



PRESCRIBED GRAZING:

A FLEXIBLE TOOL FOR FIRE & FUELS MANAGEMENT IN CALIFORNIA

Kristina Wolf, PhD, CRM 122
Board of Forestry & Fire Protection
Range Management Advisory Committee
Kristina.Wolf@bof.ca.gov

Cole Bush
Shepherdess Land & Livestock Co. LLC
Grazing School of the West (501c3)
bcb@shepherdesslandl.co



OVERVIEW

DEFINITIONS & TERMINOLOGY

PURPOSE

RESEARCH & EVIDENCE

SUCCESSSES

CONSTRAINTS

OPPORTUNITIES



LIVESTOCK GRAZING

ALL GRAZING

Reduces, removes, tramples and/or crushes vegetation

VARIOUS TYPES OF GRAZING APPROACHES HAVE SIMILARITIES OR DIFFERENCES, BUT SOME ARE INTERCHANGEABLY USED



- Managed Grazing
- **PRESCRIBED GRAZING**
- Targeted Grazing
- Contract Grazing
- Conservation Grazing

- Biological Grazing
- Holistic Grazing
- Mob Grazing
- High-Density Short-Duration Grazing
- Rotational Grazing



DEFINITIONS & TERMINOLOGY

| GRAZING TYPE | KEY FEATURES | PRIMARY GOAL |
|-----------------------------|---|--|
| Managed Grazing | General term for controlled timing, intensity, and location of grazing | Improve forage use, animal health, pasture condition |
| PRESCRIBED GRAZING | Structured plan with specific management goals | Meet conservation or fuel reduction targets |
| Targeted Grazing | Focus on specific vegetation goals (e.g., weed control) | Control invasives, reduce fire fuels |
| Conservation Grazing | Supports biodiversity, native species, habitat improvement | Ecosystem restoration |
| Holistic Planned Grazing | Part of Holistic Management®; considers whole system impacts | Regenerate soil, integrate socio-ecological outcomes |
| Biological Grazing | Uses animals as biological tools, alternative to chemicals or machinery | Non-chemical vegetation control |
| Rotational Grazing | Livestock are moved between paddocks to allow forage recovery | Improves soil health, forage productivity, and animal health |
| Mob Grazing | High-density, short duration, long rest periods | Soil improvement, plant recovery, mimic natural herds |
| High-Density Short-Duration | Similar to mob grazing; quick rotations, high impact, long rest | Boost soil health, forage productivity |



HOW IS PRESCRIBED GRAZING DEFINED IN STATE LAW?

Prescribed grazing is the lawful application of a specific kind of livestock at a determined season, duration, and intensity to accomplish defined vegetation or conservation goals, including reducing the risk of wildfire by reducing fuel loads, controlling undesirable or invasive plants, and promoting biodiversity and habitat for special status species.

California Public Resource Code (PRC) 4124.5



**Herbivores are self replicating
“biological masticators”**

Biomass → Lunch

**Lunch → Soil Organic Matter
(SOM)**

**GOALS OR TARGETED OUTCOMES MAY
INCLUDE:**

- **REDUCTION OR REMOVAL OF
VEGETATION THROUGH GRAZING
AND/OR BROWSING**
- **ANIMAL IMPACT THROUGH
“TRAMPLING”, “CRUNCHING”,
“CRUSHING”, CREATING SPACE
BETWEEN DENSE VEGETATIVE
STANDS OR PLANTS**
- **FERTILIZATION
+ BUILDING SOM**



BENEFITS & CONSIDERATIONS

WHEN TO USE

PRESCRIBED GRAZING

- **Air Quality**, when compared to the use of prescribed fire
- **Noise Pollution**, when compared to mechanical operations
- **Steep Slopes**, hard to access areas or presence of poisonous plants
- **Soil Compaction** and surface disturbance concerns



The GRAZING Rx

What are you treating?

Symptom or Systemic Cause

- **Species + Breed Selection**, browsing vs grazing
- **Stock Rate** - # of animals in the herd, flock, or “flerd”
- **Density** - # of animals in grazing area
- **Duration** - based on animal density and impact goals
- **Time of year** - seasonality
 - early vs late season
 - growing vs dormant season





Grassland Biomass Thresholds Critical to Fire Behavior and Land Management in California

RESEARCH & EVIDENCE



AUTHORS

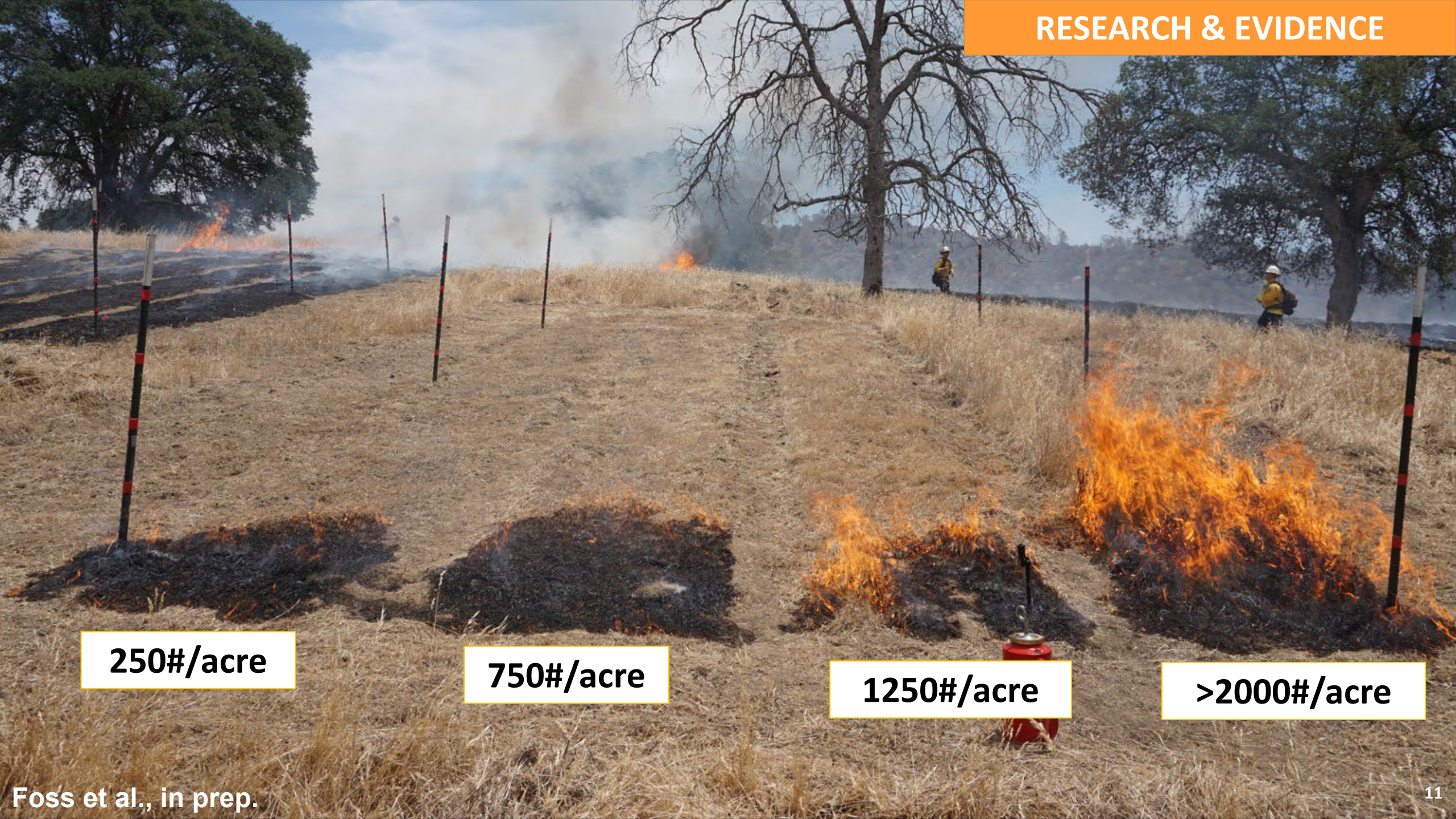
- Roxanne H. Foss
- Matthew Wk. Shapero
- Shane L. Dewees
- Jeffery W. Stackhouse
- Lenya N. Quinn-Davidson
- Luke T. Macaulay

250#/acre

750#/acre

1250#/acre

>2000#/acre

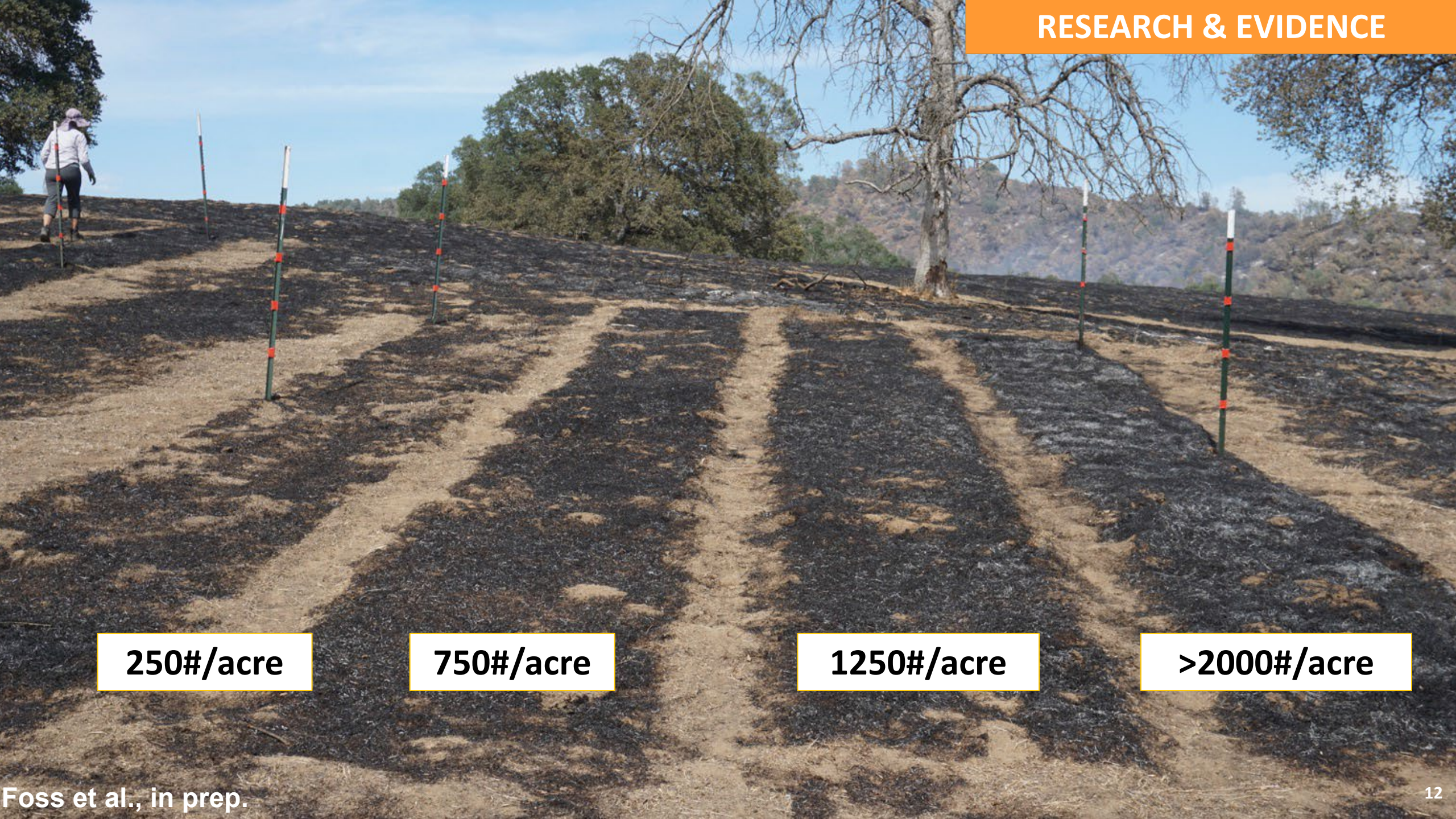


250#/acre

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250#/acre

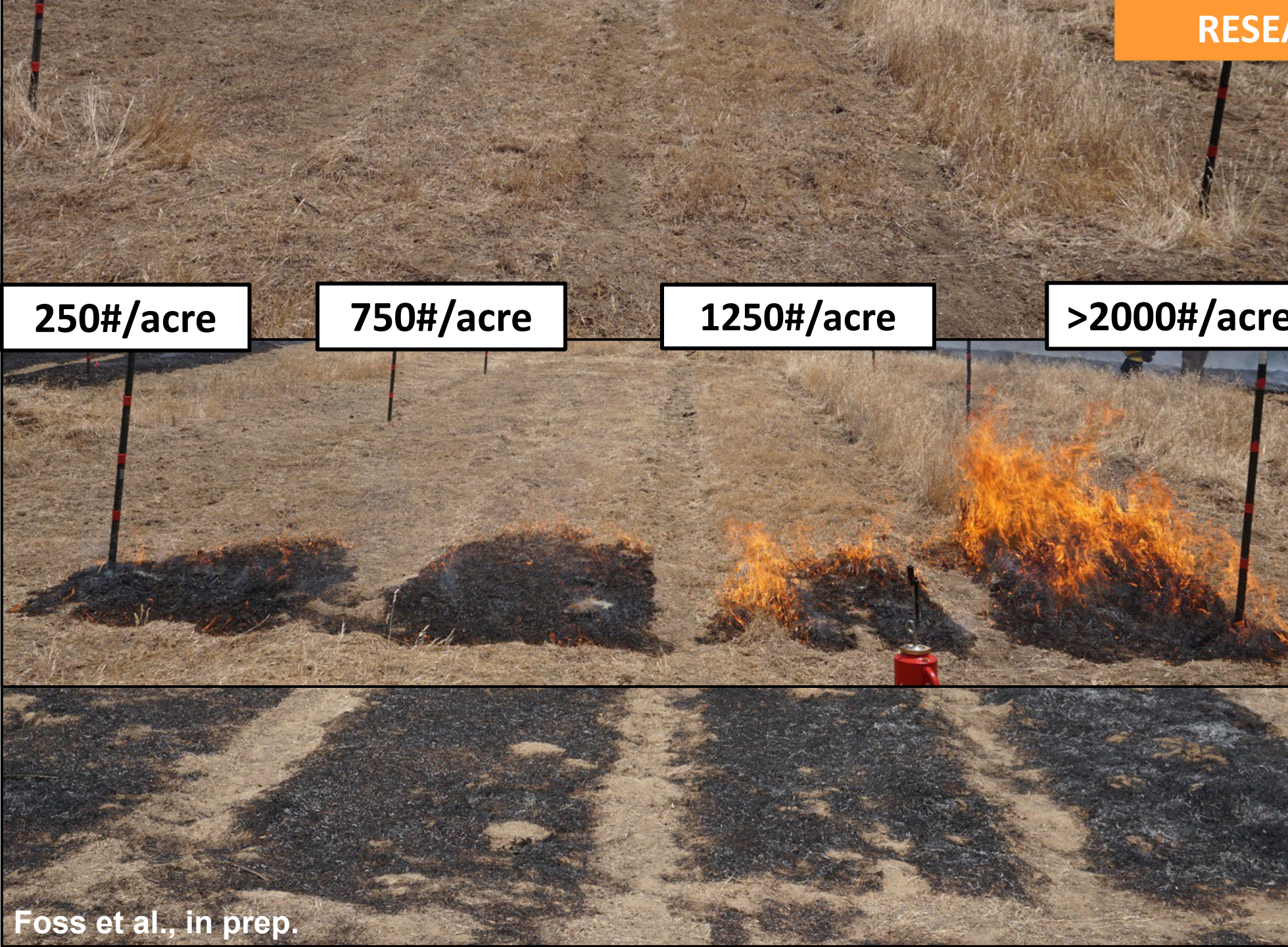
750#/acre

1250#/acre

>2000#/acre

Grassland management alters fire behavior

- maximum flame height
- total area burned
- surface temperature
- white ash cover





Biomass reductions reduce fire hazards

Matthew Shapero,
UC Cooperative Extension

Project partners:
Roxanne Foss
Shane Dewees
Lenya Quinn-Davidson
Jeff Stackhouse
Luke Macaulay

| Biomass Range (lbs/acre) | Grazing Level | Potential Fire Behavior |
|--------------------------|--|--|
| >4,000 | Ungrazed | Highly likely flames above 4 ft. and all biomass is burned |
| 2,500 to 4,000 | Generally ungrazed except productive coastal sites | Possible flames above 4 ft and majority burned |
| 1,250 to 2,500 | Light grazing | Flames likely below 4 ft and fire will not be stopped |
| 400 to 1,250 | Moderate grazing | Flames below 4 ft and fire may be stopped |
| <400 | Heavy grazing | Flames below 4 ft and highly likely fire stopped |

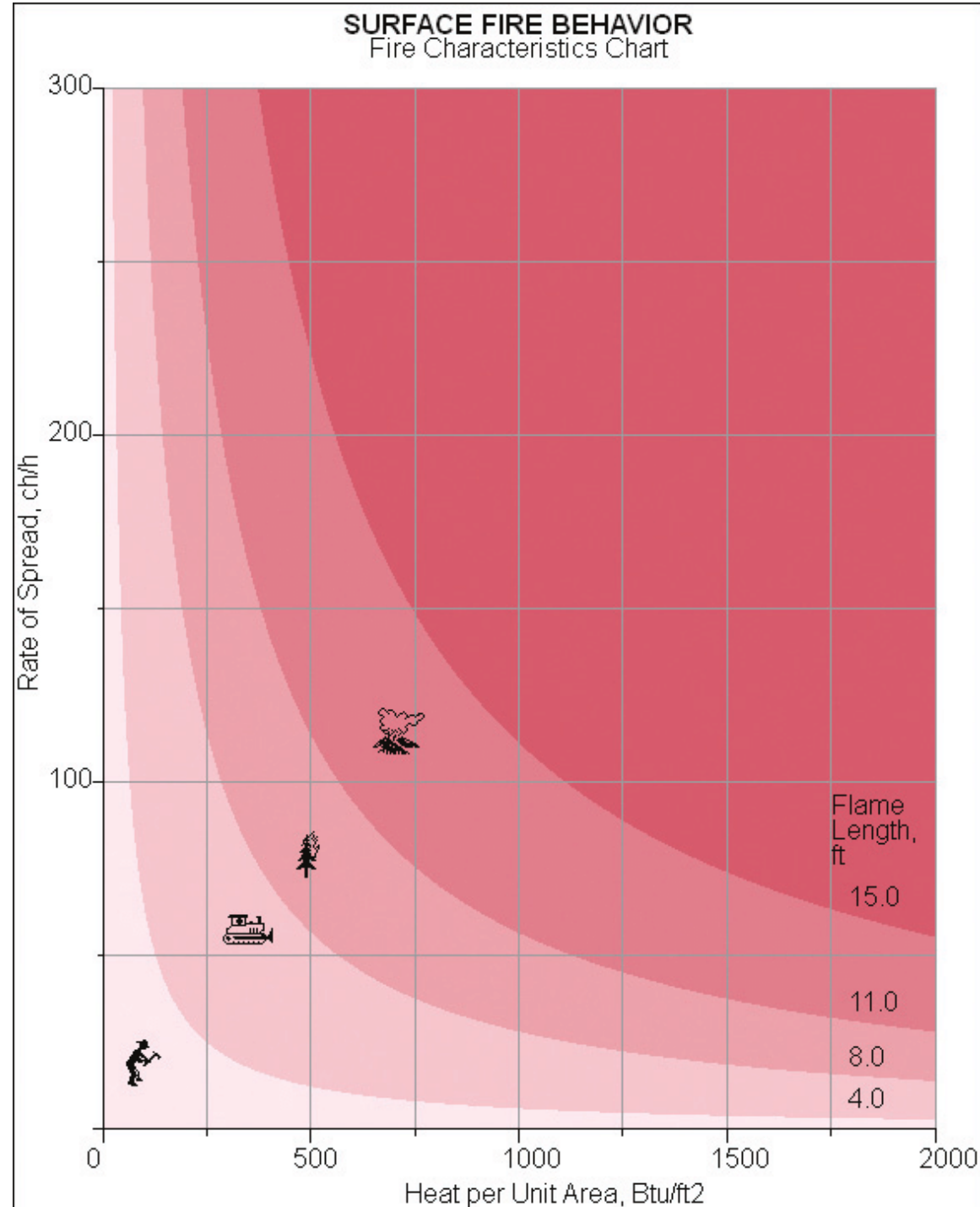
**LOWER FLAME
LENGTHS**

=

**REDUCED RESOURCE
NEEDS**

**IMPROVED PERSONNEL
ACCESS**

INCREASED SAFETY



**Andrews
et al. 2011**

DEMONSTRATED SUCCESSES

**EXAMPLES OF
WHERE GRAZED
AREAS STOPPED
FIRE SPREAD**

SUCCESSSES





Fine Fuels Reduction Project Grazing Rx

- Mixed-species herd of 400 sheep & goats
- 1 acre paddock per day
- 45 degree slope
- Vegetation type: primarily annual grass

East Bay Regional Parks District, July 2015

Courtesy of Star Creek Land Stewards





Courtesy of Shepherdess Land & Livestock



Before



Before



After



After



CONSTRAINTS

STATEWIDE, LOCAL & REGIONAL CONSIDERATIONS

Kristina.wolf@bof.ca.gov

CHALLENGES IN CALIFORNIA AND BEYOND

- Insurance, Liability
- Permitting and CEQA
- Rigid contract terms and inflexible grazing agreements
- Wage and labe challenges, funding and resource limitations
- Climate change
- Unpredictable weather
- Rapidly changing systems
- Limited ability adapt quickly
- Coordination with agencies/grazing operators
- Lack of consistent guidance or policies across regions
- Institutional & public resistance to grazing as a tool
- Social perceptions, community support, history of poor grazing management outcomes

FOR AGENCIES

- DO NOT own animals, less flexibility to respond quickly
- Lack of livestock management expertise

FOR PRACTITIONERS

- Animals require feed source and home base
- Depredation
- Animal movement among non-contiguous parcels
- Degraded and lacking permanent and temporary Infrastructure

CONSTRAINTS

GRAZING OPERATOR CONSIDERATIONS:

- 
- **WILDLIFE & OTHER ANIMALS**
 - **TRANSPORTATION**
 - **FRAGMENTED LANDSCAPES**
 - **LAND USE
DEVELOPMENT**
 - **VEGETATION MANAGEMENT**
 - **INVASIVE SPECIES**
 - **MULTIPLE LAND USES**
 - **ECONOMIC FEASIBILITY**
 - **WATER RESOURCES**
 - **INFRASTRUCTURE**

TOOL LIMITATIONS



COST STRUCTURES

1. Per acre cost with set number of head.

*ex. 20 acres at \$950 an acre = \$19,000

2. Per head per day cost based on the number of animals per day for the duration of the project.

*ex. 800 head for 60 days at \$.50 hd/per day= \$24,000

3. Weekly or monthly cost based on estimated rate of grazing.

**Additional costs such as, transportation or “flushing” of weed-free forage may be presented.*

Considerations determining cost of services:

- Scale of project - acreage
- Duration of treatment
- Seasonality – weather factors, veg growth associated
- Complexity – access, slope, veg type/density, ecological sensitivities

A photograph of a herd of goats in a dry, hilly landscape. In the foreground, a white goat with brown patches on its head and neck is walking towards the camera. Behind it, several other goats are visible, some standing and some grazing. The background shows rolling hills under a clear sky. The text is overlaid on the right side of the image.

National Prescribed Grazing rates vary greatly. In California average rates range between \$850-1,500 per acre and are annually increasing.

Rates determined by many variables and considerations. Rates can be reduced at certain times of year or with land access to off-season operations.



EVALUATION

Is this the right tool for the job?

- Project goals
- Vegetation characteristics
 - Species Composition
 - Height
 - Diameter
 - Density
- Infrastructure - Roads, Water, Containment
- Environmental Characteristics
- Scale of project
- Transportation
- Proximity to public, operations, predation

**PRESCRIBED
GRAZING CAN BE AN
ECOLOGICALLY- AND
COST-EFFECTIVE
ALTERNATIVE OR
COMPLEMENT TO
OTHER TREATMENT
METHODS**

OPPORTUNITIES – WHAT, WHEN, WHY, WHERE, HOW?

TREATMENT CONSTRAINTS

- Air quality restrictions (prescribed fire)
- Noise pollution (mechanical and manual treatments)
- Topographic limitations in steep or rocky terrain
- Adjacency to structures, (especially w / prescribed fire)
- Herbicide restrictions in some areas and ecosystems
- Proximity to protected resources

ECOSYSTEMS AND AREAS

- Oak Woodland for ladder fuels and invasive plants
- Recently Burned Forest or Chaparral to control invasive plants
- Grassland to manage fine fuels and invasive plants
- Riparian Areas to manage understory and decadent vegetation
- Wildland-Urban Interface to manage fuels in high-risk zones

TREATMENT INTEGRATION

- Graze > Fire to reduce risk of spotting and uncontrolled spread
- Fire > Graze/Mechanical for maintenance of fuel breaks
- Graze > Herbicide/Mechanical for spot treatment of invasive plants and resprouts

OPPORTUNITIES

Selecting the appropriate grazing contractor who has experience with the scale, landscape, community, and ecology of the site is essential to achieve project goals.

This includes selecting the right species, breed of animal, and class of animal.





OPPORTUNITIES

ONGOING EFFORTS TO SUPPORT GRAZING ON STATE LANDS AND BEYOND

SOLUTIONS

- LOCAL, GRASSROOTS EFFORTS
- COORDINATED PARTNERSHIPS across segmented landscapes
- COMMUNITY-SUPPORTED GRAZING PROGRAMS
- Streamlined PERMITTING and state- or locally-represented TOOL KITS and RESOURCE ADVISORS
 - CalVTP and Revision (Prescribed Herbivory White Paper)
 - Prescribed and Targeted Grazing Guidance
 - UCANR/UCCE Advisors
 - ***NEW*** State Lands Grazing Packet Agreement
- WORKFORCE DEVELOPMENT
 - Grazing School of the West (501c3)
 - Internships, Woofing, Scholarships
 - Coordinated efforts to streamline and improve education and certification processes in California and federally
- LEGISLATION
 - ***NEW*** SB 675 (Limon 2023): Prescribed grazing: local assistance grant program: Wildfire and Forest Resilience Task Force.
 - AB 297 (Fong 2023): Wildfires: local assistance grant program: prescribed grazing: advance payments.



OPPORTUNITIES

**PUBLIC & AGENCY
SUPPORT &
RESISTANCE
INFRASTRUCTURE
CONSTRAINTS
UNDER-FUNDED
UNDER-STAFFED**

ONGOING NEEDS

- Funding
- **Resources**
- Expertise
- **Practitioners**
- Collaborative and Open Partners
- **Address institutional and treatment constraints**
- Education across emergency response and landscape management fields

An aerial photograph showing a large flock of sheep grazing on a dry, hilly landscape. The sheep are scattered across the slope, which is covered in dry grass and some small shrubs. The background shows a dense forest of trees.

CONCLUSION

Prescribed grazing is an effective management tool for:

- reducing fire fuels
- sequestering invasive species
- supporting resilient watersheds
- maintaining biodiversity
- creating and maintaining native wildlife and plant habitat

Success of grazing prescription treatments will require collaborative planning with livestock operators, science-based monitoring and adaptive management with clear goals.

Studies that incorporate site- and species-specific research would help to better understand effects of specific grazing activities in various contexts, climates, and ecosystems.

Cole Bush
Grazing School of the West
Shepherdess Land & Livestock Co
grazingschoolofthewest.com
shepherdesslandl.co
bcb@shepherdesslandl.co

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Citations & Resources

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- Andrews, P.L., 2011. How to generate and interpret fire characteristics charts for surface and crown fire behavior (No. 253). US Department of Agriculture, Forest Service, Rocky Mountain Research Station.
<https://www.researchgate.net/publication/265527478> How to Generate and Interpret Fire Characteristics Charts for Surface and Crown Fire Behavior
- Foss, R.H., M.W. Shapero, S.L. Dewees, J.W. Stackhouse, L.N. Quinn-Davidson, and L.T. Macauley. *In prep.* Grassland Biomass Thresholds Critical to Fire Behavior and Land Management in California. Available by request.
- Ingram, R.S., M.P. Doran, and G. Nader. 2013. Planned herbivory in the management of wildfire fuels. *Herbivory*, pp.61-76.

Legislation:

- **SB-675 Prescribed grazing: local assistance grant program: Wildfire and Forest Resilience Task Force.**(2023-2024)
https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202320240SB675
- **AB-297 Wildfires: local assistance grant program: prescribed grazing: advance payments.**(2023-2024)
https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202320240AB297
- **PUBLIC RESOURCES CODE Section 741**
https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=PRC§ionNum=741.

Other Resources:

- Roche, L. M., D.K. Macon. 2025. Expanding prescribed grazing for wildfire resilience in California: A Brief on opportunities and strategies for strengthening wildfire preparedness and resilience efforts. DOI:10.13140/RG.2.2.27987.69927/1
- **SRM-RMAC Prescribed Grazing Symposium Supplementary Resources:** <https://calfire.box.com/s/vb9fxjvki4t3iroubssdesy9cifxtqci>
- **RMAC Webpage:** <https://bof.fire.ca.gov/board-committees/range-management-advisory-committee/>