Appendix 5: Postfire Restoration Prioritization Tool for Chaparral Shrublands

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The concept and design of the Postfire Restoration Prioritization Tool (PReP) for chaparral shrublands is based on a spatial tool developed by the Mediterranean Center for Environmental Studies and the University of Barcelona (Duguy et al. 2012) to operationalize guidance for postfire restoration planning found in the Technical Guide for the Management of Burned Forests developed in Spain (Alloza et al. 2016). The original tool assesses the impact of forest fires based on a variety of detailed vegetation data and ecological criteria. Using the Copper Fire on the Angeles National Forest as a pilot case study, we collaborated with the original researchers to adapt and apply the Spanish tool to chaparral shrublands in southern California.

PReP is a dynamic tool that provides a transparent and repeatable framework for U.S. Forest Service resource managers to guide and prioritize postfire restoration efforts in shrublands. Generating this information efficiently is important given the often short timeframes involved in implementing restoration activities, such as the use of fire settlement funds or implementing emergency activities to reduce erosion, sediment transport, and infrastructure damage postfire. Objectives of PReP include the following:

- Assess the regeneration ability of native vegetation postfire
- Predict areas of degradation on the burned landscape
- Identify priorities for postfire restoration

The tool determines the intrinsic regeneration capacity of pixels within the fire perimeter based on the relative proportion of seeding, resprouting, and facultative-seeding shrub species. In contrast to the original tool which is informed by species-level maps, we developed landscape units based on vegetation type, aspect, and topographic position, and compiled data on species composition from U.S. Forest Service Forest Inventory and Analysis plots and the postfire reproductive strategies from ecological field guides for the region. The regeneration capacity of landscape units is then modified on a pixel-by-pixel basis according to fire history (number of fires in the past 40 years and time since last fire), drought occurrence pre- and postfire, and presence of nonnative grasses, which are major competitors with native seedlings. These three factors—absent in the original tool—have important impacts on woody plant regeneration on California shrublands (Allen et al. 2018). The final step of the tool integrates the modified

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regeneration capacity with soil erosion risk data (from the Burned Area Emergency Response program assessment) to identify areas at risk of ecosystem degradation.

PReP is designed to be a straightforward interface, using a conceptually simple scoring method, and is intended to be used as a management tool by resource staff working with chaparral shrublands. The tool uses a Jupyter Notebook framework that allows revisions to be made easily and efficiently. There is some preparation required to download and clip spatial data to the target fire, after which PReP can be run without further Geographic Information System (GIS) analysis. Input from a botanist or person familiar with the prefire vegetation is important, as well as is the validation of tool outputs in the field. Within PReP, there are options to download spatial outputs generated as geotiff rasters that can be viewed in GIS platforms such as ArcGIS. This also allows the outputs to be viewed with other spatial datasets, such as roads, trails, project area boundaries, ecosystem services (Underwood et al. 2018), etc. At this point, the PReP tool has been run on the Copper and Powerhouse Fires on the Angeles National Forest, and there are plans to expand the framework to include modules applicable to forested areas as well.

Users can run PReP by downloading the Jupyter Notebook and example data for the Copper fire pilot study contained in the zipped file ('PReP.zip') from https://github.com/adhollander/postfire. Also available on the site are a technical guide for the tool, installation instructions, and a case study for the Copper Fire (fig. A5.1) that shows and interprets the outputs of the tool.

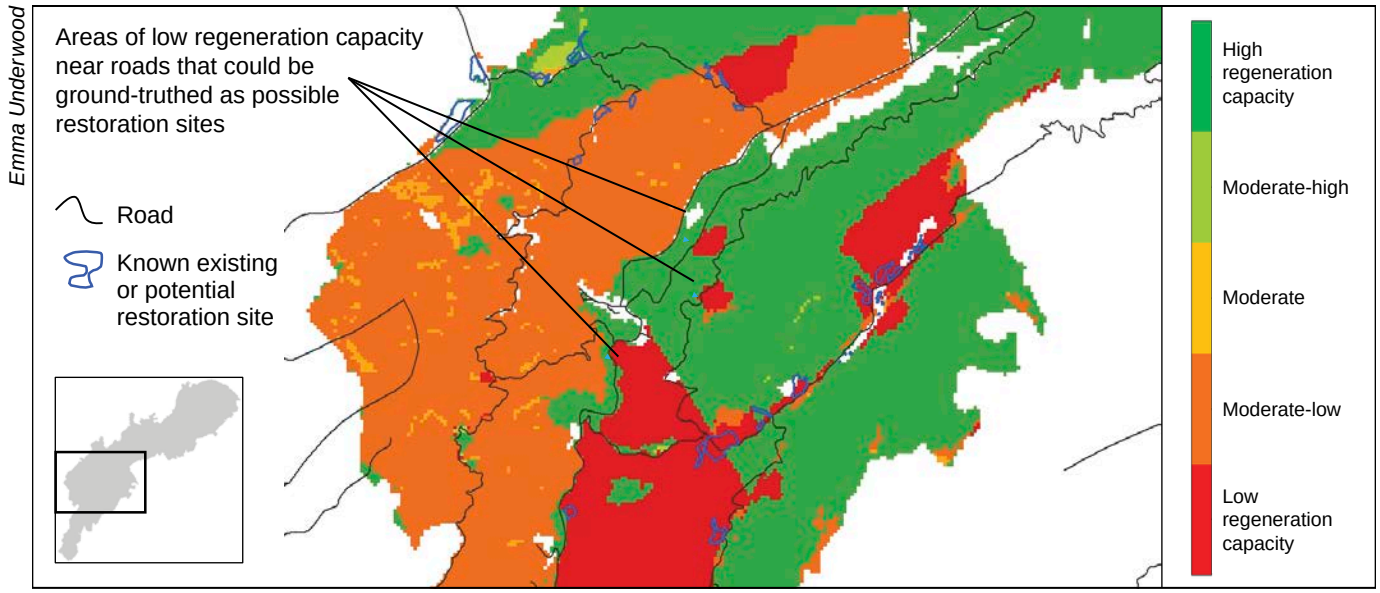

Figure A5.1—This output for the Copper Fire uses the penultimate output from the postfire restoration prioritization tool (PReP) before the integration of soil erosion risk. Because the fire occurred almost two decades ago, the risk of fire-caused erosion today is minimal. The figure shows calculated postfire regeneration capacity based on the postfire reproductive strategy of the vegetation-based landscape units, fire history, drought, and nonnative grasses. Overlain are existing restoration sites that have been identified by the Angeles National Forest and roads to indicate the accessibility of potential restoration sites.

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