Livestock Grazing & Fuels

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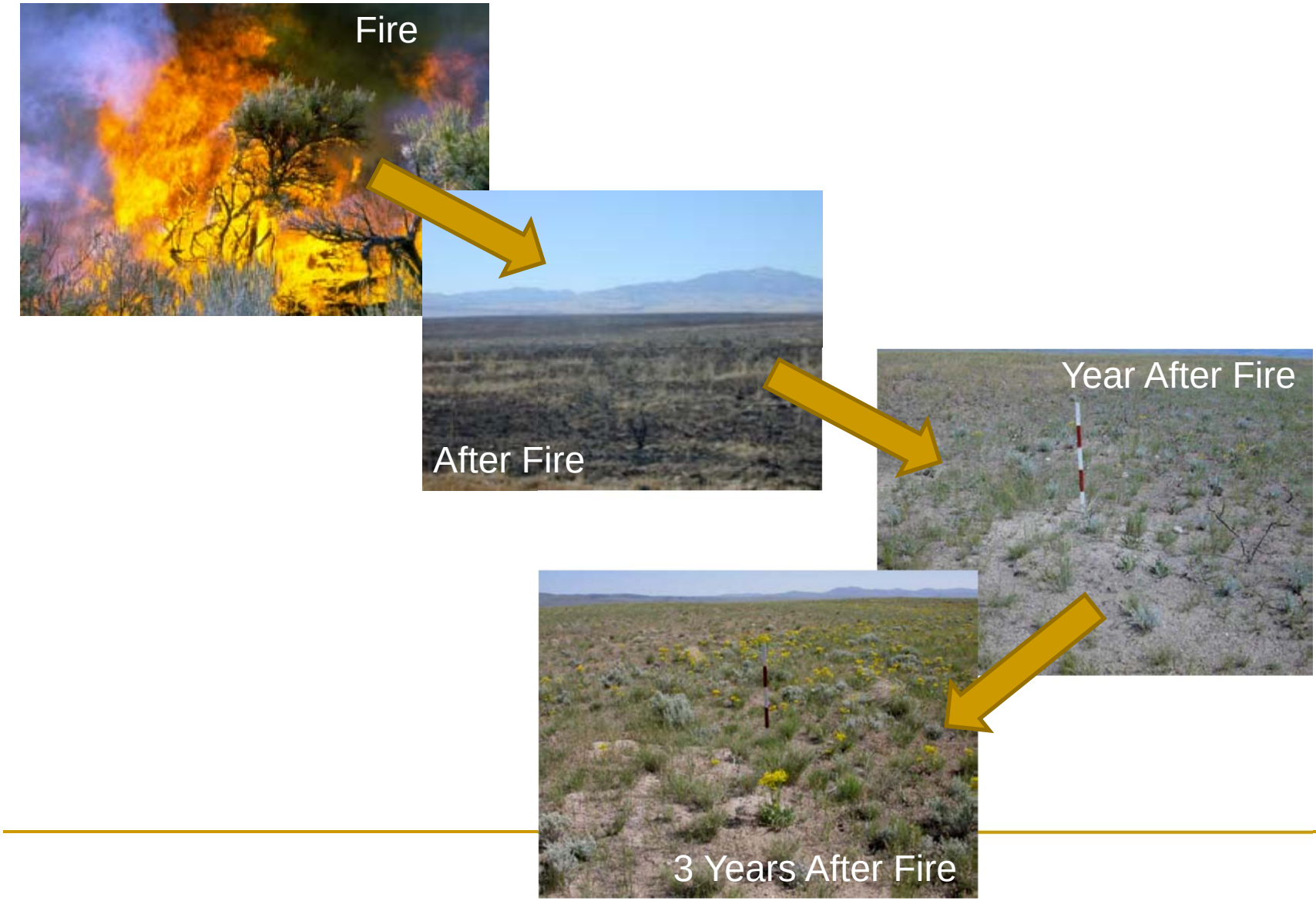
Grazing Management Decisions

- **Historic & Modern** Livestock Grazing Regime

- Grazing Management **Before** fire
  - Good Grazing Management
  - Targeted Grazing Strategies

- Grazing Management **After** fire
  - Delay of grazing after fire
  - Role of grazing in revegetation

Historic Interactions



Rangeland Response

Increased Herbaceous Biomass after fire

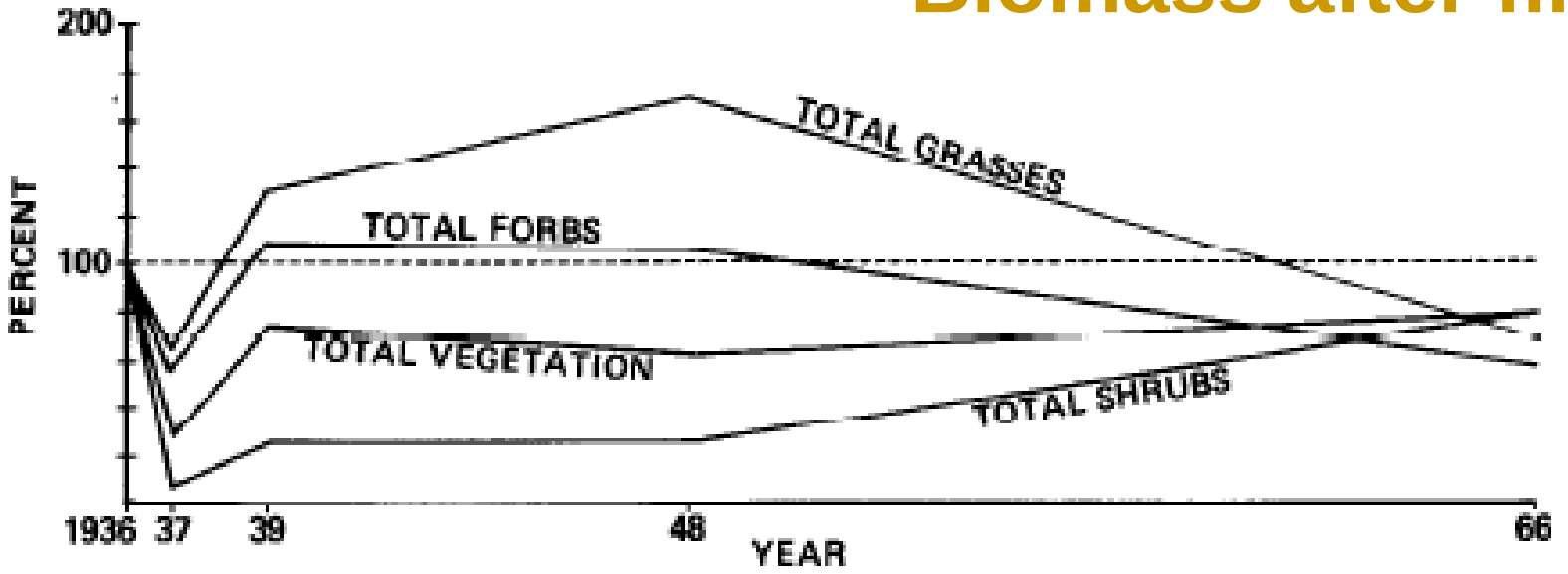


Fig. 1. *Trends of species classes on a planned burn near Dubois, Ida., 1936–1966. Values on burned plots are adjusted for the natural variation between years.*

(Harniss and Murray 1973)

Rangeland Response

Grasses vary in response

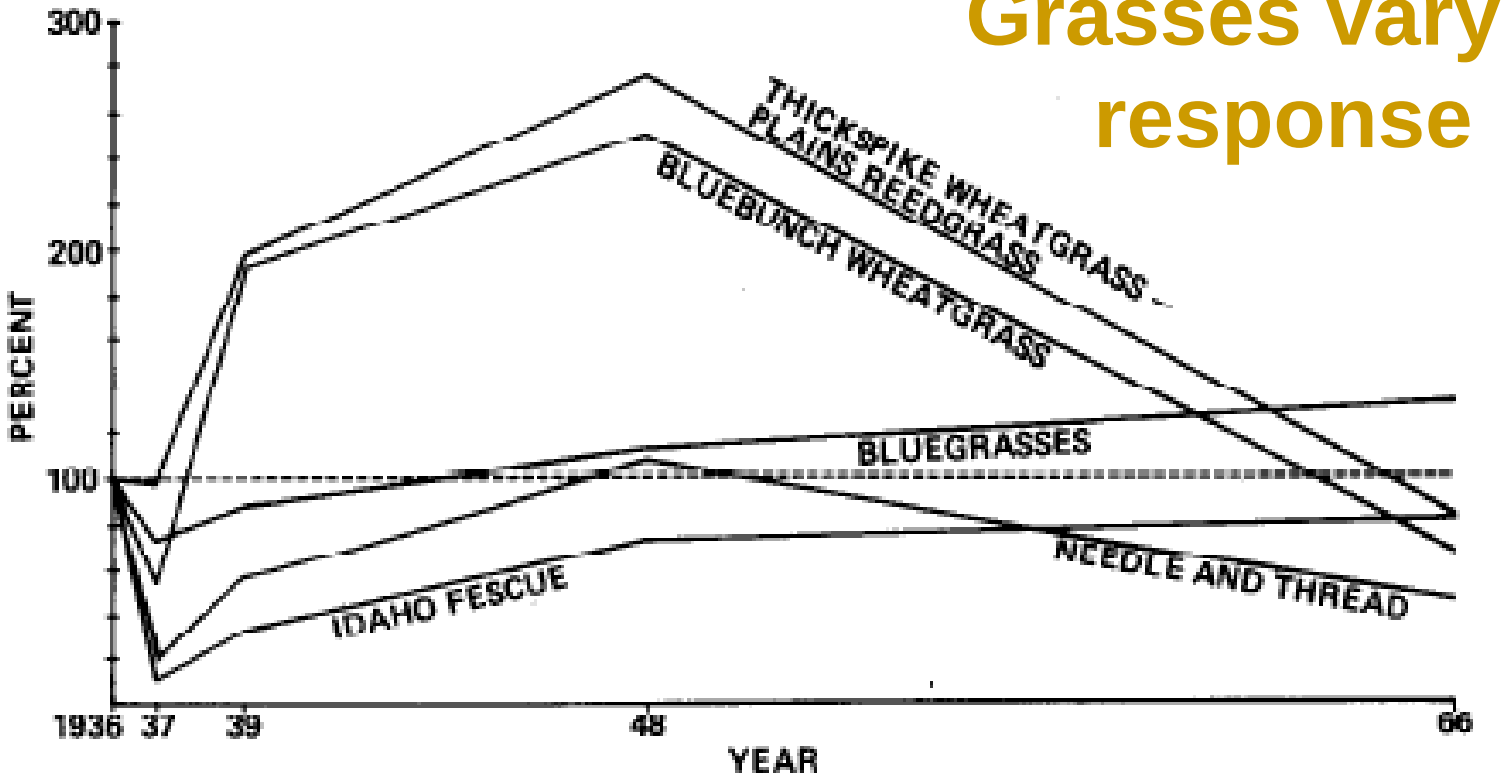


Fig. 2. *Trends of important grass species on a planned burn near Dubois, Ida., 1936–1966. Values are adjusted for the natural variation (a) between burned and unburned plots and (b) between years.*

(Harniss and Murray 1973)

Historic Interactions

Shrubs response after fire

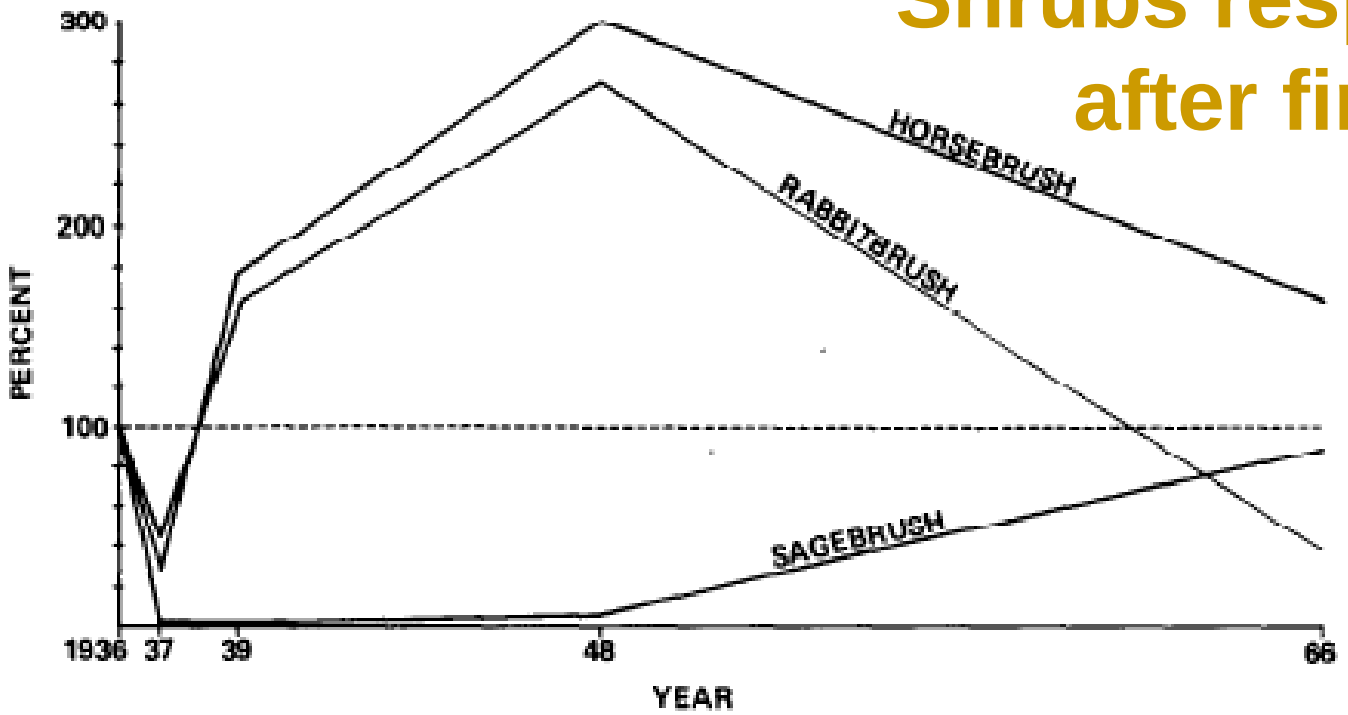
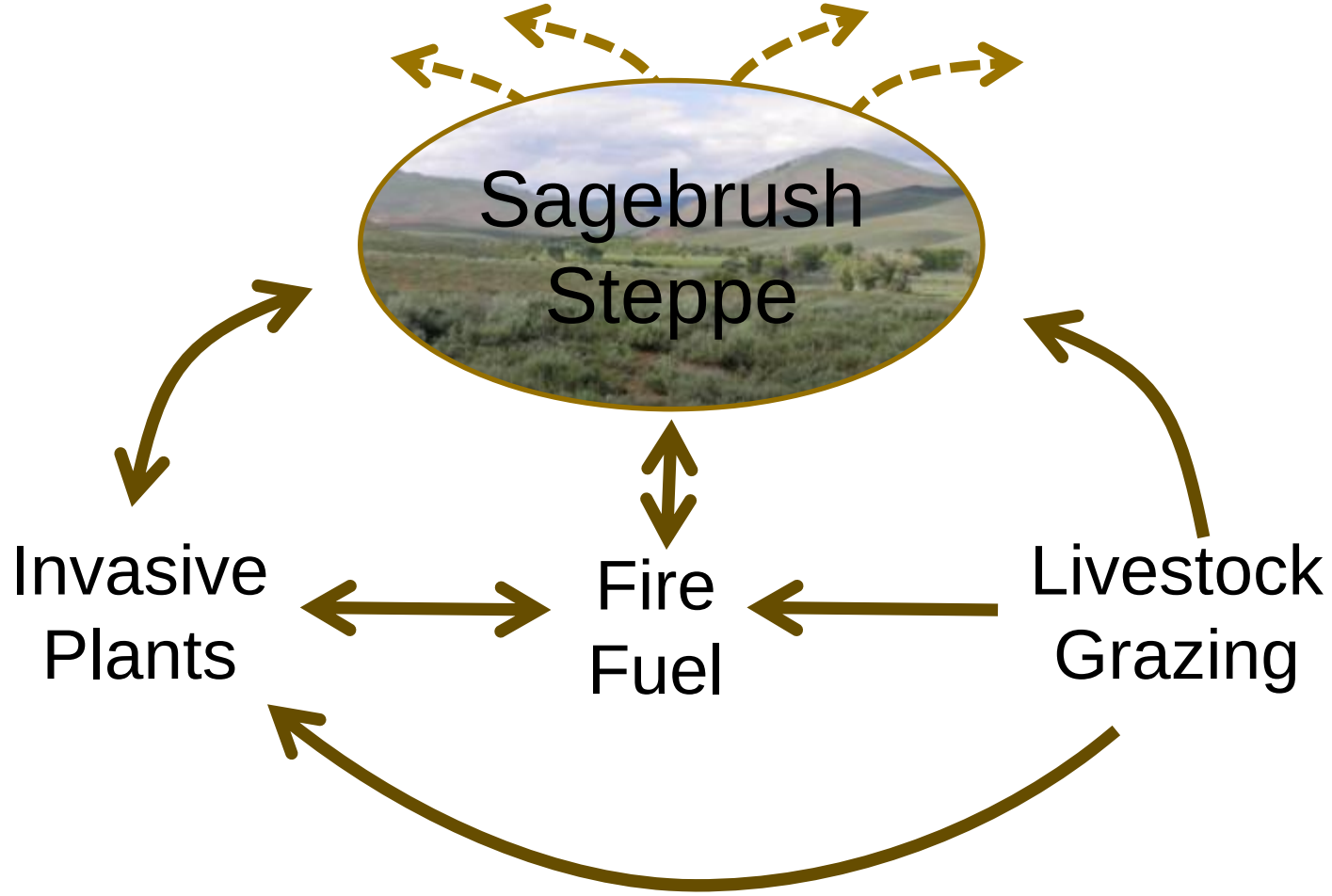


Fig. 3. *Trend of important shrub species on a planned burn area near Dubois, Ida., 1936–1966. Values are adjusted for the natural variation (a) between burned and unburned plots and (b) between years.*

(Harniss and Murray 1973)

Where Grazing Fits In



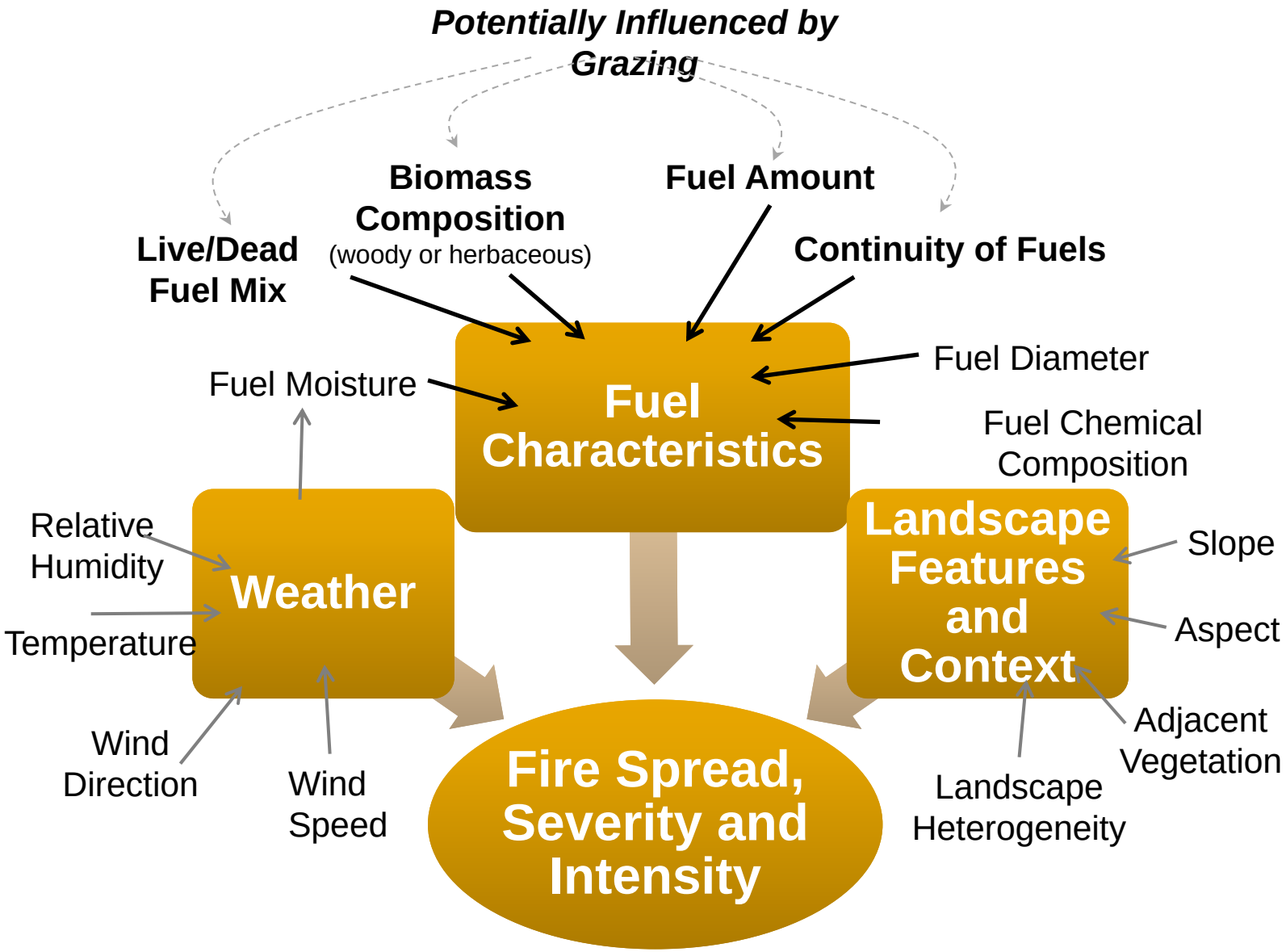
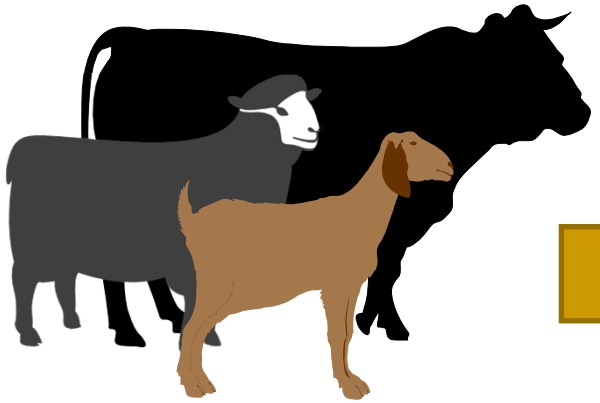

Potentially Influenced by Grazing
Biomass Composition
(woody or herbaceous)
Fuel Amount
Live/Dead Fuel Mix
Continuity of Fuels
Fuel Diameter
Fuel Moisture
Fuel Characteristics
Fuel Chemical Composition
Relative Humidity
Weather
Landscape Features and Context
Slope
Temperature
Aspect
Wind Direction
Wind Speed
Fire Spread, Severity and Intensity
Landscape Heterogeneity
Adjacent Vegetation

Figure 1.

Where Grazing Fits In



Reduce Fuel Loads

Grazing → *Fire/Fuel*

- Grazing Affects Fire Behavior
  - Perimeter or Extent
  - Intensity
  - Patchiness
  - Flame Length

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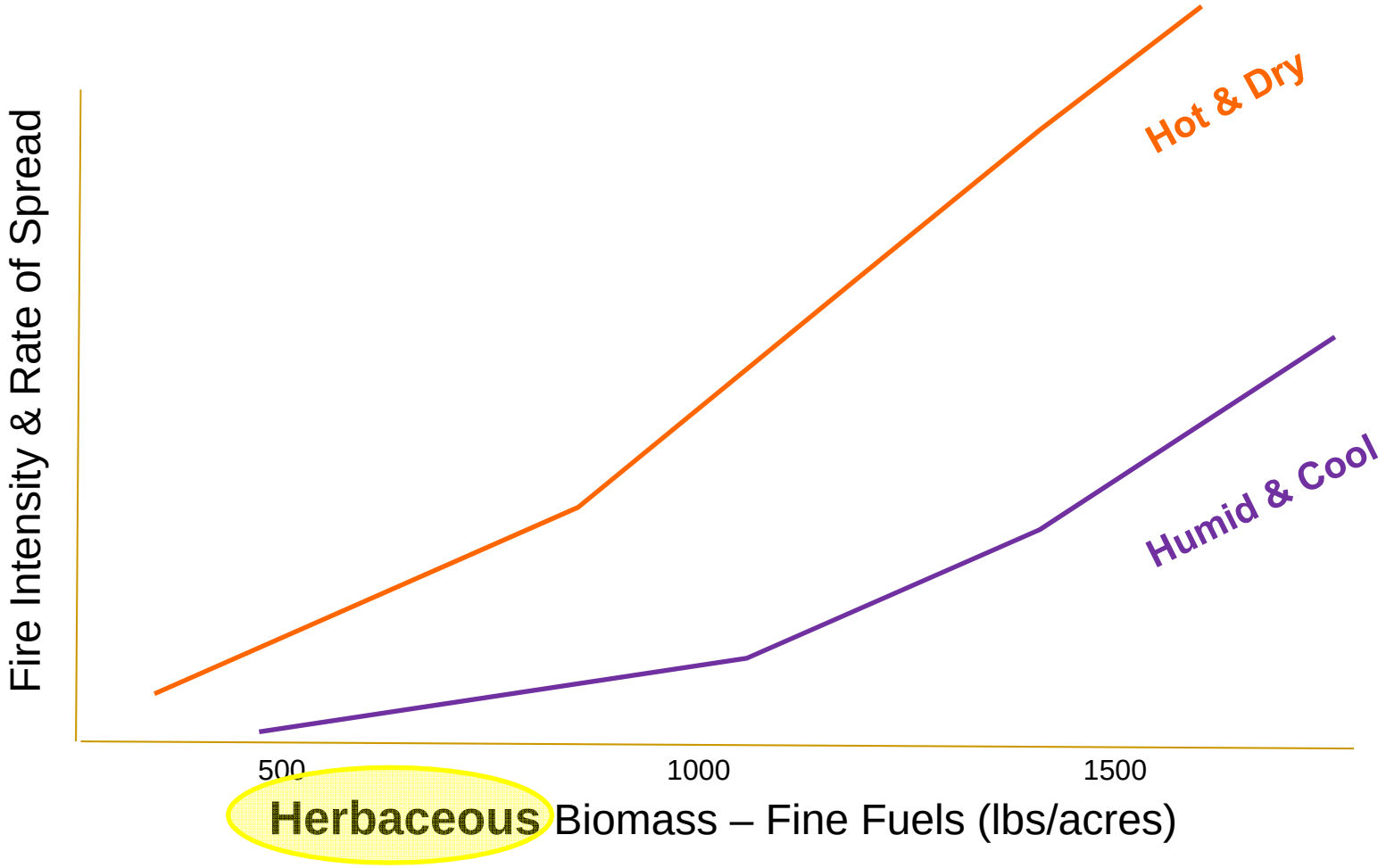
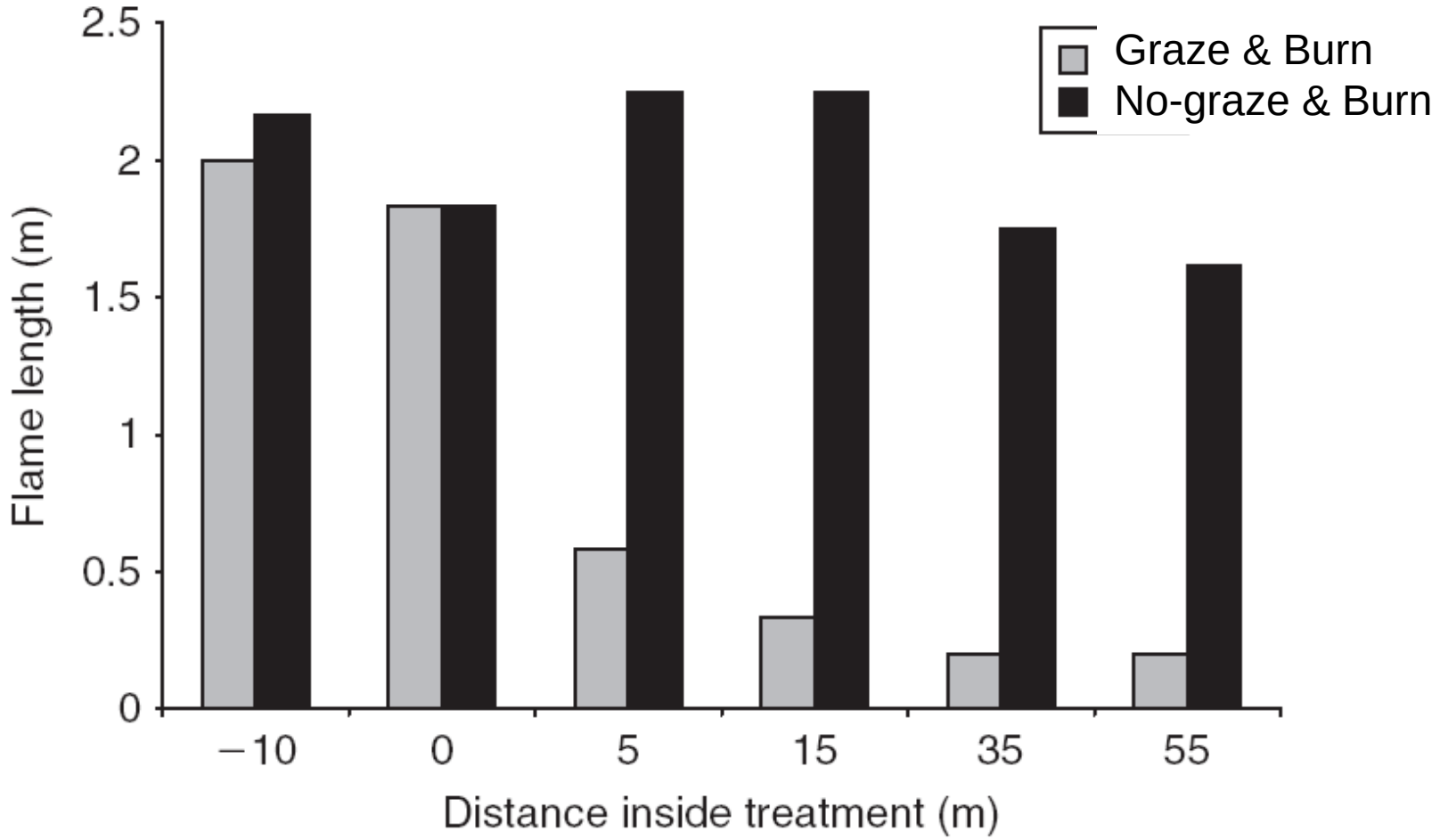
Risk or Potential?

Where Grazing Fits In



Grazing Affects Flame Length- Cheatgrass



(Diamond, Call & Devoe 2009)

Grazing Affect Fuel Accumulation

- Accumulation of litter
- Distribution of litter around perennial grass crowns
  - 3-fold accumulation
  - increased litter depth

Photos: Kirk Davies

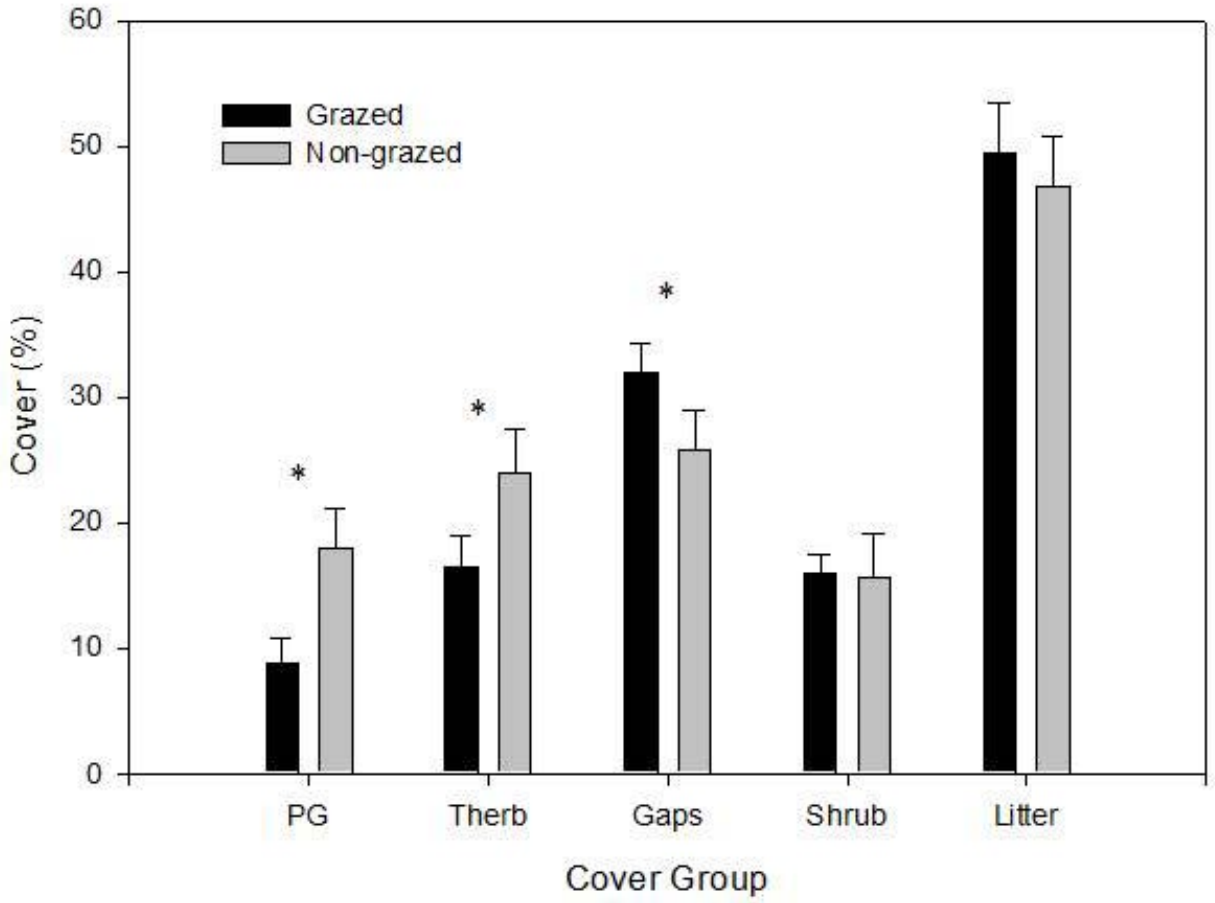
Methods: A.R.S. Burns, OR

- Exclosures erected 1936
- 8 exclosures compared to 8 moderately grazed adjacent areas
- Exclosures occurred in 8 different fields ranging from 100 to 2000 acres
- Moderately grazed = 40-50% utilization, rotational grazing
- Measured fine fuel accumulations, continuity, and heights
- Sampled prior to grazing that year

Davies et al.

Results: Cover

(current & previous years' growth)



PG = Perennial Grass

Therb = Total Herbaceous

Gaps = Fuel Gaps

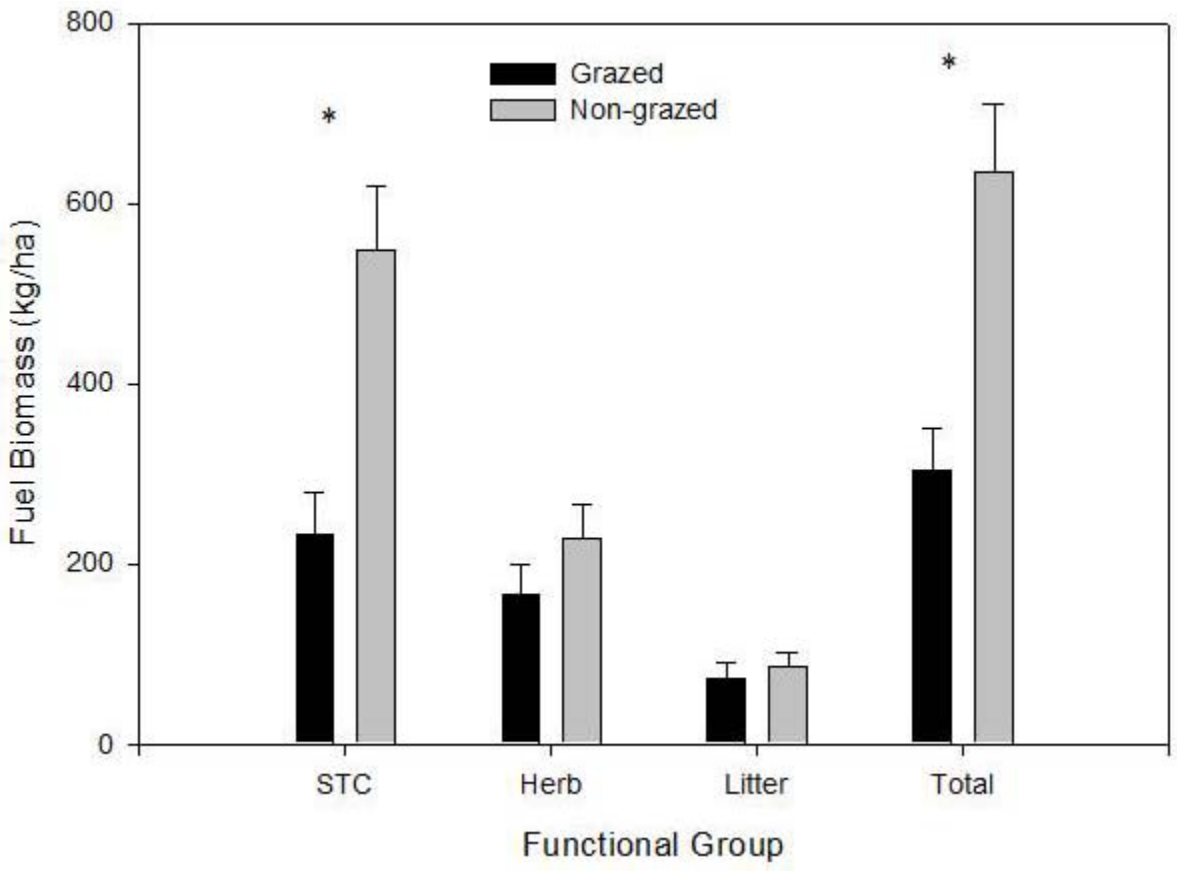
Shrub = Sagebrush & Rabbitbrush

Litter = litter on the ground

Grazed plots had less Per Grass, less Tot Herb, more Gaps

Davies et al.

Results: Accumulations



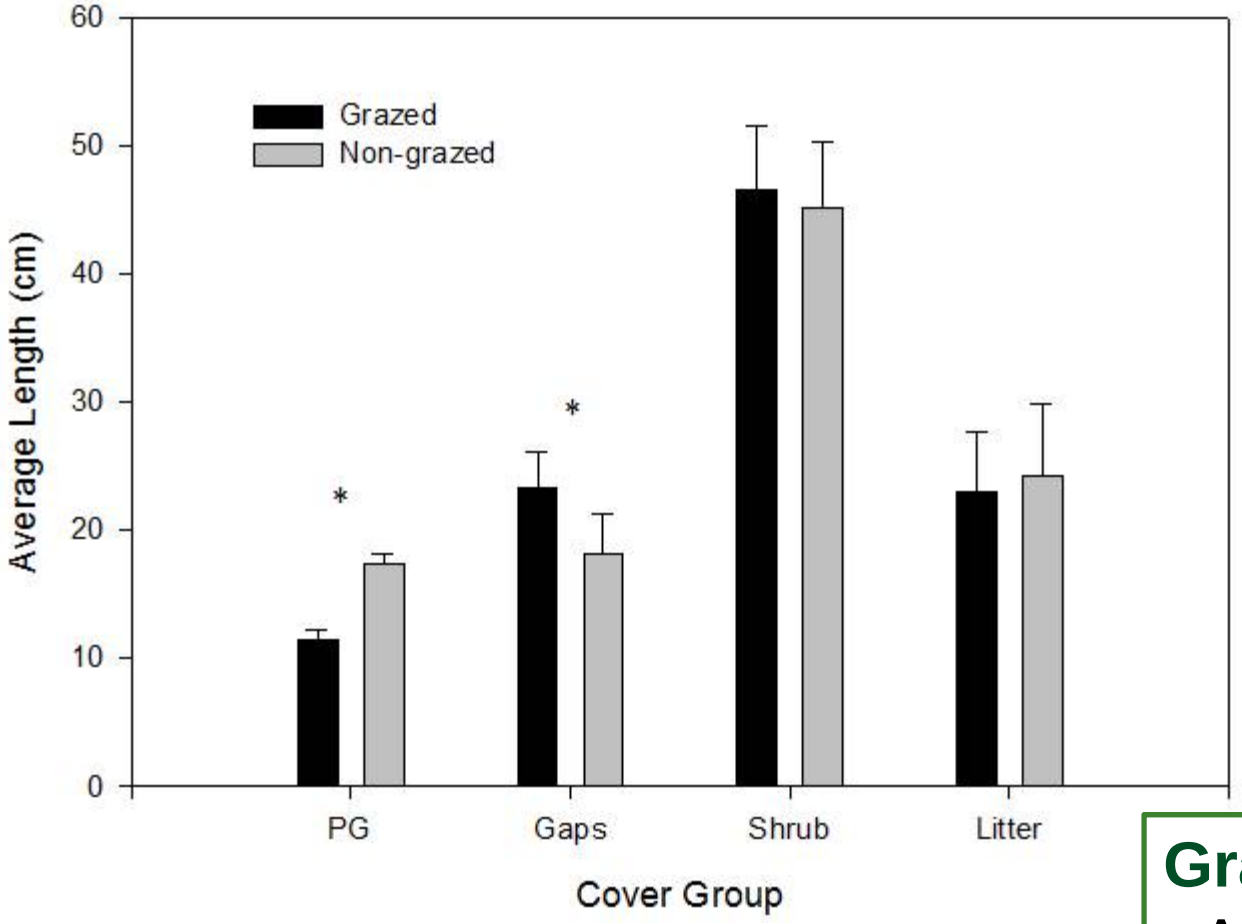
STC = standing crop (current and previous years vegetation that is erect)

Herb = Living herbaceous vegetation

Litter = ground litter

Davies et al.

Results: Fuel Continuity



Grazing Affects

- Amount Herb Fuel
- Fuel Continuity

Davies et al.

Results: Fuel Continuity

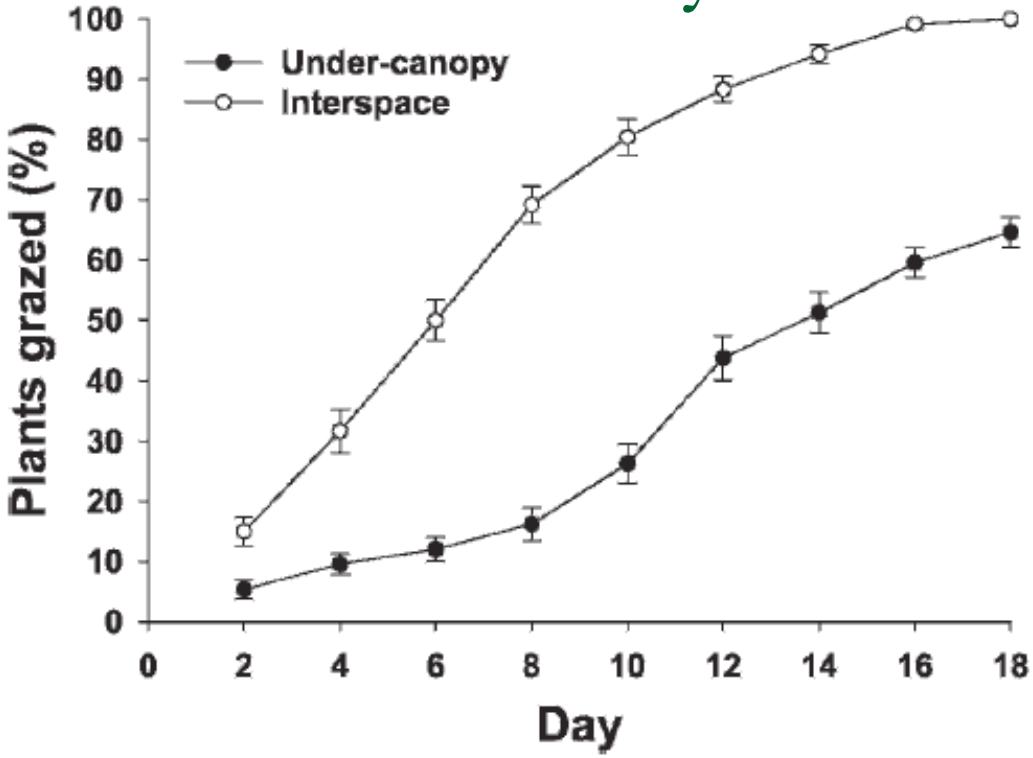


Figure 2. Percent of interspace and undercanopy grass tussocks grazed as cattle progressively utilized herbage in a study documenting forage-selection patterns in sagebrush/steppe vegetation near Foster Flat, Oregon in 2003 and 2004 (displayed data combined across years).

Cattle eat plants between shrubs first.
Does this change fuel continuity and fire behavior?

France et al. 2008

Grazing Can Affect Fire Behavior

Fire Modeling

USDA United States Department of Agriculture
Forest Service
Rocky Mountain Research Station

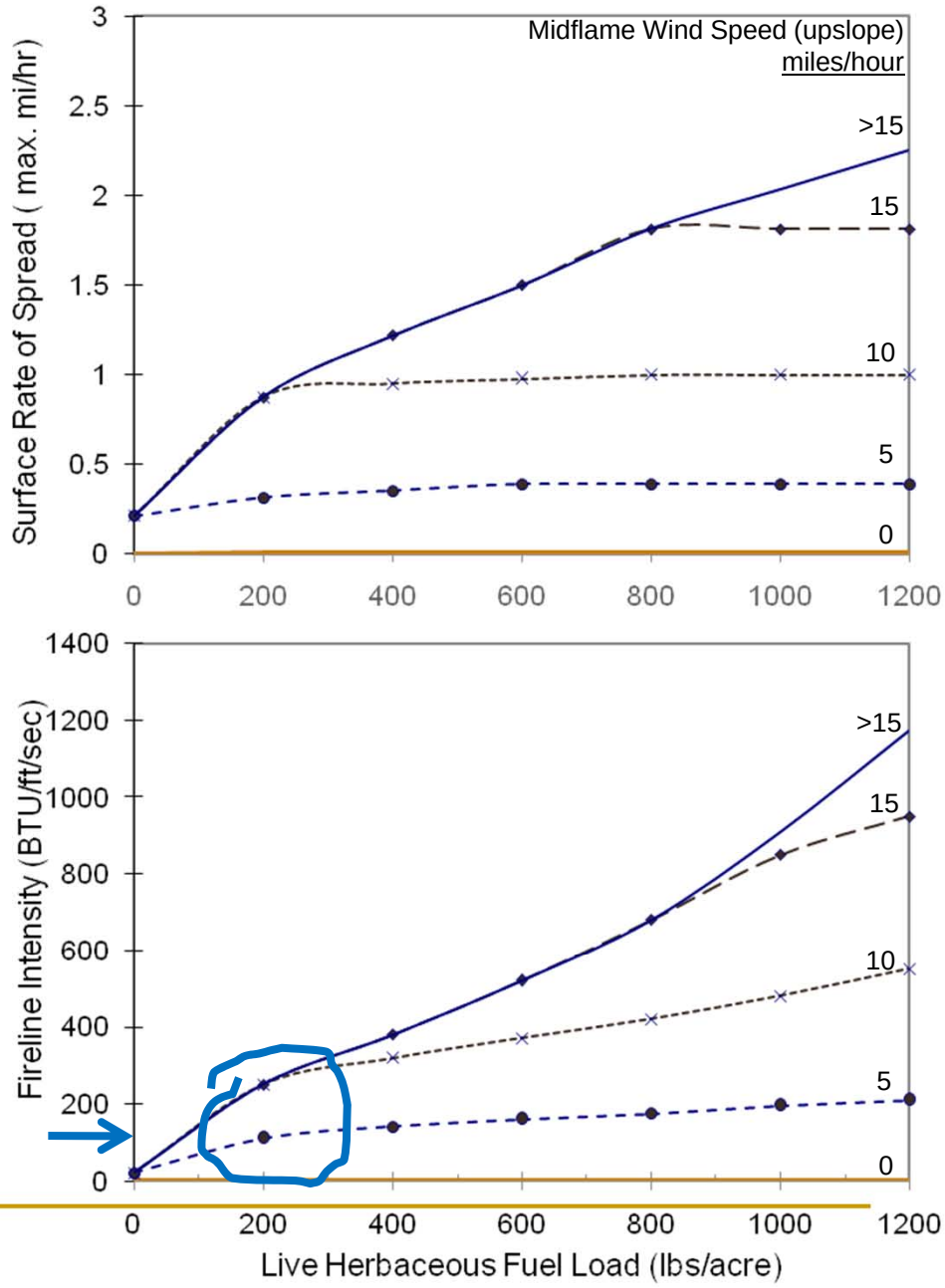
BehavePlus fire modeling system
Version 3.0

- Simulated grazing effects on fire behavior while incrementally reducing herbaceous fuel loading and holding other fuel and environmental factors constant.

Launchbaugh et al. 2008

Fire Behavior

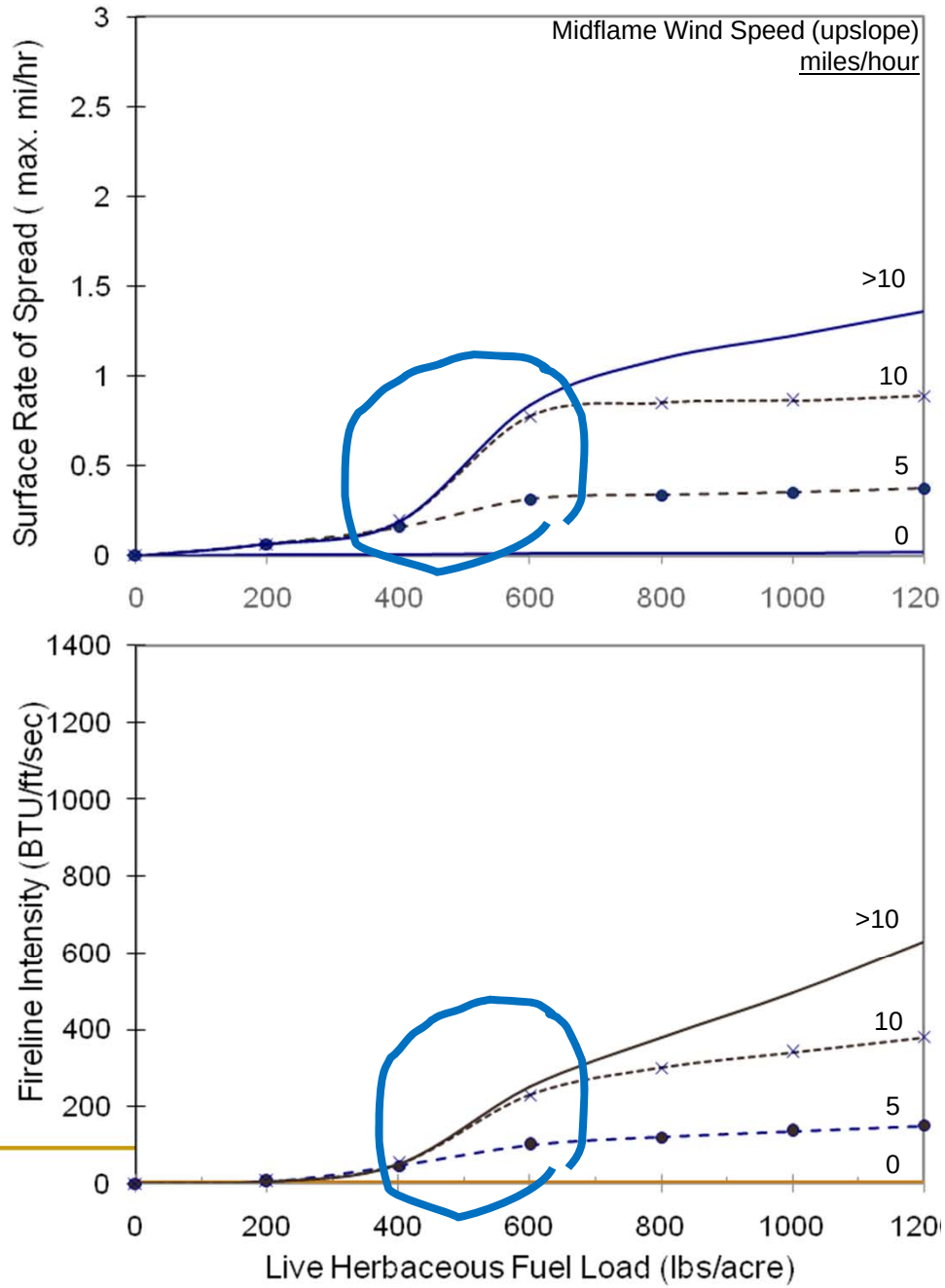
10% Dead Fuel Moisture



Sagebrush Steppe (GS1)

Fire Behavior

12% Dead Fuel Moisture



Sagebrush Steppe(GS1)

Fire Behavior

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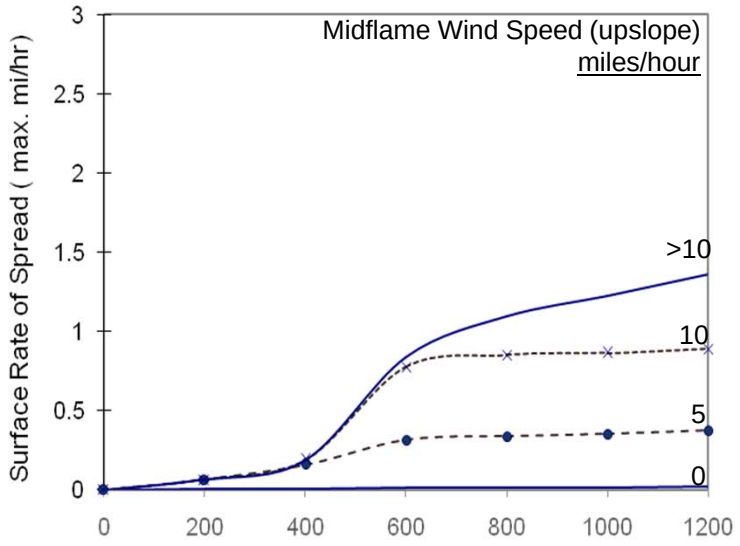
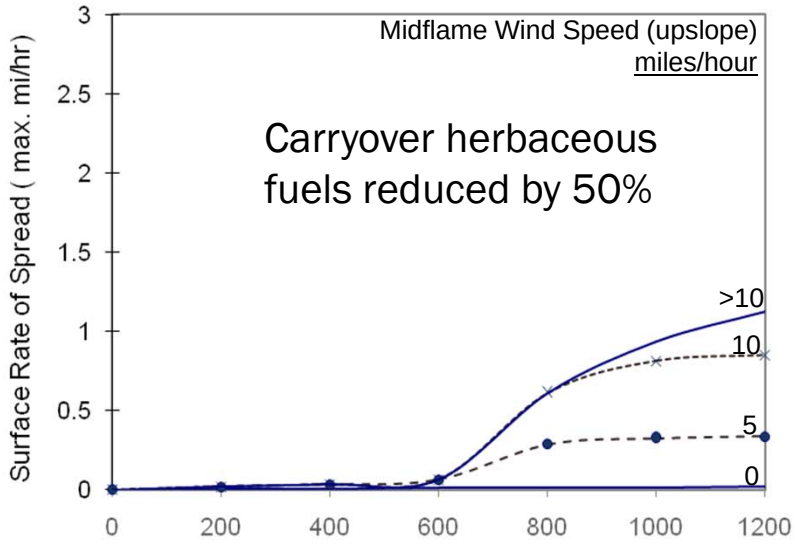
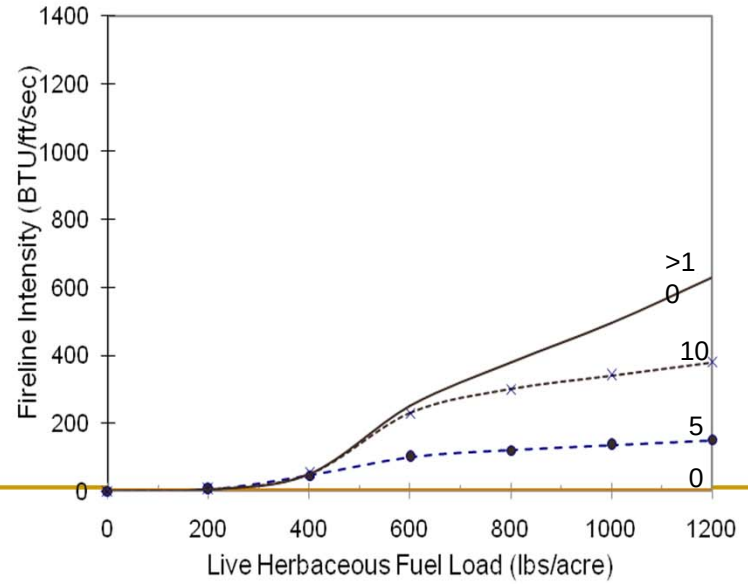
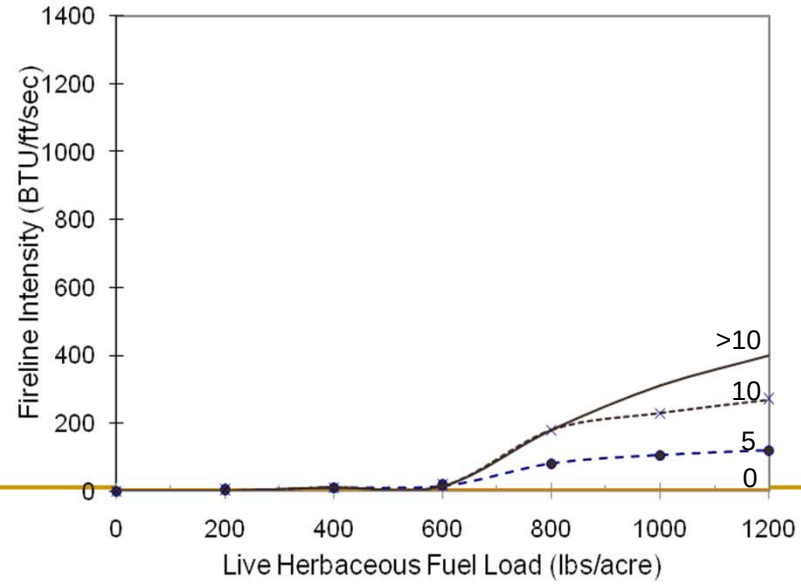








Grazing Can Affect Fire Behavior

Grazing Study in Hawaii

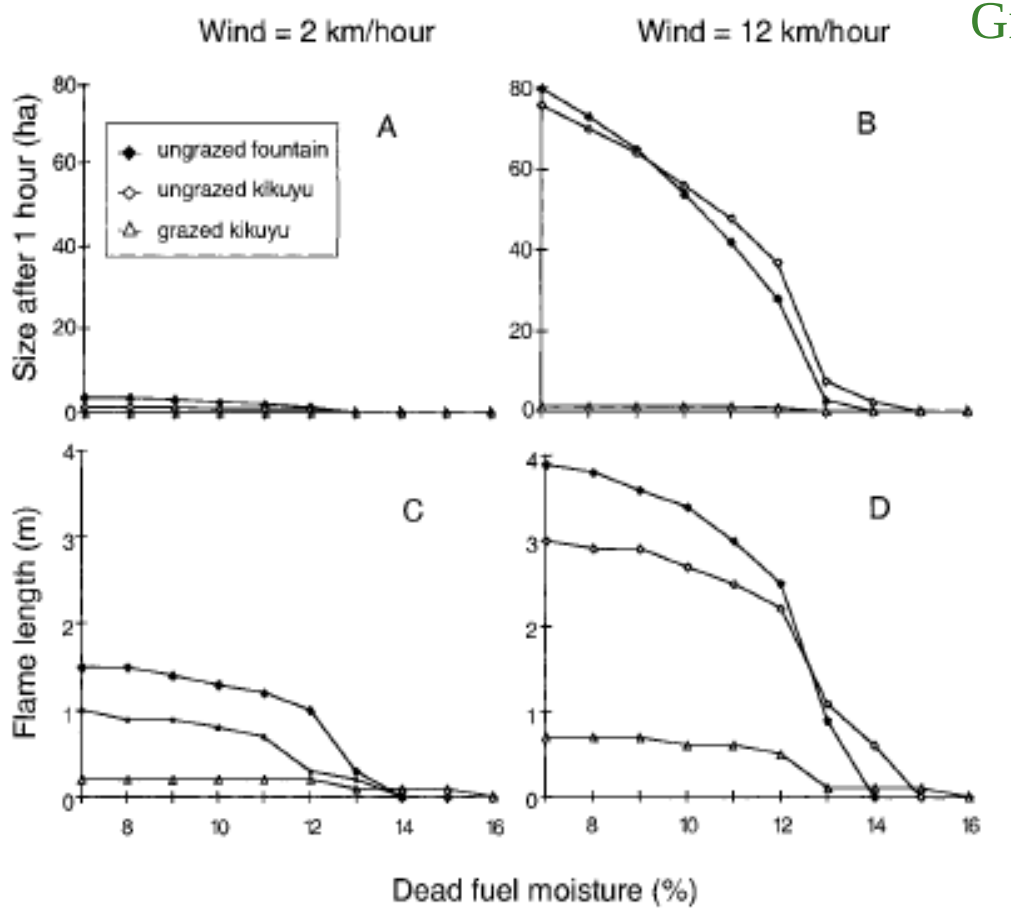


FIGURE 4. Rates of fire spread and fire intensity predicted by the BEHAVE model, using customized fuel models for grazed kikuyu at Pu'u Wā'aWa'a Ranch, Hawai'i. Predicted rates of spread (A, B) and flame lengths (C, D) are shown for a range of fuel moistures (water content of standing dead grass), at moderate (A, C) and high (B, D) wind speeds.

Blackmore & Vitousek 2000

Grazing Affects Fire Intensity

- Accumulation of litter affects fire characteristics.

Photos: Kirk Davies

Methods: Davies et al. (2009)

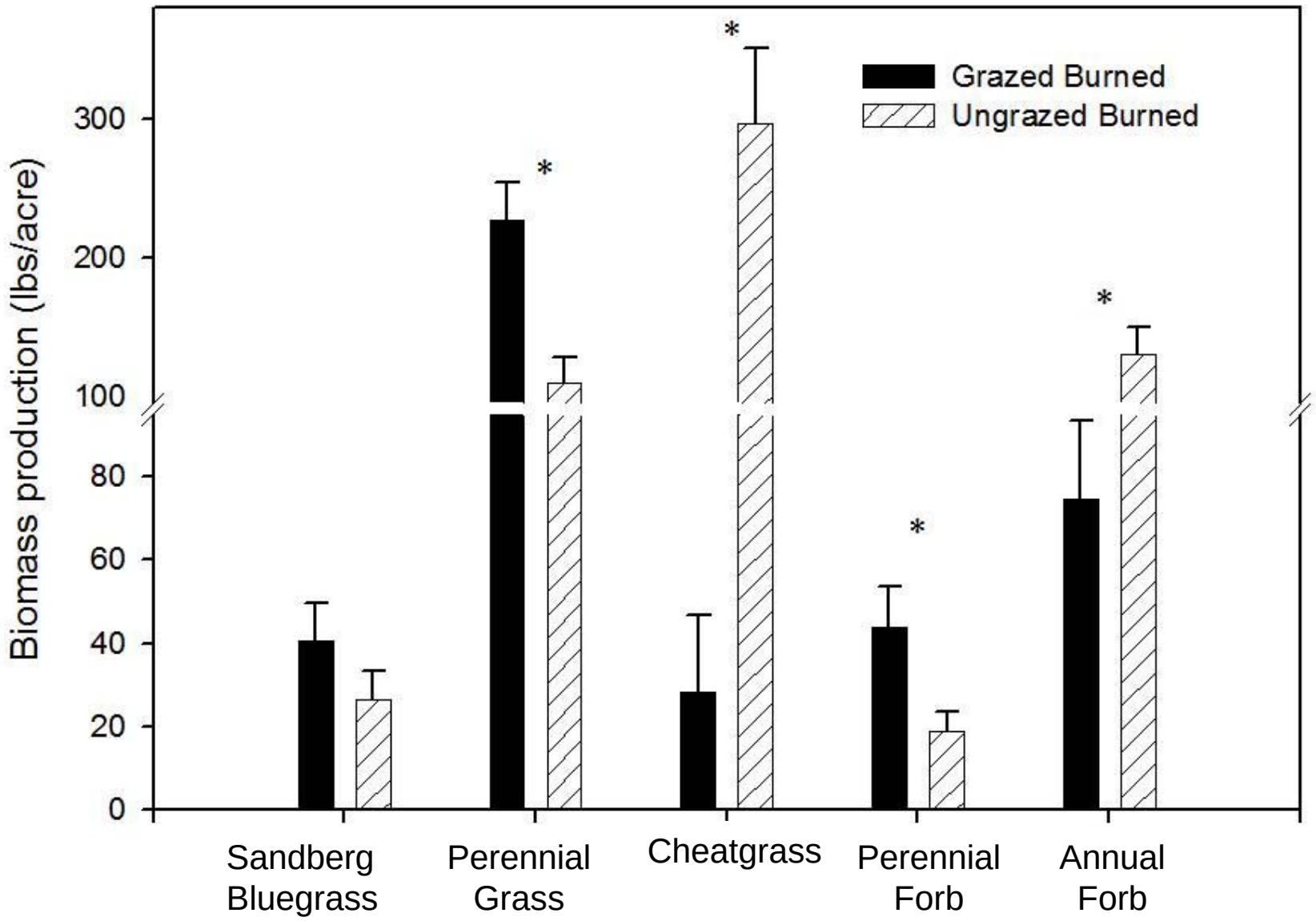
Treatments - 1) ungrazed unburned, 2) **ungrazed burned**, 3) grazed unburned, and 4) **grazed burned**.

- Treatments applied at 3 different sites
- Livestock exclosures erected 1936 - no difference in plant density
- Livestock grazing – moderate levels ~40% utilization

In 1992 and 1993 – plant cover, density, and biomass production were similar

However, litter biomass was almost 2-fold higher in exclosures

Burned fall 1993


Grazed Burned
Ungrazed Burned
Biomass production (lbs/acre)
0
20
40
60
80
100
200
300
*
*
*
*
Sandberg Bluegrass
Perennial Grass
Cheatgrass
Perennial Forb
Annual Forb

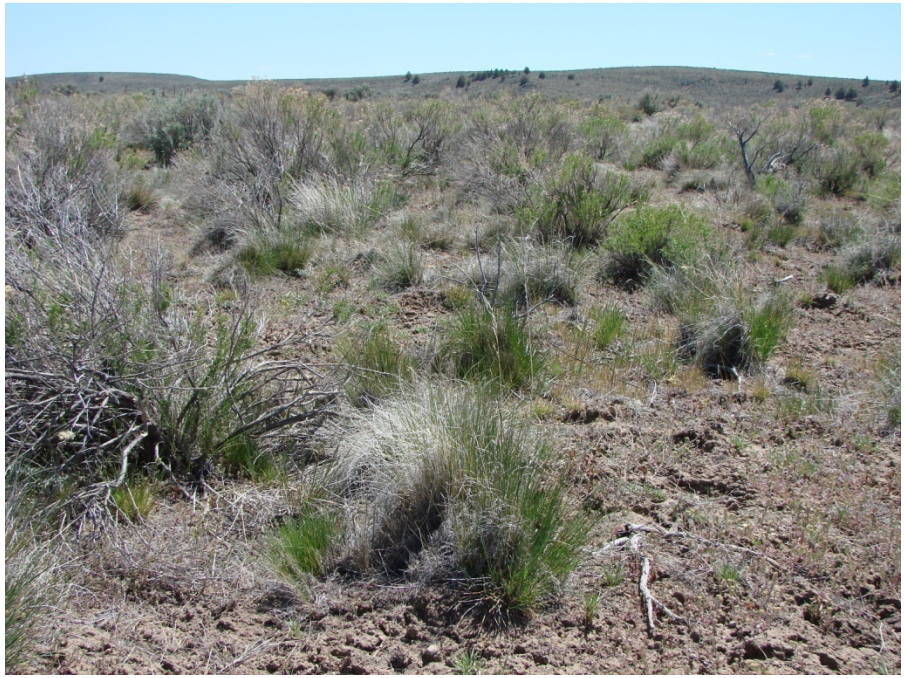
Davies et al.

Results

- Substantial cheatgrass invasion following fire in ungrazed areas (exclosures)
- Less perennial grasses in exclosures post-burning compared to moderately grazed treatment
- Few differences between **unburned** exclosures and **unburned** moderately grazed treatment

Davies et al.

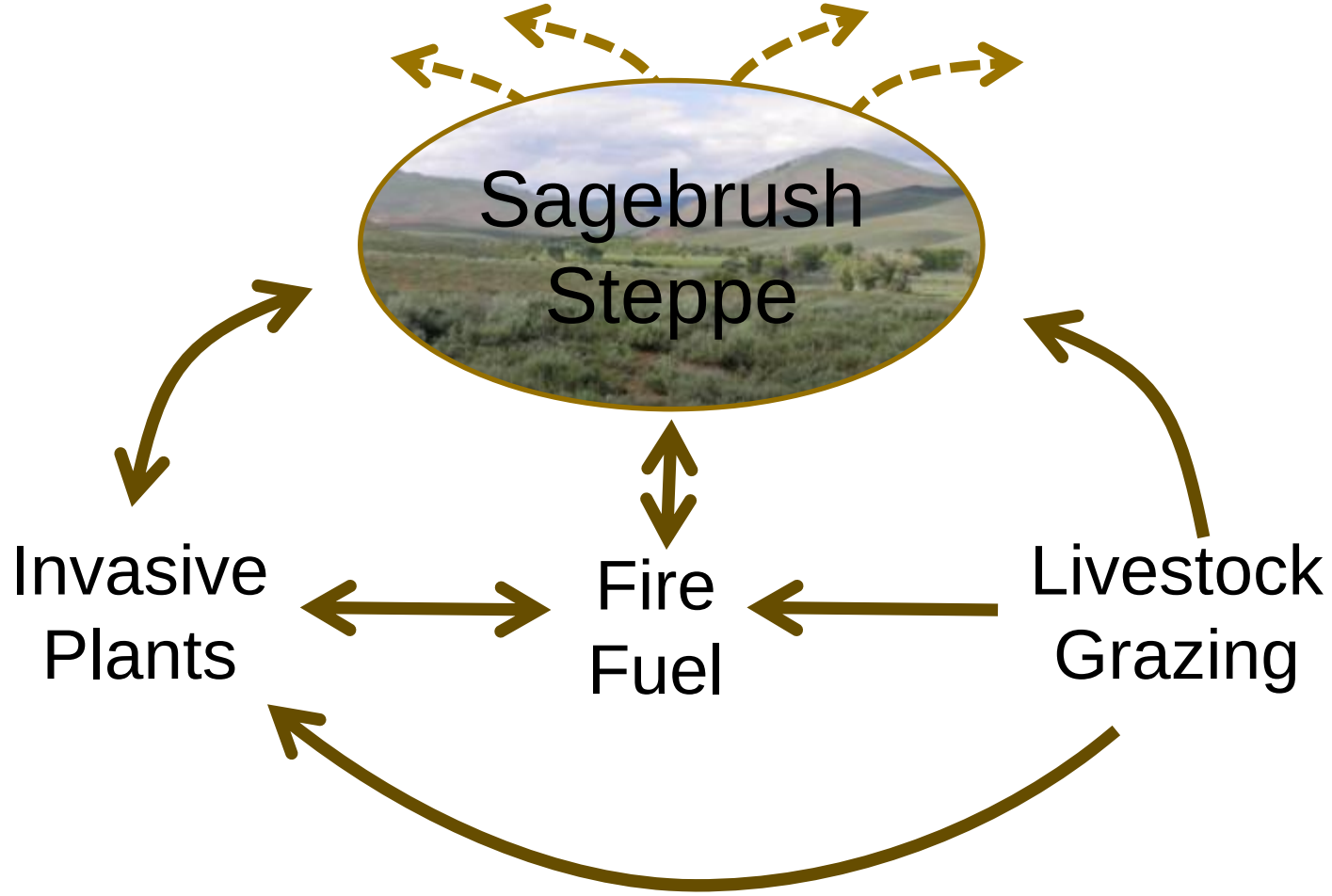
Grazed Burned 15 yrs post-fire



Ungrazed Burned 15 yrs post-fire

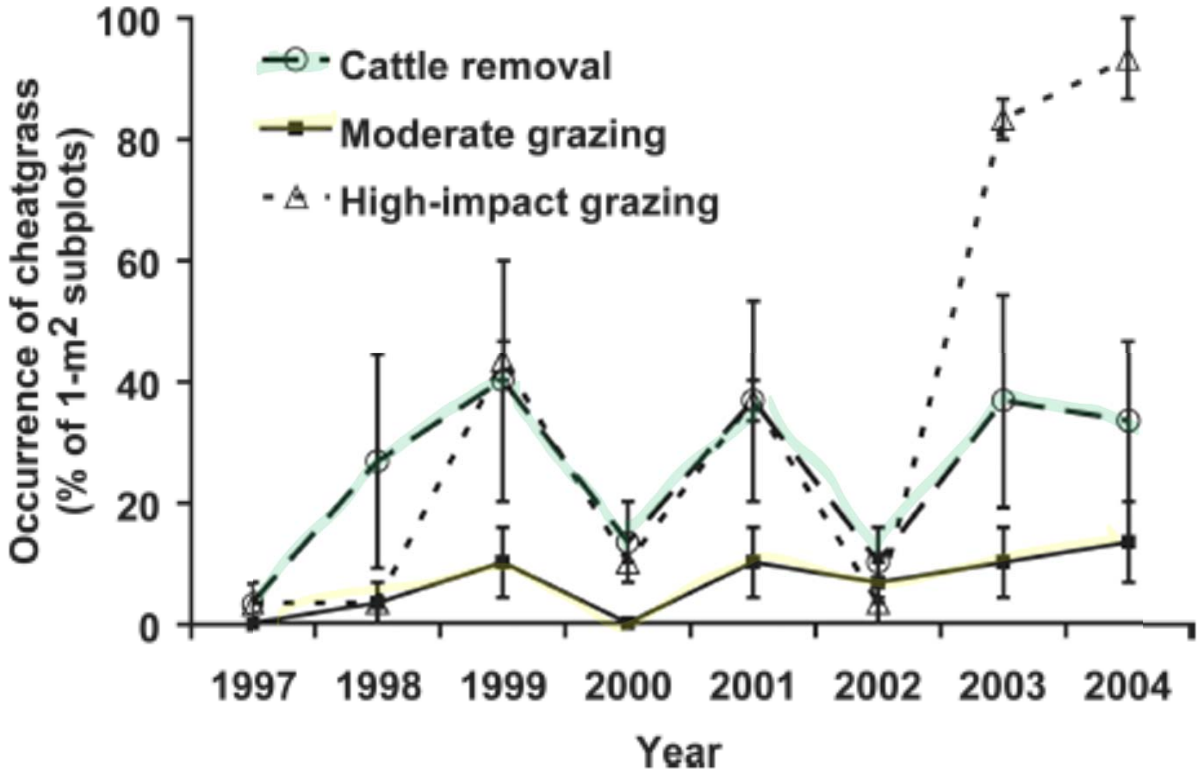
Davies et al.

Where Grazing Fits In



Grazing and Cheatgrass Abundance

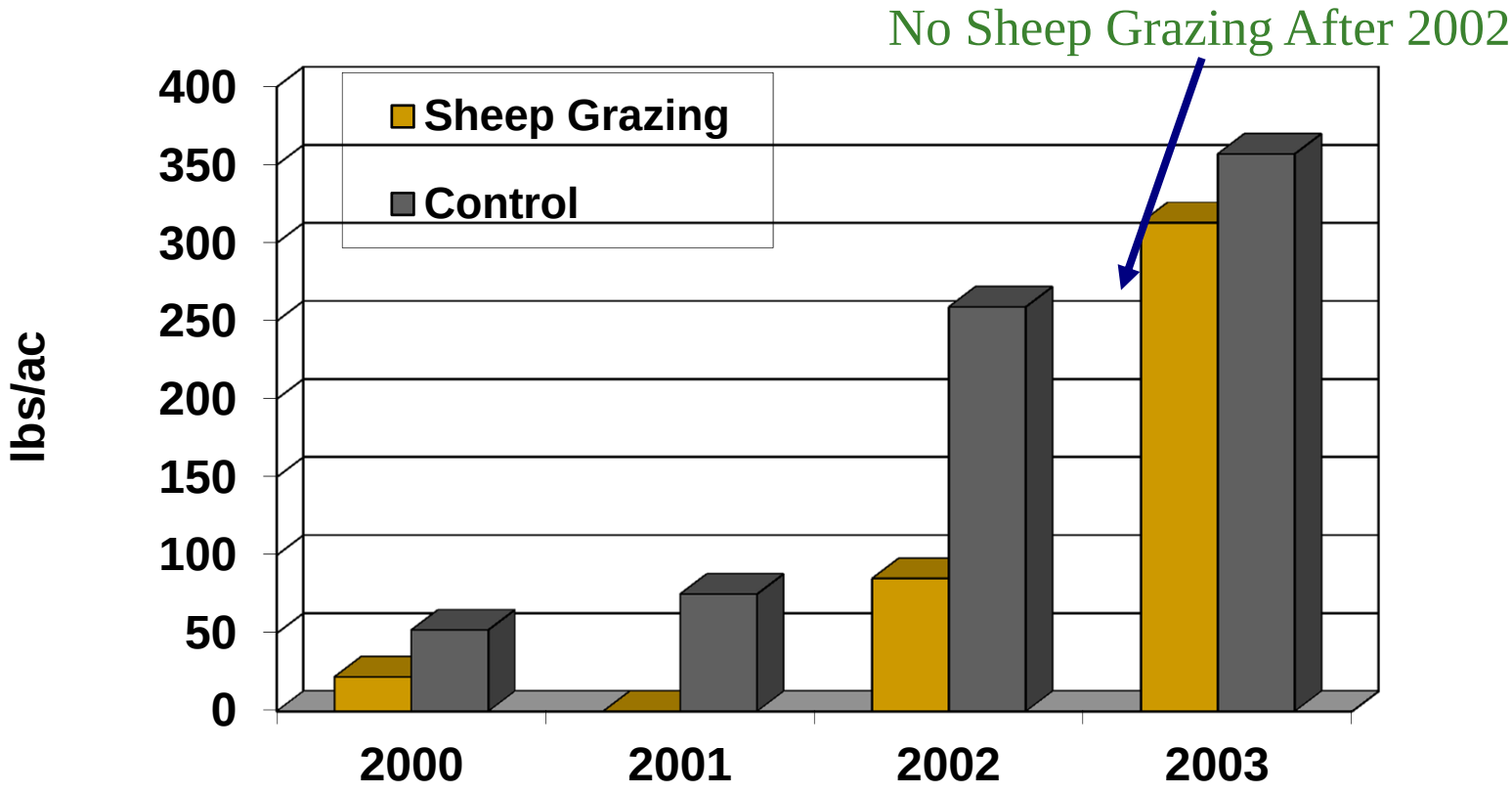
8-year Grazing Study in Northern Arizona



- Moderate grazing had less cheatgrass then no grazing
- Moderate grazing also had less cheatgrass than heavy "High Impact" grazing
- High Impact grazing caused a great increase in cheatgrass after drought year.

Loeser et al. 2007

Grazing → *Cheatgrass*



Early Spring Grazing can Reduce Cheatgrass

Davison et al. 2004

Grazing & Fuels

What do we really know?