Use of Fire for Rangeland Vegetation Management

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Considerations

- Goal
  - Weed management
  - Wildlife habitat
  - Forage production/quality
  - Cultural resources
- Fire regime
  - Fire frequency
  - Timing
  - Fire intensity
- Target species phenology
- Growth form of target species
- Non-target species
- Policy considerations

Permitted ranch burning in California 1945-1977

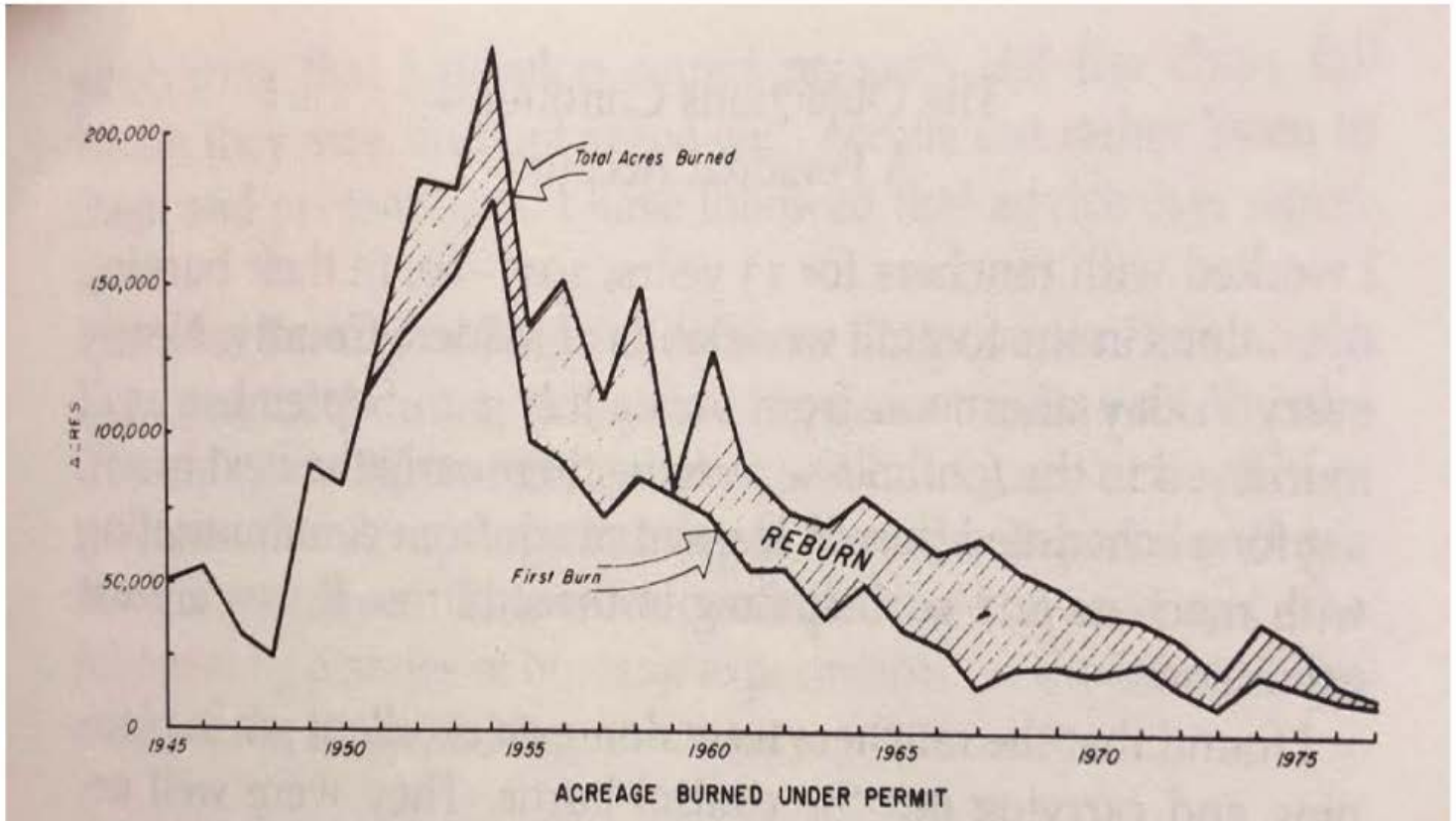
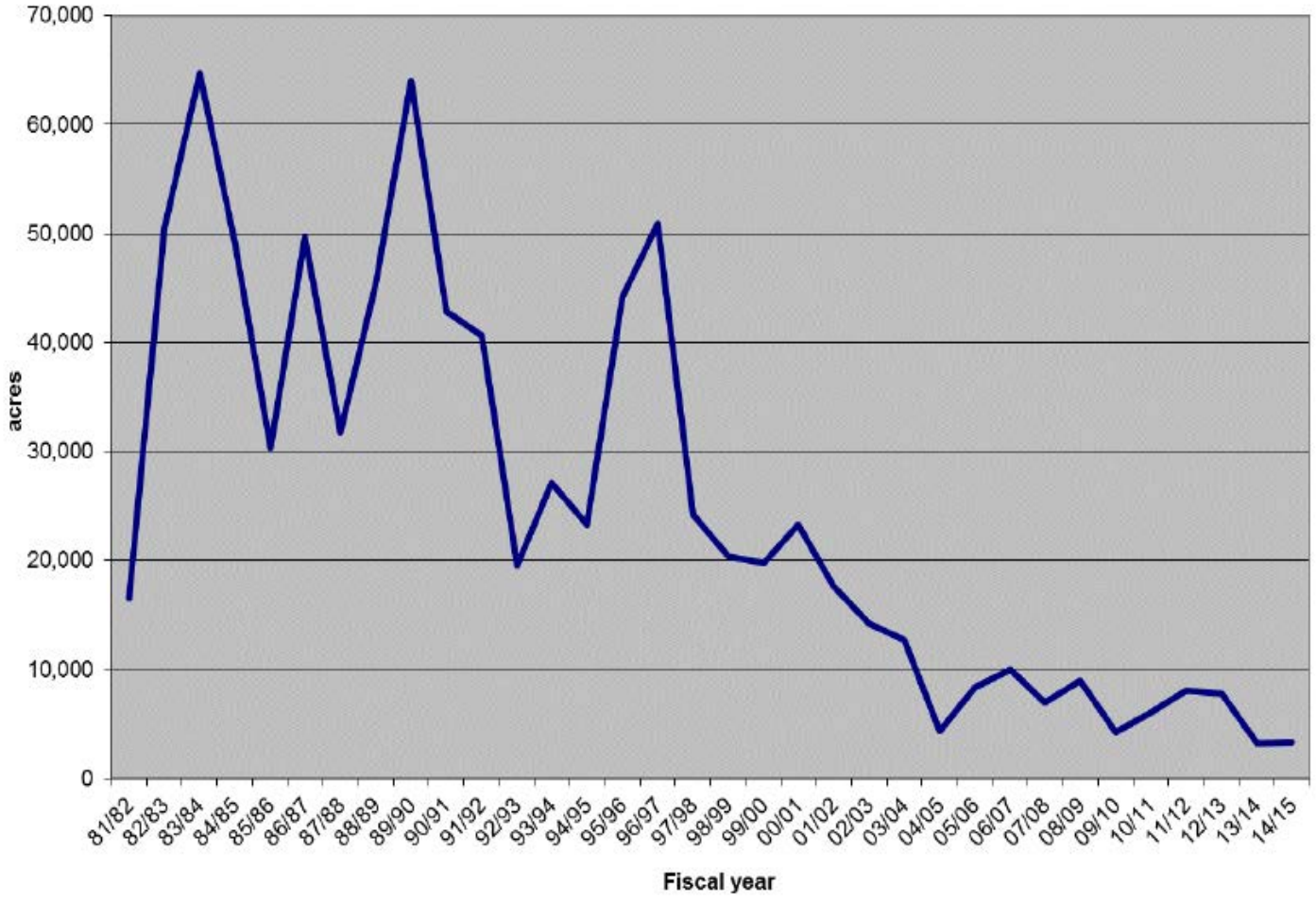


Figure 41. *Acreage burned by California ranchers under permit from 1945 to 1977 to reduce fire hazard and improve grazing for livestock and wildlife. (Graph from the California Department of Forestry.)*

Biswell 1999

- > Peak of more than 200,000 acres per year
- Gradual decline

VMP completed acres between 1981-2015

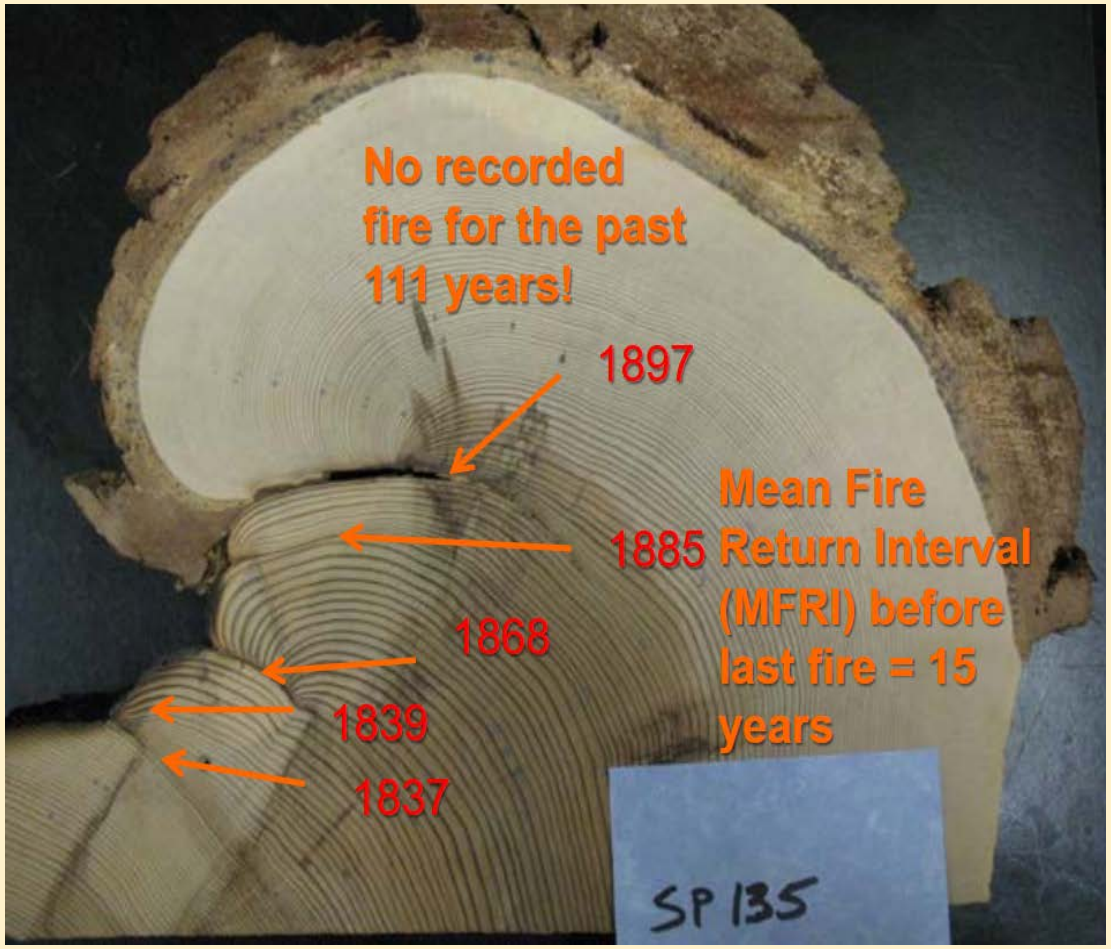


- Peak of 65,000 acres/acres
- <10,000 acres/year in last 15 years

Pic by: Brian Mattos

Historic Average Fire Return Interval (FRI)

Vegetation Type	Pre-1860 FRI	20th Century FRI
Foothill Hardwood and grasslands	10	78
Ponderosa Pine	4	192
Foothill Chaparral	30	-



"The whole fire issue in the US is one of bad habits and loose morals" Bernard Fernow

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

Lynn Huntsinger
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Changes in fire frequency

- Decrease
  - Fire suppression → Increased fuel load
  - Grazing intensity → reduced fuel load
- Increase
  - Introduction of non-native species
  - Eg cheatgrass in the western US → decline in native shrubs
  - Eg. Buffelgrass and lehman lovegrass in Sonoran desert →affecting desert succulents

Fire adapted ecosystems

- California plants Fire adapted
  - Tolerance to periodic fires (recovers)
  - Avoidance (e.g. matures early to avoid fire
  - Scarification e.g. lodgepole pine
  - Smoke

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Invasive Species

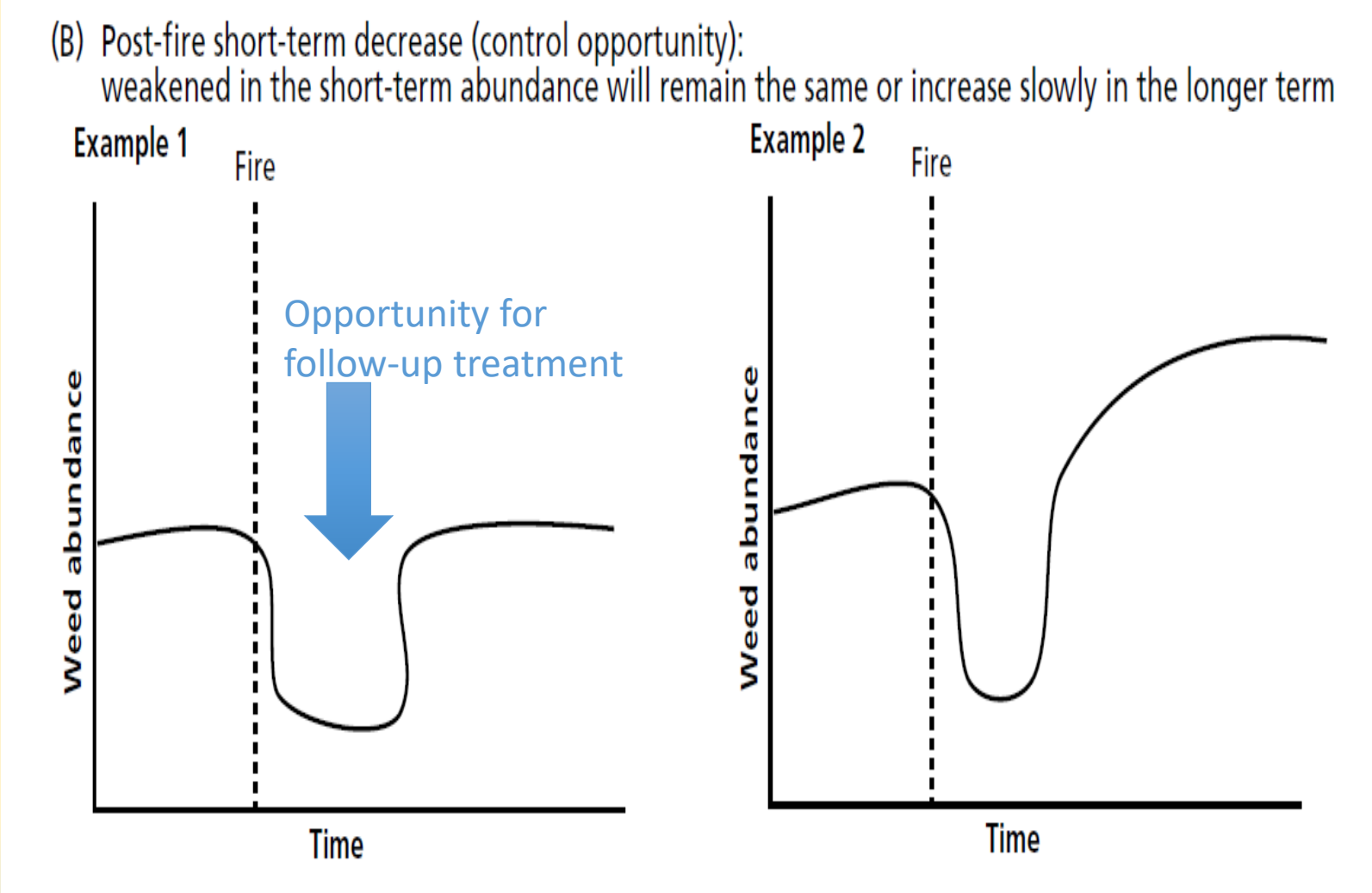
- Annual Grasses: medusahead, red brome, barb goatgrass
  - Most mature late

- Annual Forbs: yellow star thistle

Impact of fire

- Reduce seed production and seed bank
- Consumes thatch/biomass
- Reduced competition for desirable and perennial plants

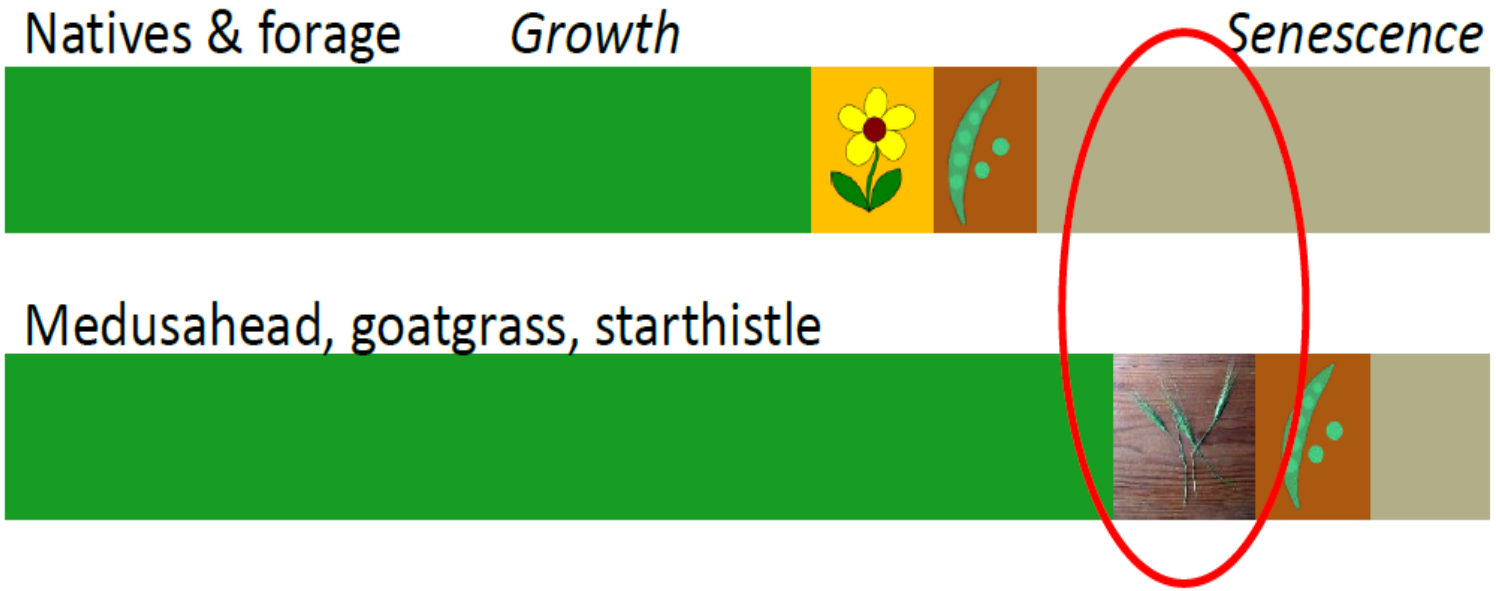
Potential weed/plant response to fire



- Different species respond differently
- Potential for follow-up treatment

Plant phenology and timing of Rx fire

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul



- Late spring to early summer
- Selectively affect invasives
- Enough fuel from desirable species
- Summer/fall fire for perennial grasses and shrubs

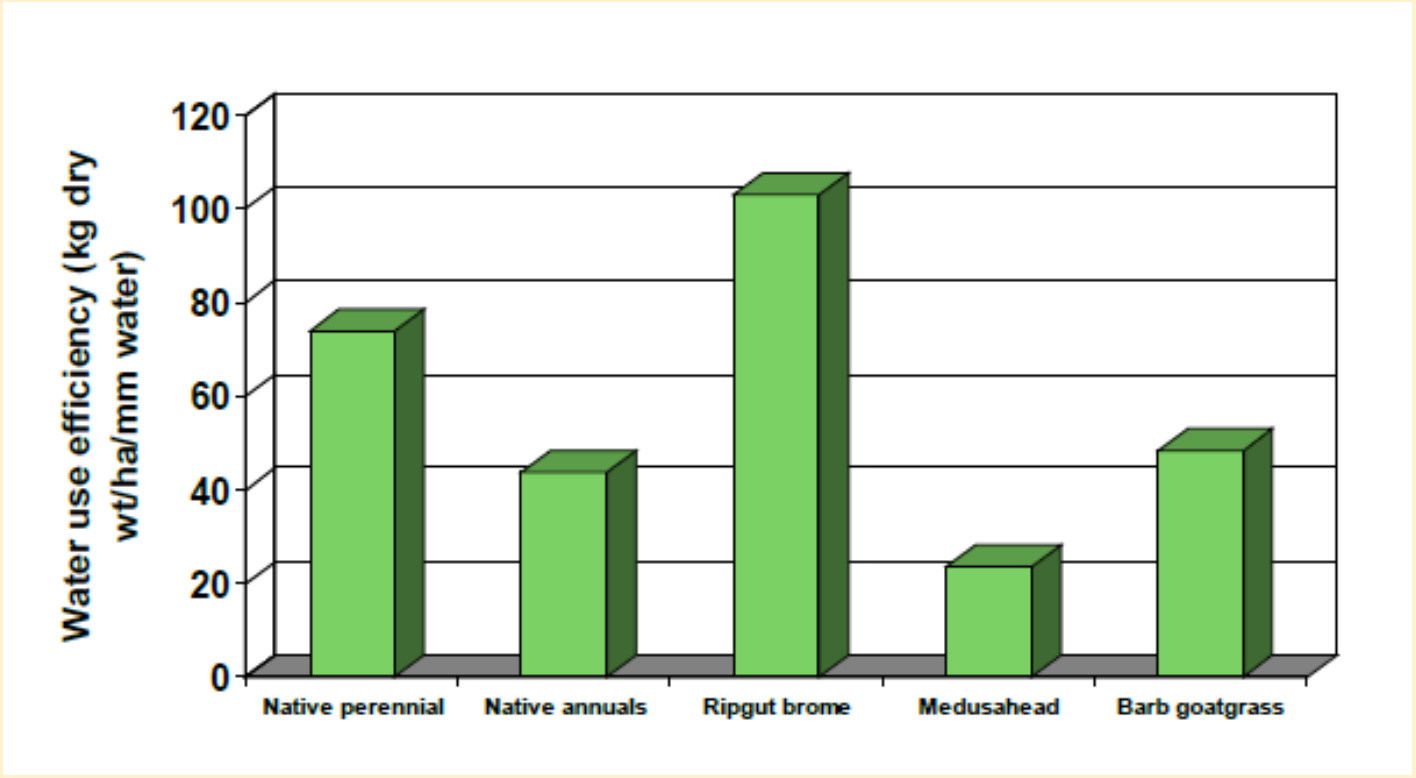
Medusahead

Invasive potential

- Early germination
- Stays green longer
- Produces lots of seeds
- Higher water efficiency
- Low nutritional quality–
  - Protein content declines fast with maturity
  - Silica content – low digestibility and decomposition

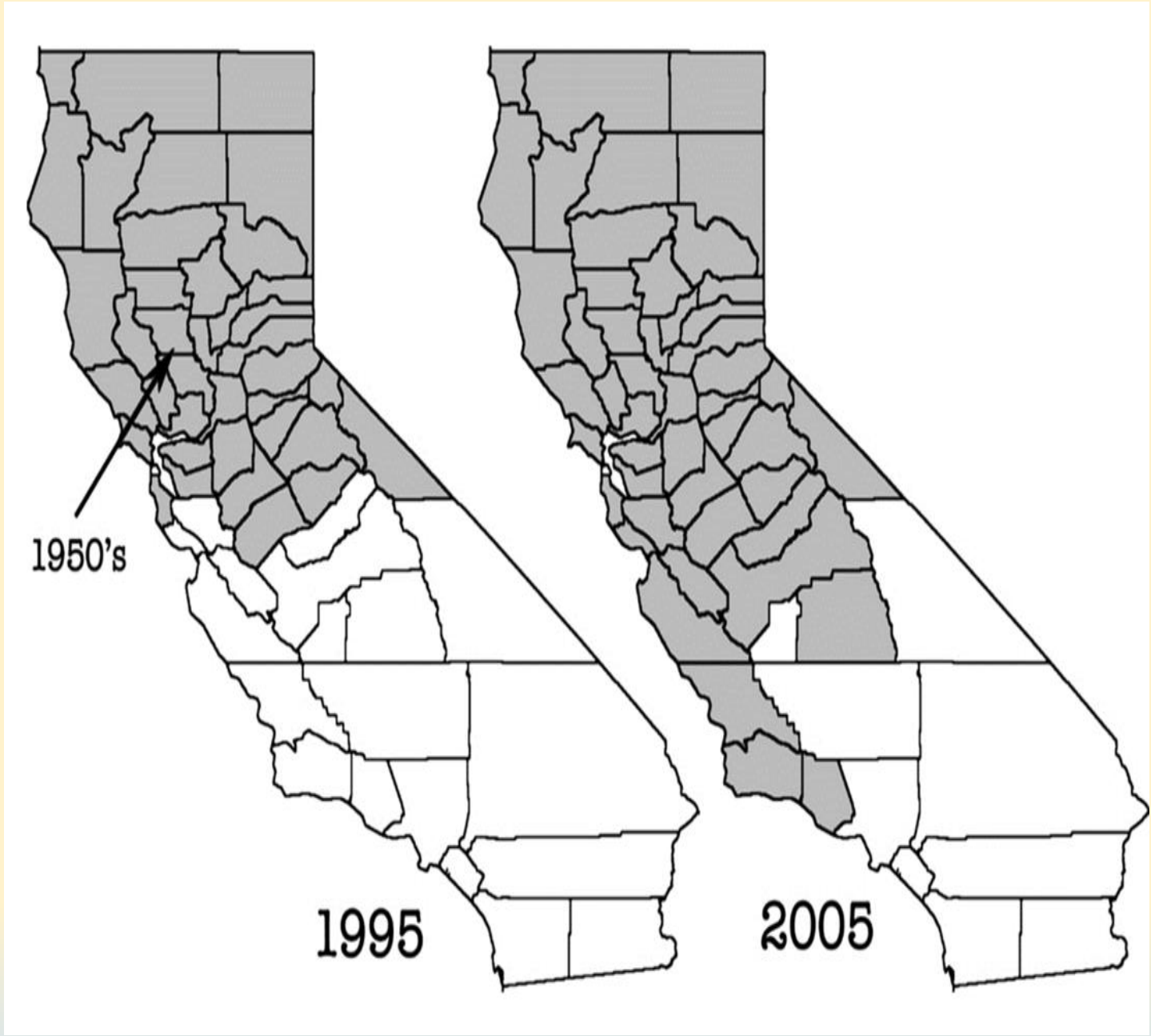
→Thatch→ monoculture→low forage value

- Mechanical injuries to livestock



Medusahead
Distribution

- First introduced to U.S. in 1887
- Now: > 2.5 million acres in CA
- More than 5 million acres in 17 western states



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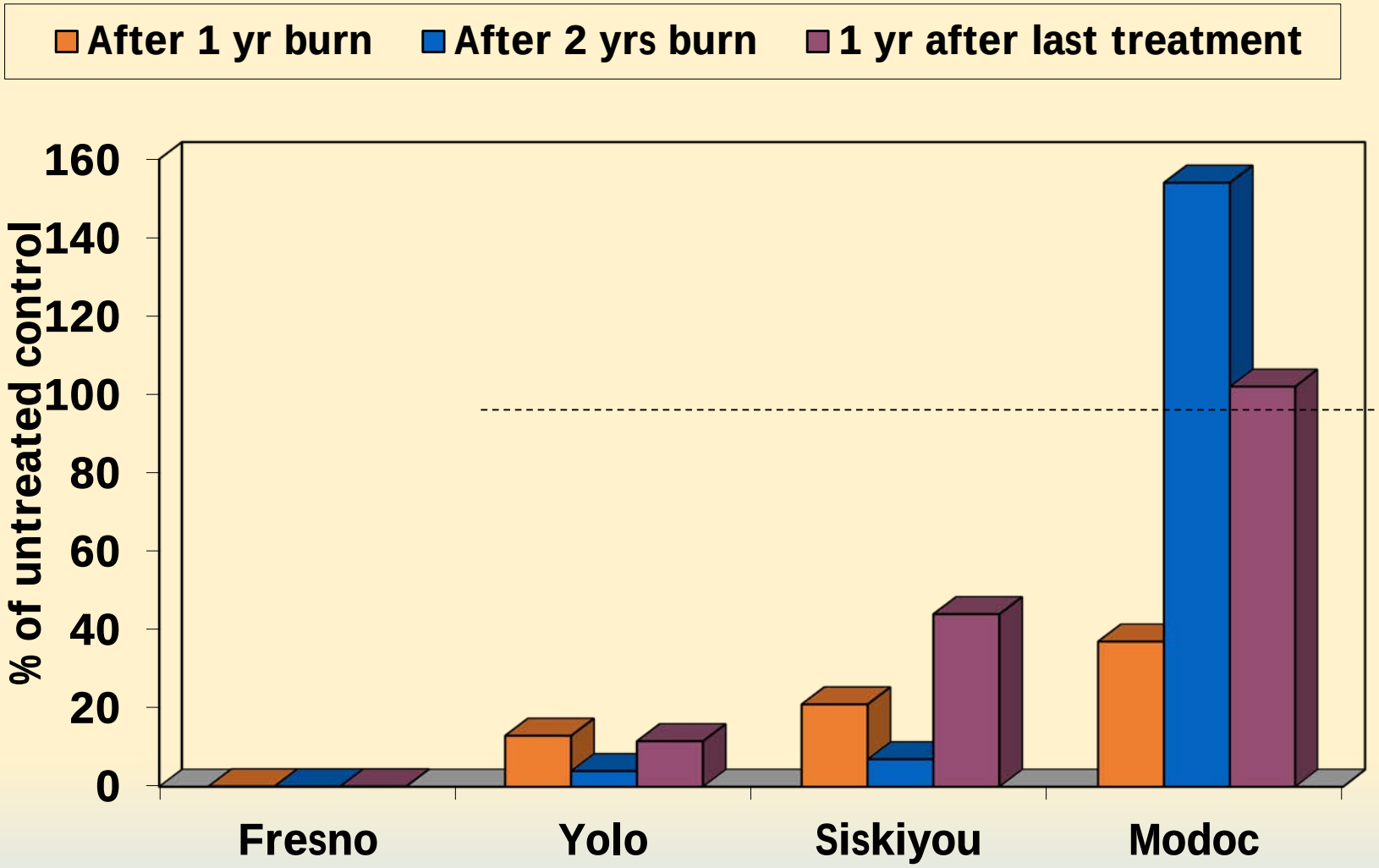
Burning to control medusahead



- Environmental conditions
- Phenological stage/timing
- Moisture content of target plants
- Weather

Fire temperature

- Soil surface temperatures ~480 F
    - not hot enough to kill seeds
- Desirable species seeds escape fire.
- Canopy temperatures ~1200 F
    - enough to kill seeds
    - Burn awns (Bartolome et al, 2019)

Yellow star thistle

- Occur in area with altered fire regimes
- Disturbed, forage cover
- Positive feedback towards reduced fire frequency

- Seed bank and density declined with number of years burned
- YST decline with increasing diversity

- YST increased once burning stopped

Yellow star thistle

- **Timing:**
  - Early-mid summer
  - Bolted but not seeded & still green
  - Whole plant wilts after burn

  - After seeding fire must be hot enough to kill seed
- **Follow up treatment very important**
  - Herbicide application
  - Grazing
  - Fire
- **Effectiveness**
  - dead YST
  - If NOT follow flush germination with herbicide treatment
  - E.g. Capstone , Milestone,

Perennial grasses benefit

- Summer burn
  - Stimulates perennial bunchgrasses to split into several plants
  - Increase perennial plant density, biomass and quality

- Fire not effective for perennial grasses or forbs

Except:

- Under high fuel load

Desert ecosystems

- **Not fire-adapted**
  - Fuel to carry fire
  - Invasive grasses introduction
  - ~≤97% mortality of native species
  - Some sprout (0-60%; depends on species and intensity)

- Little use for Rx fire

Post fire management

- Controlled/adaptive grazing to
  - benefit perennials
  - adjust for lower forage production and shorter growing period
- Follow with other weed/forage/brush/resources management tools → Integrated Management Approach
- Seeding

Benefits of fire – planned/prescribed

- Reduce fuel loads and risk of large catastrophic fires
- Weed management
- Promote perennial grasses
- Restore habitat
- Promote seed germination
  - Tree, forb species
- Change balance between plant types
- Create patchy plant communities
- Releases nutrients
- Sterilize landscapes

Pic by: Brian Mattos

Challenges of using fire for weed control

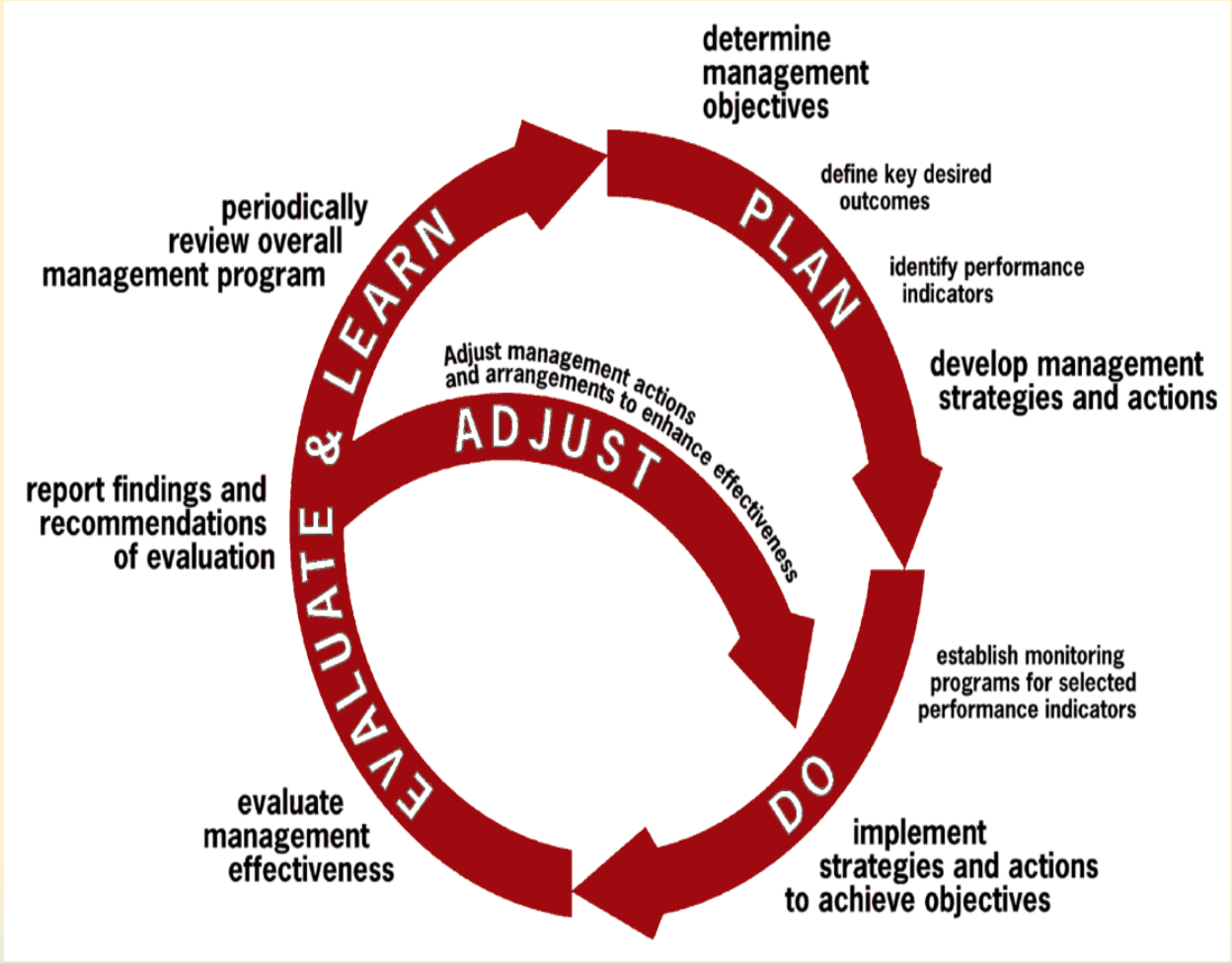
- Potential for fire escape
- Air quality issues
- Permits required
- Volatilization of nitrogen and sulfur from soil
- Hydrophobic Soils
  - Reduce infiltration → Increase runoff → erosion
- Resources (logistical, financial, equipment, human)
  - Pre-fire planning → Implementation →Post fire management
- Reduces next season feed and green period
- Unpredictable results
  - Complex plant communities
  - Complex ecosystems – Fresno vs Modoc
  - Pre and post fire conditions

Vegetation management decisions

Adaptive management approach:

- Plan
- Implement
- Monitor and learn
- Adjust

*Management decision strongly tied to monitoring results



Questions?

The Use of Fire as a Tool for Controlling Invasive Plants

https://fireadaptednetwork.org/

https://ucanr.edu/sites/fire/

http://wric.ucdavis.edu/