

Evaluating control of late-season noxious grassland invasives with multiple approaches: wildfire, prescribed fire, native grass restoration, and organic herbicides

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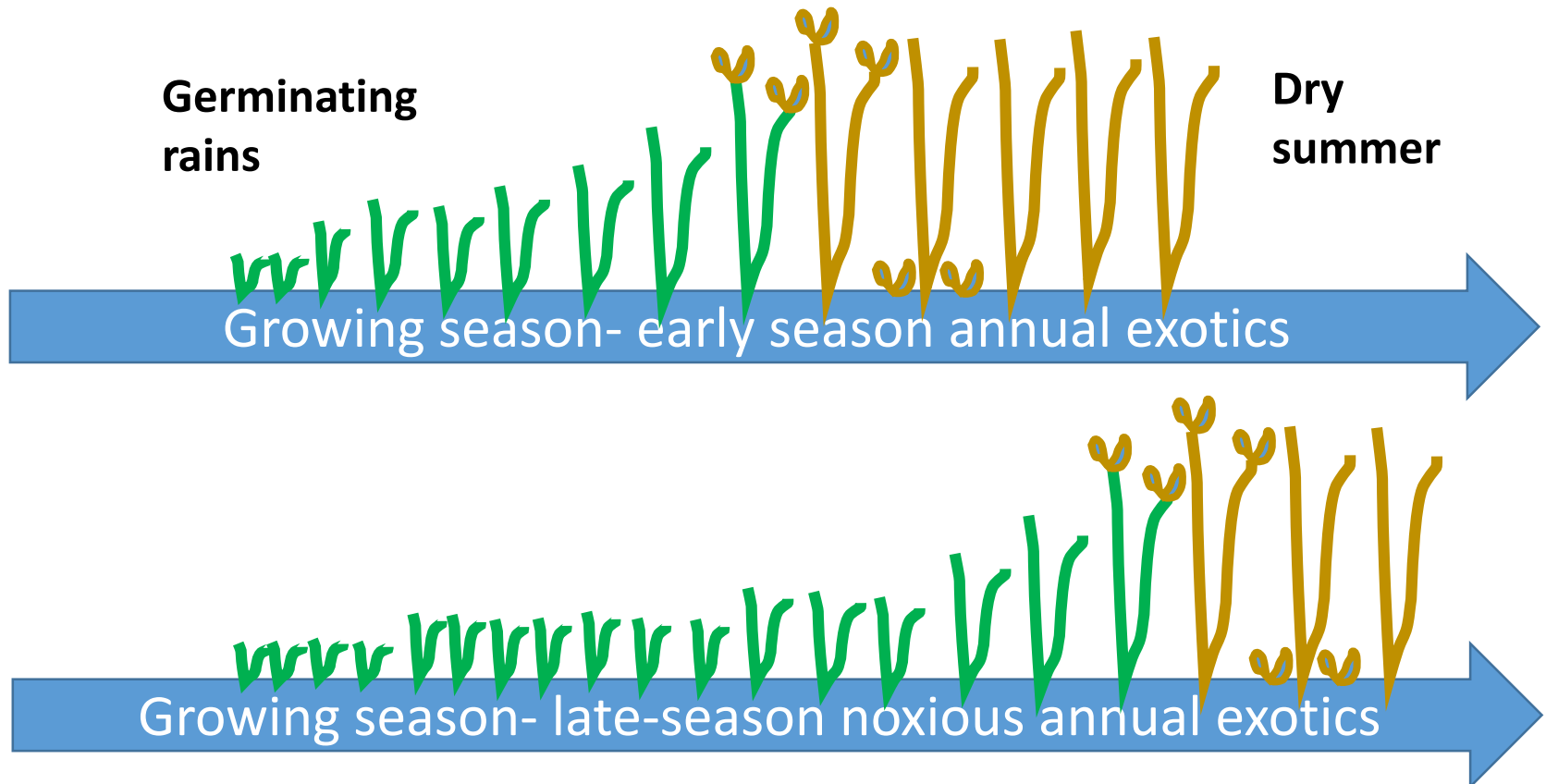
In California
grasslands, late-
season invaders are
some of our most
noxious weeds



Phenological differences provide potential for control of late-season invasives



Phenological differences provide potential for control of late-season invasives

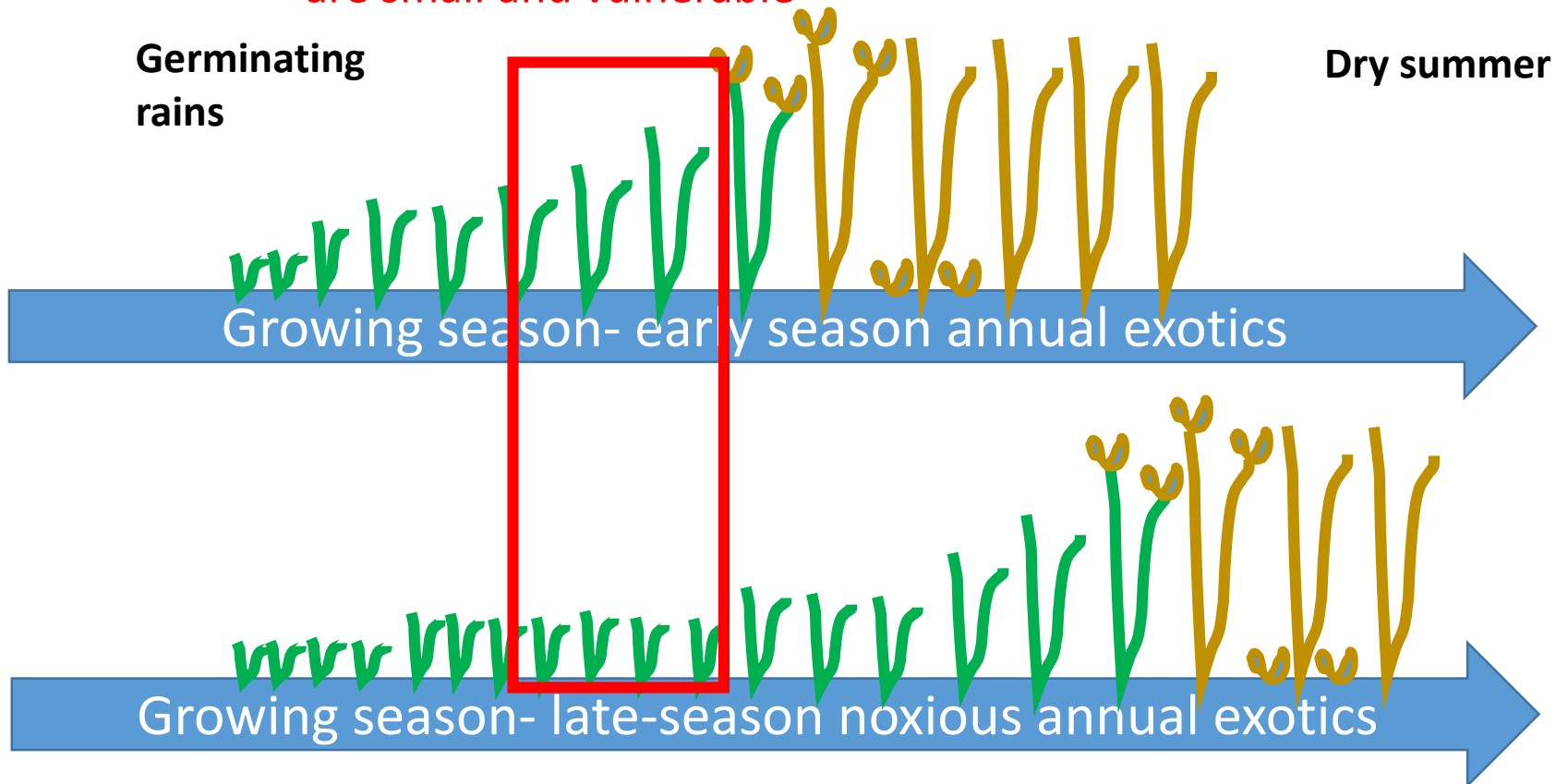


Phenological differences provide potential for control of noxious weeds by:

- Herbicides
- Burning
- Suppression by native perennial grasses
- Grazing

Organic herbicides rely on contact-kill, most effective on small seedlings

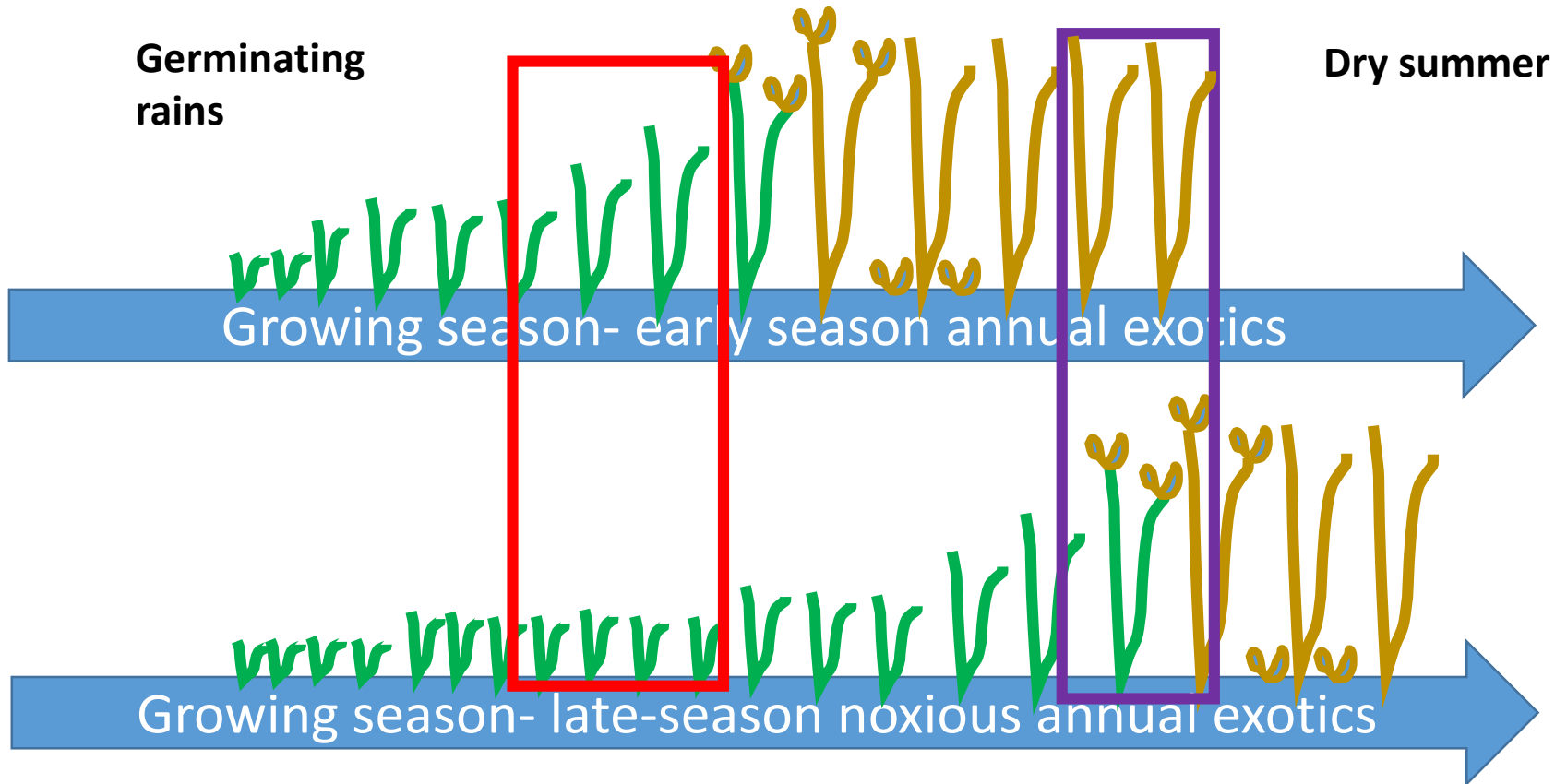
Early spring- early-season
grasses large and less
vulnerable vs. late-season
are small and vulnerable



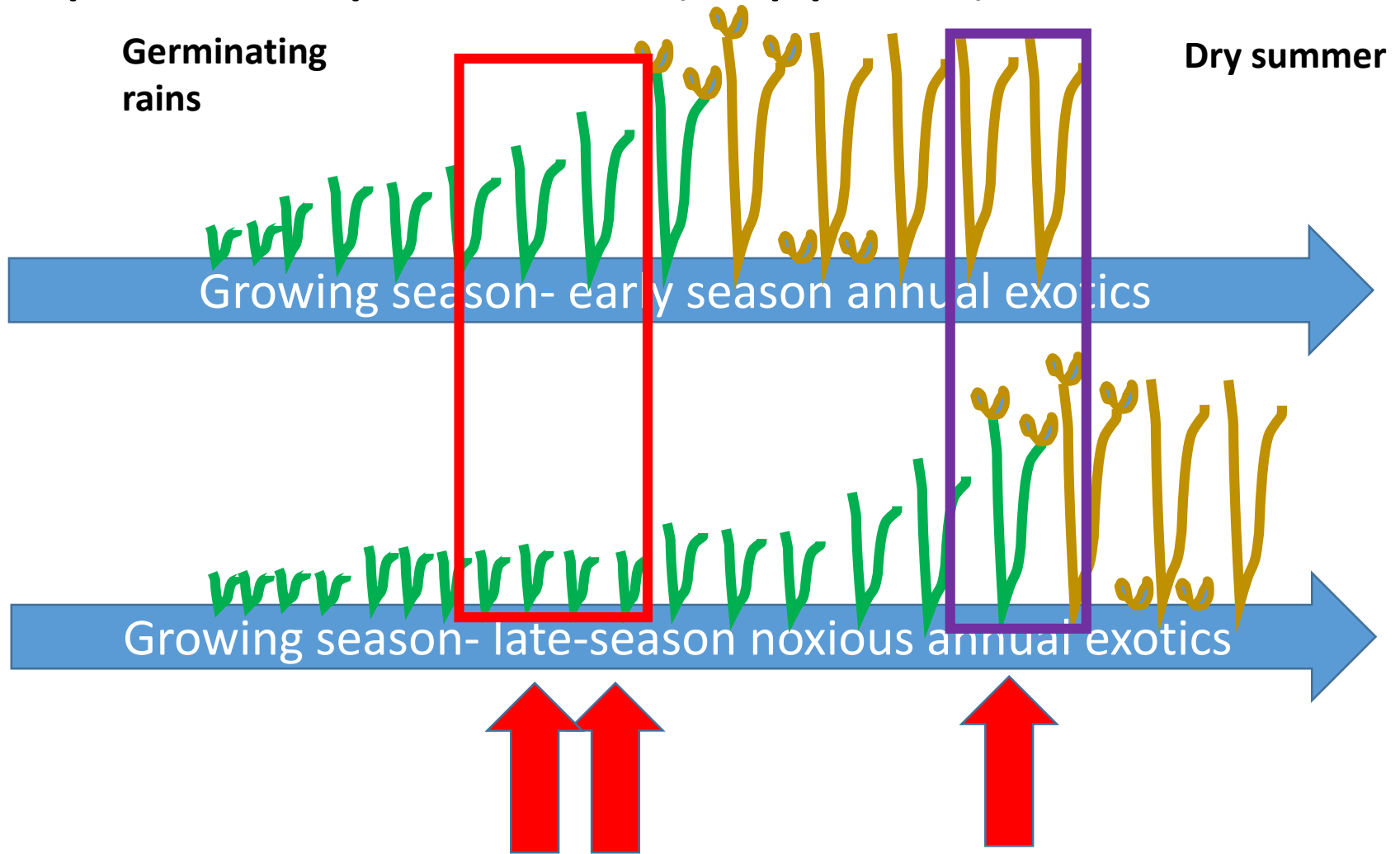
Organic herbicides rely on contact-kill, potential for targeting developing flowers

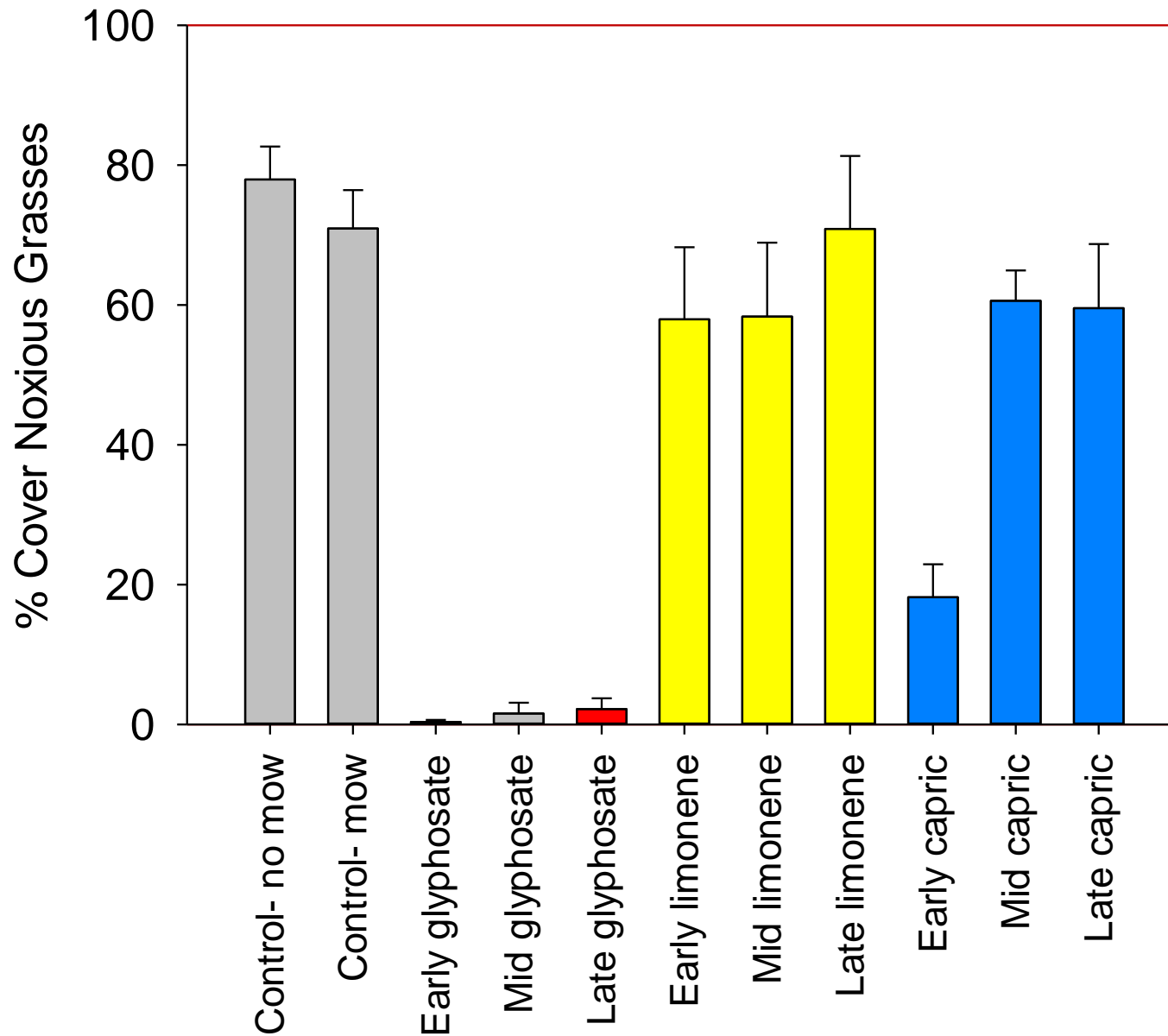
Early spring- early-season
grasses large and less
vulnerable vs. late-season
are small and vulnerable

Late spring- early-season
grasses senesced, can
damage developing flowers &
seeds of late-season grasses



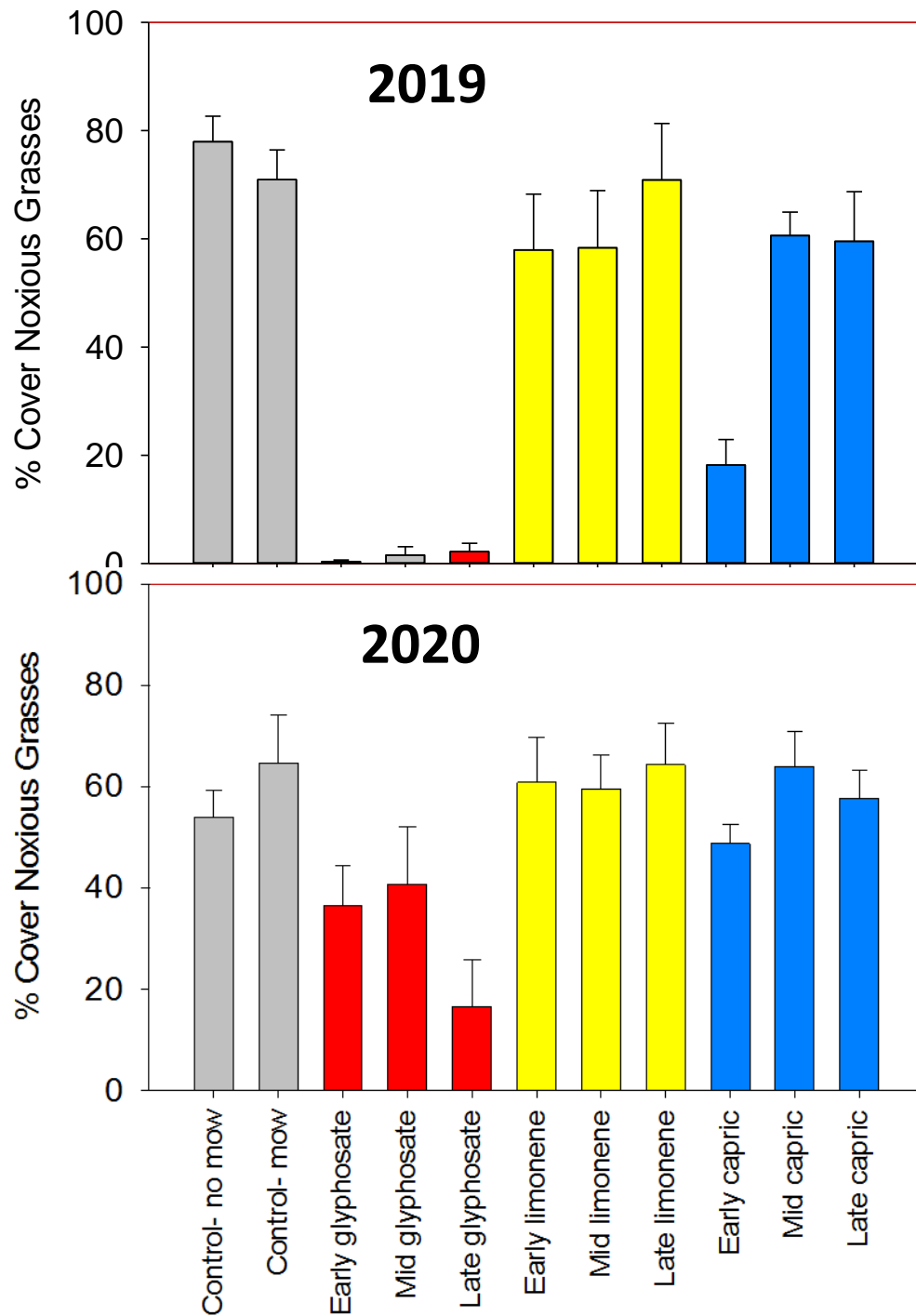
Glyphosate vs. D-Limonene (Avenger) vs. Capric & Caprylic Acid (Suppress)



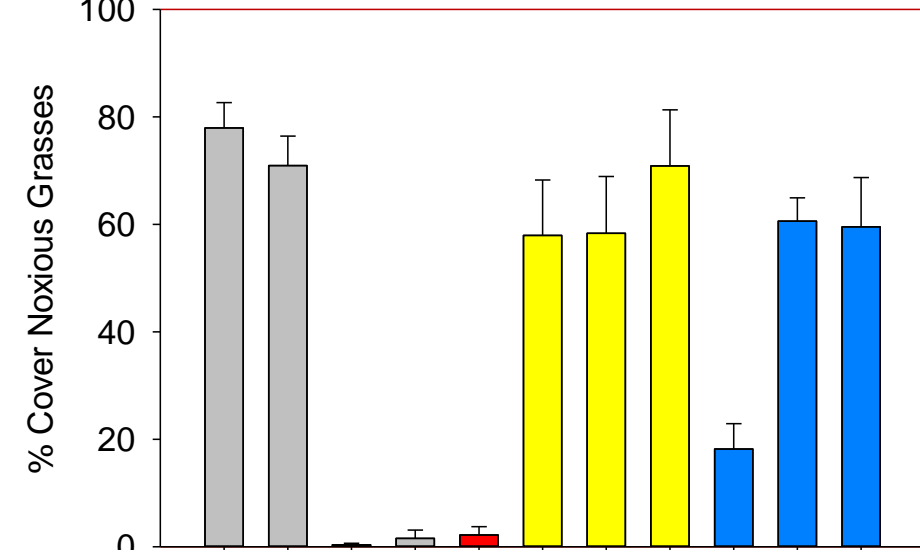


Any timing of glyphosate decreases cover of Medusahead and Goatgrass

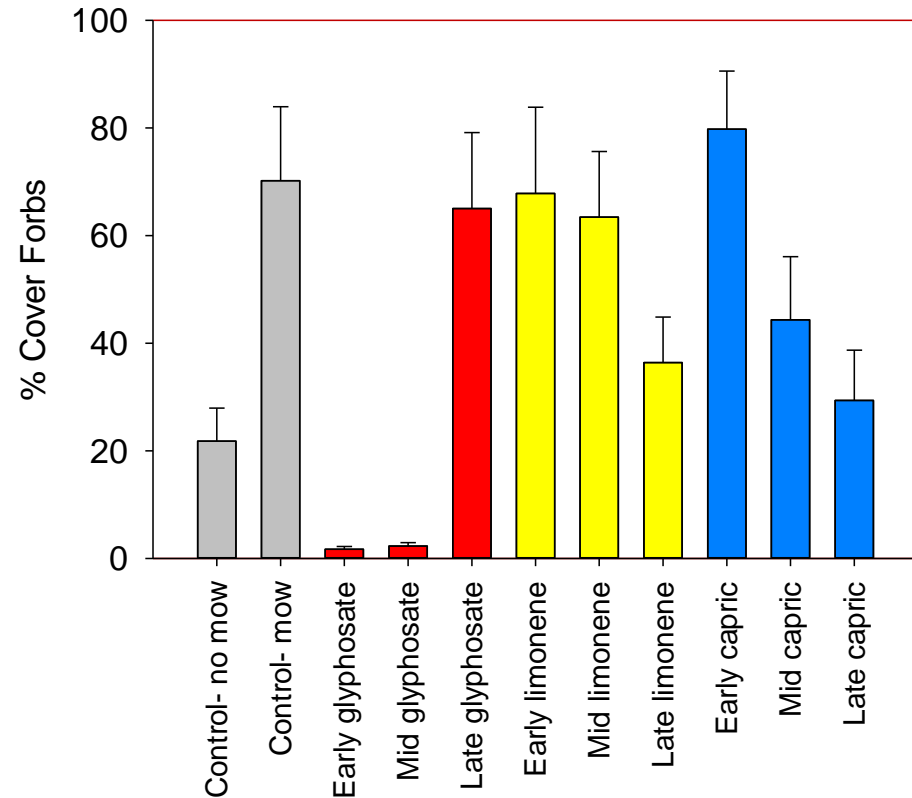
Early spring application of Capric acid has a moderate effect on noxious grasses



No significant
persistent effects of
organic herbicides
one year after
treatment



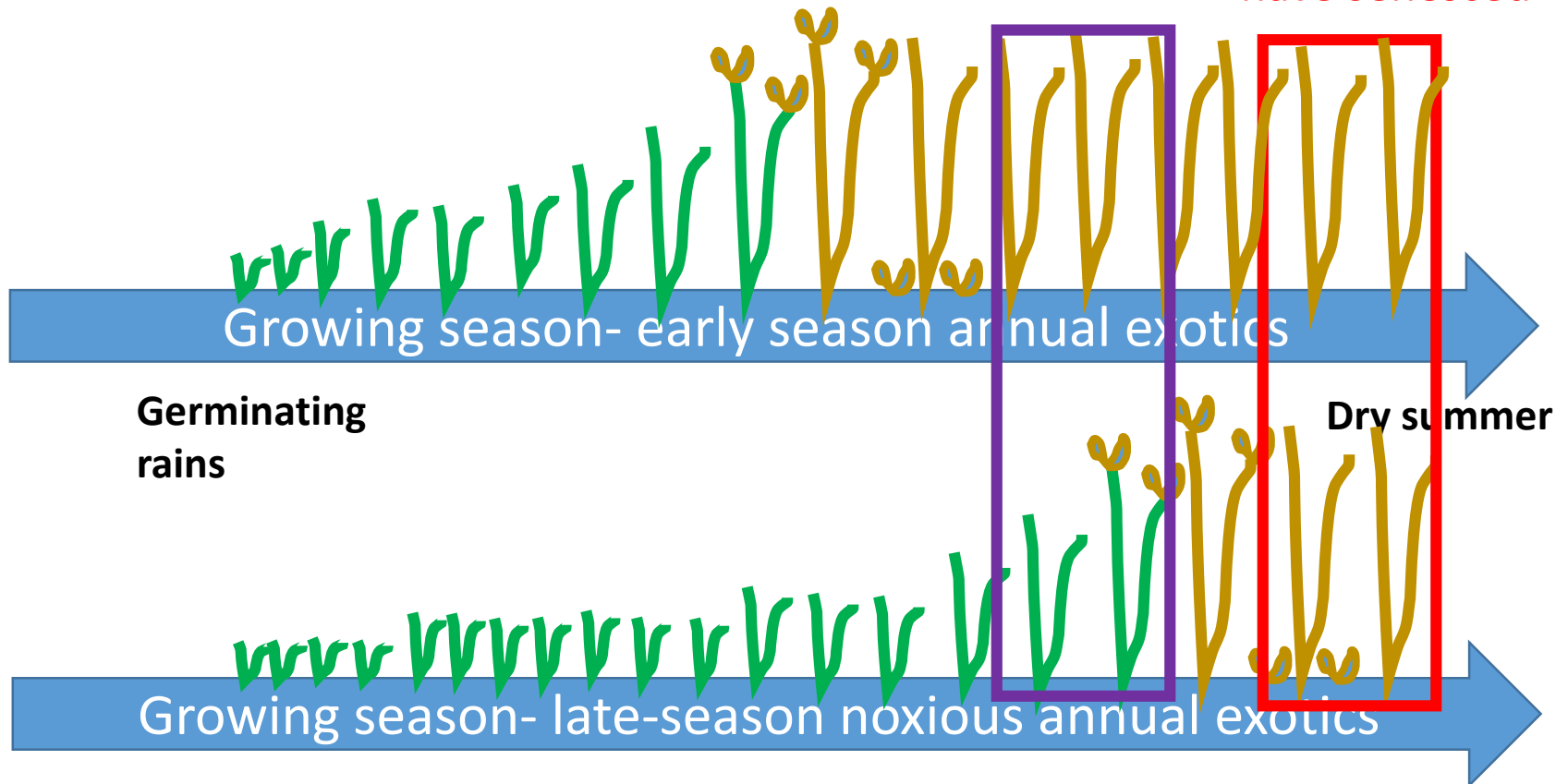
Early and mid- spring applications of glyphosate virtually eliminate wildflowers (organics have more muted effects)



Phenological differences provide potential for control of late-season invasives

Prescribed burns target
time when flowering and
seed production are
vulnerable

Wildfires most
often occur later
when all annuals
have senesced



Fire mortality- seeds

- Vulnerable to fire: Up to 85% of seed production from the previous growing season is in the thatch layer (Young et al. 1981)
- Wildfire reduced overall germination 7-fold, and decreased germination of the dominant grasses 50-fold (Cox and Allen 2008).

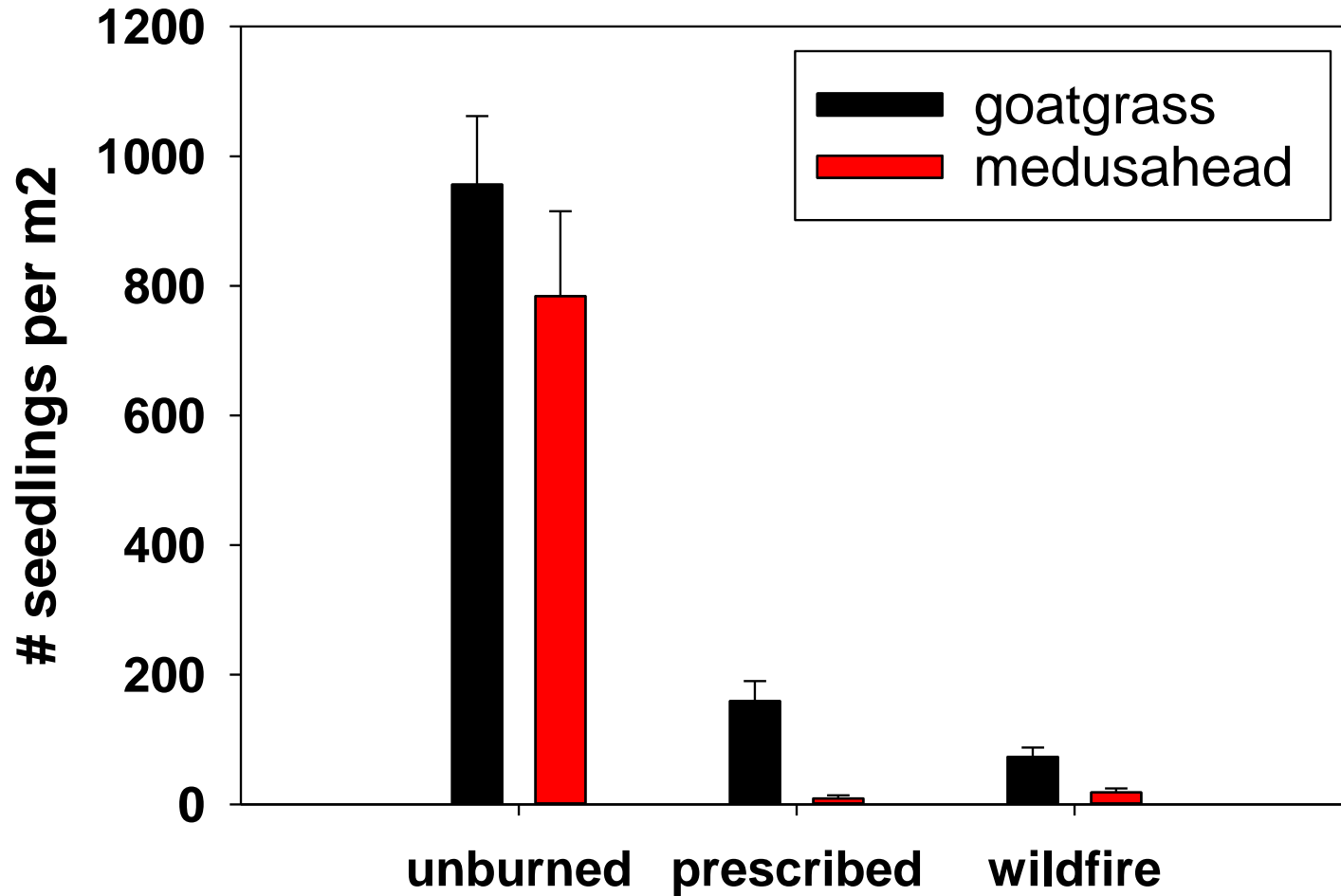




Mendocino Complex Fire:
late July 2018

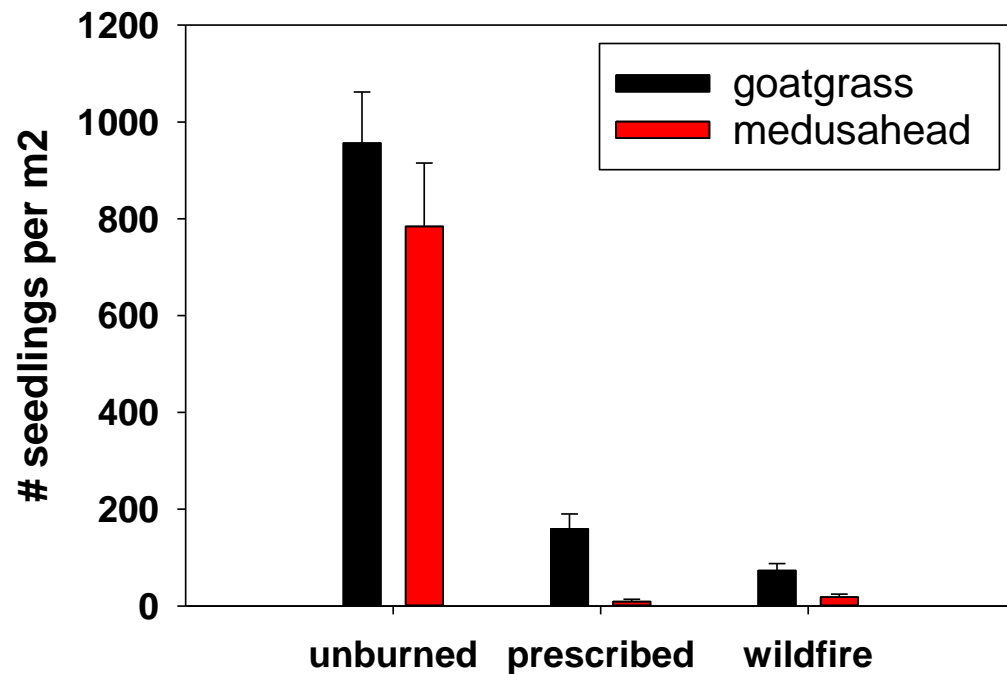
Prescribed fires: June 2018



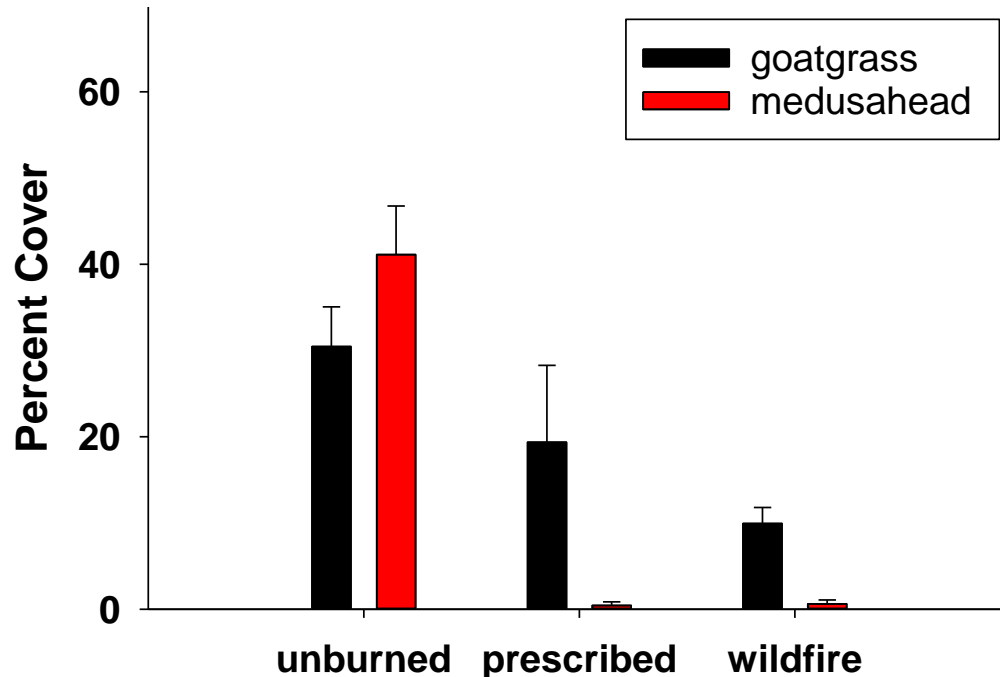


Medusahead
seed survival
impacted
similarly by
prescribed
and wildfires

Goatgrass
seed survival
lower in
wildfires

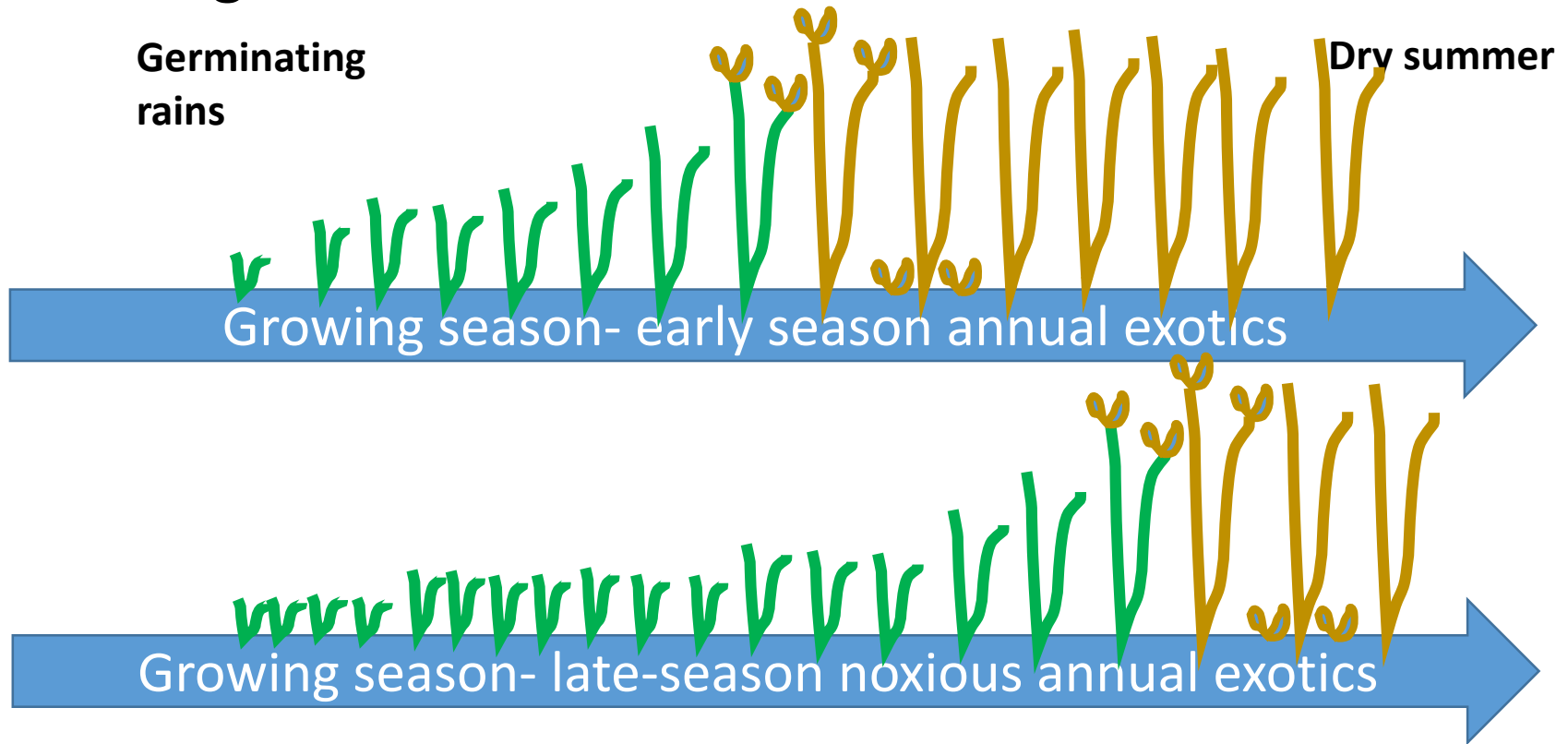


For medusahead, both burns decrease seed survival and next year's cover by 98%



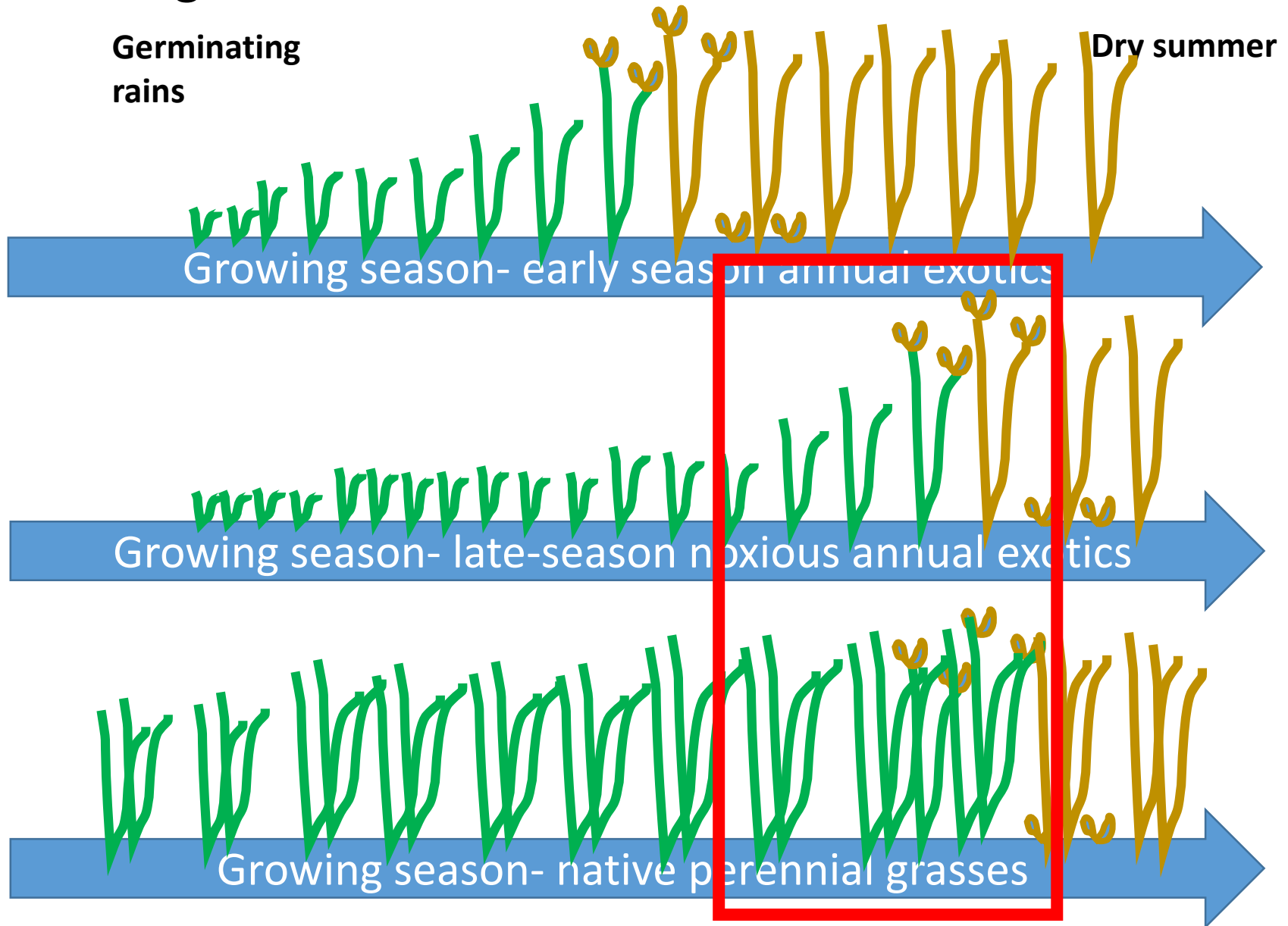
For goatgrass, despite high seed mortality, fire effects on first year's cover is more muted

Phenological differences to control late-season invasives?



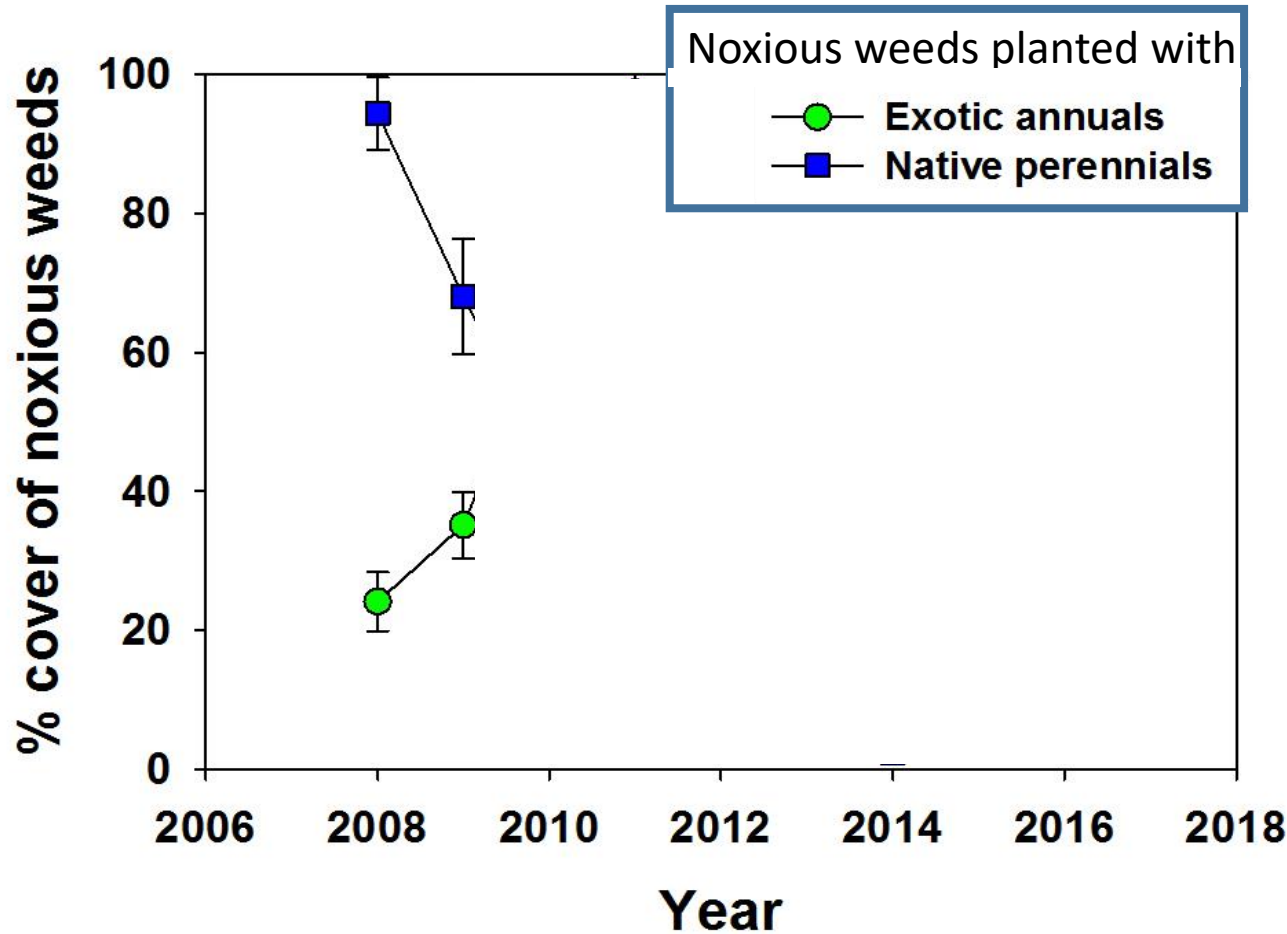
Limited ability of early-season annuals to suppress late-season annuals because of different phenologies

Phenological differences to control late-season invasives?



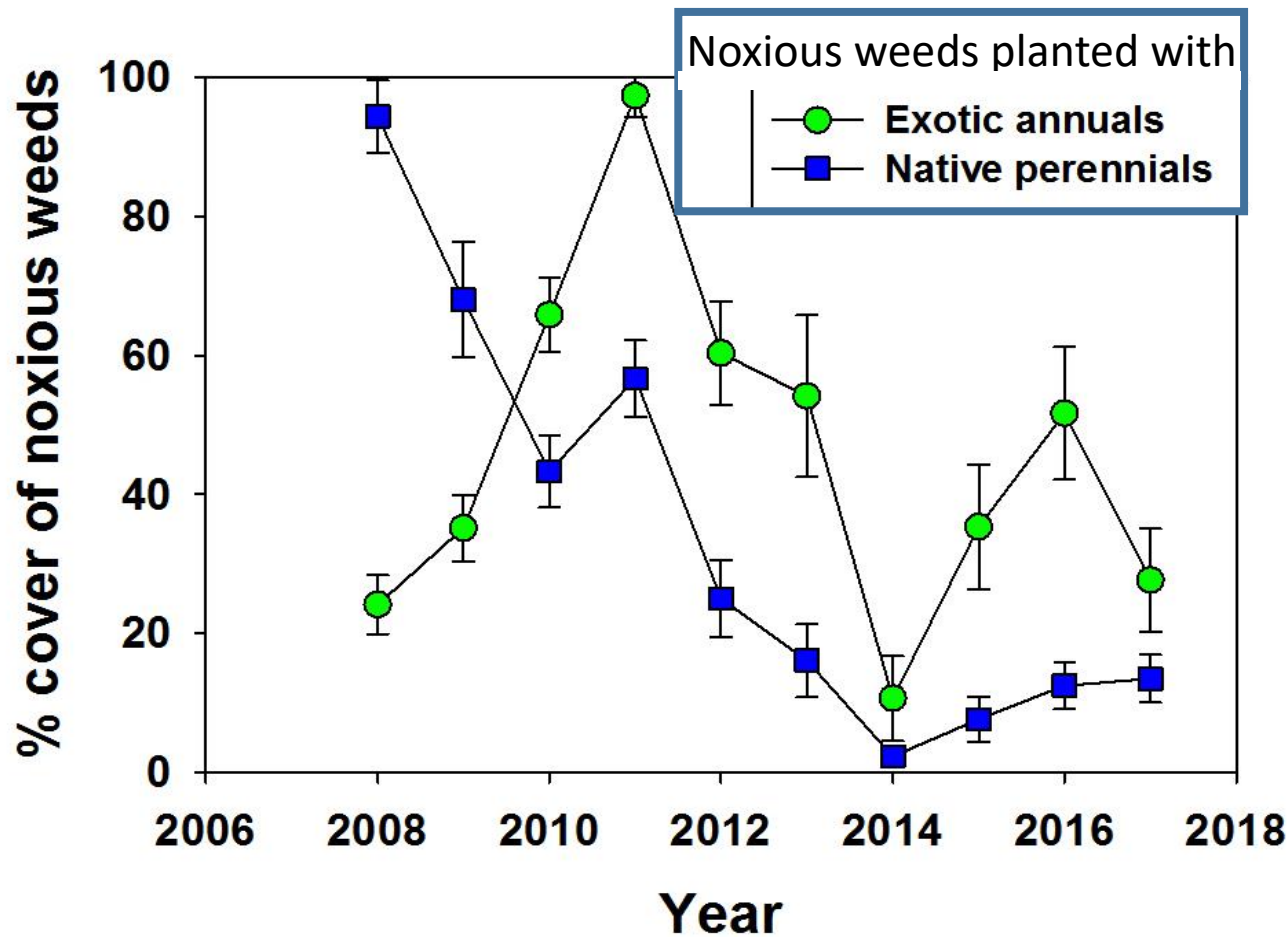
Native perennials can provide direct competition for late-season resources

Changes in cover of noxious weeds depends on who they are competing with



- Noxious weeds are initially higher in natives vs. annual exotic treatments

Native restoration can suppress noxious weeds over time



- Over time, noxious weeds in annual exotics are highly influenced by annual rainfall, vs. natives suppress noxious weeds

Phenological differences provide opportunities for controlling noxious grasses



- Organic herbicide effects on noxious weeds are small and short-term. Their benefit is they have less negative effects on wildflowers
- Medusahead is virtually eliminated for at least the first year after prescribed and wild fires
- Goatgrass cover decreased by 39% in prescribed fires and 65-70% in wildfires
- Native perennial grasses, once established, provide long-term suppression of noxious weeds, even in highly-favorable years
- Is native grass restoration post-fire an effective long-term strategy for suppressing medusahead and goatgrass?

