

WERA 40 ANNUAL MEETING 2007

Nevada City, CA

October 4-5, 2007

Western Education/Extension Research Activities

Attendee List

WERA 40
2007 Nevada City, CA

Bailey, Derek	dwbailey@nmsu.edu	New Mexico State University
Fernández-Giménez, Maria	gimenez@warnercnr.colostate.edu	Colorado State University
Flarell, Dustin	dkflarell@ucdavis.edu	Sierra Foothill Res. & Ext. Cen.
George, Mel	mrgeorge@ucdavis.edu	Univ. of California, Davis
Hardesty, Linda	lhardest@wsu.edu	Washington State University
Jacobs, Jim	jjj@uwyo.edu	University of Wyoming
Johnson, Pat	patricia.johnson@sdstate.edu	South Dakota State University
Perryman, Barry	bperryman@cabnr.unr.edu	University of Nevada, Reno
Pyke, David	david.a.pyke@usgs.gov	U. S. Geological Survey
Smith, Michael	pearl@uwyo.edu	University of Wyoming
Stringham, Tamzen	Tamzen.Stringham@oregonstate.edu	Oregon State University
Tate, Ken	kwtate@ucdavis.edu	Univ. of California, Davis

Accomplishments

- 1) Organized a symposium for the 2008 Annual Meeting of the Society for Range Management in Louisville, Kentucky entitled "State-and-Transition Models: Triggers, Feedbacks and Thresholds" for January 29, 2008. This symposium presents recent advancements in Site and Transition Models (STMs) including the concepts of ecological resilience, triggers and feedback mechanisms that strengthen the potential for STM's to capture a broader set of relevant information for anticipating and identifying variables and conditions that drive ecosystem dynamics. (An agenda for the symposium is attached).
- 2) A Riparian Ecological Theory Development Workshop was held August 13-17, 2007 at Albuquerque, New Mexico. The Workshop involved selected NRCS grazing lands specialists and scientists, researchers, professors from universities, and the Agricultural Research Service. This Workshop was designed to allow the research and scientific community to communicate with NRCS on how riparian ecology can be addressed when developing State and Transition models for ecological sites. Discussions and decisions allowed NRCS to better refine riparian theory concepts and will support management recommendations to producers.

Outcomes

- 1) General state & transition models for the most common upland ecological sites within the Major Land Resource Areas 23 and 24 will be developed by Tamzen Stringham for use by NRCS. Development of these academically peer reviewed models will facilitate the entry of data into the ESD program and will immediately be useful to field office operations, technical service providers, state and federal land management agencies, and other users.
- 2) General state & transition models for upland ecological sites within the Major Land Resource Areas B10 have been completed by Tamzen Stringham and delivered to NRCS.
- 3) General state & transition models for the California annual grasslands have been completed by Mel George with assistance from others in University of California Cooperative Extension.
- 4) David Briske, Brandon Bestelmeyer and Tamzen Stringham prepared a manuscript that describes conceptual improvements to Site and Transition Model framework. The paper has been accepted by *Rangeland Ecology and Management* with minor revisions.
- 5) Maria Fernández-Giménez is conducting a project that seeks to underpin the state-and-transition model (STMs) framework with a network of long-term empirical data. Research objectives of the project are to 1) explore new protocols to construct STMs that are based on empirical ecological data, 2) investigate the ecological validity of existing qualitative STMs by comparing them with data-based models, and 3) evaluate the decision rules and assumptions that various authors utilize to construct STMs.
- 6) Maria Fernández-Giménez is conducting a project to develop Site and Transition Models (STMs) based on ecological field data and professional and local knowledge, using qualitative and quantitative analysis techniques. A participatory stakeholder process will be used to compare and evaluate the accuracy and utility of STMs based on different knowledge sources and data analysis approaches, and to develop “best-fit” models that combine local knowledge and field data. The project will promote adoption of STMs through: a) direct stakeholder participation in workshops to develop and evaluate STMs, b) partnerships with local and state-wide organizations to integrate STMs into existing producer and manager workshops, short-courses, and publications, c) incorporation of STMs models into NRCS site descriptions, and d) publication of the STMs and a handbook describing their development and use on the Colorado Rangelands and Rangelands West websites.

Additional WERA 40 Minutes and State Reports

Old Business

Meeting opened by Tamzen Stringham on October 4 at 9:00 am at the University of California Sierra Foothill Research and Extension Center.

The minutes of the 2006 WERA minutes were read. Pat Johnson moved and Barry Perryman seconded acceptance of minutes.

Thanks go to Clayton Marlow for coordinating arrangements for the meeting and the excellent field tour at Billings, MT in November 2006.

Jim Jacobs our Administrative Advisor will no longer serve as our Advisor after 2007. The WERA 40 committee will need a new Administrative Advisor.

The format of the minutes and reports must be stream-lined to include:

- Participants
- Accomplishments
- Impacts

New Business

2008 Meeting Location. The committee considered conducting joint meeting with WERA 108 Rangeland West committee. Jim Jacobs informed the committee that a short petition would be required for a March 2008 meeting to coincide with WERA108. The concern expressed regarding a joint meeting with WERA 108 was that most time spent at WERA108 was computer work. Barry Perryman and others emphasized that one of the greatest values of WERA 40 meetings was the rangeland field trips.

The committee then considered organizing a joint meeting with WERA 21 (Revegetation and Stabilization of Deteriorated and Altered Lands) for the 2008 meeting. Dave Pyke is on the WERA 21 committee and organizing a field trip for the WERA 21 meeting next year. Maria Fernández-Giménez and Derek Bailey volunteered to help organize a fall 2008 meeting in Colorado. Dave Pyke agreed to coordinate a joint meeting in Colorado with WERA 21.

In the event that Colorado cannot host the 2008 WERA 40 meeting, Derek Bailey agreed to pursue Tucson, AZ as a location.

Elections. Pat Johnson made a motion to nominate Lance Vermeire as secretary for 2008. Barry Perryman seconded the motion.

Increasing WERA 40 participation. Tamzen Stringham suggested that participants personally invite people to attend future WERA 40 meetings. The committee also suggested sending the WERA 40 minutes to:

Jim Dobrowolski, USDA CSREES
Leonard Jolley, NRCS
Cindy McArthur, USFS
Linda Coates-Markel, BLM

Tamzen Stringham and other committee members will personally invite these individuals after the minutes have been sent.

Rangeland Health evaluation. The committee expressed concerns with how the Rangeland Health evaluation procedures are being implemented by some range technicians. The possibility of an SRM certification course or a 1-week course for undergraduates was discussed. The committee recommended that the language on the page 1 of the Technical Reference 1734-6 "Interpreting Indicators of Rangeland Health" be made stronger.

Rangeland PhD programs. The committee was concerned with the lack of PhD graduates with a rangeland focused study versus ecological focus study. More discussion on this topic is needed.

White Paper to SRM Advisory Council. In 2006, the WERA 40 committee proposed developing a white paper to influence funding from CSREES for ecological and threshold identification. To the 2007 meeting participants' best recollection, no white paper was prepared but there were discussions with the SRM Advisory Council regarding STMs. Follow up with Clayton Marlow to learn the status of the white paper.

International Rangeland and Grassland Congress. Maria Fernández-Giménez plans to attend the joint meeting of the International Rangeland and Grassland Congress in China in 2008. Although it is past the deadline date, she will try to take a poster on STMs to the meeting.

Potential 2010 Symposium. In 2006, the WERA 40 committee proposed symposium for 2010 focusing on the repair of damaged processes and the maintenance of functional processes. Discussions regarding this symposium were still positive.

Concerns with review and editorial process of Rangeland Ecology and Management. Several WERA participants were concerned with the timeliness and quality of scientific critique of manuscripts submitted to Rangeland Ecology and Management. Valid non-traditional, statistical approaches should be considered. Derek Bailey and Mike Smith are on the Associate Editor Board and will relay these concerns at the 2008 SRM meeting in Louisville.

Thanks to Jim Jacobs! The WERA 40 committee would like to express our gratitude to Jim Jacobs for serving as our Administrative Advisor.

Station Reports (full reports are attached)

University of Wyoming reported by Mike Smith. "Hard core range" faculty are growing old. Quinton Skinner may retire in March 2008. This is the last year that Dan Rogers will teach. Only a few range graduate students. Move to ecology faculty.

Washington State University reported by Linda Hardesty. A new president has been hired at Washington State University (WSU). The president made new requests for excellence in Animal Health with increased emphasis on competitive grants and classical animal science. There is no range program at WSU. A new riparian ecologist will be hired at WSU. Linda is conducting research on pygmy rabbit recovery, canary grass and cheatgrass.

South Dakota State University reported by Pat Johnson. There are three programs in Animal and Range. Four range faculty at SDSU. A new Dean has been hired. Facilities at Cottonwood and Antelope Research Stations will be improved with new 0.5 million appropriation to each station. There are 45 undergraduates and 5 MS students.

US Geological Survey reported by Dave Pyke. USGS rangeland activities include sagegrouse habitat and sagebrush ecosystem research. They are very concerned with transition of shrublands to annual grasslands (cheatgrass). They will be hiring a new range fire ecology position. A new interest is to identify the best approaches to monitor livestock impacts on BLM lands that will allow them to scale up from allotments to regions. See attached report.

New Mexico State University reported by Derek Bailey. Seven academic faculty plus 3 extension faculty. Undergraduate enrollment increasing due to recruitment efforts by Jerry Holechek. Virtually 100% employment for undergraduates in range. See attached report.

University of California, Davis reported by Mel George. Range faculty at UC Davis are limited with many involved in other projects. Fifteen farm advisors in range of which 3 have PhDs. Mel George is developing a long-distance grazing management class. UC Berkley is promoting working landscapes with grazing as a goal.

Oregon State University reported by Tamzen Stringham. OSU is in flux. Mike Borman is the interim department head. OSU will begin a new range department head search. John Buckhouse is not teaching now and may retire soon. There are 45 range undergraduates. Tamzen Stringham currently has most of the range graduate students (currently 8).

Colorado State University reported by Maria Fernández-Giménez. Range is a program within a department. CSU is searching for a new department head. There are 6-10 range faculty of which three are new. There are 22 range majors. See attached report.

University of Nevada, Reno reported by Barry Perryman. Two programs at UNR with range interests: Natural Resource and Ecology and Animal BioTechnology. Twelve to 15 range students in Animal Technology program. UNR is filling an endowed position in range.

SRM – AFGC Joint Meeting
Building Bridges: Grasslands to Rangelands

Symposium: State-and-Transition Models: Resilience, Triggers, Feedbacks and Thresholds

Date: Tuesday, January 29, 2008

Time: 8:30 – Noon and 1:30pm-5:00pm

Sponsored by: Western Education, Extension and Research Committee and the Natural Resource Conservation Service

Moderator: James P. Dobrowolski

8:30 to 9:00 Current Status of the State-and-Transition Framework: Dr. Tamzen Stringham

9:00 to 9:30 Variation in ecological resilience: a fundamental concept for rangeland ecology:
Dr. Brandon Bestelmeyer

9:30 to 10:00 Resilience-based Application of State-and-Transition Models: Dr. David Briske

10:00 to 10:30 Break

10:30 to 11:00 Soil Resilience and State-and-Transition Models: Dr. Jeff Herrick

11:00 to 11:30 Rangeland Health Indicators: Can they provide early warning signals? Dr. David Pyke

11:30 to Noon: Panel Question and Answer

Noon to 1:30 Break

Moderator: Barry Perryman

1:30 to 2:00 Resilience, triggers, feedbacks and thresholds: A western juniper model: Dr. Steve Petersen

2:00 to 2:30 Identification of ecological resilience within a winterfat plant community: Casey Matney

2:30 to 3:00 Vulnerability and triggers in regime shifts: a model from the Chihuahuan Desert:
Dr. Brandon Bestelmeyer

3:00 to 3:30 Break

3:30 to 4:00 Plant Community Dynamics in the Northern Great Plains - Recognizing the Impacts of Invasive Species: Jeff Printz (NRCS North Dakota State Rangeland Management Specialist) and Stan Boltz (NRCS South Dakota State Rangeland Management Specialist)

4:00 to 4:30 Resilience and feedbacks within a deep sand savanna ecological site: Pat Shaver NRCS

4:30 to 5:00 Panel Question and Answer

WERA 40
Report from Colorado State University
October 2007

Colorado Agricultural Experiment Station Projects in Rangeland Resources

NOTE: All of these projects are up for renewal in 2007 or 2008.

Project Title: Vegetation Change and Risk in Management of Rangeland Plants

PI: Dennis Child

Objectives: The three main objectives of this project are: 1) Determining the relationship of the endophytic fungi *Alternaria* sp. with swainsonine concentrations in *Oxytropis sericea*; 2) Determining the interaction of soil moisture and soil nitrogen levels with the relationship of the endophytic fungi *Alternaria* sp. with swainsonine concentrations in *Oxytropis sericea*; and 3) Identifying management strategies that can be used by Colorado rangeland users to minimize livestock losses to locoweed poisoning.

Project Title: Understanding, Evaluating and Enhancing Community-based Collaboratives and Participatory Research Processes on Colorado Rangelands

PI: Maria Fernandez-Gimenez

Objectives: 1) Increase understanding of community-based and collaborative management of Colorado rangelands; 2) Evaluate the social and environmental impacts of community-based collaboratives; 3) Document the local knowledge of resource users and investigate the roles that local knowledge, science and other forms of expertise play in natural resource management decisions; 4) Identify opportunities for participatory research with rangeland users, natural resource agencies and community-based collaboratives and forge participatory research partnerships with one or more groups; 5) Develop a framework and recommendations for enhanced communication and cooperation among researchers, agencies and resource users.

Project Title: Understanding Plant Invasion on Colorado Rangelands

PI: William Lauenroth

Objectives: 1) To understand how invasive plants disperse into Colorado rangelands. 2) To understand how propagule pressure, disturbance, and resource supply interact to control the spread of invasive plants in Colorado rangelands.

Project Title: Metal Toxicity Thresholds for Important Colorado Reclamation Plant Species

PI: Mark Paschke

Objectives: The proposed research will establish soil metal toxicity thresholds and uptake factors for plant species that are commonly used in reclamation activities in Colorado and other Western States. This information is currently not available and, as a result, ecological risk assessments must rely on toxicity thresholds established for agronomic species. These crop plants have very different physiological characteristics and sensitivity levels than native species used in the reclamation of sites contaminated with metals. As a result, risk assessors may classify sites as phytotoxic to native species and call for intensive remediation activities that may not be necessary. The objective of this work is to provide a better estimate of soil metal toxicity thresholds for four metals and a large number of native plant species (and a few commonly used introduced species). These threshold values would be used by those in the reclamation industry (government regulators and private entities) to more accurately assess risks associated with soil metal contamination, and to better match revegetation plant species to site conditions.

Project Title: Disturbance, Invasion, Restoration, and Rangeland Health

PI: Joe Trlica (resources currently shared by 2 new faculty members, Paul Meimen and Julia Klein)

Objectives: 1) Compare surficial hydrology, soil and vegetation characteristics of sagebrush, grassland, and montane riparian communities as related to rangeland health measures and invasion by undesirable species. 2) Determine if rangeland health indicators are correlated with water infiltration, runoff and erosion from uplands and riparian zones. 3) Quantify sediment and water yield from upland sagebrush and grassland communities with varying species composition, vegetation canopy cover, and microchannel networks with field experiments of rainfall simulations. 4) Determine abiotic and biotic site characteristics that favor invasion of sagebrush-grasslands in the Gunnison Basin by cheatgrass. 5) Determine if willow cuttings can be used effectively in riparian restoration as related to soil water dynamics, heavy metals, site amendments, and herbaceous species competition. 6) Determine how species rooting characteristics affect soil stability in riparian communities. 7) Develop techniques for restoration of degraded high elevation riparian zones. 8) Define Best Management Practices that provide for the optimum combination of overstory willow and herbaceous cover to maintain high rates of water infiltration, soil and streambank stability, and water quality and quantity.

Other Related Research

Project Title: Participatory Development of Ecological State-and-Transition Models: Integrating Scientific and Local Knowledge for Rangeland Sustainability (NRCS Conservation Incentive Grant)

PI: Maria Fernandez-Gimenez

Project Objectives: 1) Develop S-T models based on ecological field data and professional and local knowledge, using qualitative and quantitative analysis techniques. 2) Use a participatory stakeholder process to compare and evaluate the accuracy and utility of S-T models based on different knowledge sources and data analysis approaches, and to develop “best-fit” models that combine local knowledge and field data. 3) Promote adoption of S-T

models through a) direct stakeholder participation in workshops to develop and evaluation S-T models, b) partnerships with local and state-wide organizations to integrate S-T models into existing producer and manager workshops, short-courses, and publications, c) incorporation of S-T models into NRCS site descriptions, and d) publication of the S-T models and a handbook describing their development and use on the Colorado Rangelands and Rangelands West websites.

Project Title: Development of a Data-based Validation Network for State-and-Transition Models (CSREES)

Project Collaborator: Maria Fernandez-Gimenez (PIs David Briske and Ben Wu at Texas A&M)

Project Objectives: This project seeks to underpin the state-and-transition model framework, which represents the primary technology for rangeland assessment, with a network of long-term empirical data. Research objectives are to 1) explore new protocols to construct STMs that are based on empirical ecological data, 2) investigate the ecological validity of existing qualitative STMs by comparing them with data-based models, and 3) evaluate the decision rules and assumptions that various authors utilize to construct STMs.

State Report
2007

State: New Mexico

Faculty list: researchers, extension, ARS with e-mail and/or phone numbers

	Phone	E-mail / fax
Dept. Animal & Range Sciences	(505) 646-2514	(505) 646-5441
Laurie Abbott	646-2870	labbot@nmsu.edu
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Extension

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USDA-ARS Jornada Experimental Range

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Deb Peters	debpeter@nmsu.edu

Current research projects and investigators:

NMSU Department of Animal and Range Sciences

Laurie Abbott Disturbance effects on vegetation and soil dynamics on New Mexico rangelands: Implications for restoration and management.

African rue reproductive ecology.

	Desert grassland dynamics: Are herbivorous rodents ecosystem engineers? Gary Roemer, Ed Fredrickson, and Laurie Abbott
Kelly Allred	Systematic and floristic studies of southwestern plants.
Derek Bailey	Management of cattle behavior to achieve specific goals: use of adapted animals and prescribed grazing. Development of novel approaches to minimize encroachment of invasive shrubs in the Chihuahuan Desert using biological control.
Andres Cibils	Management of one-seed juniper using sheep and goats as biological control agents. Behavioral approaches to manage cattle in rangelands containing locoweed.
Sam Fernald	Land use effects on runoff and water quality on upland watersheds and along stream corridors. Flow measurement for improved acequia water management. Vegetation treatment effects on forest runoff and sediment yield Time domain reflectory monitoring to runoff, erosion and sediment transport in Pinon-Juniper Woodland Watersheds
Jerry Holechek	Effect of two stocking levels on cattle production, forage production and financial returns in the Chihuahuan Desert.
Kirk McDaniel	Integrated weed management for New Mexico rangelands Locoweed and Broom snakeweed management: Integrated management, ecology and toxicology studies Saltcedar control with a carpet roller Evaluation of mesquite control projects in southern New Mexico Salt cedar control and riparian management in the Bosque del Apache National Wildlife Refuge.

USDA-ARS Jornada Experimental Range <http://usda-ars.nmsu.edu/>

These recent publications summarize a great deal of the Chihuahuan Desert research:

Havstad, K.M., L.F. Huenneke, and W.H. Schlesinger (Eds.) 2006. Structure and Function of a Chihuahuan Desert Ecosystem. Oxford Univ. Press. New York, 465 p.

Journal of Arid Environments. 2006. Landscape Linkages and Cross Scale Interactions in Arid and Semiarid Ecosystems. Special issue Volume 65 Issue 2, April 2006.

Recent graduate theses:

Boykin, K. 2006. Multiscale evaluation of habitat, vegetation change, and streamflow as ecological factors affecting population dynamics of *Rana chiricahuensis*. NMSU PhD Thesis.

Combs, N. 2007. Evaluation of triclopyr/clopyralid application to mesquite on various ecological sites in eastern New Mexico. NMSU MS Thesis.

Fink, R. W. 2007. A floristic inventory of Salinas Peak, White Sands Missile Range. NMSU MS Thesis.

Franco, J. G. 2007. Management of saltcedar regrowth with carpet-roller applied herbicide. NMSU MS Thesis.

Gallegos, J. A. 2007. Evaluation of litter hydrology in ponderosa pine and mixed conifer stands in northern New Mexico. NMSU MS Thesis.

Helmus, A. 2006. Effects of shallow groundwater quality of surface water inputs from irrigation and river seepage along the Rio Grande in northern New Mexico. NMSU MS Thesis.

Jackson, K. T. 2006. Social facilitation of white locoweed ingestion by cattle: Influence of alternative food choices and feeding site related factors. NMSU MS Thesis.

Khumalo, G. Z. 2006. Long-term vegetation trends and productivity under conservative and light grazing on Chihuahuan Desert rangelands: Application to Swaziland beef cattle production. NMSU Ph.D. Thesis.

Mason, G. J. 2006. Crown fire potential and vegetative response under different frequencies and intensities of silvicultural treatment in mixed conifer stands in the Lincoln National Forest, New Mexico. NMSU MS Thesis.

Recent NMSU Department of Animal & Range Science scientific journal publications:

- Abbott, L. B., D. Lepak, and D. L. Daniel. 2007. Vegetative and reproductive phenology of African rue (*Peganum harmala*) in the northern Chihuahuan Desert. *Southwestern Naturalist* 52:209-218.
- Abbott, L. B. and T. M. Sterling. 2006. African rue (*Peganum harmala*) seedling response to herbicides applied under water-deficit stress. *Weed Science* 54:198-204.
- Bailey, D.W. and G.R. Welling. 2007. Evaluation of low-moisture blocks and conventional dry mixes for supplementing minerals to beef cows. *Rangeland Ecology and Management* 60:54-64.
- Black-Rubio, C., A. Cibils, and W. Gould. 2007. Maternal influence on feeding site avoidance behavior of lambs. *Applied Animal Behavior Science* 105:122-139.
- Fernald, A. G. and S. J. Guldan. 2006. Surface water-groundwater interactions between irrigation ditches, alluvial aquifers, and streams. *Reviews in Fisheries Science* 14: 79-89
- Fernald, A. G., D. H. Landers, and P. J. Wigington. 2006. Water quality changes in hyporheic flow paths between a large gravel bed river and off-channel alcoves in Oregon, USA. *River Research and Applications* 22: 1111-1124.
- Khumalo, G., J. L. Holechek, M. Thomas, M., and F. Molinar. 2007. Long-term vegetation productivity and trend under two stocking levels on Chihuahuan Desert Rangeland. *Rangeland Ecology Management* 60:165-171.
- Madrid, A., A. G. Fernald, T. T. Baker, and D. M. VanLeeuwen. 2006. Evaluation of silvicultural treatment effects on infiltration, runoff, sediment yield, and soil moisture in a mixed conifer New Mexico forest. *Journal of Soil and Water Conservation* 61:159-168.
- Ochoa, C. G., A. G. Fernald, S. J. Guldan, and M. K. Shukla. 2007. Deep percolation and its effects on shallow groundwater level rise following flood irrigation. *Transactions of the Asabe* 50: 73-81
- Thomas, M. J. Hawkes, G. Khumalo, and J. L. Holechek. 2007. Brangus cow-calf performance under two stocking levels on Chihuahuan Desert Rangeland. *Rangeland Ecology Management* 60:110-114.
- Utsumi, S. A., A. F. Cibils, R. E. Estell, and Y. F. Wang. 2006. Influence of plant material handling protocols on terpenoid profiles of one-seed juniper saplings. *Rangeland Ecology and Management* 59:668-673.

Recent NMSU Department of Animal & Range Science book chapters:

McDaniel, K., T. Sterling, and S. Ivey. 2007. Herbicidal control of locoweed, In: Poisonous Plants: Global Research and Solutions (K. E. Panter, T. L. Wierenga, and J. A. Pfister, eds.). CABI Publishing, Wallingford, Oxon, UK.

Recent NMSU Department of Animal & Range Science reviewed publications:

Beck, R., R. McNeely, M. Thomas, and C. Bailey. 2007. Seasonal and yearlong grazing in the Northern Chihuahuan Desert: Impacts of forage and cow-calf production," NMSU Agricultural Research Bulletin 793.

George, M., D. Bailey, M. Borman, D. Ganskopp, G. Surber, and N. Harris. 2007. Factors and Practices that Influence Livestock Distribution. University of California ANR Rangeland Management Series Pub. 8217, 20 p. Available at <http://anrcatalog.ucdavis.edu/pdf/8217.pdf> (accessed 31 January 2007).

Holechek, J.L. 2006. Recruiting thoughts and experiences. Rangelands 28(4):21-22.

Holechek, J.L. 2006. Changing western landscapes, debt, and oil: A perspective. Rangelands 28(4):28-32.

Tanaka, J. A., N. R. Rimbey, L. A. Torell, D. Taylor, D. Bailey, T. DelCurto, K. Walburger, and B. Welling. 2007. Grazing distribution: The quest for the silver bullet. Rangelands 29(4):38-46.

Wyman, S., D.W. Bailey, M. Borman, S. Cote, J. Eisner, B. Leinard, S. Leonard, F. Reed, S. Swanson, L. Van Riper, T. Westfall, R. Wiley, and A. Winward. 2006. Riparian area management: Grazing management processes and strategies for riparian-wetland areas. Technical Reference TR 1737-20. BLM/ST/ST-06/002+1737. U.S. Department of Interior, Bureau of Land Management, National Science and Technology Center, Denver, CO. 105 p.

CURRENT RESEARCH OF RESIDENT FACULTY

DR. MIKE BORMAN: Interim Dept. Head (Range Ecology and Restoration)

Goat grazing as a tool for controlling Himalayan blackberry.
Ongoing.

DR. JOHN BUCKHOUSE (Watershed and Riparian Management)

Twin Watershed Response to Juniper Overstory Reduction.
Ongoing.

DR. DOUGLAS JOHNSON (Landscape Ecology and Range Restoration)

Ecology and restoration of southwestern Oregon foothill rangelands.
Ongoing.
Interactions between elk and cattle.
Ongoing.

DR. WILLIAM KRUEGER (Plant/Animal Relations and Riparian Ecology)

State-and-transition modeling: nutrient changes within dry forest systems with canopy closure.
Complete 10/07

DR. TAMZEN STRINGHAM (Rangeland & Riparian Ecology)

Research Projects with Graduate Students

1. Pat Shaver PhD candidate

Soil Moisture and Vegetation Responses to Juniper Removal on Sandy Soils in Central New Mexico

This project focuses on the long-term (20+ years) effects of soil moisture and vegetation response to the removal of One-seed juniper through herbicide application. Data will be used to increase our understanding of the impact of juniper on ecosystem processes and to further our ability to predict response to encroachment and/or treatment of juniper. State-and-transition models will be developed as a method for describing ecosystem change to land managers. Ongoing.

2. Casey Matney PhD candidate

Rehabilitation of winterfat rangelands: understanding the role of soil change

Dynamic soil properties are elements of the soil ecosystem that change with management and/or natural disturbance. Understanding the relationship between changes in soil structure and water capture and infiltration will further our knowledge concerning winterfat viability and seedling establishment. Ongoing.

3. Mark Estes M.S. student

Nutritional value of native forages and restoration of a northern Great Basin valley using winterfat (*Eurotia lanata*) and squirreltail (*Sitanion hystrix*).

Winterfat and squirreltail were broadcast seeded into four different seedbed preparations to determine if seedbed preparation increased the likelihood of seedling establishment and survival. The most successful seedbed preparation method for winterfat was the till treatment whereas squirreltail showed no preference between seedbeds. Ongoing.

4. Sarah Quistberg M.S. student

Riparian revegetation techniques for a reconstructed meadow channel

Two native sedge species *Carex nebrascensis* (Nebraska sedge) and *Carex utriculata* (beaked sedge) were planted as plugs into two geomorphic surfaces (depositional and erosional) within a reconstructed channel in northeast Oregon. In addition, within the erosional surface subplots with and without Canadian thistle were planted to determine the impact of this weed on sedge plug survival. Ongoing. Defense November 16, 2007.

5. Erica Ersch M.S. student

Using livestock as a tool to manipulate plant community composition and structure to enhance habitat for important sage grouse chick food: insects and moths.

Four allotments, two winter grazed and two spring grazed, within the same ecological site were measured for vegetation composition and structure in 2007. In addition, blacklight trapping of moths and pitfall trapping of insects was completed for April through September 2007. The relationship between grazing methodologies, plant community attributes and insect and moth abundance is being analyzed.

6. Ryan Leary M.S. student

Winterfat biomass production and seed viability with and without five years of rest from winter grazing.

Twenty one-half hectare exclosures were installed within three different winter grazed pastures in the Catlow Basin of southeastern Oregon in 2001. The viability and reproductive capabilities

of winterfat, the dominant shrub within this ecosystem, is being compared between exclosures and grazed paired plots to determine whether or not five years of rest has been beneficial or not. Ongoing.

7. Jennifer Wiseman M.S. student

Riparian capability vs. potential: NE Oregon mountain streams.

Channel morphological attributes, vegetation, hydrologic regime, floodprone area, channel material, and anthropogenic constraints were measured on three Rosgen C type channels in 2006 and 2007. The concepts of potential vs. capability and the ecological stability of the three channels is under investigation. Ongoing.

8. Candy Mollanu M.Ag. student

Water cycle within a Western juniper encroached rangeland.

Thirty, 70 to 90 year old Western juniper trees, located within a rangeland drainage have been instrumented for sap flow measurement. Trees were stratified by distance from channel in the upslope direction. Soil moisture measurements, sap flow measurement and additional environmental variables are being measured for determination of total water use by juniper by location within this drainage. Ongoing.

EASTERN OREGON STATE UNIVERSITY FACULTY

DR. LARRY LARSON (Weed Ecology)

Eastern Oregon rangeland research on the knapweed complex, perennial pepperweed, whitetop, and sulfur cinquefoil. Ongoing.

DR. MICHAEL MCINNIS

Restoration and maintenance of native plant diversity on deteriorated rangelands of the Great Basin and Columbia Plateau in a changing climate. Ongoing.

Invasive Plants Program for the Blue Mountain Demonstration Area (USDA Forest Service PNW Station)

EXTENSION SERVICE & COURTESY FACULTY

DR. PATRICIA DYSART

Development of bioherbicides to combat invasive weeds on western rangelands. Ongoing.

TIMOTHY DEBOODT

Camp Creek Paired Watershed Study. Understanding the water relationships associated with juniper removal. After collecting 12 years of pre-treatment data, juniper in Mays Watershed was cut in fall of 2005 and spring of 2006. Post-treatment monitoring includes looking at responses in spring flow, soil moisture, depth to ground water and channel flow. Cooperative project with Dr.'s Buckhouse and Fisher. Ongoing.

AMY PETERS

Rust invasion of Himalayan blackberries in coastal Oregon. Potential for control of blackberry spread. Research is focused on determining extent of rust invasion, host specificity, and potential for use as a control on Himalayan blackberries.

WERA 40

2007

U.S. Geological Survey
Forest & Rangeland Ecosystem Science Center
Annual Report

Research Scientists in conducting rangeland-related research:

Dr. David A. Pyke – Rangeland Restoration and Monitoring

Title:

Coordinated Intermountain Restoration Project

Objectives:

The Coordinated Intermountain Research Project (CIRP) evolved from the Intermountain Greenstripping and Rehabilitation Research Project (IGRRP), which was established by the Idaho State Office, Bureau of Land Management, in 1982, to select plant materials and technologies to reduce wildfire incidence and improve rehabilitation practices. Research and technical assistance associated with CIRP will emphasize the restoration of native species on rangelands that are infested with exotic annual grasses or other invasive or noxious weeds. To accomplish this objective, the project will promote the understanding of disturbance dynamics along with selecting plant materials, site preparation techniques, weed control methods, seeding equipment, management methods, and monitoring techniques for restoration projects. CIRP will not address the restoration of forested or woodland (juniper) ecosystems. It will include a component on fuels management to reduce the impacts of wildfires on semi-arid rangeland ecosystems where exotic annual grasses provide the fuel. The people who will benefit directly from this research include land managers and users of public and private lands in the northern Great Basin, the Columbia Plateau, and the Snake River Plain. CIRP will provide an integration framework for a multi-disciplinary approach to research with numerous opportunities for input and collaboration.

Title:

Standardized Emergency Stabilization and Rehabilitation Monitoring Protocols (ES&R)

Web Site: <http://fresc.usgs.gov/research/esrmonitoring>

Objectives:

Need: Land management agencies with the USDA and USDol recognize the need for a common monitoring protocol within and among agencies. A standardized monitoring protocol would

allow for:

- Evaluations of the effectiveness of various rehabilitation treatments within ecoregions.
- The creation of a standard database for data storage and retrieval.
- Querying the database for information.
- Regular reports could be constructed regionally and by agency on the use and effectiveness of various ESR techniques.

Title:

Regional Experiment to Evaluate Effects of Fire and Fire-surrogate Treatments in the Sagebrush Biome (JFS)

Objectives:

The goal of this research project is to provide information to managers that will allow them to better predict the extent to which their treatments will result in sagebrush steppe systems that are more resilient to wildfire, and to help them evaluate different treatment options using both ecological and socio-economic criteria. The research design is built around the concept of a 'state-and-transition' model that can be used to predict the types and probabilities of transitions from one state to another. Historically, sagebrush steppe ecosystems within the Great Basin naturally shift from communities with sagebrush as dominant to those with perennial bunchgrasses as dominant. In drier areas, cheatgrass invasion into the sagebrush understory has set up the potential for much more frequent fires, which can eventually eliminate the sagebrush entirely and lead to a community dominated by perennial weeds. For the sagebrush/cheatgrass system, our objectives are focused on the Exotic Grass State, and address the question of how much representation of perennial bunchgrasses there needs to be in order for managers to recover the system without having to conduct expensive restoration (i.e. reseeding of native grasses). Our research will provide much better information on the probabilities of transition from one state to another, when a variety of treatments are applied under a wide range of conditions.

The objectives listed below reflect a research program that is aimed at defining critical ecological thresholds, through the application of alternative treatments over a wide array of conditions:

- (1) Identify the abiotic and biotic thresholds that determine sustainability of big sagebrush plant communities in sagebrush-steppe, specifically related to threats posed by cheatgrass invasion.
- (2) Assess the ecological effects of fire and fire surrogates on big sagebrush communities at risk of crossing a threshold of conversion to cheatgrass, beyond which restoration may be difficult or logistically infeasible.
- (3) Document how fuel loads change across vegetation treatments and ecological conditions in relation to the objectives above.
- (4) Portray the ecological trade-offs and treatment effects of no action, applying only fire and fire surrogate treatments, and restoration treatments in these sagebrush communities.
- (5) Identify and measure environmental benefits affected by conversion to cheatgrass.
- (6) Provide insight and guidance regarding use of our results for effective multi-species and

multi-scale planning as part of ecosystem management of sagebrush communities in the Great Basin.

This research is designed to complement related work on assessment and restoration within the Great Basin. Restoration efforts include the Great Basin Restoration Initiative (USDI BLM 1999; led by team member Mike Pellant), the USGS Coordinated Intermountain Restoration Project (David Pyke), and the IFAFS Project (led by team members Paul Doescher, Jeanne Chambers, David Pyke, and Eugene Schupp). Our research is designed to be used to support land use plan revisions underway by the BLM and the Forest Service in the Great Basin, and results will be available for use by these and other federal and state agencies engaged in the recovery and restoration of sagebrush communities across interior North America.

Dr. Michael Adams – Livestock grazing and Amphibian Populations

Title:

Effects of Cattle Grazing and Related Habitat Alteration on Columbia Spotted Frog Population in Oregon: Post-treatment Funding

Objectives:

Test the hypothesis that full and partial livestock grazing exclosures provide similar protection of Columbia spotted frog populations in the Wallowa Mountains of northeastern Oregon. Will compare breeding habitat, larval survivorship, water quality, and potential pathogens and endocrine disruptors among fully grazed, fully exclosed, and partially exclosed ponds

Locations:

Oregon

Dr. David Pilliod – Landscape Ecology and Landscape Monitoring

Title:

Land treatments across the sagebrush biome

Objectives:

Land treatments including habitat restoration and rangeland improvement projects have been applied by the BLM lands for years. This project is attempting to create a spatial databases for these past and future projects.

Dr. Steven Knick – Landscape Ecology and Sagebrush-obligate wildlife populations

Title:

Fragmentation of Shrubsteppe Habitats and Breeding Passerine Birds

Objectives:

The effect of habitat fragmentation on biological diversity is an important consideration in the conservation of the Earth's resources because of detrimental effects on biodiversity and individual species' distribution and abundance. From previous work in 1991-1996, we demonstrated the influence of fragmentation of shrubsteppe habitats on the spatial and temporal distribution of passerine birds that breed in the Snake River Birds of Prey National Conservation Area (NCA). Interaction of landscape characteristics and processes of bird population dynamics have been difficult to study because of the inability to quantify attributes such as patch size and habitat evenness at large spatial scales more suited to management strategies. In this study, we examine habitats at both local and landscape scales to draw conclusions on structure of avian communities and species distribution and productivity. The results are relevant to concurrent investigations that assess the impact of short-term influences on biological diversity relative to long-term changes predicted with global climate change.

Locations:

Idaho

Title:

Ecoregional Analysis of Sagebrush Ecosystems of the Wyoming Basins and Colorado Plateau.

Objectives:

The purpose of this project is to 1) provide data layers appropriate for use in preparing ecoregional assessments; 2) identify primary land uses and changes, potential impacts to sagebrush habitats and associated wildlife, and species of concern that use sagebrush during some part of their life-cycle, 3) model potential impacts on sagebrush habitat and associated wildlife species, and 4) conduct extensive field sampling to test wildlife occupancy models.

PROGRAM: Wildlife and Terrestrial Resources

5-YEAR GOAL: Develop tools such as predictive models, decision support, and expert systems for science-based management of wildlife and plant populations and their habitats.

Title:

Regional Experiment to Evaluate Effects of Fire and Fire-Surrogate Treatments in the Sagebrush Biome: Bird Community Changes (JFS)

Objectives:

The goal of this research project is to provide information to managers that will allow them to better predict the extent to which treatments in sagebrush steppe systems influence bird

community structure and dynamics. The research design is built around the concept of a 'state-and-transition' model for vegetation communities that can be used to predict the types and probabilities of transitions from one state to another. In more mesic areas, tree encroachment due to years of fire suppression can result in a tree-dominated system in which sagebrush and the perennial bunchgrass understory is also eliminated. Continued dominance by trees can lead to a highly eroded state that features a variety of weedy species (Eroded State). For bird communities, the changes in habitat composition and structure as a result of treatments may cross a threshold in determining source and sink dynamics of species dependent on these habitats. We will address the following questions:

1. What are the dominant habitat characteristics that determine response in the bird community? What spatial and temporal scales are the primary drivers of change in birds populations?
2. What are the primary mechanisms by which the bird community responds to changes in quantity, composition, and configuration of their habitat? Does individual or area/specific productivity of birds change relative to habitat treatments?

The relationship between habitat changes that result from management actions using fire and fire surrogates and the response of the bird community forms the overarching question that we will address in this study. Birds respond to habitat features at multiple scales (Rotenberry and Knick 1999, Vander Haegen et al. 2000). In addition, response by bird species to habitat changes often lags the habitat change (Wiens and Rotenberry 1985, Wiens 1989). Therefore, we will address the hierarchical relationships between the spatial and temporal structure of habitats and bird communities.

Publications:

Beever, E.A., Huso, M., Pyke, D.A., 2006, Multiscale responses of soil stability and invasive plants to removal of non-native grazers from an arid conservation reserve: Diversity and Distributions, v. 12, no. 3, p. 258-268.

Katzner, T., Bragin, E., Knick, S.T., Smith, A.T., 2006, Spatial structure in the diet in imperial eagles (*Aquila heliaca*) in Kazakhstan: Journal of Avian Biology, v. 37, no. 6, p. 594-600.

Rotenberry, J.T., Preston, K.L., Knick, S.T., 2006, GIS-based niche modeling for mapping species' habitats: Ecology, v. 87, no. 6, p. 1458-1464.

Wirth, T.A., Pyke, D.A., 2007, Monitoring Post-fire Vegetation Rehabilitation Projects- A Common Approach for Non-forested Ecosystems (ES&R): U.S. Geological Survey Scientific Investigations Report 2006-5048, p. 36.