Healing native rangeland may require combination of burning and rotational grazing

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The application of summer patch burning to heal native rangeland may be best accomplished using rotational grazing, according to a Texas AgriLife Research range ecologist.

Dr. Richard Teague recently completed a study of native rangeland vegetation and soils subjected to summer patch burns followed by cattle being allowed to graze either continuously or using a rotational grazing system.

Prescribed summer fire as a management tool is gaining interest among resource managers in the southern Great Plains, Teague said. Applying a prescribed fire in the summer is more effective in controlling unwanted woody plants and prickly pear cactus than winter fires because they burn hotter.

Patch burning was used in this study because most ranchers graze continuously with no deferment or layout of pastures, he said. With patch burning, a different patch is burned each year so the concentration of cattle grazing on the burnt area in one year is followed by a shift in grazing pressure the next year to the most recently burned patch.

"We burned one-eighth of the grazing unit in continuously grazed paddocks and compared this to burning one-eighth of an eight-pasture rotationally grazed unit each year," Teague said.

The study, funded in part by the E. Paul and Helen Buck Waggoner Foundation Inc., The Joe Skeen Institute for Rangeland Restoration and the Dodge Jones Foundation, measured the recovery of vegetation and soils on burned patches annually and compared them to those in immediately adjacent unburned areas in both grazing treatments, Teague said.

"We managed the rotational grazing using planned grazing protocols to achieve the best animal and vegetation response the way a responsible conservation rancher would to achieve the best animal and vegetation response," he said.

They chose not to do small plot work, Teague said, because it has little relevance for ranchers who must manage large commercial operations where maintaining resources and economic viability are the primary long-term concerns.

Teague said it is important to recognize that some problems can be created by fire and grazing, such as a reduction in infiltration, increased runoff and erosion. Also, livestock grazing can reduce grass biomass and create patchy vegetation alternated by bare soil.

Biologically, fire can cause ecosystem degradation since it removes vegetation that protects the soil from exposure to the sun, raindrop action and overland water flow, which increases soil erosion, he said.

Grazing by livestock can decrease the rate of recovery of vegetation after fire as animals tend to concentrate on recently burned areas. Preferred patches are often overgrazed even if the grazing management unit is not overstocked, Teague said.

So fire and grazing need to be properly managed to achieve desired results, he said.

"We wanted to see if the deferment and periodic rests provided by rotational grazing would result in less impact on the environment than continuous grazing."

Teague said it is important to have less bare ground and higher soil organic matter.

"We focused on bare ground in our study because it is a well-documented way to assess erosion hazard, which increases if there is insufficient plant cover to dissipate the energy of raindrops before they strike the soil," he said.

Also, previous research on Texas' rangeland indicated that bare ground has considerably lower infiltration and higher runoff and erosion than ground covered by perennial grasses, Teague said.

"We measured treatment impacts on soil organic matter, since higher organic matter results in higher rainfall infiltration, better soil fertility and higher plant production," he said. "The amount of plant cover is important for soil organic matter because bare ground is not protected from the sun and gets much hotter than covered soil, causing accelerated loss of organic matter."

The rotational grazing treatment had less bare ground and lower soil temperatures on both unburned and burned areas than the continuously grazed treatment, Teague said. Soil organic matter was also higher with rotational grazing.

This has significant implications for infiltration rates, runoff and erosion in favor of the rotational management, he said.

Teague said soil compaction and structure were not affected by either the burn or grazing treatments, but the presence of trees reduced soil

temperature, improved soil compaction, structure and infiltration rate relative to open grassland.

"The lower incidence of bare ground and lower soil temperatures with rotational grazing were evident on unburned areas, presumably because of the manner in which we managed the rotational grazing," Teague said.

"We grazed moderately for short periods, leaving relatively high amounts of ungrazed forage when exiting each paddock in the rotations."

Using evidence from rainfall simulation studies and other, similarly managed rotational grazing studies, the lower incidence of bare ground measured with rotational grazing indicates the potential of rotational grazing for improving soil hydrological characteristics.

Adequate rainfall for rapid post-fire recovery was experienced in this study, but under drought conditions responses may be different, Teague said. Other studies have indicated that areas burned in any year do not recover until after a season of favorable precipitation.

When drought conditions precede and follow burning, there can be an increase in bare ground and the proportion of annual forbs and annual grasses at the expense of perennial grasses, he said. Recovery takes three to five years in times of drought, but only one year with good rainfall.

The response to rotational grazing compared to continuous grazing may be different under drier conditions, Teague warned. There was less bare ground under rotational grazing on the drier types of soil but not the wetter types of soil. If conditions were drier, the wetter soils may also have benefited from rotational grazing, as measured in previous research.

He also noted that shading provided by trees reduces soil temperature

which decreases soil carbon loss and tree leaf litter breaks down more slowly than grass phytomass resulting in higher levels of soil carbon.

Overall, Teague said this study points to factors that are important for managers to aim at if they wish to maintain or improve ecosystem function.

However, he said, care needs to be taken in interpreting the results of short-term studies such as this.

There are no long-term experiments in this eco-region to indicate whether burning at frequencies of six or seven years required to effectively reduce woody plants and cacti would maintain the long-term ecosystem health, Teague said.

"If fire is used in these communities to regularly reduce mesquite and cacti, managers need to pay careful attention to stocking levels and monitor to ensure full recovery of plant and litter cover after burning before applying further burns to the same area," he said.

In rangeland ecosystems, he said, maintaining normal soil function is possible only if adequate plant cover is available to provide protection from soil loss and promoting conditions that allow the soil microorganisms to perform and maintain ecosystem functions.

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