North Carolina Disasters

Using NASA EOS to Assess Burn Severity and Perform Fire Risk Mapping of the 2011 North Carolina Wildfire Season

Ande Ehlen (Christopher Newport University), Andrea Beale (Princeton University), Beth Brumbaugh (University of North Carolina at Charlotte), Anthony Gaudino (Virginia Polytechnic Institute and State University), Ryan Green (Millsap North High School), Ryan Johansen (Old Dominion University), Rachael Maingot (Clark University), Amanda Taylor (Louisiana State University)

NASA DEVELOP Program, Langley Research Center

Abstract

In 2011 North Carolina experienced drought conditions that contributed to numerous wildfires and greatly affected the state's ecosystem and citizens. For this project, NASA EOS was utilized to map burn severity for the two largest fires during 2011 in order to show the impact of the fires on the ecosystem. To create these maps, Relative difference Normalized Burn Ratios (RdNBR) were calculated from pre- and post-fire NBRs. The Normalized Difference Vegetation Index (NDVI) and Normalized Difference Moisture Index (NDMI) were derived from Landsat 5 TM data to show changes in vegetation cover and moisture, and the Normalized Multi-band Drought Index (NMDI) was derived from MODIS data to analyze soil moisture. Fire-risk assessment maps were also created using Landsat 5 TM data in ArcGIS. Together, these methodologies will provide project partners with more reliable, accurate tools to aid in drought analysis and fire prediction and prevention.

Objectives

- Provide burn severity analysis of study area fires utilizing Landsat 5 TM imagery
- Provide a time series method to evaluate drought by assessing vegetation and soil moisture using MODIS Terra/Aqua (NMDI)
- Provide time lapse of vegetation conditions and fire extent across the landscape using Landsat 5 TM (NDVI, NDMI, and burn scar composites)
- Provide a multi-criteria evaluation of fire risk to aid in fire extent and damage forecasting

Study Area

North Carolina

- Pender County Juniper Road Fire 31,140 acres burned
- Dare County Pains Bay Fire 45,294 acres burned

Methods

Drought Analysis

- Landsat 5 TM Data
- Converted DN to Reflectance: Processing with ArcGIS Tools
- Normalized Difference Vegetation Index (NDVI)
- Normalized Difference Moisture Index (NDMI)

Burn Severity

- Landsat 5 TM Data
- Converted DN to Reflectance: Processing with ArcGIS Tools
- Burn Scar Maps
- Normalized Multi-band Drought Index (NMDI)

Fire-Risk Assessment Maps

- Landsat 5 TM Data
- Converted DN to Reflectance: Processing with ArcGIS Tools
- Fire Risk Map

Project Partners

Alligator River National Wildlife Refuge
Kelley Van Druten
WUI Specialist

North Carolina Forest Service
Tim Howell
Fire Environment Branch Head

NASA EOS

Aqua
Terra
Landsat 5 TM

Team Members

• Ande Ehlen
• Andrea Beale
• Beth Brumbaugh
• Ryan Green
• Ryan Johansen
• Rachael Maingot
• Amanda Taylor

Conclusions

- Effects seen in NDVI and NDMI are consistent with increases observed by precipitation and KBDI ground-truth data
- Effects seen in NMDI allowed for daily assessment of drought conditions immediately before, during, and after each wildfire
- The RdNBRs allowed for assessment of burn severity of the land
- Fire-risk maps for study areas displayed areas at high risk for future wildfire
- The end user-tutorial will assist in familiarization with NASA EOS capabilities and replication of end products necessary for future fire risk and analysis

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Links

Project Video
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