

**WERA 40, Annual Meeting 2006**  
**Billings, MT**  
**November 10-11, 2006**  
**Western Education/Extension Research Activities**

Meeting opened at 8:00 am by Barry Perryman

ATTENDEE LIST

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Tamzen Stringham	OSU	<a href="mailto:tamzen.stringham@oregonstate.edu">tamzen.stringham@oregonstate.edu</a>	541-737-0923

Old Business

Barry Perryman provided copies of the minutes from the 2005 meeting held in Las Cruces, NM. Minutes were read and Clayton Marlow moved and Pat Johnson seconded acceptance of the 2005 minutes. Accepted as written.

Jim Jacobs – has agreed to serve as administrative contact for this year  
Provide list of attendees and attendances plus reports to Jim Jacobs ([jjj@uwyo.edu](mailto:jjj@uwyo.edu) or 307-766-3598).

Barry Perryman attempted to arrange a joint meeting with WCC 55, however their charter was not renewed; therefore no joint meeting.

## New Business

### Elections

The first order of business was to elect a new secretary and discuss potential locations for the 2007 meeting. Derek Bailey from New Mexico State was elected secretary for 2007.

### 2007 Meeting Location

Discussions concerning the location of the 2007 meeting focused on trying to increase participation from the following states: California, Arizona, Texas, Nebraska, Oklahoma, and Kansas.

Tamzen Stringham agreed to make contact with Mel George at UC-Davis in California to determine interest in hosting the 2007 meeting. Participants showed interest in touring the California annual grasslands to learn about their ecology and the application of state-and-transition models within that ecosystem.

In the event that California is not able to host the 2007 meeting Derek Bailey agreed to pursue a location in Arizona. If all else fails Tamzen Stringham will find a location in central Oregon possibly Redmond.

Time Preference: September or early October 2007

### Charter

Clayton Marlow, Barry Perryman, Mike Smith, Steve Bunting, Bruce Jones, and Tamzen Stringham, with input from other members of the WERA-40 committee, developed a new project proposal that was approved. The primary outreach goal of the new WERA committee is broad dissemination of new advances in rangeland assessment to policy makers, land managers, and the scientific community.

Title: Application and Utility of the *Ecological Site and Condition Concept* for Monitoring Rangeland Ecological Status in the Western U.S.

Specific goals outlined in the new proposal:

1. Provide a discussion platform for university and Federal scientists working on ecological thresholds, biodiversity and formative processes in arid ecosystems;
2. Review draft reports and technical bulletins for regional applicability;
3. Organize and present at least one National level workshop on emerging ecological threshold and ecological site descriptors and
4. Publish two or more proceedings from the workshop(s).

## Outcomes-to-Date

1. Dr. Tamzen Stringham of Oregon State University, Department of Rangeland Ecology and Management in cooperation with USDA-Natural Resources Conservation Service hosted a national level State and Transition Ecological Theory Workshop in Corvallis, OR, on August 29–30, 2006. Presentations by Drs. Briske, Bestelmeyer, Fuhlendorf, Herrick, and Stringham along with Mr. Pat Shaver can be found at the following web site. <http://oregonstate.edu/dept/range/events/archivedevents/StateAndTransitionMonitoringPage.php>

In addition, a working group consisting of Drs. Briske, Bestelmeyer, and Stringham was formed to produce a journal article updating concepts of State and Transition Modeling (STM) for publication in the J. of Rangeland Ecology and Management. Submission date is projected to be April 2007.

2. Maria E. Fernandez-Gimenez, Asst. Professor at Colorado State is currently working on assessing landowner's perspectives of STM concepts and understanding.

3. Tamzen Stringham, Assoc. Professor at Oregon State University is currently working with NRCS on development of STM for Oregon rangelands to be used in planning with range managers. Project completion: January 15, 2007.

## 2007 Outcomes and Responsibilities

Responsibilities: (Jim Jacobs)

### 1. Outcomes:

- a. Produce a white paper to the SRM Advisory Council to influence funding from CSREES for ecological transition and threshold identification. NRI funding is November (talk to John Buckhouse about who to contact). The National Association of State Universities and Land-Grant Colleges (NASULGC) meeting is in November. Need to have white paper to SRM (Owensby out of Kansas and Whisenant out of A&M are SRM representatives to Land-Grant Universities). Tamzen Stringham will take lead on getting the white paper together after the Briske, Stringham, Bestelmeyer paper is in draft form. Will work with Don, Pat, Clayton, and Paul, possibly Barry on the paper.
- b. Resolution asking the Board and President to pursue this line of funding. Has to come from a section. Wyoming and Colorado will hold their section meetings in December and will get approval from the section – the section officers have to introduce it. Clayton and Pat will draft the resolution and ship to Paul Meiman and Mike Smith to present to their section meetings. Also should present this resolution to the RAM committee.
- c. SRM symposium/proceeding to discuss difficulties on identifying ecological transitions and thresholds within different biomes and how the general model is working or not. Focus on triggers and feedbacks. SRM 2008. Whole day: presentations in morning with panel discussions in the afternoon Check SRM web page – call for 2008 symposiums. 2010 symposium focusing on the repair of damaged processes and the maintenance of functional processes.

- d. Barry Perryman plans on attending the joint meeting of the International Rangeland and Grassland Congress in China in 2008. He has offered to take a poster on the STM topic.

#### Other Discussion Topics

1. Need to get more of the land-grant universities participating in WERA-40, along with agency folks: NRCS, BLM, USFS. Might be worth extending invitation to the tribal colleges and 1890s (historically black colleges). Need list of official representatives to the WERA-40. Check web page. Barry will help Tamzen with this effort.
2. Curriculum also a topic: concepts that could be shared through Rangeland WEST that instructors could download for ideas. Contact person for Rangeland WEST? Possibly George Ruyle or... Clayton Marlow will ask if Karen Launchbaugh had visited with the committee in 2005 concerning Rangeland WEST. Rangeland West is supposed to be the clearinghouse for range ecology and management information. ARS stations should be linked as should be university range programs.

#### Experiment Station and Agency Summary Reports (full reports attached)

##### University of Wyoming, Renewable Resources report by Mike Smith

7 range faculty, 6 soils, 3 entomologists, 1 landscape ecologist, etc. total of 20 faculty

Hiring a wildlife habitat position plus a Range Extension Specialist.

Outside dollars: range perspective – faculty is aging and pretty soon will need 4 new faculty. Range Undergraduate program has 150 students. Approximately 50 graduate students. May have passed Texas A&M in student numbers. Have an introductory course being taught in five community colleges around the state.

##### South Dakota State University – Pat Johnson

Animal and Range Sciences Dept.

New Experiment Station director has the mission of reducing salary from Hatch dollars. This puts SDSU in a difficult position. Cuts are occurring in support staff. Soft dollars will need to be put into faculty and staff salary support.

Range Faculty: five faculty – no cuts in the foreseeable future

Undergraduates in Range = 40

Graduates = 5; graduate degrees awarded thru Animal Science or Biological Sciences

Weeds an accelerating problem on South Dakota Rangelands.

##### Montana State University – Clayton Marlow

MSU Tier 1 Research Institution 2006

Focus on applied research is decreasing. All vacant positions reverting to the Provost's office. Soils pedologist being replaced by geo-statistician.

Degree Title: Natural Resources and Rangeland Ecology

Two Options: Rangeland Ecology and Wildlife Habitat Improvement

M.S. is offered in Animal and Range Sciences

ARS Miles City – Lance Vermeire

Five year action plan at the National level

Individual units are now writing their specific goals to meet the National plan

Ft. Keogh – 10 scientists; one currently being advertised for a plant physiologist

Will send report.

University Nevada Reno – Barry Perryman

NRCS has established a Plant Material Center in Fallon

Natural Resource and Environment Science Program: Range & Forestry degree = 5 students

Dept. of Animal Biotechnology

Degree: Range Livestock and Management = 15 students; curriculum meets CPRM and 454 series requirements;

Endowed position will be hired next year – July 1, 2007 advertising for an Associate/Full Professor for a Range Scientist

North Dakota – Don Kirby

Animal and Range Sciences

415 students, 45 grad students; 37% of students in the College; added Equine Program;

Natural Resource Management: 78 students every one in the Biotic Option meets the 454 series.

Twenty nine faculty (5 range faculty)

Range Science: B.S., M.S. Ph.D.

Range and Natural Resource Mgt. moving out of Animal Science to Soils Dept. in order to try and bolster the Soils Dept. Soils has 9 students therefore Range can save them?

Range will be moved to the School of Natural Resource Sciences and there is concern about state support – afraid the livestock industry will only stay with Animal Sciences

Number one resource issues: Hatch funds spent on salaries, no flexibility. Pocketbook is bare. Soft money salaries.

Colorado State University – Paul Meiman

Dept. of Forest, Rangeland and Watershed Stewardship

30 Faculty; 3 program leaders; Dept. Head Tom Hobbs; approximately 10 Range Faculty, however not 10 traditionally trained Range scientists;

Range degree undergraduates approximately 30 plus graduate students. B.S., M.S., PhD degrees offered; M.S. degree for professionals; coursework with project.

Natural Resource Management degree: Paul expressed concern with this program which has approximately 120 students. If focus on this NRM degree will we lose the Range, Forestry, and Watershed degrees?

Curriculum review underway

50% of Hatch funds go to salaries, chunk to GRA and some to staff.

New Mexico State University – Derek Bailey

Dept. of Animal and Range Science

B.S. Range Science

Number of incoming freshman increasing: approximately 45

Actively recruiting

Oregon State University – Tamzen Stringham

Dept. of Rangeland Ecology and Management

B.S., M.S. and PhD degrees

Two campuses: OSU Corvallis and OSU La Grande

OSU Corvallis: 26 undergraduates, 13 M.S. and 6 PhD students

OSU La Grande: 45 undergraduates

Undergraduate program is growing and jobs are plentiful. Graduate program numbers are down primarily due to the age structure of the faculty. Anticipate 3 retirements within the next 18 months. Currently hiring new department head and filling an open Assistant Professor position.

**November 11, 2006**

**Field Trip**

Clayton Marlow of Montana State University arranged a field trip to the Pryor Mountain Wild Horse Management Area with the goal of utilizing the combined skills of the scientists present to conduct numerous rangeland health assessments using the Interpreting Indicators of Rangeland Health, Version 4 guide developed by the Bureau of Land Management, Natural Resource Conservation Service, U.S. Geological Survey, and the Agricultural Research Service, Jornada Experimental Range. Three locations were assessed using the methodology and discussion centered on the positives and the negatives of the assessment method. Positives: provides a list of rangeland ecology questions that focuses group discussion and promotes group interaction; teaches users to observe features (soil, plants etc) that are relevant to range health. Negatives: must be used by trained professionals in a group setting within an area they are familiar with; reference sheets are not yet well defined or tested; must understand ecological site concepts and have ecological site information for the area you are attempting to assess; may be inappropriately used for monitoring.

The group decided to ask the authors of the method to add language to the document outlining the training requirements and knowledge level of individuals assigned to teams doing rangeland health assessments and to outline specifically the methodology that is to be followed in the assessments. Tamzen Stringham has contacted Pat Shaver of the NRCS with a verbal request to insert such language. Pat Shaver has agreed to take the request forward to all agencies involved once WERA-40 committee has drafted the language. Derek Bailey of New Mexico State is responsible for drafting the language.

**Fort Keogh Livestock & Range Research Laboratory – ARS  
2006 WERA-40 Report**

**Rangeland Research Personnel: 5.4 SY**

Rod Heitschmidt – Research Leader and Supervisory Range Scientist  
Elaine Grings – Range Animal Nutritionist  
Lance Vermeire - Ecologist  
Richard Waterman – Range Animal Nutritionist  
Matt Rinella – Weed Ecologist  
vice-Haferkamp

**Areas of Focus**

Rod Heitschmidt – Drought management and rangeland response to seasonal precipitation.  
Elaine Grings – Predicting nutrient intake and diet selection processes.  
Lance Vermeire – Fire-grazing-drought interactions and proactive management solutions.  
Richard Waterman – Ruminant microbe response to invasive weed consumption by livestock.  
Matt Rinella – Interactions among invasive weeds, environment, and native plant communities.

**2006 Accomplishments**

**Drought Risk Assessment**

Drought is an inherent factor in the northern plains and creates substantial risks for rangeland management and livestock production. Drought management decisions are often delayed with the hope that summer rains may compensate for spring forage losses. Large amounts of summer rain can increase forage, but increases were insufficient to offset more than 50% of reductions caused by spring drought and the probability of receiving the 6 inches of water applied in July and August is less than 1%. Results allow rangeland managers to make timely drought management decisions to reduce risks for livestock enterprises and rangeland resources. Research was published in *Rangeland Ecology & Management*.

**Modeling Weed Dynamics**

Identifying optimal rangeland weed management strategies requires predicting how candidate strategies will affect the production of weeds and livestock forage. We used data from field experiments to develop a model that predicts weed and forage responses to management actions. Model accuracy was tested by comparing model predictions to data from published studies. The model fairly accurately predicted

published weed and forage data. Therefore, we concluded the model could improve decision-making with respect to rangeland weeds. Research was published in *Weed Science*.

### **Summer Fire**

Historically, wildfires were common during summer but their potential role as a management tool is not well understood because of the perceived dangers associated with summer wildfires. To this end, we have been studying the effects of summer fire on Northern Great Plains rangelands, and to date our data shows that prescribed summer fires can be used to reduce abundance of sagebrush, prickly pear, and annual brome without causing undue harm to the dominant perennial grasses. Moreover, results show that grazing at up to 50% utilization during the first year following fire does not significantly impact the ecological health of these grasslands.

### **Forage Quality Prediction**

A predictive model of rangeland forage quality was developed using growing degree days and percentage of dead plant material thereby allowing rangeland managers to assess forage quality in an easy and timely manner.

### **Livestock Exclusion**

Quantified the effects of livestock grazing *versus* livestock exclusion on annual productivity and biodiversity of rangelands. Diversity varied by year, but was similar between grazing treatments. Livestock exclusion increased the presence of annual bromes and introduced species as a whole. There was no indication that livestock exclusion increased biomass or improved plant community integrity, suggesting proper grazing is essential for maintaining the health and well-being of Northern Great Plains rangelands.

### **Season of Calving**

Studies evaluating the effects of different seasons of calving (i.e., February, April, and June) on herd productivity and economic returns show that: 1) calving season affects milk production, and subsequently calf weight gains, in direct relation to forage/diet quality; 2) calving season and age of calf at weaning interact to affect post-weaning performance including carcass characteristics; and 3) June calving tended to be the most profitable of the 3 seasons of calving because of lowered input costs.

### **Grazing Systems**

Quantified the effects of varying livestock grazing systems on herbage production and plant species composition at moderate rates of stocking. Found that response to varying grazing systems was minimal during 7-year period thereby countering the argument that certain grazing systems are superior to all others. Results help ranchers better evaluate the economic and ecological costs and benefits derived from implementing varying grazing systems.



## **Technology Transfer**

We are constantly transferring technology on preliminary and final results of all studies. This information was shared during FY2006 with producers, state and federal agency personnel, and scientists through more than 35 presentations at local and regional meetings and the annual meetings of the Society for Range Management, American Society of Animal Sciences, Western Section of American Society of Animal Sciences, Soil and Water Conservation Society, Western Society of Weed Science.

## **Popular Publications**

"Cows prefer Green" Conservation Update, Custer County Conservation District, Spring 2006, 11:5.

"Bye-Bye Hoppers" Beef Magazine, April 2006 Issue, page 40.

"Green Acres" Agricultural Research Magazine, February 2006, page 19.

Invited instruction on "Grazing management in a rangeland environment", for US Forest Service Rangeland Management for Line Officers Training School, Milford, PA, April 2005

"Scientists Exchange Knowledge" Miles City Star, November 2005.

## **Scientific Publications and Abstracts:**

- 188719 Branson, D.H. and Vermeire, L.T. 2006. Effects of summer fire and post-fire grazing on grasshopper abundance and species composition. Society for Range Management Meeting Abstracts #44.
- 185045 Grings, E.E., Blummel, M., Sudekum, K.H. 2005. Methodological considerations in using gas production techniques for estimating ruminal microbial efficiencies for silage-based diets. *Animal Feed Science and Technology* 123-124:527-545.
- 185046 Grings, E.E., Short, R.E., Klement, K.D., Geary, T.W., MacNeil, M.D., Haferkamp, M.R., and Heitschmidt, R.K. 2005. Calving system and weaning age effects on cow and preweaning calf performance in the Northern Great Plains. *Journal of Animal Science* 83:2671-2683.
- 184463 Grings, E.E. 2006. Use of in vitro gas production techniques to evaluate associative effects of forages. Society for Range Management Meeting Abstracts #134.

- 179168 Grings, E.E. 2006. The language of rangeland science. *Rangelands* 28(2):36-37.
- 169018 Haferkamp, M.R., Macneil, M.D. 2004. Annual brome seed germination in the Northern Great Plains: An update. *Forest Service Proceedings RMRS-P-31*. p. 115-119.
- 175853 Haferkamp, M.R., Macneil, M.D., Grings, E.E., Klement, K.D. 2005. Heifer production on rangeland and seeded forages in the northern great plains. *Rangeland Ecology and Management* 58:495-504.
- 183660 Haferkamp, M.R., MacNeil, M.D., Vermeire, L.T., and Muscha, J.M.. 2006. Measuring carbon dioxide flux over Northern Great Plains rangelands. *Society for Range Management Meeting Abstracts #140*.
- 174359 Heitschmidt, R. K., and Vermeire, L. T. 2005. An ecological and economic risk avoidance drought management decision support system. p. 178. In: *Pastoral systems in marginal environments, Proc. of Satellite Workshop, XX International Grassland Congress*.
- 186034 Heitschmidt, R.K. and Vermeire, L.T. 2006. Can abundant summer precipitation counter losses in herbage production caused by spring drought? *Rangeland Ecology and Management* 59:392-399.
- 183777 Heitschmidt, R.K. and Vermeire, L.T. 2006. The significance of summer precipitation in the northern great plains. *Society for Range Management Meeting Abstracts #160*.
- 167946 Muscha, J.M. and Hild, A.L. 2006. Biological soil crusts in grazed and ungrazed Wyoming sagebrush steppe. *Journal of Arid Environments* 67:195-207
- 185922 Phillips, W.A., Grings, E.E., Short, R., Heitschmidt, R.K., Mayeux, Jr, H.S. 2006. Effect of calving date on stocker and feedlot performance of calves born in the northern great plains and finished in the southern great plains. *Journal of Animal Science* 84(Suppl.2):106.
- 181478 Richardson, K.D., Browne-Silva1, J., Waterman, R.C., Kelly, W.L., Reil, M.S., Lodge-Ivey, S.L. 2006. Comparative Effects of Leafy Spurge on Rumen Bacterial Ecology of the Bovine and Ovine. *American Society of Microbiology Meeting Abstracts N-213*.
- 193432 Richardson, K.D., Kelly, W.L., Reil, M.S., Waterman, R.C. and Lodge-Ivey, S.L. 2006. Effects of leafy spurge (*Euphorbia Esula*) on ruminant gas production and in vitro digestion. *Proceedings, Western Section American Society of Animal Science* 57:36-39.

- 170236 Rinella, M.J., Sheley, R.L. 2005. Models that predict invasive weed and grass dynamics: 2. Accuracy evaluation. *Weed Science* 53:605-614.
- 170233 Rinella, M.J., Sheley, R.L. 2005. Models that predict invasive weed and grass dynamics: 1. Model development. *Weed Science* 53:586-593.
- 183620 Rinella, M.J. and Sheley, R.L. 2006. Using light attenuation to estimate leafy spurge impacts on forage production. *Rangeland Ecology and Management* 59:431-437.
- 183820 Rose, J.L., Vermeire, L.T., Wester, D.B. 2006. Short-term effects of summer fire and post-fire grazing in the northern Great Plains. *Society for Range Management Meeting Abstracts* #314.
- 176004 Vermeire, L.T., Wester, D.B., Mitchell, R., Fuhlendorf, S.D. 2005. Fire and grazing effects on wind erosion, soil water content, and soil temperature. *Journal of Environmental Quality* 34:1559-1565.
- 183832 Vermeire, L.T., Heitschmidt, R.K. Haferkamp, M.R. 2006. Grazing and livestock exclusion effects on northern plains diversity and heterogeneity. *Society for Range Management Meeting Abstracts* #365.

WERA – 40  
2005 Report  
Animal and Range Sciences  
Montana State University, Bozeman, MT

Faculty:

Clayton B. Marlow (0.60 COA/0.40 AES)  
Jeff Mosley (1.0 CES)  
Bret Olsen (0.50 COA/0.50 AES)\*\*  
Bok Sowell (0.9 AY/0.2 AES)  
Carl Wambolt (0.50 COA/0.50 AES)

\*\* Dr. Olsen begin serving as Interim Department Head 1 September 2006

Student Enrollment:

- A. Undergraduates – 45
- B. Masters – 7, PhD – 1, Post Doc – 1

Faculty Research Focus

- A. Marlow – linkage between wildfire patterns and riparian processes
- B. Mosley – sustainable ranching
- C. Olsen – control of invasive plants through grazing management
- D. Sowell – herbivory
- E. Wambolt – sagebrush ecology

Current Status

- A. Undergraduate degree revision approved by Board of Regents
  - 1. Degree title – Natural Resources and Rangeland Ecology
  - 2. Options – Rangeland Ecology and Wildlife Habitat Improvement
    - a) 3 new courses created by Range faculty – habitat improvement, wildlife nutrition and wildlife management topics
- B. Nearing fund raising (12 million) for construction of new Animal Bioscience Building
  - 1. Range faculty will have new office/lab space

## Research Effort:

### 1. New Grants Secured During the Year

**Brewer, T.K., R.E. Kott, J.C. Mosley, J.E. Knight, and W.F. Gipp.** Montana Sustainable Rangeland Livestock Task Force. USDA Joe Skeen Institute for Rangeland Restoration, 2 years, \$514,953 (J. Mosley's portion = \$112,513)

**Marlow, C.B.** Whitetail Watershed Conifer Research Project. Montana Bureau of Land Management. 1 Year, \$10,000

**Brunson, M., C.B. Marlow, D. Buschena and W. Weight.** Prescribed Fire in Riparian Zones Affected by Expansion: Ecological, Hydrological and Socio-economic Effects. USDA National Research Initiative, 3 years, \$399,133 (Marlow's share = \$84,7474)

**Rothschaller, S. and C.B. Marlow.** Wetland Mapping and Impacts of Irrigation on Wetlands on the Elk Ranch, Grand Teton National Park. USDI Park Service, 2 years, \$4,080.

**Neuman, D. and C.B. Marlow.** Assessment of Steep Slope Reclamation Practices at the Alta Mine. USDI Bureau of Land Management. 2 years \$64,397 (Marlow is now PI on project)

**Mosley, J.C.,** and J. Peterson. Undaunted Stewardship. USDI Bureau of Land Management, 3 years, \$887,000

**Sowell, B.F. and C.L Wambolt.** Sage-grouse habitat research. USDI Bureau of Land Management. \$16,841

**Wambolt, C.L. and B.F. Sowell.** Sage-grouse winter habitat. Montana Dept. of Fish, Wildlife, & Parks. \$17,500

## Current Year Publications

### 1. Peer-reviewed

**Marlow, C.B.,** Marlow, C.B., R. Finck and H. Sherwood. 2006. Grazed Stubble Height as a Criterion for Controlling Sediment Production from Grazing Lands. J. Amer. Water Resources. 42(4):891-900.

Grove, A.J., **C.L. Wambolt,** and M.R. Frisina. 2005. Douglas-fir's

effect on mountain big sagebrush wildlife habitats. *Wildlife Soc. Bull.* 33:74-80.

**Wambolt, C.L.** 2005. Sagebrush-ungulate relationships on the northern Yellowstone winter range. *Rocky Mountain Research Station. RMRS-P-38:109-115.*

**Wambolt, C.L.,** M.R. Frisina, S.J. Knapp, and R.M. Frisina. 2005. Effect of method, site, and taxon on line-intercept estimates of sagebrush cover. *Wildlife Soc. Bull.* 34:189-195.

## 2. Reviewed Materials

Daubert, T., **J. Mosley,** and **L. Schmidt.** 2005. Ayrshire Dairy Farm historical site interpretive exhibit. *Undaunted Stewardship<sup>®</sup>* (Montana State University, Montana Stockgrowers Association, and Bureau of Land Management).

Daubert, T., **J. Mosley,** and **L. Schmidt.** 2005. Beaverhead Rock historical site interpretive exhibit. *Undaunted Stewardship<sup>®</sup>* (Montana State University, Montana Stockgrowers Association, and Bureau of Land Management).

Daubert, T., **J. Mosley,** and **L. Schmidt.** 2005. Big Hole Pass historical site interpretive exhibit. *Undaunted Stewardship<sup>®</sup>* (Montana State University, Montana Stockgrowers Association, and Bureau of Land Management).

Daubert, T., **J. Mosley,** and **L. Schmidt.** 2005. For undaunted travelers only travel brochure. *Undaunted Stewardship<sup>®</sup>* (Montana State University, Montana Stockgrowers Association, and Bureau of Land Management).

Daubert, T., **J. Mosley,** and **L. Schmidt.** 2005. Gates of the Mountains historical site interpretive exhibit. *Undaunted Stewardship<sup>®</sup>* (Montana State University, Montana Stockgrowers Association, and Bureau of Land Management).

Daubert, T., **J. Mosley,** and **L. Schmidt.** 2005. Judith Landing historical site interpretive exhibit. *Undaunted Stewardship<sup>®</sup>* (Montana State University, Montana Stockgrowers Association, and Bureau of Land Management).

Daubert, T., **J. Mosley,** and **L. Schmidt.** 2005. Pilot Rock historical site interpretive exhibit. *Undaunted Stewardship<sup>®</sup>*

(Montana State University, Montana Stockgrowers Association, and Bureau of Land Management).

Daubert, T., **J. Mosley**, and **L. Schmidt**. 2005. Thompson Homestead historical site interpretive exhibit. Undaunted Stewardship® (Montana State University, Montana Stockgrowers Association, and Bureau of Land Management).

**Mosley, J.** 2005. Browsing the literature. *Rangelands* 27(1):53-55.

**Mosley, J.** 2005. Browsing the literature. *Rangelands* 27(2):56-58.

**Mosley, J.** 2005. Browsing the literature. *Rangelands* 27(3):70-72.

**Mosley, J.** 2005. Browsing the literature. *Rangelands* 27(4):72-74.

**Mosley, J.** 2005. Browsing the literature. *Rangelands* 27(5):48-50.

**Mosley, J.** 2005. Browsing the literature. *Rangelands* 27(6):50-52.

Roeder, B., **J. Mosley**, **T. Brewer**, and **R. Kott**. 2005. Prescribed sheep and goat browsing for controlling conifer encroachment, p. 51. In: MSU Sheep Program Update, Dept. of Animal and Range Sciences, Montana State Univ., Bozeman.

**Wambolt, C.** 2005. Big Sagebrush. 2005. Plant Guide, USDA Natural Resources Conservation Service.

### 3. Completed Thesis

Keren, I.N. 2005. Thermal balance model for cattle grazing winter range. M.S. Thesis, Animal & Range Sciences, Montana State University, Bozeman, MT.

Lane, V.R. 2005. Sage-grouse (*Centrocercus urophasianus*) nesting and brood-rearing sagebrush habitat characteristics in Montana and Wyoming. M.S. Thesis, Animal & Range Sciences, Montana State University, Bozeman, MT

Miller, T. 2005. Evaluating Riparian Health Assessment Methods for Perennial Streams in Montana. M.S. Thesis, Animal & Range Sciences, Montana State University, Bozeman, MT

Thrift, B.D. 2005. Summer diets of sheep grazing spotted knapweed-infested foothill rangeland in western Montana. M.S.

Thesis, Animal & Range Sciences, Montana State University,  
Bozeman, MT.

#### 4. Abstracts and Presentations

**Brewer, T.K.**, S.C. Bunting, K.D. Sanders, and **J.C. Mosley**. 2005. Predicting utilization of foothill and mountain rangeland by cattle in summer. Abstract. Soc. Range Manage. Annual Meeting, Fort Worth, TX.

Frisina, M.R. and **C.L. Wambolt**. 2005. Habitat competition from diet overlap of elk and mule deer. Proc. Soc. Range Mgt. 58<sup>th</sup> Annual Meeting, Fort Worth, TX.

Lane, V., **B.F. Sowell**, and **C.L. Wambolt**. 2005. Sage-grouse nesting and brood-rearing habitat in central Montana. Proc. Soc. Range Mgt. 58<sup>th</sup> Annual Meeting. Fort Worth, TX.

**Marlow, C.B.**, C. Wood, R. Meeks and T. Miller. 2005. Response of Riparian Groundwater Levels to Prescribed Fire. Abstract. 58<sup>th</sup> Annual Meeting of the Society for Range Management, Fort Worth, TX 5-11 February 2005.

McCalmant (Thrift), T.M., **T.K. Brewer**, **J.C. Mosley**. 2005. Effects of grazing intensity on an elk winter-spring range. Abst. Soc. Range Manage. Ann. Mtg., Fort Worth, TX.

**Mosley, J.C.** 2005. Montana's Undaunted Stewardship<sup>®</sup> program. National Environmental Farm Planning Practitioners Conference, Agriculture and Agri-Food Canada, Montreal, Quebec. (Invited)

**Mosley, J.C.** 2005. Livestock grazing to enhance wildlife habitat. Pacific Northwest Range Management Short Course, Boise, ID. (Invited)

**Mosley, J.C.** 2005. Sheep or goat grazing effects on wildlife habitat: Complementary or competitive? Sheep, Goats, Weeds, and Wildlife Workshop. Missoula, MT. (Invited)

**Mosley, J.C.** 2005. Undaunted Stewardship<sup>®</sup>: Accomplishments, challenges, and lessons learned. Building Communities Through Innovative Environmental Stewardship Conference. Crestomere, Alberta, Canada. (Invited)

**Olson, B.E.** 2005. Effect of defoliation, mycorrhizae, and nutrients on nitrogen uptake and allocation in *Centaurea maculosa* and two native grasses. Soc. Range Manage. Ann. Mtg., Fort Worth, TX



Roeder, B.L., **J.C. Mosley**, **T.K. Brewer**, and **R.W. Kott**. 2005. Prescribed sheep and goat grazing for controlling conifer encroachment. Abstract. Soc. for Range Manage. Ann. Mtg., Fort Worth, TX.

Simonsen, J., **Olson, B.E.** 2005. Rumen microbial response to invasive plants and anti-toxicants. Soc. Range Manage. Annual Meeting, Fort Worth, TX.

**Sowell, B.K.** 2005. Collaborative Research through innovative approaches: the American Indian Research Opportunities program case study: Invited panel member (1 of 5). Tribal College Summit on Institutional Cooperation. August 5-6, 2005. Newberry Library, Chicago, Ill.

Strauch, O.E., **S.D. Cash**, A. Lenssen, **B.F. Sowell**, R.L. Ditterline and **P. Hatfield**. 2005. No-till alfalfa establishment in Western Montana. Abst. West. Soc. Crop Sci., 19-22 Jun. Bozeman, MT.

Thrift B.D, B.L. Roeder, **T.K. Brewer**, **J.C. Mosley**, **R.W. Kott**, and **B.E. Olson**. 2005. Summer diets of a ewe-lamb band grazing spotted knapweed-infested rangeland. Abstract. Soc. for Range Manage. Annual Meeting, Fort Worth, TX.

Thrift, T.M., **T.K. Brewer**, and **J.C. Mosley**. 2005. Effects of long-term grazing and intensity on an elk winter-spring range. Abstract. 54th Annual Montana Livestock Forum and Nutrition Conference. Bozeman, MT.

**Wambolt, C.L.** 2005. Sagebrush ecological considerations for management. Symp: Ecology and management of pinyon-juniper and sagebrush communities. Uncompaghre Project, Montrose, CO. (Invited Paper)

Wood, C. and **C.B. Marlow**. 2005. Prescribed Fire in the Missouri River Breaks: Gains or Losses for Mule Deer and Elk. Abst. 58<sup>th</sup> Ann. Mtg. Soc. Range Manage., Fort Worth, TX 5-11 February 2005.

**Nevada Agricultural Experiment Station  
2006**

**1. NEVADA ARID RANGELANDS**

**INVESTIGATOR:** Pardini

**OBJECTIVES:** Our Vision and Mission will be supported by four basic program goals. These have been identified in partnership with our rural communities and families, and in consultations with other agencies and organizations responsible for or concerned about the future of our Nevada rangelands. We consider these four goals as basic to the needs of our rangelands and their stewards. They are 1.) Healthy Rangelands for Multiple Uses. 2.) Improved Campus-Based Range Management Education Programs. 3.) Healthy Economies at the Ranch, Community, and County Level. 4.) Public Land Decision-Making Models That Value and Support Public Inputs.

**2. ECONOMIC IMPACTS OF GRAZING BUYOUTS: A RANCH AND REGIONAL LEVEL ANALYSIS**

**INVESTIGATOR:** Harris

**NON-TECHNICAL SUMMARY:** a. Grazing permit buyouts and impacts on represented ranches in study area. b. Impacts at the regional level from alternative range buyout scenarios. a. The project examines the ranch level and regional level impacts of proposed grazing buyout. b. Impacts to county government fiscal balances will also be estimated for alternative buyouts.

**3. ECONOMIC IMPACTS OF CHANGES IN ELK POPULATIONS ACROSS MULTIPLE USER GROUPS AND COUNTIES**

**INVESTIGATOR:** Rollins

**NON-TECHNICAL SUMMARY:** Rangelands in Central Nevada support elk, mule deer, and livestock. Elk and livestock have similar habitat needs, both being grassland dependent, which implies a trade-off in terms of the productive use of grazing resources. Mule deer are sage brush habitat dependent species and thereby pose less of a productivity trade-off with livestock. Climatic changes and ecological processes over recent time have caused changes in the Great Basin that have favored expansion of grasslands as sagebrush systems have declined. These changes have in turn caused a reduction in populations of sage dependent species, such as mule deer with an increase in grassland dependent species such as elk. The increase in elk has contributed to added pressure on existing grazing resources allocated to livestock producers and a shift in hunting opportunities for these game species. This project will investigate the costs and benefits generated as a result of changes in elk, mule deer and livestock populations. The changes in populations imply changes in the distribution of costs and benefits among producers, and different hunter groups. We hypothesize that hunters receive considerable

economic benefits from hunting; that economic benefits and costs to livestock producers differ between deer and elk; and that changes from current wildlife population levels will involve changing distributions of costs and benefits among the various user groups.

#### ***4. WEED CONTROL AND RESTORATION OF GREAT BASIN RANGELANDS***

**INVESTIGATOR:** Nowak

**NON-TECHNICAL SUMMARY:** Cheatgrass is a non-native invasive plant that is having profound impacts on Great Basin rangelands and is fueling wildfires. This project will identify strategies to control cheatgrass and other weeds on Great Basin rangelands, restore native species, and increase biodiversity using replicated experiments across the Great Basin. We will also develop an economic basis for choosing appropriate management techniques, have an active program to disseminate knowledge, and increase public awareness of invasive species issues.

#### ***5. DEVELOPMENT OF A PROTOTYPE SIMULATION MODEL FOR GREAT BASIN VEGETATION TRANSITIONS***

**INVESTIGATOR:** Weisberg

**NON-TECHNICAL SUMMARY:** Woodland encroachment into rangeland vegetation is a global phenomenon that remains poorly understood, despite having pervasive ecological and economic effects. Since vegetation changes near the woodland-rangeland interface occur gradually over long time periods and large areas, it is difficult to test hypotheses concerning causal mechanisms directly using experimental approaches or field observations. Computer simulation models can be useful for scaling up what we know for small areas and short time periods, and for helping managers to predict possible future changes given different management scenarios. Our study will develop a prototype simulation model to investigate vegetation change at the lower woodland-sagebrush ecotone. A novel landscape model will be developed, including separate modules for vegetation succession and fire regime. Aerial photographs and field investigations will be used to compare model predictions, based on historical model runs, against current vegetation patterns. The overall goal is to integrate existing data and expert knowledge for predicting transitions among woodland, shrubland and grassland vegetation types. The model will adopt a spatially-explicit approach, where simulated outcomes are a realistic function of location on the landscape. Specific hypotheses to be explored consider the relative influences of observed patterns of climate change, grazing effects on plant competition, grazing effects on fire regime, rangeland restoration treatments, and modern fire suppression, on woodland dynamics in central Nevada.

#### ***6. LONG TERM CONTRACEPTION IN FERAL HORSE: EFFICACY, SAFETY AND BEHAVIOR***

**INVESTIGATOR:** Thain

**NON-TECHNICAL SUMMARY:** Population control of horses presents management difficulties as current techniques are expensive and not particularly effective. Contraceptive is a proposed alternative, but the efficacy and side-effects of long term contraceptive treatment has not been investigated. This project investigates the efficacy of contraceptive treatment as well as the behavioral side-effects of two different immunocontraceptive agents.

## ***7. A FIELD GUIDE TO NEVADA GRASSES***

**INVESTIGATOR:** Perryman

**NON-TECHNICAL SUMMARY:** The land base in the State of Nevada is comprised primarily of rangelands. Much of the economy, most of the land use and government activities, and recreational opportunities occur on rangelands. Given the myriad of activities, planning, management, and public policy activities based on rangelands, it is difficult to conceive that a taxonomic resource dedicated specifically to the grasses found within the boundary of the State of Nevada is not available to the various publics, stakeholders, and constituents that live, work, and recreate there. Large taxonomic works including all vascular plants have been developed for the Intermountain West and for California. They are very technical, expensive, large, cumbersome and often out of print. A significant amount of rangeland planning, management, and policy development is based on responses of key grass species or groups of grass species to various management scenarios. It is imperative that stakeholders involved in these types of activities have a taxonomic guide to assist them in grass species identification. More specifically, they are in need of a photographic reference that also contains vegetative keys for identification that can be used in the field, under field conditions. The project will develop a basic, and currently missing management tool that will assist in providing the science-based knowledge and skills required to manage healthy and productive rangelands, provide abundant renewable natural resources, and support the economic and value based sustainability of our rural communities.

## ***8. RETROSPECTIVE STUDY OF THE LANDSCAPES, VEGETATION AND FAUNA OF THE PINE FOREST RANGE***

**INVESTIGATOR:** Brussard

**NON-TECHNICAL SUMMARY:** The extent to which Great Basin ecosystems have changed through time is the subject of intense and sometimes polarized debate among ecologists, land managers, and stakeholders. A scientific expedition to the Pine Forest Range in 1909 produced the oldest documented scientific data on Great Basin ecosystems. This project will revisit the expedition's collection sites, re-photograph the landscapes and vegetation, and re-survey the vertebrates to assess the extent of ecological change during the past century.

## ***9. RESTORATION OF CUTTHROAT TROUT IN THE LOWER TRUCKEE RIVER***

**INVESTIGATOR:** Chandra

**NON-TECHNICAL SUMMARY:** An important Great Basin ecosystem, the Lower Truckee River once provided connectivity between the saline waters of Pyramid Lake and ultra-oligotrophic waters of Lake Tahoe which once yielded Lahontan cutthroat trout (LCT) greater than thirty pounds. In the last decade a multi-agency group (Truckee River Recovery and Implementation Team) has identified potential impediments (nonnative fish predators, dams and diversions as barriers to migration, low flow conditions) for restoring LCT within the watershed. Working towards restoring LCT in the Lower Truckee River, this team is seeking scientific information to create management scenarios to overcome these obstacles. We propose a study that integrates previously collected information and approaches to aid local agencies in restoring LCT in the river. Through a cooperative framework with NDOW and PLF, the goals are to understand 1) the movement patterns and habitat utilization of reintroduced LCT, during low and high flow periods, to determine the impact from nonnative fish predation and barriers (dams/diversions) on the recovery effort, 2) the feeding behavior of LCT and their potential competition for food resources with other nonnative fish, and 3) their growth rates growth rates as a result of their habitat use and feeding behavior and compare them to cutthroat trout from other river ecosystems. This project addresses potential habitat and food utilization by reintroduced native trout in the Truckee River ecosystem.

## ***10. INTERACTIONS BETWEEN UNGULATE SPECIES AND RANGELANDS IN NEVADA***

**INVESTIGATOR:** Weisberg

**NON-TECHNICAL SUMMARY:** The interaction between native and introduced ungulates on the arid rangelands in the Great Basin causes concern to many stakeholders, particularly the potential for competition between these ungulates. The project aims to study the interactions between ungulate species by compiling a literature review, measuring habitat selection by the ungulate species, modeling these interactions and including economic factors in the model, and the sharing the resultant information among the various stakeholders.

## ***11. SPATIAL ANALYSIS OF PINYON-JUNIPER EXPANSION IN NEVADA GREAT BASIN***

**INVESTIGATOR:** Weisberg

**NON-TECHNICAL SUMMARY:** Over the past century, pinyon-juniper woodland in the Great Basin has expanded at a rapid rate into sagebrush and other types of vegetation. Pinyon-juniper expansion threatens rangeland lifestyle and economy by reducing forage base and increasing the risk of stand-replacing, catastrophic wildfire. In addition, the resulting alterations to landscape habitat mosaics threaten sagebrush-dependent species of

concern such as the sage grouse and pygmy rabbit. Much has been done to manage encroaching pinyon-juniper woodland by eradicating it with fire or mechanical means. However, the effectiveness of restoration management activities is diminished by lack of information concerning how pinyon-juniper expansion varies according to diverse site conditions and changing climate. The goal of the proposed project is to use historical information (air photos and satellite data) to improve our understanding of how woodland expansion has occurred in the state of Nevada. From our detailed investigation of past woodland expansion, we will develop useful models that will help us to predict how pinyon-juniper expansion might occur in future, under various scenarios of restoration management and climate change. Results from our study will be useful for identifying areas of pre-settlement pinyon-juniper woodland, as well as priority areas for rangeland restoration activities.

## ***12. DISTRIBUTION AND BEHAVIOR OF THE PYGMY RABBIT IN NEVADA***

**INVESTIGATOR:** Brussard

**NON-TECHNICAL SUMMARY:** As a result of the loss, fragmentation, and degradation of sagebrush vegetation, many animal species dependent on sagebrush may be in serious decline. One of these species is the pygmy rabbit, and it has been petitioned for listing under the US Endangered Species Act. This project will draft a conservation blueprint for the pygmy rabbit in Nevada. The blueprint will be put together by Ph.D. and M.S. students working with representatives of relevant agencies. The blueprint will be the first step toward a statewide effort to conserve this species and thereby help prevent its listing under the ESA.

## ***13. INCREASING BASIN WILD RYE FOR WINTERING LIVESTOCK, WILDLIFE HABITAT, AND SEED PRODUCTION***

**INVESTIGATOR:** Perryman/McAdoo

**NON-TECHNICAL SUMMARY:** Great Basin wildrye or basin wildrye (*Leymus cinereus*) is a native grass species that has been ignored for many years but has great potential for wintering livestock, wildlife habitat, and commercial seed production. Under pristine conditions, there may have been approximately 1 million acres of basin wildrye in the Humboldt River Basin alone. Historical wildrye stands were greatly decimated near the turn of the century by intensive (season long) livestock grazing and/or haying (Lesperance et al. 1978). By increasing the dominance of basin wildrye on private pastures, many Great Basin ranchers can improve their economic and environmental sustainability. Many sites where basin wildrye is only a minor component of the plant community can be treated with fire or perhaps a fire surrogate to release this grass in meadows and lower elevation greasewood and sagebrush-grass areas. Advantages of such a scenario as follows: (1) reduction of winter livestock feeding costs; (2) enhancement of wildlife habitat; (3) production of grass seed for commercial market; (4) reduction of soil

erosion; and (5) competition against invasive weeds. The authors propose this study as a pilot project to evaluate the effectiveness and economic costs of increasing basin wildrye on study plots at three northeastern Nevada ranch locations.

#### ***14. A PROGRAM OF ARID RANGELAND RESEARCH WITH TURKMENISTAN***

**INVESTIGATOR:** Thawley

**NON-TECHNICAL SUMMARY:** This project is designed to establish and support mutually beneficial cooperative relationships between the College of Agriculture, Biotechnology and Natural Resources at the University of Nevada, Reno and the Saparmurat Niyazov Agricultural University, the Magtymguly Turkmen State University in Ashgabat, and the Institute of Desert Flora and Fauna of Turkmenistan.

#### ***15. EFFECTS OF SHRUBSTEP VEGETATION STRUCTURE***

**INVESTIGATOR:** Sedinger

**NON-TECHNICAL SUMMARY:** A key rationale underlying listing petitions for Greater Sage Grouse was that grazing impacted vegetation, which in turn affected Sage Grouse reproductive success. The linkage between vegetation characteristics and Sage Grouse reproduction is based on a small number of studies, primarily in northern Nevada and southern Idaho. These studies form the basis for habitat management guidelines for Sage Grouse published in the Wildlife Society Bulletin in 2000. Concern has been raised about the applicability of habitat guidelines based on studies in ecosystems that differ from those in much of Nevada (Shultz 2004). These concerns are based on uncertainty about: (1) generality of relationships between vegetation and nest success; and (2) uncertainty about the relationship between grazing management and vegetation structure. These concerns have important management, public policy, and societal implications because guidelines for management of Sage Grouse habitat will undoubtedly influence management of grazing on public lands. The research proposed here will establish the relationship between nest site selection and success of Sage Grouse, and key vegetation parameters in central Nevada. The purpose of the project is to develop understanding of the effects of vegetation structure on sage grouse reproduction in Nevada so management of vegetation for conservation of sage grouse will be appropriate.

#### ***16. PRODUCTION OF NATIVE SEED AT RAFTER 7***

**INVESTIGATOR:** Perryman

**NON-TECHNICAL SUMMARY:** We cannot restore western rangelands without native plant materials, and those native plant materials do not exist in species numbers or quantities large enough to meet the magnitude of demand. This project will determine how to accelerate development of local ecotypes from field collections to saleable quantities.

State Report  
2006

State: New Mexico

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

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Current research projects and investigators:

NMSU Department of Animal and Range Sciences

Laurie Abbot	Disturbance effects on vegetation and soil dynamics on New Mexico rangelands: Implications for restoration and management.
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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 Piñon-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: 2005-2006

Black, C. M. 2005. Influence of non-food factors on habitat selection of cattle and sheep. NMSU MS Thesis.

Ebel, C. A. 2006. Controlling shrub invasion: Effects on a shortgrass plant community. NMSU MS Thesis.

Melendez, V. 2006. Response of creosotebush communities to tebuthiuron application on Bureau of Land Management lands in southwest New Mexico. NMSU MS Thesis.

A few recent NMSU Department of Animal & Range Science publications:

Bailey, D.W., H.C. VanWagoner, and R. Weinmeister. 2006. Individual animal selection has the potential to improve uniformity of grazing on foothill rangeland. Rangeland Ecol. Manage. 59:351-358.

Khumalo, G. and J. Holechek. 2005. Relationships between Chihuahuan Desert perennial grass production and precipitation. Rangeland Ecol. Manage. 58:239-246.

McDaniel, K.C., L.A. Torell, and C.G. Ochoa. 2005. Wyoming big sagebrush recovery and understory response with tebuthiuron control. Rangeland Ecol. Manage. 58:65-76.

Perkins, S.R. and K.C. McDaniel. 2005. Infiltration and sediment rates following creosotebush control with tebuthiuron. Rangeland Ecol. Manage. 58:605-613.

Sandavol, L, J. Holechek, J. Biggs, R. Valdez, and D. VanLeeuwen. 2005. Elk and mule deer diets in north-central New Mexico. Rangeland Ecol. Manage. 58:366-372.

Torell, L.A., K.A. McDaniel, and C.G. Ochoa. 2005. Economics and optimal frequency of Wyoming big sagebrush control with tebuthiuron. *Rangeland Ecol. Manage.* 58:77-84.

Utrilla, V.R., A.F. Brizuela, and A.F. Cibils. 2006. Structural and nutritional heterogeneity of riparian vegetation in Patagonia (Argentina) in relation to seasonal grazing by sheep. *J. Arid Environ.* 67:661-670.

VanWagoner, H.C., D.W. Bailey, D.D. Kress, D.C. Anderson, and K.C. Davis. 2006. Differences among beef sire breeds and relationships between terrain use and performance when daughters graze foothill rangelands as cows. *Appl. Anim. Behav. Sci.* 97:105-121.

## **CURRENT RESEARCH OF RESIDENT FACULTY**

### **DR. MIKE BORMAN (Range Ecology and Restoration)**

Site characteristics for riparian vegetation.

Monitoring goose-grazing impacts on crops.

Goat grazing as a tool for controlling Himalayan blackberry.

Pictorial Field Guide to Riparian Plants of Central and Eastern Oregon  
Joint Project with Dr. Tamzen Stringham

### **DR. JOHN BUCKHOUSE (Watershed and Riparian Management)**

Watershed research on Oregon's rangelands.

Mill and McKay Creeks streambank Erosion project.

Twin Watershed Response to Juniper Overstory Reduction.

Willow Regeneration in Response to Livestock Grazing and Planting Location.

Crested Wheatgrass: A Model of Soil Characteristics in Old Field Succession.

### **DR. DOUGLAS JOHNSON (Landscape Ecology and Range Restoration)**

Ecology and restoration of southwestern Oregon foothill rangelands.

Analyzing ecosystem complexes using principles of landscape ecology, computer analysis, Geographic Information Systems (GIS) and spatial analysis techniques.

Animal distribution modeling - KRES project

Veg-Measure project - measure vegetation using new and innovative approaches

Weedmapper project - Internet acquisition & Delivery of weed info Modeling of weed spread

Animal use of mountainous rangelands

Mongolian Khulan (wild ass) project

In progress of developing a new project with new Graduate Student, Alberto Perez-Amaro

Impacts of wolves on Agro-pastoral stock rearing systems

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

Environmental and management impacts on stream temperature.

Riparian ecology.

Ecology and management of foothill rangelands.

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

**DR. JEFFERY MILLER**

1. completing a manuscript for my second book (2007, Harvard press) on Lepidoptera of Costa Rica, co-author Dan Janzen and Winnie Hallwachs (University of Pennsylvania).
2. completing a manuscript for book (2007, USFS) on conservation of Lepidoptera in the Pacific Northwest, co-author Paul Hammond (OSU, Zoology).
3. analyzing data from 1993 to present on Lepidoptera of the HJ Andrews Experimental Forest in the western Cascades. Funded through 2008.
4. initiating a project on caterpillars and their foodplants in eastern Oregon rangelands in the context of their role as food for chicks of sage grouse and effects of grazing practices. Collaboration with: Tamzen Stringham, Erica Ersch (Masters Thesis), Tony Svejcar, and John Bates. Funded through 2008.
5. conducting long-term research (since 2003) in Taiwan on Lepidoptera biodiversity, sampling protocols, and student exchange. Collaboration with Andy Moldenke (OSU, Botany) and Hans Luh (OSU, Forest Science). Funded through 2007.
6. sampling and contributing PNW specimens to the North America Lepidoptera Gene Sequencing Project.
7. revising a grant proposal to study conservation of Lepidoptera in Ecuador.
8. writing the manuscript for a book (2008?, USFS) on wood-infesting beetles in the PNW, co-author James LaBonte (ODA).
9. developing the sampling protocol for rapid assessment of endangered insect species required in Environmental Impact Studies.
10. finalizing the results of field data regarding population trends in an insect used to promote the biological control of Mediterranean sage near Lakeview, Oregon. In collaboration with Eric Coombs (ODA).
11. Research on food plants for the gypsy moth infestation near Bend

**DR. STEVEN SHARROW (Agroforestry)**

Agroforestry systems for western Oregon.

Alternative grazing systems for improved pastures in western Oregon.

Tree/herbivore/understory interactions-facilitation and interference

**DR. TAMZEN STRINGHAM (Rangeland & Riparian Ecology)**

Environmental and management impacts on water quality, riparian ecology, watershed, desert shrub ecology, and grazing management.

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.

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.

3. Griff Gilbert M.S. graduate

Habitat parameters associated with seven willow species on a southeast Oregon channel

The role of channel gradient, bed material, width-depth ratios, and sinuosity along with valley width, elevation and winter air temperature were correlated with the distribution of seven species of willow.

4. 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.

5. 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.

6. Jennifer Wiseman M.S. student

Riparian site capability and woody riparian species along streams in northeast Oregon

The relationship between the channel attributes of gradient, width-depth, entrenchment, bed materials, bankfull and overbank flood events in combination with air temperature and solar radiation is being correlated to floodplain woody plant communities to determine if any environmental parameter determines the presence of particular woody plants.

7. 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.

8. Candy Mollnau M. Ag. student (Fulbright Scholar from Germany)

New student whose project will focus on the impact on stream temperature of three different timber harvesting prescriptions within forested riparian zones. Joint project with Dr. Mike Newton, Dept. of Forest Science.

9. Gwen Taylor M.S. student

Sub-surface Irrigation as a Management Tool for Modifying Stream Temperature

Re-hydration of an eastern Oregon meadow using flood and sub-surface irrigation was studied for two years. Groundwater elevations were monitored through a network of 90

shallow wells along with temperature of water in the associated stream channel. Mixed results were found in regards to the modification of stream temperature.

#### 10. Erica Ersch M.S. student

Vegetation structure and composition: relationship to a potential sagegrouse chick food – caterpillars.

New project investigating the relationship between vegetation structure and composition in the high desert area of central Oregon to caterpillar abundance. Recent work suggests caterpillars may be a critical source of food for sagegrouse chicks however research is lacking on caterpillar – vegetation associations.

### Research Projects

#### 1. State-and-Transition Models for Oregon Rangelands

NRCS funded project to develop state-and-transition models for Oregon rangelands. Report due 12/31/06.

#### 2. Sprague River Riparian Vegetation Assessment

NRCS funded project to determine if riparian community types can be developed for the Sprague River system. Project end date: 12/31/07.

#### 3. Wood River Valley Meadow Vegetation Monitoring

NRCS funded project to determine the impact of removal of irrigation from pastureland within the Wood River Valley. Project will assess changes in groundwater levels, vegetation composition and production, forage quality and carrying capacity. Project end date: 12/31/08.

#### 4. Wood River Valley Riparian Community Types and Monitoring

NRCS funded project to develop riparian community types for the Wood River system and to install a monitoring network consisting of channel cross-sections and vegetation greenline monitoring locations. Project end date: 12/31/08.



## **EASTERN OREGON STATE UNIVERSITY FACULTY**

### **DR. LARRY LARSON (Weed Ecology)**

Rangeland water quality and vegetation management.

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

### **DR. MICHAEL MCINNIS (Large Herbivore Ecology)**

Cattle grazing dispersion methods and riparian ecosystems.

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

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.

### **DAVID CHAMBERLAIN**

Mobile Solar Powered Livestock Water project and endeavoring to finish analyzing a 10 year data set of air and water temperature.

### **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 Drs. Buckhouse and Fisher.

Renewable Resources Department  
2005-2006 Annual Report (July 1, 2005- June 30, 2006)  
Rich Olson, Interim Head

Abstract

The Department of Renewable Resources (Entomology, Soil Science, and Rangeland Ecology & Watershed Management) continues to reach greater productivity milestones in teaching, research, extension, service, and student enrollments each year. We are making satisfactory progress in addressing action items of the University, College, and Department academic plans. Our current undergraduate enrollment (majors) is 169 and graduate enrollment 75 (42 M.S., 33 Ph.D.), totaling 244 students Department-wide. Total undergraduate minors is 70. With the exception of our Entomology Ph.D. program, every degree program in the Department has experienced substantial enrollment growth in the last 5.5 years. Most notably, enrollment in our Reclamation/Restoration Ecology B.S. minor increased by 90% since Fall 2000, with similar growth in our Reclamation/Restoration Ecology graduate certificate program. Total student enrollments in all departmental courses increased from 843 in 2003-04, to 1,832 in 2005-06. Faculty participation on graduate student committees (as chairs and members) increased from 135 in 2003 to 178 in 2005. Our departmental research focus is characterized as an “interdisciplinary ecological approach having a balanced emphasis on applied management with fundamental/basic research elements.” Major research focus areas include: invasive plant management and control; pest management strategies and implementation; human health issues related to mosquitoes; reclamation and restoration ecology; water quality; coal bed methane extraction impacts; air quality; soil carbon sequestration; drought; stable isotope analysis; livestock production and grazing management; wildlife habitat development, restoration, and management; and riparian/wetland/aquatic habitat restoration and management. Faculty were principal or co-principal investigators on 173 grants last year totaling \$12,254,840. We currently maintain 79 externally-funded research grants totaling \$4,099,238. Accelerated energy development activity this past year has increased extension/service workloads in a number of natural resource management areas including livestock grazing management, wildlife habitat restoration, water quality protection, invasive plant species management, and other areas. Major extension educational efforts focused on water quality evaluation and monitoring, early livestock calving, conducting range management schools and range monitoring workshops, small acre management, and grasshopper control and management. We are suffering from an extremely serious secretarial staffing shortage (e.g., 2 employees to provide support services to 23 faculty, 5 AP Professional staff, 11 post-doc and staff research scientists, 244 undergraduate [majors] and graduate students, and 70 undergraduate student minors), which severely restricts our capacity to fulfill requested services/tasks from internal departmental, college-level, and university-level colleagues. We are currently operating on a “prioritized task accomplishment” basis. Because of this restrictive staff support situation, we are unable to implement effective public relations campaigns, development activities, student assessment programs, and comprehensive student recruitment efforts. Departmental philosophy to increase diversity is reflected in our success in recruiting students, staff, and faculty from a variety of

gender and ethnic backgrounds. The department's continued outstanding achievements in teaching, research, extension, service, and student advising is largely due to dedicated and principled work ethics of staff and faculty.