Introduction

Southern California experienced a number of wildfires which began on October 20, 2007 and continued through early November. The fires burned over 900,000 acres in the densely populated region (1).

Study Questions

• What effect did these wildfires have on air quality in the region?
• What factors made a given place more likely to experience bad air quality during a fire?

Methods

This study focused on the time period of October 19, 2007 to October 27, 2007 and used PM10, a measure of particulate matter with a diameter smaller than 10 μg/m³ as an indicator of overall air quality. The South Coast Air Quality Management Department (SCAQMD) collects PM10 data at about 20 sites throughout Southern California.

GIS Analysis

• Obtained a point shapefile for all 2007 fires in the United States from the USDA Forest Service and MODIS and extracted data to create individual shapefiles for each day studied for Southern California.
• Plotted the locations of all PM10 data collection sites and created a point shapefile for each day containing locations and PM10 readings.
• Used Geostatistical Analyst’s Kriging feature to interpolate rasters of PM10 levels for the region. (Ordinary Kriging, spherical semivariogram model, lag size = 14480).
• Used raster calculator to analyze these interpolated rasters.
• Used Spatial Analyst to create distance rasters around fire locations for each day (above right).
• Georeferenced NASA satellite images of the fires (see above) and used the Editor tool to create polygon shapefiles estimating smoke coverage (below right).

Results

• The fires had a positive effect on PM10 levels which was largest at the beginning of the fires (Oct 21 and 22).
• The smoke shapefiles show that until Oct 24, the region experienced Santa Ana winds. These winds blow from east to west and are often very hot and dry. On Oct 25, the winds returned to the more common west to east directions.
• Air quality appears to reflect smoke patterns.
• The Environmental Protection Agency set the PM10 air quality standard at 150 μg/m³.
• The map at left shows that almost the entire region experienced PM10 levels above 150 for at least one day (from October 21-25) and that some areas experienced a PM10 level above 150 for 5 days.
• The graphs at right plot distance from fires against PM10 levels for each data collection site. They show that there is a negative correlation between distance from a fire and PM10 level.

Discussion and Conclusions

The October 2007 wildfires did have a drastic effect on air quality in Southern California. This effect reflects both distance from fires and wind direction.

Assumptions

• Data collection sites accurately reflect region.
• Air quality differences over a given day are irrelevant.
• Fire intensity did not effect air quality.

Further Questions

• How did the fires affect other measures of air quality?
• Were there any long term air quality effects from the fires and if so, what were these effects and how long did they last?
• How did the fires affect areas outside of Southern California?

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