2006 Eastern Nevada Range Research Field Days

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Presentation Abstracts

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TABLE OF CONTENTS

Introduction

Maria M. Ryan[1] and Robert E. Wilson[2]

The nexus of scientific investigation and applied natural resource management is often challenging. Collaboration between managers and researchers many times is conducted in a fragmented fashion or barely exists at all. Many times collaborative efforts break down because of perceived problems and agendas that are particular to the needs of agency personnel and the scientific community. Those interested in natural resource management need to recognize and acknowledge that differences exist between managers and scientists that affect their approach to issues and actions. Natural resources managers and scientists must understand that these differences encompass variation in cultures, mandates, expectations of research results, and measures of success. Recognizing that managers and scientists function in very different ways is the first step in producing desirable results in their collaborative efforts. Once these differences are recognized and dealt with, the next step is focusing on the issues on the landscape, capitalizing on strengths and needs of both interests. Understanding each other and the issues at hand can then lead to developing a collaborative planning process for research and management actions that provide benefits to those involved as well as the resources. Working together, managers and researchers can address questions and apply adaptive management. Together this effort can move the state of knowledge ahead incrementally, and hopefully, systematically. Bringing science and management together in an adaptive management context can lead to management that is considered anticipatory rather than reactionary.

Eastern Nevada and the Great Basin in general are facing many very serious natural resources issues that cannot be easily solved within a short timeframes, let alone with fractured research and management efforts. Current natural resource problems are the result of past policies, incomplete or inaccurate ecological understandings, and mismanagement based on these. Over time these issues have become increasingly important and the need to address them is now immediate. Important and difficult issues such as non-native and native plant introduction and expansion, altered fire regimes, habitat fragmentation, sensitive or rare species conservation, conflicts regarding forage allocation, increased recreational activities, and energy and water development require innovated and anticipatory approaches to natural resource management than has traditionally been practiced. Managers and researchers must work to create an environment that includes increased collaboration, open and frequent difficult discussions about difficult problems, a systems-based approach to information synthesis that leads to focused research, scientifically defensible management actions, adaptive management from lessons learned, and flexible policies.

There are many efforts taking shape in the Great Basin that range from the BLM's Great Basin Restoration Initiative (www.fire.blm.gov/grbi), the Great Basin Ecosystem Management Project (http://www.ag.unr.edu/gebm), the interagency and inter-regional fire sciences and restoration projects (http://jfsp.nifc.gov), remote sensing and satellite imagery collaboration and development (http://gbirs.stanford.edu), to community efforts to develop planning and policies that affect everyday lives of the citizens in the region (Northern Nevada Stewardship Group, Eastern Nevada Landscape Coalition, Tri-County Commissioners, White Pine and Lincoln Counties Coordinated Resources Management Groups). The BLM, largest land manager in eastern Nevada, has also

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applied innovative approaches to natural resources management in the Ely District which in turn, has fostered an atmosphere where innovations in natural resources management has become standard, as opposed to approaches that are considered traditional and restrictive.

Purpose

The mission of the University of Nevada Cooperative Extension is to discover, develop, disseminate, preserve and use knowledge to strengthen the social, economic and environmental well-being of the people of Nevada. To this end, Cooperative Extension personnel, working with campus-based scientists, created the Eastern Nevada Range Research Field Days. Its purpose is to bring the latest rangeland research information being conducted in eastern Nevada to a forum where natural resource managers and an interested public could learn about current research efforts. The forum was specifically structured to allow and encourage interactions between scientists, managers and interested local citizens. The Field Days are a success because current, preliminary research being performed in eastern Nevada was presented and discussions and examination field experiments of projects were integrated into the program. People most affected by natural resource decisions are given the opportunity to interface with researchers and managers to discuss current issues and identify future research projects.

Natural resources research takes many years from inception of the project to completion and publication, therefore research results are not usually applied in a timely manner. The process includes conceptualization of the issue(s) to be studied, development of hypotheses and research proposals to funding agencies, data collection and analysis, writing and reporting of the research results, the peer review process, and finally publication in reputable scientific journals. This long process is not particularly useful to managers that need to make management decisions on a daily basis. However, preliminary information from research projects can be included in the decision-making process although results may be non-conclusive. The Range Research Field Days presented many research projects that are in preliminary stages of planning and implementation, but most have preliminary results of data analysis. These Field Days allow researchers the opportunity to present these preliminary findings to managers so they could incorporate new information into management decisions right away.

The 2005 Eastern Nevada Range Research Field Days is a concerted outreach effort to bring the latest science and innovation from the Nevada Higher Education System (NSHE) to the citizens of rural Nevada. Given the success of this event, periodic field days such as this will continue into the future.

Acknowledgements

Funding to support the 2005 Eastern Nevada Range Research Days was provided by the Bureau of Land Management Ely District, the University of Nevada Reno Agricultural Experiment Station and Cooperative Extension, and the Eastern Nevada Landscape Coalition. Special thanks go to Senator Harry Reid for his support.

The University of Nevada Cooperative Extension administrative support staff of Martha Barajas and Gail Mahoney were instrumental in coordination of the event and publication of these proceedings. Thank you.

Strengthening a State and Transition Model for Wyoming Big Sagebrush Ecological Sites in Eastern Nevada

Sherm Swanson[1] and R. S. Roche[2]

Background

For decades rangelands were assessed using Clementsian succession to describe and forecast changes in plant communities through time. A new approach referred to as State and Transition or Multiple Stable States concept utilizes conceptual models for specific communities that may better explain plant community changes, especially given disturbances and impacts related to invasive species. For these models to be useful to land managers, conceptual models must be developed and tested on scales from ecological sites to regional applications.

The approach of this study is to apply the concept of State and Transition concept to specific sites in eastern Nevada to test a previously constructed conceptual model (Figure 1) for Wyoming big sagebrush *Artemesia tridentata* ssp. *Wyomingensis,* Beetle and Young (8-10" loamy and shallow loam) ecological sites. Historic data (1981 to 2000) was available from the BLM on these sites.

Objective

This study had two objectives. First, historical and current data were analyzed to determine if any of the ecological sites had changed through time to support the State-and-Transition conceptual model. The second objective was to determine if the attributes of these ecological sites could demonstrate a crossing of a threshold over a long period of time.

Study Sites and Methods

The Ely BLM office has monitored 32 key areas in eastern Nevada for 25 years. These sites are located in Lincoln, Nye and White Pine Counties and all were potential Wyoming big sagebrush ecological sites. Of the 32 sites, 16 were determined to be appropriate for this study as they were native Wyoming big sagebrush sites. The remaining sites were not included in the analysis because they were either seedings (11), or in ecotones (5). Frequency, cover, and sagebrush age data were collected from May through August 2004 and analyzed with historic data regarding species presence and frequency.

Results

Preliminary data revealed that the frequency of the perennial herbaceous dominant (Indian ricegrass *Stipa hymenoides* Roemer and Schultes and Ricker) significantly increased on 5 of 12 native Wyoming big sagebrush key area, and significantly decreased on one ($p \leq 0.005$). The average frequency of the perennial herbaceous dominants on all native Wyoming big sagebrush key areas (16) was not significantly greater ($p \geq 0.311$).

In the loamy 8-10" ecological site, the key area with the lowest frequency of Indian ricegrass had the oldest estimated stand age. In the shallow loam 8-10" site, the key area with the youngest estimated stand age had the highest frequency of Indian ricegrass. Preliminary analysis of shrub age and frequency of perennial herbaceous dominants suggests that there is no significant relationship across key areas. Analyses are ongoing.

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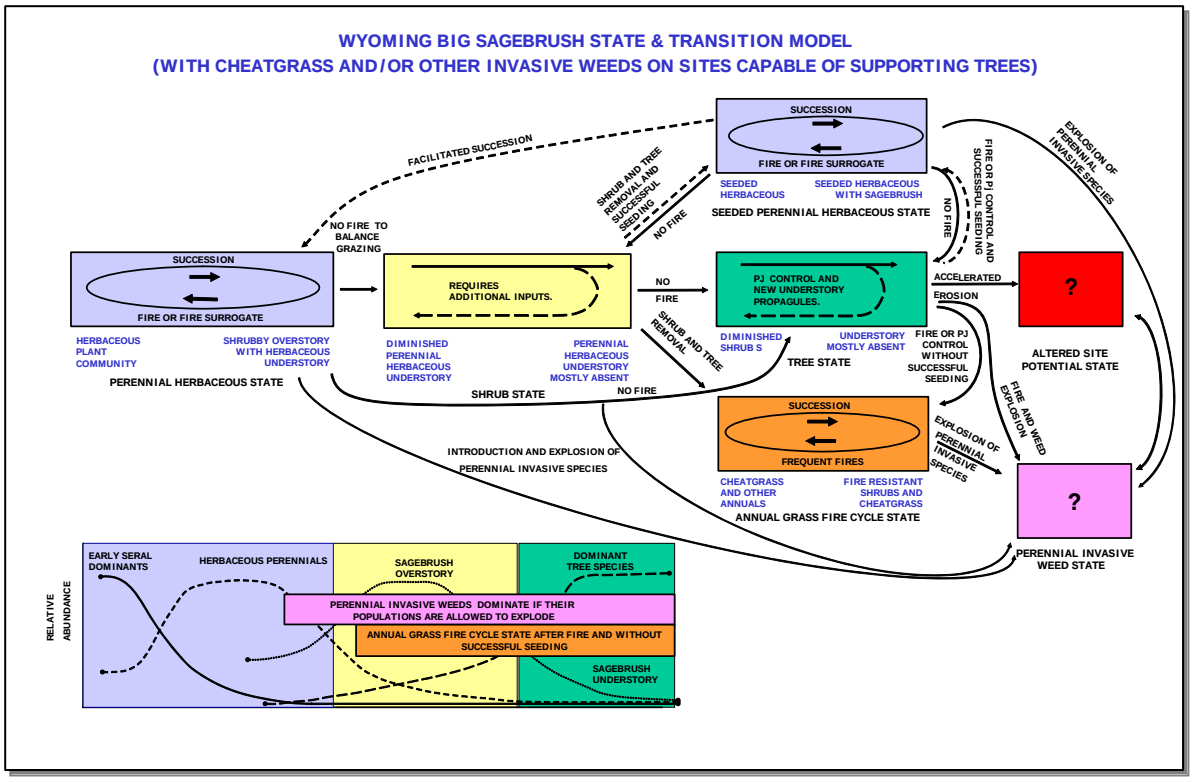
Preliminary Conclusions/ Discussion

With only one year's data for analyses we do not have enough information to comment on the overall applicability of the Wyoming big sagebrush state and transition model. It appears, however, that none of the sites had crossed a threshold. Perhaps this is due selection criteria for key areas to reflect expected responses to management.

The authors consider the increase or static frequency of the perennial herbaceous component of these key areas as an indication that the grazing management and vegetation composition over the past 25 years has been improving. This is somewhat surprising to the authors given the recent climatic history of eastern Nevada. Historic data were collected during or soon after the wet years of 1981, 1982, 1983, 1998. Excepting these years, eastern Nevada has experienced below average precipitation for the past 20 years, condition often associated with a decrease in the perennial herbaceous plants.



Dynamics of Sage Grouse (*Centrocercus urophasianus*) Populations in Response to Transmission Lines in Central Nevada

Michael Atamian[1] and James Sedinger[2]

Background

Transmission lines have been hypothesized to impact Sage Grouse (*Centrocercus urophasianus*) populations through the provisioning of perch sites for raptors and/or ravens (*Corvus corax*) (Alstatt 1995). A single posthoc study (Hall and Haney 1997) has been conducted on the effects of transmission lines on Sage Grouse populations. The study showed a general trend of lower peak male attendance at leks nearer to transmission lines, however, it could not account for confounding factors and has not been replicated. Hall and Haney (1997) proposed three possible mechanisms for the relationship they detected: 1) decreased lek attendance due to harassment and/or direct predation via raptors, 2) decreased nest and brood survival due to predation via ravens, 3) decreased lek attendance and nesting due to the perceived threat of predation caused by the visibility of perch sites (transmission line poles).

Objective

The objective of this 10-year study is to determine the impact of the Falcon to Gondor transmission line on the population of Sage Grouse in Eureka County and if any or all of the mechanisms proposed by Hall and Haney (mentioned above) are at work. The project has four main components: mark-recapture, lek observations, nest monitoring, and brood monitoring. These components allow us to estimate key population dynamics, such as adult survival, nest success, and chick survival, which in turn will be used to determine the impact of the line and the mechanisms responsible.

Study Site

The study site is located in Eureka County, Nevada in the Denay, Pine, Kobeh, Diamond, Horse Creek, Grass, and Garden Valleys. The study was initiated in the spring of 2003, covers an area of approximately 4000km^2, and encompasses 90km of the Falcon to Gondor transmission line. The transmission line belongs to Sierra Pacific Power Company; construction began in the fall of 2003 and was completed by the summer of 2004. The line is approximately 288km long with 758 (23-40m) towers. Within the study area we monitor 11 leks that vary in distance from the line from 0.8km to 19km.

Methods

Mark-Recapture – Sage grouse are trapped using three million candle powered spotlights and either a small portable generator or an ATV for background noise. Once captured, a variety of morphological measurements are taken and each bird is given both a metal leg band and a plastic alpha-numeric leg band (used for resighting). Blood and fecal samples are also taken from a sub-sample of the captured birds for West Nile antibody testing and corticosterone testing, respectively. In the past three years 408 sage grouse have been banded - 356 males and 52 females. In 2003, 2004, and 2005 we have had 24, 31, & 43 unique recaptures, respectively.

Lek Observations and Re-sights – All leks are observed once every five to seven days from portable blinds set up either on the ground or on top of 10ft towers. Observers enter the blinds one hour

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before first light and remain until the lek disperses. Counts are taken every 20-30 minutes of all males and females present. In 2003 we had a high count (sum of maximum observed at each lek) of 228 males and 44 females, 264 males and 65 females in 2004, and 316 males and 53 females in 2005. In between counts observers use high powered spotting scopes to read alpha-numeric leg bands (resights). We've had 11, 26, and 25 unique band re-sights in 2003, 2004, and 2005 respectively.

Nesting Monitoring – All female Sage Grouse when captured are also fitted with a 22-gram battery powered radio transmitter necklace from Advanced Telemetry Systems; model number A4060. Each hen is located twice weekly either via triangulation or by walking in and flushing. When a nest is found the hen is flushed once to float the eggs (in order to estimate incubation stage), then checked once every three days until three days prior to estimated hatch when the nest is checked every day. All nest checks are done from a distance (≥ 20 meters) via radio or visually, depending on the nest location. In 2003, 2004, & 2005, 12, 18, & 36 females nested of which 5, 7, & 12 hatched, respectively. After a nest has hatched or a predated nest has reached its estimated hatch date, we estimate both shrub cover and forb density.

Brood Monitoring – All broods are captured within three days of hatch, at which time a variety of morphological measurements are taken; two blood quills for DNA work are plucked, and each chick is subdermally implanted with a Passive Integrated Transponder tag (PIT tag). PIT tags will allow us to permanently mark individuals and over time estimate survival and recruitment of young into the breeding population. The blood quills along with blood membranes from eggs will allow us to estimate population and clutch sex ratios. We have currently PIT tagged 77 chicks and have DNA samples from approximately 130. Following initial capture each brood is flushed once a week to estimate chick survival and fledge rates. At each flush point we estimate shrub cover and forb density and pit traps are placed to determine invertebrate composition and density.

Preliminary Conclusions/ Discussion

With only two years of data for analyses we do not have enough information to comment on the overall effects of transmission line on the Sage Grouse population in Eureka County. We have seen some movement between leks by male Sage Grouse in both our resights and recaptures, but not enough to show dispersal in response to the line. Using just the 2003 and 2004 banding data Comstock & Sedinger (2004) performed a Bowden's estimation (Bowden 1993) to calculate a population estimate of 342 male Sage Grouse (95% CI 256-422). Combining both 2003 and 2004 nest data we calculated a 0.967 daily survival rate. This gives us a 39.1% nest success for incubation only (28 days) and 27.9% nest success for egg laying and incubation (38 days). Based on previous studies, our nest survival rates are low, but do not significantly differ from the 47.7% (incubation only) Connelly (2004) calculated from 16 previous studies.

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Steptoe Valley Sage-grouse (*Centrocercus europhasianus*) Habitat Restoration Project

Tara Forbis[1]

Background

The greater sage grouse (*Centrocercus europhasianus*) is a species whose habitat requirements are strongly correlated with those of other sagebrush species. Concerns about the decrease in historical range of the bird, population declines and degraded or lost habitat have caused groups to petition listing the greater sage grouse as a threatened or endangered species. Within the species' range in Nevada, the Great Basin Restoration Initiative and the Ely Bureau of Land Management (BLM) have called for habitat restoration activities that benefit the species. Within the Ely District of the BLM, recent vegetation sampling indicates that the majority of rangelands consist of decadent shrub communities with no understory, or shrub communities with weedy understories. The goal of the project is to restore sage grouse habitat, add to the body of knowledge about sagebrush community restoration and its effects on the grouse habitat, and be used in an adaptive management context. Objectives of the project are threefold. First, the study will investigate the effects of creating mosaic landscape patterns with mechanical treatments on seeding success using native seed. In addition, the treatment's effects on sage grouse habitat use will be analyzed. Third, the project will directly restore 100 acres, creating a mosaic effect that will influence approximately 300 acres of sage grouse lekking and brooding habitat. This project is located in Steptoe Valley in northern White Pine County.

Methods

An aerator will be used in a curvilinear pattern to create 30 blocks consisting of ten acre blocks of 1) 40 percent sagebrush removal and seeding treatments, 2) 80 percent sagebrush removal and seeding, and 3) control blocks (no treatments). The livestock operator who grazes sheep on the site has agreed to use funds that were designated for fencing projects to be used for seed, and the sheep will not be grazed on the site until the seeded plants have established.

Research questions for this project include 1) does a mosaic of mechanical treatment increase the cover of native grass and forb species? 2) Do results of different levels of treatments (0, 40, 80 percent sagebrush removal) differ from one another? 3) Do these treatments increase sage-grouse use of treated sites? 3) Which forb species will germinate and establish in treatment sites?

Indicators of success include herbaceous vegetation percent cover and density, native forb seed success, and sage-grouse site use. Pre-treatment data will be collected in June 2005, treatments applied in October of 2005, and post-treatment data will be collected in June of 2006 and in subsequent years.

Acknowledgements

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Distribution and Behavior of the Pygmy Rabbit (*Brachylagus idahoensis*) in Nevada

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Background

The pygmy rabbit (*Brachylagus idahoensis*) are the smallest members of the rabbit family (~1 pound) in North America and is a sagebrush obligate species. They are habitat specialists requiring dense, large sagebrush (*Artemesia tridentata* spp.) growing in deep, friable soils for food, shelter, cover from predation, and burrow location. Sagebrush can constitute up to 99 percent of its diet, but it also consumes grasses. Their burrows are located at the base of big sagebrush, where the soils generally deep and loamy and there are usually multiple entrances.

Pygmy rabbits were recently petitioned for listing as a threatened or endangered species recently due to concern over habitat degradation and reduction and lack of current species status information. Although Nevada encompasses the greatest portion of the pygmy rabbit's historic distribution, very little was known regarding its status in the state. To increase the current understanding of the rabbit in Nevada, this study was designed to provide information to meet the following objectives: 1) determine an objective method of detecting current pygmy rabbit activity at a site, 2) determine the species' current distribution in Nevada and how this relates to its historic distribution, 3) determine microhabitat characteristics of areas used by pygmy rabbits, and 4) determine seasonal and temporal activity patters of the species in its natural environment.

Methods

Activity Detection – There are several survey methods used to detect pygmy rabbit activity. Four methods were used at 20 locations known to be occupied with the following results: 1) burrow surveys were correct 85 percent of the time, 2) fresh pellet surveys were correct 70 percent of the time, 3) sightings were correct 30 percent of the time, and 4) camera survey provided correct results 95 percent of the time. This information is important because pygmy rabbit sites also contained cottontails (*Sylvilagus* sp.) and jackrabbits (*Lepus* sp.) as well as other animals. Often pellet survey results were difficult to distinguish between young cottontail and pygmy rabbit pellets. Also, some active burrows were in fact used by animals other than pygmy rabbits. The camera surveys and sightings methods produced the only conclusive evidence of current site activity. Of these, the camera surveys were more effective and provided the additional benefit of documenting other animals inhabiting the site. The cameras were active 24 hours per day and shot 5 separate angles for positive identification.

Status and Distribution – The authors obtained 93 historic records of pygmy rabbits in Nevada from published literature, museum collections, and agency files. As of March 2005, 64 of the 93 sites were visited, and using the camera survey technique found current pygmy rabbit activity at 31 sites (48%). Sites were assigned values of high, medium and low of disturbance and habitat alteration.

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Microhabitat Characteristics – Preliminary microhabitat data indicate that pygmy rabbits are more likely to place their burrows in areas of higher, more dense, and more structurally complex sagebrush. It is thought that pygmy rabbits prefer areas that stand out as taller sagebrush clusters within the shorter surrounding sagebrush. This assumption was tested in 50 random points in loamy 8-10" Wyoming big sagebrush ecological sites. Fifty additional sites within the prominent sagebrush clusters were also selected. To date, soil and vegetation measurements and pygmy rabbit surveys have been collected at 23 pairs randomly selected and chosen sites. Preliminary results indicate that 13 percent of randomly selected sites and 65 percent of chosen sites had rabbit activity. Pygmy rabbits coexist with jackrabbits at virtually every site. Pygmy rabbits coexisted with cottontails in areas with high amounts of understory, while moderate amounts of understory had only cottontails. Pygmy rabbits were generally found with no cottontails in areas of little or no understory.

Activity patterns – Four populations were studied using five cameras in every population for one year. The cameras were moved every week to >100 m from the previous location, providing data on 20 locations per population per month. Preliminary results revealed that all populations display a bimodal activity pattern that is tightly linked to sunrise and sunset. There appears to be differences among populations in the level of diurnal activity. More research is needed to determine if these are population-specific or result form differences in population densities.

Preliminary Conclusions

It now appears as though pygmy rabbits are still reasonably abundant in Nevada, and doing better than expected. Complete removal of sagebrush (e.g. fire, agricultural conversion) seems to be the greatest hazards. There may be competition with cottontail rabbits. There may be a shift in location of available habitat.

Acknowledgments

The authors thank the Nevada Arid Rangelands Initiative, Nevada Biodiversity Initiative, UNR Biological Resources Research Center, UNR Graduate School Association for providing support.

Integrated Weed Control and Rangeland Restoration

Robert Nowak[1], Kim Allock[2], Jacob Landmesser[3], Kendra Moseley[4]

Background

Cheatgrass (*Bromus tectorum*) is widespread throughout the Great Basin, dominating more than 3 million acres with another 14 million acres classified as heavily infested and more than 60 million acres considered at risk to potential domination by the grass, and the infestation rate is increasing. Two reasons why cheatgrass is so successful are that it is a prolific seed producer and it has high competitive ability. Restoring native rangelands in the Great Basin is challenging given the arid environment, but invasive species such as cheatgrass make rangeland restoration even more difficult. To integrate weed control with rangeland restoration, a cooperative research group that includes three universities, five federal agencies, and 16 collaborators has initiated a regional project that has study areas dispersed across the Great Basin to capture variation in climate. This cooperative research effort will provide a regional approach to rangeland restoration and weed control. Three new studies under this program are discussed here. Each consists of two study sites in each cooperating state (Nevada, Idaho, Utah and Oregon), with half the study sites on an 8-10 inch precipitation Wyoming big sagebrush site and the other half on 10-12 inch precipitation Wyoming big sagebrush site. Study sites in Nevada are located near Battle Mountain (near Izzenhood Ranch, 8-10" precipitation zone) and near Winnemucca (in Eden Valley, 10-12" precipitation zone). Focus of the project is primarily cheatgrass, but includes studies of other invasive plants. Results from the first year of a multiyear study are presented for two experiments, focusing on study sites in Nevada, but also comparing observations with those of six other sites in adjacent states. Plans for a third experiment are also presented.

Methods

Transition Stage Approach – This experiment is exploring use of a transition stage within the context of state and transition theory to restore sagebrush ecosystems when cheatgrass has become dominant. It examines whether creating one or more transition steps using a mix of competitive native plant species lowers thresholds that are difficult to cross. Twenty-five accessions of commercially available species (nine grass and two forb species, and on one site three shrubs) were seeded into eight sites (three replications each) with herbicide (glyphosate) applied and control plots. Results from the fall 2003 seeding indicate that a spring application of herbicide reduced the density and biomass production of cheatgrass during the following fall-spring growing season, although the density and biomass of other weeds often increased. Density and biomass of the seeded native species did not consistently differ between the herbicide and control treatments across all sites. Across all sites, the best performing accessions were: Anatone and P-12 bluebunch wheatgrass; Secar and SERDP Snake River wheatgrass; Critana thickspike wheatgrass; and Sherman sandberg bluegrass. Results for Nevada were similar, although the P-7 and P-12 bluebunch wheatgrass accessions and Sherman sandberg bluegrass did particularly well. Plant densities of these accessions often were similar to that of crested wheatgrass. This experiment has been repeated with another set of plots seeded in fall 2004. The Truax rangeland drill was used for all the seedings, and staff at the NRCS Aberdeen Plant Materials Center engineered several changes to the drill that improved seed placement and planting; these changes have since been incorporated by Truax into their manufacturing process.

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Plant Functional Type Approach – Research has shown that cheatgrass is inhibited by low soil nitrogen levels whereas natives are tolerant of lower nitrogen levels. Thus, one objective of this study is test the possibility of increasing the competitive ability of the native species by tying up nitrogen (sugar application) to inhibit cheatgrass. The second objective of this experiment is to determine if a mix of native species that have different phenological and rooting characteristics provides a continuous and intense use of soil resources and thus is more effective at reducing cheatgrass than the individual native species. This experiment will be conducted at eight sites across the Great Basin (three replications each) and be repeated in two consecutive years. Other aspects will be investigated (effects of secondary weeds and of different seeding rates, soil nutrient changes, soil physical and biological characteristics), but these results are not presented here. Results from the first year following the fall 2003 seeding indicate that sugar applications reduced soil nitrate during the fall and early spring, and cheatgrass biomass and seed production are consistently reduced on all sites when sugar is added to tie up soil nitrogen. However, sugar application increased density of the seeded species only for bluebunch wheatgrass; sugar application decreased density of sandberg bluegrass and did not affect plant density of the other natives. The mix of native species did not have a stronger negative impact on cheatgrass than monocultures of native species.

Large-Scale Restoration Trials – This project attempts to determine if the ecological principles used in the first two studies can be applied to large tracts of land, essentially moving information gained at the plot level to larger, management levels. We only have enough funding for one site to be studied. The first objective is to determine if a transitional community comprised of the best performing species from the first experiment above results in better establishment and cheatgrass control than the mix of native species used in the second experiment above. The second objective is to determine if specific restoration treatments can reduce cheatgrass and hence increase the success of the native species. The restoration treatments include a seed-burn-seed treatment targeted to reduce both cheatgrass seedbank and cheatgrass access to available soil nitrogen, and springtime high intensity, short duration grazing targeted to reduce current year seed production of cheatgrass. These treatments will be applied during the 2003-2004 growing season, and the native species accession and seed mix will be seeded in the fall 2005.

Conclusions

Initial results from the first year of seeding for the first experiment show that: (1) certain accessions of native species consistently tend to be nearly as successful as crested wheatgrass across the Great Basin; and (2) application of herbicide in the spring prior to cheatgrass seed production reduces cheatgrass at least through the following fall-spring growing season, providing at least 1 year of reduced cheatgrass competition. Initial results from the first year of seeding for the second experiment show that: (1) sugar application ties up soil nitrogen and reduces cheatgrass biomass and seed production; but (2) only bluebunch wheatgrass appears to benefit from the sugar application, whereas sandberg bluegrass is negatively affected by the sugar applications. These study plots will be followed for at least 2 more years to determine longer term effects on the native species, and the replication of the experiments in a second year will provide information on year-to-year variability of the results.

Acknowledgements

Funding for these projects comes from the USDA Initiative for Future Agricultural and Food Sciences grants program, Nevada Agricultural Experiment Station, Bureau of Land Management, U.S. Geological Survey, USDA Agricultural Research Service, and Natural Resources Conservation Service (NRCS). Special thanks go to the BLM State and Field Offices in Nevada, Idaho, Oregon, and Utah for use of BLM lands to conduct the studies and for their help and cooperation in establishing the study sites and in applying the herbicide treatments and to Truax Company, Inc. for use of the rangeland drill.

Activities of the University Center for Economic Development in White Pine County

Tom Harris[1]

Background
The University of Nevada Reno Center for Economic Development has been involved in several projects in eastern Nevada to help further economic understanding and development in the area. Below are summaries of current projects.

Project Overview:
White Pine County Strategic Tourism Plan - The UNR Center for Economic Development worked with White Pine County Commissioners and the White Pine Economic Diversification Council in completing a White Pine County Strategic Tourism Plan. The plan outlined short-run and long-run tourism goals for White Pine County. One special output of the planning exercise was that a specialized tourism map of White Pine County was completed. The tourism strategic plan was developed with a University Center Technical Publication listed below as:

> Harris, T.R., G.M. Verserat, G. Ebai, S. Stoddard, K. house, M. Sibley and the White Pine County High School Sociology Class. **Comprehensive Tourism Master Plan**. University Center for Economic Development Technical Report UCED93-07, June 1994.

White Pine County Retail Sector Study - A retail sector leakage study was completed by the University Center for Economic Development for the White Pine County Commissioners and the White Pine County Economic Diversification Council. The study derived commercial sector pull factors for White Pine County. From 1997 to 2001, pull factor activity for White Pine County declined from 1.07 to 0.67. This meant that White Pine County was losing retail trade to outside counties. Given the importance of taxable sales revenues to county government budgets, the lost retail sector sales were of concern to White Pine County Commissioners. Reasons for the commercial sector pull factor loss were discussed as well as remedies. Results of this report were used by White Pine County economic development officials to help the creation of the locally owned retail business. The University Center Technical Bulletin developed from the White Pine County commercial sector analysis is listed below:

> Harris, T.R. **White Pine County Retail Trade Sector to Leakage Study**. University Center for Economic Development Technical Report UCED 2003/04-06, September 2003.

Economic Impacts of Cattle Ranching and Farming Sector on the White Pine County Economy - The UNR Center for Economic Development worked with White Pine County Commissioners in completing an analysis of the economic impacts of the cattle ranching and farming sector on the White Pine County economy. Results of the analysis found that the cattle ranching and farming sector was the second largest exporter in the county economy. These export sales brought money into White Pine County for future economic growth and development. Also the analysis estimated that the cattle ranching and farming sector impact 189 jobs and $3.224 million

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in household income, respectively, in the White Pine County economy. The analysis was made into a University Center Technical Bulletin listed below:

> Harris, T.R. and J. Wright. **Estimated Economic Impacts of the Cattle Ranching and Farming Sector on the White Pine County Economy**. University Center Technical Bulletin UCED 2004/05-18, September 2004.

Economic Impacts of Grazing Buyouts: Ranch and Regional Analysis - This is a study recently funded by the Nevada Rangelands Initiative. The study will investigate the financial impacts to a Eureka/White Pine Counties' representative ranch from a proposed federal buyout of grazing permits. The impacts of this proposed federal buyout will be expanded to estimate total White Pine County economy impacts. The study started on July 2005.

Gleason Creek Restoration Project

Lee Turner[1]

Background

Studies have shown that wildfire had been a reoccurring event across Great Basin landscapes. Although the periodicity varied, the fires that naturally occurred in sagebrush and pinyon-juniper woodlands were mostly ground fires that burned grasses, herbaceous plants, shrubs and seedling trees. These fires moved relatively quickly across the landscape and burned at low temperatures. These fire disturbances were the dominant forces that shaped the vegetation communities across the west. The past 70 to 80 years of federal land management policies dictated wildfire suppression. These suppression efforts have created unhealthy sagebrush communities that are now dominated by pinyon and juniper trees (*Pinus monophylla, Juniperus osteosperma*) because seedlings were not suppressed periodically by fire. In addition, cheatgrass (*Bromus tectorum*), an invasive annual grass, has become ubiquitous - dominating in some areas and established in sagebrush understories in other areas. The overall effect of these changes on the landscape has been large scale degradation and/or loss of sagebrush ecosystems. This has lead to effects such as loss of biological diversity, loss of forage for livestock and wildlife, and changes in ecological community structure and function.

The objective of this project is restore ecological health of the Gleason Creek watershed in the Egan Range of White Pine County. The Gleason Creek watershed is approximately 38,000 acres, and this project will attempt to restore approximately 14,000 acres over three years. The project will attempt manipulation of the sagebrush and pinyon-juniper communities with the objective of restoring native grasses, herbaceous plants and shrubs in the area so that fire can be reintroduced to a more natural set of circumstances.

Methods

The strategy for this restoration project includes mechanically thinning pinyon and juniper trees with chain saws and large equipment. Sagebrush thinning is to be accomplished with brushbeaters. Competition from invasive weeds will be eliminated via physical and chemical methods. Additionally, a fall and/or winter prescribed fire will be conducted on approximately 1500 acres to reduce pinyon and juniper density in a cost effective manner.

The project began in 2004 with planning between the BLM and the grazing permitee. Pre-treatment data was collected that year. Approximately 60 acres of sagebrush was selected for thinning because an herbaceous understory existed that was expected to recover quickly and seeding was considered unnecessary. This treatment cost $40/acre using the BLM's 20 foot brushbeater. Work was accomplished in September. In another area, pinyon and juniper trees of approximately 40 to 90 years of age were thinned in an adjacent area from approximately 250 trees/acre to 10 trees/acre. Woody material was scattered on-site along contours and no seeding was done.

Future treatments include two 450 to 500 acre units of black sagebrush vegetation communities and a 460 acre Wyoming sagebrush dominated community. These sites are located in the Copper Flats area of Gleason Creak and will be treated in the fall of 2005. The black sagebrush sites are upland from the Wyoming sagebrush site and have extensive pinyon and juniper tree encroachment. Four 15-20 acre lop and scatter tree thinning treatments and four entire tree removal treatments of similar size and pattern will be performed on the west unit to reduce tree density. Control sites will be areas of similar size located adjacent to each of eight sites. The same treatments, similar in size and

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number will be performed on the east unit. The Wyoming sagebrush site treatment will include broad patches of brush beating, leaving patches/islands of sagebrush in tact to assist in regeneration and mimic a mixed-aged stand for sage grouse habitat.

Acknowledgements
This project is funded by the U.S. Department of Energy, the BLM, and the Eastern Nevada Landscape Coalition. The Nevada Division of Forestry contributed labor, the U.S. Fish and Wildlife Service and the USDA Natural Resources Conservation Service assisted with advice on private lands within the project area. Special thanks to Gracian Uhalde for his input and cooperation as the grazing permittee in this project. The Tri-County Weed Program and the University of Nevada Cooperative Extension collaborated on invasive weed control and advice. We especially thank Senator Harry Reid who made this project possible with his support.

Understory Response to Cutting, Seeding, and Chip Application in a Pinyon-Juniper Dominated Site

Tracy L. Dianda[1], Hudson Glimp, and Barry L. Perryman[3], John L. McLain[4], Sheila Anderson[5], Ryan Shane[6]

Background

The Healthy Forest Restoration Act (H.R. 1904) of 2003 stimulated interest in new forest management projects and technologies. In Nevada, forest thinning projects are being planned in areas where pinyon and juniper trees have expanded their range into sagebrush ecosystems and where pinyon-juniper woodlands have become decadent. Land managers, seeking alternatives for utilizing biomass as a by-product of pinyon and juniper thinning projects, are exploring one alternative, which includes chipping the biomass and applying the chips across the landscape. There are not research projects that have quantified the effects of chip application to sagebrush and pinyon-juniper woodlands to vegetation response. There is a need to determine the effects of chip application to exiting vegetation, seeded land, and invasive or weedy species. This study was designed to inform the Bureau of Land Management, through an experimental approach, of the efficacy of perennial shrub and grass establishment following tree thinning (fuels reduction).

Methods

The goal of this study was to determine the efficacy of chip application for use in restoration or rehabilitation projects. The study site, located in northern Lincoln County, Nevada, was constructed in a randomized complete block design, arranged in an augmented split plot factorial. Treatments were implemented between January and March 2004. Data was collected in June and August 2004, and June 2005. The two main factors were investigated: 1) tree cutting 2) control and the split plot factors include two seeding treatments (seeded and unseeded) and two chip treatments (chips and no chips). Preliminary results indicate implementation of the tree cutting treatments reduced mature tree cover and density by 100 percent, and shrub cover and density by 65 percent. Chips were applied in areas at a 1-2" depth. These applications represent litter cover of 98 percent.

A greenhouse study was conducted simultaneously to elucidate differences in chip application depth to seedling emergence. A completely randomized block design with five replications of each treatment combination was created (n=120). Treatment combinations included chip depth at four levels (control, 0.5", 1.0", 2.0"). Soil was used from the field and six plant species (western wheatgrass, bottlebrush squirreltail, Indian ricegrass, crested wheatgrass, Sandberg bluegrass, antelope bitterbrush) were tested.

Results/Discussion

In the field experiment, seeded grass species density was significantly higher (6.89 plants $m^{2\ -1}$ $p=<0.001$) in thinned plots with chips, than in thinned plots – no chips (1.67 plants $m^{2\ -1}$ $p=<0.001$), and control plots (0.12 plants $m^{2\ -1}$ $p=<0.001$). Annual grass and forb cover was greatest in thinned plots (3.9 percent) and least in thinned plots with chips (<0.1 percent). Percent

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soil moisture by weight was greatest in thinned plots with chips, at all sample points. Additional data collection is necessary to determine long-term vegetative trends. In summary, chip applications provided for increased perennial grass seedling density, high percent soil moisture, and decrease in annual grass density.

Results from the greenhouse study indicate that western wheatgrass and bottlebrush squirreltail emergence were significantly reduced at 2" depth of chips. There were no significant differences between percent emergence of Indian ricegrass, crested wheatgrass, Sandberg bluegrass, or antelope bitterbrush at any of the chip application depths. In summary, there was a decrease in emergence with great chip depth, bottlebrush squirreltail had the highest emergence rates, and antelope bitterbrush has the lowest emergence rate.

Future Research

The field study will need further monitoring to determine is a trend exists favoring perennial species for chip application. Further research to determine optimum chip application depth is also needed. Additionally, further information is needed to determine chip movement and change to soil chemistry.

Acknowledgements

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Assessing Evapotranspiration in Northern Nevada Basins

Dale Devitt[1], Lynn Fenstermaker[2], Michael Young[2], Ben Conrad[3]

Background

Valid hydrologic balances require accurate estimates of recharge and discharge. In closed basins, discharge is dominated by the process of evapotranspiration. In northern Nevada, most basins are dominated by open stands of vegetation that vary in size, plant density and species composition. The challenge is to collect meaningful data across large scales. The objective of this study is to estimate basin evapotranspiration in the White River and Spring Valleys of eastern Nevada. We are using a micrometeorological approach comparing various techniques to estimate water usage of the vegetation on a basin level. Spring Valley is located in Lincoln and White Pine Counties and encompasses approximately 1661 square miles or 1,063,040 acres. The White River Valley is located in Lincoln, Nye and White Pine Counties and is approximately 1607 square miles or 1,028,480 acres.

Methods

The research approach is to assess plant water use / status at the plant, canopy and basin levels. Various measurements are being made at each level including – 1) plant level - leaf water potential, canopy temperature differentials, stomatal conductance, and chlorophyll index, 2) canopy level - Eddy Flux, and 3) basin level – scintillometer and remote sensing. The vegetation communities have been described, with both valleys being dominated by sagebrush, rabbit brush and greasewood (density and cover values). The study focuses on sagebrush and greasewood because these plants are considered phreatophytes (plants that habitually grow where roots can reach the water table or the capillary fringe to obtain a perennial and secure water supply). This study began in July of 2004 and will continue through the Spring 2006.

Conclusions

Preliminary findings suggest that the use of eddy flux towers in combination with scintillometer estimates and remote sensing has the potential to provide valid basin-wide evapotranspiration estimates. We believe that differences in the basin evapotranspiration estimates are driven by a unique combination of factors that include depth to groundwater and percent canopy cover. Data also suggest that because vegetation stands are open, energy balances are dominated by sensible heat (warming air), not latent heat (generated by transpiration / evapotranspiration), as Bowen ratios are often greater than 2.0.

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Current Economic Research and Education Programs

Kynda Curtis[1]

Background

Dr. Curtis is conducting research in five areas, including 1) Nevada forage and cow-calf operation production costs and returns; 2) risk management for sustainable agriculture in Nevada; 3) wildland seed cooperative feasibility assessment; 4) Nevada supporting Nevada market initiative; and 5) marketing and price risk management for cool season grasses.

Projects

Nevada Forage and Cow-calf Production Costs and Returns – This cooperative research project includes many UNR and Cooperative Extension faculty. The outcome of this study is the construction of enterprise budgets for major crops in Nevada, which can be used as a basis for all other budgets (whole farm, partial, and cash flow). Additionally, these budgets are used by lenders, land appraisers, tax adjusters, and federal and state agencies. This approach captures all costs and returns associated with the production of one enterprise (e.g. alfalfa hay). Enterprise budgets provide estimates of the profitability of each enterprise. The process of constructing an enterprise budget includes identifying the region, collecting data from producer focus groups in the region, and setting up common procedures and assumptions. Enterprise budget publications contain an overview of the operation with assumptions, a production costs and returns budget, investment summary, and monthly cash flow statement. The study began in 2004 for forages in Humboldt, Eureka and Churchill Counties, and Humboldt, Eureka, White Pine and Elko Counties for cow-calf analysis. In 2005, the study will focus on Lincoln County for cow-calf production and possibly onions and garlic.

Risk Management for Sustainable Agriculture in Nevada – The program is designed to provide producers with the tools to effectively manage risks, such as production, market/price, financial, and legal risks. This program includes six 2-day workshops in Elko, Fallon, Yerington, Eureka, Winnemucca, and Lovelock, Nevada, as well as other education opportunities across the State.

Wildland Seed Cooperative Feasibility Assessment – This cooperatives study includes UNR, the Nevada Association of Counties and the Nevada Wildland Seed Producers Association. The objective is to assess the business feasibility of a cooperative effort by Nevada native seed producers organized to grow, process, package and market Nevada native plants. The approach includes examination of current and potential markets and production capabilities, and construction of financial statements to determine feasibility. Assessment results indicate that local native seed producers are only filling 1-18% of the market share in Nevada, indicating that there is a large potential for growth, especially in mine reclamation and residential markets. Also, markets have been identified that are willing to pay premium prices for labeled Nevada-grown products. Analysis indicates that a cooperative of 30 members producing nine varieties of native plants or seed is feasible on 3200 acres.

Nevada Supporting Nevada Market Initiative – This cooperative project includes UNR, the Nevada Rural Development Council, the Nevada Department of Agriculture and the Nevada Association of Counties. The goal of the project is to increase use of Nevada grown food products in Nevada at

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high-end (gourmet) restaurants and specialty food stores. The project investigators will determine the needs of gourmet restaurants and specialty food stores, determine the production possibilities ofNevada growers, and bring chefs and producers together to initiate discussions and purchase agreements. Investigators conducted focus group meetings with chefs and producers, which led to survey development. Surveys were then sent to chefs and producers across Nevada in the spring of 2005. Results of the initiative will include written reports on the needs of the chefs/owners of gourmet restaurants and specialty food stores and production capabilities in terms of food types and characteristics in Nevada. Additionally, there will be a conference between chefs and producers to discuss purchasing agreements. At the conference, there will also be education and consulting opportunities for producers regarding cooperatives and buying contracts with chefs/owners.

Preliminary data indicates that chefs are currently seeking high value foods (i.e. meats, fruits, vegetables) in small quantities for gourmet meals, but there are supply problems. These chefs indicated that they are willing to pay higher per item prices in order to get the small quantities and qualities needed. Chefs also indicated that producers need to inform restaurants of the kinds of products available so chefs can plan seasonal menus. Investigators recommend that producers organize as one entity to contract with restaurants/casinos. The organization could provide seasonally available information and samples to the chefs/owners. If producers stay in close communication with chefs, they can determine needs and adjust production.

Marketing and Price Risk Management for Cool Season Grasses – The pricing of cool season grasses is volatile as it is subject to strict quality requirements, which differ across buyers and is subject to buyer whim. Forward contracts could help minimize the current price and market risks. There are also pest, weed and weather issues that impact production. For this study enterprise budgets for cool season grasses in Eureka County will be constructed, followed by an evaluation of existing and potential markets for cool season grasses. Investigators will also develop educational programs for producers on marketing contracts.

Future Projects

Dr. Curtis, along with other colleagues, will be conducting research to assess the economic impacts of grazing buyouts and the feasibility of a meat processing plant in northern Nevada.

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