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Bison Grazing Increases Biodiversity In Grasslands

Science Daily (May 6, 1998) — Grazing by herbivorous mammals like bison increases biodiversity in North American grasslands, says National Science Foundation (NSF) ecologist Scott Collins, even during periods of frequent burning and other stresses. In fact, loss of species diversity in these grasslands due to frequent burning was reversed by bison grazing, according to Collins. "Thus, reestablishing grazing in grasslands stressed by human activities enhances biodiversity," says the scientist. Collins' research results are published in this week's issue of the journal *Science*. His work was conducted at NSF's Konza Prairie Long-Term Ecological Research (LTER) site in northeastern Kansas, one of a network of 20 such NSF sites in North America and Antarctica.

Species diversity has declined in ecosystems worldwide due to habitat fragmentation, eutrophication, and land-use changes, scientists believe.

Collins and his colleagues conducted two long-term field experiments in native grasslands to assess effects of fire, addition of nitrogen, and grazing on plant species diversity. In one experiment, species richness declined on burned and fertilized areas, whereas grazing maintained diversity under these conditions. In a second experiment, loss of species diversity due to frequent burning was reversed by bison, animals that Collins calls keystone herbivores in North American grasslands.

In North American tallgrass prairies, diversity and productivity are controlled to a large extent by nitrogen availability, Collins explains. Historically, nitrogen availability in prairies was driven by interactions between frequency of fires and grazing by large herbivores. In general, spring fires enhance growth of certain grasses, and herbivores such as bison preferentially graze these grasses, keeping a system of checks and balances working properly, and allowing many plant species to flourish.

"Extirpation of native grazers, habitat fragmentation, increased nitrogen deposition from the atmosphere, and altered fire frequency have disrupted grassland ecosystems worldwide," adds Collins. "Although burning is essential to maintaining tallgrass prairies, fire alone is not a sufficient management solution for restoring prairie diversity, as some have proposed." Whereas fire is used as a conservation tool throughout much of the tallgrass region, the use of grazing by bison or cattle as a management tool for maintaining species diversity is less common. Yet herbivores such as bison historically served as keystone species in tallgrass ecosystems.

"This research indicates that by adding or maintaining grazing," states Collins, "at least in ecosystems like grasslands that were impacted historically by these herbivores, diversity in native vegetation can be retained under conditions that would otherwise lead to a decline in species richness."