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Prescribed Fire for Weed Control

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Considerations when using prescribed fire

- 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

Permitted ranch burning in California 1945-1977

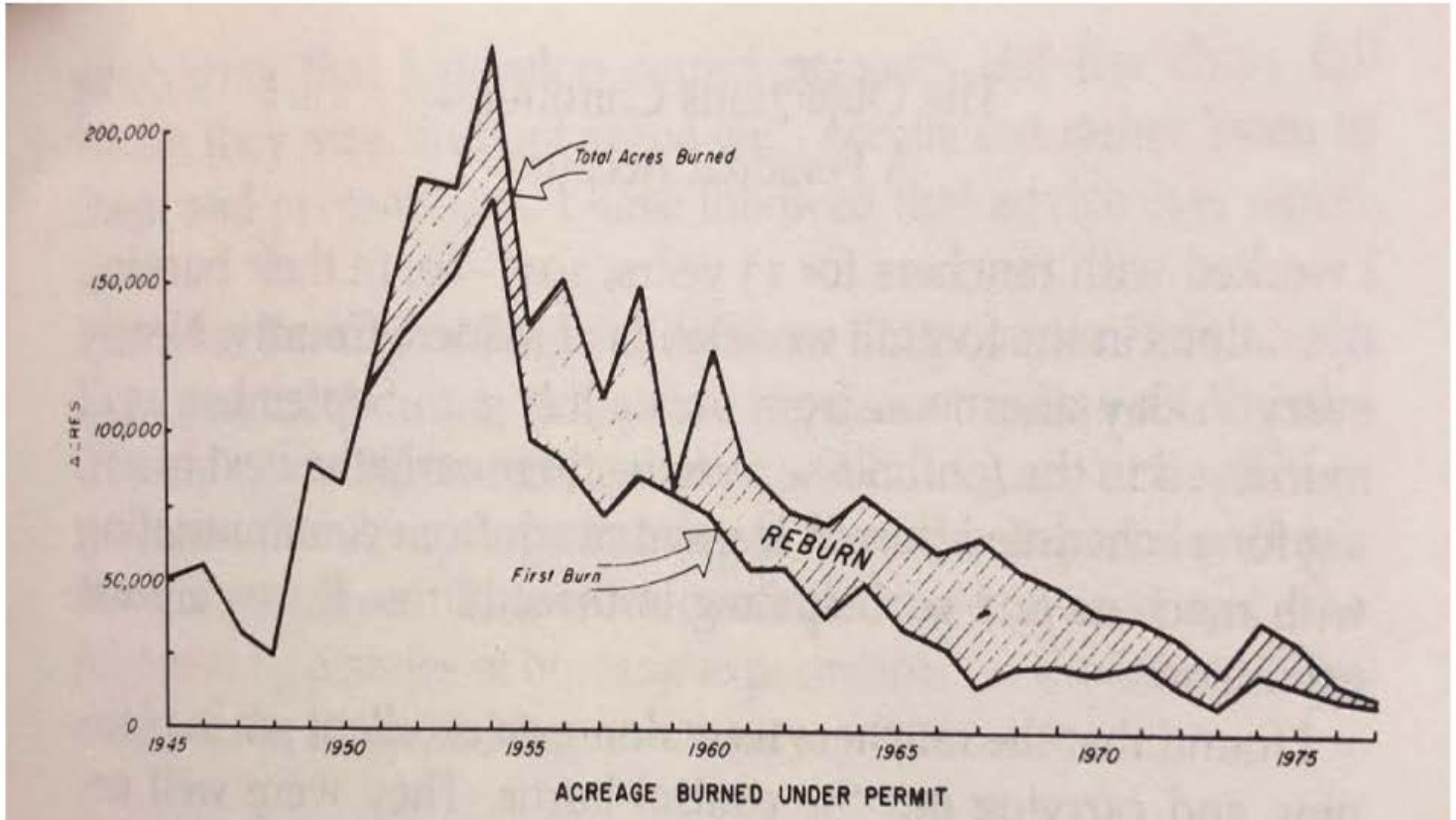
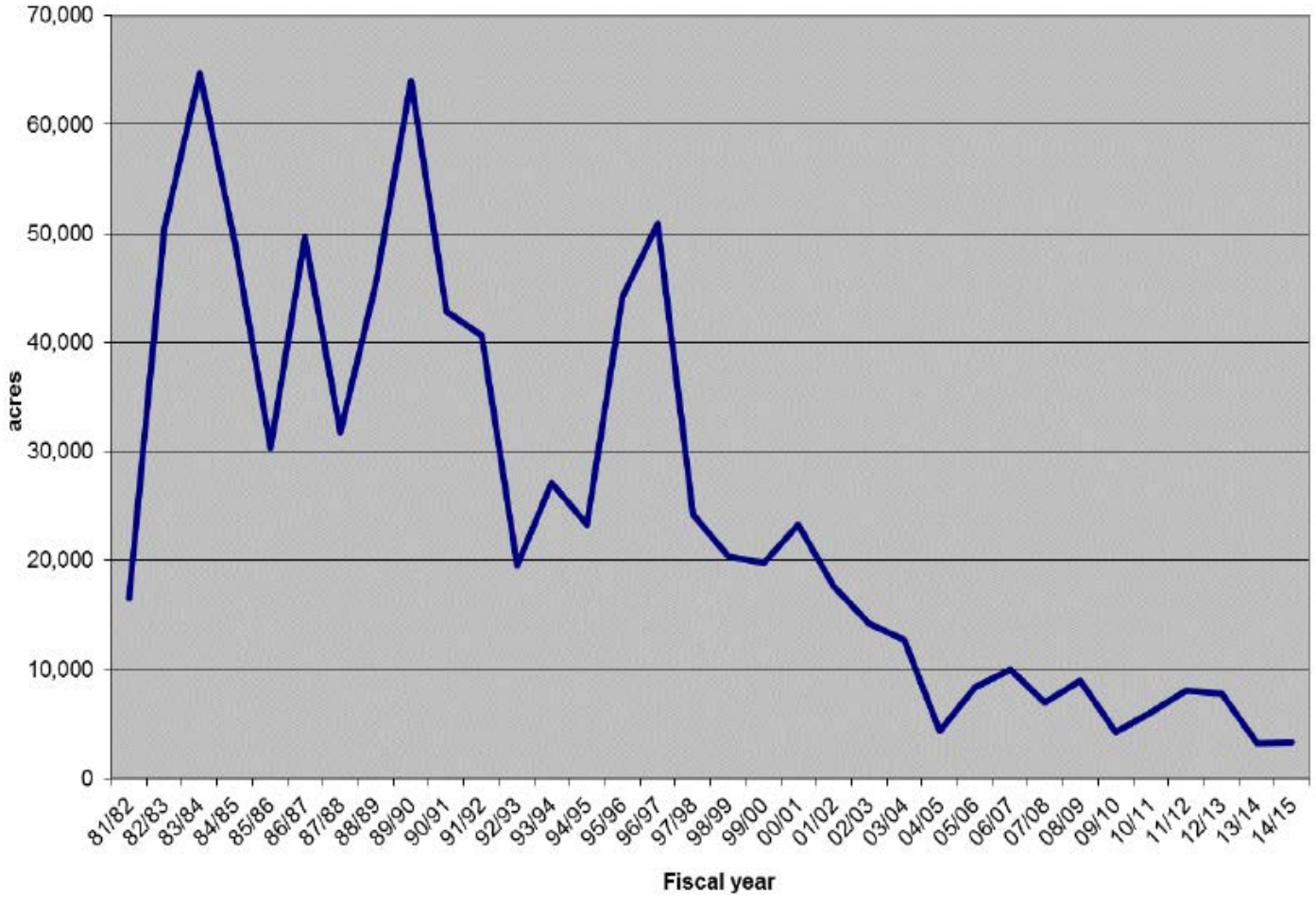


Figure 41. *Acreage burned by California ranchers under permit from 1945 to 1977 to reduce fire hazard and improve grazing for livestock and wildlife. (Graph from the California Department of Forestry.)*

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

Biswell 1999

VMP completed acres between 1981-2015



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

Pic by: Brian Mattos

Fire adapted ecosystems

- Tolerance to periodic fires (sprout)
  - Underground/low growth points
- Avoidance
  - matures early to avoid fire
  - Thick barks
- Need for scarification –
  - Buckbrush
  - Lodgepole pine
- Smoke increases acorn production

Historic Average Fire Return Interval (FRI)

Lynn Huntsinger

Vegetation Type	Pre-1860 FRI	20th Century FRI
Grasslands and oak woodlands	10	78
Ponderosa Pine	4	192
Foothill Chaparral	30	-

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

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Changes in fire frequency

- Decrease
  - Fire suppression →increase fuel
  - Grazing → 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 Sonora desert →affecting desert succulents

Photo by Brian Mattos

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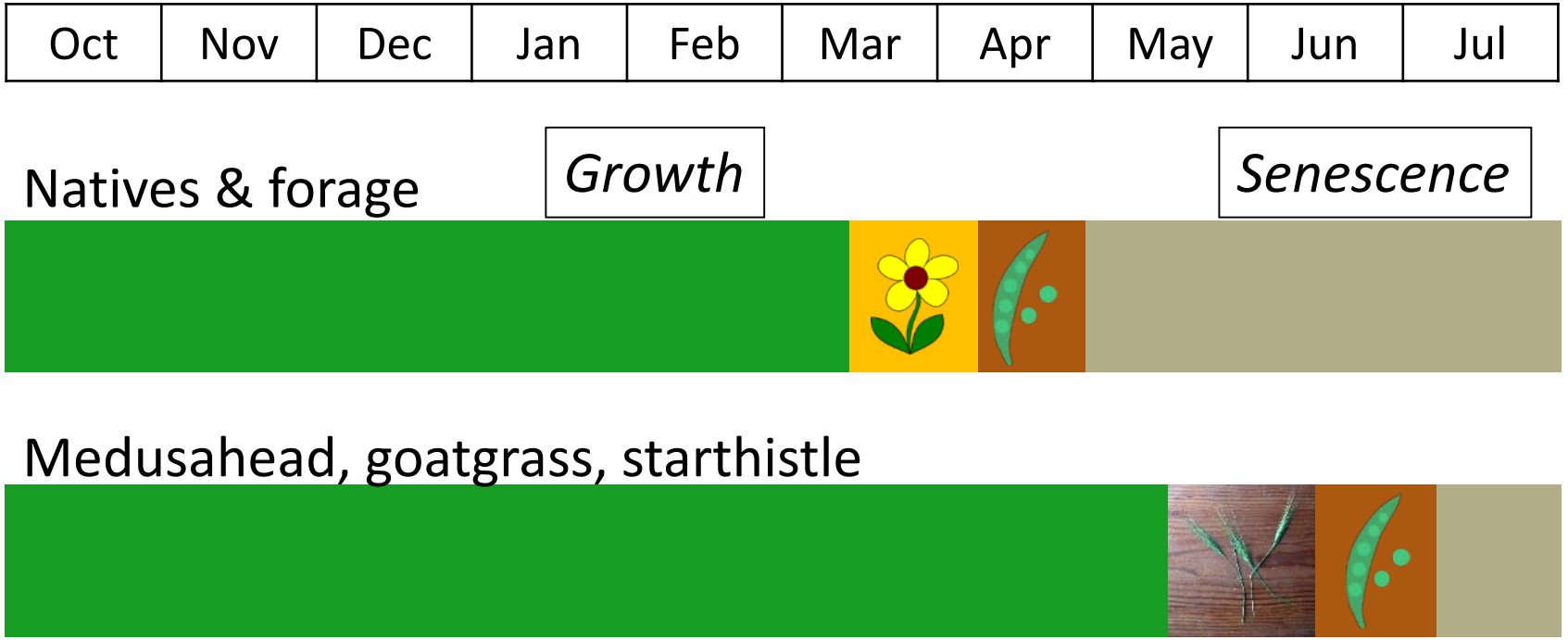
Fire regimes and plant phenology in annual grasslands

- Fire regime
  - Fire frequency
  - Timing
  - Fire intensity
- Target species
  - phenology
- Non-target species



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

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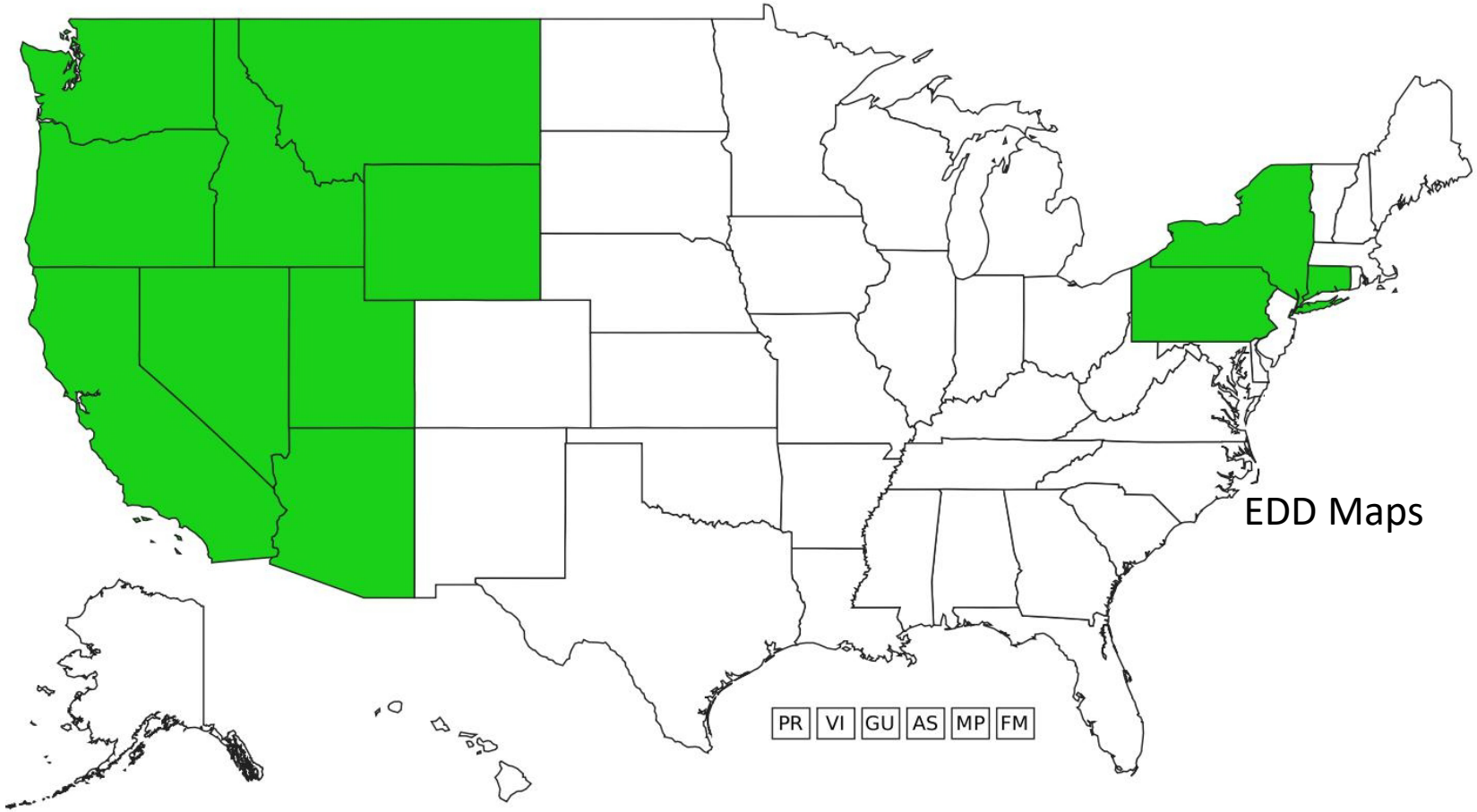
Medusahead (*Taeniatherum caput-medusae* (L.) Nevski)

- Annual grass
- First introduced to U.S. in 1880s
- > 2.5 million acres in CA
- > 5 million acres in US



EDD Maps

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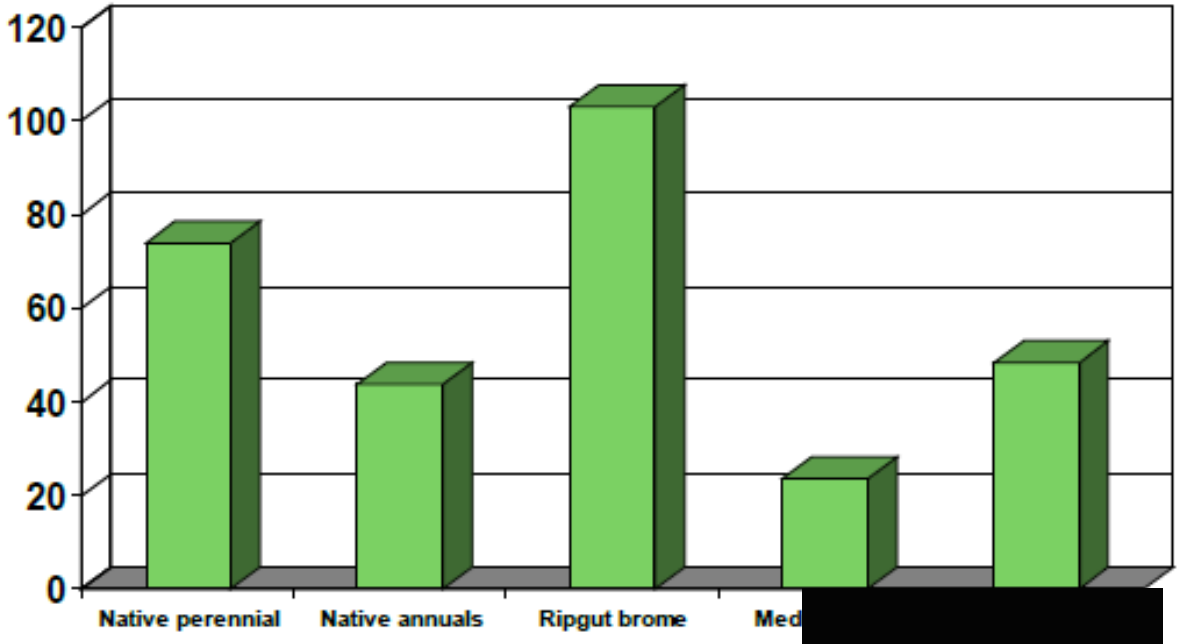
Medusahead (and Barb goatgrass)
Invasive potential



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

→Thatch→ monoculture→low forage value

- Mechanical injuries to livestock

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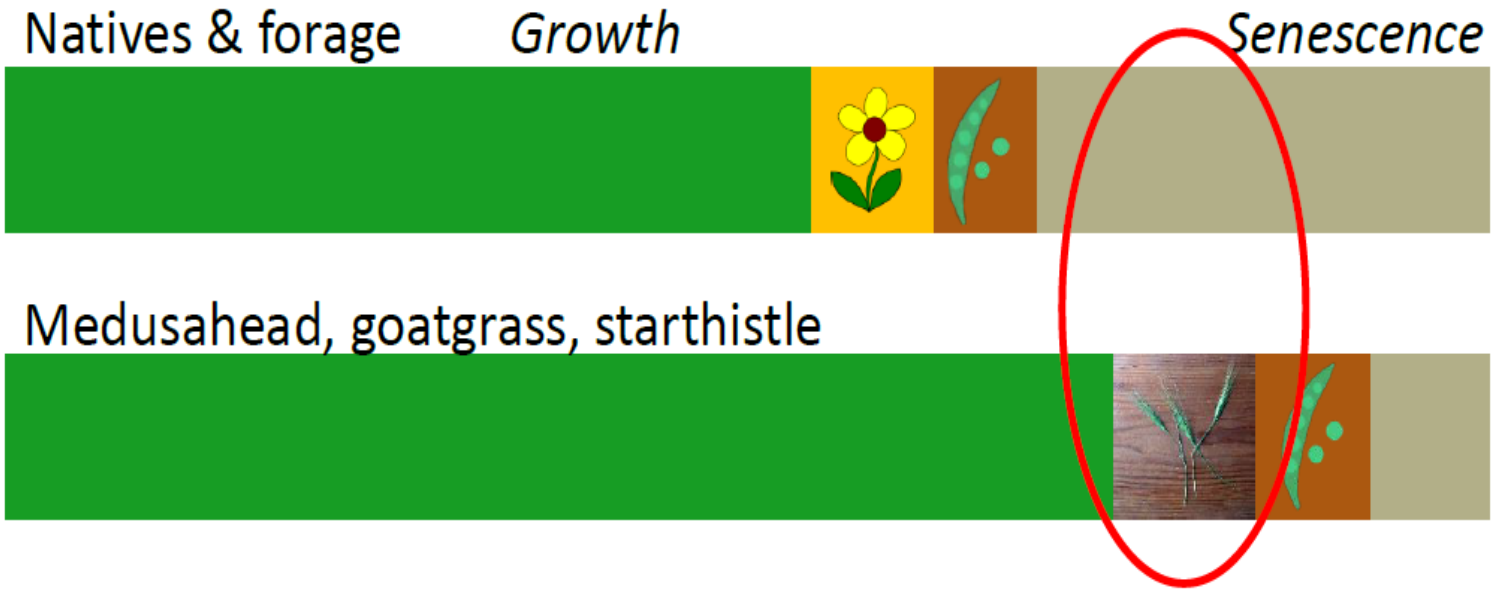
Impact of fire

- Reduce seed production → reduces seed bank
- Consumes thatch/biomass
- Reduced competition for desirable and perennial plants from medusahead
- Less competition allows other plants to grow

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
- Kills 90% of seeds

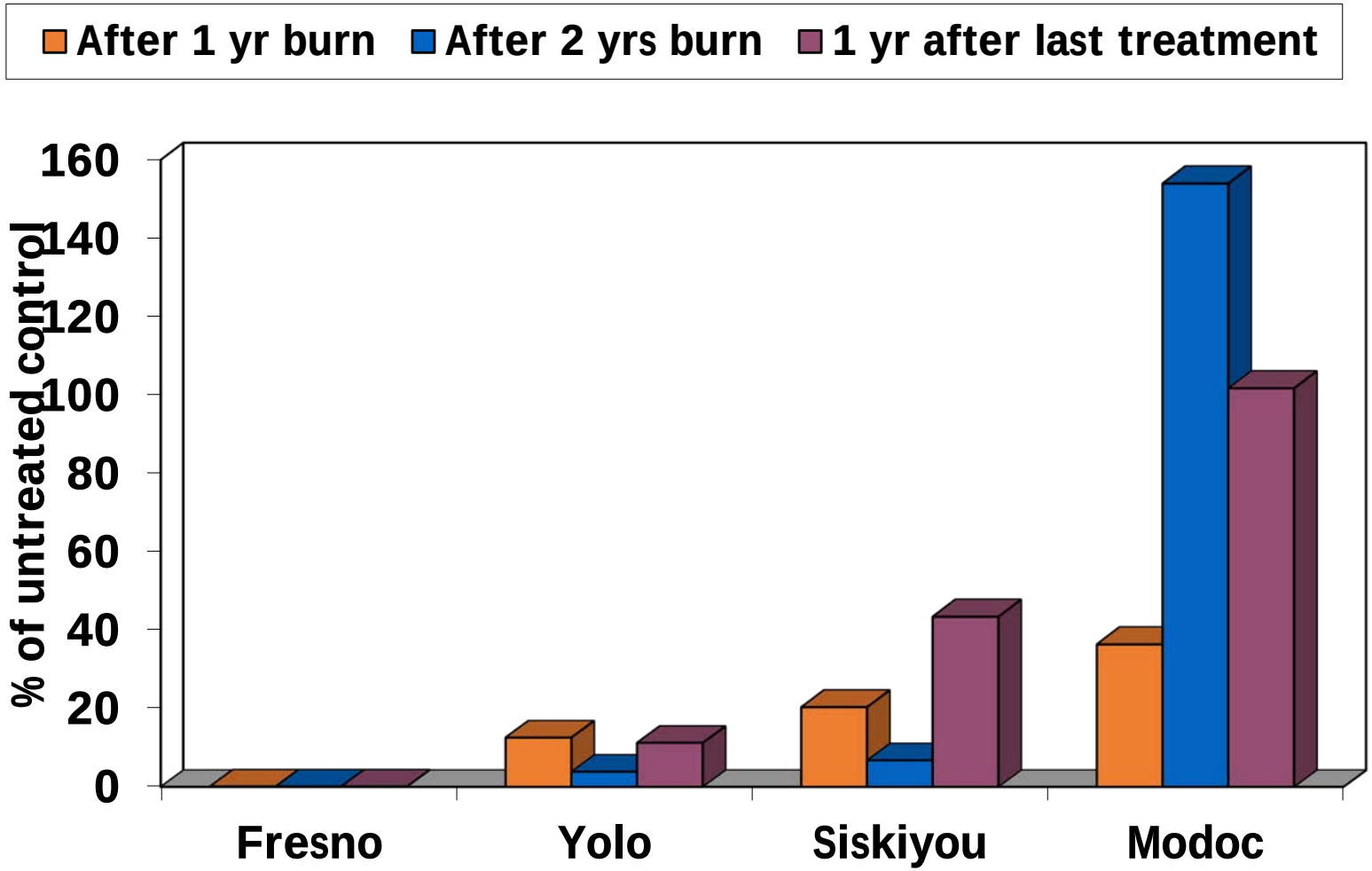
Photo by Brian Mattos

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)

Photo by Brian Mattos

Burning to control medusahead



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

Kyser et al, 2008

Yellow starthistle

- Occur in disturbed area with altered fire regimes
- Decline with increasing diversity
- Increased once burning stopped

Table 1.

Yellow Starthistle Seedbank and Seedling Counts Following Burns

Burn Sequence	Seeds per square meter; 5 cm deep (percent of unburned)	Seedlings per square meter (percent of unburned)
Unburned	10,000	1,400
After 1 burn	2,600 (26)	265 (19)
After 3 burns	52 (0.5)	5 (0.4)

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
  - Increase perennial plant density, biomass and quality

- Fire not effective for perennial grasses or forbs

Except:

- Under high fuel load →High Fire intensity

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Shrubs/chapparal spp

- Fire may reduce shrub encroachment
- Short-term effect because most sprout
- Follow-up treatment important

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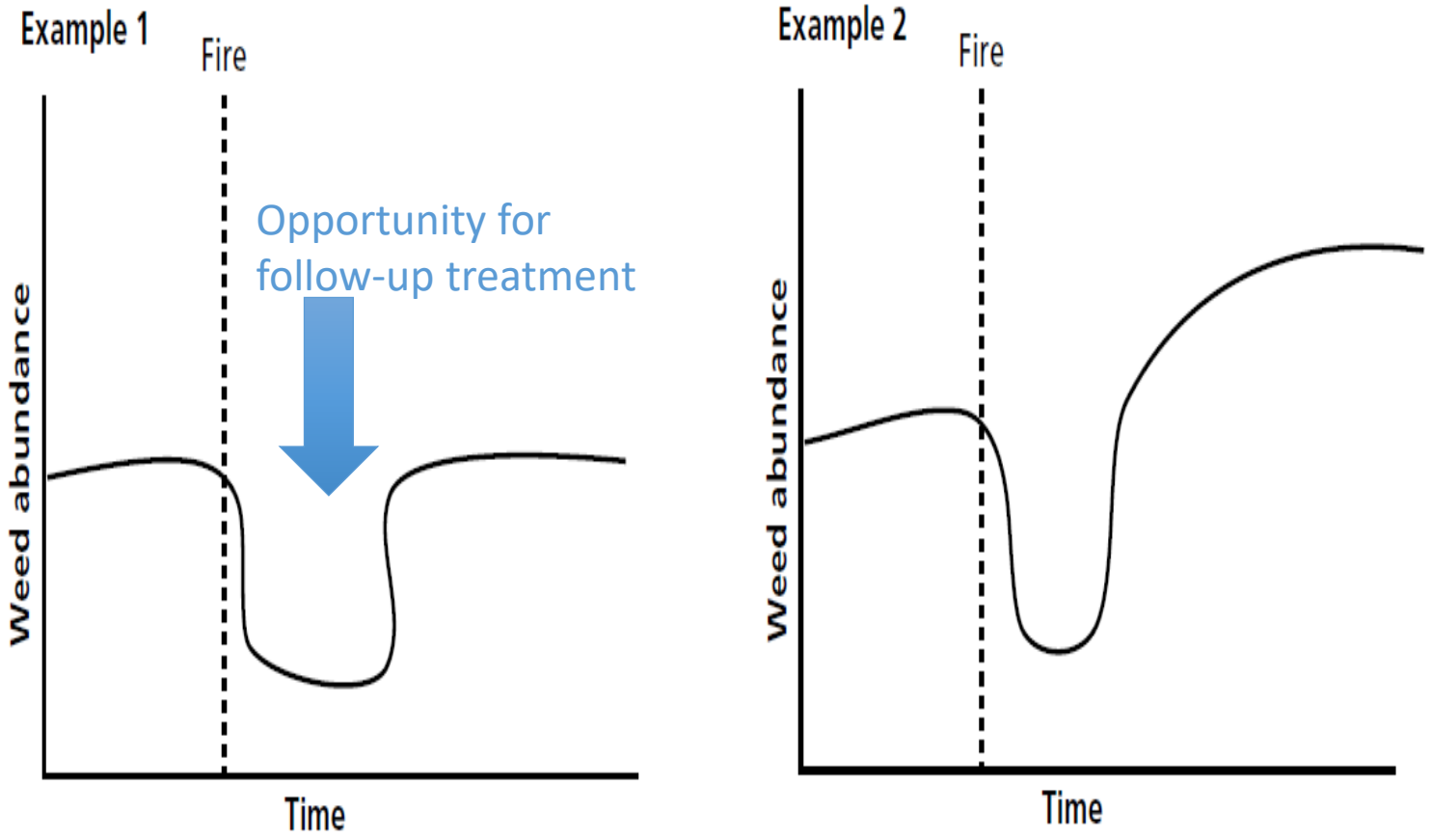
Desert ecosystems

- **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

Potential weed/plant spp response to fire

(B) Post-fire short-term decrease (control opportunity):
weakened in the short-term abundance will remain the same or increase slowly in the longer term



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

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Post fire management

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

Fire for weed control in orchards

Flaming

- Used to manage in-row weeds that are smaller than eight leaves.
- Ensure the trunks of young trees are protected from flamers to avoid injury to the cambium layer of the tree.
- Keep flamers away from the plastic irrigation tubing.
- Flamer should be used when weeds are still green – dried weed may result in fires that may injure trees and irrigations systems or spread out of control.

Fire for weed control in orchards cont….

- The flamer should pass quickly over the green vegetation to damage cells, not to set the plant on fire.
- Suspend microsprinkler irrigation lines in the trees or on stakes to prevent then from burning.
- Repeated flaming may result in grasses becoming the dominant weeds because their growing points are at or below soil level and are not readily killed with flaming.
- Perennial weeds can be suppressed, but usually are not killed by flaming.

Questions?

Thank You!

More Resources

The Use of Fire as a Tool for Controlling Invasive Plants

https://fireadaptednetwork.org/

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

http://wric.ucdavis.edu/