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Patch Burn Grazing to Manage Fuels, Ignition, and Wildfire Spread

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SITUATION

The Great Plains is a fire-dependent ecosystem with short fire return intervals. Unfortunately, wildfires can present a threat to life and property. While prescribed burning and grazing have been separately suggested as fuel reduction strategies (Diamond 2009), there is potential for patch burn grazing to alter fuel patterns and continuity and thus reduce wildfire risk. Based on fire spread and ignition modeling, patch burn grazing could be a useful tool for reducing the incidence and severity of large, catastrophic fires.

PATCH BURN GRAZING CONCEPT

Patch burn grazing is an approach to restoring the fire-grazing interaction, a formative ecological process in the Great Plains of North America. Patch burning requires fire to be applied variably through space and time while allowing grazing animals to select where they want to graze. Herbivores tend to graze in the most recently burned areas because of the highly palatable forage regrowth. Over time, this creates a shifting mosaic of vegetation structure (Fuhlendorf and Engle 2004) that varies in its susceptibility to ignition and fire spread.

FIRE SPREAD AND PERCOLATION THEORY

The spatial specificity of fire spread across the landscape is well explained by percolation theory (models of cell connectivity) (Figure 1). The critical percolation threshold for movement through cells ranges from 40 to 60% of connectivity depending on the other factors such as wind (Nahmias et al. 2000). Applying this concept of percolation theory to fuel mitigation treatments, Loehle (2004) suggested that treatment of as little as 30% of the landscape limits fire spread and would result in a fire tolerant landscape. This is not to be confused with a landscape that does not include fire, but rather, the prevention of large catastrophic fires due to the inhibited capability of fire spread.

APPLICATION

The response of herbivores to patchy fires alters fuel distribution, continuity, scale and pattern, modifying ignition and fire spread potential (Kerby et al. 2007). Recently burned and grazed patches result in a grazing lawn unlikely to ignite or support fire spread because ignition and spread require dead fuels (Figure 2 and 3). Furthermore, reducing the spatial scale of patches increases burn complexity and variance of areas burned by different fire types (backfires, flankfires and headfires) (Kerby et al. 2007). Relative length of headfire and increased length of backing fire and flanking fire make suppression more likely because, many headfires cannot be suppressed directly while backing fires and flanking fires can. This concept expands on the strategy of reducing dead fuels with only burning or only grazing. Grazing after fire limits fuel accumulation, prolonging the benefit of fuel reduction and reduced burning potential beyond a single year (Figure 2). In summary, patch-burn grazing could be adopted as an integrated fuel reduction and fire spread prevention strategy.

Figure 1: Theoretical landscape fuel and fire spread map (adapted from Kerby et al. 2007). Cells are randomly arranged patches: low fuel cells could represent recently burned patches, medium fuel cells could represent burn patches from the previous year, and high fuel cells could represent patches not burned in over two years.

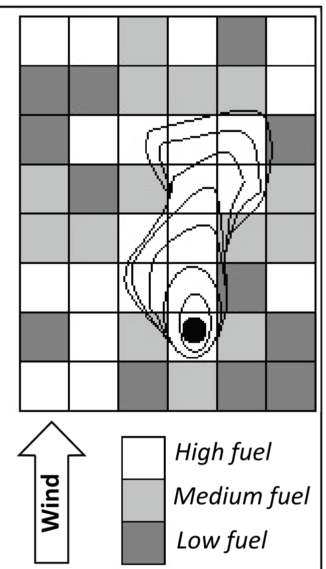
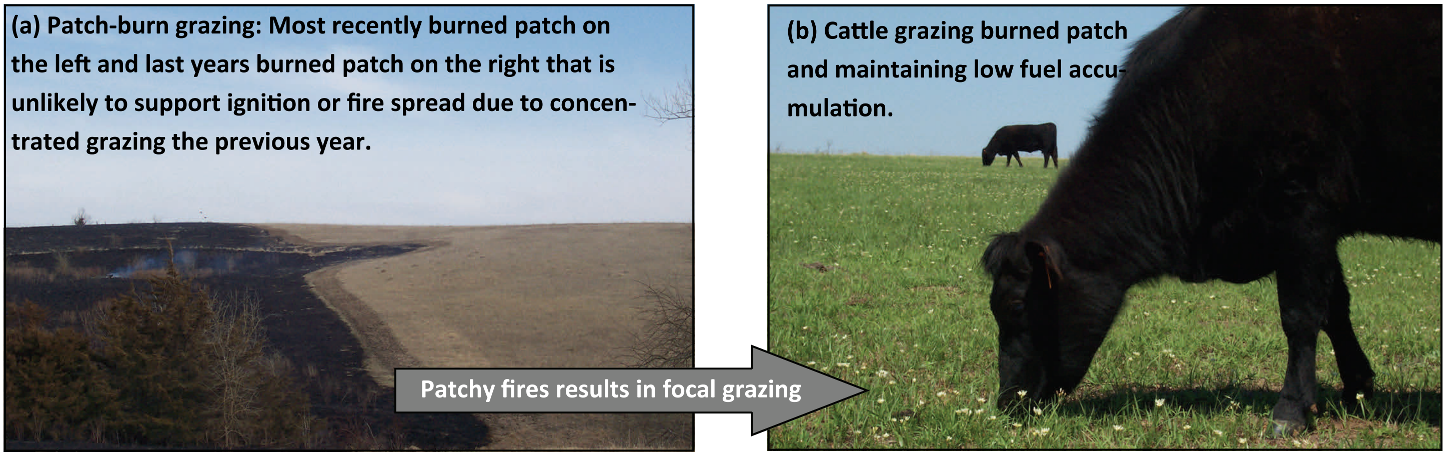


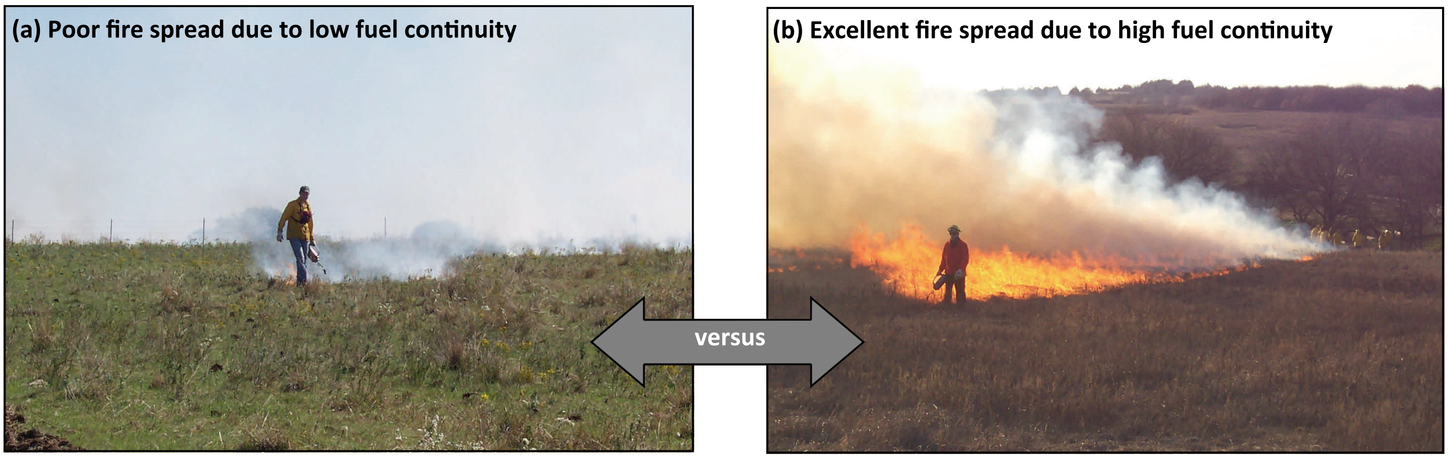
FIGURE 2: PATCH-BURN GRAZING CREATES FUEL BREAKS AND ALTERS FUELS



(a) Patch-burn grazing: Most recently burned patch on the left and last years burned patch on the right that is unlikely to support ignition or fire spread due to concentrated grazing the previous year.

(b) Cattle grazing burned patch and maintaining low fuel accumulation.

FIGURE 3: FUEL CONTINUITY IMPACTS IGNITION AND FIRE SPREAD



(a) Poor fire spread due to low fuel continuity

(b) Excellent fire spread due to high fuel continuity

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For more information go to: http://fireecology.okstate.edu/patch_burning.html

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