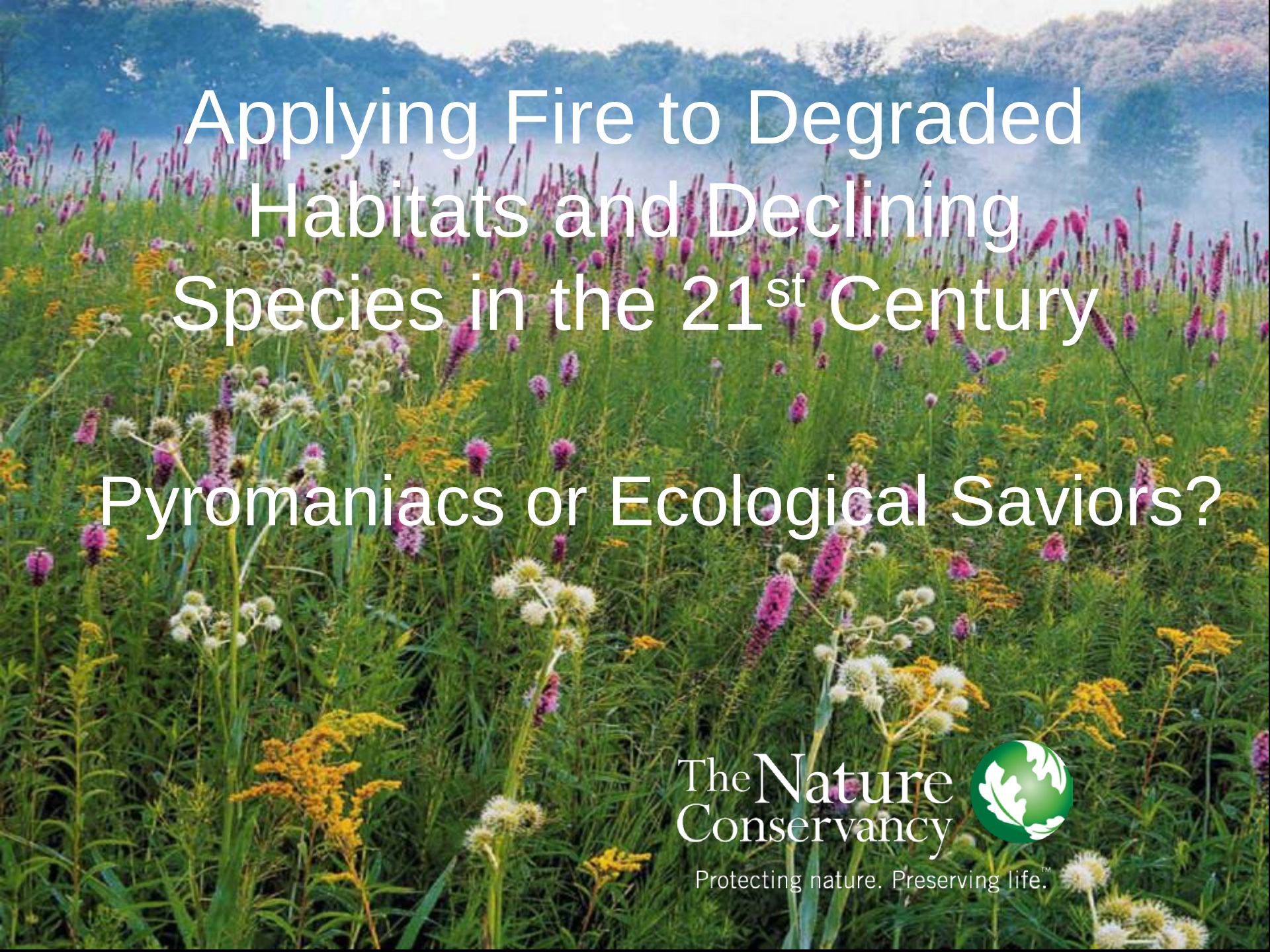

Applying Fire to Degraded Habitats and Declining Species in the 21st Century
Pyromaniacs or Ecological Saviors?
The Nature Conservancy
Protecting nature. Preserving life.™


Splendor in the Grass
“a story of sexual repression, love and heartbreak in the Michigan Prescribed Fire Council”
rural Kansas

Ecological Role of Fire

Ecological and Historical Role of Fire

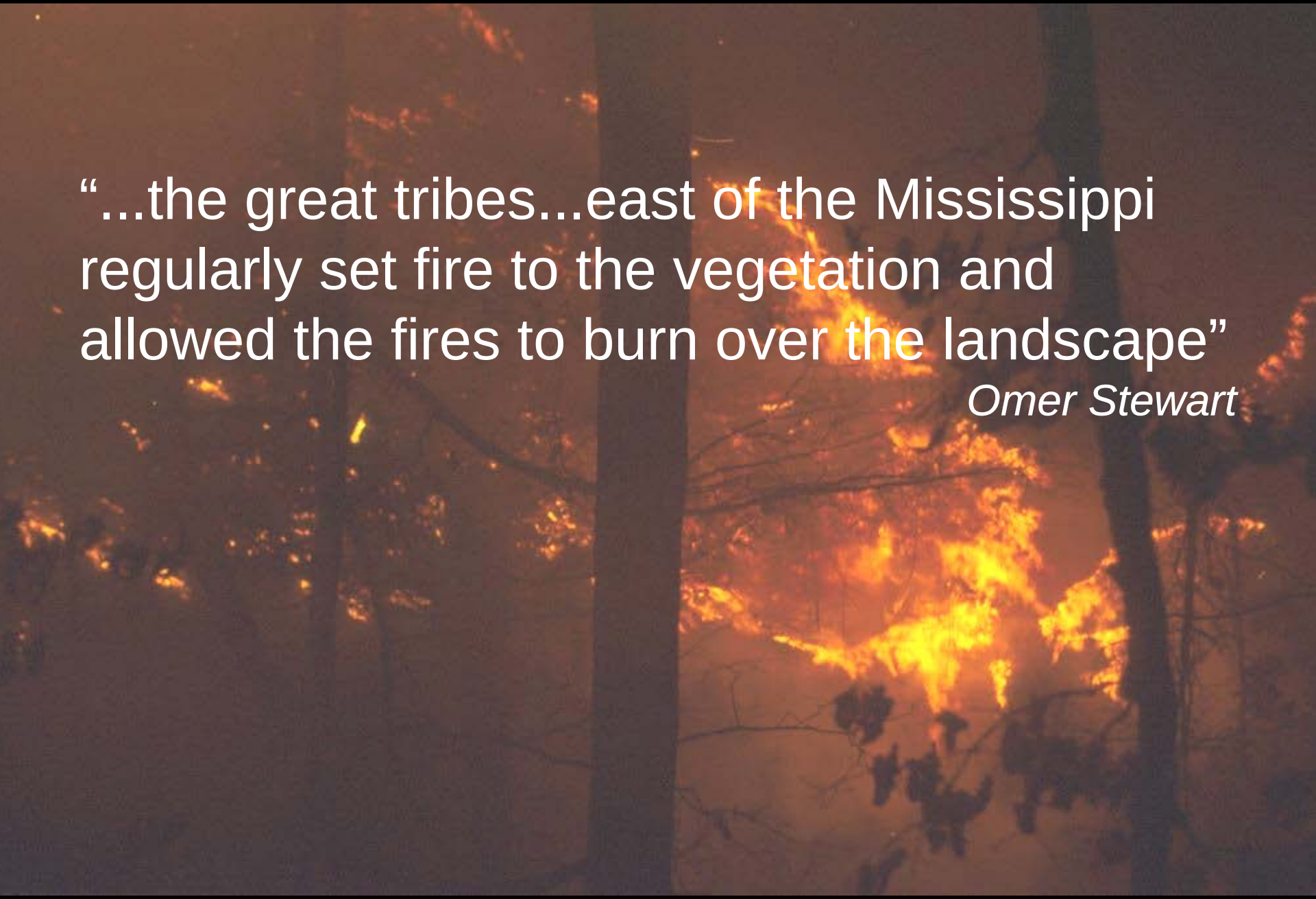

Augusta Michigan
728,000 weeks ago

“It is a common practice among Indians ...to set the woods and prairies on fire”

Stoddard 1812

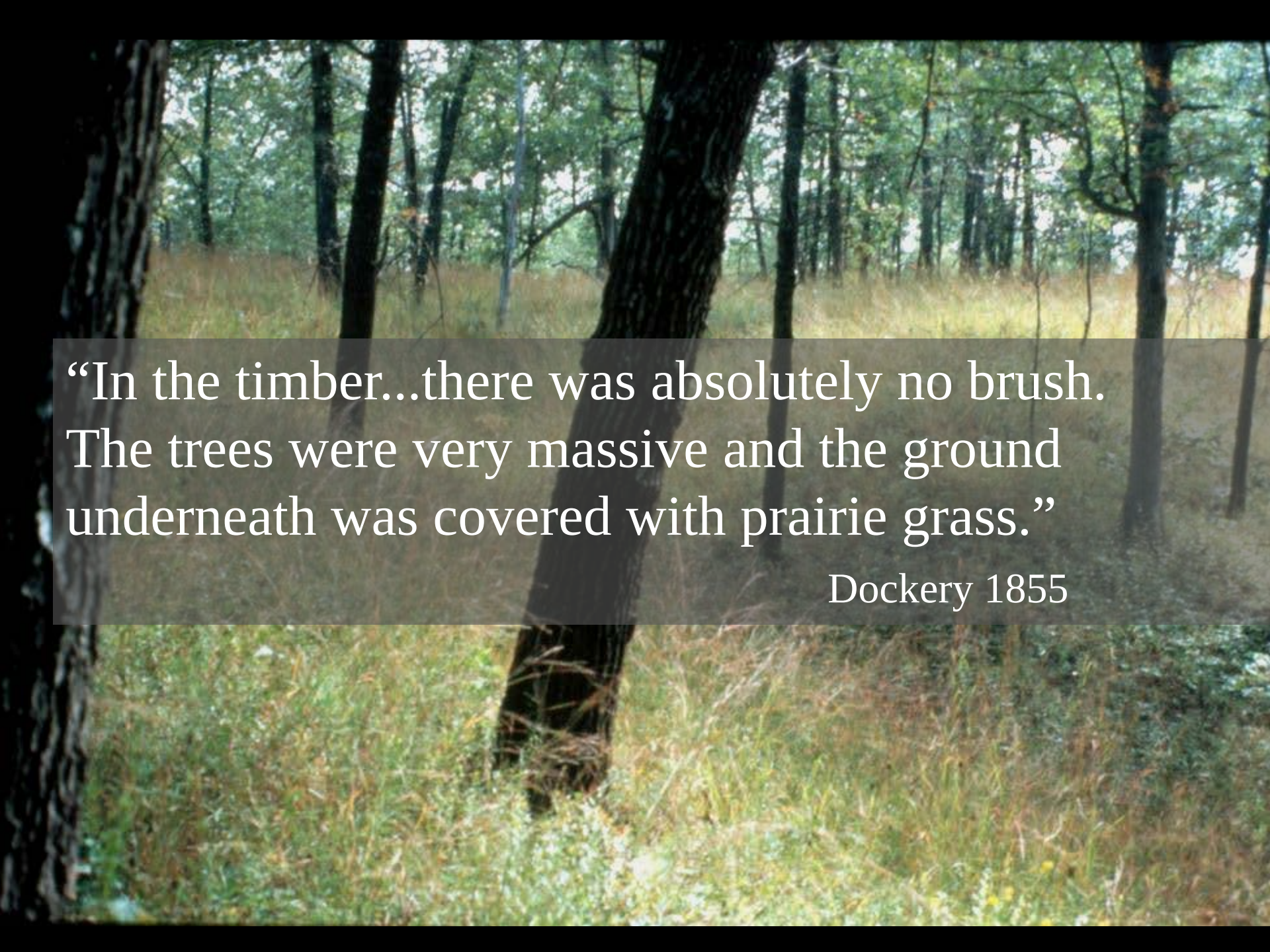
“...Indians annually, and sometimes oftener, burned such parts of the North American forest as they found sufficiently dry.”

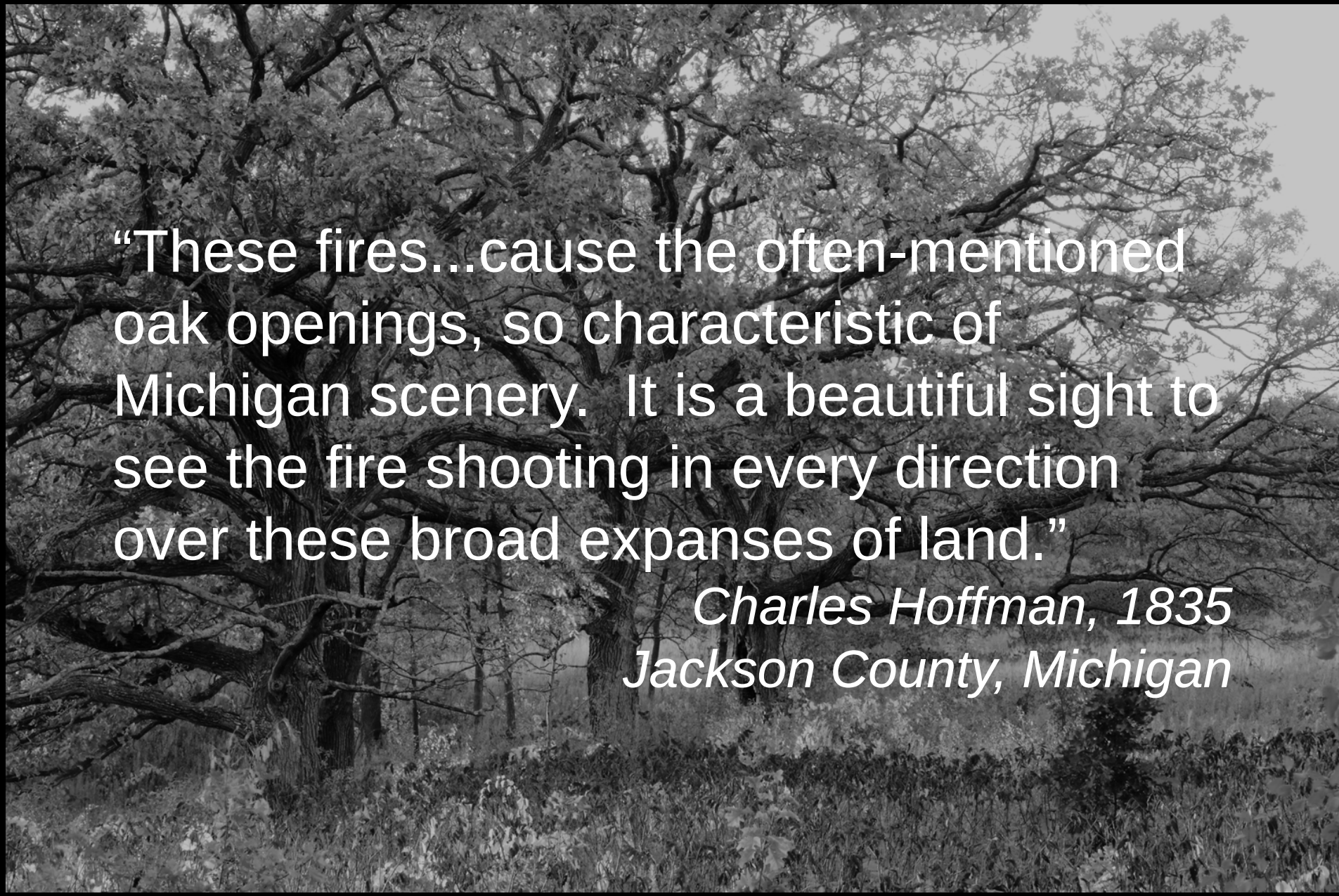
Dwight 1800


“...the great tribes...east of the Mississippi regularly set fire to the vegetation and allowed the fires to burn over the landscape”
Omer Stewart

Pre-Eurosettlement fire regimes in the Midwest were:

- Overwhelmingly human ignition sources
- Deliberate
- Enduring, consistent, milennia-old cultural practices
- Prevailingly dormant season; usually autumnal
- High frequency (underpredicted by most models/surveys)
- Low intensity
- Ground layer fires (surface fuels)
- Light to moderate fuel loads; mostly 1 hr fuels


“In the timber...there was absolutely no brush. The trees were very massive and the ground underneath was covered with prairie grass.”
Dockery 1855


“These fires...cause the often-mentioned oak openings, so characteristic of Michigan scenery. It is a beautiful sight to see the fire shooting in every direction over these broad expanses of land.”
Charles Hoffman, 1835
Jackson County, Michigan

“That the annual fires alone occasioned the peculiar character of the oak openings, is proved by the fact, that as soon as the Indians had left the country, young trees of many species sprang up and grew luxuriantly upon them.”

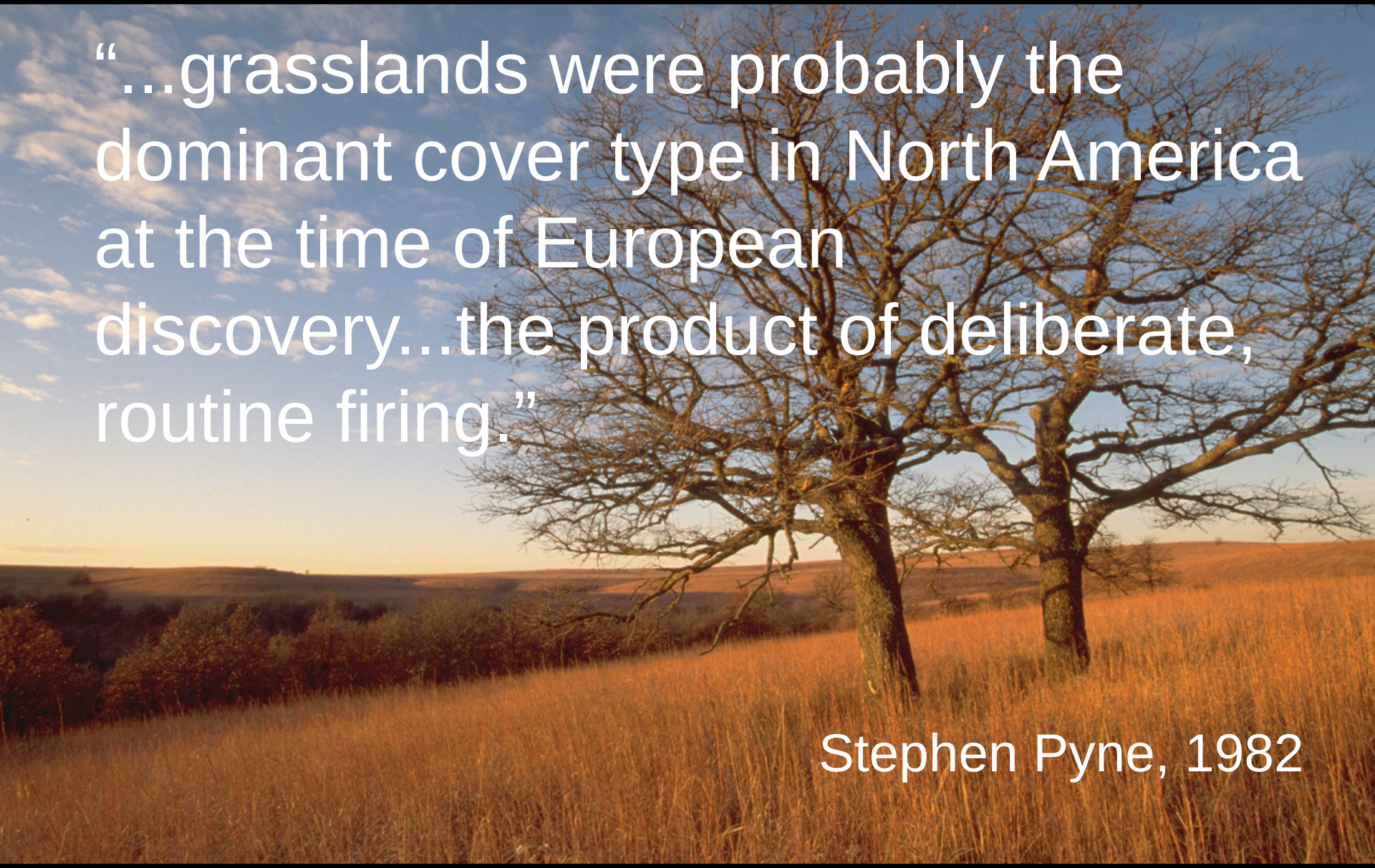
Marsh, 1867, referring to the Sandusky Plains

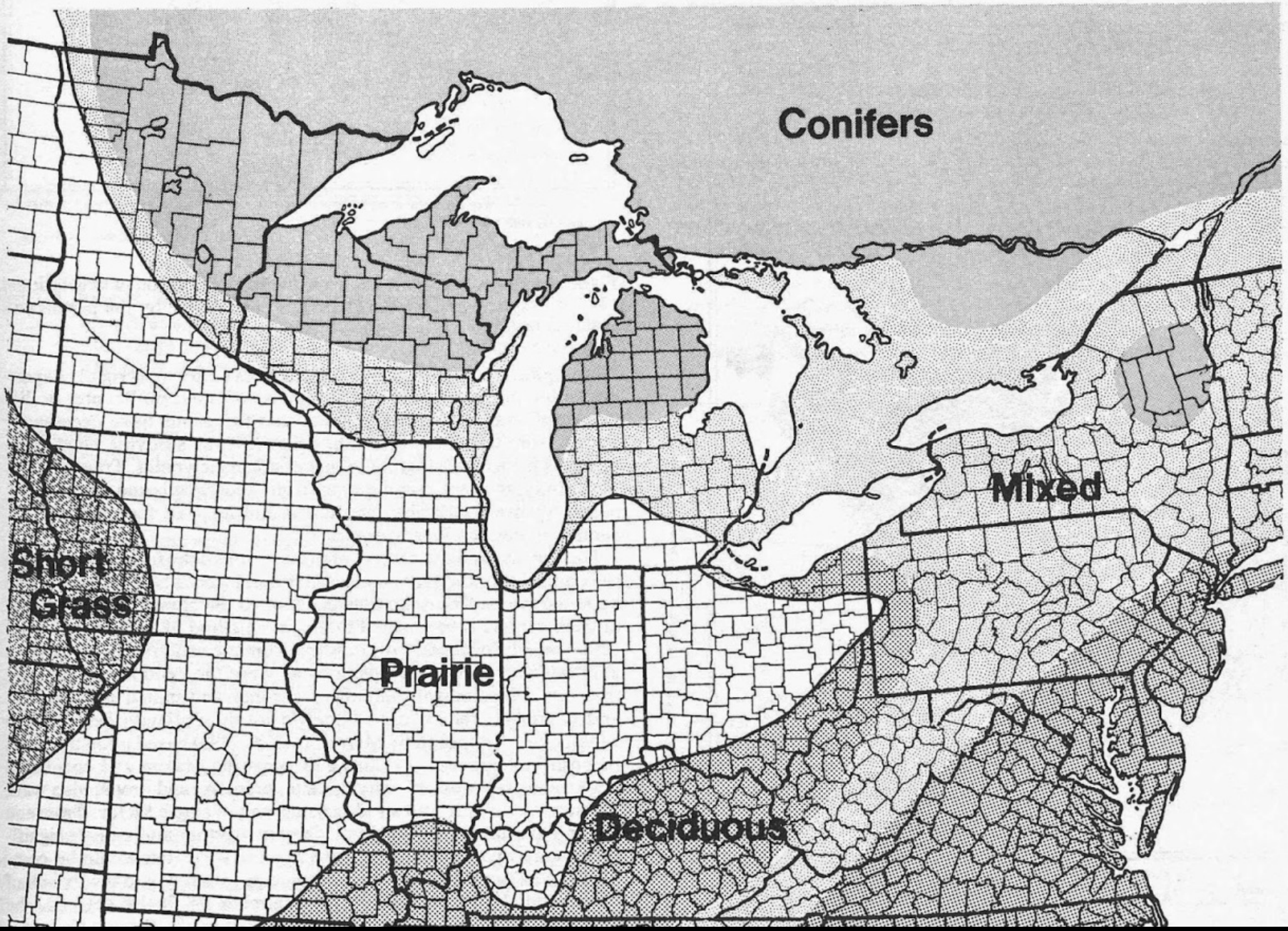
“The native Indians of this part of the country were in the habit...of firing the prairie grasses every spring.”

Nathaniel Shaler, 1891, referring to the “humid districts of Michigan”

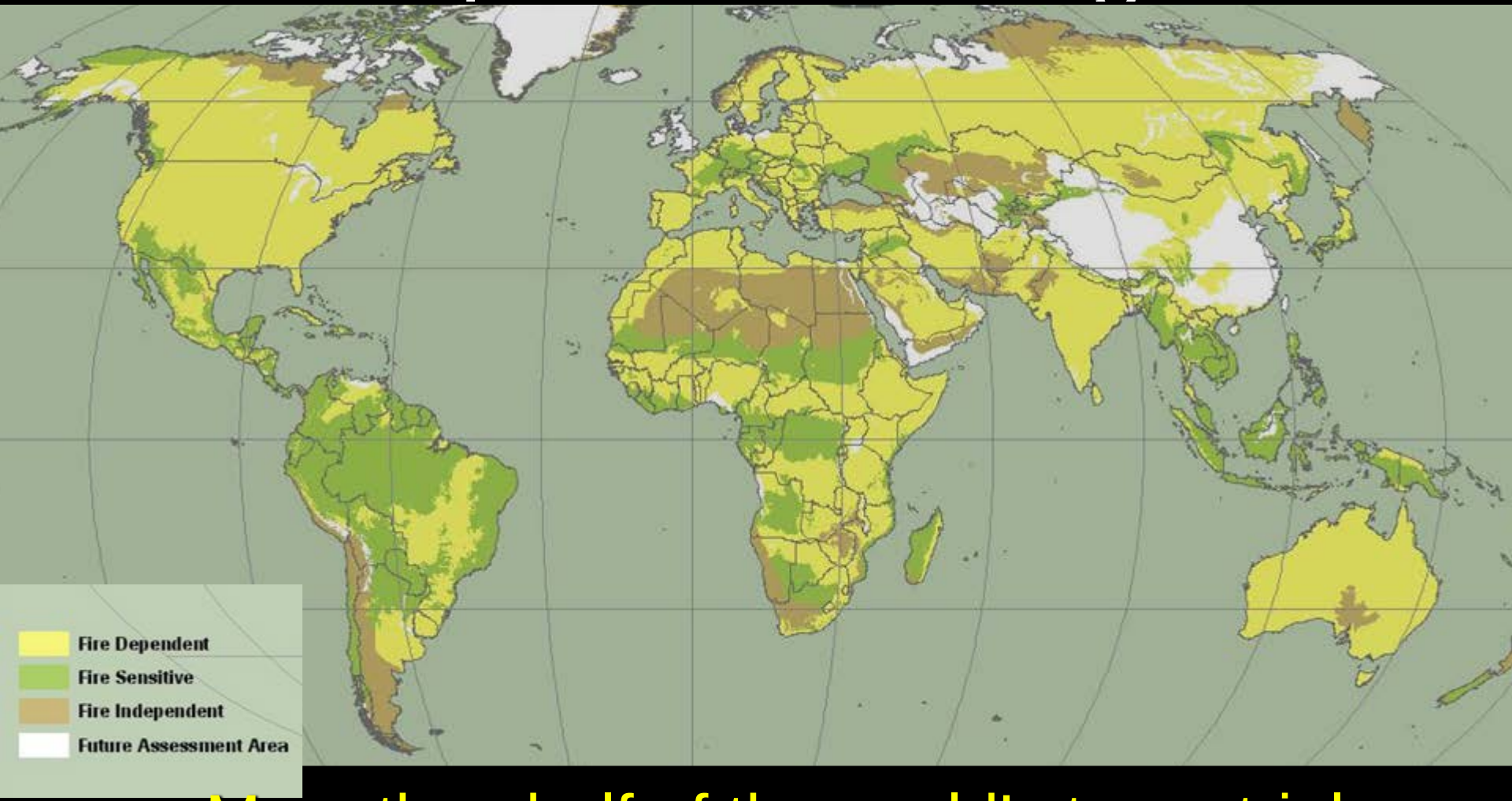
“The Great American Forest may be more a product of settlement than a victim of it.”

Stephen Pyne 1982


“...grasslands were probably the dominant cover type in North America at the time of European discovery…the product of deliberate, routine firing.”
Stephen Pyne, 1982


Conifers
Mixed
Short Grass
Prairie
Deciduous

Fire-dependent Ecoregions



More than half of the world's terrestrial ecosystems depend on fire to maintain their character and biodiversity.


Fire is a powerful force with major destructive potential


Media images of catastrophic wildfires are unrelated to local fuel types and fire behavior

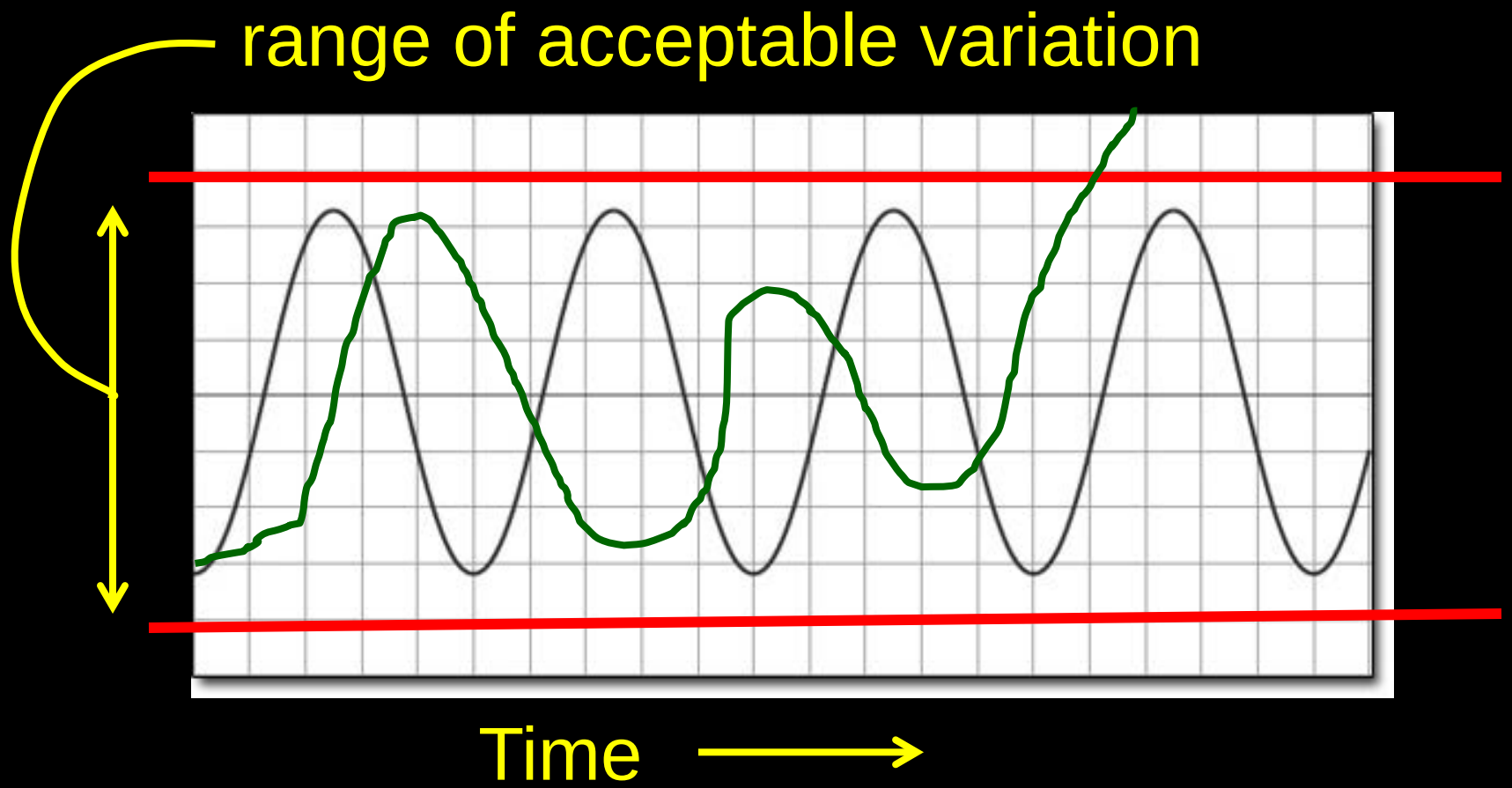
Negative Impacts of Fire, Real and Perceived

- Destructive force
- "Fire storm" images
- Air pollution
- Climate change
- Animal mortality
- "Unnatural" process

In fire-dependent landscapes, ecologically appropriate fire does not release net carbon to the atmosphere.

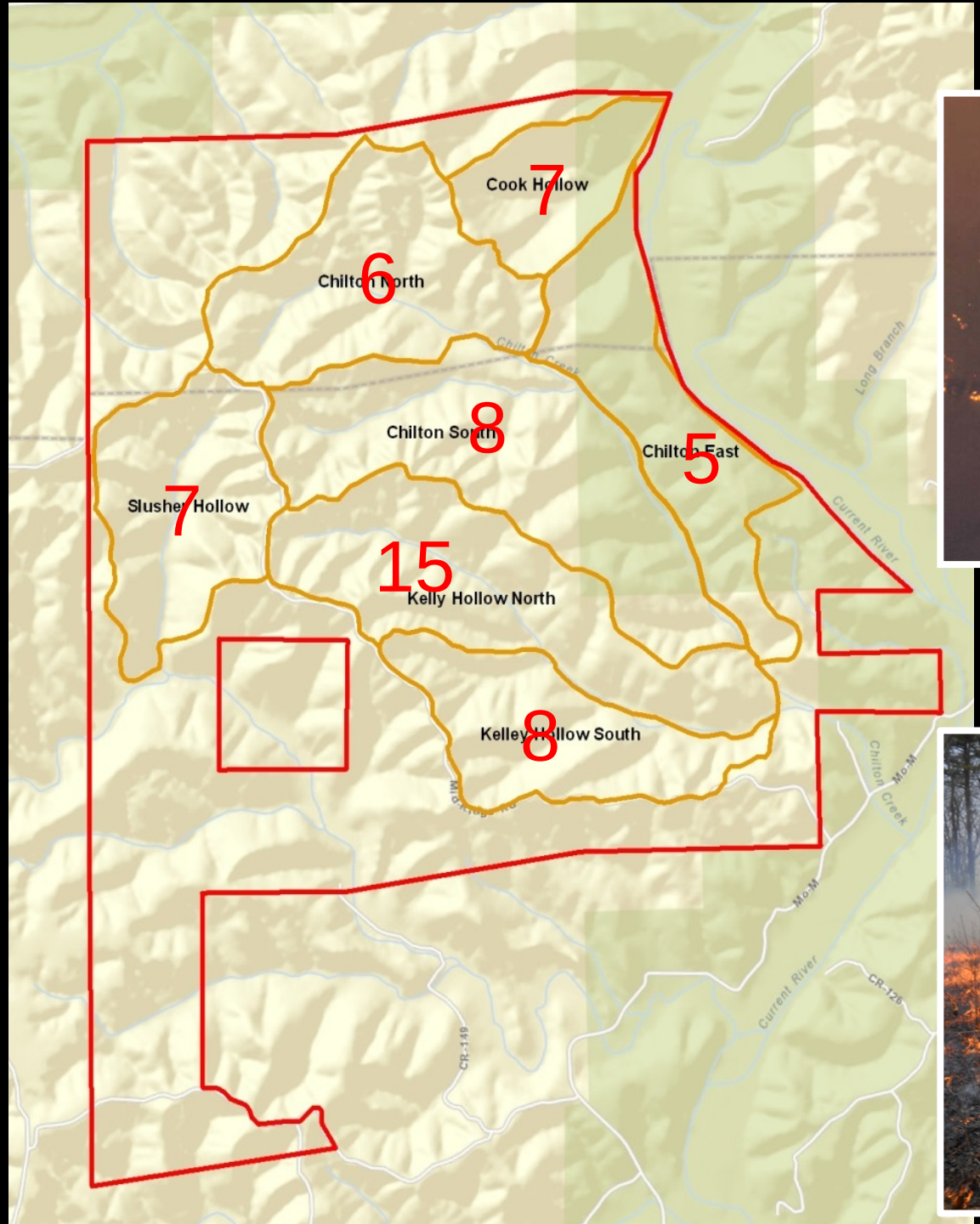
In most cases, regular fire provides significant carbon storage not available in unburned systems.

Constrained Dynamism

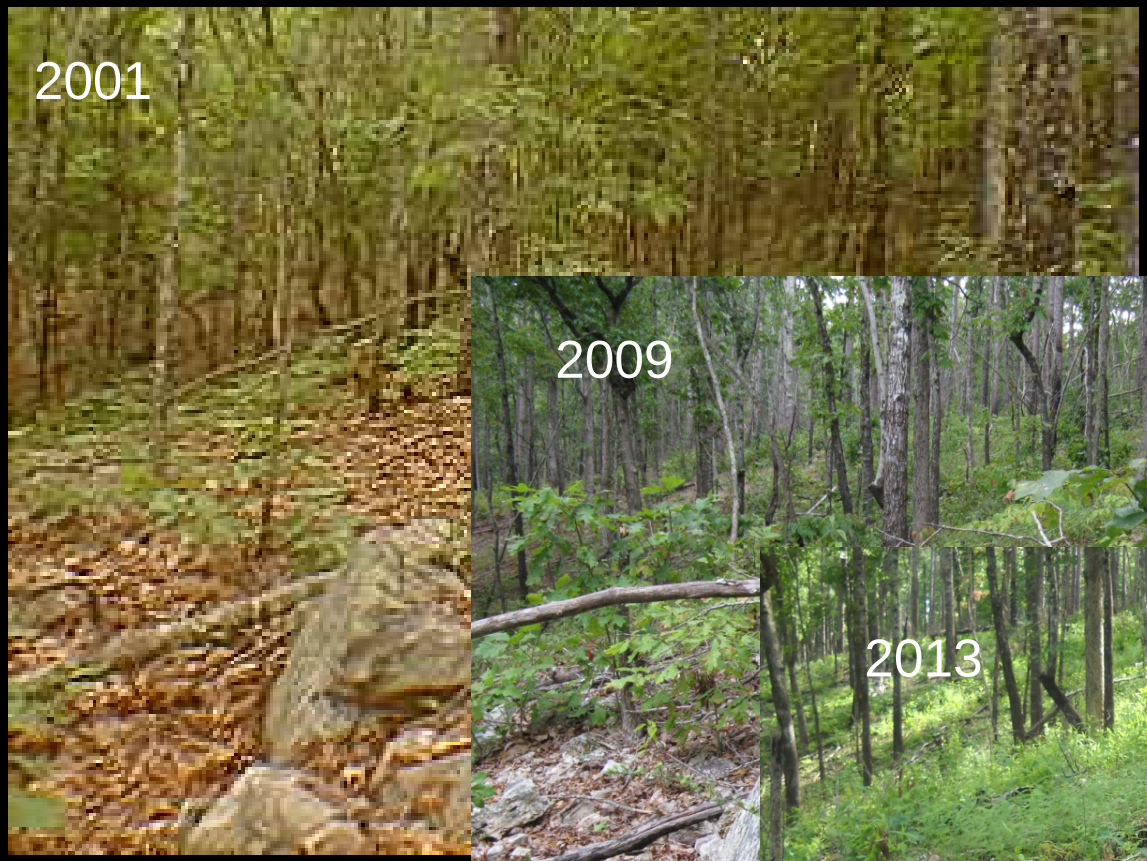


Dynamic Equilibrium

Assessing fire effects on ecological integrity & sustainability requires a broad-based organismal approach


Cook Hollow
7
Chilton North
6
Chilton South
8
Chilton East
5
Slusher Hollow
7
15
Kelly Hollow North
Kelley Hollow South
8
Long Branch
Current River
Chilton Creek
Mo-M
CR-149
CR-126

Chilton 29-3-3



MTNF Pineknot restoration

Parameter	2000	2001	2005
mean C/quadrat	3.9	3.7	4.3
mean N/quadrat	2.2	2.1	3.1
mean FQI/plot	6.0	5.6	7.4
ΣRIV^{200} woody	28.6	26.6	25.5
Σ frequency	11,245	10,289	15,503
Σ cover	26,051	22,990	29,456
Empty quadrats	781	929	427
Transect N	205	224	255
Transect mean C	4.3	4.3	4.5
Transect FQI	62.2	65.7	71.4
C ≥ 6	22	24	36

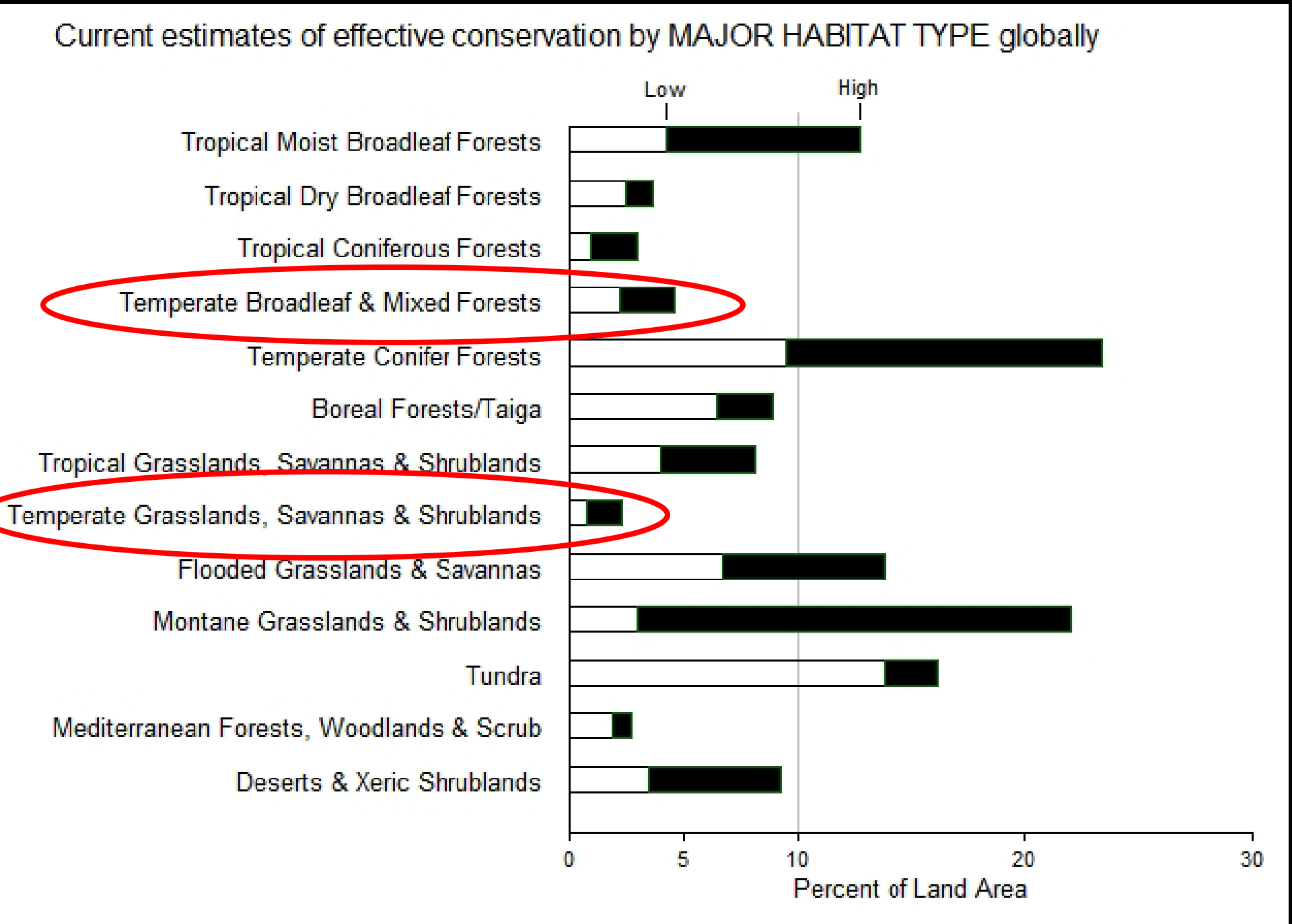
University Forest 1949-1995

Treatment	Unburned	5 Year Burn	Annual Burn
Mean taxa/plot (0.25 M^2)	1.2	6.6	9.8
Mean C/plot	3.5	4.5	4.2
Mean FQI/plot	4.1	11.4	13.0
N/transect	12	39	53
Mean C/transect	4.2	4.4	4.3
Mean FQI/transect	14.1	27.0	30.7
Σ woody RIV_{200}	88.9	21.5	3.0
Σ graminoid RIV_{200}	4.3	26.0	17.4
Total cover	63	246	358

Problems and Pitfalls

- Failure to understand the role of fire in ecosystems.
- Failure to understand the socio-economic contexts in which modern fires occur.
- Failure to understand the role of human burning in maintaining ecosystem integrity.
- Cultural bias against frequent fires
- Failure to distinguish between ecologically detrimental & beneficial fires.
- Over-/under-constraining fire regimes.
- Problems of scale.

Fire ≠ Fire

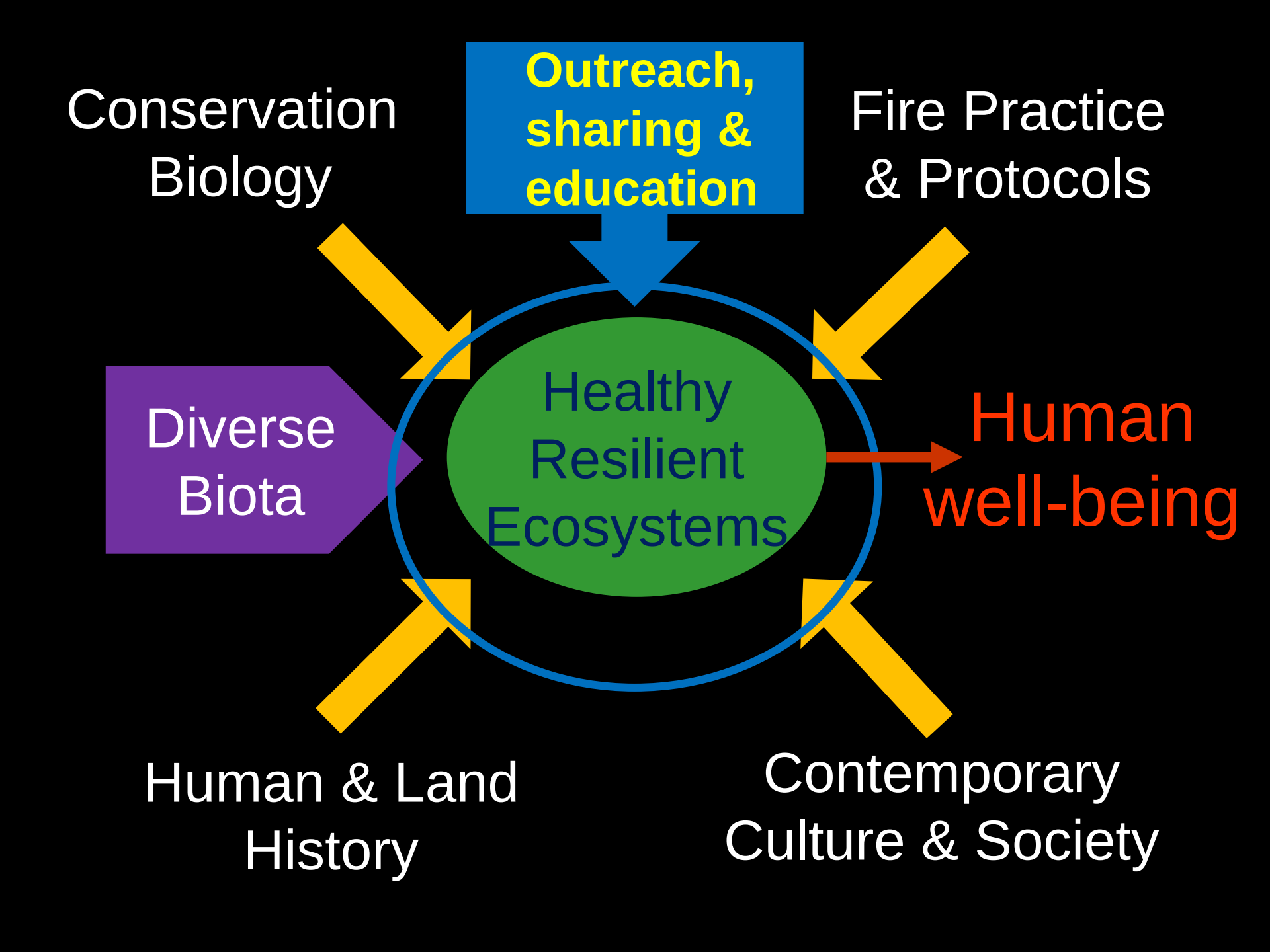

Current estimates of effective conservation by MAJOR HABITAT TYPE globally
Low
High
Tropical Moist Broadleaf Forests
Tropical Dry Broadleaf Forests
Tropical Coniferous Forests
Temperate Broadleaf & Mixed Forests
Temperate Conifer Forests
Boreal Forests/Taiga
Tropical Grasslands, Savannas & Shrublands
Temperate Grasslands, Savannas & Shrublands
Flooded Grasslands & Savannas
Montane Grasslands & Shrublands
Tundra
Mediterranean Forests, Woodlands & Scrub
Deserts & Xeric Shrublands
0
5
10
20
30
Percent of Land Area

Potentially dangerous assumptions

- fuels/fire intensities are analogous
- assuming fuels/regime stasis
- ignoring heterogeneity considerations
- assuming unburned is default condition
- seeking solace in “rest intervals”
- overweighting single species data
- favoring lowest intensity burns
- reliance on non-biotic monitoring
- diverse fire timings/intensities are best
- focus on growing season burns
- ignoring human context (then & now)

BKEJWANONG TERRITORY
WALPOLE ISLAND FIRST NATION

Cultural Reconnection


Conservation Biology
Outreach, sharing & education
Fire Practice & Protocols
Diverse Biota
Healthy Resilient Ecosystems
Human well-being
Human & Land History
Contemporary Culture & Society

The Nature Conservancy

Protecting nature. Preserving life.™