Forest Grazing Revisited

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Forest Grazing Revisited

- A brief overview of fire suppression history
- Forest grazing experiment, 1983-86
A brief overview of fire suppression history
Dendrochronology
Measuring and matching tree rings
Mean Fire Return Interval (MFRI) before last fire = 15 years

No recorded fire for the past 111 years!

1897

1885

1868

1839

1837

SP13S
Frequent use of fire
Native Californians manipulated the vegetation for thousands of years.
Muir: the “Range of Light”
John Muir, 1890, inspired National Park System

• “Fire, the ax, and wholesale vandalism, have long threatened the forests of the country with utter destruction.”

• “Nature sends down fire from heaven every year in the form of lightning, making the care of man all the more necessary.”
Gifford Pinchot, first Chief of Forest Service

- "There is no doubt that forest fires encourage a spirit of lawlessness and a disregard for property rights."

USFS started managing forests circa 1905, though federal management started in the 1870’s
1890’s: Bernhard Fernow: Founded first American forestry school

• “the whole fire question in the United States is one of bad habits and loose morals”

• Trained in Prussian “scientific forestry”
“Preventable fire is more than a private misfortune. It is a public dereliction.

At a time like this of emergency ... it is more than ever a matter of deep and pressing consequences that every means should be taken to prevent this evil ...

...400 men working ...to suppress man-caused fires, and these men are needed at the front. It is therefore the patriotic duty of the stockman to prevent fire.” (Morrow 1918)
Uncle Sam, 1937

Campaign kicked off by President F.D. Roosevelt
During the war, fire associated with the enemy.

Our Carelessness
Their Secret Weapon
Prevent Forest Fires

Prevent Forest Fires!

U.S. Dept. of Agriculture
Forest Service
State of Wisconsin
Conservation Department
Disney allowed use of Bambi for one year in 1944.
• Bear cub found in New Mexico in 1950
High frequency, low intensity
Native Burning
+
burning by herders, farmers, hunters
U.S. fire suppression 1900+

• Fires are set by criminals, immoral, and unpatriotic persons

• Stop Indians, farmers, ranchers, hunters from burning the woods

• Eliminate human use from national parks
Berkeley Hills 1900
Berkeley Hills, 1990
Climate Trends in California (1960-2000)

Maximum summer temperature (°C)

Minimum winter temperature (°C)

Direction of change:
- Cooling
- No change
- Warming
“Transhumance” use of Sierran meadows.
Cow Months of Forage Harvested By Year, Forest Service Grazing Leases

Reduced numbers & season
Grazing removes biomass, which is also fuel
The abandonment of agricultural activities has become more intense in mountain areas.

This abandonment increases the combustible material that proliferates without management.

Transform agrarian surfaces into productive firebreaks.
Plantations that are more resilient to fire.
Agriculture as an essential part of an integrated management of natural spaces.

“Project Mosaic,” Spain
Before the mountains were clean, because they were the appetite of all kinds of livestock.

The fires are the result of the gradual disappearance of this important partner of the economy and rural culture.

To effectively protect ourselves from fires, we must give cattle the rank of firefighters.

The abandonment of agricultural activities
Before the mountains were clean
Forestry has been until now
II. Forest Grazing Dissertation Research
Study Area: Blodgett Forest Research Station

Manager’s Goal: to control shrubs to enhance tree growth by suppressing shrubs with cattle grazing
Methods

- Build exclosures on forest plantations, comparing with and without grazing (B. Allen-Diaz and J. Bartolome)
- Fence cows onto pastures and see what they eat
- Control timing, intensity, and frequency of grazing with clipping study
- Build model impact of grazing practices
Exclosure Study (Allen-Diaz and Bartolome)
Develop a model for vegetation management:

Deerbrush, *Ceanothus Integerrimus*, edible by cattle and deer.

Competes with regrowing trees
Shelterwood

- Leave sparse large trees to provide seed source, protect the site
Shelterwood study: Three pastures, grazed one month each
Stocking rates: 1983-- 2 AUMs/acre; 1984-- 2.2 AUMS/acre
Cover reduced each year, but vigorous regrowth.
But not as big as outside the pastures
Cows escape before eating conifers
Lessons learned

• Cattle spent 1 month in each pasture: deerbrush recovered quickly
• Most trampling occurred the first year, and was not a problem relative to the number of seedlings, softer soil, more damage (10,404 seedlings per ha to start, ideal around 500)
• Cattle did not eat conifers, deer browsed off most of them
Cattle browsing: Simulate!
Clipping study

- Clipped deerbrush on two sites once or three times
- Clipped all, half, or no annual growth
Thank You!
Results: timing of grazing

Change in Basal Diameter by Timing of Defoliation, October 1986 to October 1988

Change in Basal Diameter, in mm

Bars are one Standard Error of the Mean, N=12
Results: intensity of grazing

Change in Basal Diameter by Intensity of Defoliation, October 1986 to October 1988

Change in Basal Diameter, in mm

Bars are one Standard Error of the Mean, Controls: N=6; Others, N=18
Results: frequency of grazing

Change in Basal Diameter by Frequency of Defoliation, October 1986 to October 1988

Bars are one Standard Error of the Mean, Clipped Once, N=18; Others, N=6
Grazing Influences: a simple model for management

*Ceanothus integrerrimus*, 1-5 years old

- Repeated, moderate browsing:
  - Shrubs kept at browsable height, vigorous regrowth, maximum forage for livestock and wildlife. Effects on trees unclear.

- Repeated, heavy, browsing:
  - Shrub growth and reproductive effort stops, mortality may occur. Tree growth thought to be maximized.

- Browsing of low frequency:
  - Shrubs exceed maximum browse height; succession to forest slowed by a decade or more.
Moderately grazed, grazed repeatedly during the summer: Good for deer, cattle
Vegetation can be manipulated with grazing.
Grazing or burning: Can’t start here!
Without grazing or burning: Flammability is high a few years after a wildfire.
Start as soon as possible
Start when the plants are small
Firefighters?
YES!

• Start right away!
• How palatable are the problem plants?
• What do the livestock prefer? (kind, class, history)
• Allow repeated, season long use? Or other system
• Planning: where are important spots for wildfire, potential management issues
• Can combine with other treatments, burning or mechanical.
<table>
<thead>
<tr>
<th>Desirable</th>
<th>Less desirable</th>
<th>Undesirable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Deerbrush</td>
<td>1. Manzanita</td>
<td>1. Chinquapin</td>
</tr>
<tr>
<td>\textit{(Ceanothus integerrimus)}</td>
<td>\textit{(Arctostaphylos patula)}</td>
<td>\textit{(Castanopsis chrysophylla)}</td>
</tr>
<tr>
<td>\textit{(Ceanothus prostratus)}</td>
<td>\textit{(Ceanothus cordulatus)}</td>
<td>\textit{(Lithocarpus densiflora)}</td>
</tr>
<tr>
<td>\textit{(Carex sp.)}</td>
<td>\textit{(Symphoricarpos acutus)}</td>
<td>\textit{(Rhododendron occidentale)}</td>
</tr>
<tr>
<td>\textit{(Agrostis sp.)}</td>
<td>\textit{(Prunus emarginata)}</td>
<td>\textit{(Chamaebatia foliolosa)}</td>
</tr>
<tr>
<td>5. 20 additional grasses</td>
<td></td>
<td>5. Bracken fern</td>
</tr>
<tr>
<td></td>
<td></td>
<td>\textit{(Pteridium aquilinum)}</td>
</tr>
</tbody>
</table>
Distribution Change: Modeling used to estimate change when surveys are done by different people with different methods and effort.
## Pre and Post-Settlement Fire Frequency

Means and ranges of fire-return intervals on 3 sites on the Klamath National Forest, California.

<table>
<thead>
<tr>
<th>Location and period</th>
<th>Time interval</th>
<th>Mean (years)</th>
<th>Range (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Site 1</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Presettlement</td>
<td>1745-1849</td>
<td>17.3</td>
<td>5 to 41</td>
</tr>
<tr>
<td>Settlement</td>
<td>1849-1894</td>
<td>15</td>
<td>8 to 26</td>
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<tr>
<td>Fire exclusion</td>
<td>1894-1987</td>
<td>46.5</td>
<td>43 to 50</td>
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<td><strong>Site 2</strong></td>
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<tr>
<td>Presettlement</td>
<td>1742-1855</td>
<td>10.3</td>
<td>5 to 18</td>
</tr>
<tr>
<td>Settlement</td>
<td>1855-1901</td>
<td>9.2</td>
<td>7 to 12</td>
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<tr>
<td>Fire exclusion</td>
<td>1901-1987</td>
<td>28.7</td>
<td>18 to 45</td>
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<tr>
<td><strong>Site 3</strong></td>
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<tr>
<td>Presettlement</td>
<td>1752-1849</td>
<td>13.9</td>
<td>7 to 25</td>
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<tr>
<td>Settlement</td>
<td>1849-1913</td>
<td>16</td>
<td>5 to 25</td>
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<tr>
<td>Fire exclusion</td>
<td>1913-1987</td>
<td>37</td>
<td>3 to 71</td>
</tr>
</tbody>
</table>

Suppress all disturbance (fire) to create one path, maximum speed

- Pioneer species (just cut)
- Shrub-sapling (cut 20 years ago)
- Immature (cut 25-50 years ago)
- Just mature (cut 75-150 years)

No Old Growth (decadent)
What permittees have done

- Two thirds have increased leased land in last 10 years
- Half have increased stocking rates
- One third have purchased land
- 95% have carried out range improvements
- Of those who lost allotments and kept ranching, one found new lease, one reduced herd.
History: Berkeley Hills, 1990
Berkeley Hills, 1900