

Fire and Grassland Management

“The only catastrophic grassland fire is the one that is not lit.”
S. Bear, 2002

OBJECTIVES

- To introduce the concept of fire regimes
- To review data on prescribed fire effects in California grasslands
- To discuss why an understanding of fire regimes is necessary to achieving desired fire effects over the long term

WHAT IS A FIRE REGIME?

- A fire regime is a set of recurring conditions of fire that characterize a given fire-maintained ecosystem.
- The reproductive responses and population dynamics of the species characteristic of an ecosystem are keyed to certain attributes of the fire regime, allowing them to persist. The regime, in turn, is perpetuated by the vegetation/fuel complex and the landscape setting, coupled with ignitions.
- Alter an attribute of that set of conditions beyond its normal range of variability, and the ecosystem changes to something else: species are lost (e.g. type conversion of shrubland to grassland).
- Wildland remnants are usually divorced from the landscape processes that used to maintain them.
- For any given location, the fire regime is a unique fire history, which may or may not recur.

Fire Regime Components

- § Fire type
- § Severity
- § Intensity
- § Frequency
- § Timing
- § Size and pattern

Factors that affect fire regimes

- § Sources of ignition
- § Frequency of ignition
- § Climate
- § Topography (macro and micro)
- § Spatial relationships to other ecosystems
- § Fuel quantity
- § Fuel quality
- § Fuel distribution

Why do we burn grasslands?

- § Control non-native invasive species
- § Increase native species diversity
- § Protect endangered species
- § Reduce thatch in preparation for planting
- § Initiate regeneration of fire-adapted species
- § Improve forage quality
- § Restore the “natural” or historic fire regime

RESTORATION VS. MAINTAINANCE

Restoration phase

- Focused burning with specific objectives for each burn (e.g. removal of thatch, destroy weed seed, stimulation of flowering or tillering of grasses)
- Burn prescriptions may not reproduce “natural” fire regime

Maintenance phase

- Calls for more variable application of fire within the normal range of fire regime attributes
- More closely mimics natural fire regime
- Some sites may never get to this phase if weeds or other site constraints require more intensive management

Deterministic fire management

- Narrowly defined regimes
- Single-species management

Stochastic fire management

- Functional groups or guilds
- Critical thresholds
- Range of variability

CASE STUDIES OF FIRE EFFECTS IN CALIFORNIA GRASSLANDS

- Willow Slough Watershed—Yolo County
- Dye Creek Preserve—Tehama County
- Jepson Prairie Preserve—Solano County
- Santa Rosa Plateau—Riverside County

FIRE EFFECTS DATA

Fire effects vary by habitat type: data from the Jepson Prairie Preserve

- Cover of native grasses and forbs increased in all habitat types
- Cover of exotic annual grass decreased significantly on mound and inter-mound habitats.
- The proportion of quadrats dominated by native species increased in burned plots across all habitat types.

But...

- Exotic early forbs increased in every habitat type, due mainly to an increase in *Erodium* spp.
- Native early forbs increased on swale and intermound habitats, but showed no statistically significant increase on mounds.
- Native late forbs increased on mound habitats, but showed no statistically significant increase on intermounds or swales.

Fire effects vary by season and by species guild: data from the Santa Rosa Plateau

- Spring burns reduce biomass and frequency of occurrence of non-native annual grasses.
- Fall burns increase the biomass and frequency of occurrence of non-native annual grasses.
- Spring burns increase the vigor and diversity of native perennial grasses.
- Fall burns may increase the diversity of native annual forbs.
- Repeated spring burns may reduce the diversity of native perennial grasses.
- Three years following a single burn, treatments begin to resemble pre-treatment plots.
- A prescribed fire regime that varies the season and frequency of burning will maximize native species (at the Santa Rosa Plateau).

WHAT DOES IT ALL MEAN?

- Multiple data sets from multiple sites demonstrate high variation of fire response in grasslands.
- Fire response will vary by year, by soil type, by topography, by microclimate, by fuel quantity and quality, and by the other factors that determine fire regimes.
- As a result, site managers must always ask: What is driving fire response at my site?

“There are likely manifold routes to desired outcomes, thus there is no single protocol for designing and implementing fire regimes. Innovate.”

PRESCRIBED FIRE REFERENCES AND WEBSITES*

(*SEE ALSO SECTION 1, RESOURCES)

I. RESEARCH PAPERS ON PRESCRIBED FIRE IN GRASSLANDS AVAILABLE ON THE WEB

- *Conference Proceedings, Australian Bushfire Conference, Albury, July 1999*—Includes useful paper on *The Role of Indicators in Developing Appropriate Fire Regimes* (Burrows, et. al., 1999). <http://life.csu.edu.au/bushfire99/papers>
- *Fire Controls Yellow Starthistle (Centaurea solstitialis) in California Grasslands*- a paper describing work on burning starthistle at Sugar Loaf State Park in Sonoma County by Marla Hastings and Joseph DiTomaso. Originally given at the 1996 conference of the California Exotic Pest Plant Council and later published in *Restoration and Management Notes* 14(2). Available at www.caleppc.org/symposia/96symposium/hastings.htm
- *Grassland Management with Prescribed Fire*-A primer on burning grasslands from the University of Nebraska Cooperative Extension. Some information specific to Nebraska, but the discussion of principles of plant adaptations to fire, fire planning, and habitat management are applicable to California as well. www.ianr.unl.edu/pubs/range/ec148.htm
- *Proceedings of the Invasive Species Workshop: The Role of Fire in the Control and Spread of Invasive Species*. Includes a number of papers on grasslands in California. www.nifc.gov/joint_fire_sci/invasive%20publications/invasiveproceedings
- *The Use of Prescribed Fire to Control Invasive Exotic Weeds at Jepson Prairie Preserve* (1996). A paper describing research on the use of fire to control medusahead in the Jepson Prairie's vernal pool and grassland complexes by Oren Pollak and Tamara Kan. Originally published as part of Ecology, Conservation, and Management of Vernal Pool Ecosystems-Proceedings of a 1996 Conference, California Native Grass Association, Sacramento, CA, 1998. Available at www.cnps.org/vernalpools/pollak.pdf

II. OTHER FIRE INFORMATION RESOURCES

- *California Department of Forestry and Fire Protection (CDF)*. Provides information on the **Vegetation Management Program (VMP)**, CDF's statewide prescribed fire assistance program that provides up to 90% cost-share for Rx fire projects. www.fire.ca.gov
- *FEIS-The Fire Effects Information System* maintained by the Forest Service



has very comprehensive information not only on fire effects and fire ecology of individual species, but distributional and ecological information as well. An invaluable source for all types of plant research. Includes voluminous references. www.fs.fed.us/database/feis/

- ***Fire Management Tools Online***-a web product of the USDA Forest Service, Rocky Mountain Research Station, Intermountain Fire Sciences Library. Includes computer models of fire and fuel behaviors and other information. [WWW. fire.org/perl/tools.cgi](http://www.fire.org/perl/tools.cgi)
- ***Fire weather sources.***
 Accuweather. <http://www.accuweather.com>
 National Weather Service Fire Weather. www.boi.noaa.gov/firewx.htm
 Weather Net. cirrus.spri.umich.edu/wxnet.
- ***National Association of State Foresters*** (includes links to state forestry sites). <http://www.stateforesters.org>
- ***National Fire Protection Association.*** <http://www.nfpa.org>.
- ***National Interagency Fire Center (NIFC).*** The seven-agency support center for wildfire firefighting, based in Boise, ID. <http://www.nifc.gov>
- ***National Interagency Prescribed Fire Training Center*** (in Tallahassee, FL). <http://fire.fws.gov/pftc>.
- ***National Park Service fire program.*** <http://fire.nifc.nps.gov>. Robin Wills, NPS Region Fire ecologist (and CNGA Boardmember) Robin_Wills@nps.gov.
- ***National Wildfire Coordinating Group.*** An interagency operational group that coordinates the fire programs of the participating agencies. <http://www.nwcg.gov>
- ***The Nature Conservancy Fire Program***-A useful source for information on fire management planning, training courses, fire effects on biota, success stories, jobs and more. Includes The Nature Conservancy's Fire Management Manual that describes the Conservancy's standard operating procedures, protocols, and guidelines for prescribed fire. www.tncfire.org
- ***USDA Forest Service***-Includes links to national fire information networks, fire news and publications, fire centers and research and fire publications. [WWW. fs.fed.us/land](http://www.fs.fed.us/land)
- ***USDI Fish and Wildlife Service*** fire management program. <http://fire.r9.fws.gov/fm/rx.htm>
- ***Wildland Fire Training***—A comprehensive listing of all California wildland fire training courses, dates, locations, nomination process, and contact information (See also PFTC, NWCG, and NIFC, below). <http://www.r5.fs.fed.us/>