



Chapter 9:

Indicators of the Condition and Use of Grasslands and Shrublands

Grasslands and shrublands cover vast tracts of the United States, especially in the West. The sagebrush steppes of the northern Rockies, the prairies of the Midwest and the Great Plains, and the deserts of the Southwest and the intermountain West are all part of this system, as are the Alaskan tundra and shrublands, and the scrublands of Florida. Pastures and haylands, which are also part of this system, are often treated as part of the farmlands landscape. From bare-rock desert to lush coastal meadows, the diversity of grasslands and shrublands is staggering, but their value—ecological, economic, and social—is often overlooked.

Lands dominated by grasses and shrubs are also widely referred to as “rangelands.” The definition of rangeland has evolved slowly over the past half-century, from one tied closely to livestock production, to definitions that focus on the natural vegetation found on the land—grasses, grasslike plants, other small broadleaf plants, or shrubs—and on the lack of intensive agricultural management, regardless of how the land is used. Therefore, even though the terms “rangelands” and “grasslands and shrublands” are nearly synonymous, the latter may be less open to misinterpretation by those who continue to associate the term “rangelands” with livestock grazing.

What can we say about the condition and use of grasslands and shrublands?

Fourteen indicators describe the condition and use of grasslands and shrublands in the United States. Partial or complete data are available for six of these indicators, four of which have a long enough data record to enable reporting on trends. Of the eight indicators for which data are not reported, seven have inadequate data for national reporting, while one indicator requires additional development before it will be possible to determine whether data are available.

After the following brief summaries of the findings and data availability for each indicator, the remainder of this chapter consists of the indicators themselves. Each indicator page offers a graphic representation of the available data, defines the indicator and explains why it is important, and describes either the available data or the gaps in those data.

System Dimensions

Three indicators describe the dimensions of the grassland and shrubland system. The first reports the acreage of the major types of land cover: grasslands, shrublands, pasture, and tundra. The second tracks such major land uses as livestock raising, intensive recreation, or rural residences. The third indicator reports the fraction of grassland area and shrubland area that is in patches of different sizes.

- **How much land is covered by grasslands and shrublands?** There are 683 million acres of grasslands and shrublands in the lower 48 states, or about 36% of the total land area. In addition, there are 178 million acres of pastures, some of which—especially if they are not cultivated—have many of the qualities of more “natural” grasslands. There are about 200 million acres of shrubland and tundra in Alaska. It is clear that substantial areas of grassland and shrubland have been converted to other uses since European settlement: in fact, from 1982 to 1997 alone, 11 million acres of nonfederal grasslands and shrublands were converted to other uses.
- **How are grasslands and shrublands used?** Data are not available to report on the acreage used for livestock grazing; oil, gas, and mineral development; rural residences; “protected areas”; and intensive recreation. About 29 million acres, or about 4% of all grasslands/shrublands in the lower



48 states (excluding pastures), are under Conservation Reserve Program (CRP) contracts involving planting to grassland/shrubland cover types.

- **What fraction of grasslands and shrublands is found in patches of various sizes?** Grasslands and shrublands are commonly found intermingled with each other and with forests and woodlands. Changes in the mix of patch sizes and types can affect the value of habitat for different species, may encourage the spread of non-native species, and can change fire frequency and intensity. Data are not adequate to report nationally on this indicator.

Chemical and Physical Conditions

Four indicators describe the chemical and physical condition of grasslands and shrublands. Two are quite similar to two forest indicators: nitrate in water and carbon storage. We track nitrate in groundwater because elevated concentrations of this nutrient can be a sign that inputs from human sources have increased or that plants are under stress. We track carbon storage because carbon is the major building block of grasslands and shrublands and because increased carbon storage can play a role in offsetting emissions of carbon dioxide from burning fossil fuels.

Water—or the lack of it—is important in many grassland and shrubland regions. Two indicators focus on the availability of water in these low-rainfall regions: we track how often streams go dry and, when they do, for how long; and we report depth to groundwater.

- **How much nitrate is there in groundwater in grasslands and shrublands?** Increasing levels of nitrate (a common form of the essential plant nutrient, nitrogen) in groundwater is a signal that plants in the ecosystem are under stress or that the amount of nitrogen entering the system is increasing. Such increases can come from fertilizer use and disposal of animal waste and from rain and snowfall (acid rain), or from changes in vegetation. Data are not adequate for national reporting on this indicator.
- **How much carbon is stored in grasslands and shrublands?** Soil organic matter (decaying plants and animals) consists primarily of carbon. Organic matter helps soils hold water and can be a source of plant nutrients and a deterrent to erosion. Increased carbon storage by ecosystems can offset emissions of carbon dioxide, of concern because of climate change. Data are not adequate for national reporting on this indicator.
- **How many streams have zero flow for at least one day a year? For these streams, are the dry periods getting longer or shorter?** Flowing water in streams and rivers is important for human needs such as drinking water and irrigation; it also sustains plants and animals, both in the stream and nearby. When this flow stops—even for short periods—both human uses and ecological functioning can be disrupted. In the 1970s, 1980s, and 1990s, the percentage of streams experiencing periods of zero flow was noticeably lower than in 1950s and 1960s. Fewer streams and rivers had longer than average zero-flow periods in the 1970s, 1980s, and 1990s, compared with the 1950s and 1960s.
- **What is the depth to shallow groundwater in various parts of the country?** Shallow aquifers provide water for streamflow and maintain water levels in lakes, are used for a variety of human uses, and can be used directly by some plants. Increased groundwater pumping and reduced percolation of water through soils due to development or soil compaction can lead to lower groundwater availability. Data are not adequate for national reporting on this indicator.

Biological Components

Five indicators describe the biological condition of grasslands and shrublands. As with several of the other ecosystems, we track the fraction of native grassland and shrubland species that are at different levels of risk of extinction. Non-native species often crowd out more desirable natives, so the second indicator tracks the percentage of grassland/shrubland area covered by non-native plants. A third indicator compares population trends in invasive bird species to those of non-invasive birds. A fourth focuses on



fire frequency, while the final indicator, still under development, will focus on the condition of riparian areas (stream edges), which serve as cover and feeding habitat for much of the wildlife in these systems.

- **How many grassland and shrubland species are at different levels of risk of extinction?** About 9% of 1700 native animal species that depend on grasslands and shrublands are considered “imperiled” or “critically imperiled,” and about 0.5% may already be extinct. When “vulnerable” species are counted, a total of about 17% of grassland and shrubland species are considered “at risk.” Interpretation of these data will be greatly enhanced when information on population trends for these species becomes available.
- **What percentage of grassland and shrubland plant cover is not native to the region?** Some non-native species can spread aggressively, reducing habitat for native species. In other cases, non-native plants have been used to control erosion and fire and as livestock feed. Data are not adequate for national reporting on this indicator.
- **Are invasive bird populations increasing more than non-invasive populations?** For most of the past 35 years, about the same proportion of invasive and native, non-invasive bird species were increasing. However, from 1996 to 2000, significantly more populations of invasive species increased—a disparity that should be interpreted as a sign of changing ecosystem conditions only if it persists into the future, because many factors can cause short-term fluctuations in bird populations.
- **Are grassland and shrubland fires occurring more or less frequently than in presettlement times?** The frequency with which fires burn is an important factor in determining the kind of vegetation in many grasslands and shrublands. Data are not adequate for national reporting on this indicator.
- **What is the condition of stream banks (riparian areas) in grassland and shrubland areas?** Riparian areas provide habitat for many grassland and shrubland species. This indicator requires further development.

Human Use

We track two human uses of grasslands and shrublands: production of cattle and recreational use, such as hunting and hiking.

- **How many cattle are fed on grasslands and shrublands?** The number of cattle on grasslands and shrublands declined from about 100 million to 93 million from 1994 to 2001.
- **How much recreational activity takes place on the nation’s grassland and shrublands?** A variety of recreational activities, including hunting, fishing, and driving off-road vehicles, takes place on the nation’s grasslands and shrublands. Data are not adequate for national reporting on this indicator.

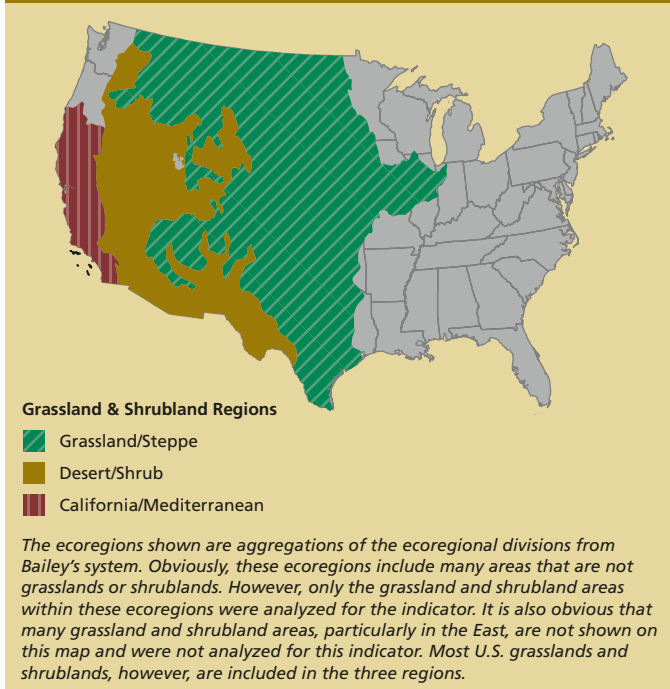
What do we mean by “grasslands and shrublands”?

The name of this system is quite descriptive: lands in which the dominant vegetation is grasses and other nonwoody vegetation, or where shrubs and scattered trees are the norm. Grasslands and shrublands are the parts of the terrestrial landscape that are not generally recognized as forests, cropland, or urban and suburban areas. Examples of grasslands and shrublands include

- Tall, mid-, and shortgrass prairies of the Midwest and Great Plains
- Sagebrush steppes of the northern Rockies
- Palouse prairies of Oregon and Washington
- Florida scrublands
- Coastal grasslands of the Atlantic and Gulf coasts
- Chaparral and savanna in California
- Deserts of the Southwest and intermountain West
- Mountain shrublands
- Shrubland and tundra in Alaska
- Pastures, as long as they are not cultivated



Map 9.1. Ecoregional Scheme Used for the Dry Streams Indicator



There are overlaps between lands considered here as “grasslands and shrublands” and lands considered elsewhere as either forest or farmlands. For example, lands in the Southwest where pinyon–juniper and chaparral grow are considered shrublands in this chapter, but they are also, based on USDA Forest Service definitions, classified as “forests.” And as noted above, pastures are considered both farmlands (since they are clearly part of farming operations and the farmland landscape) and grasslands and shrublands (since, by definition, they are generally covered with grass, with scattered trees or shrubs).

A Note about Regions

In this section, two indicators are reported on a regional basis. The Number and Duration of Dry Periods in Grassland/Shrubland Streams (p. 166) uses a three-region approach based on an ecoregion map developed by the USDA Forest Service and known as Bailey’s system, after its author (Map 9.1). The at-risk native species indicator (p. 168) also uses a regional scheme, this one developed by The Heinz Center for use with all at-risk species indicators (Map 9.2).

Map 9.2. Ecoregional Scheme Used for At-Risk Native Species Indicator

