Soil Structure and Stability

RESOURCE BRIEF

Importance

Soils are the foundation of terrestrial ecosystems. Healthy soils provide diverse habitats for plants, animals, and fungi. Soil microbial communities provide critical plant nutrients, such as nitrate and ammonia. In arid ecosystems like Bighorn Canyon National Recreation Area (NRA), soils are the primary reservoir for the water that drives all life processes. When soils lose the structure that allows them to provide these ecosystem services, a feedback cycle can begin where increased soil erosion reduces soil's ability to support plants and fungi, and the loss of plants and fungi further increases soil erosion.

Status and Trend

In 2004, the Natural Resources and Conservation Service (NRCS) reported that approximately half of the rangeland in and around Bighorn Canyon NRA is at risk for site degradation and that the other half has already deteriorated.[1] This includes 21% of the Pryor Mountain Wild Horse Range (PMWHR), which lies in the southern part of Bighorn Canyon NRA and is managed by the park. Rangeland health has deteriorated since at least the 1980s; the NRCS reported that at least 31% of the PMWHR within Bighorn Canyon NRA was experiencing severe erosion.[2] In 2004, vegetation communities had only 44% similarity to baseline data collected in 1981 and key forage species, such as Idaho fescue (*Festuca idahoensis*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and Indian ricegrass (*Achnatherum hymenoides*), were particularly hard hit.[2] Rangeland health varies considerably within the PMWHR though most of the deterioration occurs near perennial water sources where horses, a nonnative species, congregate. A 2008 pilot study by the Greater Yellowstone Network determined that biotic cover types (moss-lichen, basal vegetation, and plant litter) were significantly more abundant outside the PMWHR than inside the range (Fig. 1). Abiotic cover types (rocks and bare soil) were significantly more abundant inside the range.

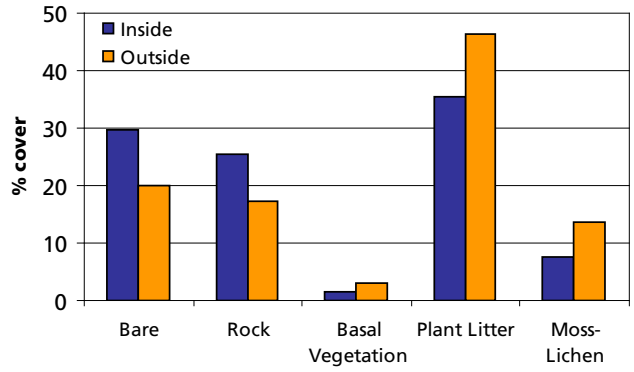

Figure 1. Distribution of soil cover (%) inside vs. outside the PMWHR.

NPS

Biological cover helps protect arid soils from erosion.

Discussion

Several factors contribute to the degraded state of the PMWHR. Bighorn Canyon NRA experienced heavy cattle grazing prior to its establishment as a National Park Service (NPS) unit in 1966. Permitted cattle grazing continues to occur in the park. The Pryor Mountain horses use the PMWHR and are managed by the Bureau of Land Management (BLM), lead of the range's interagency management group. In 2008, the PMWHR horse population exceeded the BLM's recommended Appropriate Management Level of 92–117 horses;[2] there were approximately 170 adult horses and 27 foals. In addition to grazing by cattle and horses, the region is experiencing drought, which increases the vulnerability of forage plants to grazing. Between 1996 and 2007, only four years had average rainfall. The Greater Yellowstone Network will continue to monitor soils on a regular basis to determine the long-term trends in soil conditions in Bighorn Canyon NRA.

Citations

[1]Ricketts, M.J. 2004. PMWHR survey and assessment. Bozeman, MT: NRCS.
[2]BLM, Billings Field Office; NPS, Bighorn Canyon National Recreation Area; Forest Service, Custer National Forest. 2008. PMWHR evaluation. Interagency report. pp. 86. http://www.blm.gov/pgdata/etc/medialib/blm/mt/field_offices/billings/wild_horses.Par.96169.File.dat/PMWHRevaluation.pdf.