

Nevada Rangelands



OPPORTUNITIES • SOLUTIONS • PARTNERSHIPS



College of Agriculture, Biotechnology
and Natural Resources
University of Nevada, Reno

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Cheatgrass-dominated landscape

IMAGE COURTESY OF ELIZABETH LEGER, ASSISTANT PROFESSOR OF PLANT ECOLOGY,
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL SCIENCE.

INTRODUCTION

FROM THE DEAN, RON PARDINI

The primary landscape in the Great Basin ecosystem is its rangelands, with the largest portion located in Nevada. Couple this with the fact that the Great Basin ecosystem is imperiled because of issues like the cheatgrass fire cycle, invasion of noxious weeds, encroachment of pinyon-juniper and concerns over sage-grouse and other wildlife habitats to name a few, and it's clear that the issues of the Great Basin rangelands are central to the land-grant mission of University of Nevada, Reno.

In response to significant input from Nevada citizens, the College of Agriculture, Biotechnology and Natural Resources and the Nevada Agricultural Experiment Station (CABNR/NAES) have hired world class scientists who have developed cutting edge research, extension and education programs to address the critical issues of Nevada's rangelands.

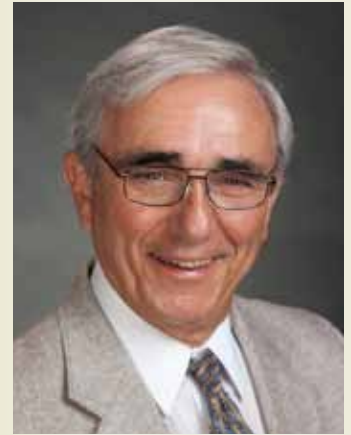
Our research and education programming targeted at these issues demonstrates the value of the CABNR/NAES and University of Nevada Cooperative Extension, reflects the land-grant mission of the University, and shows the impact of our programs on the economic and environmental health of the state of Nevada.

To impact the wide breadth and complexity of issues surrounding Nevada Rangelands, creative innovations and unparalleled collaborations are required, and you will find within the pages of this publication that this has occurred. Collaborations with the University of Nevada Cooperative Extension, USDA Agricultural Research Service (ARS), Natural Resource and Conservation Service (NRCS), Nevada Department of Wildlife (NDOW), Bureau of Land Management (BLM), U.S. Forest Service (USFS), Nevada Division of Forestry (NDF), Nevada Department of Agriculture (NDA) and the ranching community have been formulated.

In addition, multi-state collaborations with other universities throughout the nation Great Basin College, Humboldt State University, Oregon State University, University of Alaska, University of Arizona, University of California - Berkeley, University of Idaho, University of Wyoming, Utah State University, and international collaborations with China and Turkmenistan, have strengthened the capacity to address these complex issues and ensure that these research and education programs will succeed.

CABNR is dedicated to providing solutions for the myriad of rangeland and natural resource issues – by conducting meaningful and high quality research strengthening educational programs and expanding on widespread alliances.

A publication of this sort cannot possibly list every project from the University that is aiming to solve the state's range and natural resource problems, so we've highlighted those closely associated with our land-grant mission. I invite you to read this publication to get a sense of the wide range of research and education programs that our University is engaged in that are devoted to helping Nevada's fragile rangelands. I welcome your feedback and comments.

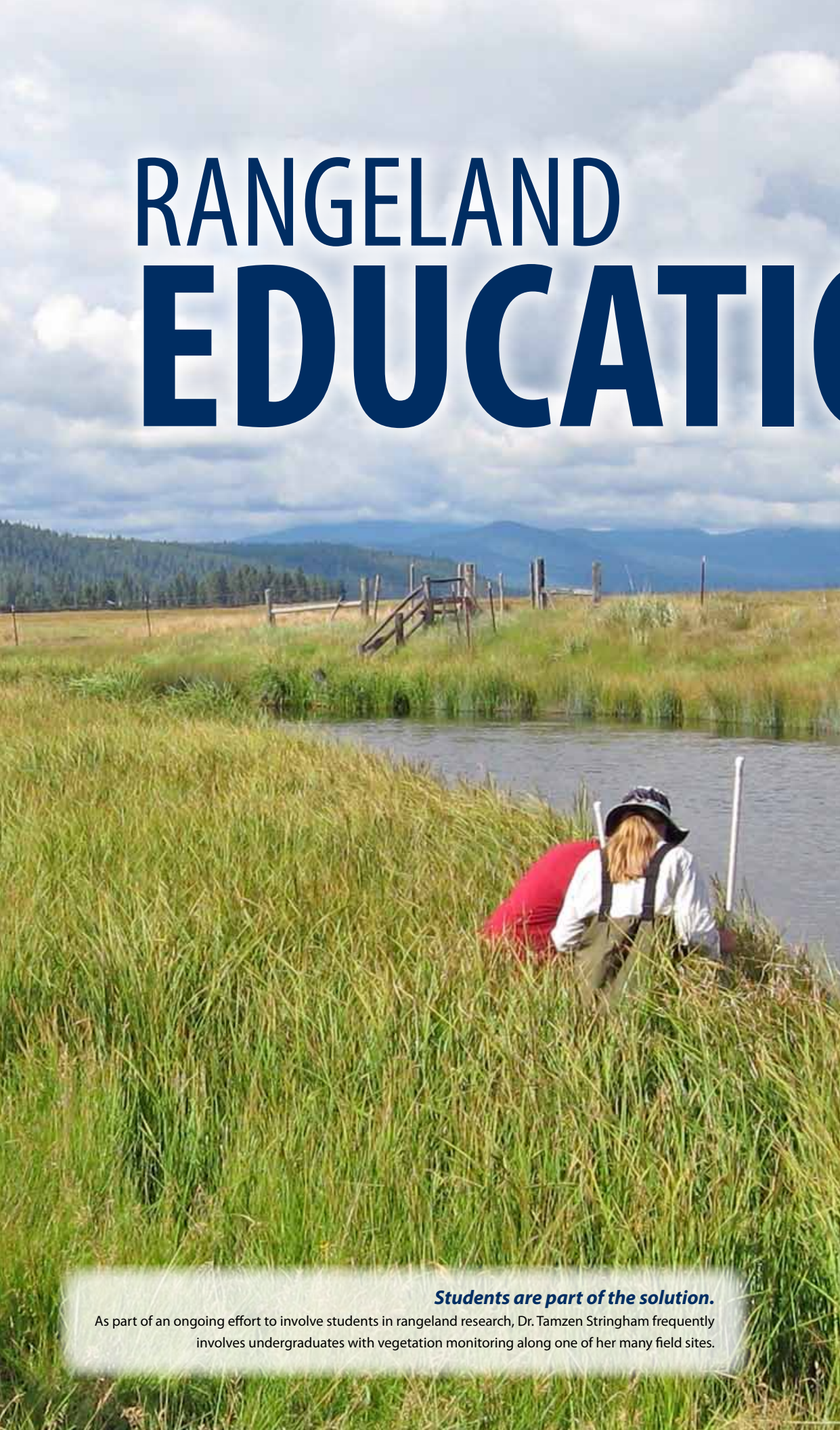


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RANGELAND EDUCATION



Students are part of the solution.

As part of an ongoing effort to involve students in rangeland research, Dr. Tamzen Stringham frequently involves undergraduates with vegetation monitoring along one of her many field sites.

▶ THREE DEPARTMENTS

- Biochemistry & Molecular Biology
- Natural Resources & Environmental Science
- Agriculture, Nutrition & Veterinary Sciences

▶ THREE NEW MAJORS

- Agricultural Science
- Rangeland Ecology & Management
- Forestry Management & Ecology

TODAY NEW DEGREE OPTIONS

IN THE PAST FEW YEARS, the College of Agriculture, Biotechnology and Natural Resources – and the University as a whole – has faced unprecedented budgetary challenges. Throughout this time, the priorities have been to preserve vital research programs and degree programs that chart career paths for students. Continuing to serve these priorities are the college's Department of Biochemistry and Molecular Biology and the

Department of Natural Resources and Environmental Sciences (NRES). A third, new department is aimed at meeting the Great Basin's changing needs for workforce and environmental solutions directed toward agriculture and rangeland. In addition to traditional degree programs in nutrition and pre-veterinary sciences, two new degrees are now offered through the new Department of Agriculture, Nutrition and



Veterinary Sciences (ANVS): an Agricultural Sciences degree and a Rangeland Ecology and Management degree. Additionally, NRES will jointly sponsor the Range Ecology and Management degree, while revamping and renaming the Forestry Management and Ecology degree. Significant input from industry, faculty and other stakeholders contributed to the development of these degrees.

"We've realigned departments to build new offerings for students, developed these new or revamped majors and both strengthened and created new synergies between departments and the ag and rangeland community," Ron Pardini, dean of CABNR, said.

Agricultural Science is an innovative major that enables students to design a curriculum to either emphasize agriculture business and economics or agriculture production and science.

The new interdepartmental Rangeland Ecology and Management program was developed between the new ANVS and NRES. This curriculum was specifically designed to meet accreditation standards of the Society of Range Management.

A third new program in Forestry Management and Ecology within the NRES allows student to

specialize in Sierra forests with emphasis in ecology and restoration.

Additional efforts are underway to build a consortium of range expertise from universities across the western United States. A faculty committee led by the University of Nevada, Reno, and with representation from numerous western universities, is in place and is working on a multi-state grant proposal (see page 9) to coordinate sharing of range courses across universities.

It is anticipated that the consortium will enhance the range programs at member universities using existing resources and may lead to possible hands-on learning experiences at the Gund Ranch in Austin, Nevada. There, students can participate in research to explore the interaction of commercial livestock

production with wildlife management on private-public rangelands.

With the three new majors and the collaboration of western universities, the College of Agriculture, Biotechnology and Natural Resources is looking to innovate education for the future.



STUDENTS COLLECTING NATIVE SEED, COURTESY OF BARRY PERRYMAN

Agricultural Science is an innovative major that enables students to design a curriculum to either emphasize agriculture business and economics or agriculture production and science.

With the three new majors and the collaboration of western universities, the College of Agriculture, Biotechnology and Natural Resources is looking to innovate education for the future.

SOCIETY FOR RANGE MANAGEMENT

University of Nevada Student Chapter

► RANGE-RELATED STUDENT CLUBS AT NEVADA

- CABNR Student Ambassadors
- Collegiate FFA
- Ecohydrology Club
- Pre-Vet Club
- Student Association for International Water Issues
- American Fisheries Society
- Student Chapter of the Wildlife Society

IT'S PLANT LIFE, WILDLIFE, soils and much more. The Society for Range Management (SRM) is a professional scientific society and conservation organization whose members are concerned with studying, conserving, managing and sustaining the varied resources found on rangelands.

Established in 1948, the SRM has about 4,000 members in 48 countries, including many developing nations. SRM's members are land managers, scientists, educators, students, producers and conservationists – a diverse membership guided by a professional code of ethics and unified by a strong land ethic.

The University of Nevada, Reno has a student chapter of the SRM called the Nevada Section, which

also has members concerned with rangeland issues. Activities include social gatherings, service projects, and fundraising.

The mission of the University Student Chapter is to foster the advancement of the science and art of managing rangelands. The emphasis is within the state of Nevada, but the group's concerns transcend state and national boundaries. The Nevada Section promotes enhancing the conservation and sustained use of natural resources and ecological services present on rangelands that are required to support the high standard of living.

The Nevada Section attempts to do this by stimulating discussion and understanding of scientific and management problems and issues on public and private rangelands. The Nevada Section serves as a medium for the exchange of facts, knowledge, concepts, and ideas among Section members, and between rangeland professionals and the broader public. Their ultimate goal is to improve management on rangelands in Nevada so that natural resources desired or required throughout the Society for Range Management are available to all, in perpetuity.

For more information, visit:
http://www.cabnr.unr.edu/students/clubs_organizations/range.aspx.



MONITORING VEGETATION FOR ECOLOGICAL SITE DESCRIPTION, COURTESY OF TAMZEN STRINGHAM

Rangeland Education Across Institutions

Rangelands are incredibly dynamic and intriguing places to work. The profession of rangeland management attracts people who want to work in the grasslands, shrublands, woodlands and deserts we know as rangeland.

In a rapidly changing time of demands for rangeland resources and ecosystem services, the workforce to manage these lands is shrinking and aging. Data show that the workforce necessary to manage rangelands is diminishing, and there are comparatively few students to meet workforce needs in rangeland management.

Who will fill the shoes of today's range managers? Universities are facing tremendous budget reductions and the capacity to offer excellent undergraduate rangeland education is declining. Rangeland science is unique in the broader scope of the ecological sciences, focusing not only on rangeland ecology but also on integrating ecological knowledge into land management decisions. Traditional uses of rangelands such as livestock grazing and mineral extraction continue while the demands for recreation opportunities and green energy development—geothermal, wind, solar, biomass—are escalating.

A multi-institution effort is underway to meet these challenges. The goal is to revitalize and coordinate rangeland curricula across universities in the West and to increase the number of students, both degree and non-degree seeking, ultimately increasing the number of well-trained professionals who will manage the rangelands of the world. By coordinating curricula and courses, along with a platform of delivery approaches to attract diverse students, these institutions are helping to prepare the knowledge and skills to manage rangelands in the future.

The University of Nevada, Reno, as a partner in this effort, is reshaping its rangeland ecology degree requirements in comparison to the Society for Range Management requirements for program accreditation. The result is that traditional on-campus students, including those attending universities that cannot offer the suite of rangeland courses necessary to qualify for rangeland management positions, will have access to a greater set of courses offered in alternative formats.

Collaborating institutions include the Great Basin College, Humboldt State University, Idaho State University, Montana State University, Oregon State University, University of Alaska, University of Arizona, University of California - Berkeley, & University of Wyoming – with many others invited to participate in this new degree offering. With this program, range graduates will be prepared to engage the emerging issues in the management of the world's rangelands.



RANGELANDS WEST

The Western Rangelands Partnership is building the Rangelands West Web portal as part of the Agriculture Network Information Center (AgNIC) initiative. Extension professionals and librarians from 19 western land-grant institutions, including the University of Nevada, are working together to provide access to authoritative information and answers to questions about rangelands. Topics online include:

- Rangelands and how they work
- Plants and animals
- Soils and water
- Climate, drought and fire
- Grazing, recreation and wildlife
- Vegetation management
- Rural communities
- Ranch economics
- Training, teaching and careers

▶ VISIT:

<http://rangelandswest.arizona.edu/rangelandswest/>





RANGELAND RESEARCH

Research is a cornerstone of the land-grant mission

Wildfires in Nevada take a heavy toll on wildlife, range productivity and species biodiversity. Fire, a natural process, and prescribed burns can restore plant communities when woody vegetation exceeds sustainable level. Nevada scientists are researching invasive plants, grazing economies, wildfire histories and range management practices.



COURTESY OF TAMZEN STRINGHAM

TAMZEN STRINGHAM

Department of Agriculture, Nutrition and Veterinary Science

www.cabnr.unr.edu/anvs/

PORTER CANYON

An Experimental Watershed

THE PORTER CANYON Experimental Watershed, located on Smith Creek Ranch, is the first and only fully instrumented experimental watershed in Nevada. This research is the result of a collaborative project between the University and USDA-ARS Great Basin Rangelands Research Unit in Reno, Nev. Researchers include Dr. Tamzen Stringham, Dr. Craig Carr, and Erica Freese with UNR, as well as Dr. Mark Welts and Dr. Keirith Snyder with ARS.

A goal of the Porter Canyon project is to determine the impact of deploying a conservation practice – tree cutting – on a pinyon-juniper dominated watershed to facilitate the reestablishment of a historical sagebrush plant community in order to meet wildlife and livestock forage needs.

A second goal of the project is to quantify the impact of pinyon-juniper treatment on the hydrologic budget and soil erosion potential. By removing the trees, water may be captured and put to beneficial use. Increased spring flow and increases in ground water recharge could lead to changes in plant community composition and annual production in the meadow.

Smith Creek Ranch, with the help of the U.S. Fish and

Wildlife Service, treated approximately 200 acres of woodlands within the 230,000-acre project area. Another 33,000 acres are proposed to be treated in the next five to seven years. There have been several accomplishments to date: researchers have instrumented 28 wells in order to acquire continuous water level measurements. More than 120 acres of woodlands have been treated to begin observing the effects on sagebrush communities, evapotranspiration, soil moisture and erosion.

Partners include BLM's Carson City and Battle Mountain districts, the USDA-Natural Resources Conservation Service, U.S. Geological Survey, USDA-Agricultural Research Service, the Nevada Department of Wildlife, University of Nevada, Reno, University of Nevada Cooperative Extension and Smith Creek Ranch, LLC.

About \$500,000 in cash and in-kind support has been donated and provided for the project.



SOIL EROSION STUDY AT THE SMITH CREEK RANCH. IMAGE COURTESY OF TAMZEN STRINGHAM.

THE WINTERS RANCH: WATER AND PLANTS

Research partnership aids open-space planning and wildlife habitat

THE VALLEY BETWEEN Reno and Carson City is noted for its green ranchlands, Washoe Lake and the majestic Sierras. At the northwestern tip the valley is the Winters Ranch, a property managed by the Bureau of Land Management (BLM).

Previously the ranch home of Theodore and Maggie Winters and their children, the Winters family raised race horses on the property, in addition to raising beef cattle and operating a large dairy in the late 19th century. The property, adjacent to Highway 395, was recently acquired by the BLM for open space and recreation.

There has been substantial urban growth in Washoe County in recent decades. The publicly owned Winters Ranch, however, offers open space and wildlife habitat in an area with increasing population density. The ranch was previously grazed and irrigated, but removing grazing and irrigation from the property has altered the property's plant communities. Because of the site's new open-space designation, science-based information was needed to best understand how to transition this once agricultural land to a public property.

The BLM called upon University researcher Tamzen Stringham, professor in the Department of Agriculture, Nutrition and Veterinary Science, for help.

The result was a research partnership that is helping to develop plans for the ranch's future.

Stringham and rangeland botanist Erica Freese mapped ground-water-plant relationships at the

ranch in order to best manage the property's natural resources for future use. Plans for management treatments, such as herbicides and controlled burning, are being developed to help promote the desired plant community. Stringham has extensive experience in riparian and

rangeland restoration and management. Her studies have been used at numerous meadow sites around the West over the last 15 years.

"This research will facilitate BLM's goals of understanding the ecological processes occurring on Winters Ranch and the impact these processes have on wildlife habitat," Stringham says.

Although the project is local to northern Nevada, Stringham says data will also be used outside of the state in order to benefit lands that were once irrigated agricultural lands and are now in transition.

"Increasing knowledge of plant community dynamics will also enhance understanding of other meadow locations in the West where irrigation is removed or where there is a decline in the water table," Stringham explains.

This project shows that research partnerships even at the local level can have broader impacts. It is the nature of collaboration among researchers and government agencies that allows for this to occur.



WELL DRILLING AT WINTERS RANCH

"Increasing knowledge of plant community dynamics will also enhance understanding of other meadow locations in the West where irrigation is removed or where there is a decline in the water table."



COURTESY OF FRANCO BIONDI

FRANCO BIONDI

Department of Geography
College of Science
dendrolab.org

CLIMATE CHANGE AND FIRE

Students and faculty tackle hot issue in the Great Basin

RECORDS OF PAST climate and wildfire variability in the Great Basin are needed not only for fire use, but also for understanding the mechanisms behind the century-long expansion of pinyon-juniper woodlands.

Nevada researchers have addressed this issue by looking in detail at specific aspects related to climate change and fire. Led by Franco Biondi in the Department of geography within the College of Science, researchers have focused on the Great Basin's fire history, evidence found in tree rings, analyses of fuels in pinyon-juniper woodlands and changes to pinyon-juniper over time.

FIRE HISTORY

In the Mount Irish area of Lincoln County is a remote mountain ecosystem between the Great Basin and the Colorado River Basin. Non-scarred ponderosa pines and single-needle pinyons

were used by researchers to develop a tree-ring reconstruction of drought from 1396 to 2003.

A hypothetical fire regime was obtained from assumed relationships between climate and wildfire occurrences. A census of fire-scarred trees was then sampled at the study area, and cross-dated with fire-scar records which were used to generate the fire history.

"The results indicated that less favorable climatic conditions, not post-settlement fire management, were responsible for reduced wildfire occurrence in the modern era," Biondi says.

"The fire history showed lower fire frequency after Euro-American settlement, which most likely displaced Native people and any deliberate use of fire, but did not introduce publicly organized suppression in the area."

Other research indicates that Mount Irish is more susceptible to a severe crown fire.

WHAT BIG SAGEBRUSH CAN TELL US

That's not all. Big sagebrush growth rings can be used to reconstruct environmental changes in areas where there is little information available.

Using accelerator mass spectrometry radiocarbon dating, these researchers revealed hidden information about the Great Basin's environmental changes over time.

"Wood layers in big sagebrush can tell us a lot," Biondi explains.





“Our research confirmed the annual nature of growth rings formed by big sagebrush, and this will facilitate the creation of records of environmental change, such as wildfire regimes, in Great Basin valleys.”

A TREE-RING BASED FIRE HISTORY

Another study in Lincoln County found that, in the Clover Mountains, human fire suppression activities may be the cause of this fire gap in the last 60 years, which suggests the Clover Mountains are moving outside their historic range of variability.

Using fire scars from ponderosa pine trees fire history was reconstructed back to 1785 and examined fire frequency, fire extent and fire severity through time.

“Historically, the Clover Mountains were dominated by frequent, low severity fires,” Biondi says. “Fires were often large, with half the fire events scarring greater than 10 percent of trees. Visual and ecological evidence on the landscape suggests the 1946 fire

may have been a high severity event.”

PINYON-JUNIPER: PRE- AND POST-SETTLEMENT

Lastly, graduate student research results showed that density of pinyon pine at both sites - Mount Irish and the Clover Mountains - has more than doubled since Euro-American settlement. An increase in the survivorship of pinyon pine was observed at both sites.

Data show that pre-settlement trees occur throughout each site, particularly at Mount Irish. Other studies in the Intermountain West have shown similar survivorship trends in pinyon-juniper woodlands.

This research shows that Euro-American influences on the landscape have continued to have a profound effect on fire behavior in the Great Basin.

“If management goals are to prevent destructive fires, then careful examination of available options to modify existing fuel loads is recommended,” Biondi says.

This research shows that Euro-American influences on the landscape have continued to have a profound effect on fire behavior in the Great Basin.



COURTESY OF TOM HARRIS

▶ **TOM HARRIS**
 University Center for Economic
 Development
www.cabnr.unr.edu/uced/

ELKO LAND GRAZING

An analysis of the economic impacts

WITH HARD ECONOMIC times, limiting the areas and occasions ranchers can have access to grazing land means there will be an increase in costs and a reduction in profits for ranch operations.

According to researchers in the University's Center for Economic Development, leased Bureau of Land Management (BLM) and U.S. Forest Service (USFS) land are an integral part of ranch production in Elko County, which has over 70 percent or nearly eight million acres of federally managed land.

A previous survey of ranches in northeastern Nevada found only four out of 56 ranches did not use federal land for grazing. On average, the ranches used federal rangeland to provide 49 percent of the feed requirements for their animals. Because of the multiple use character of federal BLM lands, reduction of availability of grazing is often under consideration.

For example, changes in federal

grazing land management have been under consideration in Elko County because of concerns over wildlife habitat for Lahontan cutthroat trout, sage grouse and other species.

"It is clear that reducing access to available animal unit months (AUMs) of grazing will increase costs and reduce profits for ranchers in Elko County," says researcher Tom Harris. "University research quantifies these losses to ranchers and the local economy."

Recent research by the University's Center for Economic Development (UCED), a center associated with the College of Business in partnership with NAES and UNCE, found that cattle sector exports bring money into the Elko County economy which then cycles through the economy. This process helps support other sectors, such as local wholesalers and retailers, and by providing wages to employees.

Recent UCED studies have



shown the variability that exists within the Elko County agricultural sector and has validated the importance of the cattle ranching and farming sector on the county's economy.

"Not only is sectoral output, employment, and labor income important, but the degree that the cattle ranching and farming sector participate in the economic base of Elko County is of equal or greater importance," Harris says.

Also, the degree of economic linkages the cattle ranching and farming sector has on the Elko County economy is critical - the

economic, employment and labor income linkages and impacts of these industries go beyond its own sector.

"The changes in economic activity by the cattle ranching and farming sector in Elko County from weather, cattle prices or public land management will greatly impact the economy and other sectors in the Elko County economy," Harris says. "Also changes in public land policies may yield higher variability in agricultural input purchase patterns and net incomes to the Elko county agricultural sector."

"It is clear that reducing access to available animal unit months (AUMs) of grazing will increase costs and reduce profits for ranchers in Elko County."

▶ QUICK FACTS

Cattle Production in Elko County

- Elko County has over 70 percent or nearly 8 million acres of federally managed land.
- Beef cattle inventories have fluctuated over the past 30 years but have displayed an overall downward trend.
- Sales of cattle made up more than 95 percent of the county's livestock receipts.
- Net farm proprietor's income totaled \$11.5 million and incorporated farm income was \$18.3 million in 2004.
- The average ranch size has decreased from 8,745 acres in 1987 to 6,227 in 2002.
- Variability of ranch profits increased as reductions in federal AUM (animal unit month) availability increased.
- There were an estimated 847,000 permitted AUMs in 2006.
- Approximately 85 percent of these were on BLM allotments with the remaining on the Humboldt-Toiyabe National Forest.
- Using information per AUM, the permitted 847,000 federal grazing AUMs in Elko County could generate \$32.6 million in cattle production, \$57.3 million in total economic activity, \$11.4 million in labor earnings and 553 jobs.
- One AUM of federal grazing land in Elko County can be associated with as much as \$84 in value of cattle production.
- Total economic impacts from one AUM of federal grazing are associated with as much as \$148 of total economic activity, \$30 of labor earnings and 0.0014 jobs (this implies one job per 714 AUMs of federal grazing).
- Total labor income associated with all permitted federal AUMs would be \$25.0 million representing 1,212 jobs.



COURTESY OF ELIZABETH LEGER

▶ **ELIZABETH LEGER**
 Department of Natural Resources and
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CHEATGRASS

Can native plants respond to invasion?

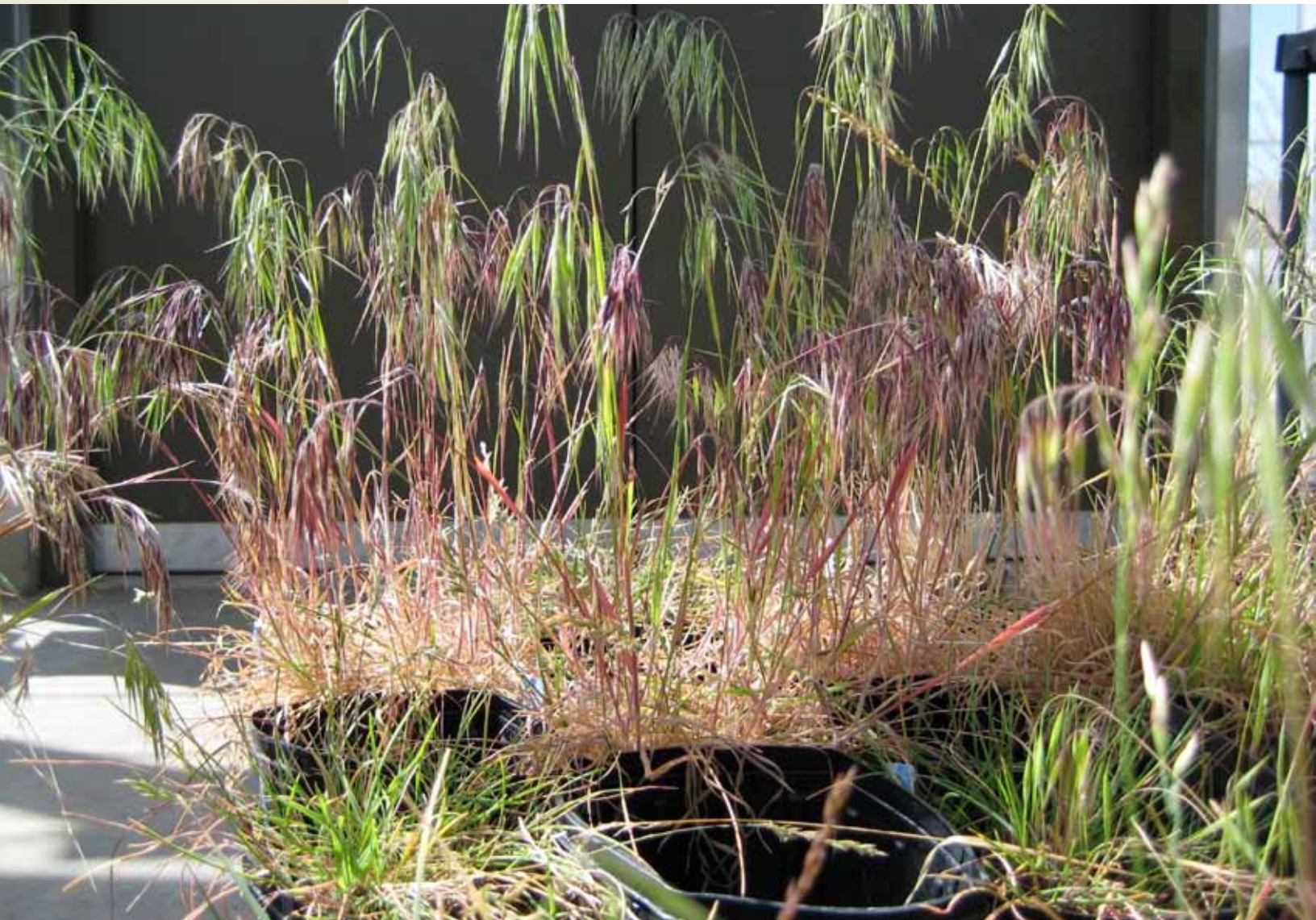
CHEATGRASS HAS INVADDED the Great Basin, and people of all walks of life from homeowners to plant ecologists have attempted to understand how this invasion happened.

“Changes in the species composition of plant communities may alter patterns of natural selection occurring within them,” says Elizabeth Leger, plant ecologist in the College of Agriculture, Biotechnology and Natural Resources.

Leger is interested in the

population biology of plants and works on local adaptation and rapid evolution of native and invasive species. She is looking into how genetic variation affects the distribution and abundance of species.

“Native perennial grass communities in the Intermountain West are experiencing a shift from domination by primarily perennial species to an exotic, annual grass,” she says. “Traits that confer an advantage to perennial grasses in the presence of novel





COURTESY OF ELIZABETH LEGER

"Native perennial grass communities in the ... West are experiencing a shift from domination by primarily perennial species to an exotic, annual grass."

annual competitors may increase in invaded communities. Our research shows that increased abundance of adaptive traits are apparent in populations of a native perennial grass – big squirreltail in particular – exposed to cheatgrass competitors."

On one research project, Leger looked at the impact of cheatgrass on big squirreltail. Dormant big squirreltail plants were collected from cheatgrass-invaded and uninvaded sites near Bordertown, Calif. These plants were split in two, then transplanted into pots in a greenhouse. One half was grown with competition from cheatgrass, and the other half was grown without competition.

Plants collected from invaded sites responded more quickly to watering, growing more leaves in the first 10 days after transplanting.

In addition, big squirreltail plants collected from invaded areas experienced a smaller decrease in plant size when grown with competition than did plants collected from uninvaded areas.

"While there were fewer big squirreltail individuals in the invaded sites, they were more competitive with cheatgrass than were the more abundant big squirreltail plants in nearby uninvaded areas," Leger explains "If hot spots of rapid evolutionary change can be identified within invaded systems, these areas should be managed to promote desirable change. And the areas could serve as possible sources of restoration material or reveal traits that should be prioritized during the development of restoration seed material."



COURTESY OF BARRY PERRYMAN

BARRY PERRYMAN

Department of Agriculture, Nutrition and
Veterinary Sciences
www.cabnr.unr.edu/anvs/

"Fall grazing is more logical because the cows consume it all the way including the litter, thus helping reduce cheatgrass the following years."

CHEATGRASS CONTROL

University collaborates with BLM research to improve management of annual invasive weed

By Schirete Zick

Bureau of Land Management

WHEN IT COMES to cheatgrass, finding the most beneficial way to manage the annual weed has been a goal of rangeland ecologists and ranchers alike. Thanks to new research by Nevada scientists, light is being shed on how cattle can help manage the grass by grazing it in the fall.

"Several theories have prevailed throughout the years regarding cheatgrass," says Jerry Smith, district manager for the Bureau of Land Management's Battle Mountain District. "You had to graze it in the spring when it was green, and once it dried out, it had no nutritional value to livestock."

Some people believe cows won't eat dry cheatgrass.

"Now, an experiment by University of Nevada scientists and rangeland researchers Barry Perryman and Ben Bruce dispels these theories," Smith says. "Perryman, who is a member of the BLM's Northeastern Resource Advisory Council, demonstrated that cheatgrass can be significantly reduced with the use of fall grazing. I believe it is important to bring the research to the attention of the public."

Perryman, who is an associate professor of rangeland ecology in ANVS and Bruce, who was an associate professor of rangeland

animal nutrition, conducted the experiment between 2006 and 2009 at the Nevada Agricultural Experiment Station's Gund Ranch near Eureka, Nev.

The results showed reductions from 500 lbs. of cheatgrass biomass per acre to 90 lbs. of cheatgrass biomass per acre when cattle grazed in the fall season.

"In subsequent years, we reduced the cheatgrass to less than 90 lbs.," Perryman says. "With the reduction in wildfire potential came improvement in perennial grass production. Over the course of the study, production of perennial grasses increased from 45 pounds per acre to 577 pounds to the acre."

Perryman and Bruce began the research to investigate whether or not previously held theories regarding cheatgrass were true. Only grazing cheatgrass when it is green seemed like an impractical solution for large-scale control, according to Perryman.

"You can't get enough animals to graze it all, you don't know when it is going to be green, making it difficult to plan, and you don't know how many animals to bring to an area before it is too late," he says.

"The notion that animals don't eat dry cheatgrass is incorrect," he

adds. "Our experiment showed that once the seeds fell off the plants, cheatgrass became palatable."

Perryman also ruled out the notion that dry cheatgrass has no nutritional value.

"The protein content and energy of cheatgrass in the fall is at least as good, if not better, than perennial grasses. And the results were consistent through the four-year study. We analyzed the cheatgrass in the lab. The protein level fluctuated between 3.5 percent and 6 percent, but never went below the 3.5 percent. Energy levels measured 45 percent and above."

Perryman and Bruce began their research by shifting the calving cycle to later in the season. They found that using this system would benefit ranchers, the rangeland and other wildlife.

"Fall grazing is of great benefit to ranchers, giving them another source of forage that previously was not considered nutritious," Bruce explains. "Also, decreasing cheatgrass increases perennial grass growth."

"We made sure that the cows were in the second trimester before putting them on a cheatgrass diet. This time in their production cycle is less nutritiously damaging. We supplemented their diet with

Anipro liquid protein just as ranchers do when grazing with local perennial grasses in the fall."

Bruce points out that liquid protein supplements not only stimulate the cattle's appetite, but also keeps them in a specific area where the cheatgrass is located.

"Protein stimulates the microbes in the rumen and increases the cattle's appetite to consume the cheatgrass," he says. "When we entered the study, we didn't know what condition the cows were going to be in after 30 to 60 days of a cheatgrass diet. We didn't want them to lose weight. We found that the cows either maintained their weight or gained weight."

Perryman and Bruce maintain that fall grazing will help reduce the fire danger and the spread of cheatgrass.

"Fall grazing is more logical because the cows consume it all the way including the litter, thus helping reduce cheatgrass the following years. It's also easier because you know where the cheatgrass is and how much of it there is," Perryman says.

To Jerry Smith, who has dedicated his 34-year career with the BLM to managing natural resources, the research shows great promise in the fight against cheatgrass.

Two Benefits to Fall Grazing

The hazard of cheatgrass is twofold, says Jerry Smith, district manager for the Bureau of Land Management's Battle Mountain District. "It comes up earlier than most perennial grasses, stealing resources like water and nutrients needed by other grasses, which provide forage for wildlife. Secondly, once cheatgrass dries, it is highly flammable and becomes a fire hazard."

Doug Furtado, field manager for BLM's Mount Lewis Field Office, agrees with the research results, but points out that it is important to remember that effective grazing of cheatgrass must be accompanied and supported by the appropriate level of livestock management.

Doing away with prevailing theories about cheatgrass through scientific research gives ranchers, rangeland conservationists and wildland fire managers hope that the war on cheatgrass is on its way to being won.





COURTESY OF BOB NOWAK

▶ BOB NOWAK

Department of Natural Resources and
Environmental Science
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GLOBAL CHANGES IN ARID ECOSYSTEMS

Strengthening U.S.-Asian partnerships in science and education

ARID LANDS OCCUPY extensive areas of the planet and are important in regional and global processes. Although the understanding of arid-land ecology is low, global comparisons of arid ecosystems have advanced the sciences.

“The central theme of global change ecology addresses important national and state agricultural priorities,” says Bob Nowak, professor of plant physiological ecology in the Department of Natural Resources and Environmental Science. “This theme ultimately benefits rangeland management in arid ecosystems, such as in the Great Basin.”

To better understand global connections in these ecosystems, University researchers have collaborated with institutions in China and Turkmenistan that investigate responses of arid ecosystems to global changes.

Arid ecosystems are sensitive to global changes such as global warming, elevated carbon dioxide and invasive species, Nowak says. These factors interact in complex ways that challenge students and scientists to understand underlying mechanisms and ecological impacts. Because the success of international programs requires a common understanding between the United States and international faculty, one objective of the collaboration between the University of Nevada and China is to cultivate understanding through faculty exchanges.

The research uses the theme of invasive plants to enhance collaborations between the U.S. and Chinese scientists interested in arid lands. Nevada’s participants include range scientists and plant ecologists, including Barry Perryman, Elizabeth Leger and Peter Weisberg in an interdepartmental collaboration.

Nevada researchers are looking at species that are native to Xinjiang and that are invasive in the Great Basin, and vice versa.

Broader impacts of this project are twofold. Proposed activities build research capacity in both the United States and China by assembling a team of scientists who will simultaneously test hypothesis for native and invasive plants in both native and invaded communities. The activities will also build human scientific capital, especially related to ecology and natural resources with an international component.

U.S. undergraduate research interns from the University will conduct dominance measurements in China alongside peers and role models, which increases cultural awareness and international perspectives for these students. To impact a larger number of people, students and scientists in the host country structure workshops to maximize





“The central theme of global change ecology addresses important national and state agricultural priorities.”

ROOTS

Comparing invasive annual grasses and native Great Basin perennials

THE GREAT BASIN is an arid to semi-arid region and is experiencing rapid invasion by exotic plants such as cheatgrass, medusahead and goatgrass.

Cheatgrass is among the most widespread and successful of these invaders, and many of the ecological mechanisms to explain its success can be linked to its root system.

University researchers Elizabeth Leger and Bob Nowak of NRES, along with graduate student Scot Ferguson, have found one major root system difference between cheatgrass and the other annual grasses: cheatgrass produces the greatest amount of fine roots in the top layer of soil, where the majority of rooting occurs and where competition for seedling establishment is important.

“Water is the most limiting resource in arid lands, and the deployment of roots in these ecosystems may be a key strategy for successful invasion and dominance,” Nowak says. “Previous studies indicate that cheatgrass has a high root growth rate compared to natives and is able to branch and create lateral root development in response to low soil water conditions.”

Although cheatgrass, goatgrass and medusahead showed no difference in their ability to rapidly utilize deep soil resources, the Nevada researchers found that the ability of cheatgrass to simultaneously extend roots to deep soil depth, as well as dominate the upper soil, may be a trait that allows it to out-compete other plants, enabling the greater spread of cheatgrass as an invasive weed.



COURTESY OF JIM SEDINGER

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SAGE GROUSE IN THE NEW AMERICAN WEST

THE GREATER SAGE GROUSE is a large ground-dwelling bird found at higher elevations. It depends on sagebrush for cover and food, making Nevada's landscape ample living territory.

However, wildfires in the area and habitat degradation have caused the U.S. Fish and Wildlife Service to declare that the sage grouse deserves protection under the Endangered Species Act. But with other threatened species precluding the sage grouse, it has been placed on the waiting list.

The precarious balancing point described in a recent announcement has created a collaborative spirit among a variety of groups who are interested in making sure that the sage grouse is not added to the endangered species list.

Conservationists and ranchers alike do not want to see the demise of this majestic, iconic species. It

would be like losing the elk or pronghorn antelope, which are so important to Nevada's sagebrush ecosystem.

On the other hand, there is a growing body of individuals and corporations

looking at the sagebrush ocean as an incredible renewable energy resource to harvest. A conflict has emerged between developing commercially viable green energy and protecting the Great Basin's threatened species. But the University's Jim Sedinger is among a group of people working to avoid such a conflict.

There is evidence that a collaborative spirit can prevail in the development of Nevada as "the Saudi Arabia of renewable energy," as Nevada's Senator Harry Reid calls it. Listing the sage grouse could bring development of wind, geothermal and solar power farms to a screeching halt. And therein arises a key motivation to saving the sage grouse.

The formation of the Sage Grouse Research Wind Collaborative is evidence of the cooperation developing to help the sage grouse. Sedinger has been involved in designing research to determine impacts of new wind facilities. Developing green energy will require new power lines across the state. The trouble comes when raptors, watching from high power line perches, start scaring the sage-grouse males off below the power line. Males flee before winning a mate, which can disrupt the grouse's natural reproduction patterns. Or ravens may use power line perches to search for sage-grouse nests.



COURTESY OF JIM SEDINGER



COURTESY OF JIM SEDINGER

Sedinger and his team count raptor flybys and document when they disrupt sage-grouse mating dances. They want to learn if and how these disturbances impact breeding success rates and consequently population numbers. They are also documenting the impact of ravens on female behavior and nesting success.

That's a lot of data to collect.

The transmission line in Sedinger's study, the Falcon-Gondor line, runs through prime sage-grouse habitat, meandering through a territory rich with sage-grouse lek sites, the areas to which the grouse return year after year to perform the spectacular mating dance for which the bird is so well known. Sedinger's team identified 13 leks within a 2500-square mile area around the transmission line.

The study is now in its ninth year, and Sedinger reports that the

jury is still out on the impact the power lines are having. Though 10 years may seem like a long time to collect the data, a cause and effect relationship is difficult to establish.

Given the potential impact the results from this kind of study will have on future management practices, getting it right is crucial. Sedinger sees his role as a neutral party in the collaboration.

What's at stake for him is to establish an accurate picture of what is going on with the sage grouse. Casual observations and hunches aren't enough, particularly when the stakes are so high: for the very survival of the sage grouse in Nevada, as well as for developers seeking commercially viable renewable energy.

Both objectives are crucial to Nevada, and Sedinger's research plays a role in determining how to balance these interests.



COURTESY OF PETER WEISBERG

▶ **PETER WEISBERG**

Department of Natural Resources and
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WOODLAND EXPANSION

Changes in the Great Basin landscape

TO THE CASUAL EYE, Nevada's tree-covered hills may appear fixed and constant. However, the woodland of mostly pinyon pine and juniper has been incredibly dynamic in its density and extent, over the several millennia since the pinyon pine colonized the region from the south.

Since the late 1800s, though, the cover of woodlands in Nevada has increased by as much as ten-fold. The increase in woodland cover, or "woodland expansion," has many possible causes.

Over-grazing in the late 19th and early 20th centuries reduced grass cover, which had the dual effect of reducing competition for tree seedling establishment and reducing the frequency of range fires. Both of these effects would favor expansion of the fire-susceptible pinyon and juniper trees.

Climate has also changed over this period, favoring expansion of tree cover particularly into higher elevations and onto more northerly aspects. Yet another explanation is that many trees were harvested or burned during the settlement period, and now we are seeing a natural regeneration in response to those events.

In short, there are a number of reasons to be concerned about woodland expansion in Nevada. Expanding woodlands increase the risk of intense crown fires from continuous cover of trees,

especially with the increasingly frequent regional droughts.

Over the past 20 years, the area of Nevada subject to wildfire has increased markedly, often leading to cheatgrass invasion at the lower elevations of woodland distribution. Where woodland becomes dense, there is very little fire-adapted native understory, leaving an "ecological void" for cheatgrass to invade following a major fire event.

Woodland expansion reduces habitat for species that depend upon sagebrush communities, such as sage grouse and pygmy rabbit. It may also increase soil erosion associated with lack of understory cover. In addition, it challenges the ranching way of life, as little palatable forage persists in the dense woodland.

Over the past seven years, the Department of Natural Resources and Environmental Science's associate professor Peter Weisberg's lab has investigated woodland expansion in Nevada using diverse resources including historical air photos and other documents, satellite images, computer models, tree-ring research and collections of field data over large areas. A primary interest has been to disentangle the puzzle of what has caused woodland expansion, especially where multiple potential causes likely work together.

Fire history studies show that



fires have been especially rare since settlement times. Other studies suggest climate change is important for expanding tree populations, particularly at higher elevations. Widespread, but often localized tree harvesting from 1870 to 1890 significantly reduced tree cover for many areas in northern Nevada, mainly to produce charcoal for the mining industry but also to provide cord wood. In these areas woodland expansion represents the process of tree recovery following impacts of tree harvesting.

Weisberg believes that time scale is important in whether we view the expansion process as tree recovery or tree invasion. In any case, improved knowledge of causes underlying woodland expansion leads to improved management recommendations. In collaboration with Robin Tausch of the USFS Rocky Mountain

Research, Weisberg and NRES graduate student Nathan Bristow have investigated the relative merits and effectiveness of chaining (mechanical tree removal) and prescribed fire treatment.

They found that prescribed fire had much longer-lasting effects on the plant community, leading to a sagebrush grassland community with very little tree establishment 40 years later, whereas chained sites never developed a substantial understory and quickly became tree-dominated again. However, prescribed burning brings increased risk of cheatgrass invasion.

Weisberg's ongoing research should provide more specific guidance – using computer models and GIS analysis – to land managers about where and what kinds of active management of pinyon-juniper woodland are most appropriate, depending on the management objective.

Over the past 20 years, the area of Nevada subject to wildfire has increased markedly, often leading to cheatgrass invasion at the lower elevations of woodland distribution.





OUTREACH



Reaching out to improve rangeland health.

University of Nevada Cooperative Extension Educator Rod Davis works with young adults in Nevada as part of the Bootstraps program. To date, the program has restored about 2,000 acres of sagebrush habitat by cutting down invasive trees.

“If you want to reverse the problem and get these young people back in school or in a job, programming has to be intensive and provide long-term support. That’s what Bootstraps does.”

BOOTSTRAPS

University program creates jobs, improves natural resources

By Jim Sloan

University of Nevada Cooperative Extension

YOU CAN FORGIVE ROD DAVIS if he gets a little excited about the Bootstraps program he and colleague Marilyn Smith have developed in recent years.

Bootstraps gives unemployed young adults in rural northern Nevada jobs and job training while they work on vital natural resource projects on public land. The program that is located in Battle Mountain, Tonopah and Hawthorne helps solve two big problems at once by teaching lasting life skills to idle youth while protecting Nevada’s rangelands from invasive vegetation.

“It’s not often that you get a two-for-one deal in our business,” Davis, an extension educator in Battle Mountain, says. “But I’ll take it any time I can get it.”

PROBLEM NO. 1

Rural Nevada counties have some of the highest rates in the nation of young adults from 18 to 25 years old who are not working and not in school. Approximately 30 percent of the families headed up by single mothers live below the poverty level in rural northern Nevada.

“The isolation of these communities contributes to the lack of resources available to the young people,” Davis says. “What you wind up with is a large number of

idle youth ‘hanging on the street corners,’ which makes them very visible to community adults.”

Smith, an area specialist in youth development in Elko, says Nevada has one of the worst records in the nation for teens successfully transitioning from youth to adult. These young people who drop out of school and then find themselves unemployed often wind up in jail or abusing drugs or alcohol, costing the state money.

“The economic impacts on the family and community of idle youth not capable of supporting themselves are obvious,” Smith says. “But if you want to reverse the problem and get these young people back in school or in a job, programming has to be intensive and provide long-term support. That’s what Bootstraps does.”

PROBLEM NO. 2

Besides the obvious need for a job program for rural Nevada young adults who are not successfully transitioning into adulthood, the involvement of Cooperative Extension in creating a plan for sage-grouse habitat restoration provided the synergy for the environmental focus of the work program. The idea for Bootstraps came along about the time that Davis was working with state and federal land managers

to figure out how to control the pinyon-juniper forests spreading out across the central Nevada range.

Pinyon-juniper has increased 10-fold in Nevada and the Intermountain West since the late 1800s, squeezing out other vegetation and the wildlife that need mountain brush. Once the trees move in, sterilizing the ground beneath them and causing critical topsoil to erode, it's difficult to get the lost shrubs, grasses and forbs to come back.

The biggest victim is the Nevada sage grouse, which is a candidate for the endangered species list. The sage grouse needs the diverse vegetation, bugs and perennial streams that are swallowed up by pinyon-juniper forests.

"When the heavens didn't open up and rain down money to fight the pinyon-juniper, we started looking at the old model of the

California Conservation Corps and the idea of a program that would train people and put them to work," Davis recalls. "It turned out there was a pretty big target audience for that kind of program."

So far, the Bootstraps crews have restored about 2,000 acres of sagebrush habitat by cutting down invasive trees. Outside Tonopah, crews have sprayed pesticides or otherwise removed weeds from nearly 550 acres of public land in Esmeralda, Nye, Lander and Eureka counties, protecting valuable rangeland from an infestation of plants that compromises wildlife habitat and rangeland health.

"And they aren't just flipping burgers," Davis says. "Seventy percent of these participants either wind up back in school or getting meaningful work. That's probably the greatest accomplishment we get from this."

RECOGNITION

The Bootstraps program has been noticed. A few years ago, a representative of Nevada Bighorns Unlimited, a group that works to increase populations of wildlife in Nevada, improve wildlife habitat, and promote hunting and outdoor sports, came across a Bootstraps crew installing a wildlife watering device in the mountains outside Battle Mountain.

On the spot he offered to make a donation, and since then NBU has pledged \$10,000 a year to the program. Other funds have come from BLM, the National Fish and Wildlife Foundation, the Nevada Division of Wildlife and the National Mule Deer Foundation.



STEWARDSHIP GROUP COLLABORATES AND EDUCATES

The Northeastern Nevada Stewardship Group (NNSG), formed in 1999, is a diverse community-based organization that includes area ranchers, miners, businessmen and multi-agency personnel. The group's goals include providing a community forum for scientific information/education related to healthy ecosystems and issue resolution through the collaborative process, and developing sustainable relationships and expectations that reduce conflicts, simplify and streamline planning and provide multiple use opportunities.

Educating group members as well as local citizens about natural resource management has been, and continues to be, a priority of the NNSG. The group has hosted numerous symposia and workshops that bring scientists, private citizens, public land users and agency personnel together to share and discuss information. A 2007 grant helped the group complete a watershed-scale conservation assessment of the Tuscarora Watershed/Sage Grouse Population Management Unit.

In 2009, NNSG received another and has contracted a watershed/scale conservation assessment for the North Fork Watershed/Sage Grouse Population Management Unit. Since 2001, NNSG has received four national awards for its collaborative approach to natural resource education and conservation.

FROM CONTROVERSY TO CONSERVATION

Working together to create a model for land stewardship

COTTONWOOD RANCH is a beautiful spread covering 1,200 acres of private land and 36,000 acres of Bureau of Land Management and Forest Service land where Cottonwood cattle graze. The country supports large meadows and pastures, sagebrush-grass vegetation in the lower elevations and a mixture of mountain shrub, aspen, curl-leaf mountain mahogany and conifers in the upper elevations.

In addition to cattle, the land also supports mule deer, antelope, elk and sage grouse. Trout and spotted frogs inhabit its streams and beaver ponds.

But in the early 1990s, disputes

over how that country should be used resulted in ranch managers and land management agencies having difficult conversations. There was a perception that cattle grazing on public land was negatively impacting sensitive riparian areas.

Out of that conflict, which has been repeated across the arid West on public rangelands for many years, arose a new way of dealing with conflict – a program called Collaborative Resource Stewardship. In the case of Cottonwood Ranch, a team of more than 40 people – from Cottonwood Ranch owners and workers to land management agency personnel,



COLLABORATIVE RESOURCE STEWARDSHIP TEAM MEMBERS AT COTTONWOOD RANCH. IMAGE COURTESY OF KENT MCADOO, UNCE.

private citizens, public land recreationists and local community leaders – began working together and making decisions based on ecological, social and financial considerations.

University of Nevada Cooperative Extension Range Resource Specialist Jay Davison and Natural Resources Specialist Kent McAdoo have been involved with the Collaborative Resource Stewardship program since 1999. Working together, ranch operators and range, wildlife and water experts from various state and federal agencies and the University of Nevada made recommendations to BLM managers to implement the following:

- Move larger herds of cattle over the landscape at a faster clip than in previous grazing strategies and alternate season of use, thus allowing grasses an increased opportunity to grow and regrow.
- Handle cattle in a low-stress fashion to allow them to move the herds more effectively and reduce long-term stress on the animals and the land and streams.
- Set up vegetation monitoring sites, including photo points that help managers react quickly if they see damage that needs to be prevented.

This holistic approach to land management has made the Cottonwood Ranch in northern Elko County a prime example of how public lands can be restored to vitality even while ranches improve their bottom line by

carefully managing a greater number of cattle. Today, miles of streams are functioning properly and those that were functioning at risk are showing improvement. What's more, a ranch that once could only support less than 100 cows now can support hundreds.

As a result of this collaborative stewardship approach, the successes at Cottonwood Ranch culminated in rancher owner Agee Smith winning the 2004 Cattleman of the Year award from the Nevada Cattlemen's Association.

But even before then, neighboring ranchers were eager to have the Collaborative Resource Stewardship program brought to their land. In 2000, the Boies Ranch also became a participant, bringing the total to 160,000 acres of public and private land in collaborative resource stewardship.

All told, McAdoo has worked with Cottonwood Ranch for 12 years and the nearby Boies Ranch for nine, co-leading field tours and teaching natural resource-related topics. Jay Davison, now an alternative crop specialist in Churchill County, and UNCE Range/Riparian Specialist Sherm Swanson have also worked for years with the Collaborative Resource Stewardship program.

McAdoo said an Environmental Assessment that evaluates this team approach is currently in progress for the Boies Ranch, but the team anticipates that the BLM will continue to recommend implementation of collaborative resource stewardship for the Boies Ranch's Hubbard-Vineyard allotment on a permanent basis.

This holistic approach to land management has made the Cottonwood Ranch in northern Elko County a prime example of how public lands can be restored to vitality even while ranches improve their bottom line by carefully managing a greater number of cattle.



THE TEAM

► The Creeks and Communities Team is part of a multi-state network focused primarily in the West. The Creeks and Communities Network was launched in 1996 by the Bureau of Land Management, the U.S. Forest Service and the Natural Resources Conservation Service. Its mission is cooperative riparian restoration and they strive to collaborate with all the stakeholders interested in riparian areas.



CREEKS AND COMMUNITIES

University personnel partner with stakeholders and agencies to help improve rural rangelands

TO THE UNTRAINED eye, the Nevada range looks like a sparse, dry land. But, Nevada's rangelands are interlaced with a system of streams that, when healthy or functioning properly, slowly drain surface water off the surrounding mountains and give that water time to seep into the ground.

The areas near streams and other waters – known as riparian areas – are critical to the overall health of the range. A healthy riparian area supports wildlife, streams and diverse vegetation. A properly functional riparian area captures, stores and safely releases water more slowly and for longer periods of time than one that has been incised by excess erosion. Because they can erode from the forces of water, riparian areas have been the focus of much attention.

For the last 14 years an interagency team has been working with Nevada ranchers and federal and state land managers on a program to keep riparian areas healthy and resilient.

The Nevada Creeks and Communities Team, led by State Rangeland Specialist Sherm Swanson, travels around the state teaching ranchers and federal and state agency officials about properly functioning riparian areas and what they can do to keep them healthy.

University of Nevada Cooperative Extension personnel, including Northeast/Central

Rangeland Resources Specialist Kent McAdoo and Extension Educators Gary McCuin of Eureka County, Steve Foster of Pershing County, along with Tamzen Stringham of the College of Agriculture, Biotechnology and Natural Resources, are also members of the team.

In addition to ranchers, their audience also often includes environmentalists, sportsmen, representatives of local, state and federal agencies, as well as others who own or oversee Nevada's rangeland.

"We try to convey that everyone wants a healthy riparian area that functions properly," Swanson says. "Some people haven't recognized the importance of that in the past and we've done many things to streams to cause them problems."

The team and land managers have brought about many improvements to the range. Livestock that once grazed riparian areas for long periods of time, and prevented the plants from recovering, are now rotated in and out during certain times of year to allow the stream areas to grow back.

Erosion problems caused by road cuts, which can channel streams, have slowly healed. Slowing down the flow of surface water and giving it a chance to seep into the aquifer nourishes native plants and allows riparian systems to recover. All of that is good

for livestock, fishermen, plants, wildlife and groundwater supplies, Swanson says.

“The wonderful thing about streams is that they can restore themselves,” Swanson explains. Ranchers had to learn new methods for managing their rangeland livestock, but most saw the advantages – surface water flowed longer into the warm months, ranches suffered fewer or less severe floods, their properties were more livable and in some cases animal production increased as livestock were able to stay on green feed longer than before.

“Many ranchers realize that in the long run healthy riparian areas are in their own best interest,” Swanson says.

The Creeks and Communities Team, which also includes biologists, soil scientists, botanists and hydrologists, helps ranchers and land managers learn how to conduct assessments of riparian areas and develop a plan for protecting or restoring them. Ranchers also serve on the team and provide historical perspective and other insights, Swanson says. Most years the team teaches three to five classes of up to 40 individuals.

“Many ranchers realize that in the long run healthy riparian areas are in their own best interest.”



“Nevada Youth Range Camp is a teenager's best opportunity to learn about Nevada's high deserts and mountain ranges.”

NEVADA YOUTH RANGE CAMP

by Sherman Swanson

In 1961, University of Nevada, Reno faculty Mike Kilpatrick and Joe Robertson invited high school age boys from around Nevada to camp for a week in Kingston Canyon to learn about rangeland management. Nevada Youth Range Camp (NYRC) has continued under the joint sponsorship of University of Nevada Cooperative Extension (UNCE) and the Nevada Section, Society for Range Management ever since. It became co-ed in the 1970s and has been steadily improved every year. Today, many former campers manage natural resources for their families, communities, or agencies.

NYRC focuses on relationships between people and rangeland. Campers learn about plants, wild-

life, water, and soil in order to make good decisions about rangeland management and use. They learn skills and explore careers in rangeland and related resource management. The camp challenges youth to explore resource problems and to create logical solutions. While one week does not create rangeland managers out of campers, it helps future leaders develop the perspective to understand rangeland resources.

The 51st Range Camp in 2011 involved 29 high school boys and girls from nine counties. During the week-long event, campers learned the importance of range plants, how to identify them, and their usefulness to livestock, wildlife, and watersheds. They focused on the connections between range soils and vegetation. Campers studied wildlife and learn about wildlife habitat conservation. Ranchers from Smith Creek Ranch took campers on a ranch tour and discussed range management as a business. Campers also used teamwork to develop and present a rangeland management plan and implement a conservation project.

While the camp is educational, it also offers an enjoyable outdoor experience. Activities include swimming, fishing, hiking, volleyball, horseshoes, campfires, photography and entertainment, along with ample opportunities for social interaction with peers and rangeland management professionals.



IMAGE COURTESY OF UNIVERSITY OF NEVADA COOPERATIVE EXTENSION

RANGE MANAGEMENT SCHOOL

University of Nevada Cooperative Extension's leadership has been instrumental in Nevada Range Management School. These ongoing workshops put on by an interagency team throughout central and northern Nevada allow university and agency experts to share current research on how to sustainably produce better forage for livestock while maintaining healthy rangelands for wildlife, recreation and other uses.

"The focus is on sustainability," says Kent McAdoo, a natural resources specialist with University of Nevada Cooperative Extension, who heads up the school. "It's designed to put ranchers and agency range conservationists on the same page."

Workshops focus on plant growth, animal nutrition needs and the importance of controlling timing and duration of grazing to maintain rangeland health and enhance livestock production. A workshop consists of one day in the classroom followed by a day in the field to look first-hand at successful range management strategies.

The course content, McAdoo says, emphasizes an uncomplicated approach to complex ecological concepts presented in a unified message by a team of interdisciplinary instructors led by the University of Nevada Cooperative Extension. Subjects include grazing plan strategies, riparian area management, grazing response indexes, animal nutrition, livestock behavior, ranch management examples and monitoring by permittees.

Other partners include the Bureau of Land Management, U.S. Forest Service, Nevada Department of Agriculture, U.S. Natural Resources Conservation Service, the College of Agriculture, Biotechnology and Natural Resources and the Nevada ranching industry.



EXTENSION EDUCATOR, BRAD SCHULTZ (LEFT), POINTS OUT IMPORTANT PLANTS FOUND ON THE RANGE, COURTESY OF UNCE

QUICK FACTS

Range Management School

Surveys show that most of the participants in the Range Management School came away ready to put new techniques and knowledge to work immediately on their own jobs and operations.

Here are some highlights from a professional paper, "Nevada Range Management School: an Impact Evaluation," presented at the 4th National Grazing Land Conference in 2009:

- 60 percent of the participants were agricultural producers, 29 percent were government agency resource specialists and 11 percent were consultants, academics and other land users.
- 71 percent indicated they have incorporated some or a great deal of the information they learned at the workshop in their current operation or job.
- 56 percent reported that they are now using techniques presented in the workshops.
- All said they gained an improved understanding of range plant growth, grazing timing and grazing duration considerations and grazing response index.
- 57 percent have created a grazing plan for their operation as a result of attending the workshop.

LAND STEWARDSHIP

The Smith Creek Ranch earns BLM's Rangeland Stewardship Award

“These stewardship efforts by ranchers are almost never trumpeted by the ranchers themselves.”

THE SMITH CREEK Ranch near Austin, Nev., owned by Ray Hendrix and managed by Duane Coombs, has implemented a wide variety of innovative livestock management practices that have enhanced sagebrush, aspen and riparian habitat. These efforts have been particularly effective in improving sage-grouse habitat on the public lands the ranch uses for grazing.

The ranch operators have worked closely over the years with rangeland experts from University of Nevada Cooperative Extension and the College of Agriculture, Biotechnology and Natural Resources. Eureka County Extension Educator Gary McCuin, who has worked with the Smith

Creek Ranch operators since 2003, said the ranch has benefitted from the removal of encroaching pinyon-juniper woodlands in nearby Porter Canyon. While implementing research projects on the effects of tree removal, researchers observed two shallow research wells began to flow and became springs within 40 days after a large stand of trees was removed.

“Increased water and physical removal of trees and decadent sagebrush has increased and will continue to increase the size of the wet meadow, which by definition increases lush vegetation for wildlife and livestock,” McCuin says. “None of this work would have been possible



if Duane had not pursued the agencies and worked for resource enhancement.”

The success at Smith Creek ranch represents what can happen when ranchers, land and wildlife management agencies work together, McCuin says.

Healthy, resilient rangelands are the key.

“If our rangelands are not actively managed through joint management efforts between the ranchers and the land and wildlife management agencies, biodiversity and associated productivity will continue to decrease through pinyon-juniper encroachment, invasion of noxious and invasive weeds, catastrophic wildfire, stagnation of sagebrush communities and many more challenges,” he says.

Smith Creek is just one ranch that is working closely with the University and agencies to establish sustainable land-management efforts. McCuin says Agee Smith at the Cottonwood Ranch in northern Elko County has been one of the most successful ranchers in this regard, and many more across Nevada are working on stewardship programs to protect both public and private rangelands.

“These stewardship efforts by ranchers are almost never trumpeted by the ranchers themselves,” McCuin says. Even worse, “they are rarely recognized or acknowledged by the general public ... (but) these collaborative stewardship efforts are critical to wildlife, rural economies and the

quality of life in the West, whether you live in the rural areas or urban centers.”

Researchers are studying how herbaceous production is affected when pinyon-juniper trees are removed. Tamzen Stringham of CABNR is monitoring the effect of pinyon-juniper removal on shallow groundwater and riparian meadows, and Mark Weltz with the Agricultural Research Service (ARS) is studying the effects of erosion caused by the loss of herbaceous species due to tree encroachment and decadent sagebrush. Graduate student Sam Lossing is also involved in the research, studying the interception of precipitation before it can get to the soil.

UNCE and CABNR Riparian and Range Specialist Sherm Swanson takes participants of the Nevada Youth Range Camp on a tour of Smith Creek Ranch every year, and the campers do a conservation project on the ranch. Three of the hired hands from the Smith Creek Ranch – including Lossing – have become students at the University.

“Along the way, I have had many discussions with Duane about riparian habitat and range management,” Swanson says. “Duane has always been very engaged in the conversations and is clearly putting his own and many others’ new ideas to the test on the land he manages with the ranch owners and the hired hands he mentors. He has had excellent presentations for the Range Camp youth and the staff.”

FEDERAL RECOGNITION

In presenting the Rangeland Stewardship Award, BLM Deputy Director Marcilynn Burke cited Smith Creek Ranch’s efforts to improve sage-grouse habitat. On March 5, 2010, the U.S. Fish and Wildlife Service announced that listing of the greater sage grouse as an endangered species under the Endangered Species Act (ESA) was warranted, but precluded by the need to complete other listing actions of higher priority.

“Proactive management in sage-grouse habitat is a high priority to prevent this species from becoming fully listed under the ESA,” Burke says. “Having grazing permit holders like the Smith Creek Ranch vested in this endeavor is imperative to providing healthy rangelands for future generations.”



WHY WEEDS ARE A PROBLEM

Weeds invading Nevada's rangelands have been known to:

- Ruin wildlife habitat by overcoming native vegetation and destroying wild animals' source of food and cover.
- Increase fire danger and greatly magnify the frequency, intensity and spread of fire. Weeds move onto rangeland after a fire has destroyed native vegetation or after it loses its resiliency. Once established, these weeds greatly increase the risk of future fires.
- Diminish water quality by outcompeting native streambank vegetation and encouraging erosion and sedimentation. Weeds may not provide shade and bank stability for streams and rivers. Stabilizing riparian vegetation is often needed to keep water temperatures cool, and provide fish habitat.
- Discourage recreational activities. One study by University of Nevada Cooperative Extension found that invasive weeds on Nevada public land costs the state \$6 million to \$12 million in lost recreational value.
- Threaten the economic stability of ranchers and farmers. Weeds can encroach on crops and replace native rangeland vegetation that cattle need for grazing.

WEED MANAGEMENT

Extension research and education tackles weeds across the state

NOXIOUS WEEDS are one of the most serious threats to Nevada rangelands. Weeds such as tall whitetop, medusa head, and dyer's woad have invaded thousands of acres of Great Basin rangelands and waterways and pose a serious threat to the ecological health of these lands. Cheatgrass, not contained when its population was low a century ago, now dominates tens of millions of acres, costing tens of millions of dollars for fire suppression, fire rehabilitation and impaired habitats.

In simplest terms, a weed is any type of plant that grows in places where it isn't wanted. Most weeds in Nevada can out-compete native plants and produce such a profusion of seeds that they spread quickly and easily if not immediately controlled.

EFFORTS TO CONTROL WEEDS

Various Cooperative Extension programs have brought greater weed awareness and knowledge to hundreds of farmers, ranchers, land managers and natural resource professionals who are often on the front lines of spotting and preventing weed invasions. Cooperative Extension's connections to these individuals — and its ongoing efforts to train new groups and share data with other agencies — have vastly improved efforts to monitor and halt the infestation of noxious and invasive weeds on Nevada lands.

Cooperative Extension has taught weed prevention in dozens of workshops around the state and has trained nearly 2,400 land managers on effective techniques for eliminating and preventing the spread of weeds. UNCE has established nine research and demonstration plots to explore the best ways to reduce the spread of weeds. Faculty members are developing a statewide Early Detection Rapid Response program, and UNCE faculty members are principal investigators in a multi-state program to prevent noxious weed invasions on Western farms and ranches.

Extension also consults with or helps form many of the more than 30 Cooperative Weed Management Areas located around the state. These groups coordinate efforts to survey, map and control invasive weeds, as well as providing public education and outreach programs to reduce the spread of weeds.

Faculty and staff teach workshops on safe pesticide use, weed management and rangeland restoration at a wide variety of programs, including landscape conferences, trade shows, conservation district meetings and grower conferences.

RESEARCH AND OTHER WORK

UNCE researchers have weed research and demonstration trials for perennial tall whitetop



CHEATGRASS-DOMINATED LANDSCAPE.

cheatgrass, medusahead, hoary cress, elongated mustard, African rue, foxtail barley, kochia and Russian thistle at various test plots around the state.

Extension and College of Agriculture, Biotechnology and Natural Resources experts have also been active in managing native vegetation so it is more resilient and less susceptible to a weed invasion.

“Active vegetation management has become a major emphasis in the pursuit of resilient rangeland

landscapes,” says Range/Riparian Specialist Sherm Swanson. “With the presence of invasive weeds and the altered fire regime that they can cause, it is increasingly important that native plant communities retain or regain the strong understory of perennial plants that can survive fire and resist weeds.”

Extension and other University researchers have also done extensive research on control methods, such as using cattle to control the spread of cheatgrass, or the use of pesticides on noxious weed stands.

“Active vegetation management has become a major emphasis in the pursuit of resilient rangeland landscapes.”

“Cattlemen’s Update provides an opportunity for livestock producers to become acquainted or refreshed on a variety of animal health, economic, or production issues.”

CATTELEMEN’S UPDATE

University provides expertise for beef cattle producers around the state

By Andrew Church

THE CATTELEMEN’S Update is University of Nevada Cooperative Extension’s (UNCE) annual educational program offered for beef cattle producers to explore and learn about issues affecting the beef industry in Nevada. Over the course of five days, the Cattlemen’s Update provides a forum each year for the exchange of information and interaction with other producers and professionals.

The Cattlemen’s Update originated in 1965, and was the creation of University of Nevada Cooperative Extension field faculty. A program that started with 150 participants in 1984 has since grown into a bustling forum, setting a new attendance record in 2010 with over 450 active participants.

“The Cattlemen’s Update provides an opportunity for livestock producers to become acquainted or refreshed on a variety of animal health, economic, or production issues,” says David Thain, state extension veterinarian.

While the Cattlemen’s Update provides information about current livestock issues to producers, it is also receptive to the concerns and interests of the agricultural community. In turn, the Cattlemen’s Update responds by addressing these concerns.

“Recently, the Cattlemen’s Update has worked to provide information on issues such as animal diseases to reproductive

diseases, as well as strategies to raise a calf economically and market a product they can sell in the fall,” Thain says. “Another issue producers are concerned about, maybe one of the biggest, is interaction with government agencies and flexibility for producers to move off of their allotments.”

The growth of the Cattlemen’s Update has also led to the development and implementation of other services such as the Beef Quality Assurance (BQA) program. Developed in 2002, BQA is dedicated to teaching beef producers safety and quality assurance practices in all aspects of their production.

A post-program survey in 2008 demonstrated producer satisfaction with the Cattlemen’s Update, with 72 percent expressing that the workshop was helpful or very helpful. “Producers appreciate these opportunities,” says Thain. “Perhaps more important, the Cattlemen’s Update provides a social network for producers to meet people face-to-face and make contacts. Now they know who to call or talk to about a particular issue.”

Although economic times have impacted the state budget and threatened to undermine the Cattlemen’s Update, the program continues to support, and receive support from, Nevada’s beef producers.

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