

Unwanted No More: Land Use, Ecosystem Services, and Opportunities for Resilience in Human-Influenced Shrublands

By Mark Brunson

On the Ground

- Shrub-dominated rangelands are highly susceptible to land degradation, partly because low land values can encourage neglect, leading to poor stewardship and/or conversion to more lucrative but ecologically less desirable uses.
- Recent efforts to assess the value of “ecosystem services” show that commodity values don’t capture all the benefits of shrublands to society.
- Efforts to prevent shrubland degradation and land type conversion can be enhanced if the value of noncommodity ecosystem services can be recognized.
- Conceptual modeling of socio-ecological systems can point decision makers and stakeholders toward strategies to enhance shrubland resilience and protect ecosystem services.

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North American rangelands have never gotten much respect. In the years following the Louisiana Purchase, the US government commissioned teams of explorers to learn exactly what sort of place they’d acquired. One such expedition headed by Major Stephen Long produced a map labeling the Great Plains—the wetter portion of North America’s rangelands—as the Great American Desert. In his accompanying report, mapmaker Edwin James wrote of the region:

I do not hesitate in giving the opinion, that it is almost wholly unfit for cultivation, and of course, uninhabitable by a people depending upon agriculture for their subsistence. Although tracts of fertile land considerably extensive are occasionally to be met with, yet the scarcity of wood and water, almost uniformly prevalent, will prove an insuperable obstacle in the way of settling the country (p. 76).¹

Of course, it wasn’t uninhabitable. Before long, pioneer settlers learned how to turn that “desert” into something they valued. Irrigation proved effective for converting rangeland to cropland, although the Dust Bowl proved there were limits to where and how well that approach could succeed. As time went on, other conversions occurred. Cities cropped up in some of the most hospitable locations, often where rivers emerged from the mountains to provide ample water and opportunities for commerce, as in

Denver, Salt Lake City, and Boise. Other communities sprung up where mineral wealth could be had, although many of those later withered once the mines had played out. By the mid-20th century, some of the driest and most inhospitable locations were chosen as sites for military bases and weapons-testing ranges. Most recently, scenic rangeland areas have become home to “amenity migrants” whose lifestyles and livelihoods allow them to live wherever they choose. Meanwhile, some of the most degraded rangelands also have been converted to residential use. Some conversion has been planned, such as suburban sprawl near cities such as Las Vegas or Phoenix. Other conversions have not, as in the creation of *colonias*, unincorporated communities in the border states of Texas, New Mexico, Arizona, and California where lands of low agricultural value are divided into small lots with little or no infrastructure and sold to low-income individuals seeking affordable housing.

All of these adaptations by human inhabitants involve conversion of rangelands to something else of greater economic value. Yet rangelands have their own values—their particular benefits to society—that are often diminished by conversion to other land uses.² To protect and enhance those benefits, range scientists have worked hard for a century to find ways to prevent or reduce degradation, typically by increasing the supply of plants that serve as forage for livestock or wildlife. Even so, restoration of semiarid and arid lands remains difficult and expensive. This is one reason why as much as 20% of the world’s rangelands have been degraded, and why the trend continues at an estimated rate of 30 million acres per year worldwide.³ A critical question that faces range managers and policy makers is: How can we slow the trend of degradation and conversion so that their benefits to society and to ecosystems are not lost?

This paper focuses on shrub-dominated rangelands, which are the most prevalent range vegetation type worldwide and which are increasing in proportion relative to grasslands.⁴ Shrublands can be especially susceptible to conversion for several reasons. First, restoration is especially difficult where precipitation is naturally low and/or varies greatly from year to year, and such rangelands tend to be dominated by shrubs rather than grasses or tundra. Second, many shrub-dominated rangelands are degraded grasslands; recovery of their original characteristics would require recrossing an ecological threshold that might be insurmountable.⁵ Third, the values of shrub-dominated systems can be less obvious to society. For example, a recent survey of residents of Montana, Wyoming, and Idaho found that rangelands in a natural shrub-steppe condition were viewed as less scenic than those that had undergone conifer encroachment.⁶ If shrublands are under-appreciated, there is less chance of public pressure to halt conversion to other vegetation types or land uses.

Societal Benefits of Rangelands

Nearly a quarter century ago, Australian rangeland economists McLeod and Johnston concluded that, except in situations where prescribed burning can achieve the objective, rangeland restoration strategies were rarely cost-effective when judged solely by private economic values.⁷ They suggested that rangeland restoration might be judged worthwhile if a “social benefit-cost analysis” were performed that could incorporate all of the benefits that society would realize from restoration. They also acknowledged numerous reasons why societal benefits were not considered in benefit-cost analyses, including technical problems in valuation as well as a lack of policy mechanisms that could give society a role in restoration.

Rangelands typically have lower real property value than other lands. For example, a 2010 study in Nebraska found that the value of nontillable grazing land was less than 20% of the value of center pivot-irrigated cropland, and grazing land was valued significantly lower in the drier western portions of the state than elsewhere.⁸ Further, while cropland values were rising at the time, rangeland values were declining. The need to identify societal benefits can be especially acute for shrublands.

In the years since McLeod and Johnston published their paper on the economic costs and benefits of restoring Australian rangelands, a new concept has emerged that can be useful to help identify, understand, and emphasize critical societal benefits of shrublands. The term *ecosystem services*, defined as “the benefits people obtain from ecosystems,”⁹ emerged during the 1990s. The idea has taken hold among environmental scientists, government agencies, and nongovernmental organizations worldwide. Economists have so seized on the idea that there is now an entire academic journal called *Ecosystem Services*. For land managers and decision makers, the concept’s chief value is its usefulness for demonstrating how the natural environment affects human health and well-being (Fig. 1). The ecosystem service model proposes four categories of services: *supporting services* such as nutrient cycling or soil formation, necessary for the production of all other ecosystem services;

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