Central Texas vegetation: the role of fire

or

Why conservation land managers are pyromaniacs

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fire-controlled plant communities - types of natural or semi-natural vegetation in which fire plays an essential role

• ~ ½ of pre-settlement North America
• including much of central Texas

• lack of fire in these communities → problems!
  • loss of native biodiversity
  • sometimes, increased fire intensity

potential natural vegetation of North America

major natural fire-controlled plant communities

- boreal forest (taiga)
- coniferous forests of the Pacific Northwest
- coniferous forests of the Rocky Mountains
- pine savannas of the US coastal plain
- Mediterranean-climate region of California
- central grasslands (eastern portion)
We distinguish between

- fires that maintain the existing plant community (stand-maintaining fires)

and

- fires that cause a different plant community to replace the pre-fire community (stand-replacing fires)

Some definitions:

- forest
- savanna
- grassland

- woodland
- savanna

- shrubland
- savanna

in general:

- growth of woody plants
- stand-maintaining fires
- stand-replacing fires
• fires that maintain the existing plant community (stand-maintaining fires)
  -- typically, surface fires

example A1: longleaf pine savanna (SE US)
example A2: tall-grass grassland (central US)

• fires that cause a different plant community to replace the pre-fire community (stand-replacing fires)
  -- typically, crown fires
  -- typically, cannot be prevented

example B1: conifer forests of the Northern Rockies

post-fire vegetation (tree seedlings, forbs)

• fires that cause a different plant community to replace the pre-fire community (stand-replacing fires)

example B2: Californian Mediterranean-climate shrublands

post-fire vegetation (grasses, forbs, resprouting shrubs, shrub seedlings)

what about central Texas?

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Four common upland plant communities of central Texas
[west of the Balcones Fault, i.e., on the Edwards Plateau]

- mixed (red oak/juniper/elm/etc.) woodland
- live oak savanna
- shrub savanna
- Ashe juniper woodland ('cedar brake')

**mixed (red oak/juniper/elm/etc.) woodland, continued**

- surface fires:
  - not known whether they occurred. If they did, fire suppression may be
    - favoring Ashe juniper (=cedar, *Juniperus ashei*)
    - making canopies more closed
    - contributing to the failure of oak regeneration
    - perhaps make fires less likely but more intense? more likely to be stand-replacing?
- stand-replacing crown fires:
  - can occur, frequency unknown
  - most hardwood species can resprout from the base

**live oak savanna**

- maintained by surface fires
- fire suppression
  - allows Ashe juniper (=cedar, *Juniperus ashei*) to increase
  - converts savanna to woodland, which
    - makes fires less likely, but
    - makes intense, stand-replacing crown fires possible
live oak savanna, continued

Under present conditions, fire is usually not very effective at controlling *Juniperus ashei* – not intense enough.

Sufficiently intense prescribed fire, combined with cedar removal, can maintain and restore these savannas.

shrub savanna

periodic fires
- were followed by resprouting of shrubs from their bases
- restored vireo habitat (~6’ high, 30-60% cover)
- prevented succession to shrubland and woodland

*Rhus lanceolata* (flameleaf sumac)

black-capped vireo

shrub savanna, continued

fire suppression
- converts savannas to shrublands and then to woodlands, causing
  - loss of black-capped vireo habitat
  - favors Ashe juniper (=cedar, *Juniperus ashei*) over other plant species
- probably makes fires more intense
Ashe juniper woodland (‘cedar brake’)

Ashe juniper (cedar, *Juniperus ashei*) is native! but probably much more abundant now than previously.

This community can develop as a result of
- fire suppression in former live oak savannas
- failure of hardwood regeneration in mixed woodlands

Summary: roles of fire

- Surface fires maintained live oak savannas.
- Fires also maintained shrub savannas.
- Surface fires may have occurred in mixed woodlands;
  - if so, they probably help control juniper there.
- Stand-replacing crown fires can occur in
  - mixed woodland
  - juniper woodland (‘cedar brakes’) but their frequency is not known.
- Present juniper abundance may be due to fire suppression.

Ashe juniper woodland (‘cedar brake’), continued

Fire suppression
- allows cedar (*Juniperus ashei*) to increase
- converts savanna to Ashe juniper woodland
- may be converting mixed woodland to juniper woodland

Relatively little evidence available -

- a few early explorer’s accounts
- some early settlers’ accounts
- richness of both woodland and grassland floras
- comparisons with similar but better-studied plant communities elsewhere
- observation of the effects of modern fires
Intense fires are probably less common now than in the past. Why?

• not being deliberately set
  • not required for bison hunting
  • burn bans in place when conditions would produce an intense fire
• cattle grazing removes fine fuels
• roads, etc. function as fire breaks
• wildfires are actively suppressed

Many things we don't know about fires in central Texas, including

• What was the fire return interval?
• In what season(s) did most fires occur?
• Did surface fires burn through woodlands as well as through savannas? If so, how did this affect them?
• Did fires create a ‘shifting mosaic’ of woodland and savanna, or was the mosaic stable over time?

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• Did fires create a ‘shifting mosaic’ of woodland and savanna, or was the mosaic stable over time?

• How, and how much, are present plant communities, the result of direct and indirect fire suppression?
• How should we be using fire to restore and maintain native biodiversity?

Use of fire to restore and maintain native biodiversity