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Rocky Mountain Research Station

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AUGUST 2018

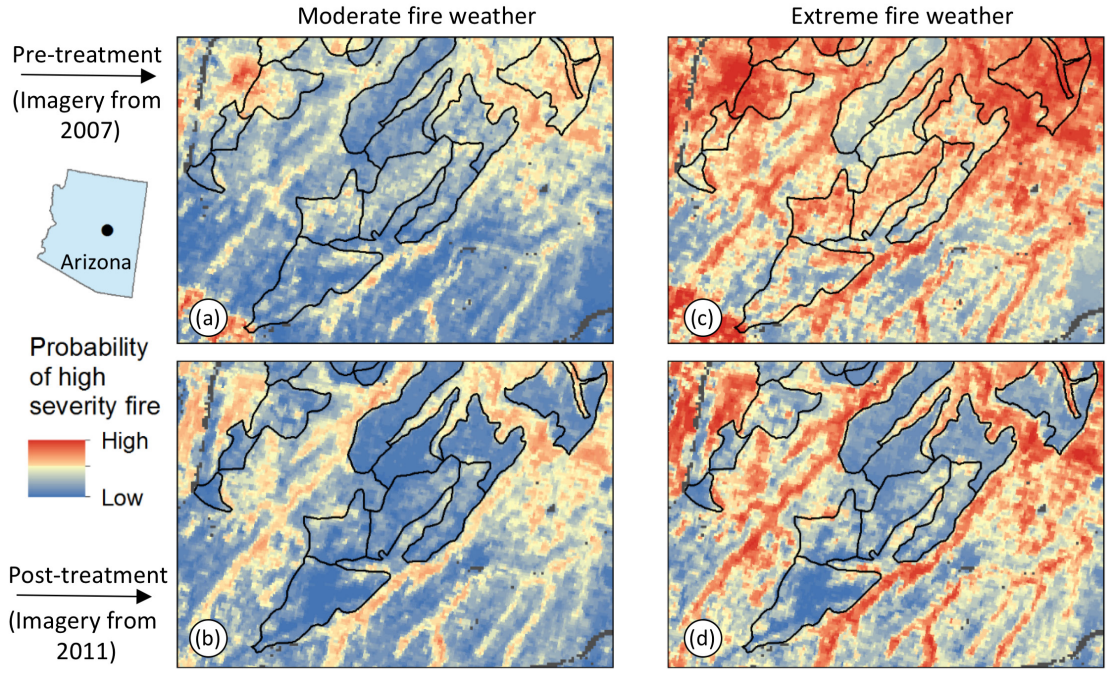
A World in Pixels: How New Research Is Helping to Predict Probability of High-Severity Fire

Another Likely Record Year for Wildfire

With drought across much of the southern and western States, it's shaping up to be another record year for wildfires. According to the National Oceanic and Atmospheric Administration, May 2018 was the fourth-worst May since 2000 in terms of U.S. acres burned by wildfires. The year 2000 is a significant measuring point, since the six worst fire seasons in the last 50 years have all occurred since 2000. It's one reason why a new U.S. Forest Service publication, entitled "High-Severity Fire: Evaluating Its Key Drivers and Mapping Its Probability Across Western U.S. Forests," is particularly relevant.

New Resources for Western Land Managers

According to Sean Parks, a research ecologist with the Rocky Mountain Research Station and the Aldo Leopold Wilderness Research Institute, the paper describes new maps that can help identify areas where high-severity fire is most likely to occur. Parks, who is the paper's lead author, says much of the research comes down to pixels—



Satellite imagery and analysis of live fuels helped generate maps showing high-severity fire probability in the Apache-Sitgreaves National Forests in Arizona. These example show pre-and post-treatment predictions (top and bottom row, respectively) of the probability of high-severity fire under moderate (50th percentile prediction) (a) and (b) and extreme (95th percentile prediction) (c) and (d) fire weather conditions on the Apache-Sitgreaves National Forests, AZ. Treatment units were commercially thinned in 2010 or 2011 and are represented by the solid black outlines (Image: U.S Forest Service).

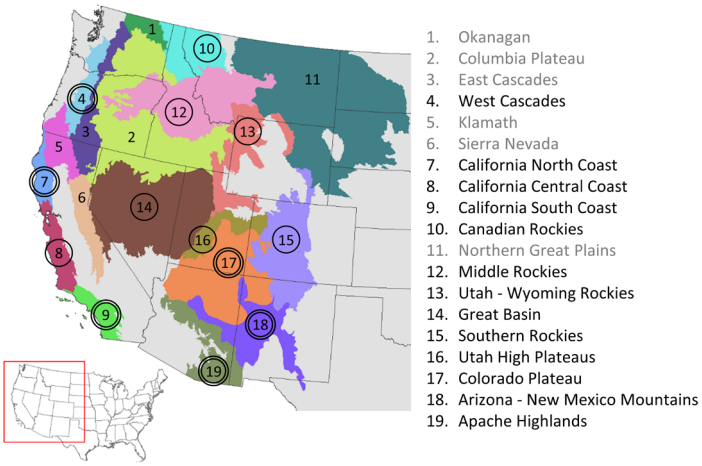
the tiny dots on a computer screen or digital device that together make up an image.

"The world is made of pixels to me," Parks says, "with each pixel representing 900 square meters. Any given fire has thousands to hundreds of thousands of pixels associated with it, depending on the size of the fire. We look at how past fires burned and how severe the burn was in each pixel, then we use that data to predict how areas with similar conditions are likely to burn." Using digital satellite images of fires since 1984, along with a statistical analysis of key drivers of high-severity fire (topography, climate, fire weather and fuel), the pixels are assigned different colors that correspond to the probability of high-severity fire. Then the pixels are made into ecoregional maps. "When a land manager has that data," Parks says, "they can see the areas where the potential for high-severity fire is greatest."

Understanding and Managing High-Severity Fires

This research has several potential uses. According to Parks, "This research is part of a grander project in which we're looking at the conversion of forests to grasslands or other non-forest ecosystems to provide managers with more information on where such conversions are most likely." Other uses could be working with stakeholders to generate financing for controlled burns, or risk-quantification for fire insurance companies.

What does this mean to land managers? Parks explains, "Managers can't control topography or the weather, but they can control fuel. If there's a high probability of a high-severity fire near a town or a wildland-urban interface area, a land manager might consider that specific area for a prescribed fire or another fuel treatment. They also might choose to allow a wildland fire to burn if the weather conditions are less than extreme."



Ecoregional wall-to-wall gridded maps predict the probability of high-severity fire across much of the western United States (Image: U.S. Forest Service).

MANAGEMENT IMPLICATIONS

- Live fuel, on average, was the most important factor driving high-severity fire in and among ecoregions. Fire weather was the second most important factor, followed by climate and topography.
- Recently published ecoregional wall-to-wall gridded maps, based on satellite imagery that characterizes live fuel, are available to help land managers in the western United States identify areas with a high probability of high-severity fire.
- Using these maps, we also predict likelihood of a high-severity fire under moderate and extreme fire weather before and after fuel reduction treatments. These predictions can serve as a performance metric for land management agencies tasked with reducing hazardous fuel across large landscapes.
- The ecoregional maps can be downloaded from www.frames.gov/partner-sites/next-generation-fire-severity-mapping/home.
- Models for a wider geographic area may become available with additional funding.

Sean Parks is a research ecologist with the Rocky Mountain Research Station and Aldo Leopold Research Institute. Learn more about his research at www.fs.fed.us/rmrs/people/sean_parks. Additional information on the project can be obtained by contacting Sean Parks at sean_parks@fs.fed.us.

FURTHER READING

Parks, Sean A.; Holsinger, Lisa M.; Panunto, Matthew H.; Jolly, W. Matt; Dobrowski, Solomon Z.; Dillon, Gregory K. 2018. High-severity fire: Evaluating its key drivers and mapping its probability across western U.S. forests. https://www.fs.fed.us/rmrs/publications/high-severity-fire-evaluating-its-key-drivers-and-mapping-its-probability-across

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