Using fire progressions and burn severity data to understand and manage contemporary mixed-severity fire regimes

U.S. Department of the Interior
National Park Service

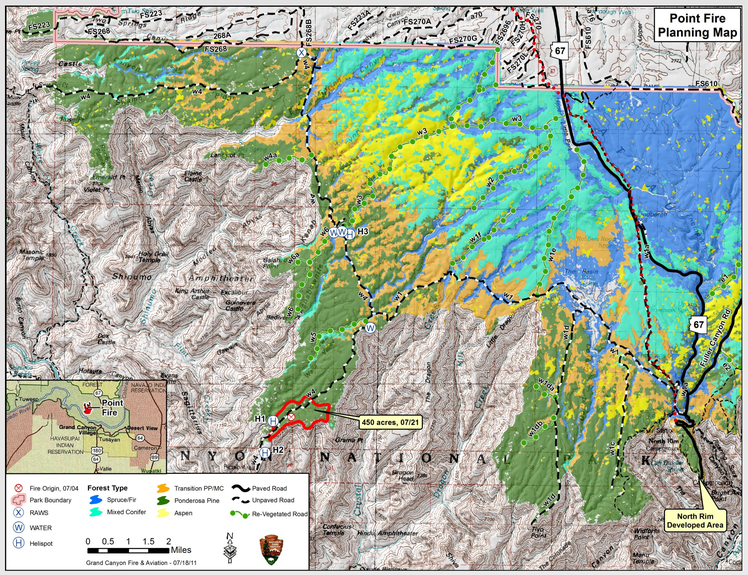
Grand Canyon National Park

ABSTRACT

To better understand and predict the conditions under which large patches of high severity fire occur in the mixed conifer forest of Grand Canyon National Park, we analyzed data from previous wildfires . We examined fire progressions, MTBS data, and RAWS weather variables to determine if weather variables predict days with large areas of high severity fire. The results showed values of maximum temperature (> 82 F), minimum relative humidity (< 9%) and ERC values (> 80) indicate days with large areas of high severity fire.

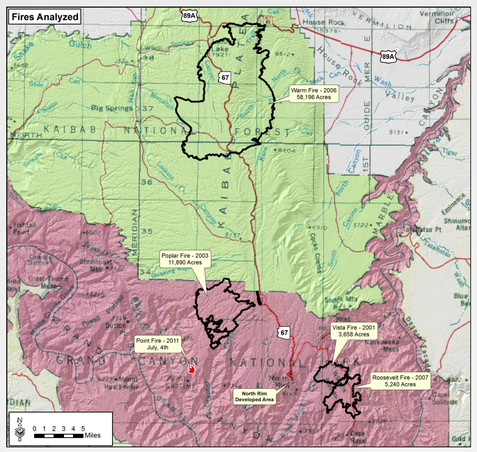
Overview of Point Fire

The Point Fire was discovered on July 4, 2011 on the Walla Valley Plateau in a ponderosa pine forest. Managers decided to allow this fire to burn for resource benefit. Two factors were identified which could change the impacts on resources from beneficial to negative: a large area of unburned mixed conifer forest and a predicted hot and dry post-monsoon period. Fire mangers needed a decision support analysis to determine if the fire should be allowed to cross an in-place fire break at the w4 Road.

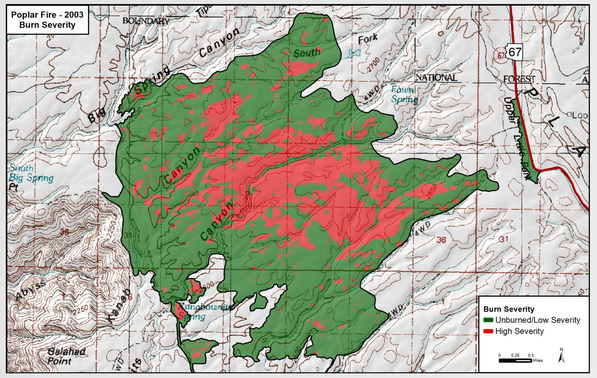


STUDY AREA

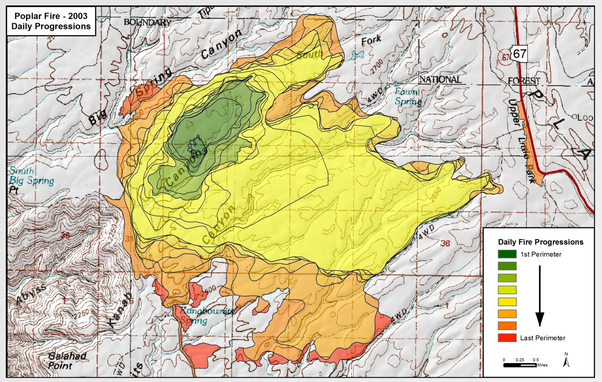
Four fires for which data satisfied minimum criteria were used for this analysis: Vista (2001), Poplar (2003), Warm (2006), and Roosevelt (2007). Criteria used were days burned in mixed conifer, complete progression maps, and MTBS 1-year post fire severity data.



Step 1. Reclassify severity to unburned/low or high

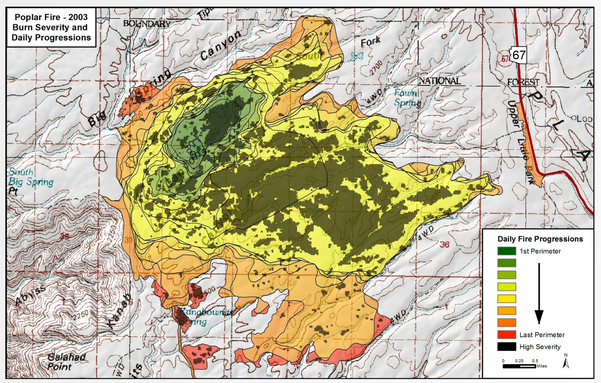


Step 2. Assemble fire progressions into one geodatabase



DATA ANALYSIS

Step 3. Calculate daily acreage by burn severity



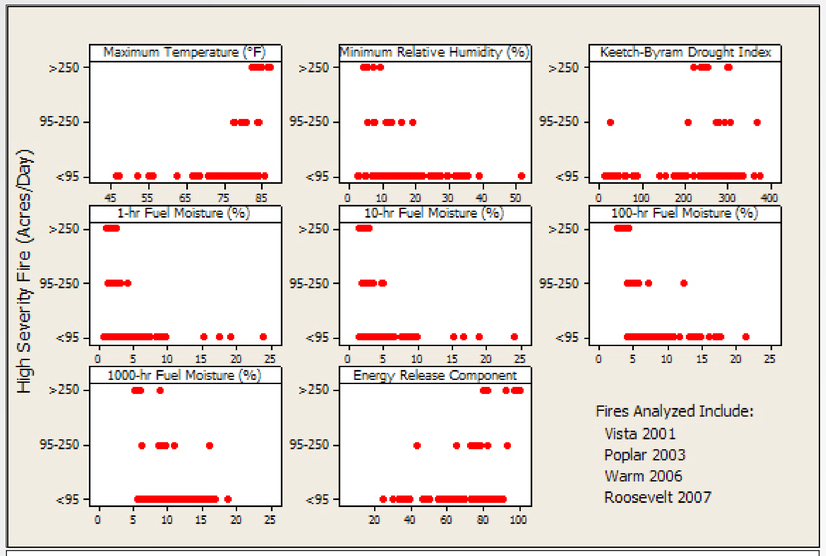
Step 4. Classify high severity burn days

Small	< 95 acres/day
Medium	95 – 250 acres/day
Large	250+ acres/day

Step 5. Correlate high severity days with RAWS weather and fuel moisture data

RAWS Variables Analyzed:
Maximum Temperature, Minimum Relative Humidity, Keetch-Byram Drought Index, Energy Release Component, Woody Fuel Moisture (1-hr, 10-hr, 100-hr, 1000-hr)

RESULTS

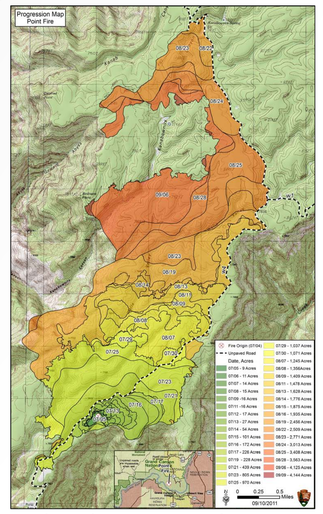


Variable	Values when large, high severity fire days are: Possible	Likely
Maximum Temperature (F)	77	82
Minimum Relative Humidity (%)	19	9
Energy Release Component	65	80

CONCLUSIONS

- Post-monsoon weather forecast: warmer and drier
- Decision: keep fire out of unburned mixed conifer
- Beneficial fire effects in ponderosa pine stands

These are preliminary results based on an analysis conducted in haste to satisfy an immediate need for decision support. The next steps will be to use data from more fires and to examine the effects of other variables such as slope, aspect, and wind speed and direction.
This work has inspired new research on historical fire regimes, including the sizes, frequency, and spatial distribution of high severity patches across the landscape.



Point Fire Progression Map

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