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THE FEASIBILITY OF WILDLAND FIRE USE FOR RESTORING NATURAL FIRE REGIMES

Keywords: wildland fire use, historical fire regimes, wildland urban interface, prescribed fire, GIS modeling

Background & Management Issues:

Unroaded areas and areas managed as wilderness provide unique opportunities for applying wildland fire use (WFU) as a fuels management strategy to restore fire to fire-dependent ecosystems. Underlying most current fire policies that emphasize WFU is the assumption that natural ignitions are sufficient for restoring or maintaining fire-dependent ecosystems.

In many wilderness areas, current fuel conditions may preclude the use of wildland fire because of excessive risks to either natural resource values within the wilderness or social values in the adjacent wildland urban interface (WUI). Ignitions outside of these areas that otherwise would immigrate into wilderness are usually suppressed, further limiting the amount of natural fire that can occur. Before investing limited time and resources in developing and implementing a fire management plan, wildland fire and fuels managers need information and tools to help them evaluate the feasibility of WFU as a fuel reduction strategy and as a method for the restoration of fire to its historic role.

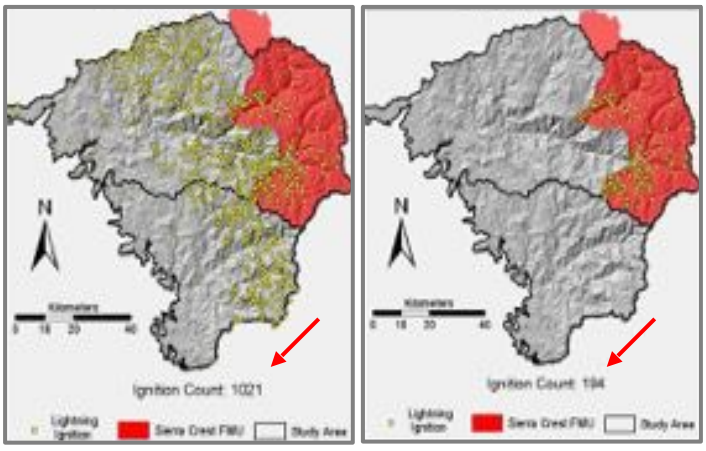
Project Objectives:

- To develop an approach for assessing the feasibility of WFU for restoring fire to landscapes.
- To identify where WFU opportunities are greatest and improve evaluation of the risk from WFU fires to areas where fire is

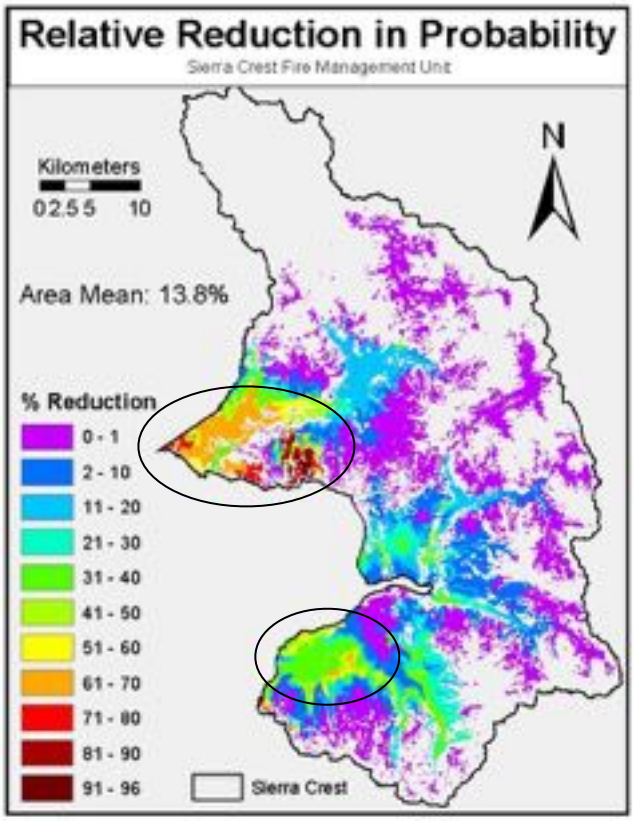
Project Description: The feasibility of using WFU for restoration of historical fire regimes was assessed in five areas that are designated wilderness or managed primarily as wilderness: the Selway-Bitterroot Wilderness, Gila-Aldo Leopold Wilderness Complex, Yosemite National Park, Sequoia-Kings Canyon National Parks, and Great Smoky Mountains National Park.

BurnPro:
A GIS model called BurnPro was used to predict the annual probability of burning for every cell on a raster landscape. BurnPro uses topography, historic weather, current fuels, and historic ignition locations to estimate the likelihood of burning given the speed and direction a fire might travel from any ignition point, the length of the fire season, and the frequency of fire-stopping rain events during the fire season.

Because fire is a contagious process, the most important variable in determining the probability of burning for a given area is the number of neighboring locations that burn. To evaluate how suppression of lightning-caused fires on lands outside of a WFU area might affect the likelihood of burning within the WFU area, probability of burning was determined using two different ignition scenarios: 1) all lightning ignitions and 2) only those lightning ignitions that occurred within the WFU area. For each study unit these two scenarios were compared to determine the reduction in probability of burning due to the suppression of lightning-ignited fires outside of the WFU area. This information was then mapped to identify areas where restoration objectives can be most easily met through natural ignitions, versus areas where managers will face more difficult challenges in restoring fire regimes solely through the use of WFU.



All lightning ignitions in Sequoia/Kings Canyon study area (left) and ignitions only within WFU area. Notice difference in ignition count.



Sequoia-Kings Canyon study area: Reduction in probability of burning in the WFU area with suppression of natural ignitions outside of WFU area. Areas with high % reduction (circled) are areas where it may be especially difficult to restore fire to a natural frequency due to suppression on adjacent lands.

Results and Discussion:

- Estimates of probability of burning across the landscape can help identify areas with the greatest opportunities for WFU. If the decision to suppress a fire is made in areas with a higher probability of burning, there is a good chance that there will be another opportunity for WFU use in these areas soon. In contrast, in areas with a low probability of burning, the chance for WFU does not occur often. In low probability areas where WFU is the preferred strategy suppression should be avoided whenever possible.
- The suppression of lightning-ignited fires outside of a WFU area can greatly decrease the probability of burning in some places within the WFU area (see map at left). Areas with a large reduction in probability of burning are a result of the unique configuration of ignitions, topography, and fuels on a landscape.
- Estimates of probability of burning can improve risk assessments and help prioritize fuels treatments. Areas that have a high probability of burning and contain a value-at-risk, such as the wildland-urban interface or critical habitat for a listed species, can be given a high priority for fuels treatment.

Management Implications:

- Estimates of probability of burning can be combined with spatial information on the social and ecological values that may be affected by fire, and used in designing strategic fire and fuels management plans, including prioritizing fuels treatments.
- To restore natural fire regimes to WFU areas with a significantly lower probability of burning due to the suppression of fires outside of the area managed for WFU, periodic prescribed burning may be necessary.
- Site-specific information of the kind used in this study can be used to directly support the development of Fire Management Plans (FMPs) or the evaluation of current FMPs as they apply to wilderness and other unroaded areas.

Publications / Products:

- Davis, Brett, Carol Miller. 2004. Modeling Wildfire Probability Using a GIS. In: Proceedings of the ASPRS 2004 Annual Conference, Denver, USA. May 23-28. American Society for Photogrammetry and Remote Sensing, 2004. Available on CD only. **Leopold Publication Number 509.**
- Miller, Carol. 2003. The spatial context of fire: a new approach for predicting fire occurrence. Pages 27-34 in K.E.M. Galley, R.C. Klinger, and N.G. Sugihara (eds.). Proceedings of Fire Conference 2000: The First National Congress of Fire Ecology, Prevention, and Management. Miscellaneous Publication No. 13, Tall Timbers Research Station, Tallahassee, FL. **Leopold Publication Number 501**.

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