Modeling Lightning-Ignited Fires in the Great Smoky Mountains using FARSITE

Presented by Bethany Munoz
Texas A & M University
College of Geosciences
Overview

• Background on natural wildfire
• Help from ArcGIS 9.3
• Running FARSITE
• Conclusions
Fire? Bad?

• Is all fire bad?
• How can it help?
  – Prescribed burning
  – Natural Ignited Burns
Types of Fires

- **Ground** fires burn in natural litter, duff, roots or sometimes in high. Once started they are very difficult to detect and control.
- **Surface** fires burn in grasses and low shrubs or in the lower branches of trees. Surface fires may move rapidly. Ease of control depends on the fuel involved.
- **Crown** fires burn in the tops of trees. Once started, they are very difficult to control because wind plays an important role in the fire behavior.
- **Spotting** can be produced by crown fires as well as wind and topographic conditions. Large burning embers are thrown ahead of the main fire. Once spotting begins, the fire will be very difficult to control.

T. Scott Rupp, Ph.D. University of Alaska-Fairbanks
Great Smoky Mountain Wildfires and FARSITE

• Purpose
  – Compare fire spread simulated by FARSITE with real fire perimeters in the Great Smoky Mountains
    • Aid in future prediction of fire spread
    • Determine historical fire behavior

• Real Fire Perimeter Used
  – Cattail II Fire
    • Burned August 6 – August 14, 2007
History of Managed Fires in Great Smoky Mountains

• Decision to manage naturally ignited fires (e.g. lightning) made in 1996
  – Fire could not burn outside of the park boundary
  • Private land and homes surround the park
Natural Zone and Interface

Provided by the Great Smoky Mountains National Park
How FARSITE Works

• Using FARSITE vs. 4.1
  – Simulates fire spread
  – Uses topography, types of fuel, and weather conditions to calculate the growth of fire and how it behaves
    • The fuel types are categorized by the Scott and Burgan Fuel Model list
    • For a full list of the fuel models visit ➔
  – It also uses fuel moisture when calculating how far a fire will spread
Landscape scenes – hardwood forest cover (lots of oak)
Oak forest
Foggy morning
Wildfire photos May 2007 this and next photo
Note patches of pine on dry sites on the ridge, surrounded by hardwood forest.
Fire-scarred tree
A few years after a hot fire – pine regeneration
Encroachment of young white pines (fire-intolerant) in an oak-yellow pine forest
Using ArcGIS 9.3

• Topography Files
  – Spatial Analyst Tools
  – Conversion Tools
An example of a Fuel Model

• Scott and Burgan’s Fuel Model 186
  – TL6
  – Moderate Load Broadleaf Litter
  – Slow fire spread
  – Small flames

Running FARSITE

• Landscape (.lcp)
• Project (.fpj)
• Disable Crown Fire
• Set Parameters
• Set Duration
• Locate Ignition Point
• Simulate
Cattail II Simulation vs. Real Fire Perimeter
More to Come

• Simulation of the Chilly Springs Fire
  – Occurred in 2006
  – Midwest Great Smoky Mountain National Park
Questions?