EarthTrends: Featured Topic

Title: Still and Silent Ecosystems: Declining Grassland Biodiversity
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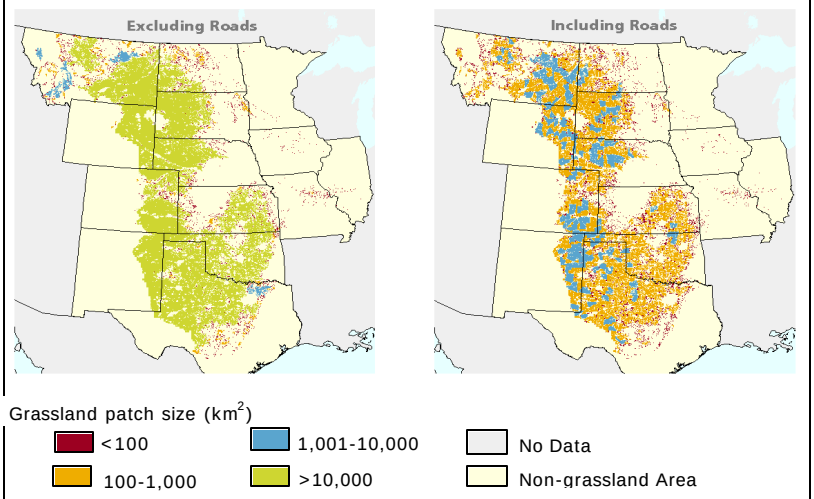
Healthy grassland ecosystems teem with plant and animal life. Some of the best-known, most dramatic, and unique large herbivores roam grasslands: antelopes and zebras in Africa; gazelles, goats, camels, bison, and wild horses in Eurasia; and deer in North America. Grasslands emanate the songs of birds—often birds found nowhere else. In fact, grasslands contain 11 percent of the world's endemic bird areas (areas encompassing the range of two or more bird species that have relatively small ranges)(White et al. 2000:40). The flora of grasslands is just as rich and important as the fauna. Grasslands were the seedbeds for the ancestors of major cereal crops, including wheat, rice, rye, barley, sorghum, and millet. These ecosystems continue to provide genetic material necessary to breed cultivated varieties of cereals that are resistant to crop diseases.

But there are growing concerns about the ability of grasslands to sustain such a rich assemblage of species. Although there are no globally comprehensive measures of the condition of grassland biodiversity, restricted regional studies suggest that increasing conversion of grasslands to agricultural and urban areas, fragmentation of grasslands with roads, and invasive species are responsible for declines in biodiversity (White et al. 2000:45–47). Although relatively small areas of grasslands have been designated as "protected," to date this strategy appears insufficient to prevent grasslands globally from becoming more still, much quieter, and far simpler ecosystems—ecosystems less able to supply the game species, medicinal plants, tourism, and genetic material we routinely enjoy.

Prairies in Pieces

Figure 1: Grassland Fragmentation in the Great Plains



Source: ESRI, 1993; GLCCD, 1998.
Projection: Lambert Equal-Area Azimuthal, Central Meridian-100, Reference Latitude 45

Pressures on Grassland Biodiversity

Globally, grasslands have been heavily modified by human activities; few large expanses of unaltered grasslands remain. Even small areas are frequently fragmented. Although forest fragmentation has been the source of recent and often heated discussions regarding the merits and drawbacks of road building, grassland fragmentation has received relatively little attention, despite the fact that the fragmentation can be pervasive. In the United States, roads have so fragmented the Great Plains that 70% of those grasslands are in blocks less than 1,000 km^2 in area, and none of the blocks are greater than 10,000 km^2 in area (White et al. 2000:47). (See Figure 1.)

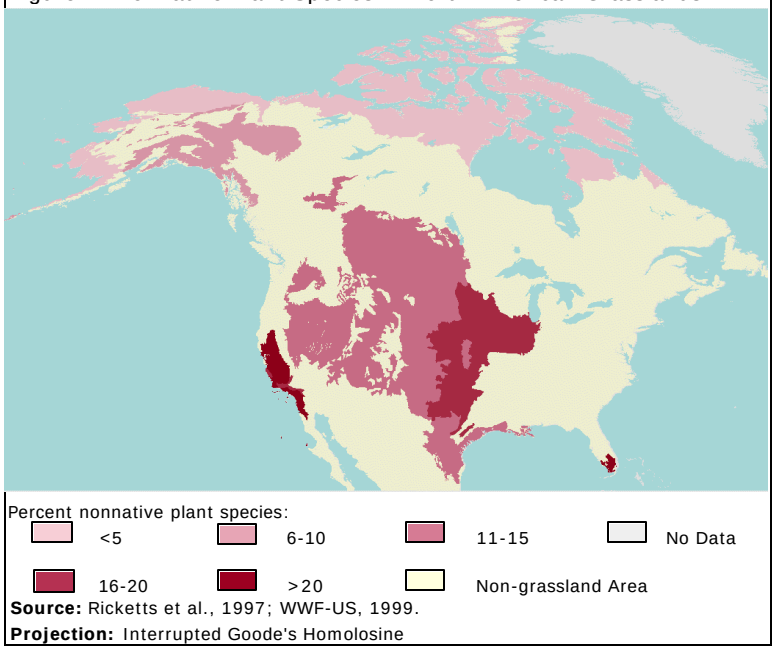
Grassland fragmentation can lead to:

- genetically isolated and reduced bird and animal populations, making them more susceptible to inbreeding, genetic drifting, and extinction;
- fewer native species because of less variety in successional stages of grasslands;
- decreased probability of species recolonization; and
- higher ratio of grassland edge to area, leading to lower nest success and higher predation (Andren 1994; Johnson and Temple 1990; Franklin 1986).

Another pressure on grassland biodiversity is the introduction of non-native plants and animals. Though not all non-native species

Pervasive Plant Invaders

Figure 2: Nonnative Plant Species in North American Grasslands



Source: Ricketts et al., 1997; WWF-US, 1999.
Projection: Interrupted Goode's Homolosine

are detrimental, some do affect the capacity of grasslands to sustain biodiversity when they become invasive, spread rapidly, change the composition of grasslands, and prevent growth of native species. The extent of nonnative species in grasslands is tremendous. Looking just at non-native plant species in North America, researchers have found that at least 10% of the species in the Great Plains and more than 20% of species in the California Central Valley Grasslands are nonnative (Ricketts et al. 1997: 81–84). (See Figure 2.)

Trends in Grassland Biodiversity

As noted above, there is a dearth of information about global trends in grassland biodiversity. However, some regional studies of bird populations suggest declines in grassland biodiversity, and evaluations of remaining large grassland mammals are not encouraging.

Grassland Bird Populations

The North American Breeding Bird Survey (BBS) provides population trends for a wide range of bird species in the United States and Canada. Survey data from 1966 to 1995 for 28 bird species that breed in grasslands show declines throughout most of the region (Sauer et al. 1997). In fact, grassland birds showed the most consistent declines of any group of birds monitored by this survey. Only a few small areas showed increases in breeding grassland birds. Habitat loss and increased mowing of grasslands for hay production on the breeding grounds, as well as problems along migratory routes or on the wintering grounds, may be responsible for many of the declines (Sauer et al. 1997; White et al. 2000:43).

Large Grassland Herbivores

In some parts of the world, grasslands have developed largely because browsing by wild herbivores has prevented the establishment and growth of trees. Main areas where grassland formation has been influenced by large herbivores are the savannas of Africa, steppes of Eurasia, and prairies of North America (WCMC 1992: 280).

Human activity, however, has seriously impaired populations of some of these large grassland vertebrates. The spectacular migrations of large vertebrates in the temperate grasslands and steppes of North America and Eurasia now occur only in isolated pockets--in the Daurian Steppe and Tibetan Plateau (Olson and Dinerstein 1997: 16). The large-scale migration of herbivores, such as wildebeest and zebra, across the savannas of Africa now occur over a much less extensive area in East Africa and the central Zambezian region (Olson and Dinerstein 1997: 16).

Is Grassland Biodiversity Sustainable?

It already may be too late for some grasslands to provide goods or services related to biodiversity in areas where conversions to agriculture and urbanization, as well as fragmentation and invasive species, have considerably altered grassland biodiversity.

Many research programs have identified grassland areas that still contain outstanding biodiversity, but the continued existence of these areas is not guaranteed. A challenge is to conserve the flora and fauna in protected areas such as the Centers of Plant Diversity, Endemic Bird Areas, Global 200 Ecoregions, and biologically distinctive areas. Protected areas (designated by IUCN--The World Conservation Union) with sizeable amounts of grassland make up only 3 percent of the global land area, or 7.6 percent of the world's total grassland area (White et al. 2000:43). Some of these areas may be more vulnerable than others and require extra attention. For example, Centers of Plant Diversity in Madagascar are subject to clearing for agriculture,

grazing, mining, erosion, and invasive exotic species (Davis et al 1994: 271). Supporting grassland biodiversity in these protected areas may require tailored, targeted protection, monitoring, and maintenance activities.

Another priority is the collection of better global information and data on grassland biodiversity. Some indicators available to evaluate grassland condition rely on subjective data rather than on quantitative measures. Just identifying and mapping large, intact grasslands is difficult because there is no consistent, up-to-date road data for the world.

Grassland biodiversity protection would benefit from the universal adoption of quantitative indicators of grassland condition, as well as regularly collected, reliable data. Such a global effort might be modeled after some regional data-gathering efforts like the Breeding Bird Survey for North America, which provides high-quality information on species abundance and population trends. These survey data permit evaluation of long-term trends across several habitats. Other datasets on grassland wildlife populations are of good quality but have limited coverage.

Datasets on invasive species must be expanded to cover the entire globe and must distinguish between introduced species and harmful species. Several workshops have addressed invasive species as an international problem, and databases related to the study and documentation of such species have been reviewed (Ridgway et al. 1999; Ricciardi et al. 2000). The National Biological Information Infrastructure (NBII) website provides information on these databases (http://www.nbii.gov/invasive/workshops/dbsurveys.html). Ricciardi et al. (2000: 240) call for a global information system for invasive species and provide a list of invasive species databases available on the Internet.

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NOTE:

1. The 28 species of birds in the BBS grassland habitat group included the upland sandpiper, long-billed curlew, mountain plover, greater prairie chicken, sharp-tailed grouse, ring-necked pheasant, northern

harrier, ferruginous hawk, common barn-owl, short-eared owl, burrowing owl, horned lark, bobolink, eastern meadowlark, western meadowlark, chestnut-collard longspur, McCown's longspur, vesper sparrow, savannah sparrow, Baird's sparrow, grasshopper sparrow, Henslow's sparrow, LeConte's sparrow, Cassin's sparrow, dickcissel, lark bunting, Sprague's pipit, and sedge wren.