2013 University of Nevada Research Annual Report of Accomplishments and Results

Status: Accepted

Date Accepted: 07/22/2014

I. Report Overview

1. Executive Summary

Nevada Agricultural Experiment Station (NAES) 2013 annual report will focus on select program impacts which reflect unique benefits to a diversity of clientele and stakeholders in Nevada.

The mission of NAES is to build and support research capacity to advance understanding of biological, environmental, natural resource and social systems that enhance agriculture, community and economic vitality in compliance with State and Federal Legislation. The fundamental issue is how NAES's mission is consistent with both the increasing share of cost borne by undergraduate students and the direction of a research driven university.

This past year, NAES priority grant program included Hatch, Multi-State, and McIntyre-Stennis funding opportunities, which is driven by peer and stakeholder review and embraces the Federal State partnership directed by the Hatch Act and subsequent Farm Bill provisions.

One of NAES's state performance metrics is external funds leveraged per dollar of state funding. In 2012-2013, this metric was one of the highest in recent years as $4.8 million in state appropriations were leveraged by faculty to generate $6.9 million in external fund expenditures.

The research programs address the five thematic areas defined by NIFA, as well as two additional areas defined by Nevada's stakeholders as critical to Nevada and the Western United States. The overarching goals of the NAES include:

- Global Food Security - Agricultural Production in a Semi-Arid Environment

This program takes into account the fact that Nevada is located with a semi-arid to arid climate. NAES research efforts have been directed towards improving stress tolerance (cold, heat and drought) in plants, evaluating cultivars and clones, assessing new technologies to be used in the greenhouse industry, and improving the nutritional value of certain alternative crops.

- Animals and Their Systems

Research activities included investigation into cattle health and disease; safeguarding the survival of endangered/threatened species; the decline of mule deer in Nevada; wildlife guzzler's effects on survival and recruitment of Nevada's ungulate populations; identifying the incidence of mycoplasma, mannheimia, and lungworm across the genetic landscape of Nevada's bighorn sheep; characterizing mountain lion distribution, abundance, and prey selection in Nevada; impact of agrochemical and environmental contaminants on avian species.

- Natural Resource Management & Environmental Sciences in the Great Basin & Sierran Ecosystems

To address these critical issues, NAES research will focus on evaluating long term vegetation changes in the Great Basin, measuring heavy metal contamination in Nevada's waterways, protecting forests through the use of insect pheromone biochemistry, evaluating livestock grazing for noxious weed

management, compatibility of wildlife and livestock grazing, evaluating post wildland fire restoration and grazing systems, gauging forest wildfires and ecosystems recovery, studying soil transport properties on burned soils, and how plants might be used to restore salt laden soils.

- Nutrition and Health

Our goal is to conduct research to better understand healthy life style habits, and educational programs that focuses on healthy life style habits. NAES research is focusing on nutritional intervention in the treatment of triglycerides levels and potentially cancer, evaluating the beneficial effect of functional foods, and looking into factors promoting regional diseases like relapsing fever.

- Economic Development with Emphasis in Rural Areas

Nevada economists have continued conducting economic analysis of various rural labor and public policy issues, while helping economic development through the University's Center for Economic Development. Non-market evaluations on Nevada natural resources were performed to improve risk-management for land owners and reducing irrevocable damage to Great Basin/Sierran ecosystems.

- Sustainable Energy

Investigation into Nevada's highly prolific rabbit brush as a good candidate for production of industrial (i.e., rubber, plastics, coatings, lubricants and adhesives) and energy feedstock (i.e. biodiesel and cellulosic-based liquid fuels. Camelina, curly top gumweed, and prickly pear cactus are being evaluated as alternative crops for biofuel and other plant derived products.

- Food Safety

Provide agricultural producers in Nevada with information about the risks associated with food safety in terms of direct marketing, including legal, financial, and marketing risks. A child and adult/elderly caregivers training programs was created to reduce foodborne illnesses and improve food safety education in this industry

The research program and facilities of the NAES provide the foundation for graduate training activities and undergraduate research opportunities in Agricultural Science, Biochemistry and Molecular Biology, Biotechnology, Natural Resources and Environmental Sciences, Nutrition, Rangeland & Forestry Management, and Vet Science.

Through an outreach program involving town hall meetings, rural tours, impact reporting, news release, web based reporting of research progress, pamphlet, booklets and a directed advisory committee, the progress of the NAES research program is communicated with stakeholders on a regular basis and feedback is obtained to provide direction to future research projects.

Some of this year's highlights include:

Total Actual Amount of professional FTEs/SYs for this State

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	26.0	0.0
Actual	0.0	0.0	18.5	0.0

II. Merit Review Process

1. The Merit Review Process that was Employed for this year

- Internal University Panel
- External Non-University Panel
- Expert Peer Review

2. Brief Explanation

Scientific peer review drives the initial selection of research projects that comprise the NAES research portfolio. NAES solicits applications from CABNR/NAES scientists in a general call for proposals that identifies the priority areas. Faculty submit proposals to an in-house content management system. Based upon research area, expert peer reviewers are arranged by NAES administration to rate proposals based upon merit in the field of research, PI's qualifications, projected outcomes, degree of multi-disciplinary activity, and budget feasibility. Tabulated results, comments, recommendations and proposals are then sent to the PI's home department administrations for internal review. Departmental recommendations are then send forward to NAES administration. The NAES administration concurrently sends proposals to its external advisory board panel for evaluation and ranking based upon their constituents' inputs. All findings are then compiled by NAES administration and final decisions are made based on the rankings, comments and stakeholder input.

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged their participation

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Other (Annual open houses are held where the general public is encouraged to submit comments.)

Brief explanation.

We have and will continue to conduct tours throughout the state for the purpose of obtaining stakeholder input. During these tours we invite participants to town hall meetings through general press coverage in the local newspapers, and we invite stakeholder groups and individuals through personal contact (i.e., email, telephone, direct mailings, and social media) to attend.

An advisory board has been established to counsel NAES in matters of research, resident instruction and outreach. The board's qualifications cover a wide spectrum of interest, from local ranchers to federal agencies. Board members are asked to conduct focus groups based upon their home district to ascertain viewpoints and ideas on the needs and deficiencies of their local region.

2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Advisory Committees
- Open Listening Sessions
- Needs Assessments
- Other (Informal discussions with key stakeholders)

Brief explanation.

We currently have a broadly based College of Agriculture, Biotechnology & Natural Resources / NAES advisory board committee that meet and provide input three times per year. In addition, we have faculty members that schedule and coordinate town hall meetings throughout the state with the purpose of obtaining direct input to the NAES research portfolio. This year county focus groups were assembled to fine tune regional issue that were being missed by previous methods. Our partnership with Nevada Cooperative Extension provides assistance and access to stakeholders through joint efforts like the annual Cattlemen's Update - a program designed to bring the researcher to the rancher. With the administration abiding by an "open door policy", informal discussions with key stakeholders provides important input into our research programs and resident instruction.

2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Meeting specifically with non-traditional groups
- Other (Conducted field days where visitors were requested to provide input and met with Cooperative Extension to corroborate input sources)

Brief explanation.

In development and strategic planning of NAES research programs and priorities, input was collected primarily through meetings with stakeholder groups and individuals including concerned citizens, ranchers, agricultural organizations, natural resources professionals and managers, state and federal agency representatives, food industry representatives, and University of Nevada Cooperative Extension (UNCE) administrators, specialists and educators.

NAES will also hold several other public events during the year to gather information from stakeholders. Whenever it is feasible, efforts will be made to coordinate relevant activities with extension to avoid duplication. Specific actions relevant to individual programs are discussed below.

NAES research project participants obtained direct and indirect stakeholder input through varied avenues. Projects with social science components frequently used questionnaires and surveys. Stakeholder input to some basic science and some applied projects occurred in the form of reviewer inputs to proposals, and from questions, comments and discussions at regional, national and international conferences. Stakeholder input for other projects was collected through comments and questions at workshops and topical meetings for end users.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities

Brief explanation.

Information collected from stakeholders was used to adjust issue areas that are influencing NAES's future direction. These stakeholder priorities also directly influenced applied research activity, while influencing which departments or areas of expertise get hiring priority. Successful strategic hires will enable us to meet existing needs and at the same time reposition for those on the horizon. Our stakeholders help us see into the future to identify those emerging issues. For example, in the past year we decided to hire a new faculty member to focus on large animal nutrition. Input from Nevada Cattlemen's Association about that industry's needs helped inform this decision, and the industry was represented on the search committee.

NAES/CABNR makes an effort to get stakeholders directly involved in important decisions that will set the course of the college for years to come. For example, the private sector was represented on the search committees that hired our new dean.

NAES used stakeholder input to make more immediate decisions, such as where to invest funding to direct current faculty and their research into emerging issues such as biofuels and alternative drought resistant crops. Stakeholder input was utilized in other activities such as annual budget allocation, providing feedback to the college, departments and faculty, and most importantly, in setting priorities for our Formula Fund research Call for Proposals and deciding how to allocate these funds.

Brief Explanation of what you learned from your Stakeholders

Inputs from stakeholders confirmed that the following issues were still of critical concern:

1. development of alternative crops such as grapes, hops, teff, Camelina, and prickly-pear cactus
2. water quality and quantity,
3. invasive species and biosecurity,
4. rural development and ranch production
5. development of bioenergy opportunities especially for small farming systems,
6. adolescent and childhood obesity.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	1408919	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	0	1294879	0
Actual Matching	0	0	989935	0
Actual All Other	0	0	0	0
Total Actual Expended	0	0	2284814	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	0	349827	0

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Global Food Security and Hunger
2	Animal and their Systems
3	Natural Resource Management and Environmental Sciences in the Great Basin and Sierran
4	Nutrition and Health
5	Economic Development with Emphasis in Rural Areas
6	Sustainable Energy
7	Food Safety
8	Childhood Obesity
9	Climate Change

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Global Food Security and Hunger

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships			13%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			62%	
502	New and Improved Food Products			15%	
504	Home and Commercial Food Service			5%	
701	Nutrient Composition of Food			5%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	3.0	0.0
Actual Paid Professional	0.0	0.0	2.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	150822	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	71857	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Engineering Plants for Increased Nutrition and Improved Stress Tolerance

Over the past year, progress has been made in seed specific gene expression constructs to express the three thiamin (vitamin B1) biosynthetic genes in plants. These genes include the Arabidopsis thiazole synthase (an important enzyme in B1 production), the Arabidopsis hydroxymethylpyrimidine synthase (a catalysis in production of B1) and the Arabidopsis thiamine-monophosphate pyrophosphorylase (another enzyme catalysis). The three, seed specific, gene cassettes were inserted into a single plant transformation vector and inserted into Arabidopsis. The team is now screening the transgenic line generated in these studies.

Improving the Reproductive Anatomy of Plants Under Heat, Cold and Drought Stress

Scientists at UNR have made significant progress in all three areas of stress. This past year, the team found a "stress protection gene" that when over expressed increases pollen fertility under stressful conditions. Additional transgenic plants are now being tested to verify results. A second line of research, which addresses rewiring the plant's cell response to drought, was completed by bio-engineering a signaling pathway mutation that controls cell responses. Gene expression between wild type pollen and transgenic pollen when placed under heat stress was also explored. Our scientists have completed both wild and transgenic RNA sequence analysis to identify changes that correlate with improved heat stress tolerance. The team is now working to insert this mutation into transgenic plants.

Evaluation of Wine Grape Cultivars and Clones

In order to better understand the dehydration response at the transcript, proteomic, and metabolite level, using a dehydration assay (also developed over the past year) to test the hypothesis that source and sink tissues respond differently to dehydration. Another approach that was tested to better understand the response to dehydration of Cabernet Sauvignon leaves was using a shotgun proteomics with collaborators in Sydney, Australia. A final transcriptomics approach is now being investigated to determine the differences between two North American root stocks known to be drought tolerant.

Hydroponics impact on Content of Bioactive Compounds

Stage one has been completed with the retrofitting of two UN R greenhouses to accommodate hydroponically-based growing systems. Evaluations are finished on four different types of systems. Trials are now underway on the production quality of vegetables grown under new LED technology vs. standard metal halide lights. Trials have also begun on hydroponically grown berries' fruit quality.

2. Brief description of the target audience

The scientific community, agriculture producers, local organizations, backyard hobbyists, as well as students taking classes or participating in research activities.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	595	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	13	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Peer reviewed journal articles, publications in commodity group publications, presentations at scientific meetings, presentations at stakeholder, Native American and agency meetings
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Demonstrations and Field Days Conducted
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Newsletters Produced

Year	Actual
2013	3

Output #4

Output Measure

- Leveraged Research Projects

Year	Actual
2013	170800

Output #5

Output Measure

- Web Sites Created or Updated

Year	Actual
2013	3

Output #6

Output Measure

- Digital Media Created or Updated

Year	Actual
2013	13

Output #7

Output Measure

- Manuals and Other Printed Instructional Materials Produced

Year	Actual
2013	2

Output #8

Output Measure

- Number of Graduate Students or Post-Doctorates Trained

Year	Actual
2013	6

Output #9

Output Measure

- Number of Undergraduate Students Involved in Research

Year	Actual
2013	19

Output #10

Output Measure

- Abstracts, Books, Book Chapter(s), Proceedings, Research Reports, and Technical Publications

Year	Actual
2013	2

Output #11

Output Measure

- Demonstrations, Field Days, and Workshops Conducted

Year	Actual
2013	28

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Peer reviewed journal articles, presentations at scientific meetings, presentations at stakeholder, Native American and agency meetings.
2	Improving Stress Tolerance in Wine Grape Cultivars for Northern Nevada
3	Urban Hydroponic Fruit And Vegetable Production: Impact On Content Of Bioactive Compounds

Outcome #1

1. Outcome Measures

Peer reviewed journal articles, presentations at scientific meetings, presentations at stakeholder, Native American and agency meetings.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Improving Stress Tolerance in Wine Grape Cultivars for Northern Nevada

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Grape production is one of the most important agricultural commodities in the USA and is threatened by global warming. This is particularly relevant in a semi-arid state such as Nevada with a rapidly growing population competing for scarce water resources. There is an emerging grape and wine industry in Nevada which has the potential for a very large economic impact on the state and the local grower. This project addresses which wine-grape cultivars are most water use efficient and seeks to select genotypes varying in enzymes, hormones and proteins production that can be used to improve water use efficiency and drought resistance.

What has been done
Over the past year, a rapid dehydration assay, developed at UNR, was used to investigate the rapid dehydration response of different Vitis cultivars. In order to better understand the dehydration response at the transcript, proteomic, and metabolite level, the above mentioned dehydration assay was used to test the hypothesis that source and sink tissues respond differently to dehydration. Another important player in drought signaling, the plant hormone abscisic acid, was shown to have differences in ABA metabolism between tissue types. Another approach that has been taken to better understand the response to dehydration of Cabernet Sauvignon leaves has been shotgun proteomics resulting in over 50 proteins showing significant

changes in abundance. Finally, a transcriptomic approach was taken to investigate differences between the two North American rootstocks (Ramsey and Riparia Gloire) to better understand their drought tolerances.

Results
To our knowledge this is the first observation of the plant hormone abscisic acid regulation in grape vine. This information will better our understanding of the complex interactions that are occurring between these two tissue types under conditions of rapid dehydration. Proteomic results are another significant addition to the scientific knowledge base, in that the abundance of over 50 proteins are changing very rapidly, some changes occurring within an hour of treatment.

Again this year, a tripartite program has provided training to the general public on how to grow grapes in Northern Nevada, how to make wine, and a wine tasting class held throughout the year. As a result, a 501 c3 was established "Nevada Vines and Wines" dedicated to improving Northern Nevada?s wine industry.

4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

Outcome #3

1. Outcome Measures

Urban Hydroponic Fruit And Vegetable Production: Impact On Content Of Bioactive Compounds

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Providing sources of high quality and safe fruits and vegetables for Nevadans, especially children, the elderly and vulnerable high-risk populations is a lofty goal. Nevadans, for the most part, live in arid rural and urban areas with short growing seasons, which limit the region's capacity to produce fruits and vegetables. Local communities and individuals are moving toward using a variety of alternative farming techniques, such as hydroponics, aquaponics, and hoop houses to grow fresh fruits and vegetables. However, there is scant research dealing with the impact of such

farming techniques on the quality and safety of fruits and vegetables.

What has been done
The investigative team from UNR analyzed four varieties of lettuce (Waldmann's Dark Green, Red Lollo Antago, Red Romaine Annapolis, and Butterleaf) to determine the concentration levels of two antioxidant compounds, vitamin C (ascorbic acid) and vitamin E (tocopherol), grown in soil verses hydroponically.

Results
Results indicate that hydroponically grown lettuce varieties are significantly higher in both vitamin C & E content than their soil-grown counterparts, and hydroponic gardening is a viable option for producing nutritious fruits and vegetables. The team has concluded that utilizing a hydroponic method of crop farming is sufficient for producing nutritious produce.

By working in close association with graduate students and various outside interests, the UNR team has given the green light for acceptable nutritional content levels of hydroponically grown lettuce. The project allowed a graduate student to complete a Master Degree in nutritional science. The project also trained undergraduate students on how to work on field projects and to otherwise assist with project implementation, data input, sample measurement, etc.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
701	Nutrient Composition of Food

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Competing Programmatic Challenges

Brief Explanation

The Experiment Station is still trying to recover from the 31 hard money positions lost after the 2010 circulation review. Until a number of critical areas are re-staffed the agricultural program will be severely diminished. The circular review has also produced a number of administrative issues that contribute to the outcomes of our Ag program: the potential merger with Cooperative Extension, and all faculty changing from 12 month to 9 month appointments.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Nevada's research projects have an evaluative element that is required by state and

federal-level funding sources that provides documentation related to project assumptions, goals and outcomes. This information is used to determine the overall success of research initiatives; their contribution to providing practical, real-world solutions and resources to address challenges and problems; and whether continuation funding and/or new dollars are appropriate and necessary as funds are available.

- Conducted over 24 workshops on cultivating, pest management and wine production
- Attracted the attention of hundreds of backyard-amateur viticulturists
- Trained 25 students and post-doc
- Leveraged over $170,000 in extramural funds
- Created a community that wants to grow and promote the wine industry in Northern Nevada

Key Items of Evaluation

Created a community that wants to grow and promote the wine industry in Northern Nevada.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Animal and their Systems

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
121	Management of Range Resources			20%	
135	Aquatic and Terrestrial Wildlife			48%	
136	Conservation of Biological Diversity			15%	
301	Reproductive Performance of Animals			2%	
302	Nutrient Utilization in Animals			1%	
303	Genetic Improvement of Animals			2%	
304	Animal Genome			2%	
311	Animal Diseases			2%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals			8%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.5	0.0
Actual Paid Professional	0.0	0.0	5.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	186786	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	285964	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Epizootic Bovine Abortion Immunity Responses Longevity Trials

Having developed a vaccine for EBA in collaboration with UC-Davis, issues have arisen in regarding the duration of immunity. The NAES research team is now investigating the time intervals between re-infection of the EBA vector. Over the past year, the team has discovered a gene that is being expressed (a cytokine inflammatory mediator associated with T-cell regulation) that correlates directly with protective antibody responses eight weeks following exposure to the vaccine agent. These results will ultimately assist in determining when a heifer should be vaccinated, but trials are now being conducted to determine safety and efficacious.

Rangeland management problems associated with cattle foraging on forage kochia

Nutritive content was determined for forage kochia during fall and winter seasons over the past two years. Foam strength and gas production assessments were also determined using artificial rumen system developed at NAES. To assist producers, fall grazing prescriptions have been developed that minimize the likelihood of mortality events.

Impacts of Cattle and Feral Horses on Sage Grouse Survival

Having selected three major field sites based upon the presence or absences of cattle and feral horses, the research team continues to conduct sage grouse population census, i.e. adult and brood survival and nesting success rates. Over 85 sage hens have been fitted with tracking devised and are currently being tracked. Further censuses were conducted to evaluated population densities and site usage times by both feral horses and cattle. Vegetation samples are being collected to determine nest site preferences. Initial statistical analyses have begun, but with only six months data, results are very preliminary.

Mineral Deficiency or Disease: Wildlife as Indicators for Livestock

Over the past year, NAES wildlife scientists collected baseline data on disease prevalence, trace mineral concentrations, and immune response from 49 mule deer blood samples, along with morphometric and condition metrics, and radio collars were deployed. Necropsies were performed on three symptomatic individuals. Trace mineral analyses were performed on plant samples collected from transects near mule deer habitat. Individual deer were monitored bi-weekly over the summer months to determine habitat use and mortality. Data are now being analyzed, with respect to immune function, trace minerals and stress hormones. The team is also in the process of conducting statistical analysis on data collected for publication.

Genetic Landscape of Big Horn Sheep Diseases

NAES scientists in collaboration with the Nevada Department of Wildlife have collected over 400 Bighorn Sheep tissue samples from across the state. Those samples were then quantified for genetic diversity at both neutral and immunity-related genes in healthy and sick/dead sheep. Initial work has gone into developing a database of individual sheep genotypes associated to disease incidence and location.

Bovine Viral Diarrhea Virus in Free-Ranging Population of Ungulates

To determine the effect of BVDV infections in mule deer in regard to reproductive failures, fawn mortalities and herd recruitment, NAES scientists have begun processing samples for analysis of glucocorticoid levels (a response to the immune system). A new procedure was developed to process hair in preparation for GC extractions. Typical GC assaying kits were calibrated to read hair samples from both mule deer and elk. Finally, scientist have quantified bacteria killing ability and hemolytic complement activity, and begun developing an ELISA test to quantify two antibody levels.

Effects of Provision Water on Juvenile Mule Deer's Survival and Recruitment

NAES scientists in collaboration with National Park Services captured 45 deer within the Mojave National Preserve. Animals were fitted with GPS or VHF radio collars and monitored over the next year. Data collected from the collars has been assembled into a database that reflects habitat selection, movement patterns and use of resources, i.e. provisioned water.

Impact Of Acute Non-Lethal Neurotoxic Compounds Exposure On Migratory Bird Species

This past year, scientists initiated two studies to access the impact of 1) methyl mercury on avian reproduction and chick development, and 2) to assess physiological condition of adults birds coated in unrefined crude oil collected from the Deep Water Horizon spill. Both studies will use the homing pigeon model (a surrogates for migratory birds) developed here at UNR. Methyl mercury test are completed through four generations. With each round of breeding, the reproductive success in the exposed group decreased from 50% in round one to 17% in round four. Based upon these results the team has initiated a similar study at one half the dosage of methyl mercury. The crude oil flight trials are still underway.

Characterizing Mountain Lion Distribution, Abundance and Prey Selection in Nevada

Tissue samples were collected from 700 lions to delineate genetic boundaries as well as estimate migration between interacting sub-populations. These data in turn have provided the research team with a source-sink model that can be used to determine direction of migration. Tracking collars were placed on 24 adult lions to determine location of kill sites. The team is also quantifying kill rates and prey selection of mountain lions in select sub-populations in Nevada.

2. Brief description of the target audience

Target audiences include US Fish & Wildlife Services, Nevada Department of Wildlife, sport hunters, livestock owners, local residents, numerous wildlife oriented NGOs, land-use planning agencies, and the scientific community in general.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	19	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Peer reviewed scientific publications, publications in natural resource and environmental organization publications, presentations at scientific meetings, presentations at stakeholder, Native American and agency meetings
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Demonstrations, Field Days, and Workshops Conducted

Year	Actual
2013	8

Output #3

Output Measure

- Newsletters Produced

Year	Actual
2013	3

Output #4

Output Measure

- Leveraged Research Projects

Year	Actual
2013	635936

Output #5

Output Measure

- Web Sites Created or Updated

Year	Actual
2013	3

Output #6

Output Measure

- Manuals and Other Printed Instructional Materials Produced

Year	Actual
2013	0

Output #7

Output Measure

- Number of Graduate Students or Post-Doctorates Trained

Year	Actual
2013	6

Output #8

Output Measure

- Number of Undergraduate Students Involved in Research

Year	Actual
2013	19

Output #9

Output Measure

- Abstracts, Books, Book Chapter(s), Proceedings, Research Reports, and Technical Publications

Year	Actual
2013	4

Output #10

Output Measure

- Digital Media Created or Updated

Year	Actual
2013	54

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Peer reviewed scientific publications, publications in natural resource and environmental organization publications, presentations at scientific meetings, presentations at stakeholder, Native American and agency meetings, and leveraged funds.
2	Bull Behavior and the Relationship with Paternity
3	Nutrient Content Of Forage Kochia and Potential for Causing Frothy Bloat
4	Characterizing Mountain Lion Distribution, Abundance, And Prey Selection In Nevada
5	Determining How the Tick-Borne Disease "Relapsing Fever" Is Maintained in Nature

Outcome #1

1. Outcome Measures

Peer reviewed scientific publications, publications in natural resource and environmental organization publications, presentations at scientific meetings, presentations at stakeholder, Native American and agency meetings, and leveraged funds.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Bull Behavior and the Relationship with Paternity

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The beef cattle industry is a major economic producer and the number one agriculture commodity in the state of Nevada. Most beef cattle operations utilize a natural service breeding program and allow multiple bulls to be released in pastures with cows and heifers. In recent years, DNA technology has allowed producers to know the paternity of their calves and understand the production of each of their bulls. While these techniques can help to identify which bulls are siring certain offspring, it is still not widely understood why certain bulls are successful in the field. Past research that has measured behavior in order to predict bull fertility often use tests outside of the breeding season and in artificial arenas, both of which have been shown to be unreliable in predicting bull fertility. Thus, intensive behavioral studies on bull social behavior in the field are needed in order to understand why some bulls are successful at securing paternity, and others are not.

The main objective of this study is to observe bull behavior in the field during the breeding season in order to determine 1) why bulls are successful at securing matings and subsequent paternity and 2) what behavioral measures and physical characteristics are correlated to bull reproductive success.

Initially, ranchers of Northern Nevada have asked UNR to look into methods for determining paternity in open-range operations. Using genetic techniques, researchers at UNR had determined that there was high variability in success rates in fathering calves. This leads one to ask, what makes one bull more successful than another? A large body of work has looked at this variability, measure a number of physical characteristics (age, scrotal circumference, tenure, etc.), but it does not seem to tell the whole story.

What has been done
Over the past couple of years, DNA has been collected from bulls, cows and calves. All bulls were semen tested to verify sound reproductively. Then over the past two years several hundred hours of behavioral observations were performed. 600 cows and 28 bulls were measured through 2012-13.

Results
This knowledge will increase our understanding of reproductive behavior of bulls, which is still relatively under researched, and can improve cattle operations, specifically bull management, in the state of Nevada.

One of the important finds from this project was a confirmation that physical characteristics do not correlate with paternity success rates. Accepts for age or tenure and testosterone levels which were positively correlated to success rates. What was found in the first year of the study was that bull that had greatest percentage time spent next to a female, or standing, and the amount of signaling were all behaviors associated with success. The second year of the study, with nearly double the sample size of bulls, what was found is that sexual behaviors are not associated with paternity success rates. A carry over result from last year was proximity to female. Again, time spent next to a cow translated into great success of fathering calves.

The bottom line to this project is that it serves a very practical purpose, do you buy the $5,000 bull that avoids copulation or the $1,800 bull that services all your females.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals

Outcome #3

1. Outcome Measures

Nutrient Content Of Forage Kochia and Potential for Causing Frothy Bloat

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Dormant season forage for grazing animals both wild and domestic in Nevada, is often in short supply and sometimes low in nutrient content. For this reason, a great deal of resources has been brought to bear on the challenge. A number of non-indigenous species have been major constituents of rangeland restoration and fire rehabilitation projects. One species, forage kochia has been a key species included in number of seed mix prescriptions. It now occurs widely across northern and central Nevada.

What has been done
Nutritive content was determined for forage kochia during the fall and winter seasons. Fermentation products were determined using a dual flow continuous culture system. To determine the potential for developing frothy bloat, foam production, foam strength and gas production were measured.

Results
The project has fostered development of a cattle grazing prescription that minimizes the likelihood of mortality events for ranches that depend on forage kochia during the fall grazing period. Through a state-wide tour of Nevada, hosted by the Nevada Chapter of Cattlemen's Association, over 450 ranchers and Bureau of Land Management personnel were provided information for better management of their herds to minimize animal losses. The same presentation is currently being given to both Arizona and Idaho Cattlemen's Association members.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals

<u>Outcome #4</u>

1. Outcome Measures

Characterizing Mountain Lion Distribution, Abundance, And Prey Selection In Nevada

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As Nevada's largest predator, mountain lions share complex interactions with species they prey upon including mule deer, elk, mountain sheep, and wild horses. Maintaining healthy rangeland ecosystems includes predator-prey dynamics and mountain lions are an integral part of western forests and rangelands. Effective management of mountain lion populations is critical to dynamics of both mountain lion prey populations, especially large prey species. Other than location, age, and sex of harvested lions, little is known about mountain lion demographics, movement patterns, other sources of mortality, or rates of predation on large mammal prey.

State legislative bill (AB 256) was proposed to classify mountain lions as an unprotected mammal in Nevada, and the controversy surrounding that bill, which failed, exemplified the need for detailed information on mountain lion populations and how they affect prey populations in Nevada. This project will clarify many of the questions and possible misconceptions surrounding mountain lions and their prey in Nevada.

What has been done
The NAES research team has delineated genetic population structure of mountain lions throughout Nevada and determined meta-population structure. Having collected over 700 tissue samples from hunter harvested mountain lions, the team delineated genetic boundaries of mountain lion populations in Nevada as well as estimated the rate of migration between interacting sub-populations. This allowed the team to identify source and sink populations by estimating the rate and direction of effective migration between populations. By quantifying kill rates and prey selection in select sub-populations across Nevada, this project provided quantitative evidence for maintaining balance between mountain lions and prey.

Results
This project highlights the innovative genetic techniques investigators used to identify source-sink dynamics of mountain lions in the Great Basin at a landscape scale.

"It would have been difficult to analyze source-sink dynamics and its potential causes at a large spatial scale in a large mammal predator using conventional methods such as population surveys, mark-recapture experiments, radio-tracking or GPS collars", states Dr. Kelley Stewart, University of Nevada, wildlife ecologist.

Leading ecological geneticists Dr. Rolf Holderegger and Dr. Felix Gugerli are strong advocates for the use of Dr. Stewart's methods to infer directional measures of contemporary or recent

migration or gene flow, in future landscape genetic studies. Dr. Holderegger remarks "this study shows that the incorporation of asymmetrical measurements of migration in landscape genetics adds substantially to this field's relevance for application." Dr. Gugerli said, "Similar insights relevant for conservation management of wild populations could be envisioned by Dr. Stewart's widespread application of approaches measuring contemporary or recent migration in other species."

Finally, results from this project can now be used by Nevada and California wildlife managers to create biologically meaningful management boundaries that incorporate the level of immigration occurring between populations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

Outcome #5

1. Outcome Measures

Determining How the Tick-Borne Disease "Relapsing Fever" Is Maintained in Nature

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Relapsing fever has affected citizens of Nevada and California alike and is transmitted to individuals through the bite of an infected tick. Tick borne diseases such a relapsing fever, epizootic bovine abortion and human granulocytic anaplasmosis are endemic in the eastern Sierra Nevada making this ecosystem an important laboratory for the study of many of these threats to human and animal health. In addition, there is evidence that strains of relapsing fever spirochetes in California and Nevada may be increasing in virulence. This increase is either due to ecological, evolutionary, or epidemiological factors. A full evaluation of these diverse relapsing fever agents, their genetic complexity, and their ecological maintenance in reservoir species has yet to be performed.

What has been done
Having collected over 1,500 small mammals from both Nevada and California, cytochrome B sequencing and subsequent microsatellite analysis were ran to identify infected samples. To determine what strains of bacteria were present in infected samples, the team sequenced three specific genes. Finally, the team ran statistical comparisons and analysis of molecular variance in order to evaluate relationships between population structure and dispersal in chipmunk species and comparing them to the prevalence and strain composition of relapsing fever bacteria existing in the same sites.

Results
This project has established important foundational results for ongoing research being applied to a little understood and often misdiagnosed disease endemic throughout the eastern Sierra Nevada Mountains. The findings are now helping epidemiologists and health care personnel in California and Nevada better understand the ecology of other endemic zoonotic diseases including hantavirus and plague. Residents of the Great Basin and Sierran ecosystems are served when physicians and public health officials make decisions based on current scientific research regarding these life-threatening diseases. This project has shown that site with human habitation (i.e. cabins, outbuilding, etc.) are serving as sinks for rodent immigration, thus fostering healthier populations of bacteria responsible for relapsing fever, which in turn may be the leading cause for increased virulence.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife
311	Animal Diseases

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Competing Public priorities

Brief Explanation

Nevada annual average precipitation continues to decline, with past two winters scoring some of the driest on record. Without adequate water supplies the competition between livestock and wildlife for resources could prove to be deadly.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Nevada's research projects have an evaluative element that is required by state and federal-level funding sources that provides documentation related to project assumptions, goals and outcomes. This information is used to determine the overall success of research initiatives; their contribution to providing practical, real-world solutions and resources to address challenges and problems; and whether continuation funding and/or new dollars are appropriate and necessary as funds are available.

- Provided ranches with tools to evaluate bull potential for being good breeders on open range.
- Provided ranchers with a grazing prescription that minimizes frothy bloat in cattle.
- Have begun instructing rural residence of the Sierras on how to minimize their chances of incurring relapsing fever.
- Expanded the knowledge base on Nevada's top predator.
- Leveraged over $635,000 in extramural funds
- Trained 25 students and post-docs

Key Items of Evaluation

The use of animal behavior research in determining potential bull fecundity is a novel approach that ranchers can easily learn.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Natural Resource Management and Environmental Sciences in the Great Basin and Sierran Ecosystems

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships			11%	
103	Management of Saline and Sodic Soils and Salinity			14%	
112	Watershed Protection and Management			13%	
121	Management of Range Resources			24%	
122	Management and Control of Forest and Range Fires			5%	
123	Management and Sustainability of Forest Resources			1%	
133	Pollution Prevention and Mitigation			20%	
135	Aquatic and Terrestrial Wildlife			1%	
211	Insects, Mites, and Other Arthropods Affecting Plants			11%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	3.9	0.0
Actual Paid Professional	0.0	0.0	6.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	524206	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	340968	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Bark Beetle Management through Biochemistry - controlling invasive forest species.

Research efforts have been directed towards understanding hydrocarbon production in bark beetles' exoskeletons (shells) that eventually leads to desiccation and animal death. This year a unique microsomal fatty acid enzyme was discovered to be involved in making the precursor fatty acids to methyl-branched hydrocarbons. This unique microsomal FAE and a soluble FAE were cloned in order to isolate genes involved in this synthesis. The team has assembled the genes and sequenced the enzyme's 7,000 base pairs. These clones are now being growing in SF9 host cells.

Another research effort is approaching the problem by looking at controlling anti-diuretic peptides in beetles. Thus far, the research team has cloned five important receptor sites in the insect excretory and osmoregulatory systems thought to disrupt molting. The team has also completed the expression of one of these receptors in the Human Embryonic Kidney cell lines and work is being conducted using these same techniques to express the other receptors.

The final research effort is working to better understand the biochemical mechanisms beetles use to detoxify turpentine resin found in pine forests. To date, this team of scientists has clarified substrate preferences and product profiles for four enzymes catalyzing detoxifying reactions.

Methyl Mercury Production And Inputs From Irrigation Drains In Nevada

Mercury concentrations in water and sediments were monitored in irrigation drains seasonally for the past two years, along with water bodies above and below drain inputs, for the three primary watersheds in Northern Nevada. Five study areas were chosen based on the presence of agricultural activity, accessibility, and partner cooperation. At each sampling location, water samples were collected for methyl mercury analyses along with phosphate, sulfur, nitrogen, dissolved organic carbon and water condition. The team has completed laboratory analyses and continues to analyze the data generated from this study.

Testing Competitiveness of Native Plant Verses the Invasive Species Cheatgrass

Using greenhouse, field, and long-term natural experiments, NAES scientists have demonstrated that there are particular traits associated with successful establishment in invaded systems, and that in some cases, native populations are evolving increased frequencies of favorable traits in invaded areas. To date, the team has found that specific phenological and phenotypic traits increase the ability of native grasses to tolerate competition from Cheatgrass, and have found that some of these traits are more frequently found in invaded communities. Root characteristics are now the main focus of the project. Using four grasses from 25 different populations, emergence and survival trials are now underway and will be

monitored in 2014.

A second line of research is to understand the roles of water and nitrogen acquisition in the competitive interactions between cheatgrass and native rangeland species. Three greenhouse experiments were conducted to examine the competition between two species of native grasses and cheatgrass. The team determined which below-ground characteristics of native grasses were competitive with cheatgrass, related to water and nitrogen acquisition. They established how directional selection effects native grasses evolution, driving plants to produce less above-ground biomass, while increasing root biomass. Finally, the team related leaf nitrogen content to assimilation rates in cheatgrass growing under greenhouse and field conditions.

Sustainability Of Mowing Fuel Breaks: Resilience Of Sagebrush Rangelands
Investigators are currently studying the characteristics of lands subjected to ongoing multiple use management that cause them to increase or decrease resilience when treated by mowing to create fuels breaks. The team has finished the preliminary data collection, data inventory, and data entry into a spatially-explicit database of land treatments conducted primarily on federal lands in the Great Basin from 1950 to present. They have begun analytical comparisons of the vegetative responses to wildfire and mowing of sagebrush to create fuel breaks by measuring changes in 13 parameters.

Long-Term Influences of Adaptive Management Practices on an Eastern Sierran Pine Forest
To date, this project has monitored the pre- and post- prescribed fire treatments of two forests that neighbor Lake Tahoe region and the effects of different methods of forest thinning for more than ten years. The 10th annual evaluation of long-term stand health, productivity, soil nutrients, watershed hydrological parameters, and understory fuel loads was conducted to better understand the effects of controlled burn sites and a combination of thinning practices. Data collected this past year has been combined with similar pre-treatment data and that collected at mid study to continue the analyses of intermediate and long-term forest responses to treatment.

Modeling Salt Loving Plants to Improve Environmental Quality and Ag Production
Thus far, the research team at UNR has reviewed and tested eight plant production models. A final decision was made to go with the APEX model. A module has now been developed that incorporates salinity as a whole into the working APEX model and parameterized. Data collect from both the Great Basin region and Uzbekistan' farming region have been now loaded into the improved model. At this point in time, simulations are being conducted to fine-tune parameters.

2. Brief description of the target audience

The target audiences for research and educational programming are livestock producers, veterinarians, environmentalists, local governments, agency personnel, and biotechnology companies.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1308	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	43	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Peer reviewed scientific publications, publications in natural resource and environmental organization publications, presentations at scientific meetings, presentations at stakeholder, Native American and agency meetings.
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Demonstrations, Field Days, and Workshops Conducted

Year	Actual
2013	25

Output #3

Output Measure

- Newsletters Produced

Year	Actual

2013	3

Output #4

Output Measure

- Leveraged Research Projects

Year	Actual
2013	2978173

Output #5

Output Measure

- Web Sites Created or Updated

Year	Actual
2013	8

Output #6

Output Measure

- Manuals and Other Printed Instructional Materials Produced

Year	Actual
2013	1

Output #7

Output Measure

- Number of Graduate Students or Post-Doctorates Trained

Year	Actual
2013	18

Output #8

Output Measure

- Number of Undergraduate Students Involved in Research

Year	Actual
2013	30

Output #9

Output Measure

- Abstracts, Books, Book Chapter(s), Proceedings, Research Reports, and Technical Publications

Year	Actual
2013	21

Output #10

Output Measure

- Digital Media Created or Updated

Year	Actual
2013	71

Output #11

Output Measure

- Lay or Popular Publications

Year	Actual
2013	54

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Peer reviewed journal articles, presentations at scientific meetings, articles in natural resource and environmental science magazines, presentations at stakeholder, Native American and agency meetings.
2	Determining Native Grasses Competitiveness Against Cheatgrass Invaded Rangelands
3	Developing Organizational Tools to Facilitate Riparian Restoration In The Walker River Basin

Outcome #1

1. Outcome Measures

Peer reviewed journal articles, presentations at scientific meetings, articles in natural resource and environmental science magazines, presentations at stakeholder, Native American and agency meetings.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Determining Native Grasses Competitiveness Against Cheatgrass Invaded Rangelands

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Restoration of cheatgrass invaded rangelands is among the largest management challenges in the Intermountain West. In an effort to reduce the conversion of native sagebrush steppe into annual communities, the Bureau of Land Management reseeds rangelands after fire at very large scales, seeding tens of thousands of acres per year in extreme fire years. These seeding efforts have mixed success. One factor that may affect the establishment of seeded species in invaded areas is the choice of seeds used in restoration. Earlier research has demonstrated that plants vary in their ability to tolerate competition with Cheatgrass. This research will compare the relative performance of native grasses, collected from field sites close to the area to be restored, with commercially-available seeds.

What has been done
The team has conducted field plantings with native seeds, which were wild-collected, as well as commercially available seeds, which were screened for early-root growth characteristics by growing seedlings for 10 days in a greenhouse environment. Siblings of these seeds were planted back into their home site. Root characteristics strongly affected performance on squirreltail in Northern Nevada rangelands. Additionally, the team conducted collections of seeds

from 25 additional populations of native grasses and screened them for root characteristics. These were planted into five different sites in Fall 2013, and will be monitored for emergence and survival in 2014.

Results
Federal and state agencies are now beginning to recognize the importance of the evolutionary potential found in genetically diverse restoration material.

This research sheds light on how native plants can adaptively respond to cheatgrass competing, via phenotypic plasticity. In turn, this will allow restorationists to identify native plant populations that may become locally adapted to persist in the face of disturbance from Cheatgrass.

Ultimately, the results of this research will better inform restorationists of where to look for such locally adapted genotypes as plants from these locations can serve as a source of seed production and collection and thus the improvement of current restoration practices. Through the efforts and guidance of the project's principle investigator, the BLM Surprise Valley field office is now commissioning their own local adapted seeds for restoration projects in Northern Nevada.

4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources

Outcome #3

1. Outcome Measures

Developing Organizational Tools to Facilitate Riparian Restoration In The Walker River Basin

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Over the past decade numerous research projects have been conducted to restore the Walker River Basin. However, despite the highly collaborative nature of Walker Basin research to date, information resides in multiple laboratories and is not seamlessly integrated in the context of providing decision support for Walker Basin restoration. GIS-based decision support systems

have emerged as a method for allowing stakeholders to balance the needs of multiple competing interests while crafting management plans. There is need for integration of existing information into a functional database that may be accessed by multiple entities.

What has been done
The team developed an integrated geodatabase of Walker Basin spatial information derived from various studies and compiled data sources. Next, the team built spatially-explicit data layers for habitat modeling of birds and invasive weeds to quantify ecologically based reference conditions for restoration of irrigated fields and riparian sites. Finally, an application was developed allowing researchers, managers, and the general public to access relevant data sources relating to Walker Basin ecosystem restoration.

Results
This decision support system uses a three step framework. First, assessing the condition of sites along the river. Next, gauging the feasibility of restoration. Finally, calculating the costs and benefits associated with restoration activities.

This spatial database begins to address the scientific basis for current and future decisions regarding ecological restoration and management of the Walker River Basin. Through the linkages of the spatial database to future conservation will help to identify gaps in our data and understanding that should prove useful for guiding future research.

Integration of spatial data sets with predictive models for a range of ecosystem attributes will help to prioritize locations most suitable for passive and active restoration and will provide a basis for assessing tradeoffs associated with particular restoration scenarios, with respect to diverse restoration goals.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
121	Management of Range Resources
135	Aquatic and Terrestrial Wildlife

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Competing Programmatic Challenges
- Other (Budgetary Restraints)

Brief Explanation

The extreme weather conditions during last year's season delayed or greatly diminished some of the research projects being conducted at our various research centers and publicly owned lands, particularly related to rangeland restoration and invasive weeds. The ongoing economic challenges being faced by Nevada continue to affect this planned program area.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Nevada's research projects have an evaluative element that is required by state and federal-level funding sources that provides documentation related to project assumptions, goals and outcomes. This information is used to determine the overall success of research initiatives; their contribution to providing practical, real-world solutions and resources to address challenges and problems; and whether continuation funding and/or new dollars are appropriate and necessary as funds are available.

- Leveraged over $297K in extramural funds
- Trained 48 students and post-docs
- Native grass trials are showing great promise in out competing invasive weeds like cheatgrass.
- Building a multi-layered GIS database is helping to prioritize locations most suitable for passive and active restoration in the Walker River Basin

Key Items of Evaluation

Development of geo-database as an organizational tool to facilitate riparian restoration in the Walker River basin.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Nutrition and Health

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
133	Pollution Prevention and Mitigation			8%	
702	Requirements and Function of Nutrients and Other Food Components			78%	
721	Insects and Other Pests Affecting Humans			6%	
722	Zoonotic Diseases and Parasites Affecting Humans			8%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.0	0.0
Actual Paid Professional	0.0	0.0	0.9	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	70836	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	53230	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Beneficial and Adverse Effects of Grape Seed Extract on Human Health

In order to better understand the effects of grape seed extract on serum triglyceride levels, the investigative team completed the in vitro studies using a human colonic cell line to assess the specific effects of the extract on human intestines. The team has moved forward with their work on "Black 6" genetically modified mice used as models of human disease. They have also determined the effect of the extract on triglyceride levels in the presence and absence of cholestyramine, a bile acid binding resin.

Another line of research being conducted is looking into the effects of drought stress on grape seed extract production from Nevada grown grapes. Seeing how this project is only six months old, seed collecting, drying, and storage have been completed for six varieties of wine grape. The methodology of extracting the bioactive compounds are now underway with finalization due in early 2014.

Genetic Influences on the Ecological Maintenance of Relapsing Fever

Chipmunks are known to host a bacterial species of spirochetes that is transferred to humans via ticks causing relapsing fever. Over the course of this project, NAES researchers have collected over 1,500 rodents infected with relapsing fever. The team has genetically identified two strains of bacteria associated with the disease. Using microsatellites techniques, population structure and gene flow were determined.

2. Brief description of the target audience

The target audience for educational programming is consumers, health care personnel, agency personnel, local school boards, and nutrition support groups.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	126	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	1	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Peer reviewed scientific publications, publications in health and nutrition organization publications, presentations at scientific meetings, presentations at stakeholder, agency, school board, Native American, and local governmental meetings.
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Newsletters Produced

Year	Actual
2013	1

Output #3

Output Measure

- Leveraged Research Projects

Year	Actual
2013	102545

Output #4

Output Measure

- Web Sites Created or Updated

Year	Actual
2013	2

Output #5

Output Measure

- Number of Graduate Students or Post-Doctorates Trained

Year	Actual
2013	2

Output #6

Output Measure

- Number of Undergraduate Students Involved in Research

Year	Actual
2013	2

Output #7

Output Measure

- Demonstrations and Workshops Conducted
  Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Manuals and Other Printed Instructional Materials Produced
  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Peer reviewed scientific publications, publications in health and nutrition organization publications, presentations at scientific meetings, presentations at stakeholder meetings, nutrition and health, school board, local governmental and Federal and State agency meetings.
2	Preceptor Nutrition and Cancer Education: A Patient-Centered Approach for Community Physicians in the Clinical Setting
3	Low-intensity dietary counseling intervention for use in primary care patients with high LDLs

Outcome #1

1. **Outcome Measures**

Peer reviewed scientific publications, publications in health and nutrition organization publications, presentations at scientific meetings, presentations at stakeholder meetings, nutrition and health, school board, local governmental and Federal and State agency meetings.

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Preceptor Nutrition and Cancer Education: A Patient-Centered Approach for Community Physicians in the Clinical Setting

2. **Associated Institution Types**

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Medical schools use community physicians, or preceptors, as an integral part of educating medical students. These community preceptors primarily offer hands-on training for medical students in their own medical offices and facilities. As important role models for these future physicians, it is a concern that many do not routinely address the medical nutrition therapy needs of their patients; partly because they do not have the training or effective resources available. To assist these preceptors in demonstrating for medical students how nutrition and cancer can be integrated into routine patient care, innovative and practice-centered educational approaches are needed.

What has been done
This was a two-year prospective study that enrolled 59 community-based physician preceptors. A self-administered, paper-based, Preceptor Nutrition Skills & Attitudes Questionnaire was used to survey the self-perceived nutrition knowledge, and nutrition related clinical practice attitudes at baseline and at the end of intervention. Paired T-test was used to assess the changes in nutrition skills and attitudes scores for the domains of the questionnaire. Associations between PQ categorical indicator scores and receptors' characteristics were examined by using multiple linear

regression tests.

Results
This study showed that a patient-centered nutrition education program for community-based physicians was successful when implemented in the clinical setting. The primary aim of this program was to provide credible and practical point-of-care patient education materials for these busy practitioners to use for their patients. After participating in this study, self-reports showed significant increases in all of the key patient-care domains that evaluated the preceptor's attitudes and skills in nutrition and cancer counseling. This program using practical hands-on medical nutrition therapy training done during routine patient counseling appointments is transferable to the ambulatory training sites of most medical schools.

Participants ordered 34,139 total patient education brochures to give to their patients during the study. Brochures included medical nutrition therapy information covering several key categories, including cancer, diabetes, heart disease, general nutrition, hypertension, obstetrics, pediatrics, physical activity, and weight management.

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #3

1. Outcome Measures

Low-intensity dietary counseling intervention for use in primary care patients with high LDLs

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Diet is the first line treatment for elevated cholesterol. High-intensity dietary counseling (360 minutes/year of contact with providers) improves blood lipids, but is expensive and unsustainable in the current healthcare settings. Low-intensity counseling trials (30 minutes/year) have demonstrated modest diet changes, but no improvement in lipids. This pilot study evaluated the

feasibility and the effects on lipids and diet of a low-intensity dietary counseling intervention provided by the primary care physician (PCP), in patients at risk for cardiovascular diseases.

What has been done
Sixty-one adults spanning 54 year in age, with high cholesterol, possessing internet access and active email accounts were enrolled. Diet was evaluated using the Rate-Your-Plate questionnaire. Dietary counseling was provided by the PCP during routine office visits, three months apart, using printed educational materials and a minimally interactive counseling website. Weekly emails were sent reminding participants to use the dietary counseling resources. The outcomes were changes in LDL-cholesterol, other lipid subclasses, and diet quality.

Results
A low-intensity dietary counseling provided by the PCP in patients at risk for cardiovascular diseases produced clinically meaningful improvements in both diet and lipids of magnitude similar to changes reported with high intensity interventions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes

Brief Explanation

Currently, this program area is on track. However, additional personnel could expedite progress toward completing goals.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Nevada's research projects have an evaluative element that is required by state and federal-level funding sources that provides documentation related to project assumptions, goals and outcomes. This information is used to determine the overall success of research initiatives; their contribution to providing practical, real-world solutions and resources to address challenges and problems; and whether continuation funding and/or new dollars are appropriate and necessary as funds are available.

- Leverage over $102,000 in extramural funding.
- Preceptor education program is providing credible and practical point-of-care patient education materials for busy practitioners to use for their patients.
- Low-intensity dietary counseling provided by the primary care physicians in patients at risk for cardiovascular diseases produced clinically meaningful improvements in both diet and lipids of magnitude similar to changes reported with high intensity interventions.

Key Items of Evaluation

Preceptor education program is providing credible and practical point-of-care patient education materials for over 34,000 patients.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Economic Development with Emphasis in Rural Areas

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
112	Watershed Protection and Management			2%	
122	Management and Control of Forest and Range Fires			6%	
401	Structures, Facilities, and General Purpose Farm Supplies			6%	
601	Economics of Agricultural Production and Farm Management			7%	
605	Natural Resource and Environmental Economics			2%	
607	Consumer Economics			5%	
608	Community Resource Planning and Development			65%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities			5%	
903	Communication, Education, and Information Delivery			2%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.0	0.0
Actual Paid Professional	0.0	0.0	2.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	90543	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	126680	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Addressing the Rural Development Concerns of the Rural West

Alternative Energy: A cost-budget simulation model for geothermal and solar has been developed using stochastic feasibility analyses of clean energy projects, providing results more unique for the Nevada topology, and interaction of public lands. The first set of simulations are now completed for Nevada's White Pine County and delivered to Western Rural Development Center's director to formulate new plans to disseminate results and procedures.

Passive Income Trends - Removing Cattle from Public Lands: Simulation models (GAMS) were developed to predict "Net Income Flows" for rural Nevada ranchers under different wildfire scenarios, as well as cattle herd reductions to accommodate Sage Grouse habitat.

Rural private landowners Wildfire Risk Management

NAES researchers conducted a survey of over 2,000 households, developed a dataset of spatially explicit defensible space along the wildland-urban interface across 35 communities in Nevada, produced a second dataset based upon survey responses, and created quantitative economic model for evaluating risk that is spatially dependent utility that estimates the likelihood of defensible space investment given these differences in wildfire risk as well as the levels of neighboring defensible space investments.

Exploring the Economic Outcomes of Transitioning from Desirable to Undesirable Ecological States on Nevada Rangelands

Last year's activities included the development of an economic simulation model based on dynamics from ecological state and transition models to estimate the expected value of wildfire suppression costs as sagebrush/Pinyon -Juniper woodland ecosystems evolve over time with and without fuels treatments. This allows the difference to be used as an estimate of the net returns from fuels treatments. Investigators continued to develop this model, working with scientists at the Center for Ecological Restoration at Northern Arizona University for application to fuels treatments versus restoration for Ponderosa Pine. Plus, the NAES team collaborated with systems ecologists to investigate how the use of quantifiable systems approaches to model how management effort can alter the trajectory of ecosystems. This enables the coordination with an integrated market and non-market approach to generate estimates of the value of these changes to society.

Lake Tahoe Regional Economic Evaluation

An investigation team has just begun the first of its kind ecosystem "non-market" evaluation of the Lake Tahoe Basin. Initial steps have been taken to form a consensus on both input and acceptance by the

seven governing bodies of the region. A preliminary survey has been developed based upon regional inputs to keep the Tahoe basin health.

Evaluating the Economic Impact of University Run Meat Plant

A community meeting discussed the future of the University's meat plant with University personnel, livestock producers, representatives of government agencies, chefs, retailers, restaurateurs, and consumers. UNR economists developed a feasibility assessment of the meat plant under continued University ownership, private ownership, and cooperative ownership, along with an impact assessment UNR's meat plant had on the region. Two surveys were developed to ascertain demands for regional meat CSA or meat buying clubs, and consumer preferences for direct marketing enterprises. A financial statements survey was conducted to help regional livestock producers better understand the cost and technical characteristics associated with running small-scale meat plants.

2. Brief description of the target audience

Local ranchers & producers, educators, community leaders, State & Federal decision/policy makers and development agencies.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	70	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	3	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Peer reviewed scientific journal articles, publications on economic development , presentations at scientific meetings, presentations at stakeholder, Native American, health care organizations, agency and local government meetings.

Year	Actual
2013	0

Output #2

Output Measure

- Newsletters Produced
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Web Sites Created or Updated

Year	Actual
2013	1

Output #4

Output Measure

- Number of Graduate Students or Post-Doctorates Trained

Year	Actual
2013	3

Output #5

Output Measure

- Leveraged Research Projects

Year	Actual
2013	114529

Output #6

Output Measure

- Manuals and other printed instructional materials produced
  Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Number of Undergraduate Students Involved in Research

Year	Actual
2013	2

Output #8

Output Measure

- Workshops, Demonstrations, and Presentations

Year	Actual
2013	14

Output #9

Output Measure

- Abstracts, Books, Book Chapter(s), Proceedings, Research Reports, and Technical Publications

Year	Actual
2013	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Peer reviewed scientific journal articles, publications on economic development, presentations at scientific meetings, presentations at stakeholder, Native American, health care, agency and local government meetings,
2	Economic Impacts of Developing Clean Energy on Western Rural Areas
3	Motivation For Private Landowner Investment To Reduce Risk And Costs Of Rangeland Wildfires In Nevada
4	Establishing The Economic Efficiency Of Pre-Fire Fuel Treatments

Outcome #1

1. Outcome Measures

Peer reviewed scientific journal articles, publications on economic development, presentations at scientific meetings, presentations at stakeholder, Native American, health care, agency and local government meetings,

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Economic Impacts of Developing Clean Energy on Western Rural Areas

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
With increasing fuel prices and the desire for energy independence, clean or green energy as an energy source has become a target for national and regional economic development. However deriving the costs of these new clean energy sources and technologies and accompanying economic impacts have been somewhat ignored.

There are national models (JEDI) which can use to derive direct expenditures for various clean energy sources and then estimate regional economic, employment, and employment impacts. However, the JEDI model is limited and has not been used for all sources of clean energy and does not avail itself to changes due to unique local conditions. For Nevada the JEDI model is quite limited and does not cover geothermal sources. Developing Nevada cost-budget models for geothermal and solar would provide budget model results more unique for the Nevada topology, interaction of public lands, and more precise input-output models.

What has been done
A Monte Carlo simulation model procedure was developed that can be employed for stochastic feasibility analysis of cost-budgets for geothermal and solar clean energy projects. The NAES's

team from the University Center for Economic Development completed a feasibility analysis for five hypothetical clean energy projects in White Pine County, Nevada.

Results
Nevada's White Pine County was the subject of the first clean energy simulations. All pertinent information garnered for this project's financial analysis have been passed on the White Pine's county commissioners. The results of these clean energy studies has provided educational background to White Pine County decision makers as to financial considerations for actual clean energy projects in solar photovoltaic and wind powered systems. These results were also shared with Utah State's Western Rural Development Center for use in other western states.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
903	Communication, Education, and Information Delivery

Outcome #3

1. Outcome Measures

Motivation For Private Landowner Investment To Reduce Risk And Costs Of Rangeland Wildfires In Nevada

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Evidence suggests that private sector under-investment in reducing wildfire risk and cost leads to excess wildfire suppression costs. These costs fall on public firefighting agencies and the general tax base that supports them. The excess cost for already limited agency resources causes a drain or "crowding out" of programs and activities that would otherwise manage rangelands for wildfire resilience. Research shows that greater levels of private effort can reduce wildfire risk and costs of fire suppression. This project investigated what motivates private property owners to take fire-safe actions in Nevada.

What has been done

First, the team analyzed how a homeowner's decision to invest in defensible space is influenced by the predominant vegetation in their community. Second, the team used the between and within community variation in homeowner wildfire risk to analyze whether homeowners' investments in defensible space reflect an understanding of how their wildfire risk is determined by factors such as community firefighting resources and the biophysical determinants of wildfire hazard in the vicinity of their property. Third, the team examined the importance of risk externalities in defensible space investment by analyzing how homeowner investment in defensible space is influenced by neighbors' investments in defensible space. Finally, for communities where risk externalities are present, the team investigated whether differences in predominant vegetation cause defensible space investments to be an increased benefit in certain communities and decreased benefit in others.

Results
This is the first study that we are aware of that analyzes how homeowner incentives to invest in defensible space and, by extension, the appropriate policy to encourage homeowner investment in defensible space differs between communities depending on predominant vegetation type.

Our results suggest that wildland fire policy to promote defensible space should focus on financial and regulatory barriers to investment in defensible space, rather than on educational programs, and that tipping policies to encourage early adopters to invest in defensible space may be appropriate in communities where the majority of homeowners have not invested in defensible space and whose predominant vegetation suggests the presence of strategic complementarities.

Analyzing homeowner incentives to invest in defensible space in the presence of wildfire risk allows policy makers to draw conclusions that are applicable to other natural disasters, such as earthquakes, extreme temperatures, floods, landslides, and windstorms (tornados, hurricanes, etc.), where individuals can make investments to mitigate material damage from the disaster.

4. Associated Knowledge Areas

KA Code	Knowledge Area
122	Management and Control of Forest and Range Fires
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development

Outcome #4

1. Outcome Measures

Establishing The Economic Efficiency Of Pre-Fire Fuel Treatments

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Wildfire suppression costs in the United States have increased steadily over the last decades with related annual expenditures by the U.S. Forest Service and Bureau of Land Management exceeding a billion dollars in four out of the seven years leading up to 2006. This steady increase in wildfire suppression costs is believed to be due in part to a century of U.S. federal wildfire policy that has emphasized wildfire suppression and post-fire vegetation rehabilitation over pre-fire fuel management treatments.

Pre-fire fuel management treatment is recognized as an important tool to reduce the frequency of severe wildfires, and thus the expected costs of damages and wildfire suppression, and to maintain ecosystem health. Public agency efforts and expenditures, however, continue to emphasize wildfire suppression and post-fire rehabilitation over pre-fire fuel treatment. The continued focus on wildfire suppression and rehabilitation may be partly explained by the lack of empirical work establishing the economic efficiency of pre-fire fuel treatments

What has been done
The research team developed a simulation model to evaluate the economic efficiency of fuel treatments and apply it to two sagebrush rangeland ecosystems in the Great Basin of the western United States. This was specially designed to simulate long-run wildfire suppression costs with and without fuel treatment. The team then analyzed the economic efficiency of fuel treatment for Wyoming Sagebrush Steppe and Mountain Big Sagebrush ecosystems in the Great Basin.

Results
This project has produced an analytical tool that can be applied to evaluating the economic efficiency of fuel treatment in many ecological settings. To our knowledge, this project provides the first estimates of the economic efficiency of fuel treatment for rangeland ecosystems and, in particular, rangelands that have been affected by invasive plants.

At this point, rangeland managers across the west are being advised that fuel treatment is economically efficient only when the ecosystems are in relatively good ecological health, on the basis of wildfire suppression costs savings. The UNR team is also advocating that shorter wildfire-return intervals, improved treatment success rates, and uncertainty about the location of thresholds between ecological states influence the economic efficiency of fuel treatments.

As the state-and-transition model framework becomes increasingly adopted as protocol for data collection and analytical structure by U.S. government agencies such as the USDA Natural Resources Conservation Service, we expect that the simulation model developed at UNR, which numerically implements state-and-transition model concepts, is going to be of increasing practical value.

4. Associated Knowledge Areas

KA Code	Knowledge Area
122	Management and Control of Forest and Range Fires
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Programmatic Challenges

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Nevada's research projects have an evaluative element that is required by state and federal-level funding sources that provides documentation related to project assumptions, goals and outcomes. This information is used to determine the overall success of research initiatives; their contribution to providing practical, real-world solutions and resources to address challenges and problems; and whether continuation funding and/or new dollars are appropriate and necessary as funds are available.

- Economic impacts of developing clean energy in White Pine County, Nevada.
- Wildland fire policy to promote defensible space should focus on financial and regulatory barriers to investment in defensible space.
- State and transition models are helping rangeland managers across the west make better economical decisions on when to invest in restoration and when not to.
- Leveraged over $114,000 in extramural funding.

Key Items of Evaluation

As the state-and-transition model framework becomes increasingly adopted as protocol for data collection and analytical structure by U.S. government agencies such as the USDA NRCS, the simulation model developed at UNR is going to be of increasing practical value.

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Sustainable Energy

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms			8%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			23%	
204	Plant Product Quality and Utility (Preharvest)			42%	
206	Basic Plant Biology			27%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.5	0.0
Actual Paid Professional	0.0	0.0	2.4	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	253371	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	96793	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Curly Top Gumweed Biofuel Potential

Three years of biomass field trials are completed. Lab analyses for bio-crude have produced a 12.5% yield. Economic projections show Gumweed will produce approximately 100-110 gallon/acre. The team is working to improve the extraction process using cheaper chemicals; acetone being the best candidate, thus far. The team has also been working on elucidating the catalytic reaction mechanisms and pathways to convert Gumweed's bio-crude into hydrocarbons. Trails have been completed in electro-chemically process transforming grindelic acid (the important component of the Gumweed's bio-crude) into a C19 hydrocarbon biofuel. As a secondary line of research, the team is also looking at grindelic acid as a substitute for abietic acid (rosin), a commodity chemical used in glues. Currently the team is look into methods that de-colorize the product to approximate commercial lines.

Improving Camelina as a Biofuel Alternative

Varietal trials were conducted over the past year to determine best seed yields and aerial biomass, with seed oil content to be determined in 2014. Progress was made on the screening of over 7,000 mutant Camelina populations. A third generation mutants lines has been found that expresses a stable mucilage-free defect, important in reducing the gum during oil extraction. Advancements in creating glyphosate (RoundUp®) resistant varieties are moving forward. Eleven lines have been generated and are undergoing validation in the next generation of plants.

Sequencing of Camelina's RNAs were completed, giving insights to major genetic determinants responsible for stress-adaptive responses. A total of 4,046,718 quality and adapter-trimmed were generated from root, leaf, stem, flower, and seedpod tissues subjected to abiotic stresses over a 24 h period including water deficit, salinity, heat, cold, and normal (control) growing conditions. These reads were assembled into transcript contigs. The data is now being complemented by paired-end Illumina sequencing.

Accumulation of Hydrocarbons in Plants - making biofuels

Camelina is general not thought of as a good field crop because of seed size. Our research team's goal is to either make bigger seeds or more of them per plant. The team has recently completed engineering Arabidopsis plants with two genes used to convert long-chain fatty acids into non-oxygenated long-chain hydrocarbons (biofuel). Two new enzyme promoters were designed to express the novel genes in leaves or seeds. Both novel genes have now been optimized for insertion into Camelina and have been cloned into different constructs that target specific parts of the plant (leaf cells, chloroplast - photosynthetic machinery, plastids - storage organelles, and seeds).

Prickly Pear Cactus Feedstock

RNA sequencing has been completed for 84 Prickly Pear pad (cladode) samples providing a detailed comparison of the mRNA expression levels between pads under well-watered and drought-stressed conditions. Genetic constructs for use in Prickly Pear have been designed based upon recent breakthroughs in metabolic engineering, i.e., the 'push', 'pull', and 'protect' strategies. Evaluation of structural proteins of Prickly Pear's oil bodies has just begun.

2. Brief description of the target audience

Those most affected by this research include the general public, energy and chemical industry, and potential producers.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	339	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	9	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Peer reviewed journal articles, publications in commodity group publications, presentations at scientific meetings, presentations at stakeholder, Native American and agency meetings. Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Demonstrations and Field Days Conducted

Year	Actual
2013	3

Output #3

Output Measure

- Number of Graduate Students or Post-Doctorates Trained

Year	Actual
2013	7

Output #4

Output Measure

- Number of Undergraduate Students Involved in Research

Year	Actual
2013	14

Output #5

Output Measure

- Research Projects Conducted
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Leveraged Research Projects

Year	Actual
2013	4574499

Output #7

Output Measure

- Web Sites Created or Updated

Year	Actual
2013	2

Output #8

Output Measure

- Workshops, Demonstrations, and Presentations

Year	Actual
2013	18

Output #9

Output Measure

- Abstracts, Books, Book Chapter(s), Proceedings, Research Reports, and Technical Publications

Year	Actual
2013	2

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Peer reviewed journal articles, publications in commodity group publications, presentations at scientific meetings, presentations at stakeholder, Native American and agency meetings.
2	Developing Prickly Pear Cactus as a Biofuel Feedstock

Outcome #1

1. Outcome Measures

Peer reviewed journal articles, publications in commodity group publications, presentations at scientific meetings, presentations at stakeholder, Native American and agency meetings.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Developing Prickly Pear Cactus as a Biofuel Feedstock

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The long-term goal of the proposed research is to develop prickly pear cactus (Opuntia ficus-indica and related species) as a new biofuel and feed crop in the arid western region. Our vision is to create a novel biofuel feedstock production platform with increased energy density within vegetative tissues that is capable of producing biodiesel, renewable diesel, or jet fuel with only 20% the water inputs required for traditional biofuel feedstocks. While prickly pear cactus is currently used for food and feed in limited areas, this research will expand the use of this crop species into a sustainable biofuel production system on marginal, semi-arid lands that are currently underutilized.

What has been done
Transcriptomic sequencing has been completed using Illumina RNA-seq technology for 84 prickly pear cladode samples collected every 4 hours over a 24 h day-night time course. Two different tissue types (e.g. mesophyll and epidermis) were also sampled in parallel. Constructs for use in prickly pear have been designed based upon metabolic engineering concepts of 'push', 'pull', and 'protect'. The "Bioenergy Crops for Semi-arid Environments" Educational Display was completed and introduced to farmers, stakeholders and the general public.

Results
Information garnered from this project have begun to influence how other scientists are applying this breakthrough metabolic engineering concept. A new method for the removal of high volumes of pectin was developed that will help future researchers quickly extract RNA from similar plants. The observations witnessed validates the strategy to use drought stress-inducible promoters to drive the over-accumulation of lipids within vegetative tissues and should further future research into delivering oilseed-like levels of triglycerides into model plants.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
206	Basic Plant Biology

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Nevada's research projects have an evaluative element that is required by state and federal-level funding sources that provides documentation related to project assumptions, goals and outcomes. This information is used to determine the overall success of research initiatives; their contribution to providing practical, real-world solutions and resources to address challenges and problems; and whether continuation funding and/or new dollars are appropriate and necessary as funds are available.

- Developing prickly pear cactus into a biofuel feedstock
- Leveraged over $4.5M in extramural funding.
- Trained 21 students and post-docs
- Conducted 18 workshop/demonstrations on biofuel production

Key Items of Evaluation

A breakthrough in removal of pectin methods will expedite metabolic engineering for scientists working in biofuel production from plant materials high in pectin.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Food Safety

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
601	Economics of Agricultural Production and Farm Management			100%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.0	0.0
Actual Paid Professional	0.0	0.0	0.1	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	18315	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	14443	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Economics of Treating Trichomoniasis in Cattle

NAES's economists investigated ranchers understanding of Trichomoniasis (trich) issues and the impacts of alternative ranch management scenarios for infected ranches financial survivability and success. Using stochastic dominance procedures found in business economics, the team estimated potential trich programs that may be adopted by risk averse producers. A rancher survey was developed to derive rancher potential adoption of the trich vaccine and acceptance of potential public policies to address outbreaks. The team is working on a ranch level simulation model of a representative Nevada ranch in Central and Southern Nevada to provide the financial impacts of alternative trich eradication scenarios.

Providing caregivers a web-based interactive modules and onsite workshops for safe food handling practices

Based upon the highly successful Fight BAC! ™ campaign, NAES faculty continue developing and modifying self-paced teaching modules for Nevada's caregivers. Over the past year, UNR students participated in module evaluations and critiques. The site now is available to the public through UNR's WebCampus Community web portal.

2. Brief description of the target audience

This program is targeting Nevada's agricultural producers and Nevada's caregiver work pool.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	70	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	1	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Peer reviewed journal articles, publications in commodity group publications, presentations at scientific meetings, presentations at stakeholder, Native American and agency meetings.
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Research Projects
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of Graduate Students or Post-Doctorates Trained

Year	Actual
2013	2

Output #4

Output Measure

- Number of Undergraduate Students Involved in Research
  Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Leveraged Research Projects

Year	Actual
2013	114529

Output #6

Output Measure

- Web Sites Created or Updated

Year	Actual
2013	1

Output #7

Output Measure

- Workshops, Demonstrations, and Presentations

Year	Actual
2013	14

Output #8

Output Measure

- Abstracts, Books, Book Chapter(s), Proceedings, Research Reports, and Technical Publications

Year	Actual
2013	3

Output #9

Output Measure

- Brochures, Bulletins, Fact Sheets, and Surveys

Year	Actual
2013	4

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Peer reviewed journal articles, publications in commodity group publications, presentations at scientific meetings, presentations at stakeholder, Native American and agency meetings.

Outcome #1

1. **Outcome Measures**

Peer reviewed journal articles, publications in commodity group publications, presentations at scientific meetings, presentations at stakeholder, Native American and agency meetings.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Childhood Obesity

☐ Reporting on this Program

Reason for not reporting

At this time, all AES nutritional scientists and dieticians have met their research obligations while fulfilling other program commitments. As those commitments conclude, renewed focus will be routed into the childhood obesity program as stakeholders deem necessary.

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.5	0.0
Actual Paid Professional	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Volunteer	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

V(D). Planned Program (Activity)

1. Brief description of the Activity

Scientists are developing a community weight control model for use in Nevada's city clinics. Investigation has begun into the effects of distance to parks, trails, food outlets, etc. in relation to amount

of vegetables consumed and obesity. The Washoe County School District has implemented a Student Wellness Policy; researchers are identifying best practices at the school and classroom level, and reporting on its execution and effectiveness.

2. Brief description of the target audience

Educators, health professionals, general public and policy-makers.

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2013

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	2	0

V(F). State Defined Outputs

Output Target

<u>Output #1</u>

Output Measure

- Peer reviewed journal articles, publications in commodity group publications, presentations at scientific meetings, presentations at stakeholder, Native American and agency meetings.

Year	Actual
2013	0

Output #2

Output Measure

- Newsletters Produced

Year	Actual
2013	0

Output #3

Output Measure

- Research Projects Conducted

Year	Actual
2013	0

Output #4

Output Measure

- Web Sites Created or Updated

Year	Actual
2013	0

Output #5

Output Measure

- Number of Graduate Students or Post-Doctorates Trained

Year	Actual
2013	0

Output #6

Output Measure

- Number of Undergraduate Students Involved in Research

Year	Actual
2013	0

Output #7

Output Measure

- Demonstrations and Workshops Conducted

Year	Actual
2013	0

Output #8

Output Measure

- Leveraged Research Projects

Year	Actual
2013	0

Output #9

Output Measure

- Manuals and Other Printed Instructional Materials Produced

Year	Actual
2013	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Peer reviewed scientific publications, publications in health and nutrition organization publications, presentations at scientific meetings, presentations at stakeholder, nutrition and health, school board, local governmental and Federal and State agency meetings.

Outcome #1

1. Outcome Measures

Peer reviewed scientific publications, publications in health and nutrition organization publications, presentations at scientific meetings, presentations at stakeholder, nutrition and health, school board, local governmental and Federal and State agency meetings.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Climate Change

☐ Reporting on this Program

Reason for not reporting

At this time, all AES natural resources and environmental scientists have met their research obligations while fulfilling other program commitments. As those commitments conclude, renewed focus will be routed into the climate change program as stakeholders deem necessary.

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.0	0.0
Actual Paid Professional	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Volunteer	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

V(D). Planned Program (Activity)

1. Brief description of the Activity

Scientists are investigating: avian and forest vulnerability, the effects of elevated nitrogen on forest, the effects of nutrients and carbon fluctuations across aquatic and desert ecosystems, the effects on soils at the rain-snow transition zone, and creating educational programs that stimulates transformative research, education and outreach on effects of regional climate change on ecosystem resources.

2. Brief description of the target audience

Scientific community, resource managers, Nevada System of Higher Education faculty, students, constituents and policy makers.

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2013

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	12	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Peer reviewed journal articles, publications in commodity group publications, presentations at scientific meetings, presentations at stakeholder, Native American and agency meetings.

Year	Actual
2013	0

Output #2

Output Measure

- Leveraged Research Projects

Year	Actual
2013	0

Output #3

Output Measure

- Number of Graduate Students or Post-Doctorates Trained

Year	Actual
2013	0

Output #4

Output Measure

- Number of Undergraduate Students Involved in Research

Year	Actual
2013	0

Output #5

Output Measure

- Web Sites Created or Updated

Year	Actual
2013	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Peer reviewed journal articles, publications in commodity group publications, presentations at scientific meetings, presentations at stakeholder, Native American and agency meetings.

Outcome #1

1. Outcome Measures

Peer reviewed journal articles, publications in commodity group publications, presentations at scientific meetings, presentations at stakeholder, Native American and agency meetings.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Other (University of Nevada budget cuts)

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}