Wildland Fuel and Fire Emissions Research

Emissions Inventory Meeting

RTP, Raleigh, NC

November 3, 2014

United States Department of Agriculture

Forest Service

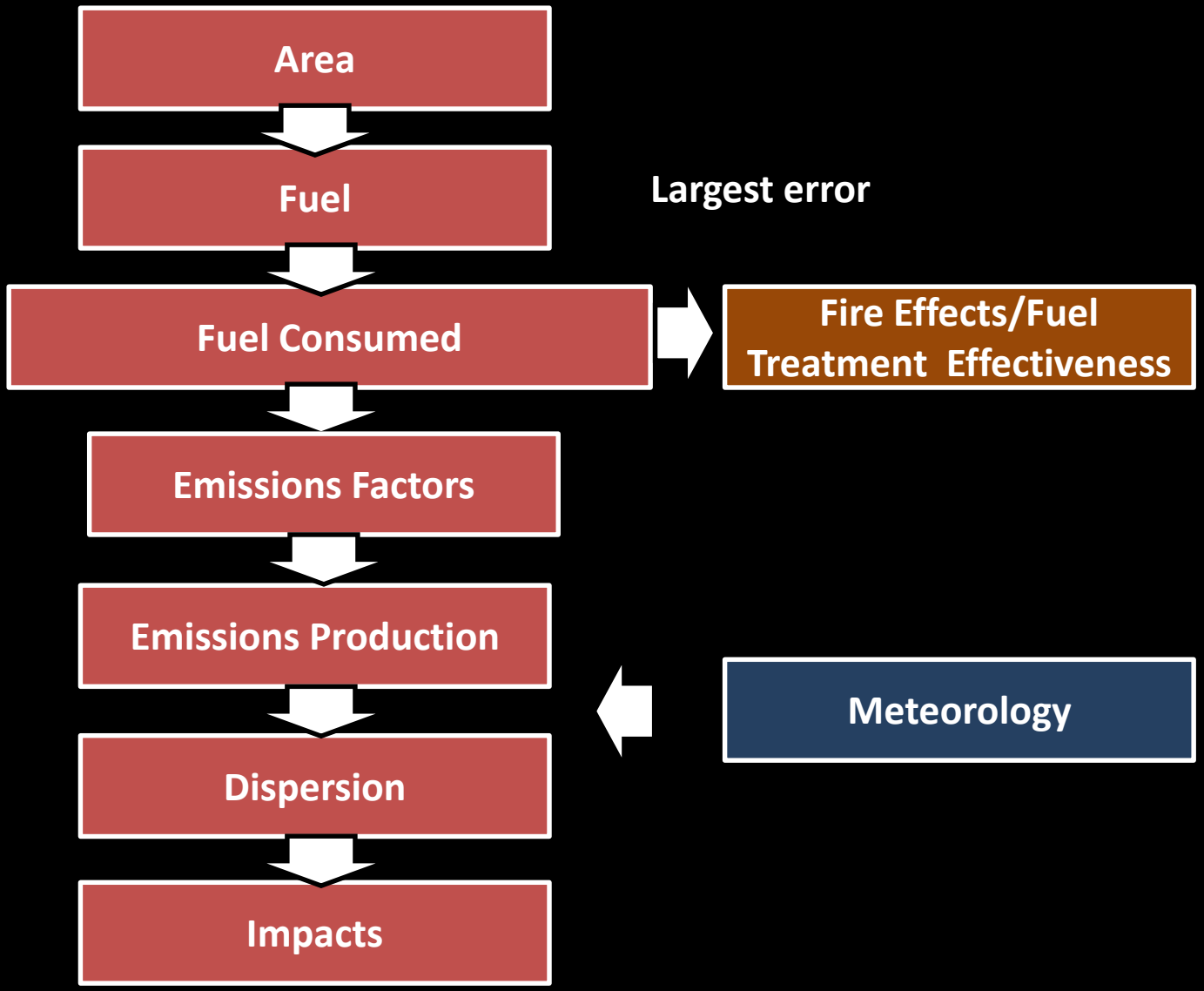
Outline

- Background
- Current lines of work and findings
  - Fuel
  - Fuel consumption
- Research gaps, future investments

Background

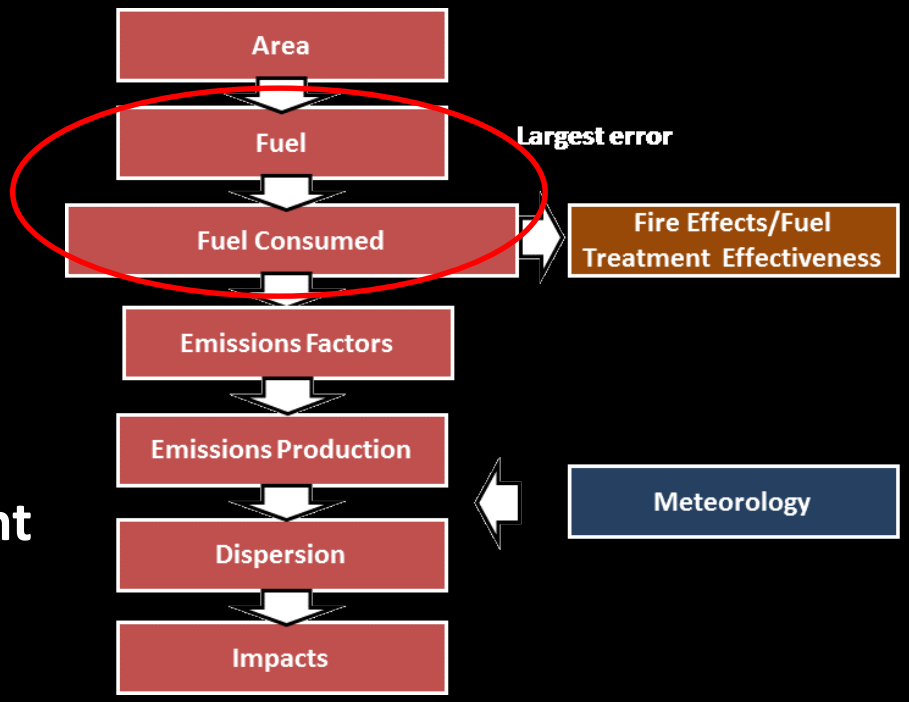
- **Wildland fire is managed to:**
  - protect valuable resources
  - fuel treatment
  - provide ecological process to restore and maintain functional ecosystems
- **Smoke from wildland fire is a critical management issue**
  - public and firefighter health
  - safety
  - regional haze/visibility
  - greenhouse gas emissions
  - nuisance
- **Managing fire to minimize adverse effects of smoke requires new knowledge and models**
- **US Forest R&D is leading research to expand new knowledge in these areas**

Research Diagram

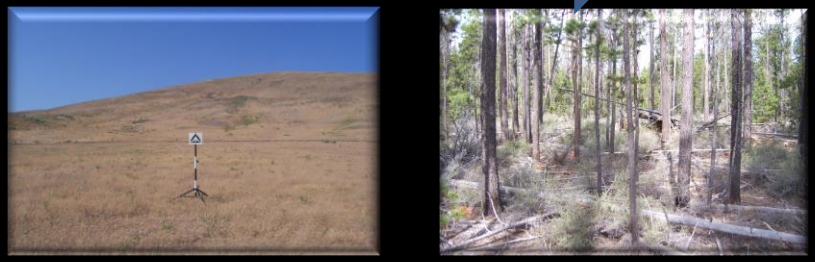


Importance of Fuels and Combustion Research

- Potential for large errors
  - Fuelbeds are variable geographically, seasonally, and over time
  - Difficult to map
  - Combustion varies by fuelbed component and moisture content



Simple → Complex



High FM → Low FM

What projects have we targeted for fuel and combustion research?

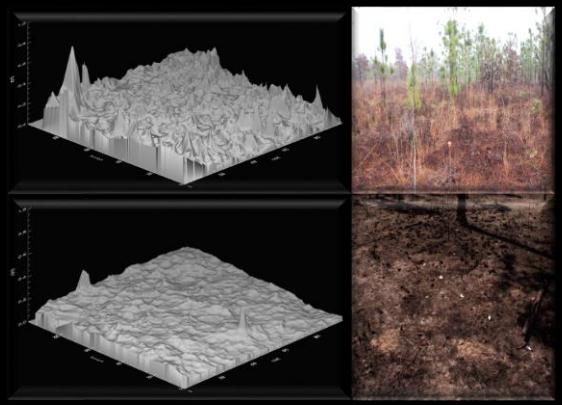
- Characterization of fuels by fuelbed categories
  - Ground sampling
  - Visual estimates
  - Terrestrial and aerial LiDAR
  - Remote sensing
  - Models
- Fuel Mapping
- Fuel moisture modeling
- Fuel consumption by fuel type, component, and combustion phase

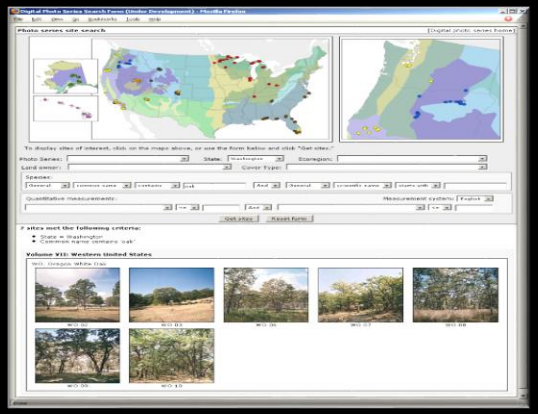
Fuel and Consumption Project Details

Ground inventory

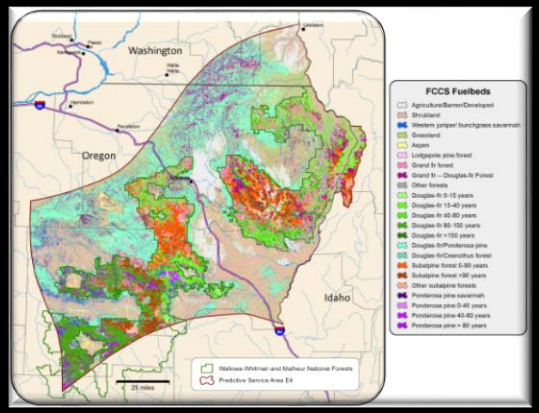
Fuelbed modeling and classification

Terrestrial LiDAR





Digital Photo Series

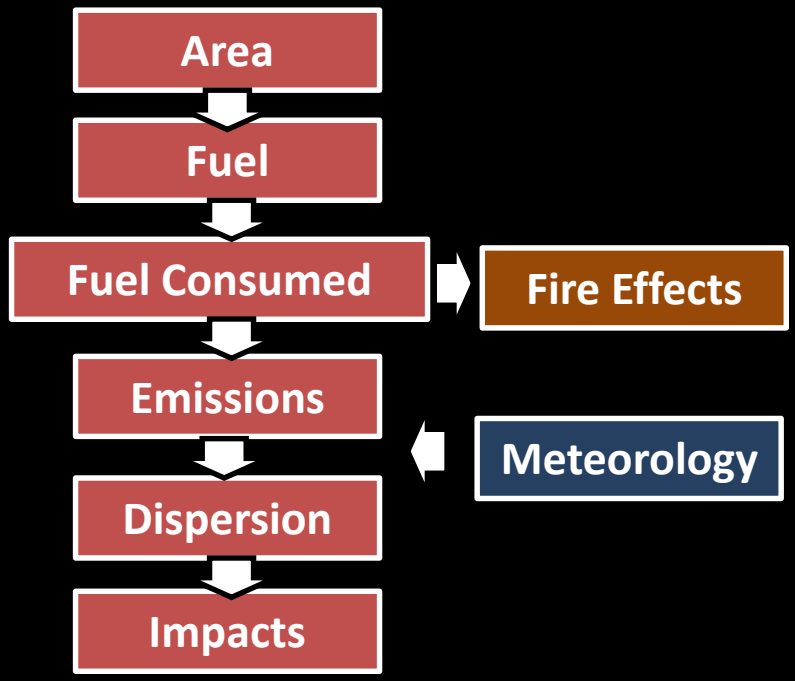


Fuelbed mapping

Consumption

Science Gaps and Needed Investments

- **Improved fuel accounting**
  - Mapping fuels
  - Change agents
  - All fuelbed components
- **Improved fuel consumption accounting**
  - Deep organic layers
  - Crowns, rotten wood
  - Consumption rate, combustion by phase
- **Data archive**
- **Model validation and uncertainties**








A Data Set for Fire and Smoke Model Development and Evaluation—RxCADRE 2008, 2011 & 2012

Fuels, Meteorology, Fire Behavior, Radiative Energy, Smoke, Fire Effects – 90 scientists and technicians, 20 Agencies, Universities, and Contractors

One of the largest collaborative fire research efforts

Questions??