# Mapping Wildland Fire Potential for the Conterminous United States

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### Increased Acres Burned by Wildfires



# **Shifting Demographics**

More People are Moving into the Wildland Interface...

With little Understanding of their Environment...

And...

Sometimes resulting in Catastrophic Consequences...

Hi Meadow Fire (2000): Pine Valley, Colorado Photo by Andrea Booher/FEMA News Photo

### Structures Lost to Wildfire 1999-2006



### Recent Fire Seasons Entire U.S.

2000: 8.5 million acres \$1.3 billion

- 2001: 3.5 million acres \$918 million
- 2002: 7.0 million acres \$1.6 billion
- 2003: 5.0 million acres \$1.3 billion
- 2004\*: 7.7 million acres \$?? billion

\*as of Sept 29, 2004



# **GAO Reports – Recent History**

- 1999 A cohesive strategy is needed to address catastrophic wildland fire threats (W. U.S.) (GAO/RCED-99-65)
- 2001 Federal agencies not organized to effectively and efficiently implement the National Fire Plan (GAO-01-1022T)
- 2002 Improved planning will help agencies better identify fire fighting preparedness needs (GAO-02-158)
  - Reducing the threat of wildland fires requires sustained and coordinated effort (GAO-02-843)
  - Leadership and accountability needed to reduce risks to communities and resources (GAO-02-259)
- 2003 Additional actions required to better identify and prioritize lands needing fuels reduction (GAO-03-805)

Technologies hold promise for wildland fire management, but challenges remain (GAO-03-1047)

2004 Wildland Fires: FS & BLM need better information & a systematic approach for assessing the risk of environmental effects (GAO-04-705)

Geospatial Information: Better coordination needed to identify and reduce duplicative investments (GAO-04-703)

### Fire Risk Map – Possible? What The Client Wanted

### What's needed to map Risk?



### Fire Risk Map – Possible? What The Client Wanted



### Fire Risk Map – Possible? What The Client Wanted

# What's needed to map Risk? **Chreat** Potential **Probability**

# **Map Wildland Fire Potential**

### **Objective/Constraints**

- · Quickly
- Conterminous for the United States
- All Lands
  - Forest, Shrubs, and Grass
- Use Existing Data Products
- Temporary Product until LANDFIRE is available



#### Data Supports – National Level Wildland Fire Potential

- Fuel Budget Allocation Process
   (Ecosystem Management Decision Support system)
  - Forest Service
    - Prioritize by Region and Forests
  - > Department of Interior
    - · BIA, BLM, FWS, NPS
    - Prioritize by Agency and Region
- USFS State & Private Forest Redesign
  - (Spatial Assessment Model Web based)
    - Prioritize by National, Regional, & State



#### **Wildland Fire Potential**

#### **Fuel Potential**



# **Surface Fire Potentials**

**Description:** 

Surface fire behavior under extreme weather conditions

**Base Data:** 

Fuels Characteristic Classification System (FCCS) - Version 1.2

- Classification of complete fuelbed
- Classifies each stratum Canopy, Shrub, Duff, etc.
- Modeling of fire characteristics
- Pacific Northwest Research Station, USFS

**Processing:** 

Model run under very dry conditions

### **Predicted Surface Fire Rate of Spread**



### **Predicted Surface Fire Flame Length**



# **Surface Fire Potential**







### **Surface Fire Potential**



#### **Wildland Fire Potential**

#### **Fuel Potential**



# **Crown Fire Potentials**

**Description:** 

Crown fire behavior under extreme weather conditions (Intensity, Speed, & Fire Brands)

Base Data:

#### Forests: FIA Forest Cover Types

- MODIS satellite
- · FIA & RSAC
- Range: Coarse Scale Cover Types
  - AVHRR satellite
  - Missoula Fire Science Lab, RMRS

**Processing:** 

Relative assignments to cover type layers by fire behavior expert

#### **Crown Fire Potential**



#### **Wildland Fire Potential**



# **Fuel Potential**







### **Fuel Potential**



#### **Wildland Fire Potential**



#### **Weather Potential**



# **Relative Energy Release Component**

**Description:** 

Average Number of Days per Year Relative Energy Release Component (ERC) is above 95%

Base Data:

Daily Average Relative ERC

- · 1980 2005
- Derived from Weather Stations
- Interpolated using terrain correction
- Missoula Fire Science Lab, RMRS

**Processing:** 

- Select Relative ERC > 95%
- $\cdot$  Count the number of days

#### Average Number of Days per Year Relative ERC > 95%



### **Fire Weather Zones**

- Based on Fire Weather Handbook
- Mapped by grouping Ecoregion Subsections



#### **Fire Seasons**



#### **Wildland Fire Potential**







### **Extreme Fire Weather**

**Description:** 

#### Average number of days a year that experience extreme fire weather

**Base Data:** 

#### Weather Stations

- Hourly observations: 1982 to 1997
- Temp, wind, & humidity thresholds
- Fires that destroyed many structures
- Interpolated using terrain correction
- Missoula Fire Science Lab, RMRS

**Processing:** 

• Average the number of days

### **Extreme Fire Weather**

Over 500 Weather Stations 1982-1997 (16 Years) -- Reported Hourly



#### **Extreme Fire Weather Potential**



#### **Wildland Fire Potential**



# **Fire Weather Potential**







#### **Fire Weather Potential**



#### **Wildland Fire Potential**



# **Fuel & Fire Weather Potential**







#### **Fuels and Fire Weather Potential**



#### **Wildland Fire Potential**



# **Fire Occurrence**

**Description:** 

#### Number of Fire Starts

**Base Data:** 

- · 1980 to 2003
- All federal lands
- State & private lands with shared fire fighting responsibility
- · Compiled by BLM (Denver Office)

**Processing:** 

- Two Data Sets:
  - \* All fires > 0.10 acres
  - \* Large fires > 500 acres
- Explored summarizing to different units
  - > Standardized to per million acres

### All Fires (Greater then 1/10 Acres)

Federal and State/Private fires where fire fighting resources are shared. 1980 - 2003

#### Legend

• Fires 1/10 acre or greater

#### Large Fires (Greater then 500 Acres)



#### **Wildland Fire Potential**



#### Summarized to the County Fire Occurrence







### Fire Occurrence – Summarized to County



### **Fire Weather Zones**

- Based on Fire Weather Handbook
- Mapped by grouping Ecoregion Subsections



#### Summarized to Weather Zones Fire Occurrence







### **Ignition Potential**





#### Wildland Fire Potential Final Steps

- Adjust Fuel and Fire Weather Potential
  > Based on Ignition Potential
  - > Increase SE Fuel & Weather Potential by 1
- Add additional land forms (water, barren...)



### **Wildland Fire Potential**



# How Good Is It

- Does it Pass the Straight Face Test
- National Scale
  Should not be used at finer scale
- Shows relative changes
- Temporary product



# Where Do We Go from Here

- Wait for LANDFIRE National
- Calculate Potential Using:
  FSPRO Model
  FIREHARM Model
- Improve Weather Inputs
- Measure Potential Based on Empirical Data

