CALIFORNIA FIRE SCIENCE CONSORTIUM

Research Brief for Resource Managers

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How to Reduce Fire Risk and Promote Conservation

Syphard, A. D., V. Butsic, A. Bar-Massada, J. E. Keeley, J. A. Tracey, and R. N. Fisher. 2016. Setting priorities for private land conservation in fire-prone landscapes: Are fire risk reduction and biodiversity conservation competing or compatible objectives? Ecology and Society 21(3):2. http://dx.doi.org/10.5751/ES-08410-210302.

Worldwide, the classic approach for reducing fire risk has been fuel manipulations by vegetation thinning, mastication, and prescribed burning. In southern California vegetation treatments are at odds with biodiversity conservation and fuels reduction to protect communities is best considered as a resource sacrifice. These authors explored an alternative approach: whether **strategic land acquisition** could fulfill mutual objectives to reduce fire risk and improve conservation at the same time**.** Land acquisition is a traditional approach for conservation and risk mitigation for some types of natural hazards such as flooding, but it is a new approach for fire risk managers. Using a novel modeling approach, the researchers found that private land purchases that prioritized **either** high biodiversity **or** high fire risk land acquisitions would simultaneously reduce future fire risk and protect biodiversity for the western San Diego County study region.

To model fire risk and conservation outcomes eight different conservation and housing development scenarios were assessed using an econometric land development model based on a fixed conservation budget (US $40million/yr) and a fixed number of new dwelling units every five years (37,000 units per time step). The conservation selection scenarios ranged from no conservation to combinations of fire risk, biodiversity, cost, and likelihood of development (Table 1). The model outputs for each time step were the mean risk of fires destroying structures and the characteristics of important natural habitat types.

Management Implications

- Models show that buying conservation lands with high fire hazards or high species richness was better at reducing future fire risk and maximizing conservation objectives than if land purchases were prioritized based on cost or likelihood of development.
- **Strategic land acquisition** may be a more effective long-term approach for reducing fire risk and protecting biodiversity in southern California than vegetation treatments.
- Novel modeling methods that combine fire risk assessment, conservation, and land use planning can be used as a framework for a collaborative approach to achieve shared goals, reduce conflict and improve economic efficiencies for conservation and fire management activities.

Table 1. Description of conservation selection algorithms.

SubMax	Acquire parcels that will develop in the absence of conservation
CostMin	Acquire as much property as possible at the least cost
FireMin	Acquire inexpensive parcels with high fire hazard
FireMin Max	Acquire parcels that are inexpensive, likely to subdivide, and have high fire hazard
BioMax	Acquire parcels that are inexpensive with high species richness
BioMax Min	Acquire parcels that are inexpensive, species rich, and are likely to subdivide
BioMax Fire	Acquire parcels that are inexpensive, species rich, and have high fire hazard
BioMax MinFire	Acquire parcels that are inexpensive, species rich, have high fire hazard, and are likely to subdivide

Mean fire risk varied across time and among the scenarios (Fig. 2). At the end of the 20 year projection, the no conservation, SubMax and CostMin strategies had the highest mean fire risks, the largest development footprints (Figure 3) and some of the largest habitat losses (Fig.4). In contrast, any combination of the fire hazard reduction or biodiversity strategies resulted in the lowest fire risk, most compact development footprint and minimum habitat loss.

Fig. 2. Mean projected fire risk to simulated structures across conservation strategies over time. Risk is defined as the probability of a structure being destroyed in a fire.

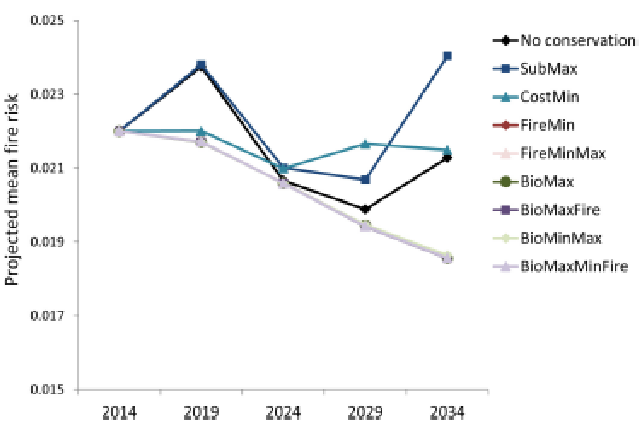

Fig. 3. Map illustrating newly developed structures in year 2034 for all conservation selection scenarios.

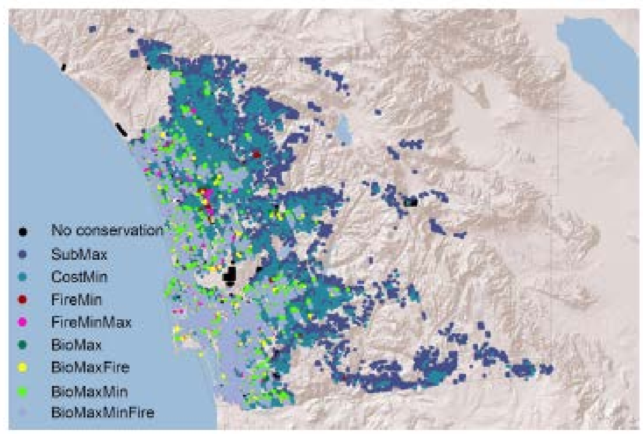

Fig. 4. Area of major vegetation types, including (a) shrubland, (b) forest and woodland over time for all conservation scenarios.