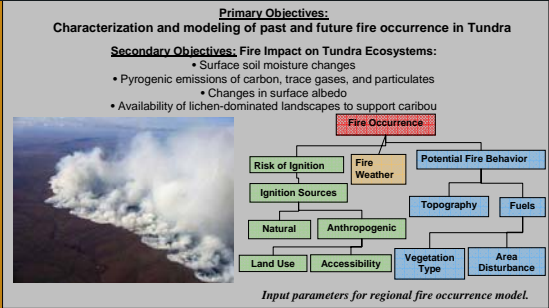


Information System Design & Development

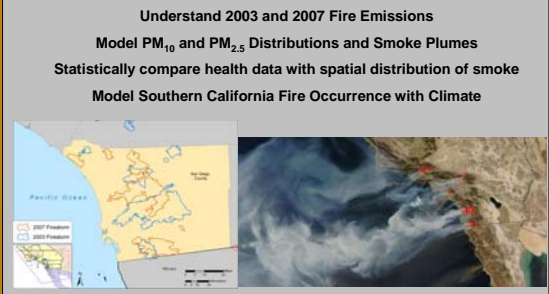


Current Fire Emissions Projects at MTRI

Climate Change Effects on Tundra Fire Regime



Health Effects of the 2003 and 2007 San Diego Wildfires



Cropland Fire Emissions

