Using Fire and Grazing for Weed Control

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Outline

- Goals
- Principles of weed management
- How invasive species thrive
- Fire as a tool
- Targeted Grazing
- Conclusion

Goals

- Weed management
- Wildlife habitat
- Forage production/quality
- Biodiversity
- Sustainability

Considerations when using fire and grazing

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

CA fire/grazing adapted ecosystems

- Tolerance to periodic fires/grazing
  - Underground/low growth points
  - Smoke → Acorn production
- Avoidance
  - mature early to avoid fire
  - Physical: barks, thorns, awns
  - Secondary compounds
  - Low palatability close to seeding
- Need for scarification –
  - Fire
  - Digestion

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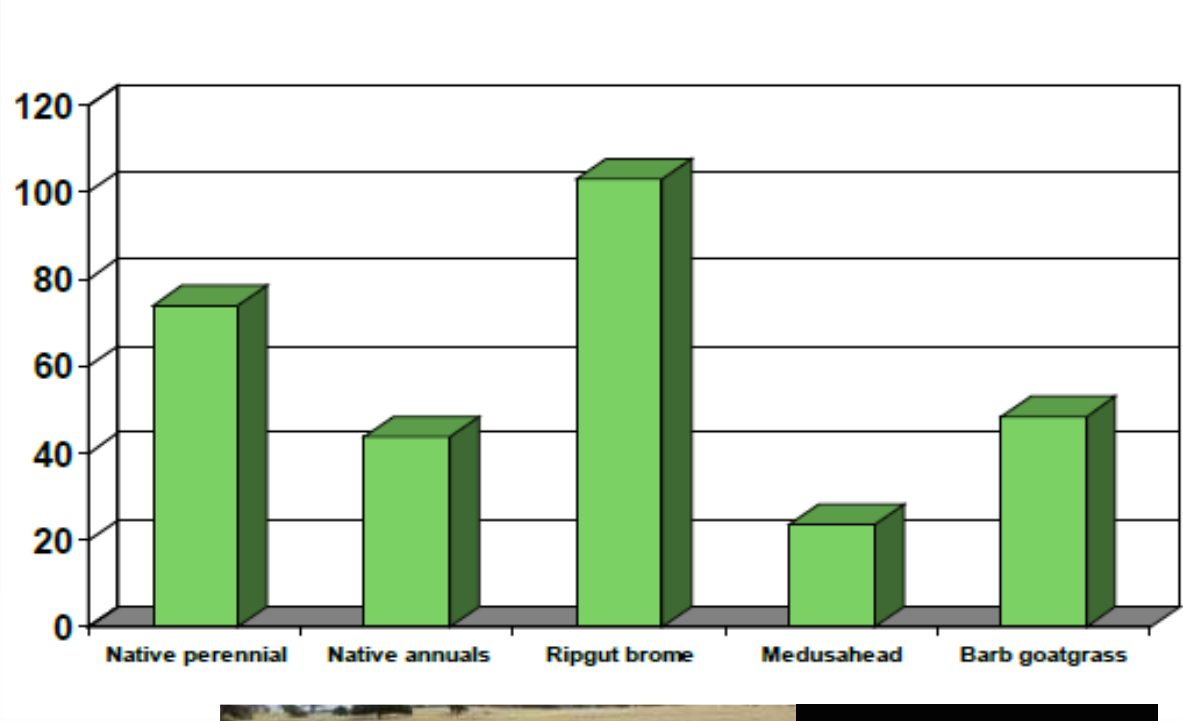
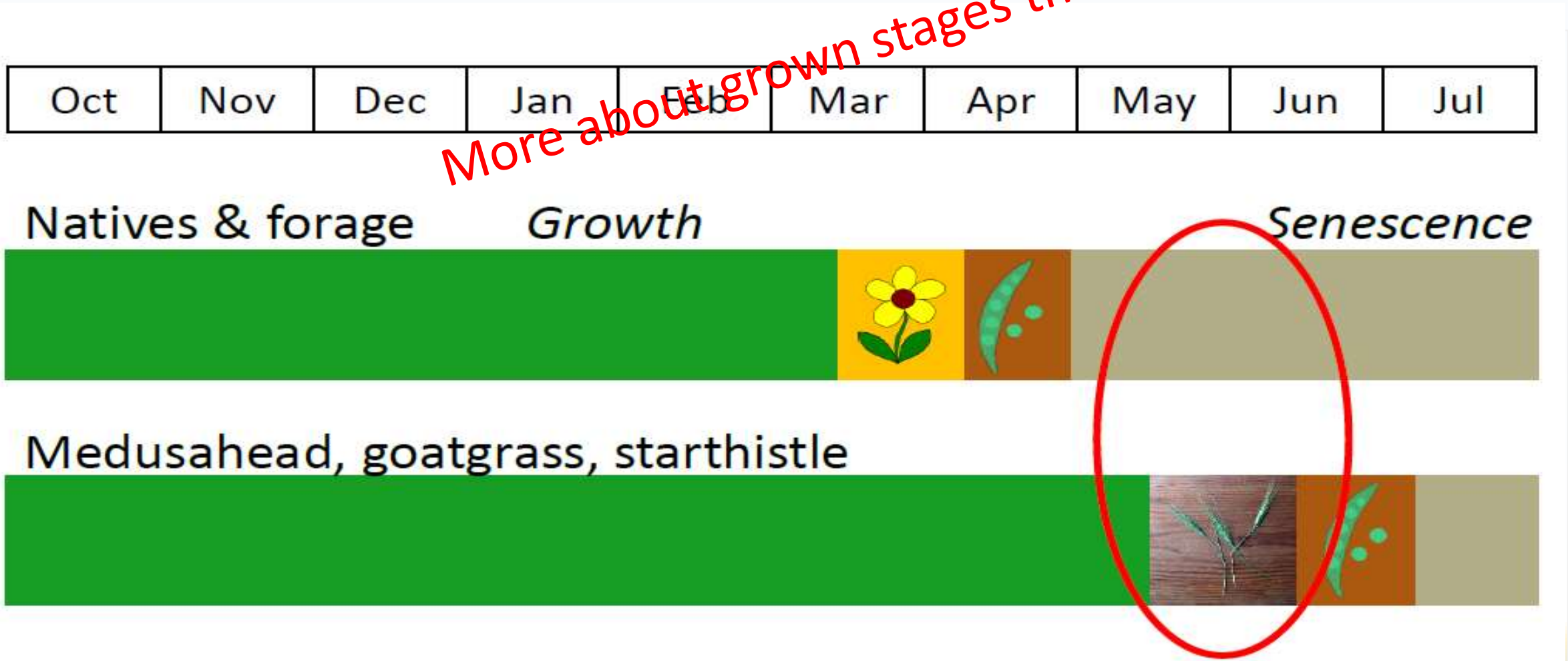
Invasive potential

- Early and all-season germination
- Stays green longer
- Produces lots of seeds
- Higher water efficiency
- Low nutritional quality–
  - Protein content
  - Low digestibility and decomposition- silica content
- Mechanical injuries to livestock



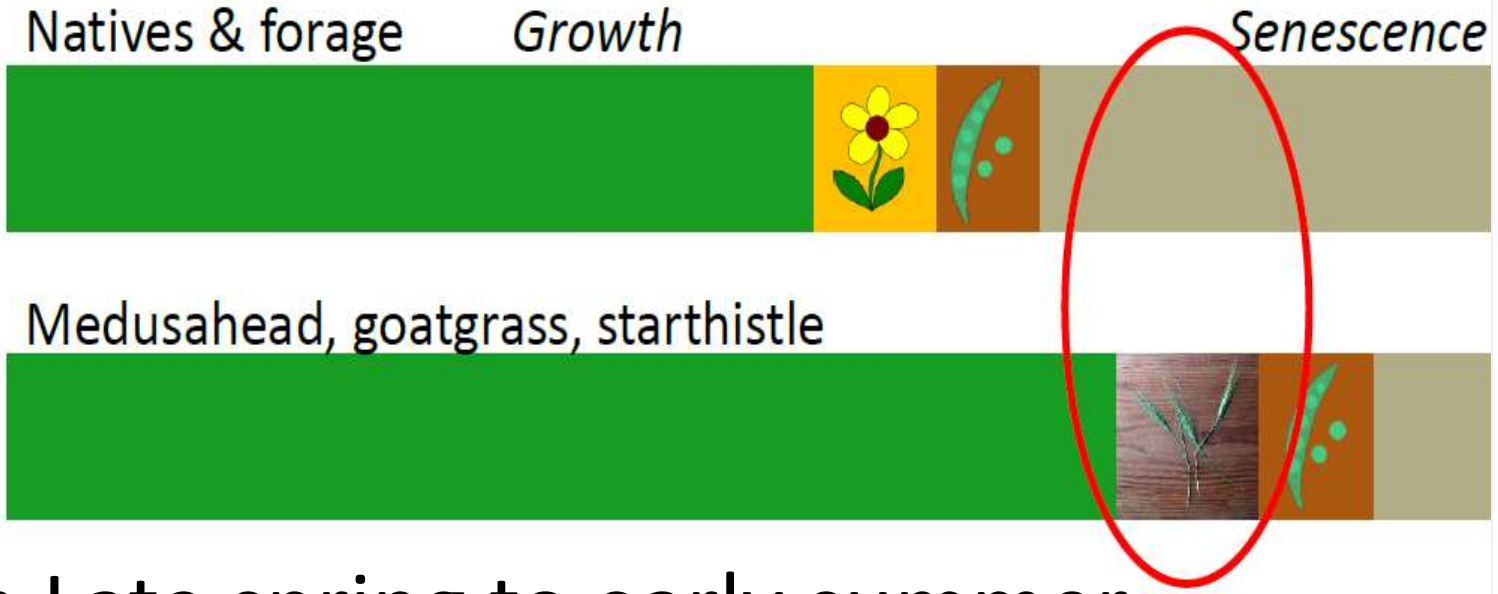
Plant phenology and timing of Rx fire

More about grown stages than time of year!



Plant phenology and timing of Rx fire

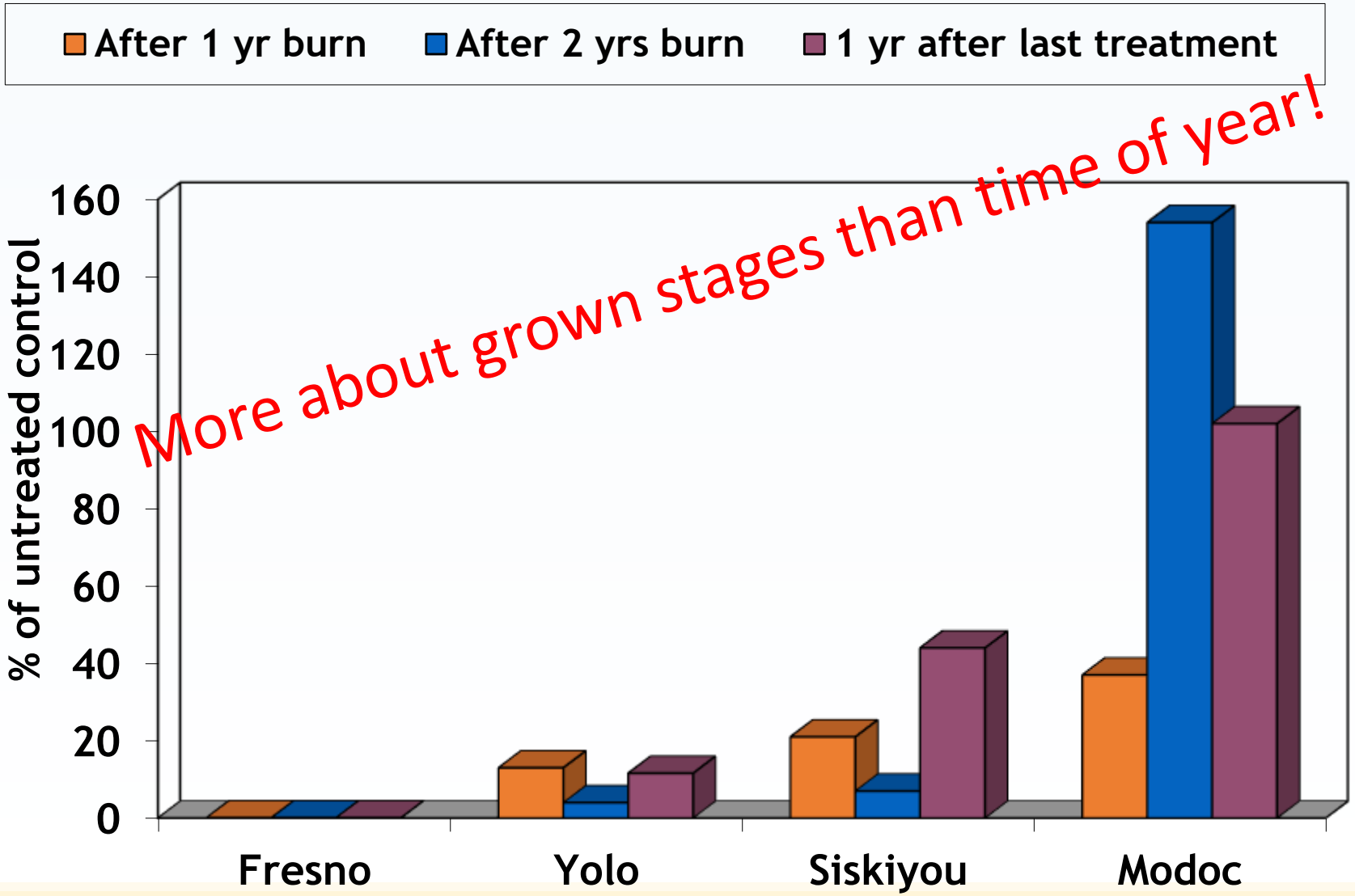
Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul



- Late spring to early summer
- Selectively affect invasives
- Enough fuel from desirable species
- Kills 90% of seeds

Photo by Brian Mattos

Burning to control medusahead



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

Kyser et al, 2008

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

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Eg. 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

Yellow starthistle

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)

DiTomasso et al, 1999

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Perennial grasses eg Johnson grass

- Spring/summer burn
    - Stimulates perennial bunchgrasses
    - Increase perennial plant density

- Fire not effective for perennial grasses or forbs

Except: Under high fuel load and Fire intensity

- May kill most plants

Shrubs/chapparal spp

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

Grazing for weed control

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Choosing the right animal for the job

Goats

Cattle

Sheep

Diet preferences and foraging behavior of livestock

Herbivory Class	Livestock Kind	Preferred Diet Selection		
		Grasses (%)	Forbs (%)	Shrubs/Trees (%)
Grazers	Cattle	65-75	20-30	5-10
Browsers	Goats	20-30	10-30	40-60
Intermediate feeders	Sheep	45-55	30-40	10-20

Animal Type		
Cattle	Sheep	Goats
Grass → Forbs → Browse	Forbs → Grass → Browse	Browse → Forbs → Grass
Graze taller grasses than sheep	Graze close to the ground	Shrubs, forbs (YST)
Prefer lower, flatter areas	Inclined to graze higher and drier areas	Do not graze close to the soil
Sensitive to plant toxic compounds and tannins	Moderate tolerance to toxin	Higher tolerant of tannins and toxicities
		Inclined to graze higher and drier areas

Control invasive weeds –targeted grazing

- Considerations:
  - Animal type
  - Animal numbers
  - Topography
  - Phenological stage
  - Plant characteristics-
    - chemical and physical
  - Animal adaptation
  - Cost
  - Infrastructure

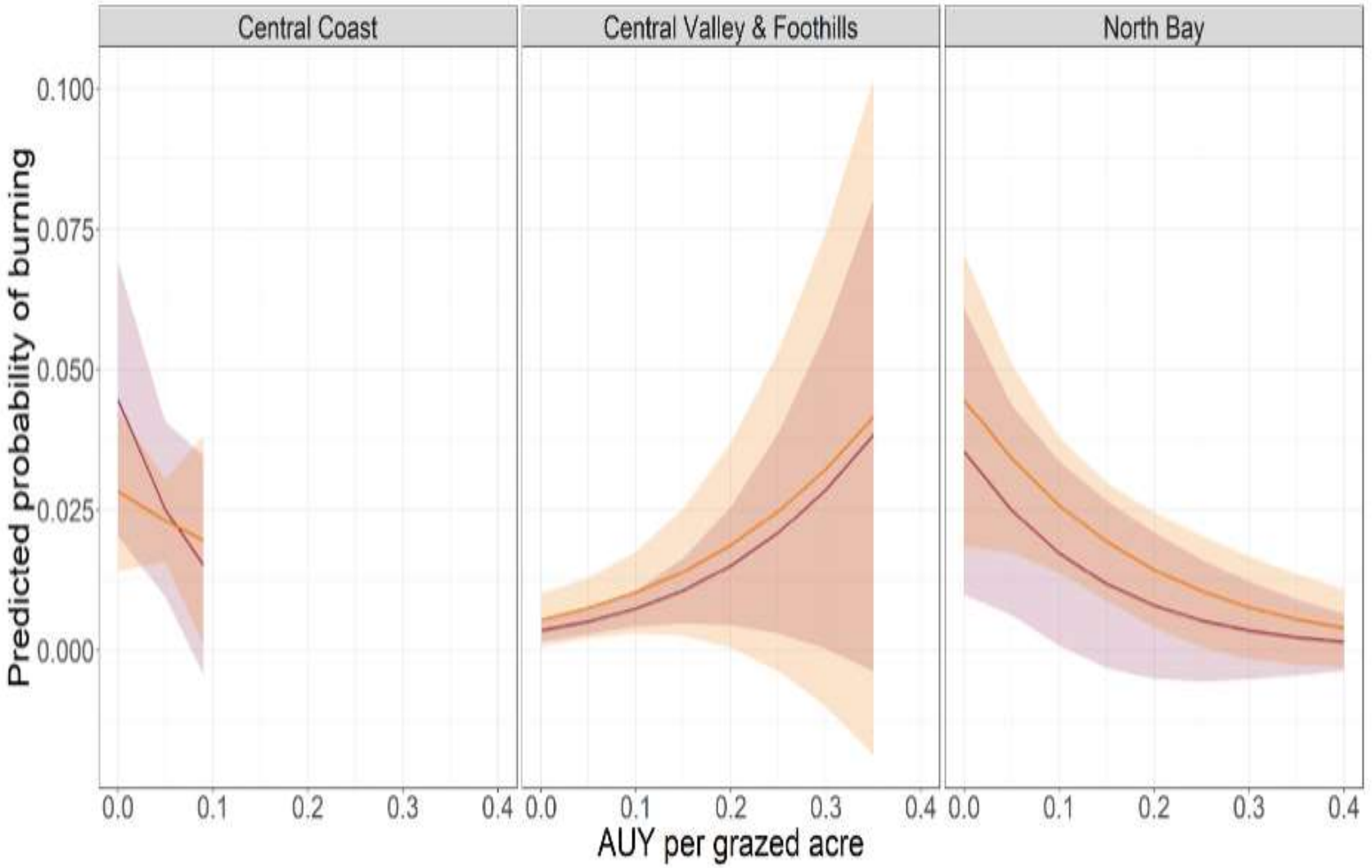
Examples

- Yellow star thistle
- Medusahead
- Shrub species

Effects of grazing on fire behavior

Potential implications on weeds?

Grazing, fire mitigation & weeds



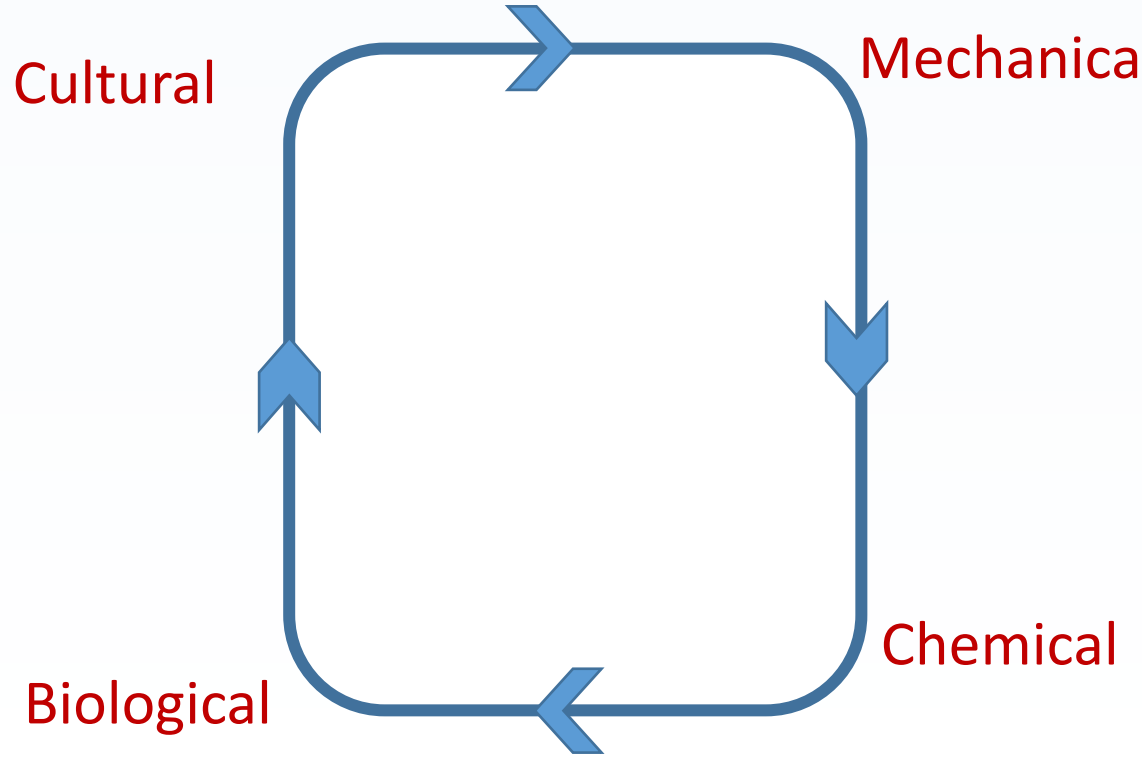
- Cow calf vs stockers
- Affect RDM
- Fire risk
- Growth stages when stocker shipped out
- May favor weeds
- Risk for low RDM

Siegel et al, 2022

Integrated Weed Management (IWM)

- Uses a combination of management tools → increases effectiveness and lowers costs

- Fire → Herbicide → Grazing
- Till → Seeding→ Grazing
- Fire → grazing→ Herbicide



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/

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