

Central Texas vegetation: the role of fire

or

Why conservation land managers are pyromaniacs

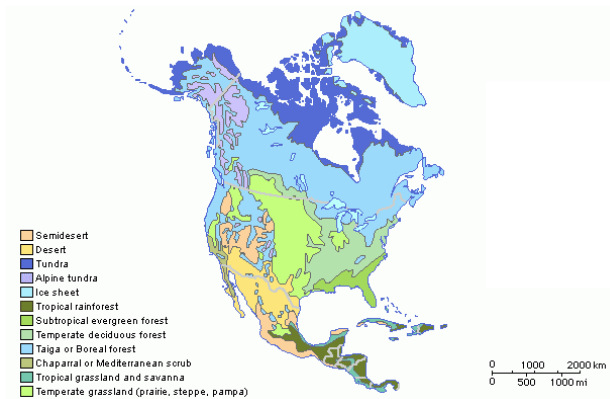
Norma Fowler, Professor
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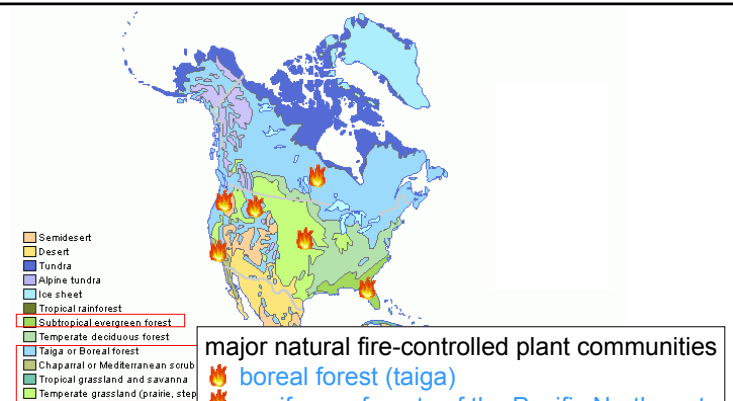
fire-controlled plant communities - types of natural or semi-natural vegetation in which fire plays an essential role

- ~ 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)

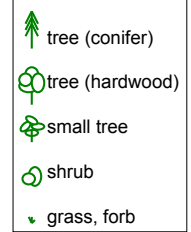
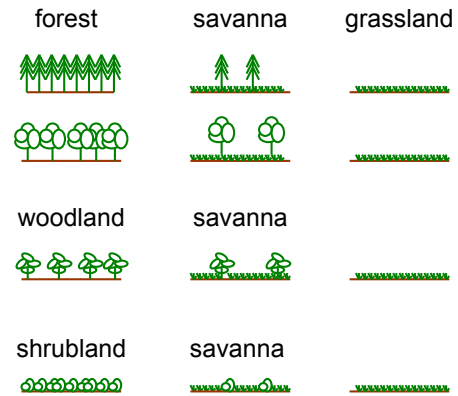
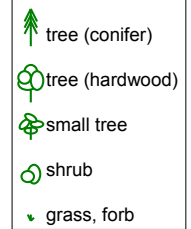
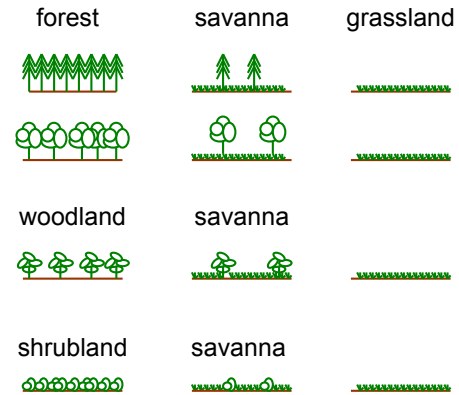
We distinguish between

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

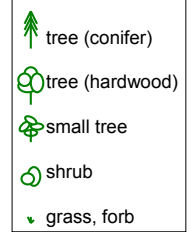
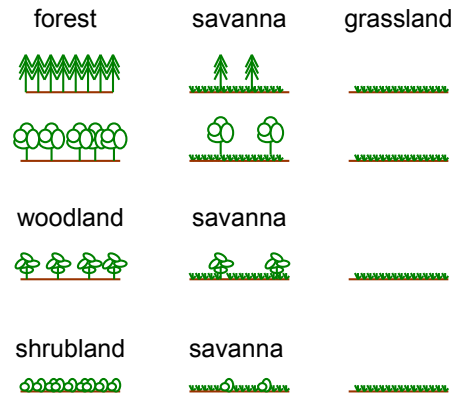
and

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


Some definitions:





in general:



- 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)





FWS

- 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)  conifer forest

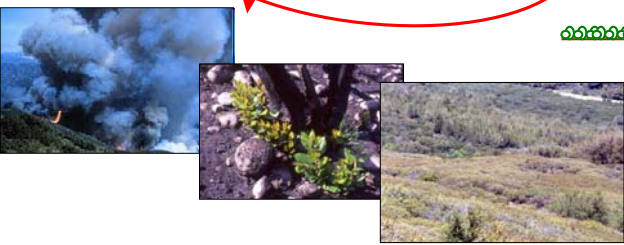
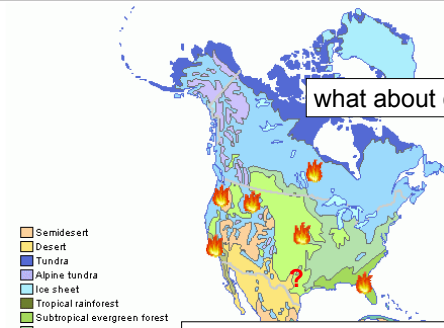
fire 



- 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)  closed canopy shrubland

what about central Texas?

major 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)

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



photo by Mark Sanders



golden-cheeked warbler



Quercus buckleyi
(Texas red oak, Spanish oak)

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



photo by Mark Sanders

live oak savanna

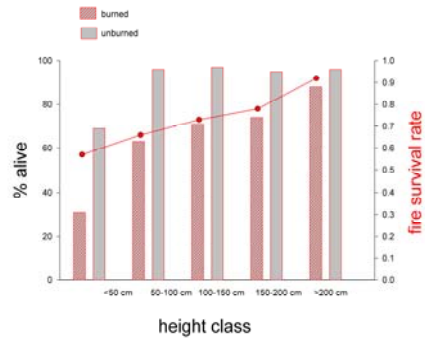
- maintained by surface fires
- fire suppression
 - allows Ashe juniper (=cedar, *Juniperus ashei*) to increase
 - converts savanna to woodland, which
 - makes fires less likely, but
 - makes intense, stand-replacing crown fires possible



Quercus fusiformis (Plateau live oak)

live oak savanna, continued

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



Noel & Fowler 2007

live oak savanna, continued



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



black-capped vireo

Rhus lanceolata (flameleaf sumac)

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



Juniperus ashei (Ashe juniper, cedar)

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



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.

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



Seth Eastman (Texas State Library and Archives Commission)



Frederic Remington (Amon Carter Museum)

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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- 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?
- 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

