



# LANDFIRE Fuel Attributes Layer Development

**Tobin Smail and Charley Martin**  
SGT, Inc., contractor to the U.S. Geological Survey (USGS) Earth  
Resources Observation and Science (EROS) Center  
Sioux Falls, South Dakota

**Work performed under USGS contract G10PD00044**

# Brief History of LANDFIRE Fuel Data

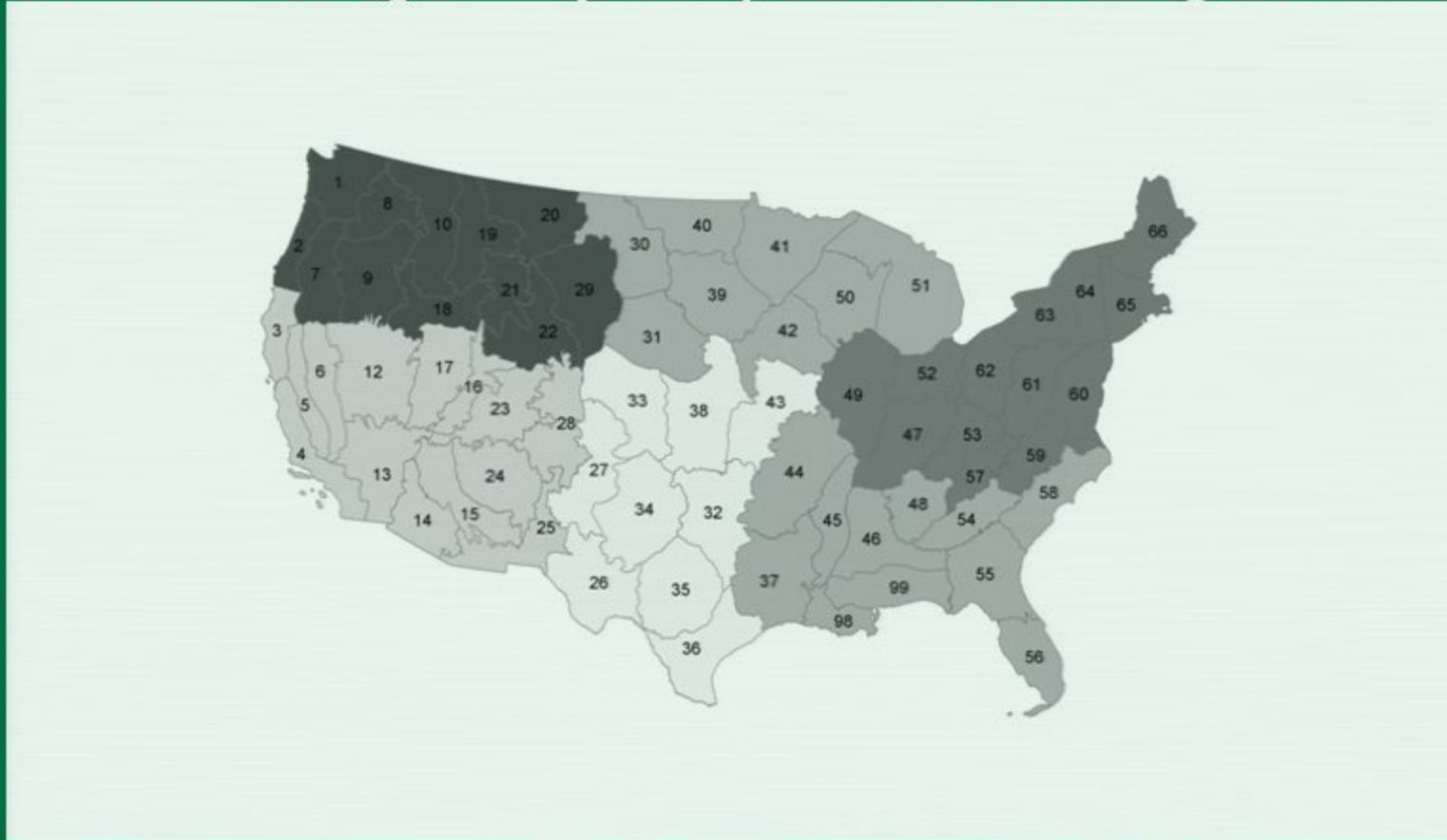
- Several versions of LANDFIRE (LF) Fuel support National Level Fire and Fuels programs like FPA & WFDSS
- LF 1.0.0 – LANDFIRE National (first national fuel dataset)
- LF 1.0.5 – Refresh 2001 (Updated Canopy Cover and Height data)

# Brief History of LANDFIRE Fuel Data

- LF 1.1.0 – Refresh 2008 (Updated with disturbances)
- LF 1.2.0? – Refresh 2010 (Coming soon with disturbance updates)

# Data Arrangement

- Data is arranged by map zones and geo areas



# Data Arrangement

- Image dates for original mapping ranged from 1999 – 2003
- Resolution of the data are 30m x 30m (Simulation considerations)
- Plot data are strongest in forested vegetation types



# Data Arrangement

- Fuel and fire data layers are based on vegetation primarily EVT, EVC, EVH, and BPS
- Existing Vegetation Type (EVT) – based on NatureServe ecological systems
- Existing Vegetation Cover (EVC) – three life forms tree, shrub, and herb and classified into 10% breaks

# Data Arrangement

- Existing Vegetation Height (EVH) – three life forms tree, shrub, and herb and classified into height classes.
- Biophysical Setting (BPS) – Vegetation that may have been dominant on the landscape prior to Euro-American settlement and is based on both the current biophysical environment and an approximation of the historical disturbance regime.

# National LANDFIRE

- LF 1.0.0 Was used during 2006 - 2007 fire seasons. AAR's after each identified:
  - Issues: Barriers, Canopy Base Height (CBH) to high, Canopy Bulk Density (CBD) to low, Urban/Ag nonburnable
- As a result several initiatives began
  - Expert Opinion CBH layer
  - Calibration workshops started with LANDFIRE personnel for input on surface fuel models.
    - FBFM based on average fire season conditions
    - Decisions were made with respect to high CBH and low CBD

# Improvements Layer

- The fire seasons of 06, 07, 08, provided significant change within the LF national base data.
  - Rock- water- roads- Barren- riparian were all reassessed with new methods
  - Urban/Ag masks were broken into burnable – nonburnable EVT's-
    - Developed areas with wildland fuel models
    - NLCD and NASS primary layers in re-classification

# LF 1.0.5 Refresh 2001

- New cover and height methods employed (EVC and EVH)
  - This causes some fuel pixels to shift within calibrated fuel rules
  - New CBH and CBD approach based on plot data (mainly FIA)
  - Improvements layer incorporated

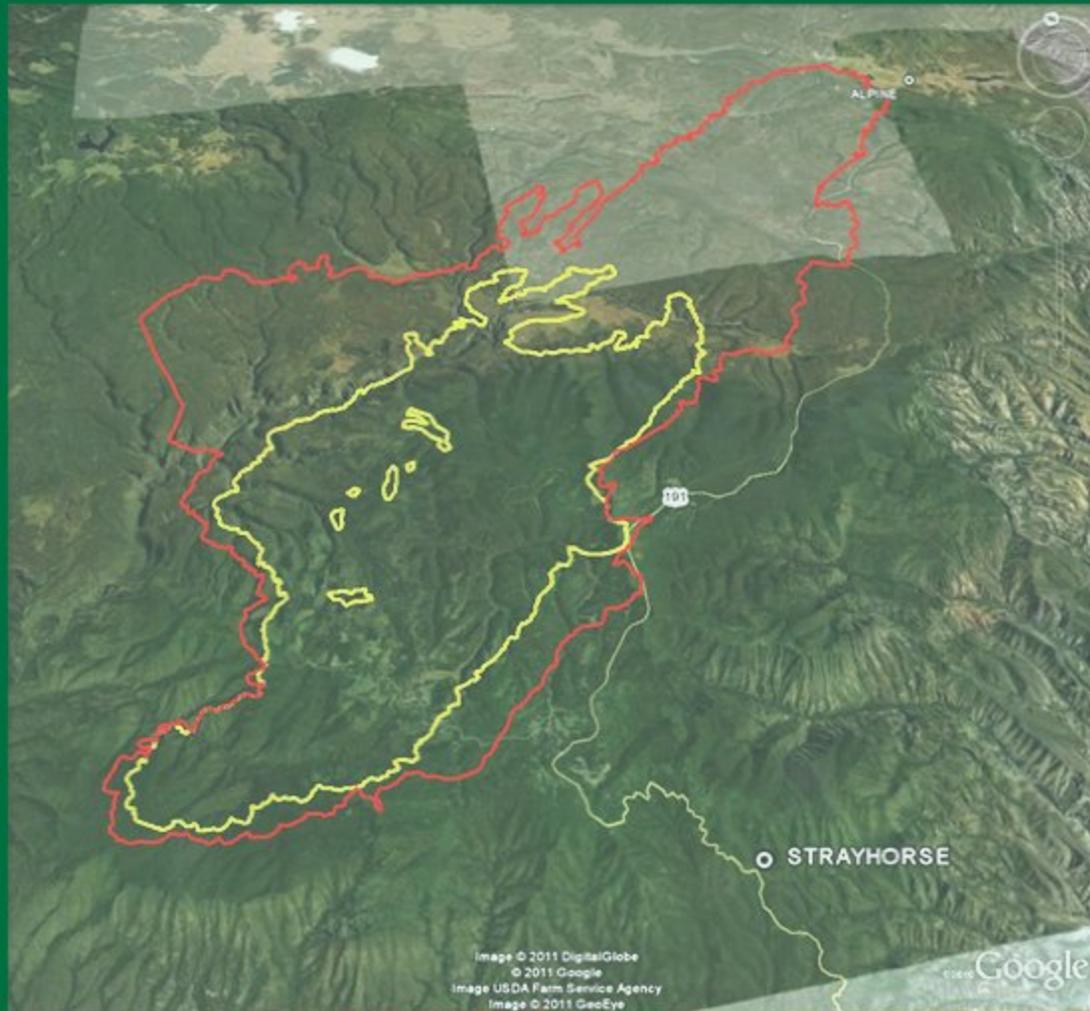
# LF 1.1.0 Refresh 2008

- Canopy (CC, CH, CBH, CBD) disturbance
  - CC, CH – Use updated EVC and EVH as attributed by FVS analysis and landscape data
  - CBH
    - values are from FVS scenarios based on coefficient of change in canopy characteristic
    - immediately after, midway between 0-5 yrs, and midway between 5-10 years.
  - CBD – general linear model that derives values from updated EVC and EVH

# LF 1.1.0 Refresh 2008

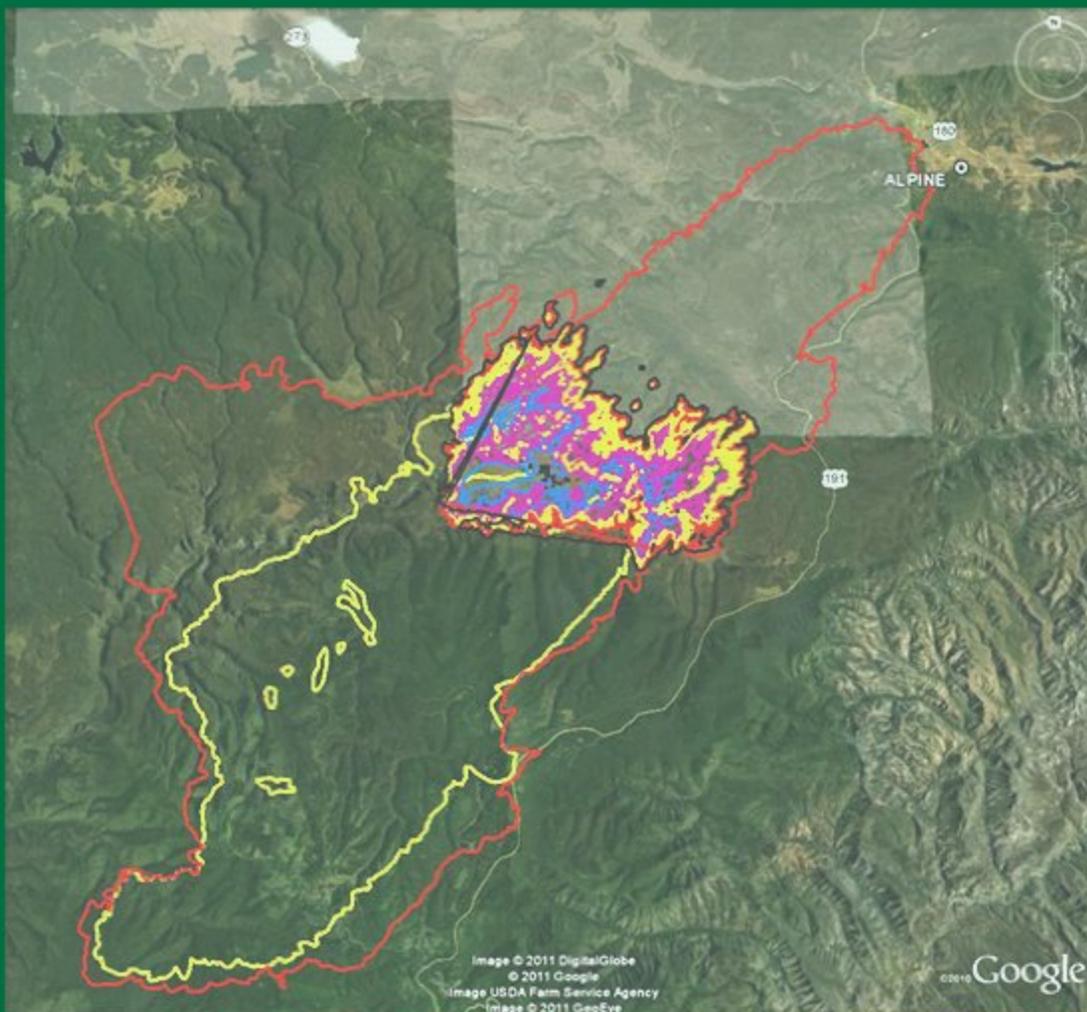
- Disturbed surface fuel models are based on expert opinion from each geo region
  - Use the second growing season post disturbance
  - Eight years post disturbance
  - Generally fire behavior is reduced immediately after moderate and high severity fire and treatment areas.

# Evaluation (Wallow Fire June 2011)

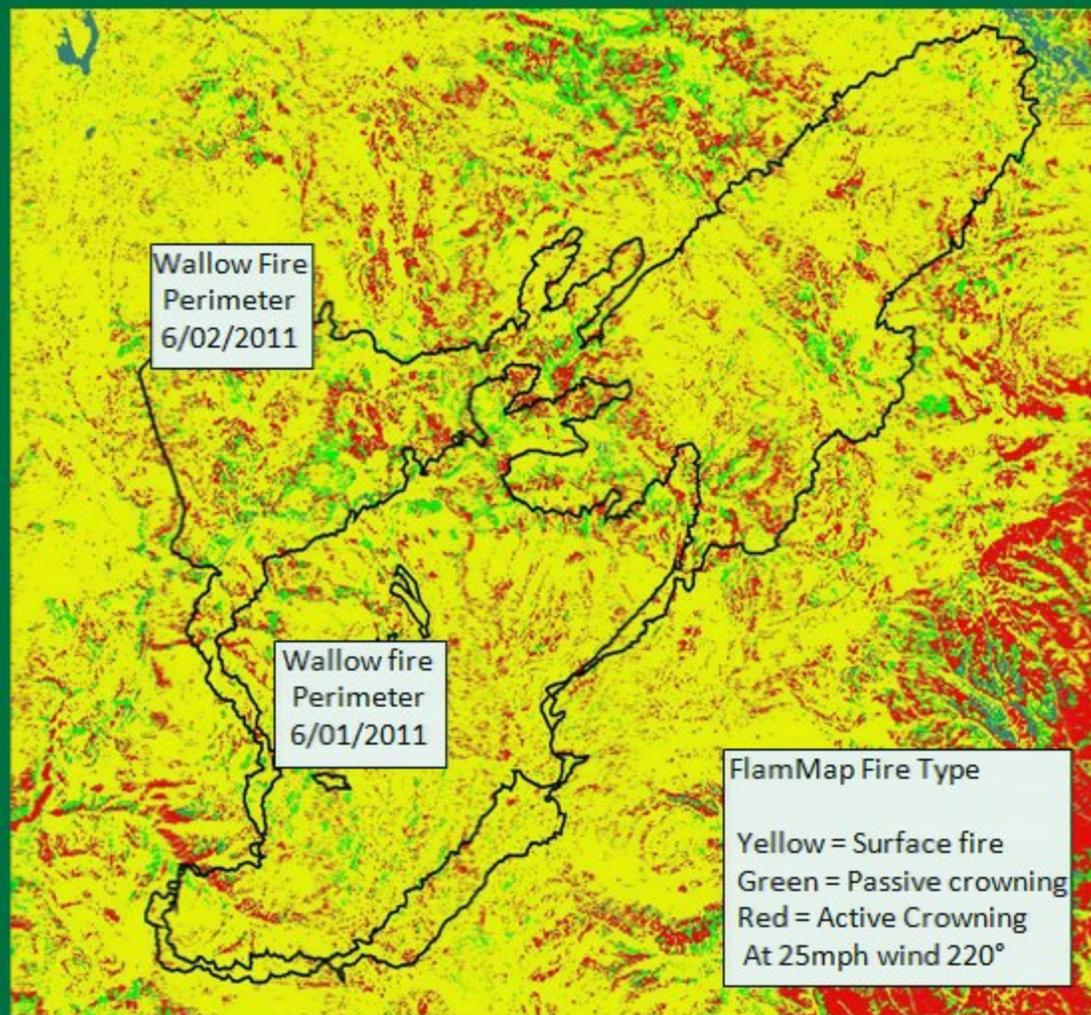


# Evaluation LF 1.0.0 Sim 6/02

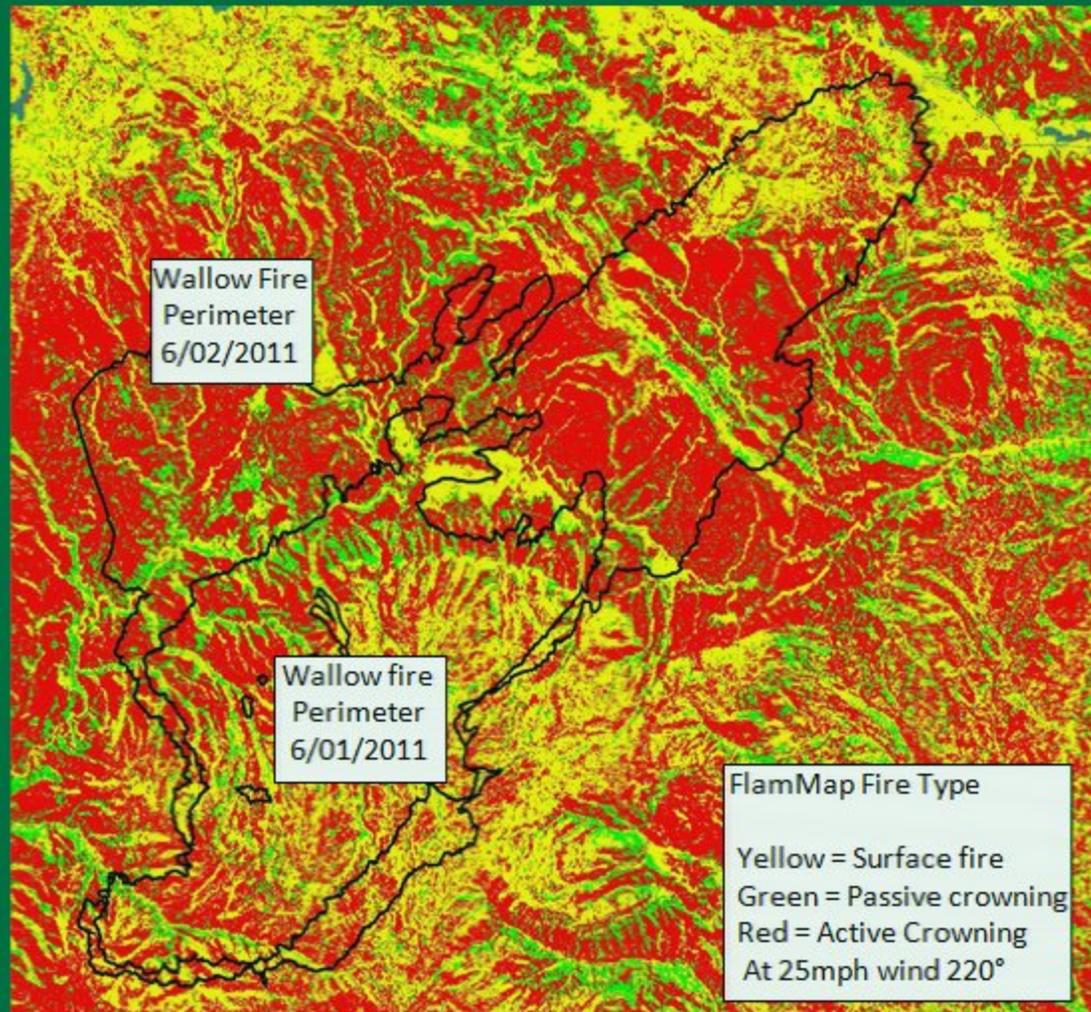
## 10 hr BP MxG Wnd



# Evaluation LF 1.0.0 Fire Type

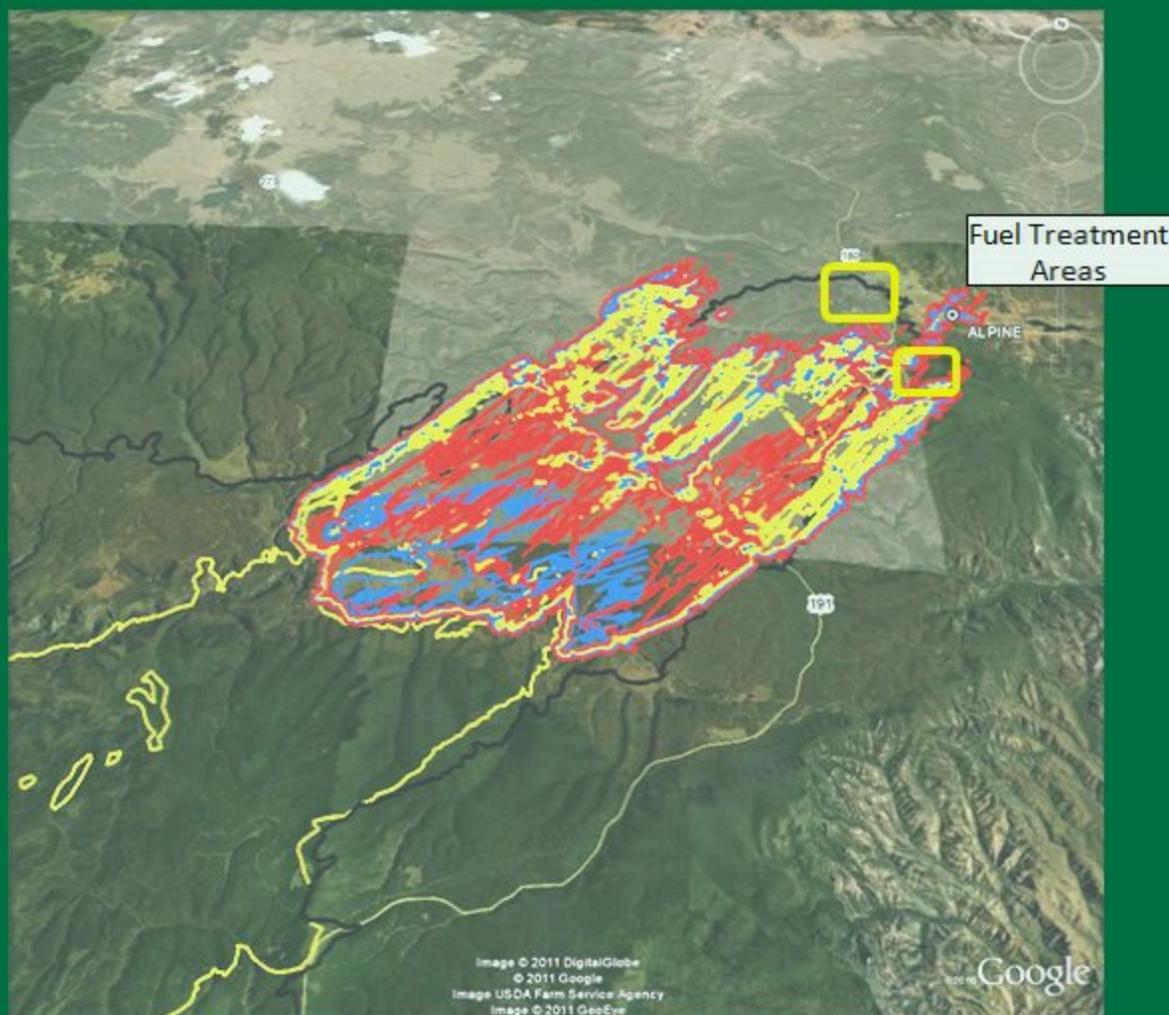


# Evaluation LF 1.0.5 Fire Type



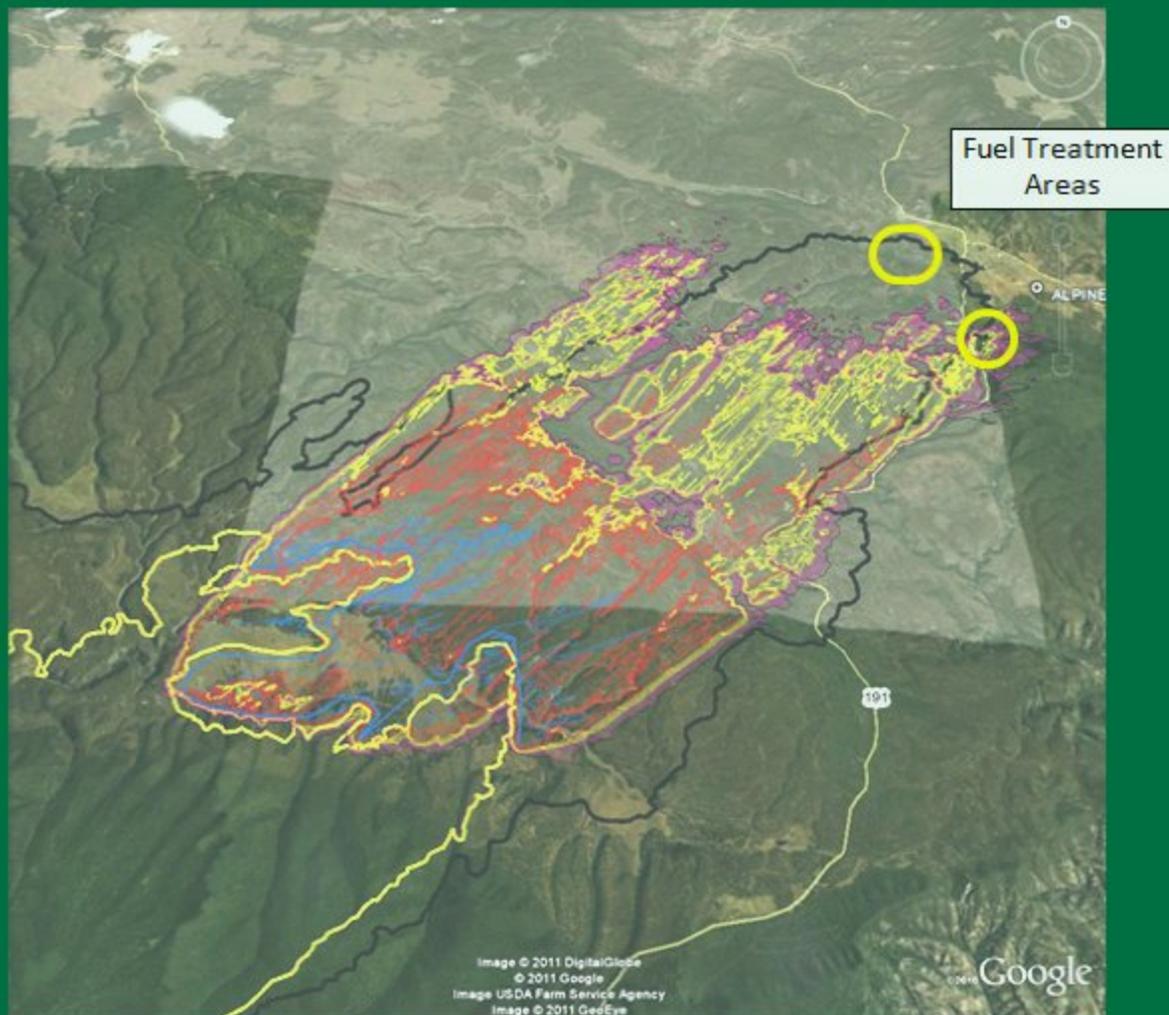
# Evaluation LF 1.0.5

## Sim 10hr BP MxG Wnd

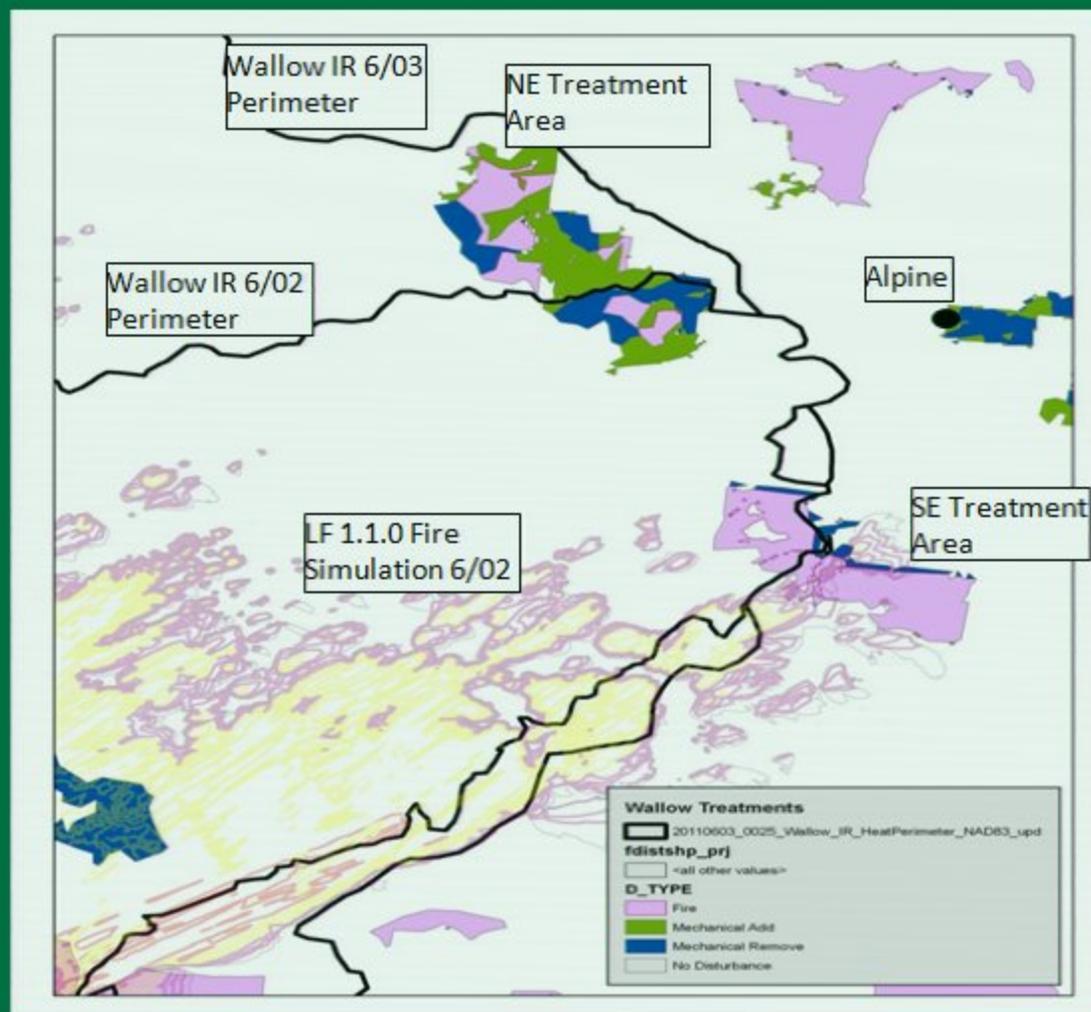


# Evaluation LF 1.1.0

## Sim 10hr BP MxG Wnd



# Evaluation Treatment Areas



# Considerations

- Some surface fuel model rules developed in LF 1.0.0 were calibrated with a high CBH and low CBD in mind, these may create more torching and crowning than desired when used with corrected/updated CBH and CBD in LF 1.0.5 and 1.1.0. – Live and foliar fuel moistures will be an important input to help curtail this artifact.

# Considerations

- Surface fuel models are not developed for extreme conditions that can characterize large fires. Most EVT's average fuel moistures and wind speed should suffice to model these conditions, but some special conditions are being considered by the LF fuel team.

# Considerations

- SE geo area - A wet season condition was used at the calibration workshops to reflect their average fire season fuel model layer. Many low timber litter fuel models were used as a result of this approach and may not accurately model the below normal rainfall years when fire activity is high.
- Great Basin/SW area - Some years have wet late winter and early spring conditions that contribute to heavier than normal annual grass fuel load. The average fire season fuel models assigned during the calibration workshops do not provide for this fuel load and the potential fire spread that could result from it.