The Role of Fire and Fuels Management in Chaparral Restoration

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The man who asks a question is a fool for a minute, the man who does not ask is a fool for life.

~ Confucius
Is there a role for fuels management in chaparral restoration?

1. What is the role of fire in chaparral?

2. What ways could fuels management aid restoration?

3. How effectively could fuels management serve these roles?

4. ????

“Oh, do not ask, ‘What is it?’ Let us go and make our visit.”

TS Eliot
What is the Role of Fire?

Natural ecosystem process
Landscape highly fire-prone
Dense, continuous canopy
Six months of drought & Santa Ana winds
High intensity crown fire; large fires historically
Resilience to Periodic Fire

Post-fire recovery
- Obligate seeders
- Obligate resprouters
- Facultative seeders

Historic FRI
- 30 – 200 + years

Species adapted to *fire regime*
- Sensitive to short intervals
- Extirpation & replacement
Beyond the Threshold of Resilience

Exotic grasses replace shrubs; promote more fire

Photo by J.E. Keeley
Burning in Water
Drowning in Flame

- Charles Bukowski

When a natural ecosystem process
Becomes a threat
Too Much of a Good Thing

Fire increasing
> 95% are human-caused
Population growth & urban expansion
Projected future increases
Housing Density 1940
Partial Block Group Resolution

Housing Units per Km²
- 0
- 2 - 4
- 8 - 16
- >128
- 0 - 2
- 4 - 8
- 16 - 128
- Water

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University of Wisconsin-Madison
Housing Density 1980
Partial Block Group Resolution

Housing Units per Km²

- 0
- 0 - 2
- 2 - 4
- 4 - 8
- 8 - 16
- 16 - 128
- >128

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“If you do not change direction, you may end up where you are heading.”

Lao Tzu
What Can Fuels Management Do?

Direct benefits?

1). Prescription burning
   Too much fire already; chaparral longevity > 100 yrs
   No apparent benefit; high likelihood of detriment

2). Fuel breaks or mechanical treatments
   Lack of surface fuels, must remove canopy
   Unlike forests, not compatible w/ resource benefits
What Can Fuels Management Do?

Primary concerns of resource managers

- Increase in exotic species
- Type conversion
- Soil compaction
- Soil erosion & rilling
- Habitat loss
- Equipment disturbance
- OHV use/disturbance

![Average Number of Exotic Species by Treatment Type](image_url)
What Can Fuels Management Do?

**Indirect effects**

Direct effects likely negative impact
But potential resource sacrifice for fire control

1). Maintain existing fuel breaks – no ecological cost
   Areas with threat of high-recurrence fire
   Around sensitive areas, restoration areas, old growth

2). Strategic placement of new fuel breaks
   Fire-prone or sensitive areas
   Combine with areas strategic for structure protection
How effectively could it serve this role?

The Role of Fuel Breaks in SoCal NFs
National Forests

Syphard, Keeley, and Brennan
Forest Ecology and Management 2011
International Journal of Wildland Fire 2011
What is the role of fuel breaks in controlling large fires & what factors influence this role?

GIS overlay and analysis
Personal interviews
The Role of Fuel Breaks in Southern CA National Forests

Most fires don’t encounter a fuel break
Fires either stopped or were controlled by firefighters
~ 50% of encounters
Outcome Results, 3 Forests

Most important: Access, Fire size, Condition of FB

> 95% were controlled due to firefighter; fires rarely stop on their own

Variation among forests

* Significant all 3 forests
Effective during normal weather or to control flanks
Unsafe and ineffective during most Santa Ana events
Embers can fly kilometers ahead of fire front

Proportion of intersections

- Red: Not Stopped
- Black: Stopped
Comments from Interviews

Role of FBs: safe anchor for suppression – not to passively stop

Top reasons fires not constrained:
  - No access
  - Scarce resources & safety when fire big, fast, or multiple
  - FB not maintained, difficult to maneuver

When FB change behavior
  – Maneuver, suppress in vicinity, buy time for structures
Back to the question: Is there a role for fuels management in chaparral restoration?

What is the role of fire?

Important ecosystem process

*But* Fire regime change; too much fire

How could fuels management work?

Direct effect (-)

Resource sacrifice for fire control (?)

How effective is fuels management in that role?

Normal weather *vs* Santa Ana winds

------→ How to weigh trade-offs?

------→ What else can we do?
Alternatives for reducing fire

Move beyond control toward prevention
95% caused by humans
Direct efforts at prevention: need to know why, when, where
Indirect through land use planning
Ignition Prevention

Predictive maps:
prioritize where to focus efforts

e.g., Education about campfires in July or road barriers in hotspots
Land Use Planning

Highest frequency low to intermediate housing density
Planning for infill development also saves structures, habitat

Syphard et al. 2012, PLoS ONE
Syphard et al. 2007, Ecological Applications
Syphard et al. 2009, Conservation Biology
Why Intermediate?

- Fewer Human ignitions
- Low Fuel
- Fast Suppression

Ignitions & Fuel Challenge w/ suppression

Housing Density

Fire
Conclusion

Chaparral restoration / conservation likely most effective with less fire

Fuels management no direct benefit

Potential indirect benefit of reducing fire

Focus on existing fuel breaks; strategic placement

Resource sacrifice worth the trade-off?

Depends on fire weather conditions

Other alternatives – ignitions and planning – deserve more thought
“It is better to debate a question without settling it than to settle a question without debating it.”

Joseph Joubert
Thank You
Altered Fire Regimes

Unlike forests
Shrublands experiencing more frequent fire

Percentage departure of current FRI from presettlement period
By H. Safford & M. Borchert
Fire Management in Southern CA

Suppression response to active fires
Pre-fire fuel manipulation (Rx & fuel breaks)
No systematic exploration of what role FBs play
Most likely to burn:
- Low-intermediate density
- Small, isolated cluster
- Close to edge of cluster
- Steep slope
- Fewer roads

Syphard et al. 2011

*PLoS ONE*
Angeles National Forest Fuelbreaks

Existing Firebreak  Existing Fuelbreak  Historic Fuelbreak  Proposed Fuelbreak  County Boundary  Angeles National Forest

(Brennan, Keeley and Pfaff, unpublished)
If used for restoration (and otherwise), where and how??

Observed vs. Predicted
Correlation: 0.61
RMSE: 1.31 (n inter)