



Today's Rangeland Management: Integrating Science, Practices, Partnerships and Policy

2nd Rangeland Science Symposium &
8th Annual California Rangeland Conservation Coalition Summit
January 24-25, 2013 - UC Davis Freeborn Hall

Poster Session



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Falconry's Role in Conservation

Dr. Noel Amherd, Falconer and Representative of the California Hawking Club

American Falconers = Conservationists. Falconers played the major role in the most significant endangered species recovery of the 20th Century: the return of the Peregrine Falcon in North America. Our innovations have become industry standards in wildlife rehabilitation and repopulation, not only Peregrines but California Condors, Bald Eagles, and more. Our no-side-effect raptors have become preferred methods of pest abatement in agriculture, airports, and landfills. Raptors depend on healthy land and habitats so our conservation interests are natural to our Falconry tradition. UNESCO itself recognized this when it voted Falconry as one of the Intangible Treasures of Humanity in 2010.

Lost Opportunity Cost As A Form Of Payment For Ecosystem Services

Theresa Becchetti, Livestock and Natural Resource Advisor, UC Cooperative Extension

*co-authors: Sheila Barry, Livestock and Natural Resource Advisor, UC Cooperative Extension; and
Stephanie Larson, Livestock and Natural Resource Advisor, UC Cooperative Extension.*

Rangelands comprise the largest land mass in the state of California and provide many ecosystem services. Markets for many of these services have been difficult to establish with limited ability to adequately monitor and measure services provided. At the same time, rangelands in some areas of the state have been experiencing rapid conversion to more profitable forms of agriculture such as almond and walnut orchards. To prevent further conversion of rangelands and the loss of the services they provide, there needs to be a mechanism to identify and compensate landowners for the value of products and services being received from rangelands. This paper looks at lost opportunity costs as a method for determining the value of Payment for Ecosystem Services (PES) for rangelands, making them more competitive financially to remain as large, unaltered land.



Genome-Wide Association Study of Grazing Distribution Traits

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co-authors: Derek W. Bailey, Professor of Range Science, New Mexico State University; Milton G. Thomas, John E. Rouse Chair of Beef Cattle Breeding and Genetics, Colorado State University, Fort Collins; Juan F. Medrano, Professor of Animal Genetics, UC Davis; Gonzalo Rincon, Postdoctoral Scholar, UC Davis; Adrienne Lipka, Master of Science Candidate, New Mexico State University; Steven Lunt, M.S. Candidate, New Mexico State University; and Gail Silver, Laboratory Technician, New Mexico State University.

A genome-wide association study was conducted using the BovineHD Bead Chip (Illumina, Inc., San Diego, CA) and grazing distribution phenotypes 1) Rough (i.e., combination of elevation and slope) and 2) Ratio (i.e., combination of elevation, slope, and distance to water) in beef cattle populations in Montana, New Mexico, and Arizona. Polymorphisms on bovine chromosomes 17 and 29 were found to account for 17 and 25% of the variation in the Rough trait, respectively. Additional quantitative trait loci accounted for 5 to 10% variation in Ratio trait. Results suggest that heritability of slope and elevation use should be at least 25%.

Bridging the Management-Science Partnership Gap:

Adaptive Grazing Management Experiment in Shortgrass Steppe

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The Adaptive Grazing Management experiment (2013-2023) in shortgrass steppe of Colorado addresses a critical gap in grazing management: lack of management-science partnerships to more fully understand the effect of management decisions for multiple ecosystem goods and services at ranch-scales. A Stakeholder Group (11 members) has determined outcomes, objectives, management practices, monitoring metrics and triggers to move livestock among the ten 320-acre pastures. Each study pasture contains multiple ecological sites and is paired with a similar 320 acre control pasture that is managed in a traditional manner: grazed season-long from mid-May to early October at a moderate stocking rate.

Precipitation Patterns Alter the Impacts of Management on Noxious Rangeland Weeds

Valerie Eviner, Associate Professor, UC Davis, Department of Plant Sciences

*co-authors: Kevin Rice- Professor, Dept. of Plant Sciences, UC Davis; and
Carolyn Malmstrom, Associate Professor, Plant Biology, Michigan State University.*

This poster will describe a 6-year study investigating how noxious rangeland weeds (particularly medusahead and goatgrass) are affected by interactions among: the timing and amount of precipitation, the timing of clipping, native grass restoration, and fertilization. While the study does not demonstrate a way to significantly decrease rangeland weeds, it does provide insights into ways to prevent them from becoming worse, particularly in years where spring rainfall patterns are normal or dry.

Habitat and Management of the Endangered Ohlone Tiger Beetle (*Cicindela ohlone*)

Lawrence Ford, Senior Scientist, LD Ford Rangeland Conservation Science

co-authors: Richard Arnold, President, Entomological Consulting Services, Ltd.; James Bartolome, Professor of the Graduate School, UC Berkeley; and Devii Rao, Rangeland Management Specialist, Point Reyes National Seashore.

This poster describes results of 2010-2012 research to describe land use and breeding habitat characteristics associated with occupation by the endangered Ohlone Tiger Beetle (*Cicindela ohlone*). The historical land uses most associated with OTB persistence are extensive cattle or horse grazing and moderate-frequency hiking and bicycling traffic. Bare soil cover was the most important predictor of OTB occupancy of Watsonville loam soils in grassland trails (avg. 50%) and open areas (avg. 12%). Non-native perennial grasses dis-favored OTB occupancy. We also provide guidance for future adaptive management by identifying the habitat features that land managers should focus upon and monitor.

UC Cooperative Extension Livestock & Range Beef Cattle Information Web Site

John M Harper, Livestock & Natural Resources Advisor – Mendocino & Lake Counties,
UC Cooperative Extension

The poster describes and highlights the new University of California Cooperative Extension Livestock & Range (UCCELR/Beef_Cattle) beef cattle Web pages. These pages are part of a more extensive Web site that provides information on various species of domestic livestock and natural resource management including rangelands, oak woodlands, wildlife, water and air quality, and ecosystem services. Within the beef pages you'll find information from University of California Cooperative Extension livestock & natural resources advisors and specialists; UC Davis School of Veterinary Medicine researchers; and Agriculture and Natural Resources (ANR) scientists grouped by topics. The goal is to make it easy for cattle producers to navigate quickly to the topics they're interested in as they pertain to California beef production. In addition, there are links to important beef resources developed by USDA, professional societies, associations, state colleges, other land grant colleges and universities and their Cooperative Extension. The goal is to provide California cattle producers and land managers with a significant portal into the internet-based information available.

Characterizing Wyoming Ranching Operations: Natural Resource Goals, Management Practices and Information Sources Emily Kachergis, Postdoctoral Ecologist, USDA-ARS Rangeland Resources Research Unit, Cheyenne, Wyoming

co-authors: Justin Derner, Research Leader, USDA-ARS Rangeland Resources Research Unit, Cheyenne, WY; Leslie Roche, Postdoctoral Researcher, UC Davis; Kenneth Tate, Professor and Rangeland Watershed Specialist, UC Davis; Mark Lubell, Professor, UC Davis; Rachel Meador, Rangeland Extension Specialist, University of Wyoming; and Jim Magagna, Executive Vice President, Wyoming Stock Growers Association.

Spanning 60 million acres, Wyoming rangelands produce food and provide other vital ecosystem services. However, the decision-making process of the ranchers who steward these lands is complex and poorly understood. In cooperation with the Wyoming Stock Growers Association (WSGA)—a predominant agricultural organization in the state—we asked WSGA producer members about their goals, ranching operation characteristics, and management practices via a mail survey. This poster highlights results from the 307 ranchers (50%) who responded. Key findings showcase the diversity of Wyoming ranching operations, suggest synergies between production and conservation goals and strategies, and recommend a multi-pronged approach to outreach.

Setting Regional Strategies for Invasive Plant Management Using CalWeedMapper Dana Morawitz, Mapping Program Manager, California Invasive Plant Council

*co-authors: Elizabeth Brusati, Science Program Manager, California Invasive Plant Council; and
Doug Johnson, Executive Director, California Invasive Plant Council.*

Cal-IPC is working with partners to develop consensus strategies for invasive plant management based on CalWeedMapper, our online mapping tool. We're charting a strategic course to help regions be shovel-ready to apply for funding and respond rapidly to new invaders. CalWeedMapper produces a Management Opportunity Report of surveillance, eradication and containment opportunities in a selected region based on the current distribution of those species. This report is used in conjunction with local knowledge and information on that species' resiliency to climate change to deduce strategic surveillance and eradication targets in a region. The goal is to provide each region with a list of species for surveillance and a regional work plan (with budget) to address top priority eradication targets.



The Feasibility of Water Quality Markets for Rangelands in California's Central Valley

Jessica Musengezi, Economics of Ecosystems Fellow, Defenders of Wildlife

co-authors: Pelayo Alvarez, California Rangeland Conservation Coalition; Michelle Bacon, Defenders of Wildlife; Molly Cheatum, Defenders of Wildlife; and Clayton Ogg, Defenders of Wildlife.

California rangelands provide a variety of ecosystem services including clean water, wildlife habitat, watershed protection, open space and mitigation to climate change. Rangelands are under increasing pressure from land conversion for urban development and intensive agriculture that result in the loss of valuable ecosystem services. Water quality markets are one option that allows regulated entities to cost effectively meet water quality standards, while providing landowners with financial incentives to adopt water quality enhancing practices and discourage land conversion. We review existing water quality trading programs in the U.S., identify successful program design features, and assess applicability to rangelands in the California's Central Valley.

Development of a Rapid Habitat Condition Assessment for Depressional Wetland Systems

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co-authors: Cara Clark, Central Coast Wetlands Group; Chris Solek, Southern California Coastal Water Research Project; Sarah Pearce, San Francisco Estuary Institute; and Chad Roberts, Roberts Environmental and Conservation Planning.

The California Rapid Assessment Method (CRAM) for Wetlands is a diagnostic tool that two trained practitioners can use to assess the condition of a wetland over a period of 1-3 hours using visual indicators in the field. The CRAM method expresses condition as an Index score. Project partners developed conceptual models for, and adjusted the module metrics representative of different depressional wetland types from various regions across the state. A team of expert CRAM practitioners then tested new metrics at a range of depressional wetlands across the state and revised the module to adequately assess systems with different hydroperiods.

History and Future Goals of the Sierra Foothill Research & Extension Center (SFREC)

Charles Raguse, Professor Emeritus, UC Davis, Department of Plant Sciences

The Division of Agriculture and Natural Resources of the University of California owns and administers nine Research and Extension Centers located across the state. The 5,700 acre SFREC is comprised of annual grass-oak woodland rangeland with a variety of vegetation including managed irrigated pastures, a diverse wildlife population and several watersheds. For over 50 years, the SFREC has served as a research facility for studies by scientists throughout the university system. It is important to synthesize and recognize the knowledge that has been derived there. Its future is vital to continue research, extension, and teaching that will be significant in development of regulatory policies and on-the-ground rangeland management and livestock production.

Spatial Methods for Low-cost Restoration of Rangeland Ecosystem Services

Dr. Andrew P. Rayburn, Postdoctoral Fellow, Dept. of Plant Sciences, UC Davis

co-authors: Heather Spaulding, Junior Specialist, UC Davis; Jessica Musengezi, Postdoctoral Fellow, UC Davis; Craig Schriefer, Lab Manager, UC Davis; Anthony O'Geen, Cooperative Extension Specialist, UC Davis; and Emilio A. Laca, Professor, UC Davis.

California rangelands provide valuable ecosystem services including forage, wildlife habitat, biodiversity, pollinator resources, and both water and carbon storage. Provision of these services has been diminished by exotic species, overgrazing, and land conversion. Rangeland restoration is increasingly demanded in California; however, high costs and low success rates limit its adoption. We report progress to-date on a series of stakeholder-driven, USDA-funded projects based in Central California that test spatially-explicit strategies for reducing rangeland restoration cost, enhancing restoration success, and quantifying restoration effects on ecosystem services. Our results are informing restoration efforts in both working landscapes and land reserves in the region.



Arthropod Response to Rangeland Restoration in the Sacramento Valley, California

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co-authors: Andrew P. Rayburn, Postdoctoral Fellow, UC Davis; Anthony O'Geen, Cooperative Extension Specialist, UC Davis; and Emilio A. Laca, Professor, UC Davis.

Since arthropod communities are closely tied to vegetation, they can fluctuate if land management changes plant community composition. In some ecosystem types, certain indicator taxa are reliable measures of ecological processes that support valuable ecosystem services. Rangeland restoration is increasingly popular in California, but restoration effects on ecosystem services are poorly understood. To assess the response of arthropod communities to rangeland restoration and to evaluate the plausibility of using arthropods as indicators of ecosystem service provision, we sampled arthropods at five restored-unrestored site pairs for an extended period in Spring 2012. We present results of our ongoing analyses.

Regime Shifts and Threshold Dynamics in California Grasslands Along a Grazing Gradient

Claudia Stein, Environmental Science, Policy & Management, UC Berkeley

co-authors: Stanley W. Harpole, Department of Biology, Iowa State University; Katharine N. Suding, Environmental Science, Policy & Management, UC Berkeley.

We present results from an experimental study testing the generality and predictability of grazing as driver of transitions among three grassland types in California rangelands: perennial native bunchgrasses, annual exotic forage grasses, and an annual noxious invader, Medusahead. High grazing intensity promoted invasion by weedy forbs regardless of the resident vegetation. Over five years, we observed frequent transitions between annual forage species and Medusahead, indicating that Medusahead might form transient stands. The native vegetation was the most persistent, but results indicate the existence of thresholds in the way that once a native vegetation gets invaded it does not recover.

Water Quality Conditions Associated with Cattle Grazing and Recreation on National Forest Lands

Kenneth W. Tate, Professor and Cooperative Extension Specialist, UC Davis

There is substantial concern that microbial and nutrient pollution by cattle on public lands degrades water quality, threatening human and ecological health. In collaboration with multiple stakeholder groups, we conducted a cross sectional survey of water quality conditions associated with cattle grazing and recreation on 12 US Forest Service public lands grazing allotments in northern California. Nutrient concentrations observed throughout the grazing-recreation season were at least one order of magnitude below levels of ecological concern, and were similar to US Environmental Protection (USEPA) estimates for background water quality conditions in the region. We found that all but the most restrictive fecal indicator bacteria water quality benchmarks were broadly met, and USEPA's currently recommended *E. coli* benchmarks were met by over 90% of the 743 samples collected during the study. This work demonstrates that cattle grazing, recreation, and provisioning of clean water can be broadly compatible goals across these national forest lands.

A Comparison of Oak Understory and Open Area Response to Nitrogen Deposition

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co-authors: Mary Cadenasso, Associate Professor, Department of Plant Sciences, UC Davis; and Samuel Reisman, undergraduate intern, Department of Plant Sciences, UC Davis.

Oak savanna rangelands are increasingly exposed to N deposition as urban areas expand. The level of N deposition at which the plant community experiences a major change (threshold response) may differ between oak understory and open areas because of the role of the canopy as a deposition hotspot. The poster describes an experiment that quantified changes in productivity, species richness, and cover of invasive species in understory and open areas in response to a range of N fertilization levels. The results highlight the importance of oaks in maintaining rangeland ecosystem structure and function in the face of landscape change.



Thank you to our sponsors!

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