Use of Fire for Management of Invasive Plants

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Considerations

- Goals
- Fire regime
  - Fire frequency
  - Timing
  - Fire intensity
- Target species phenology
- Growth form of target species
- Non-target species

Historic 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	-

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Changes in fire frequency

- Decreased
  - Fire suppression → Increase in fuel load
  - Grazing intensity
- 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 adaptability

- California plants :
  - Resilient to periodic fires
  - Fire-adapted
  - Scarification

- Important to note:
  - Plant species adapted to specific fire regimes.
  - Eg: forest vs shrubland vs grassland species

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Annual species

- Grasses: medusahead, red brome, barb goatgrass
- Forbs: yellow star thistle

Impact

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

Annual species cont..

- **Desirables:**
- Most desirable annual species mature early
- They drop seeds by late spring, early summer

- **Invasive**
- Most invasive annuals mature late
  - 2wks to 1 month after other species
- Burn in late spring, early summer

Importance of timing of fire

- Burn late spring to early summer

- Most annual plant species have dropped their seeds
- Most invasive annual still have seeds in inflorescence
- Before seeds mature or fall

- Enough fuel from desirable species

- Late spring fires can selectively kill seeds of invasive annual

Fire temperature

- Grasslands fire:
- soil surface temperatures ~480 F
    - not hot enough to kill seeds
- Good for desirable species seeds
    - escape fire.
- Canopy temperatures ~1200 F
    - enough to kill seeds

Annual forbs

- **Yellow star thistle**:
- Mostly occur in area with altered fire regimes
- Positive feedback towards reduced fire frequency

- Best time – early-mid summer
- Seed bank declined with number of years burned
- Plant density declined over 3 years
- Yellow starthistle increased once burning stopped
- Decline associated with increasing diversity

Perennial grasses benefit

- Late spring early summer burn
  - Stimulates perennial bunchgrasses to split into several plants
  - Increase perennial plant density
- But:
  - High fuel load may kill perennial grasses

Post fire management

- Return rate >3yrs
- May need 2 consecutive years e.g. barb goatgrass
- Controlled/adaptive grazing to
  - benefit perennials
  - adjust for associated reduced forage production and
  - shorter growing period
- Follow with other weed control tools
- Seeding

Perennial grasses and forbs

- Fire not effective for perennial grasses or forbs
- Perennials don’t strongly depend on seed
- Depend on underground parts
  - roots
  - shoots

Woody plants

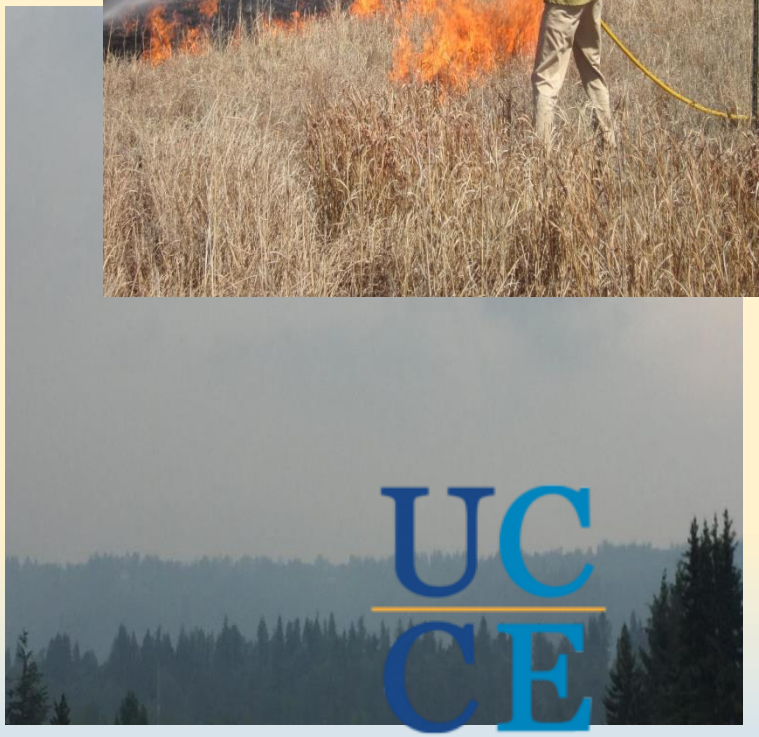
- Shrubs, vines and trees
- Most invasive will resprout after fire
- There need multiple and more intense burns
- May affect other species
- High fire intensity may cause:
  - Hydrophobic Soils - burnt litter and organic material
  - Reduce infiltration,
  - Increase runoff → erosion & siltation

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 species
  - Legumes
- Change balance between plant types
- Create patchy plant communities
- Releases nutrients
- Sterilize landscapes

Challenges of using fire for weed control

- Potential for fire escape
- Air quality issues
- Time to get permits
- Volatilization of nitrogen and sulfur from soil
- 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



Thermal weed control

- Hot water
- Steam
- Hot water and Steam combination (best)

- Water heated under pressure to 250-285F
- Temperature ensures faster speeds with effective weed control
- Sufficient heat penetration into the soil surface

Thermal weed control cont..

- Advantages:
  - Can kill annuals and some perennials
  - No chemicals introduced

- Disadvantages:
  - Labor intensive
  - Low efficacy on perennial plants
  - Kills everything it comes in contact with
  - Slow

Efficient Weed management - IWM

- Cultural
- Chemical
- Mechanical
- Biological

Questions?

The Use of Fire as a Tool for Controlling Invasive Plants

http://wric.ucdavis.edu/