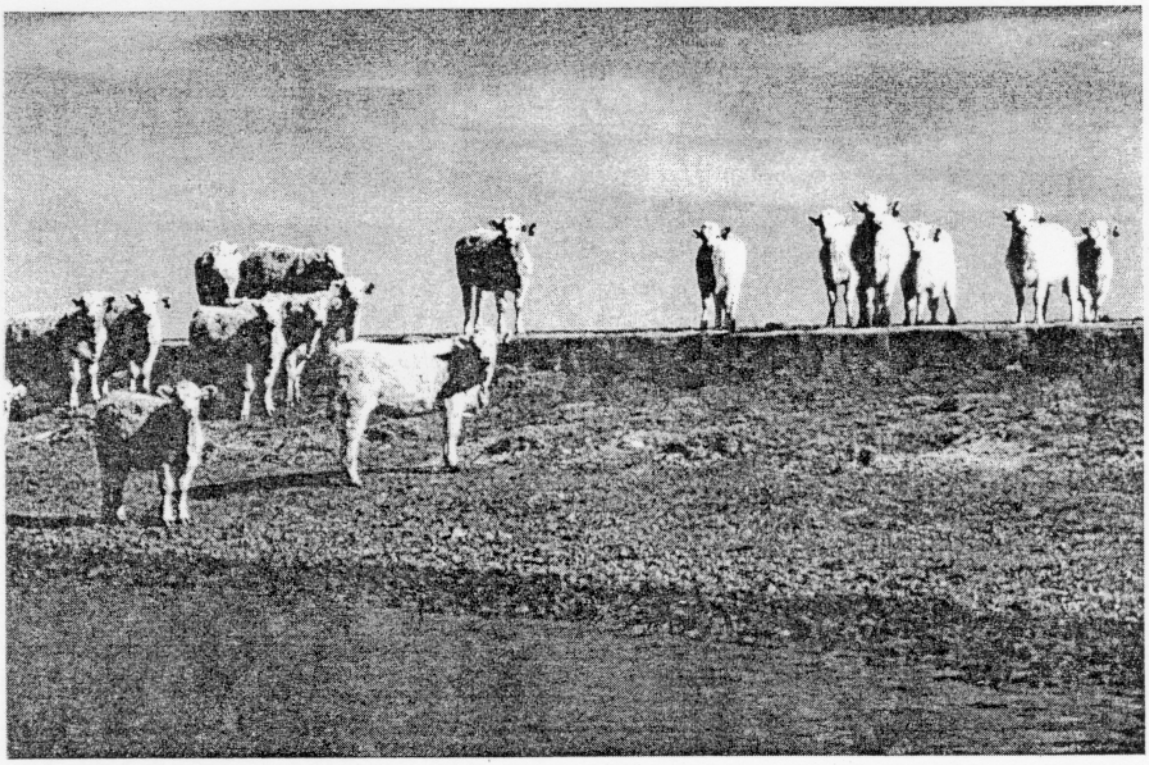
Livestock Research Briefs and Cattle Growers' Short Course



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NEW MEXICO STATE UNIVERSITY

College of Agriculture and Home Economics
– Agricultural Experiment Station
– Cooperative Extension Service,
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Jornada Experimental Range

RANGELAND RESEARCH IN THE CHIHUAHUAN DESERT

Key Words: Livestock Management, Rangeland ecology, Monitoring

Introduction

The mission of the research program at the Jornada Experimental Range is to develop new technologies for management and remediation of desert rangelands. This program leverages the 88 year research history at the 193,000 acre Jornada Experimental Range under the stewardship of the USDA to address four general objectives. These are to: 1) quantify key ecological processes that characterize functions of arid rangelands, 2) identify, evaluate, and describe methods for monitoring and assessing desert rangeland conditions, 3) design and test techniques for remediating degraded rangelands, and 4) develop agricultural practices appropriate for livestock production in desert environments.

The following are a few of the current projects at Jornada related to these four objectives. For more information about these or the many other studies in progress, or to obtain publication lists or specific publications, please contact our office (vlaplant@nmsu.edu) or visit our website (usda-ars.nmsu.edu).

Invasive Weeds

Invasion of western rangelands by exotic perennial weeds has increased at an alarming rate. Because traditional management approaches are costly, ineffective, and species- or site-specific, alternative approaches are urgently needed. Our goal is to better understand the ecological interactions among invasive weeds and native range plants in order to predict rates of infestation, identify sites most sensitive or resistant to invasion, and predict conditions for which various management options are most suited. We are using Russian knapweed as our model species, and will apply our results to other invasive weed species. A simulation model to predict weed invasion dynamics under different environmental conditions has been refined to include allelopathic interactions in order to simulate invasion of aggressive perennial weeds on sites located in Colorado with different soils and climates. We found the predicted rate and intensity of Russian knapweed invasions were highest in sites with fine textured soils and low precipitation. Our results can be used to target these sites for management inputs, with less inputs needed on sandy soils with higher precipitation. We used a field study to evaluate allelopathic effects of Russian knapweed on blue grama, western wheatgrass, prairie junegrass, and sand dropseed seedlings, and found that grass species have different seedling growth tolerances in knapweed stands. These different tolerances suggest that species composition of rangelands may be important for determining rate and susceptibility of weed invasion. This research allows scientists and managers to identify sites currently invaded by Russian knapweed that will naturally recover to native rangeland without management inputs, as well as sites and environmental conditions that require management inputs to reduce infestation rates and promote recovery of native range plants. Our intent is to expand this work into New Mexico.

Monitoring

One of the central issues in western rangeland management is how to quantify the effects of livestock grazing on public and private lands. Several hundred million acres of land worldwide are used for range livestock production, yet we lack standardized methods to monitor the effects of current management on rangeland health. We examined several indicators (vegetation, soil, and animal-based) as potential monitoring tools to assess rangeland health of southwestern deserts. A number of plant and soil related indicators have proven to be useful for monitoring purposes, e.g., size of unvegetated patch, cover of perennial grasses, and soil surface stability. Animal species diversity indicators have been less effective. A specific soil-based indicator, a soil stability test, has been incorporated into an inexpensive field kit. We have worked with individual ranchers in New Mexico to test these methods, and have established pilot projects on state lands to demonstrate these methods and their application to on-the-ground management. A manual that describes rapid and repeatable rangeland monitoring methods for use by ranchers and other land management professionals is currently in review and will be published in 2000. We have begun conducting workshops to train land managers to use this manual, in partnership with other organizations. We expect this manual to provide standardized quantitative monitoring methods for assessing the health of western rangelands. Please contact us for information regarding the availability of this manual later in 2000.

Prescribed Burns

Wildland fire is a fundamental ecological process, but is a poorly understood habitat factor in arid ecosystems. This is especially the case in southwestern deserts of the United States. Many of these grasslands have been degraded due to a combination of drought and

overgrazing during the latter portion of the 19th century, and now support vegetation typically dominated by less desirable woody species. Degradation of these lands affects a number of functions, including forage production, watershed quality, and wildlife habitat. Remediation technologies such as chemical or mechanical control for reduction of woody species are rarely economical or sustainable. Managed burning is a potential tool for improving millions of acres of degraded lands in this region. We are evaluating the effects of fire and post-fire livestock grazing on Chihuahuan Desert grasslands in controlled experiments. We are using large sample areas with well-defined land use histories, for which productivity and species composition can be measured over decades. The fire treatment (approximately 1000 acre prescribed burn) was applied to study sites in 1999 and initial responses to fire and grazing effects will be measured in 2000. From this research, we will identify post-fire guidelines for recovery of key species characteristic of grazed Chihuahuan Desert grassland communities.

Non-Wire Fencing

A major issue regarding livestock grazing on rangelands is the need to control animal distribution. The ability to monitor and control foraging animals has tremendous ecological and economic implications. Wire fencing is currently society's only ubiquitous technique to control animal location, and it has numerous limitations and significant costs associated with labor and materials for construction and maintenance. Permanent fences hinder point-in-time management by preventing rapid addition or removal of animals to or from specific areas. A method and apparatus have been developed that may allow for management of grazing livestock without ground-based fencing. We have developed a device to determine location of individual animals and control their direction of movement. The basis of this method is a minaturized device worn by an animal that combines Global Positioning System technology and a Geographic Information System database with instrument-controlled animal conditioning procedures (bilaterally applied sensory cues). Our goal is to develop a system for management of individual animals that capitalizes on innate animal behavior using low stress animal handling techniques and 21st century technology. A third generation prototype is currently being field tested for effectiveness in containing animals within an area. The ability for producers to manage livestock distribution based on decisions at a given point in time would have a number of benefits. Besides reducing labor and expense associated with locating and gathering animals and building and maintaining fence, this technology could be used to exclude livestock from ecologically sensitive areas and to restrict animals from areas containing poisonous plants during critical growth stages. Producers could more easily attain uniform forage usage and capitalize on a particular area during its most nutritious state, potentially reducing supplementation costs.