FLORISTIC RESEARCH OF POST-FIRE CHAPARRAL IN THE COAST RANGES OF CALIFORNIA

- A Framework for Fire Followers and Fleeting Abundance[1] -

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Fire is a major driver of diversity dynamics and ecosystem structure in many California plant communities. In particular, there is a suite of annual or short-lived perennial species that benefit from, or rely on, fire as a part of their life history cycle. This post-fire flora represents a fleeting diversity and abundance, typically spanning 1 to 3 years after a fire and disappearing back into the soil seed bank until the next fire event.

The annual and short-lived perennial plant species that follow fire in chaparral is a well-documented phenomenon. Few studies, however, link fire severity data with species data despite the likely impact fire severity has on species diversity, assemblages, and succession. Further, research of post-fire flora chaparral has mostly been limited to chaparral in southern California despite large tracts of chaparral in central and northern California. This gap in research is in part due to the logistical challenges inherent to studies in the post-fire environment. The research approach Nomad Ecology has developed, outlined below, intends to fill this research gap by providing baseline species diversity data and fire severity data at the plot level using a regional approach in central and northern California coast ranges. This is intended to be a long-term research program to collect these data at various fire locations over the next few decades and compile this information in a single relational database to analyzed floristic and fire severity information at local and regional scales.

Species richness and ecological dynamics in these short-lived systems are not well understood at the local and regional scales, in the California coast ranges, despite high interest from land managers, ecologists, and botanists. Implementation of studies designed to capture post-fire flora dynamics is difficult from an operational perspective due to the fleeting nature of this flora and unpredictability of fire events. Planning and budget cycles are ill adapted to projects that are based on unpredictable landscape events, and fire funding objectives are typically limited to fire suppression, suppression repair, and emergency restoration geared to minimizing immediate threats to life, property, and natural resource values such as instream clean water for fish. Land managers, ecologists, and botanists are typically focused on post-fire mitigation and do not have the resources available to initiate research in such a short time frame.

Nevertheless, more studies investigating species composition and successional patterns paired with consolidation of existing life history information of fire following species, through database development, would improve ability to model species distribution as well as develop ecological theory at the local and regional levels.

[1] Fleeting abundance: The dynamics of plant species (primarily annuals) that are generally absent from the landscape, until germination is triggered by fire, and have high abundance that typically fades between a period of 1 to 3 years.

Practical outcomes of Nomad's research work include:

- Identification of fire following taxa and quantifying their richness and diversity at local and regional scales;
- Build a database with relevant fire response and ecological information to California species based on these studies;
- More accurate rare plant rankings of fire followers, many of which are currently considered rare for regulatory purposes;
- Understanding rare plant dynamics in a post-fire environment;
- Identifying threats to these species from high severity fire and/or fire suppression;
- Connecting field data to life history information to help predict response to changing fire regimes at the species and association levels;
- Weed establishment and abundance in a post-fire environment;
- Patterns of fire follower diversity for different vegetation types and fire severities; and
- Data on different floristic outcomes of low, medium, and high severity fires, and differences correlated with season of burning, to better design prescribed fire procedures to achieve desired outcomes understanding of the ways that non-native invasive plants compete in post fire landscapes and alternative floristic successional trajectories.

The 2013 Morgan Fire, located in Contra Costa County, provided an opportunity to design and implement this research aimed at capturing diversity and short-term successional dynamics of the fleeting abundance of fire following plants. This research was designed with two scales in mind. At the local level, to provide Mount Diablo State Park managers with information that addressed their stewardship needs related to abundance and distribution of rare species, noxious weeds, and vascular plant diversity in the post-fire environment. At the regional scale, we intended to design an easy and replicable sampling method that can be applied to other ecosystems across California. The ability to compare post-fire vegetation and burn severity data from different regions will also offer insight into patterns of diversity at the landscape level allowing broader data queries.

Creating a framework and protocol that is adaptable, consistent, and ready to implement is advantageous when dealing with the short time frames associated with post-fire floristics. In addition to developing a study framework we have begun to build a database that links post-fire species to ecologically relevant information like germination triggers, life form, dispersal syndrome, etc. This database will help consolidate ecological information on these species that can be linked up to our future and current studies so that an analysis can be done from many ecological perspectives. By creating a framework that treats local studies as units in a greater network we are able to address the unique needs of local managers while working towards a greater understanding of post-fire floristics statewide in California.

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