

Pyric herbivory to promote livestock production and wildlife conservation

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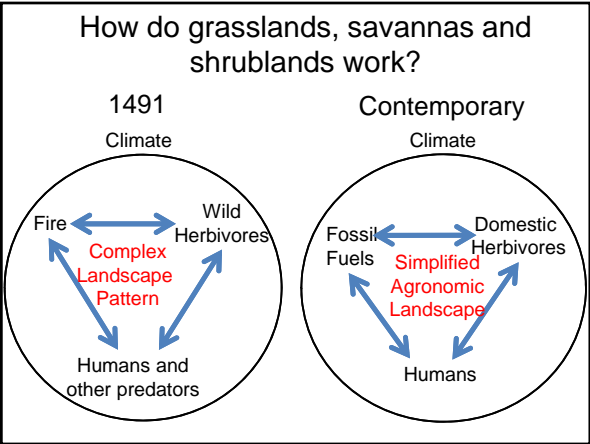
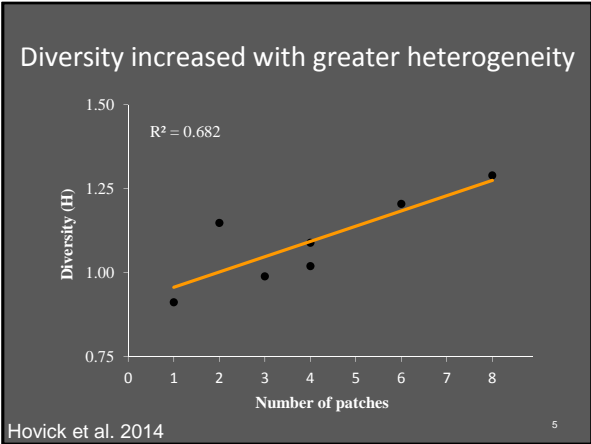
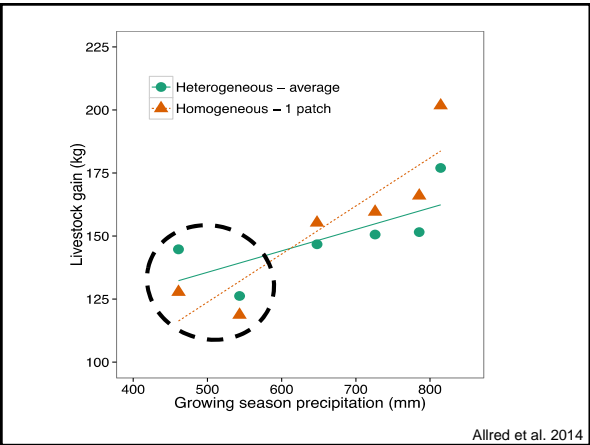
- Typical practices that promote uniform (proper?) distribution (homogenization):
1. uniform distribution of focal points (i.e. water, salt, mineral)
 2. prescribed fires
 3. application of fertilizers and herbicide
 4. grazing systems
 - rotational grazing
 - Intensive Early Stocking (IES)
 5. Etc.

But, Heterogeneity has been described as central to conservation and the foundation of biodiversity?

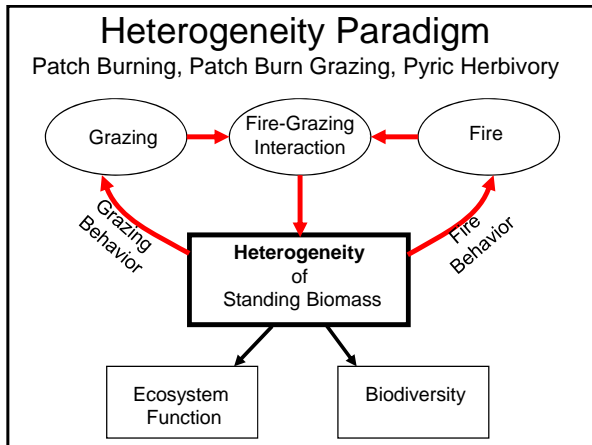
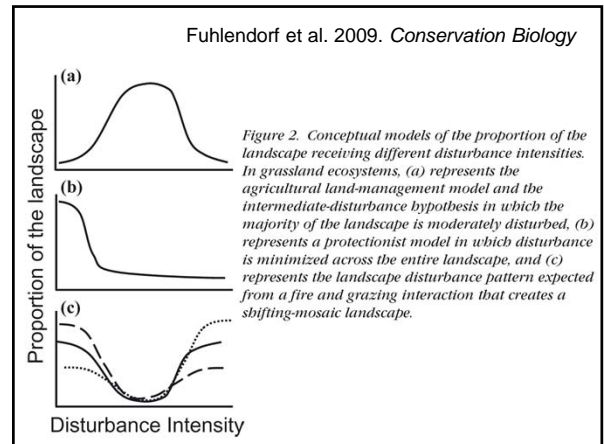
It is also critical to wildlife management.

When stress occurs – move or die, but there must be somewhere different to move.

Heterogeneity is also critical for all processes on rangelands.

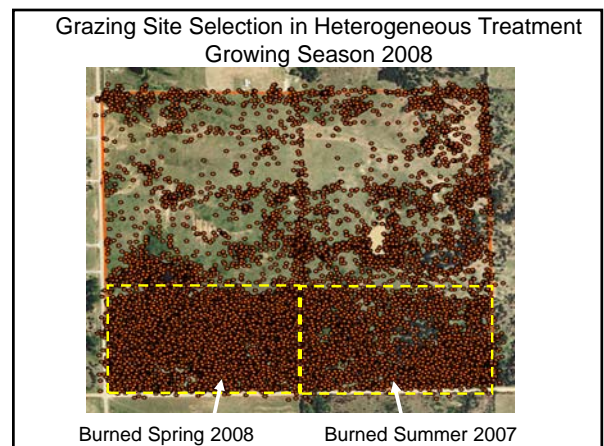
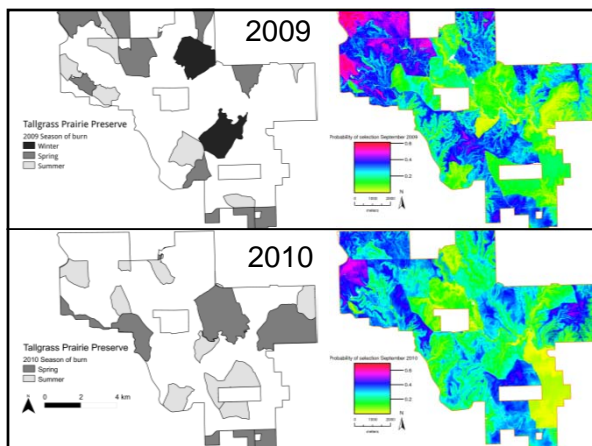


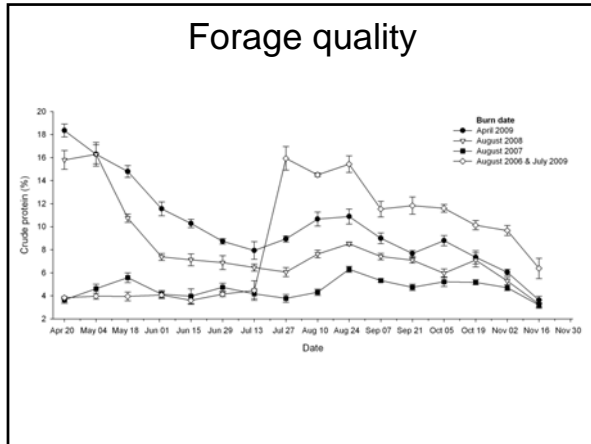
Grazing Intensity (stocking rate)	No grazing	Rare butterflies Compass Plant Cotton Rat Henslow sparrow habitat
	Light	Gain per head Water infiltration Greater Prairie Chicken nesting habitat Insect diversity Dickcissel
	Moderate	Economic Optimum for livestock Plant species diversity Upland sandpiper habitat
	Heavy	Gain per ha Prairie Chicken Lekking habitat Water yeild
	Severe	Lark Sparrow habitat Nitrogen availability Prairie Dog Town Species



Does fire alter grazing behavior?

- Bison, cattle, horses, elk
- Pasture size
- Patch size
- Time since fire
- Variable regions





Fire-grazing interaction (pyric herbivory) as a global process

Africa
 Moe, Wegge, & Kapela 1990; Wilsey 1996; Salvatori et al. 2001; Gureja & Owen-Smith 2002; Tomor & Owen-Smith 2002; Archibald & Bond 2004; Archibald et al. 2005; Klop, van Goethem, & de Iongh 2007; Savadogo, Savadogo, & Tiveau 2007; Archibald 2008; Hassan et al. 2008; Klop & van Goethem 2008; Waldram, Bond, & Stock 2008; Parrini & Owen-Smith 2010

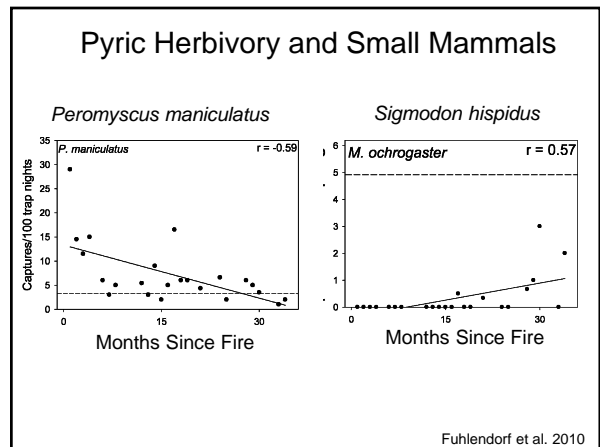
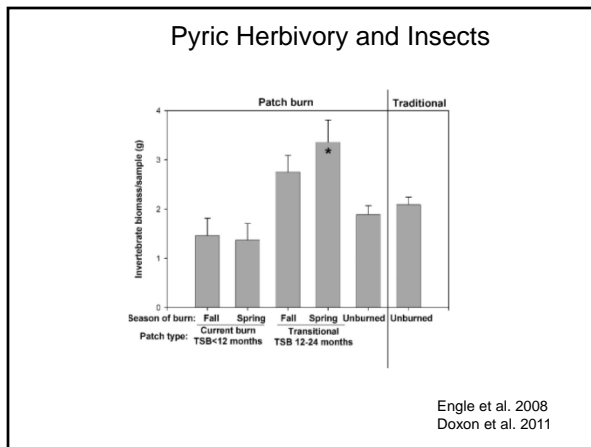
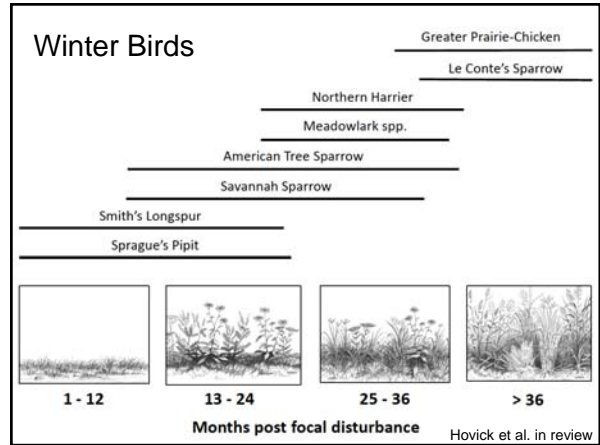
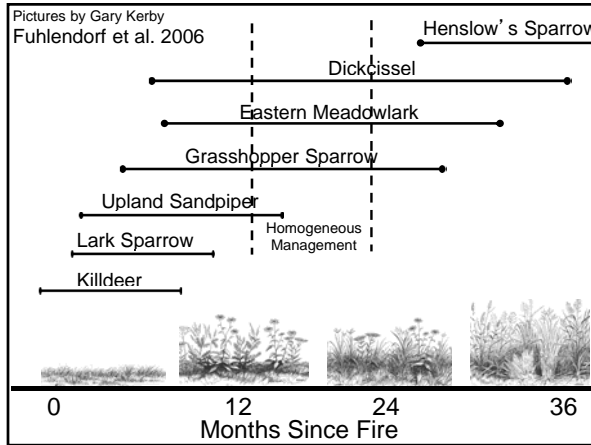
Asia
 Moe & Wegge 1994; Moe & Wegge 1997; Sankaran 2005

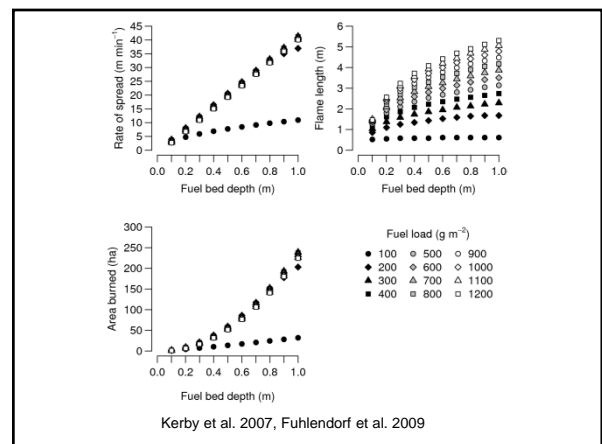
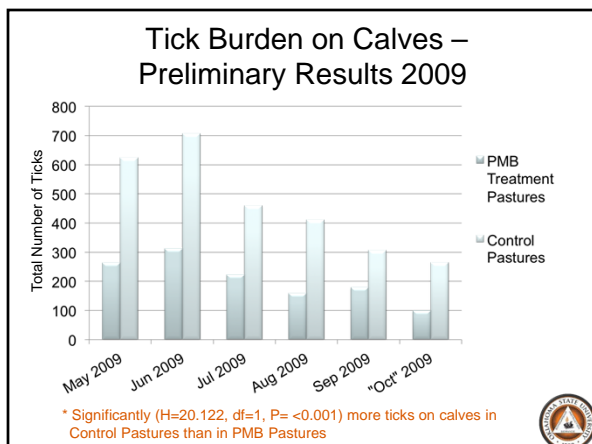
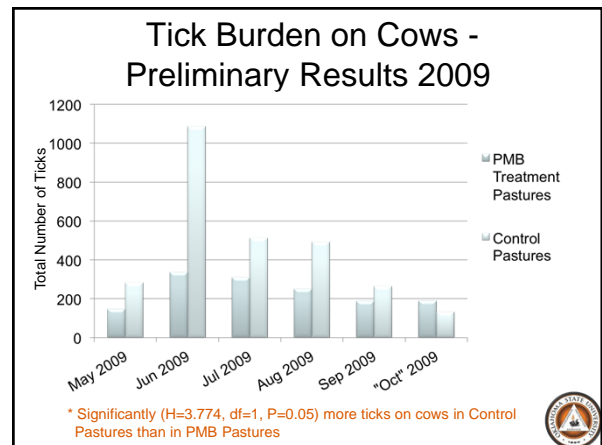
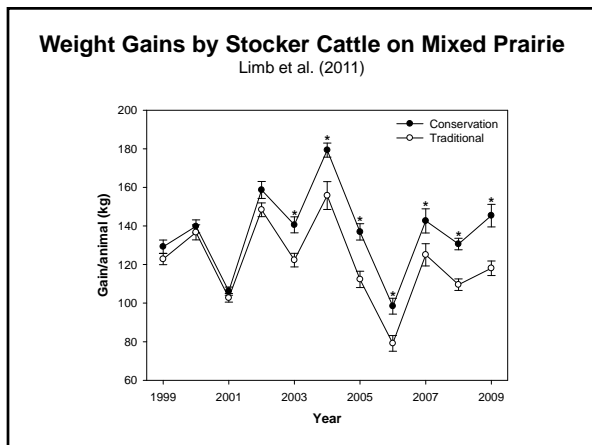
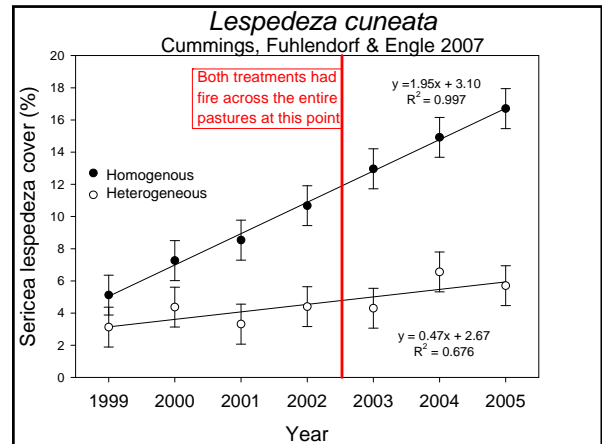
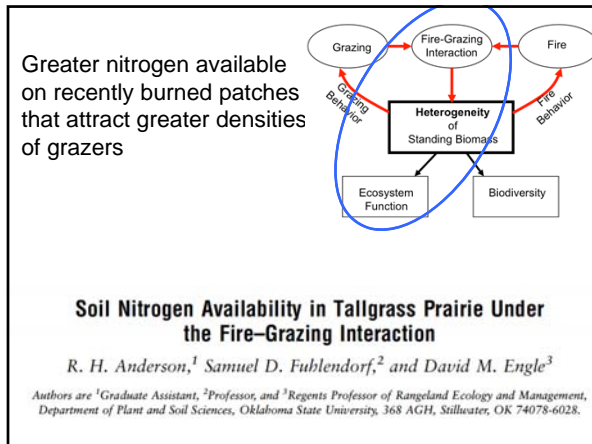
Australia
 Kirkpatrick, Marsden-Smedley, & Leonard In press; Kutt & Woinarski 2007; Murphy & Bowman 2007; Leonard, Kirkpatrick, & Marsden-Smedley 2010

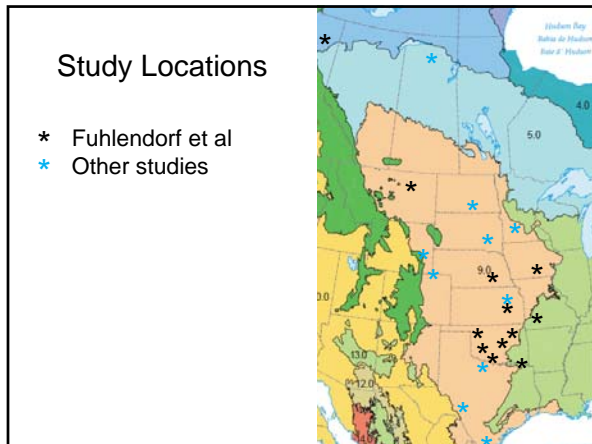
Europe
 Kramer, Groen, & van Wieren 2003; Vandvik et al. 2005; Onodi et al. 2008; Davies et al. 2010

North America
 Duvall & Whitaker 1964; Hobbs & Spowart 1984; Vinton et al. 1993; Turner et al. 1994; Pearson et al. 1995; Wallace et al. 1995; Coppedge & Shaw 1998; Biondini, Steuter, & Hamilton 1999; Smith, Hardin, & Flinders 1999; Fuhlendorf & Engle 2004; Schuler et al. 2006; Van Dyke & Darragh 2007; Bleich et al. 2008; Meek et al. 2008

Allred et al. 2011







- ### Summary before conclusions
1. All ecosystems are heterogeneous
 2. Fire and herbivory are critically linked
 3. Biodiversity and ecosystem function requires heterogeneity - e.g. highly variable fire and grazing distribution in space and time
 4. Most management is single objective and reduces heterogeneity
 5. Considering grasslands as shifting mosaics can simultaneously
 - Enhance biodiversity
 - Sustain ecosystem services

"Proper" Rangeland Management	Fuhlendorf et al. 2012	Phantasmagorical Ecology
Single Use-----	Objective	Biodiversity
Even-----	Distribution	Uneven
Minimal-----	Ungrazed Area	Substantial
Minimal-----	Severely Grazed Area	Substantial
Fast-----	Rate of Rotation	None or Slow
Uniform-----	Application of Fire	Patches
Brush control tool-----	Fire	Critical Ecol. Process
Uniformity-----	Management	Heterogeneity
Simplicity	Philosophy	Complexity
Equilibrium		Dynamic
Mgt for Middle		Mgt for Extremes

- ### Principles of Phantasmagorical Rangeland Conservation
1. Stocking rate is still most important aspect of grazing but there is no single "proper" stocking rate for everything.
 2. Uniform distribution of grazing in time and space is impossible and undesirable.
 3. Fire regimes are as critical to ecosystem structure and function as climate and soils.
 4. Management for any single condition is wrong- shifting mosaics are necessary for ecosystem structure and function.
 5. Disturbance processes, all plants and animals are critical to functioning ecosystems.