

Fire Ecology of the Southern Great Plains

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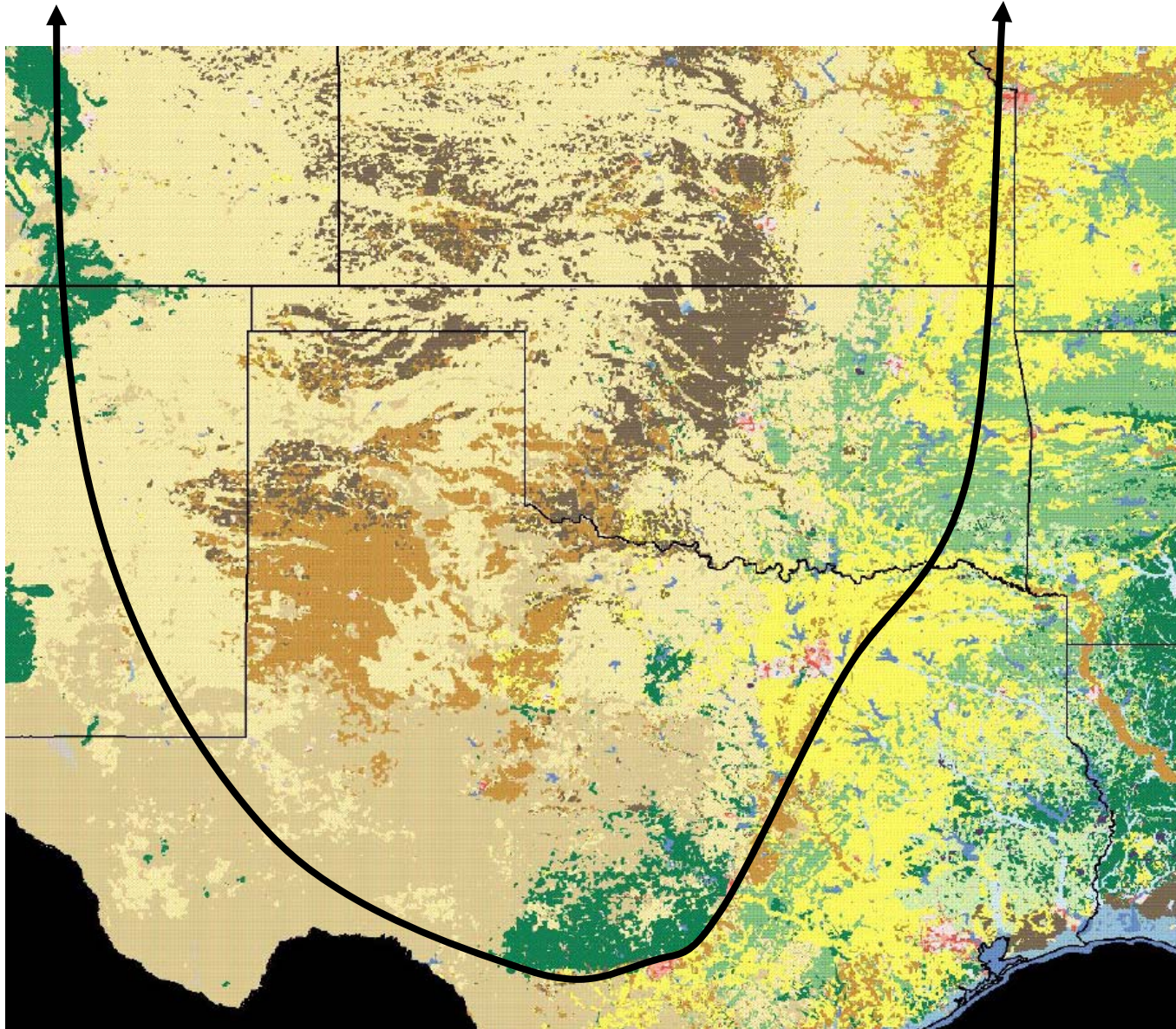
Jim Ansley
Charles Taylor

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Texas A&M University

Dave Engle

Natural Resource Ecology
and Management
Iowa State University

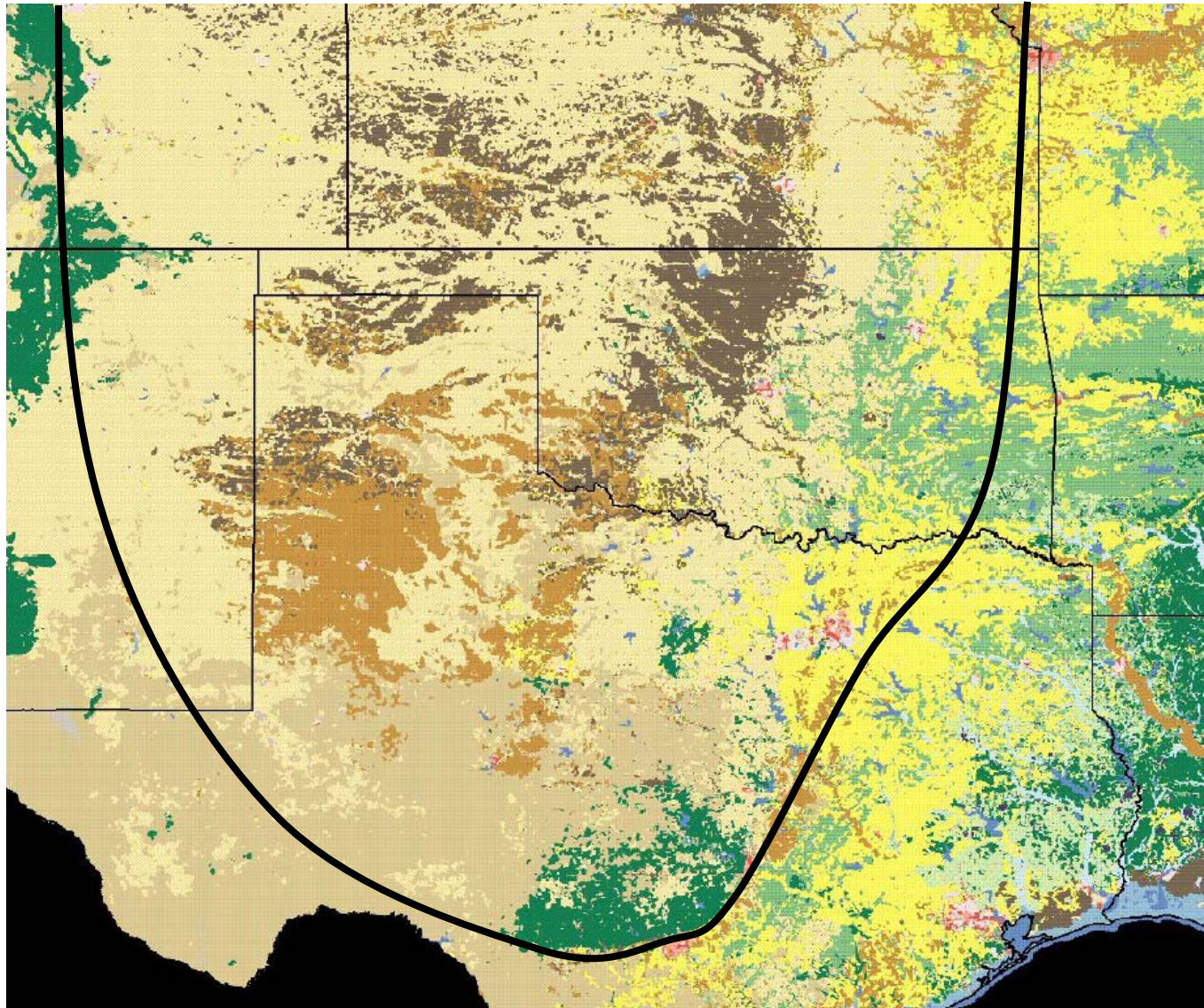
Southern Great Plains



Southern Great Plains Outline

- 1. Fire Sensitive Trees** – Ashe Juniper and Eastern Redcedar
- 2. Resprouting Shrubs and Trees** – Shinnery oak, Sand sagebrush, Plum, Sumac, Mesquite, Live Oak, Post Oak
- 3. Grasslands-** Tall-, Mixed- & Short-grass Prairies
- 4. Controlling factors of fire effects**

Fire Sensitive Trees



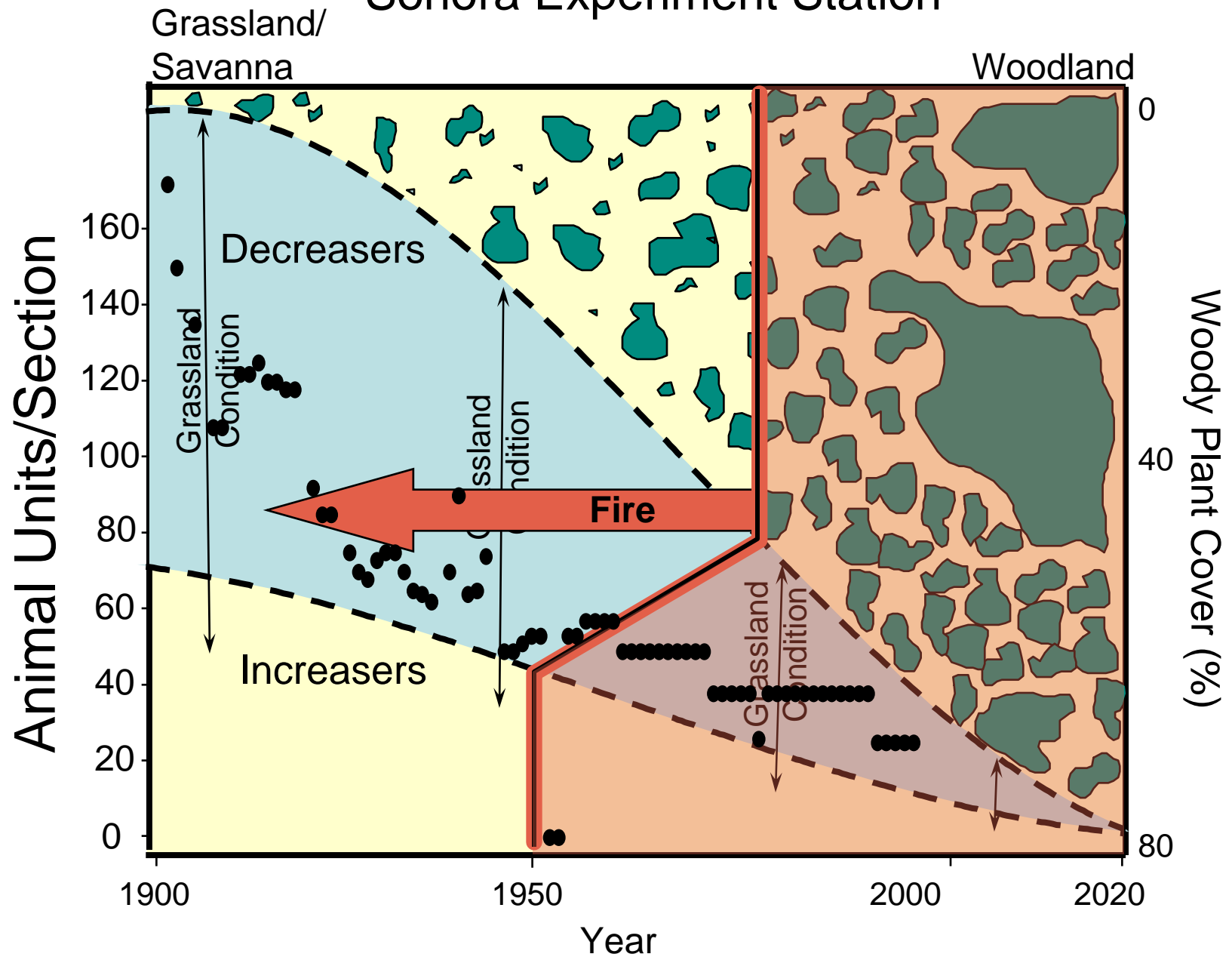
- Open Water
- Perennial Ice/Snow
- Low Intensity Residential
- High Intensity Residential
- Commercial/Industrial/Transportation
- Bare Rock/Sand/Clay
- Quarries/Strip Mines/Gravel Pits
- Transitional
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrubland
- Orchards/Vineyards/Other
- Grasslands/Herbaceous
- Pasture/Hay
- Row Crops
- Small Grains
- Fallow
- Urban/Recreational Grasses
- Woody Wetlands
- Emergent Herbaceous Wetlands



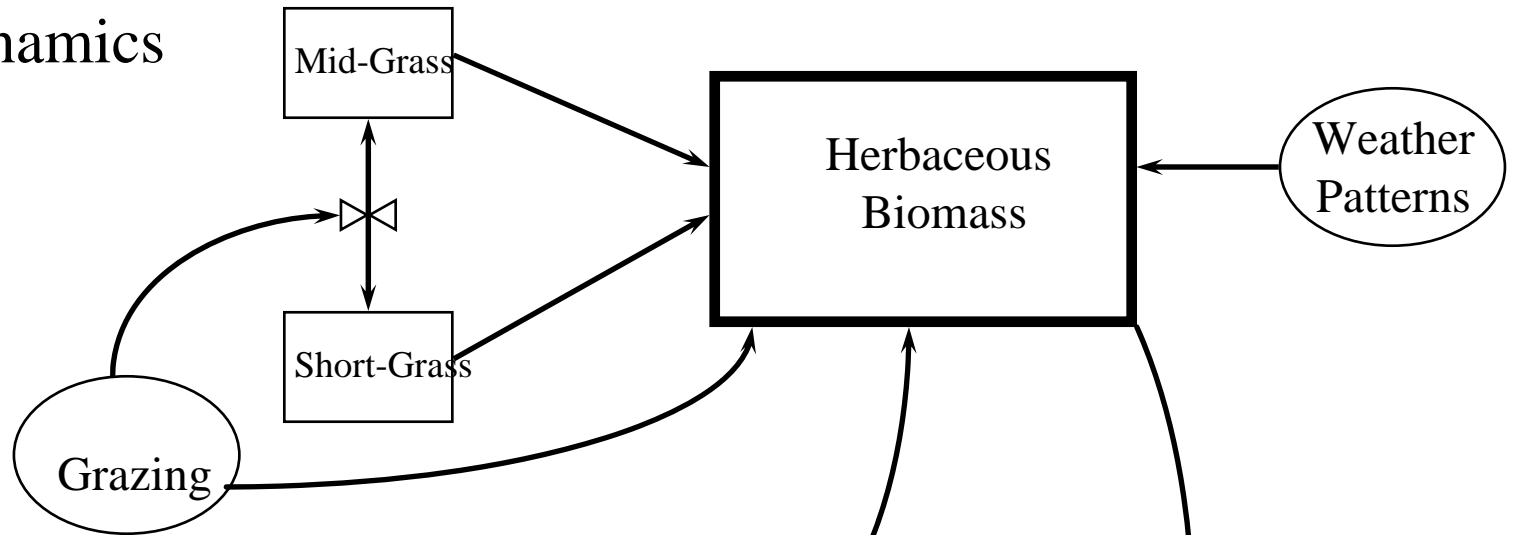


Historical Stocking Rate Decline

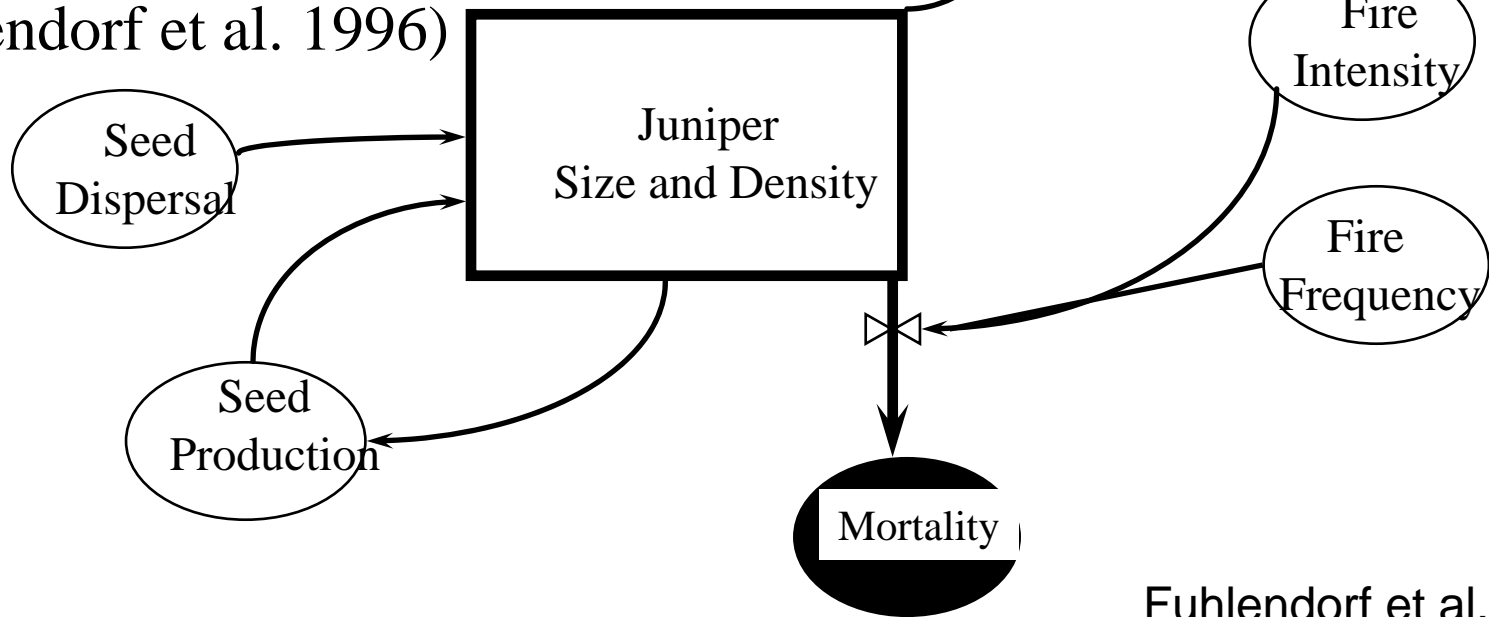
Sonora Experiment Station



Patch Dynamics

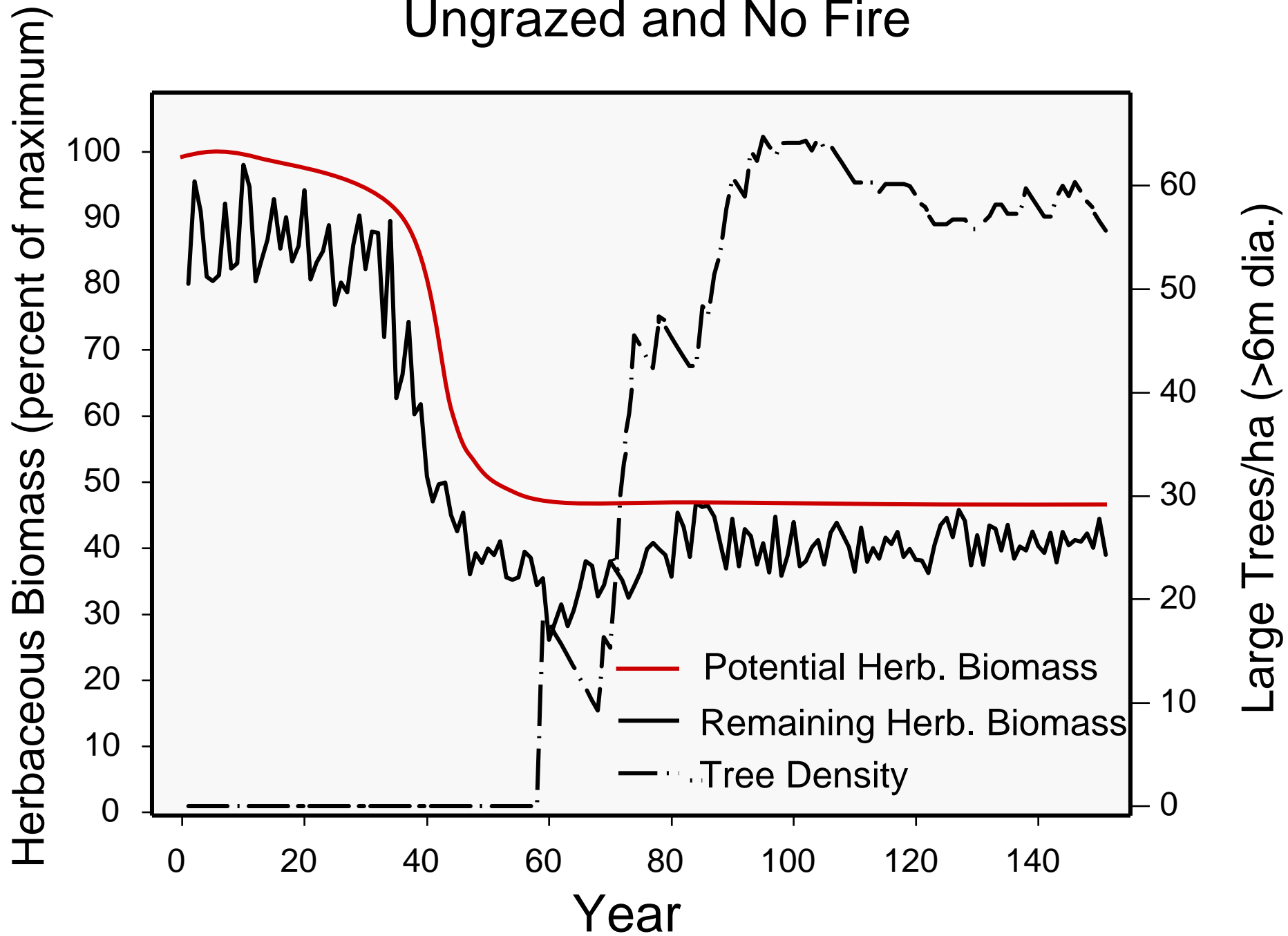


Landscape Dynamics (Fuhlendorf et al. 1996)

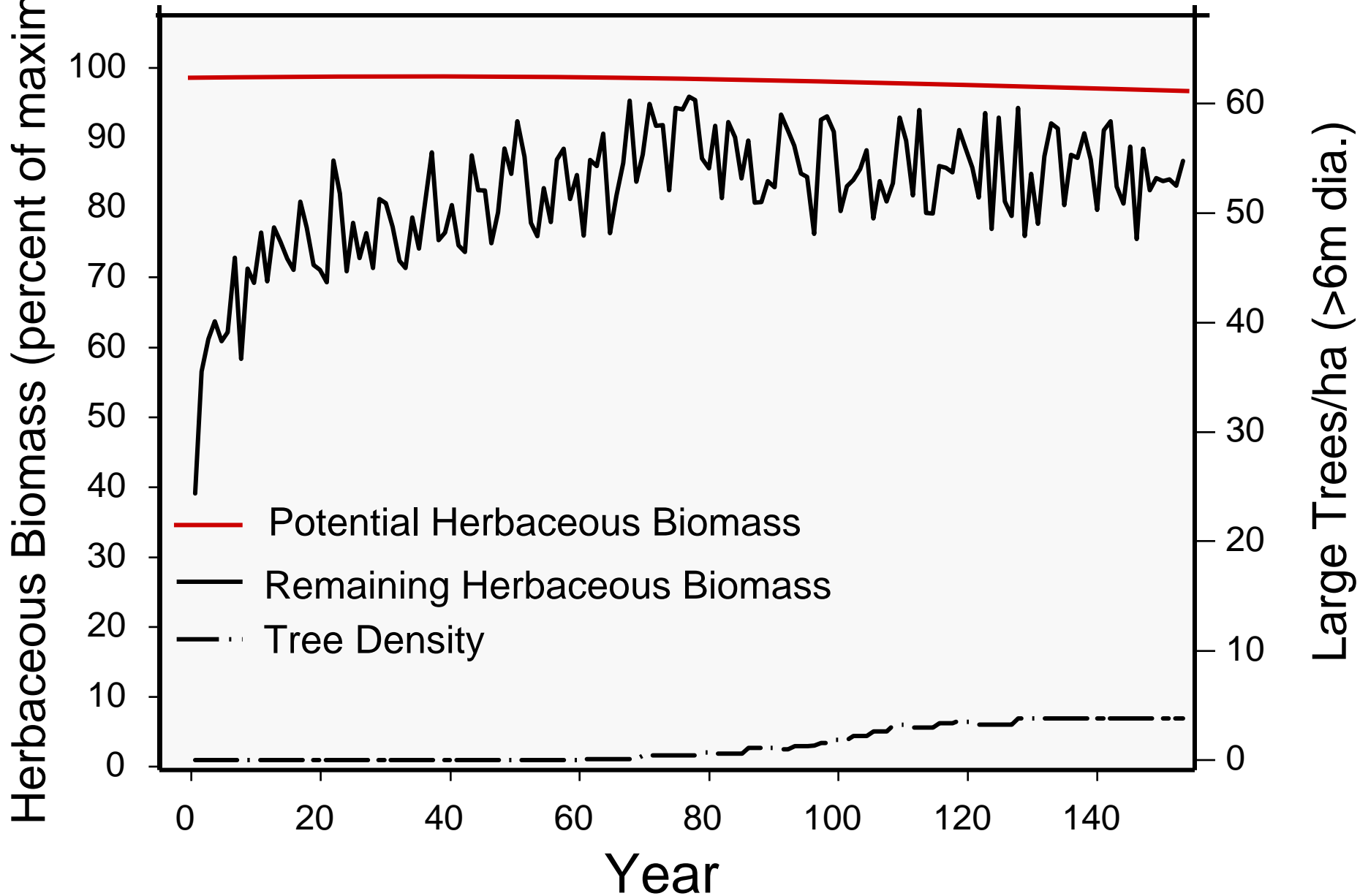


Fuhlendorf et al. 1996
Fuhlendorf et al. *in review*

Ungrazed and No Fire



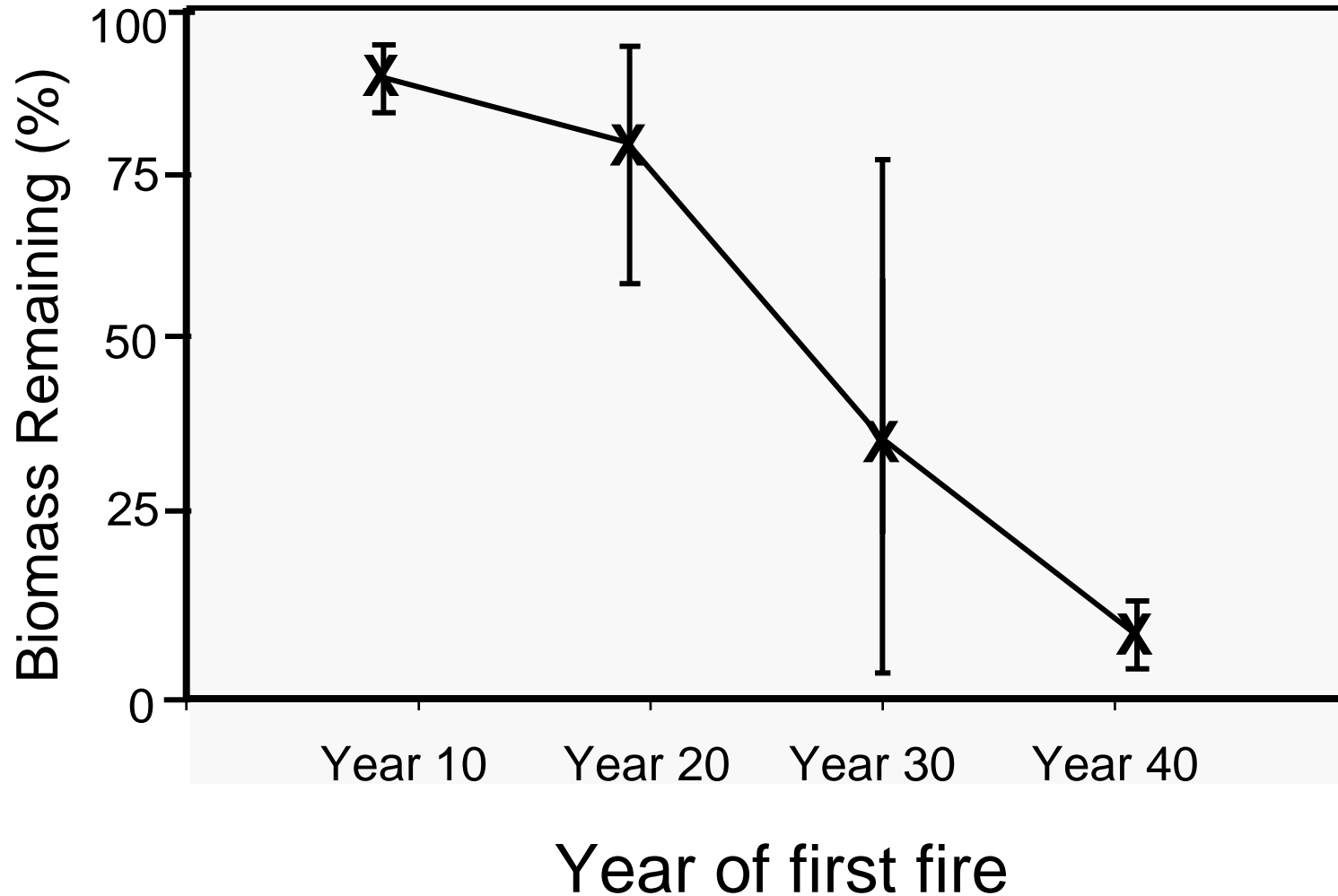
Ungrazed with a 10 year fire frequency



Timing of the first fire is critical

No Grazing with a 10 year fire frequency

Biomass Remaining after 150 years

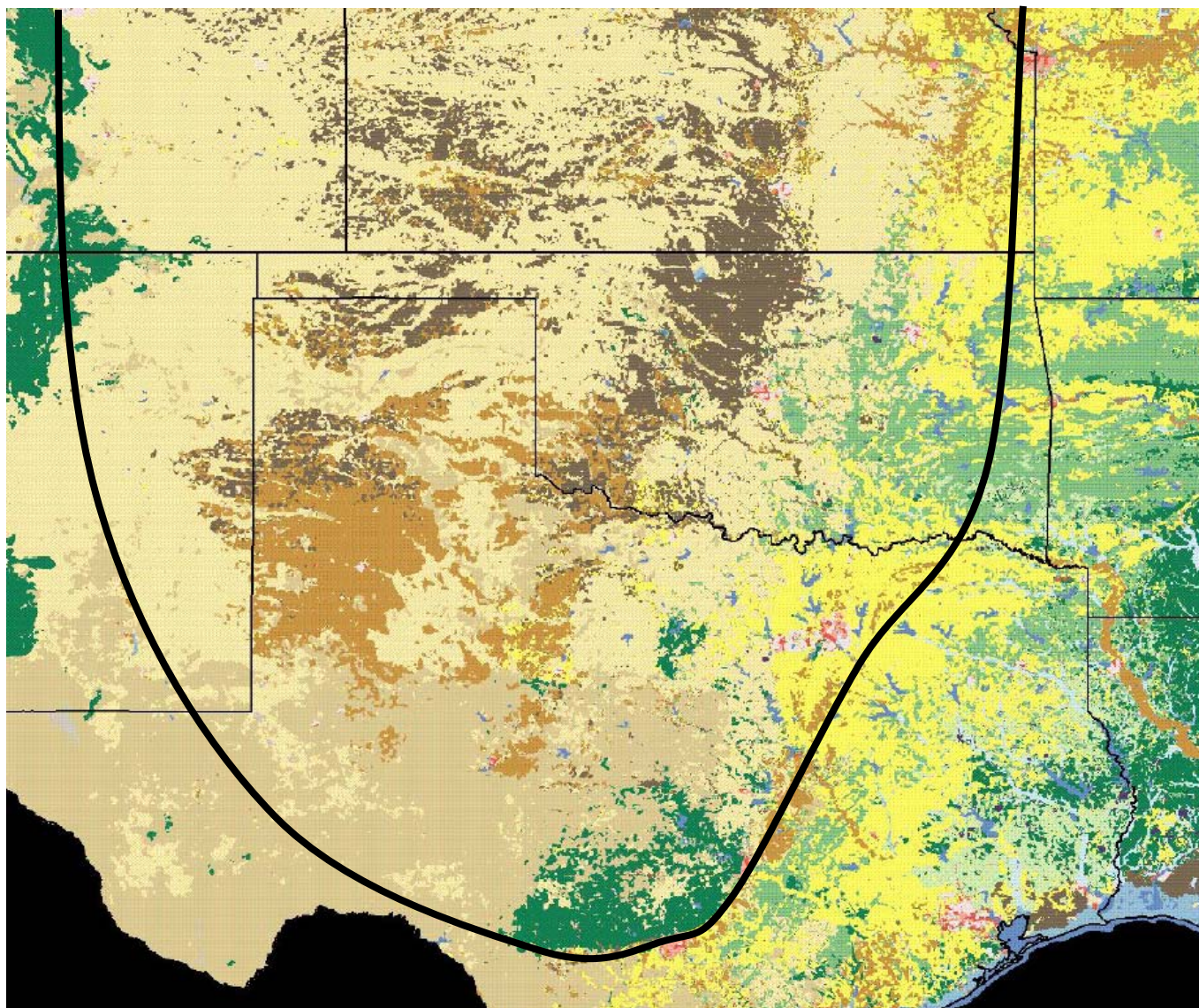


Fire-sensitive woody plants

Summary

- Ashe Juniper on Low Prod. site (Sonora TX)
 - Without fire, JUAS dominance in about 60 yr
 - Without grazing = 15 year fire return interval
 - Moderate grazing = 5 year fire return interval
 - Heavy grazing = sell the farm? or extreme fire
- Eastern Redcedar -High Prod. site (Stillwater OK)
 - Without fire, JUVI dominance in about 45 yr
 - Without grazing = 10 year fire return interval
 - Moderate grazing = 10 year fire return interval
 - Heavy grazing = 2-3 year fire return interval

Resprouting shrubs and trees



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Oak savanna annual burn

Photo by John Weir ■



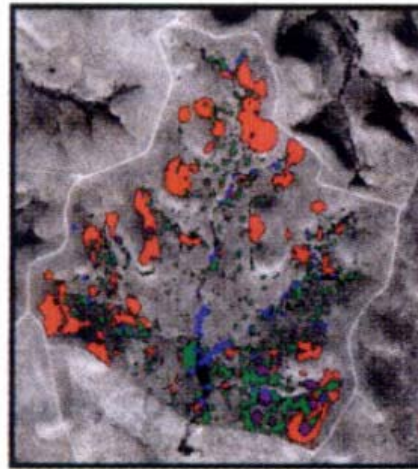


Fire Frequency on Tallgrass Prairie

Rhus glabra, *Cornus drummondii*, *Prunus americana*



Watershed 01D
(burned annually)

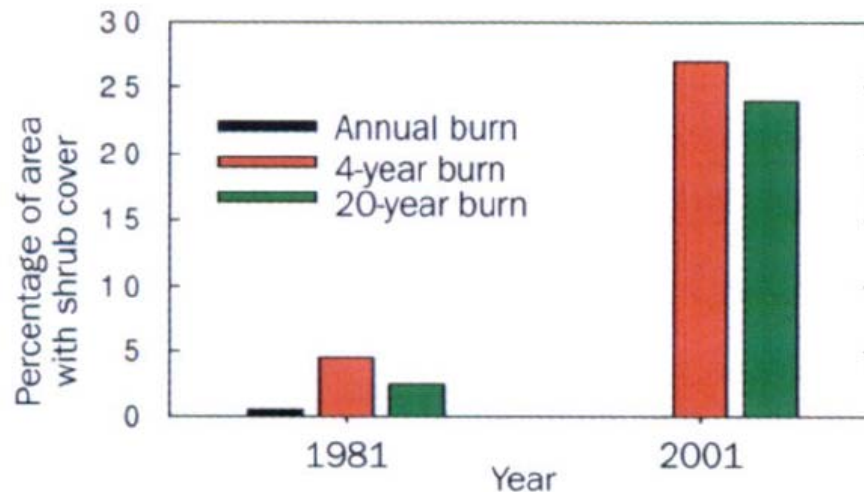


Watershed 04B
(burned every 4 years)



Watershed 020B
(burned every 20 years)

Cover of woody plants on LTER watersheds in 2001 (red=*Rhus glabra*; green=*Cornus drummondii*; purple=*Prunus americana*; blue=other shrub species).





Cross Timbers of Texas, Oklahoma & Kansas
Without fire

4-yr fire return interval



3-yr fire return interval



2-yr fire return interval



1-yr fire return interval



2 year burn frequency



5 year burn frequency



No burn- control





Photos by
Jim Ansley

Regrowth 10 years after fire



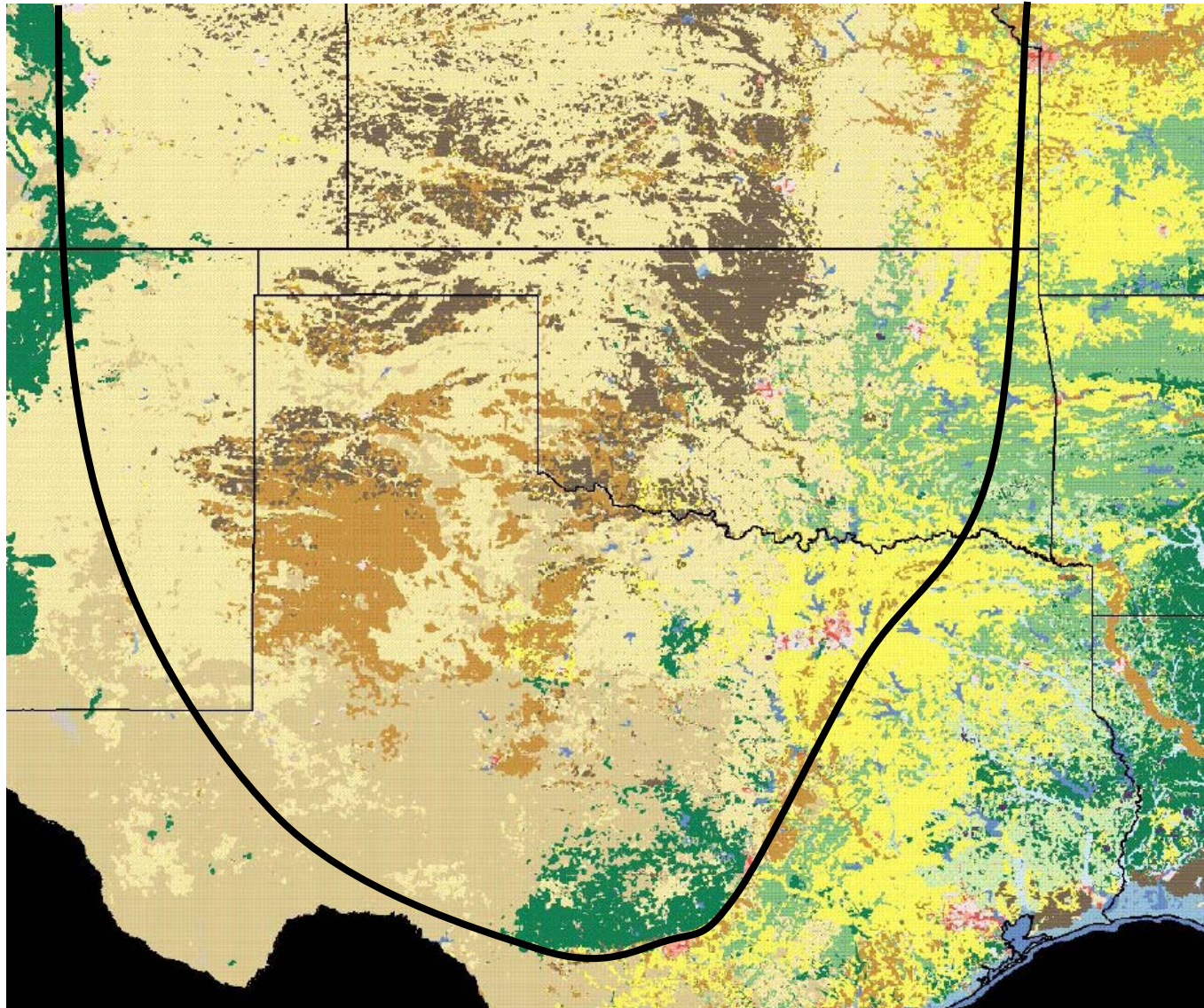


Resprouting shrubs and trees

Summary

- Temporary increase in herbaceous dominance
- Minimal negative effect (if any) on density
- Management with fire requires high frequency (e.g. 2-5 year return interval).

Grasslands



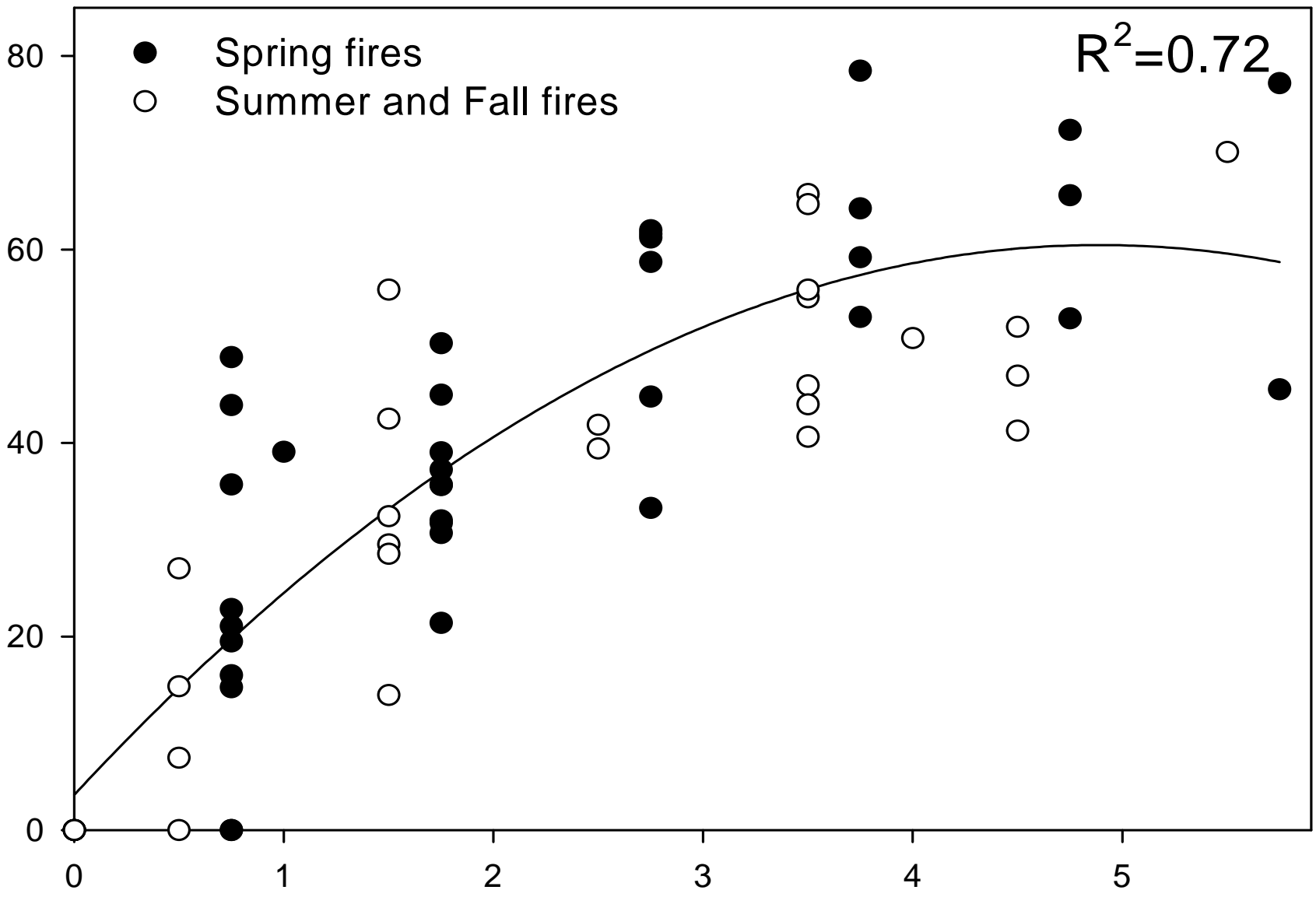
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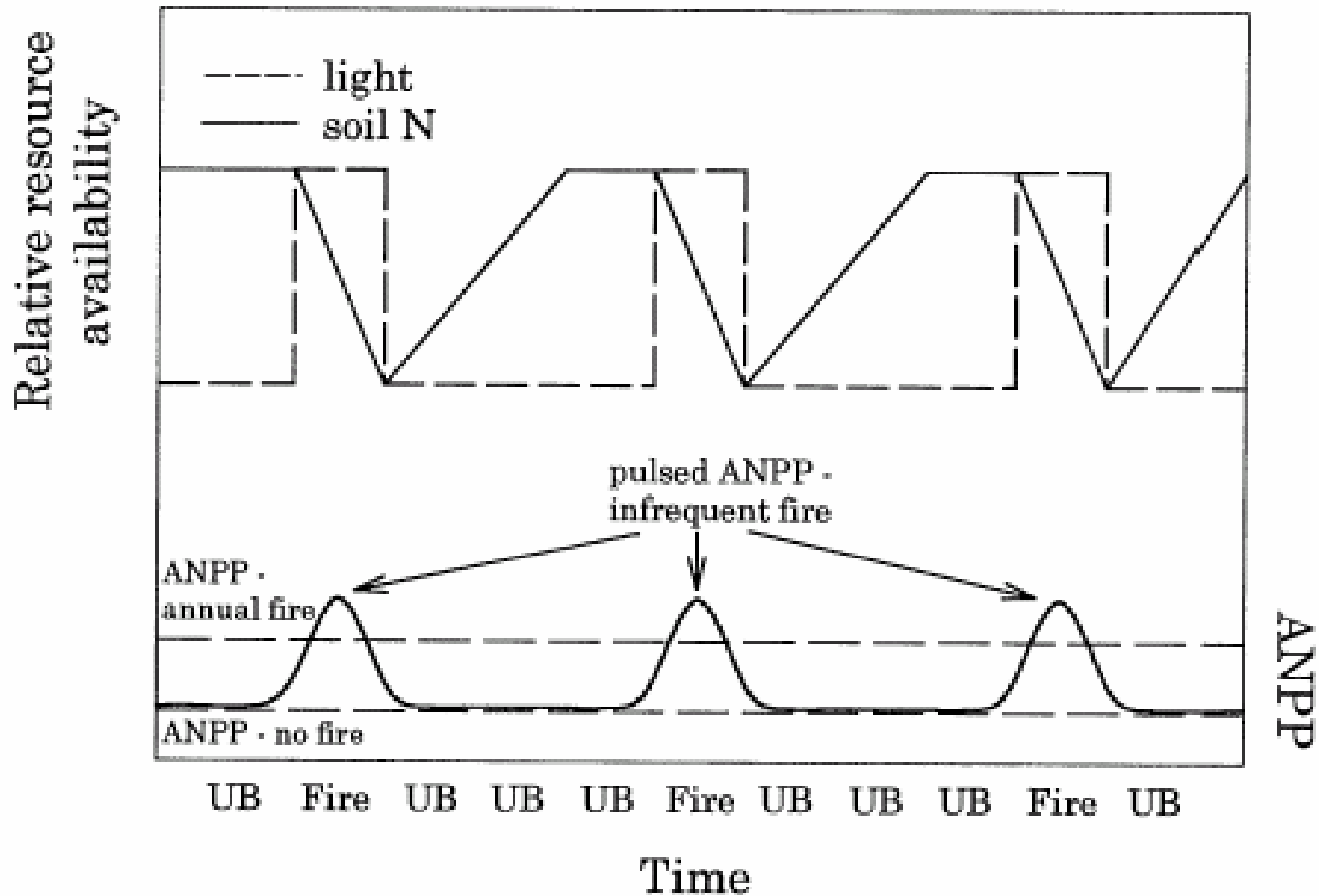
Bison Unit of the Tallgrass Prairie Preserve

Above ground biomass (g/m²)



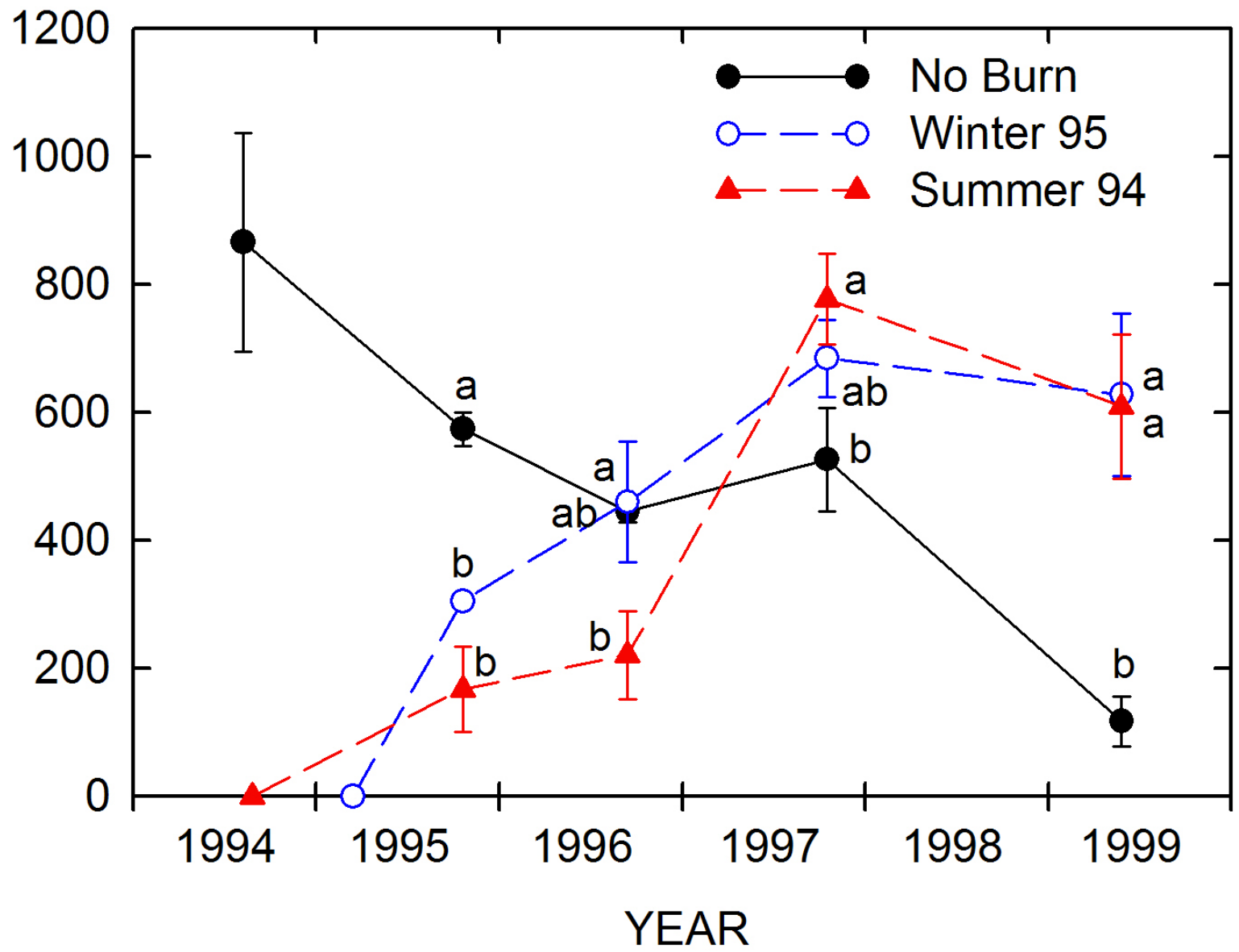
Years since focal disturbance

Transient Maxima Hypothesis



Sideoats Grama

Total Standing Crop (g m^{-2})



Ansley et al. 2006



Season has minimal longterm effects in grasslands

- Howe 1994
- Engle et al. 2000
- Engle and Bidwell 2001
- Brockway et al. 2002
- Towne and Kemp 2003
- Fuhlendorf and Engle 2004
- Fuhlendorf et al. 2006
- Ansley et al. 2006

Pre-fire Condition



1 Month Post-fire



1 Year Post-fire



Grasslands

Summary

1. Reduce woody plant encroachment
2. Alter grazing distribution to provide heterogeneity
3. Short term, stochastic effects on composition
 - Interaction with weather
 - Frequency and season have less effect than time since fire.

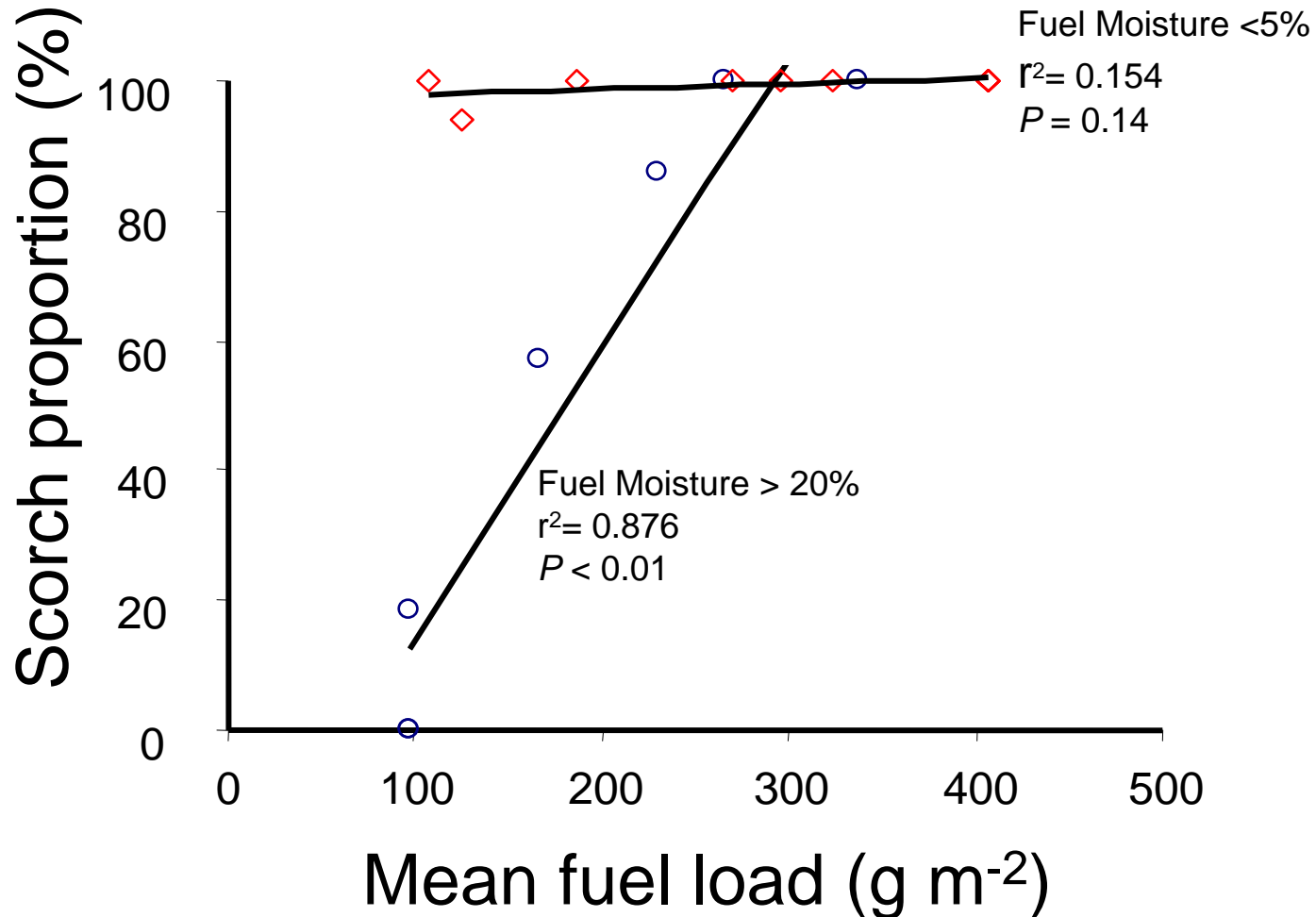
Factors that influence fire effects

1. Everything that influences fire intensity
 - Fuel load, humidity, temperature, Fuel moisture etc..
 - Grazing
 - Season



Photos by
Jim Ansley

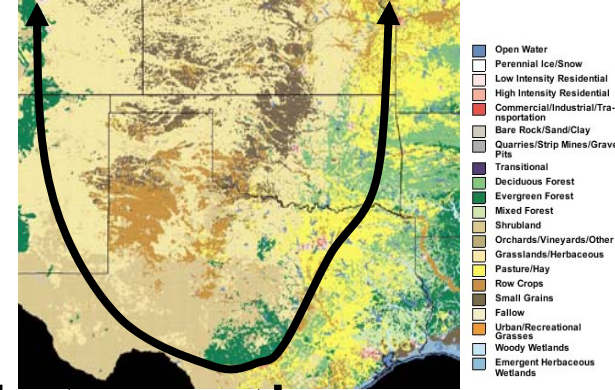
Effect of Summer Fire



Factors that influence fire effects

1. Everything that influences fire intensity
 1. Fuel load, humidity, temperature, Fuel moisture etc..
 2. Grazing
 3. Season
2. Fire Frequency / Time Since Fire

Summary and Synthesis



1. Focus on woody-herbaceous interaction

2. For Fire Sensitive species

- Fire interval – 5-15 yr
- Grazing and initial conditions are critical

3. For Re-sprouting Species

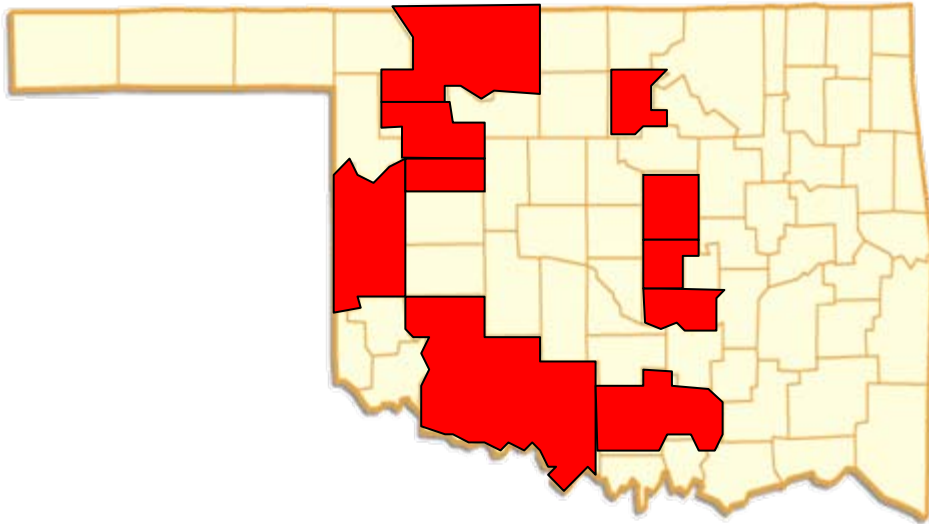
- Fire interval – 2-5 yrs

4. For Grasslands

- Time since fire

5. Critical issues

- Fire intensity
- Time since fire



Rx Fire Associations

- Cooperation among landowners
- Rural fire departments
- Go beyond ownership boundaries
- Can limit liability
- Create a new land ethic
- Provide training

