



ARIZONA RANGELANDS

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Using Knowledge of Ecological Relationships to Encourage Desirable Plants and Discourage Undesirable Plants

Objective: Maximize Forage Production for Livestock

On many rangelands, one effect of livestock grazing can be the replacement of short-lived palatable plants (e.g., grasses) with long-lived, unpalatable plants (e.g., woody plants such as juniper or mesquite). Within this context, livestock grazing favors recruitment and growth of woody plants in most rangelands. Further, livestock grazing may inhibit growth of desirable forage plants, and the presence of woody plants further interferes with forage production. Thus, livestock grazing can contribute to a decrease in the capacity of rangelands to produce herbaceous plants, and various management practices must be used to accomplish the objective of maximizing forage production for livestock.

Prescribed fire represents one tool for discouraging woody plants. In general, frequent fires are detrimental to woody plants and beneficial to short-lived herbs, especially annuals. However, periodic fires may be insufficient to control the abundance of woody plants on many sites. Rather, fire management must be integrated with appropriate grazing management. In many cases, major cultural inputs (e.g., mechanical or chemical treatments) may be required to create and maintain high herbaceous productivity because a lack of fine fuels precludes the use of fire as a restorative technique. This is particularly problematic in former grasslands or savannas dominated by dense stands of woody plants. In addition, once the abundance of woody plants is reduced to an acceptable level, maintenance of this condition will require the reinstatement of periodic fires. For example, maintenance of sparse woody plant cover requires a higher fire frequency on highly-productive sites with deep soils than on erosion-prone sites or sites with shallow soils.

Mechanical and chemical plant control methods have been developed in the range and forestry professions. The efficacy of these treatments is strongly dependent on environmental conditions and plant morphology and phenology during and after application. Further, application of these treatments requires considerable skill and, in the case of some herbicides, licenses or permits. Most mechanical and chemical treatments are designed to reduce the abundance of specific woody plants. The large number and variety of techniques allows considerable flexibility with respect to size, growth-form, and density of the target woody species. Nonetheless, there is considerable variability in efficiency of treatments. Furthermore, the large economic costs associated with mechanical and chemical methods imposes significant constraints: they are generally either labor-intensive or dependent on large investments in capital and petroleum-based fuels.

Because of their expense and the perception that their use is environmentally inappropriate, the use of mechanical and herbicidal methods has declined in the last few decades. However, when used properly,

these methods represent an important and effective tool for reducing woody plant abundance in dense stands. Thus, restoration and maintenance of grasslands or savannas often is accomplished most appropriately by using a combination of techniques. Grazing management, fire management, and use of chemical and mechanical treatments should be considered carefully when managing rangelands.

Finally, it should be recognized that livestock grazing does not contribute to increased recruitment or growth of woody plants on some sites. Further, the ability of woody plants to germinate, establish, and grow is strongly dependent on climatic conditions. These factors, and the interactions between them, contribute to extremely variable and complex patterns of plants on landscapes. As such, they insure that the ecology and management of rangelands will remain a challenging endeavor for the foreseeable future.

Additional reading

Heady, H.F. 1994. *Rangeland ecology and management*. Boulder, Colo.: Westview Press.

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Workman, J.P. 1986. *Range economics*. New York: Macmillan.

 = AZ Rangelands Website resources  = Western Rangelands resources
 = Outside resources



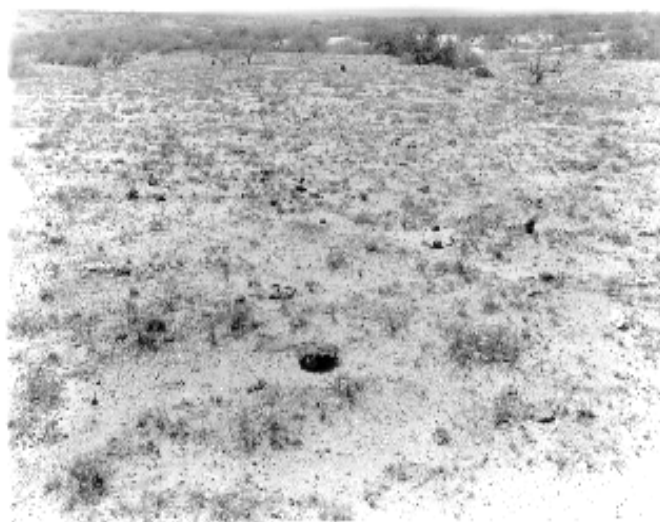
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URL: <http://rangelandswest.org/az/vegetation/example.html>
Last Revised: 11 December 2001

Santa Rita Experimental Range Repeat Photography



Pasture 1: Facing NE (1952)



Pasture 1: Facing NW (1952)



Pasture 1: Facing NE (2000)



Pasture 1: Facing NW (2000)



1922



1947



1986

This upland site changed from a native grassland site (1922) with few woody species to a mesquite-cactus-burroweed type (1947), to a mesquite-Lehmann lovegrass-dominated savannah (1988). Note that cactus has completely cycled through and lehmann lovegrass has out competed burroweed.



1903

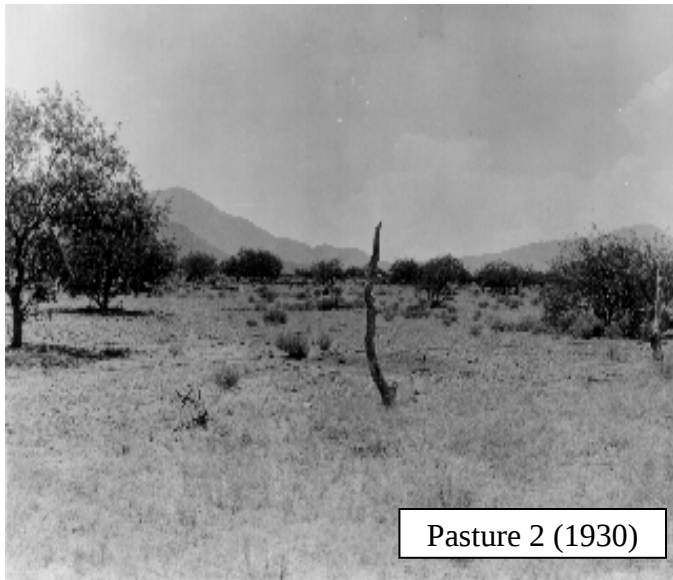


1951

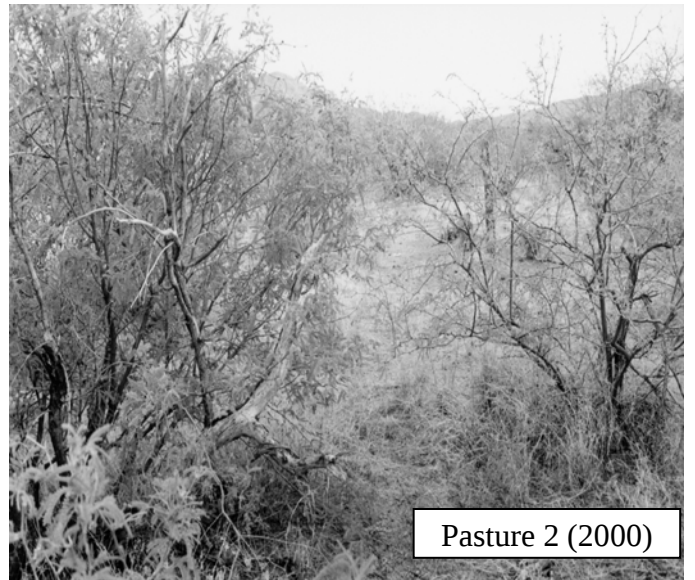


1988

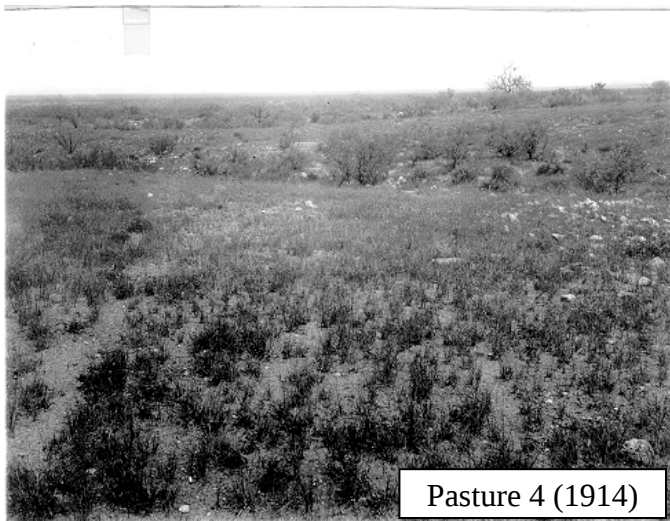
Photo sequence showing differences in range conditions between 1910, 1951, and 1988. In 1910 and 1951, native vegetation was the dominant aspect, whereas in 1988 the understory has become largely a monoculture of lehmann lovegrass, an exotic.



Pasture 2 (1930)



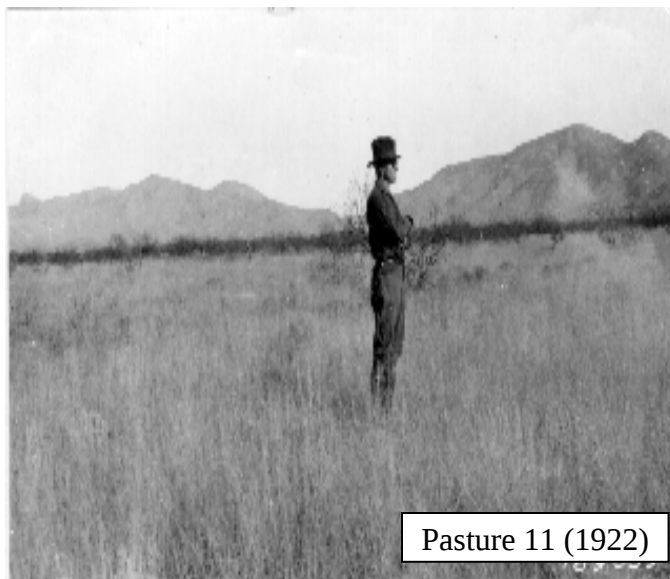
Pasture 2 (2000)



Pasture 4 (1914)



Pasture 4 (2000)



Pasture 11 (1922)



Pasture 11 (2000)