

# 2012 University of Nevada Research Annual Report of Accomplishments and Results

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## I. Report Overview

### 1. Executive Summary

Nevada Agricultural Experiment Station (NAES) 2012 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 2011-2012, this metric was one of the highest in recent years as \$3.27 million in state appropriations were leveraged by faculty to generate \$13.95 million in external fund expenditures.

The research programs address the five thematic areas defined by NIFA, as well as four 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
- Animals and Their Systems
- Natural Resource Management & Environmental Sciences in the Great Basin & Sierran Ecosystems
- Nutrition and Health
- Economic Development with Emphasis in Rural Areas
- Sustainable Energy
- Food Safety
- Childhood Obesity Prevention
- Climate Change

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:

- Further developments in biofuels and biomaterial unique to Nevada
- Economic development in both rural and urban Nevada & the western beef industry
- 501c3 NGO established for alternative crop production in Nevada
- Advances in rangeland restoration and technology transfers
- Mitigating the impacts of wildfires and invasive weeds, and
- A major breakthrough in bark beetle population management

Research is conducted in the laboratories of the Max C. Fleischmann College of Agriculture, Knudsen Resource Center, Howard Medical Sciences, Bureau of Mines building, and the Sarah Fleischmann College of Human and Community Sciences.

Five field laboratory sites are also utilized for research, including: Main Station Field Laboratory, which houses the large animal surgical facility and laboratory and the meats laboratory; Valley Road Field Laboratory, comprised of the NAES Greenhouse Complex, UNR's Equestrian Center, test vineyards, our avian facility, a fermentation lab and numerous test plots; Gund Ranch Rangeland Research Center playing host to numerous Great Basin rangeland project; and the Jay Dow Sr. Wetlands Research Laboratory.

**Total Actual Amount of professional FTEs/SYs for this State**

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	24.9	0.0
Actual	0.0	0.0	17.6	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 the proposals through an in-house content management system. NAES staff then arrange scientific peer reviews based upon departmental recommendations and tabulate results. Individual contributing departments are responsible for ranking proposal based upon tabulated results. In addition to departmental peer review process, the CABNR/NAES's Advisory Board reviewed, evaluated and ranked proposals based upon their constituents' inputs. All three groups submit their findings to the Director of NAES 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 (Conduct Field Lab Days at our Field Stations and tours of our greenhouse complex.)

#### 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, and direct mailings, to attend. We hold a "Field Lab Day" at our Valley Road Field Laboratory and the Gund Ranch Research Station's "Return of the Curlew" annually where there is an excellent dialog between stakeholders, University of Nevada Cooperative Extension and NAES faculty & administrators. Two advisory boards have been established to counsel NAES in matters of research and resident instruction. Both boards' qualifications cover a wide spectrum of interest, from local ranchers to federal agencies. County focus groups were asked to contribute their 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 provides advice 1-3 times per year, respectively. 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 part of our strategic planning efforts in restructuring our College and Experiment Station. Our partnership with Nevada Cooperative Extension provides assistance and access to stakeholders through joint efforts like the annual "Return of the Curlew" workshop conducted at the Gund Ranch Research Station. 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)
- Survey of the general public
- Meeting specifically with non-traditional groups
- Meeting with invited selected individuals from the general public
- Other (Met with Cooperative Extension to coordinate input)

**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 and specialists. The directors and scientists also attended UNCE workshops and took advantage of these opportunities to participate in discussion with groups and individuals.

The College of Agriculture, Biotechnology and Natural Resources (CABNR) and NAES continue to upgrade both websites to make the Experiment Station and agriculture much more prominent, visible and accessible to those who explore or interact through that venue. The updated NAES website allows electronic submission of questions, comments and suggestions, which are then routed to appropriate personnel for review. Other social media outlets (Facebook and Twitter) were also developed to gain even greater exposure, all of which allow for public comments and suggestion.

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 CABNR's future direction. These stakeholder priorities also directly influenced applied research

activity through local decisions about research priorities, availability of funding from certain extramural funding sources including stakeholder groups such as industry associations, and hiring decisions for faculty. Stakeholder input not only informs planning, but also influences resource allocations.

Stakeholders are very concerned about sales of experiment station field labs and loss of base faculty and staff position. They are increasingly willing to help support the mission through advocacy and fund raising as well as putting more time into prioritizing and participating in discussions about strategic directions. Stakeholder feedback also revealed where volunteers and donors would be interested in assisting with the program. Stakeholders participate in faculty search committees to advance their perspective.

**Brief Explanation of what you learned from your Stakeholders**

Stakeholder priorities for instruction, research and outreach education from our extensive strategic planning include:

- Enhancing economic stability and growth in all aspects of the Great Basin's agriculture enterprise through advances in the application of biotechnology, increased diversity of crop and animal products, increases in production efficiency, and sound strategies for soil, water, air and landscape management.
- Addressing the serious health concerns of Nevadans through improved quality of the environment and better nutrition through improved diet.
- Ensuring sustainable production of natural resources from stable and viable high desert and montane ecosystems.
- Ensuring a strong and enduring connection between CABNR/NAES and residents of the Great Basin.

**IV. Expenditure Summary**

<b>1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)</b>			
<b>Extension</b>		<b>Research</b>	
<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
0	0	1526535	0

<b>2. Totaled Actual dollars from Planned Programs Inputs</b>				
<b>Extension</b>			<b>Research</b>	
	<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
<b>Actual Formula</b>	0	0	1526444	0
<b>Actual Matching</b>	0	0	1747446	0
<b>Actual All Other</b>	0	0	0	0
<b>Total Actual Expended</b>	0	0	3273890	0

<b>3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous</b>				
<b>Carryover</b>	0	0	219601	0

## V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Global Food Security and Hunger - Agricultural Production in a Semi-Arid Environment
2	Animals 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 - Agricultural Production in a Semi-Arid Environment

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			6%	
103	Management of Saline and Sodic Soils and Salinity			21%	
131	Alternative Uses of Land			4%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			32%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals			25%	
504	Home and Commercial Food Service			6%	
701	Nutrient Composition of Food			6%	
	<b>Total</b>			100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	3.0	0.0
Actual Paid Professional	0.0	0.0	1.2	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	217497	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	282616	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**

Conduct research to enhance agricultural production in Nevada, publish the research findings in peer reviewed journals, educated our stakeholders through outreach by conducting rural tours and participating in town hall meetings, holding field lab open houses to demonstrate our research findings, submit news releases on new findings, publish an on-line CABNR Quarterly Newsletter that features research and education successes from the College of Agriculture, Biotechnology and Natural Resources (CABNR) and the Nevada Agricultural Experiment Station (NAES), include publications on the CABNR/NAES web page, report impacts through the CABNR/NAES web page, and share results with extension faculty to partner in the extension outreach programs.

**2. Brief description of the target audience**

The target audience for research and educational programming is agriculture and livestock producers, veterinarians, agency personnel and local government organizations 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**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	264	0	300	0

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

**Patent Applications Submitted**

Year: 2012

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

<b>2012</b>	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Actual</b>	0	6	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

<b>Year</b>	<b>Actual</b>
2012	29

**Output #2**

**Output Measure**

- Demonstrations and Field Days Conducted

<b>Year</b>	<b>Actual</b>
2012	3

**Output #3**

**Output Measure**

- Newsletters Produced

<b>Year</b>	<b>Actual</b>
2012	3

**Output #4**

**Output Measure**

- Leveraged Research Projects

<b>Year</b>	<b>Actual</b>
2012	517947

**Output #5**

**Output Measure**

- Web Sites Created or Updated

<b>Year</b>	<b>Actual</b>
2012	3

**Output #6**

**Output Measure**

- Digital Media Created or Updated  
Not reporting on this Output for this Annual Report

**Output #7**

**Output Measure**

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

**Output #8**

**Output Measure**

- Number of Graduate Students or Post-Doctorates Trained

<b>Year</b>	<b>Actual</b>
2012	1

**Output #9**

**Output Measure**

- Number of Undergraduate Students Involved in Research

<b>Year</b>	<b>Actual</b>
2012	14

**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	Developing Wine Grape Cultivars for Northern Nevada

**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**

Developing 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
2012	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**

Microarray comparison experiments on Cabernet Sauvignon shoot tips (sink, growing) and leaves (source, photosynthetic) in response to drought were conducted. Using the latest bioinformatic tools, cluster and hierarchal analysis, the team has discovered that over 11,000 leaf and 14,000 shoot transcripts change significantly between stressed and unstressed plants. And with new proteomics techniques, the team identified almost 2,300 different proteins with 79 proteins being highly involved in dehydration.

Regulated deficit irrigation has been used successfully to grow grapes with less water, an

important feature in arid regions such as Nevada. These drought stress experiments have identified thirteen cultivars for Northern Nevada.

The Cabernet Sauvignon gene had not been sequenced, so the UNR team has sequenced over 80% of the genome to date.

### Results

To facilitate plant dehydration assays, the UNR team has developed a novel method that quickly dehydrates plant samples in a control environment. This technique will help future scientists control relative humidity and temperature when studying drought stress plants.

A tripartite program has been setup that provides 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. Because of this program, the community has formed a 501c3 non-profit organization, "Nevada Vines and Wines" dedicated to improving Northern Nevada's wine industry.

One student was able to leverage the expertise of a team of scientist from Verona, Italy on illumina sequencing technology. Another student was able train at Macquarie University, Sydney, Australia, one of the top proteomics labs in the world.

## 4. Associated Knowledge Areas

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

## 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

Another year of State budget shortfalls continue to narrowed the breadth of NAES's research programs. Fewer research projects will be supported and recruiting graduate students will be difficult.

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, all faculty changing from 12 month to 9 month appointments, and the uncertainty regarding administrative changes (Dean/Director).

This past year has seen yet other new obstacles affecting NAES's ability to conduct

research that supports the agricultural community. NAES's Main Station Field Lab (MSFL), situated along the Truckee River, provides high quality agricultural opportunities and is an easy commute from UNR's main campus. However, MSFL has seen 168 acres sold to the city based upon eminent domain. Surplus water rights were sold by the university, but proceeds were not returned to NAES. And, the university has rezoned another 104 acres (some of the richest soils) for commercial use, opening the door for the future sales of another section of MSFL.

## **V(I). Planned Program (Evaluation Studies)**

### **Evaluation Results**

- Conducted over 20 workshops on cultivating, pest management and wine production
- Attracted the attention of hundreds of backyard-amateur viticulturists
- Trained 15 students
- Leveraged over \$500,000 in extramural funds
- Created a community that wants to grow and promote the wine industry in Northern Nevada

### **Key Items of Evaluation**

Established a 501c3 non-profit organization "Nevada Vines and Wines"

**V(A). Planned Program (Summary)**

**Program # 2**

**1. Name of the Planned Program**

Animals 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			14%	
135	Aquatic and Terrestrial Wildlife			21%	
136	Conservation of Biological Diversity			14%	
301	Reproductive Performance of Animals			26%	
302	Nutrient Utilization in Animals			7%	
303	Genetic Improvement of Animals			3%	
304	Animal Genome			2%	
307	Animal Management Systems			3%	
311	Animal Diseases			10%	
	<b>Total</b>			100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890

Actual Paid Professional	0.0	0.0	2.8	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	170726	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	264242	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**

Research activities included investigation into the decline of mule deer in Nevada; wildlife guzzler's effects on survival and recruitment, 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; the impact of contraceptive treatment on fertility and behavior of feral horses; impact of agrochemical and environmental contaminants on avian species.

**2. Brief description of the target audience**

Target audiences include Nevada Department of Transportation, NV Dept. 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**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	472	0	1100	0

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

**Patent Applications Submitted**

Year: 2012  
 Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2012	Extension	Research	Total
Actual	0	10	0

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Non-peer reviewed publications

Year	Actual
2012	2

**Output #2**

**Output Measure**

- Presentations

Year	Actual
2012	34

**Output #3**

**Output Measure**

- Demonstrations and workshops conducted

Year	Actual
2012	2

**Output #4**

**Output Measure**

- Leveraged research funds

Year	Actual
2012	859892

**Output #5**

**Output Measure**

- Web sites created or improved

<b>Year</b>	<b>Actual</b>
2012	4

**Output #6**

**Output Measure**

- Number of graduate students and post-doctorates trained

<b>Year</b>	<b>Actual</b>
2012	3

**Output #7**

**Output Measure**

- Number of undergraduate students involved in research program

<b>Year</b>	<b>Actual</b>
2012	34

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Does Vegetation Structure Effect Greater Sage Grouse Survival?
2	Impact of Environmental Contaminants on Avian Species

**Outcome #1**

**1. Outcome Measures**

Does Vegetation Structure Effect Greater Sage Grouse Survival?

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	0

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Sage grouse were proposed for listing > 10 times between 2000 and 2012, based on declining populations over the past 50 years throughout their range. Petitions were at least in part politically motivated, with a publicly stated goal of removing grazing from public lands in the west. A key rationale underlying listing petitions was that grazing impacted vegetation, which in turn affected Sage Grouse reproductive success.

The linkage between vegetation characteristics and Sage Grouse reproduction is based on a small number of studies, primarily in northern Nevada and southern Idaho. These studies form the basis for habitat management guidelines for Sage Grouse published in the Wildlife Society Bulletin in 2000. Concern has been raised by stakeholders in Nevada about the applicability of habitat guidelines based on studies in ecosystems that differ from those in much of Nevada.

These concerns are based on uncertainty about: (1) generality of relationships between vegetation and nest success; and (2) uncertainty about the relationship between grazing management and vegetation structure.

These concerns have important management, public policy, and societal implications because guidelines for management of Sage Grouse habitat will undoubtedly influence management of grazing on public lands.

The goal of this project was to establish the relationship between nest site selection and success of Greater Sage Grouse, and key vegetation parameters along the Falcon-Gondor transmission line in central Nevada.

**What has been done**

The UNR team monitored over 1,100 greater sage-grouse associated with 13 breeding leks to

characterize demographic processes in a ~6500 km<sup>2</sup> area in central Nevada. They used mark-recapture, lek observations, nest and brood monitoring, vegetation sampling, and radio telemetry to estimate key demographic parameters. Investigators used four analyses to examine the influence of distance from the Falcon-Gondor transmission line on various demographic rates (nest survival, female survival, and pre-fledging chick survival).

**Results**

This project has provided the first rigorous assessment of the effects of transmission lines on sage grouse. The stakeholders interested in the results generated were Nevada Department of Wildlife, Bureau of Land Management, U. S. Fish and Wildlife Service, and NV Energy. Based partially upon finding reported to the Bureau of Land Management by the University, the BLM's original 2001 Resource Management Plan has been amended to reflect potential impacts upon Greater Sage Grouse.

This project also represents an intense field effort, based out of a remote camp in central Nevada. Students and technicians were in the field continuously from late February -May each year of the project. Such experiences provided substantial training in managing a field study, supervising personnel and learning both practical and natural history aspects of field biology.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
121	Management of Range Resources
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
301	Reproductive Performance of Animals

**Outcome #2**

**1. Outcome Measures**

Impact of Environmental Contaminants on Avian Species

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	0

**3c. Qualitative Outcome or Impact Statement**

### **Issue (Who cares and Why)**

Birds, and in particular migratory birds, may be exposed to environmental contaminants repeatedly when traveling. Migratory birds are protected during migration by an international treaty, The Migratory Bird Treaty Act. Nevada is part of an important western flyway with over 170 migratory bird species visiting. This is a particularly important issue for Nevada especially in light of the current and historic gold and silver mining conducted in the state.

The UNR team has developed a model which we believe is useful in testing whether low-dose exposure to environmental and agrochemical contaminants has an adverse effect on migratory birds. We use the homing pigeon as our avian model to determine the impact of various environmental and agrochemical exposures to migratory birds.

Previous results showed that low-dose exposure to arsenic and cyanide compounds resulted in a decreased ability to fly back to the roost, which would imply a decreased ability for migration. Many of these compounds have also shown effects on these birds ability to successfully reproduce.

For the purposes of this study we want to test this model with other neurotoxic compounds which are persistent in the environment such as mercury and lead compounds. Mercury contamination is particularly of interest in Nevada, because of the mining conducted in the 1800's which resulted in widespread mercury contamination in the rivers in and around Virginia City, Nevada. We wish to test whether these compounds will have debilitating effects on traveling. We also wish to expand upon our understanding of the longer term effect of these exposures by testing the offspring of these birds for both learning (to home) and reproductive abilities.

### **What has been done**

Experiments were initially conducted to determine relevant mercury exposure dosages through drinking water which would impact the bird's flight ability. As part of these studies, food and water consumption were monitored throughout the study in order to not only accurately determine dosage but to evaluate water and food consumption during periods of different activities such as migration.

Subsequent studies were conducted on the offspring of parents either exposed or not exposed to mercury. These studies revealed that the offspring of parents exposed to mercury initially had more difficulty in learning how to "home" back to their loft. Once the exposed offspring birds learned how to "home" to the loft from a given release site, they then were able to do so in subsequent releases very similar to non-exposed offspring.

### **Results**

The Avian Model developed here at the University of Nevada, as well as the information collected on environmental contaminants effects on birds has now been incorporated into the US Department of Interior's Natural Resource Damage Assessment and Restoration Programs as it relates to migratory birds. The US Fish and Wildlife Service has also included our avian model into their assessments of avian toxicology related to the Deepwater Horizon oil spill.

## **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
135	Aquatic and Terrestrial Wildlife
301	Reproductive Performance of Animals

### **V(H). Planned Program (External Factors)**

#### **External factors which affected outcomes**

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

#### **Brief Explanation**

Climate: 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.

Diminished resources: Maintaining required program diversity and complexity in the face of a 38% reduction in financial support has stretched faculty resources extremely thin and programs have become increasingly vulnerable to the loss of key faculty.

Decline in Federal and State Funding: The continuing decline in federal and state appropriated funds available to support teaching and research programs places additional pressure on the need to secure external funding to adequately address priority research and education programs.

### **V(I). Planned Program (Evaluation Studies)**

#### **Evaluation Results**

The program is expanding the avian model to include other known environmental toxins. A large majority of this expansion is due to leveraged funds in excess of \$850,000.

#### **Key Items of Evaluation**

The US Department of Interior's Natural Resource Damage Assessment and Restoration Program has incorporated our avian model into their Deepwater Horizon Oil Spill plans.

**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			13%	
103	Management of Saline and Sodic Soils and Salinity			2%	
111	Conservation and Efficient Use of Water			5%	
112	Watershed Protection and Management			12%	
121	Management of Range Resources			31%	
122	Management and Control of Forest and Range Fires			2%	
123	Management and Sustainability of Forest Resources			1%	
125	Agroforestry			5%	
132	Weather and Climate			1%	
133	Pollution Prevention and Mitigation			13%	
135	Aquatic and Terrestrial Wildlife			2%	
136	Conservation of Biological Diversity			2%	
211	Insects, Mites, and Other Arthropods Affecting Plants			10%	
216	Integrated Pest Management Systems			1%	
	<b>Total</b>			100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	3.9	0.0
Actual Paid Professional	0.0	0.0	6.5	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	490183	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	686973	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**

To address these critical issues, NAES research will be conducted on evaluating long term vegetation changes in the Great Basin, measuring heavy metal contamination in Nevada's waterways, pheromone protection of forests, evaluating livestock grazing for noxious weed management, compatibility of wildlife and livestock grazing, evaluating post wildland fire restoration and grazing systems, evaluating forest wildfires and ecosystems recovery, studying soil transport properties using NAES field labs to conserve water and improve water quality and evaluating sage grouse and pygmy rabbit habitats and developing a conservation plan compatible with Nevada agriculture.

**2. Brief description of the target audience**

The target audiences for research and educational programming are livestock producers, veterinarians, environmentalists, local governments, native american groups and agency personnel.

**3. How was eXtension used?**

eXtension was not used in this program

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	1026	0	1366	150

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

**Patent Applications Submitted**

Year: 2012

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2012	Extension	Research	Total
Actual	0	49	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
2012	14

**Output #3**

**Output Measure**

- Newsletters Produced

Year	Actual
2012	3

**Output #4**

**Output Measure**

- Leveraged Research Projects

Year	Actual
2012	3856792

**Output #5**

**Output Measure**

- Web Sites Created or Updated

<b>Year</b>	<b>Actual</b>
2012	8

**Output #6**

**Output Measure**

- Manuals and Other Printed Instructional Materials Produced

<b>Year</b>	<b>Actual</b>
2012	2

**Output #7**

**Output Measure**

- Number of Graduate Students or Post-Doctorates Trained

<b>Year</b>	<b>Actual</b>
2012	12

**Output #8**

**Output Measure**

- Number of Undergraduate Students Involved in Research

<b>Year</b>	<b>Actual</b>
2012	73

**Output #9**

**Output Measure**

- Non-peer Reviewed Publications

<b>Year</b>	<b>Actual</b>
2012	99

**Output #10**

**Output Measure**

- Presentations

<b>Year</b>	<b>Actual</b>
2012	98



**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	Unraveling Insect Hydrocarbon Production
3	Castle Lake Long Term Research Program
4	Persistence of Native Grasses in Cheatgrass Invaded Ecosystems
5	Developing a Better Understanding of Nutrient Transport in Sierran Watershed Soils
6	Sagebrush Demography and Climatic Controls in Nevada's Semi-arid Ecosystems
7	Hydrologic and Vegetative Response to Pinyon-Juniper Treatments at the Watershed Scale
8	Synergistic Monitoring for Adaptive Vegetation Management in the Sagebrush Ecosystem of the Great Basin
9	Pheromone Control of the Invasive Bark Beetles

### **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**

Unraveling Insect Hydrocarbon Production

#### **2. Associated Institution Types**

- 1862 Research

#### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

#### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	0

#### **3c. Qualitative Outcome or Impact Statement**

##### **Issue (Who cares and Why)**

Hydrocarbons are important component of the insect outer surface, keeping the moisture in and nature out and, in addition, serve critical roles in chemical communication. A good analogy is the wax on a milk carton, without it, your carton leaks. Thus, if you can prevent the formation of these hydrocarbons, the insect will desiccate and die. The control over this process could lead to a novel method for dealing with insect infestations. In addition to creating targets for pest insect management, these genes may also be applied to biofuel (hydrocarbons) production in algae or plants.

##### **What has been done**

This year has been a breakthrough year. For the past 17 years, the University of Nevada has been chasing an enzyme that controls aldehyde and hydrocarbon production. Through a long series of experiments, the team has finally characterized the gene, a CYP4G2 family cytochrome P450 enzyme. Once characterized, the gene was then located in drosophila (fruit flies) and silenced. The results from the drosophila trials provided further evidence that CYP4G2 controlled hydrocarbon production in insects, while also reducing courtship behaviors. Through another series of experiments, CYP4G2 enzymes were then introduced to aldehyde with radioactive

markers built in. The results, the gene produced radioactive hydrocarbons. These findings were published in the third most prestigious journal in the world, "Proceeding of the National Academy of Science".

### Results

The work reported to the National Academy of Science has already been shown to increase the stock of useful knowledge by the sheer number of citations received. This project has created an international network of scientists all now working to better understand insect management through aldehyde and hydrocarbon control. Over the past year, the UNR team has now trained three graduate students, one of which is starting her own biotech company.

One future goal of the team involves the commercial production of hydrocarbon as biofuel. Of all the biofuels under development, hydrocarbon based biofuels are superior because they have high energy density, can be transported by pipelines, and are compatible with existing engines. If the team can transfer these genes into other organisms (e.g. algae), one could envision plants optimized to produce hydrocarbons.

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
122	Management and Control of Forest and Range Fires
123	Management and Sustainability of Forest Resources
125	Agroforestry
211	Insects, Mites, and Other Arthropods Affecting Plants

## Outcome #3

### 1. Outcome Measures

Castle Lake Long Term Research Program

### 2. Associated Institution Types

- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

Year	Actual
2012	0

### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**

Aquatic ecologists have long been interested in understanding the drivers of ecosystem production (i.e. algae, fisheries etc.) and keeping mountain lakes clear and pure. It is clear that manipulations of the food web through introductions of fisheries along with the drivers of climate (e.g. temperature, snow deposition, an ice) can impact ecosystem production and clarity. The interplay of these factors (climate and fisheries) however is not well understood largely due to the paucity of long-term data and models that calculate these interactions.

We have determined that climate and stocked fish population act as key drivers of annual primary productivity in Castle Lake. Additionally, annual stocking practices appear to be correlated with decreased density and altered species composition of emerging aquatic invertebrates subsidizing the riparian and terrestrial food webs.

The objective of this proposal is to expand these efforts and create a refined model that can be used a template for other mountain lake ecosystems in the Sierra and the Great Basin. These ecosystems are likely exhibiting similar impacts due to climate and fisheries introductions from the state and federal agencies. If the relationship of these patterns can be elucidated through long-term data collections at Castle Lake then we hope to create basic models controlling production (e.g. algae, fisheries, etc.) for each mountain lake ecosystem of interest in the Sierra and Great Basin.

#### **What has been done**

UNR has taken the lead for the past 8 years of the 54 year history of data collection at Castle Lake. The major achievements thus far centered around the development of two computer simulation models. Our team has determined that the growing season (from ice out to ice over) is staying consistent over time. California's Governor Office is very excited about this information. Combining this information along with consistent snow pack suggests that there is some resiliency in the landscape. And our models suggest that this is probably due to close proximity to Mt. Shasta.

Another finding is that biodiversity of the lake is shifting. Prior to 1988, climate change was driving biodiversity. 1988 through 1994 a long drought occurred, plus the addition of fish stocks took place, shifting Castle Lake's algae production. This shift has taken over 20 years to recover. This is information that managers need, because they assume that things return to normal in just a few years.

#### **Results**

The scientific impacts of this long-term monitoring project are of the utmost importance to all alpine lakes long the Sierra Nevada and Cascade mountain ranges. Now that the University of Nevada is directing the field station, this field station will continue to be the longest running monitoring project in North and South America. In order to preserve these import resources, the UNR team has taken the opportunity to involve not only the state and federal agencies that manage these areas, but stakeholder groups and local communities. Each year the team host a Children's Science Day that is focused on teaching best management practices, monitoring techniques, and watershed health indicators. One new outcome since UNR's involvement, ties the California Department of Fish and Wildlife's management of its alpine fisheries, to those of the USFS efforts in managing for an endangered bat that utilizes these watersheds. Without a clear understanding of how fish stocking rates influence the overall food web, one agency could have unknowingly been impacting the other's efforts.

#### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
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102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
132	Weather and Climate
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

**Outcome #4**

**1. Outcome Measures**

Persistence of Native Grasses in Cheatgrass Invaded Ecosystems

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2012	0

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

An increased demand for use of local native grasses in restoration has led restorationists to consider the genetic integrity of native seed sources. Currently, restoration in the Great Basin is implemented using agricultural seed that is produced for a wide range of locations. Plants that have been produced commercially are provided ample amounts of nutrients and water, all of which do not reflect the natural environmental conditions (precipitation, soil composition, climate, etc.) of the various locations where the seed will eventually end up for restoration. These and other "unnatural pressures" (harvest techniques, etc.) create genotypes that may not be adapted to their environmental restoration locations. This research has important implications for improving current restoration practices in the Nevada's Great Basin.

**What has been done**

In collaboration with USDA-ARS Reno, the UNR team measured seedling establishment of native perennial grass species and address whether these species were evolving to become more competitive with cheatgrass. The team developed and used a molecular method to determine rates of outcrossing within these native grasses. Field and greenhouse studies were tested to determine whether seedlings that put more energy into growing roots, rather than leaves, were more competitive with cheatgrass. They also determined if seeds collected from cheatgrass invaded areas were better at growing with cheatgrass than seeds from non-invaded areas.

## Results

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

This research shed light on how native populations of Sandberg Bluegrass (*Poa secunda*) can adaptively respond to novel environmental stimuli, such as invasion from Cheatgrass, 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.

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
121	Management of Range Resources
122	Management and Control of Forest and Range Fires
136	Conservation of Biological Diversity

## Outcome #5

### 1. Outcome Measures

Developing a Better Understanding of Nutrient Transport in Sierran Watershed Soils

### 2. Associated Institution Types

- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

Year	Actual
2012	0

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

In healthy coniferous ecosystems, rapidly decomposing litter can sustain a short-term cycling of nutrients from the canopies to the soils and back to the canopies. However, an accumulating forest floor similar to that now present in the eastern Sierras tends to hold nutrients leading to the buildup of large pools of nitrogen and phosphorus that may instead enhance nutrient discharge to

adjacent surface waters e.g., Lake Tahoe and other Sierran lakes.

An environment where the forest litter builds up on the surface of the soil faster than it degrades is thus undesirable for forest management because nutrient cycles develop progressively slower rates of turnover, and the forest floor is no longer able to maintain a short term nutrient cycle.

The overriding goal of this research is to further develop a quantitative database that will assist in the application of appropriate adaptive management strategies while incorporating the protection and effective management of critical watershed values. This investigation seeks to better characterize the natural nutrient transport processes within the upper watersheds that preferentially infiltrates into Sierran soils prior to final tributary discharge.

#### **What has been done**

Direct (soil cores) and passive sampling (resin capsules and lysimeters) methods were used to investigate the seasonal and annual spatiotemporal distribution of nutrient "hot spots" along the Sierran front northward to the base of the Cascades. Vegetation inventories and soils chemical analyses were conducted to obtain baseline data. All sites were outfitted with runoff and snow-melt collectors and data was collected annually for chemical analyses.

#### **Results**

The potential transport of nutrients from the terrestrial to the aquatic system can play a major role in the continued deterioration of water quality in the eastern Sierras and Lake Tahoe. If these nutrient laden waters enter the soil before discharge into surface waters, they are likely to create hot spots of very high nutrient concentrations, which in turn have significant implications for forest nutrition and surface and ground water quality.

This project has quantified the presence and spatial distribution of biogeochemical "hot spots" or "hot moments" relative to the surrounding soil matrix, how they are affected by fire, their geographic characteristics, and their potential impact on discharge water quality and Lake Tahoe's clarity. This new knowledge is helping management agencies make better informed decision. The current list of participating agencies include the Tahoe Regional Planning Agency, Lahontan Water Quality Management Board, California-Nevada Conservancy, and in particular the USFS Lake Tahoe Basin Management Unit.

#### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
122	Management and Control of Forest and Range Fires
123	Management and Sustainability of Forest Resources
132	Weather and Climate

## **Outcome #6**

### **1. Outcome Measures**

Sagebrush Demography and Climatic Controls in Nevada's Semi-arid Ecosystems

### **2. Associated Institution Types**

- 1862 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	0

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Shrub establishment in semi-arid areas is episodic in natural populations. The identification of when recruitment (establishment) pulses naturally occur can assist land managers in ecosystem rehabilitation/reclamation and restoration activities. Knowing the climatic variables responsible for these pulses will improve our ability to ensure success when resources are expended on restoration and wildlife improvement activities. If we understand the climatic conditions responsible, we can manipulate seed beds and microsites or modify cultural practices to improve establishment efficiency.

This study will identify the environmental conditions that have allowed natural sagebrush populations to establish and survive through extended periods of time, so that these conditions can be duplicated where necessary to enhance the establishment and survival of sagebrush.

#### **What has been done**

Seedling (cohort) origin years were determined from growth-ring analysis. Over a two years period, Black, Lahontan, Low, and Wyoming Sagebrush samples were collected for inclusion in annual growth-ring analysis. Stem cross sections were prepped, growth rings counted, and statistical analyses were conducted. Correlating to site locations, weather data back to 1925 was collected along with topography (slope, aspect and concavity) and soil texture information. Estimations were also made of current grazing pressures and current vegetation associated with the site.

#### **Results**

The most interesting finding of this research was the significance of global climatic patterns. Monthly Pacific Decadal Oscillation (PDO) index variables were correlated with seedling recruitment in all species studied. In general the shift from cool to warm phase of the PDO corresponded with increased sagebrush cohort recruitment. These results suggest that timing

restoration efforts with the larger climatic environment may result in increased success.

This is the first set of data ever published on Black, Lahontan, and Low Sagebrush growth-ring analyses. The recruitment intervals have now been included in state-and-transition models developed by the University of Nevada for BLM's ecological sites across Nevada with the potential to support sagebrush. These additions will provide restoration/rehabilitation practitioners, mined-land reclamation professionals, and ecological site delineation teams with more detailed requirements for sagebrush establishment in the Great Basin, leading to more efficient seeding activities.

The principle investigator and graduate student assigned to the project have learned new statistical techniques that deal more precisely with multitude of variables. In the past, logistic regression statistics were used to elucidate pulse recruitment phenomenon in semi-arid ecosystems. This required polytomous variables to be collapsed into presence (yes) - absence (no) formats. The team has discovered a way to maintain the polytomous nature of the data, while still relating it to the predictor variables.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
121	Management of Range Resources
132	Weather and Climate

#### Outcome #7

##### 1. Outcome Measures

Hydrologic and Vegetative Response to Pinyon-Juniper Treatments at the Watershed Scale

##### 2. Associated Institution Types

- 1862 Research

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Actual
2012	0

##### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**

Rural Nevada economies are strongly tied to farming and livestock production. The encroachment of pinyon pine and juniper into sagebrush-steppe ecosystems has reduced the forage base for livestock and wildlife species, increased soil erosion thus reducing the soil's ability to produce forage and potentially has had a negative impact on groundwater recharge. In addition, as woodlands mature and fuel loads shift from ground fuels to canopy fuels, fire frequency is reduced but fire intensity increases significantly, altering seed banks and further reducing understory species diversity. Anecdotal evidence has suggested that pinyon-juniper (PJ) encroachment has decreased water yields and that understory vegetation is essentially competing for limited water resources, though this has not been rigorously tested.

In arid Nevada, water is a scarce commodity utilized by wildlife, livestock and farmers for crop production therefore understanding the water use of pinyon - juniper woodlands will improve management's ability to predict both vegetation and groundwater recharge response to tree removal. Additionally, multiple treatment options exist for reducing the impact of pinyon -juniper on Nevada rangelands. Treatment options range from prescribed fire, to harvesting for biomass, to felling and leaving on site. Understanding the impacts of different treatment options on soil stability (erosion) and vegetation response will improve management's ability to determine the appropriate treatment for diverse ecosystems.

**What has been done**

The team of scientists from UNR determined how much precipitation is intercepted and used by PJ trees at the tree scale. Information developed at the tree scale was then scaled up to the watershed level with the use of GIS technology, providing science-based predictions of water use by PJ trees under different rainfall intensities. Additionally, the project provided information on the amount of soil erosion generated under different rainfall events within PJ dominated sagebrush plant communities. Finally, the project monitored vegetation and groundwater response to PJ treatment (felling) at the watershed scale.

**Results**

The outcomes of this project were multifaceted; there is now a fundamental understanding of canopy interception of precipitation by PJ trees. This knowledge will have future impacts on restoration efforts to control PJ encroachment. There is also a new understanding of soil erosion on treated (cutting of pinyon and juniper trees) areas. These project results influence overall watershed health and impacts of tree cutting on down-slope and downstream water quality as well as infiltration of water into the soil matrix in treated areas. Infiltration and runoff are directly related to plant available moisture which influences understory plant community response after treatment of trees.

The project also represents an intense field effort, based out of a remote camp in central Nevada. Students, post-docs, and technicians were in the field continuously from late March - September each year of the project. Such experiences provided substantial training in managing a field study, supervising personnel and learning both practical and natural history aspects of field biology.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources

**Outcome #8****1. Outcome Measures**

Synergistic Monitoring for Adaptive Vegetation Management in the Sagebrush Ecosystem of the Great Basin

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2012	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

It is estimated that more than 25,000 land treatment and wildfire events have occurred in Nevada since the early 1900's. Since then, scientists and land managers have been monitoring and conducting experiments on a substantial proportion of these events. A need was expressed for better information about the ecological resiliency and resistance on a regional scale. This project coordinated monitoring efforts and pooled monitoring data across organizations and individuals because the sum is more valuable than the individual components.

**What has been done**

In partnership with a whole host of collaborators, University of Nevada initiated a State-wide effort to capture, consolidate, and summarize implementation, monitoring, and research information for land treatments events that maintain or improve Nevada's sagebrush ecosystem. To achieve this goal, the team inventoried past land treatment data available from agency offices. They collected and analyzed monitoring data from selected recent, current and planned projects. The team also conducted field studies to identify and fill information gaps. All information was then compiled into a content management system known as SynMon. This database has now been made available to a large contingency of stakeholders including USDA (ARS, Humboldt-Toiyabe NF, and Rocky Mountain Forest and Range Experiment Station), USDI (BLM & FWS), and USGS.

**Results**

Rangeland management professionals have expressed increased interest in monitoring and in sharing data since becoming aware of this study. A large portion of SynMon's data has now been incorporated into USGS's Land Treatment Digital Library. USDA's Rock Mountain Experiment Station has used SynMon data to design and implement a five year vegetation monitoring program for habitat restoration in Elko and Eureka counties in Nevada, along with historical data for Bridgeport Ranger District, CA and Douglas county Nevada. The information contained within

SynMon has also been used to support and reinforce ecological site descriptions used in BLM's state and transition models throughout the Great Basin districts.

By working in close association with graduate students and various interdisciplinary graduate programs, the UNR faculty have augmented research and educational discussions. The project allowed graduate students the advantage of using select portions of the overall database to conduct a refined project with a narrow focus across an appropriate domain. 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
103	Management of Saline and Sodic Soils and Salinity
112	Watershed Protection and Management
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
132	Weather and Climate
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

#### Outcome #9

##### 1. Outcome Measures

Pheromone Control of the Invasive Bark Beetles

##### 2. Associated Institution Types

- 1862 Research

##### 3a. Outcome Type:

Change in Condition Outcome Measure

##### 3b. Quantitative Outcome

Year	Actual
2012	0

##### 3c. Qualitative Outcome or Impact Statement

###### **Issue (Who cares and Why)**

Bark beetles are an aggressive, destructive pest of pine forests in western North America. Historically, unprecedented outbreaks in Alaska and British Columbia are devastating forests there, and nearly a third of the trees in the Lake Tahoe basin have been killed, partially due to this insect's activity. Because they spend the majority of their life cycle beneath the surface of their

host trees, they are difficult to control by conventional methods.

We are trying to develop new control strategies based on the beetle's reliance on pheromones for successful mating. This project investigates the production of these chemicals in beetle tissues, and characterizes the genes involved in their production and/or degradation. Knowledge gained from this work will form the basis upon which future management strategies may well be developed.

#### **What has been done**

The team has been busy unraveling a family of enzymes (P450) involved in both the production of mating pheromones and the detoxification of a turpentine precursor terpene produced by pine trees as a natural defense. Thus far, the UNR team has characterized the first known terpene-hydroxylation P450s enzyme in bark beetles. An import step in detoxification. The biggest accomplishment thus far is proof-of-concept at the bench scale for the production of multiple commercially sought after chemicals.

#### **Results**

The project has led investigators to believe that a natural product could be produced from the discovery of how P450 enzymes dock to terpenes. The typical methods for mass production of ipsdienol are dangerous. However, you can buy myrcene (a common commercial terpene) for 10¢ a gram, run this through the P450 system and produce a \$380 per gram ipsdienol and when purified could be worth as much as \$1,200 per gram, all the while, under very safe production conditions. Limonene, a precursor to menthol, is a \$500 million per year market and yet another product that could be produced via the P450 systems.

Based on the information gained from our research, and interactions with the UNR's Technology Transfer Office, we leveraged our work into a successful NSF I-CORPS award to learn how to effectively function in a commercial setting. As a result, a new start-up effort, EscaZyme Biochemicals, LLC was launched to further explore commercializing our technologies.

#### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
123	Management and Sustainability of Forest Resources
211	Insects, Mites, and Other Arthropods Affecting Plants
216	Integrated Pest Management Systems

#### **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
- Other (Budgetary Restraints)

##### **Brief Explanation**

Another year of State budget shortfalls continue to narrowed the breadth of NAES's research programs. Fewer research projects will be supported and recruiting graduate students will be difficult.

The Experiment Station is still trying to recover from the 31 hard money positions lost after the 2010 circulation review. The natural resources and environmental science program is also facing the loss of two soil scientist. Their replacement will require a minimum of one year to recruit, hire and establish research programs that contribute to NAES's mission.

The circular review has also produced a number of administrative issues that contribute to the outcomes of our natural resources and environmental science program: the potential merger with Cooperative Extension, all faculty changing from 12 month to 9 month appointments, and the uncertainty regarding administrative changes (Dean/Director).

## **V(I). Planned Program (Evaluation Studies)**

### **Evaluation Results**

- Leveraged over \$3,85 million in extramural funding
- Won Gold in the 2013 Sontag Entrepreneurship Competition and received NSF's Innovation Corps grant
- Trained 85 students in field and lab techniques
- Have assumed the leadership role in America's oldest, continuous mountain lake environmental program

### **Key Items of Evaluation**

A new start-up company, EscaZyme Biochemicals, LLC was launched to further explore commercializing our pheromone production system.

**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			25%	
134	Outdoor Recreation			10%	
609	Economic Theory and Methods			8%	
702	Requirements and Function of Nutrients and Other Food Components			25%	
703	Nutrition Education and Behavior			18%	
721	Insects and Other Pests Affecting Humans			6%	
722	Zoonotic Diseases and Parasites Affecting Humans			8%	
	<b>Total</b>			100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.0	0.0
Actual Paid Professional	0.0	0.0	2.1	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	178876	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	82880	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**

Our POW 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 cancer, nutritional protection from side stream cigarette smoke, evaluating the beneficial effect of functional foods, studying school education programs on children's nutrition, and studying parameters that prevent obesity in high risk families.

**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**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	0	0	1157	275

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

**Patent Applications Submitted**

Year: 2012

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2012	Extension	Research	Total
Actual	0	4	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
2012	3

**Output #3**

**Output Measure**

- Leveraged Research Projects

Year	Actual
2012	482484

**Output #4**

**Output Measure**

- Web Sites Created or Updated

Year	Actual
2012	2

**Output #5**

**Output Measure**

- Number of Graduate Students or Post-Doctorates Trained

<b>Year</b>	<b>Actual</b>
2012	1

**Output #6**

**Output Measure**

- Number of Undergraduate Students Involved in Research

<b>Year</b>	<b>Actual</b>
2012	22

**Output #7**

**Output Measure**

- Demonstrations and Workshops Conducted

<b>Year</b>	<b>Actual</b>
2012	2

**Output #8**

**Output Measure**

- Manuals and Other Printed Instructional Materials Produced

<b>Year</b>	<b>Actual</b>
2012	0

**Output #9**

**Output Measure**

- Non-Peer Reviewed Publications

<b>Year</b>	<b>Actual</b>
2012	1

**Output #10**

**Output Measure**

- Presentations

<b>Year</b>	<b>Actual</b>
2012	10



**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.

## **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

### **V(H). Planned Program (External Factors)**

#### **External factors which affected outcomes**

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Programmatic Challenges

#### **Brief Explanation**

Another year of State budget shortfalls continue to narrowed the breadth of NAES research programs. Fewer research projects will be supported and recruiting graduate students will be difficult.

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 our nutrition and health program will be diminished.

The department of Nutrition has endured a number of significant changes. Mainly, the absorption of remaining faculty retained after circular review. This action has diluted the department's primary focus of nutrition and dietetics to include agricultural and veterinary sciences. The nutrition and health program also suffered the loss of a jointly appointed obesity specialist when Cooperative Extension stopped financial support.

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, all faculty changing from 12 month to 9 month appointments, and the uncertainty regarding administrative changes (Dean/Director).

### **V(I). Planned Program (Evaluation Studies)**

#### **Evaluation Results**

Currently only one project is active and has only just begun "Investigating The Potential Beneficial Health Effects Of Grape Seed Extracts From Nevada Grown Grapes" .

#### **Key Items of Evaluation**

See above.

**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			8%	
122	Management and Control of Forest and Range Fires			15%	
213	Weeds Affecting Plants			7%	
401	Structures, Facilities, and General Purpose Farm Supplies			5%	
601	Economics of Agricultural Production and Farm Management			9%	
605	Natural Resource and Environmental Economics			8%	
607	Consumer Economics			4%	
608	Community Resource Planning and Development			33%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities			8%	
903	Communication, Education, and Information Delivery			3%	
	<b>Total</b>			100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.0	0.0
Actual Paid Professional	0.0	0.0	1.9	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	152877	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	156510	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**

Nevada scientists will continue to conduct economic analysis of various rural labor and public policy issues, research improving childcare and diverse needs of custodial grandparents in Nevada. Research will continue in economic development through the economic development center and analysis and development of rural health care.

**2. Brief description of the target audience**

Educators, community leaders, decision-makers, parents, native american organizations and health care organizations.

**3. How was eXtension used?**

eXtension was not used in this program

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	1220	0	95	0

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

**Patent Applications Submitted**

Year: 2012  
 Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

<b>2012</b>	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Actual</b>	0	4	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.  
Not reporting on this Output for this Annual Report

**Output #2**

**Output Measure**

- Newsletters Produced

<b>Year</b>	<b>Actual</b>
2012	1

**Output #3**

**Output Measure**

- Web Sites Created or Updated

<b>Year</b>	<b>Actual</b>
2012	2

**Output #4**

**Output Measure**

- Number of Graduate Students or Post-Doctorates Trained

<b>Year</b>	<b>Actual</b>
2012	0

**Output #5**

**Output Measure**

- Leveraged Research Projects

<b>Year</b>	<b>Actual</b>
2012	346850

**Output #6**

**Output Measure**

- Manuals and other printed instructional materials produced

<b>Year</b>	<b>Actual</b>
2012	0

**Output #7**

**Output Measure**

- Number of Undergraduate Students Involved in Research

<b>Year</b>	<b>Actual</b>
2012	2

**Output #8**

**Output Measure**

- Non-Peer Reviewed Publications

<b>Year</b>	<b>Actual</b>
2012	17

**Output #9**

**Output Measure**

- Presentations

<b>Year</b>	<b>Actual</b>
2012	15

**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	Food and Agricultural Research Policy for Nevada
3	Determining the Relationships of Rangeland Fragmentation and Rural Nevada's Economy
4	Formation of the Western Nevada Development Program
5	Economics of Rangeland Invasive Weeds Control - A Cost and Benefit Analysis at the Ranch Level

## **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**

Food and Agricultural Research Policy for Nevada

### **2. Associated Institution Types**

- 1862 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	0

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

The Food and Agricultural Policy Research Institute (FAPRI) has served the U.S. Congress since the late 1970s, bringing an independent (out of Government) perspective on national agricultural policy, trade policy and other major issues that come before the Agricultural Committees of the Senate and House. Initially organized by the University of Missouri, Columbia and Iowa State University, other institutions have joined the FAPRI group to provide added capacity associated with specific agricultural commodities and sectors.

UNR, as a partner FAPRI institution, has developed cattle and sheep industry models that separate the regional industry from the rest of the U.S. and world, and will integrate these new more specific models into the FAPRI system, as well as utilize the models for solving regional issues that are important to the management of the public lands and grazing industry.

As the models are completed and they will be incorporated in the FAPRI system supporting the U.S. and World Agricultural Outlook or Baseline, which is used as definitive information by the U.S. Congress, the USDA, and the private sector for agricultural analysis and projections of policy and trade impacts. The requirement for analysis of the domestic and international markets for

crops will place additional requirements on the FAPRI system. These analyses will be different than those for the so called program crops that have traditionally been modeled within the FAPRI system, and will require different policy modeling structures. These structures will relate to impacts of marketing board rules and the inclusion or exclusion of particular producers from these organizational systems.

To address this increased need for sector and policy analysis, the University of Nevada, Reno will move to develop additional modeling capacities for major specialty crops, designing analytical systems that can assist the producers as well as the government in addressing regional, national or domestic and international issues in these markets. The model of a specific specialty crop that is produced primarily in the west developed this year will be used as a template to expand our coverage of specialty crops.

#### **What has been done**

The University of Nevada's Center for Economic Development research team completed the Western Livestock Model, showing differential impacts to Western cattle prices. Results showed that looking at only national prices may yield incorrect differential impacts to different regions of the nation from alternative public policies. Econometric models for alfalfa hay are almost completed which will be of interest to Western producers as well as a Western sheep price model.

#### **Results**

National beef and range beef price models were developed as well as sheep pricing model. The models were incorporated into the FAPRI Group and used for price projection workshop for the U S Congress. Also a Western alfalfa hay model has been developed. Results have been presented to US Congress and Nevada Cattlemen's annual meeting.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
601	Economics of Agricultural Production and Farm Management

### **Outcome #3**

#### **1. Outcome Measures**

Determining the Relationships of Rangeland Fragmentation and Rural Nevada's Economy

#### **2. Associated Institution Types**

- 1862 Research

#### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

#### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	0

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

In 2000, it was estimated that approximately 84% of the land area in the state of Nevada was under federal ownership. Although Nevada is the seventh largest state in the nation geographically, it would rank as the tenth smallest state if all federal lands were deducted from its total. Therefore, changes in public land management policies will impact the county economies in the state of Nevada.

With changing public land management policies toward ecosystem management, the mix of public land users has changed as well. The redirection of resources away from traditional uses could have significant impacts on local Nevada economies.

The goal of this proposal is to determine whether rangeland fragmentation is causing economic impacts and the extent of the related individual and cumulative impacts.

#### **What has been done**

The University of Nevada's economic development team has completed their optimization model which includes farm-level linear programming profit maximizing component and an input-output model has been constructed for Nevada. The team has developed an interregional fiscal social accounting model. This model derived impacts of reduced public land grazing in rural Nevada and accompanying impacts to urban Nevada. They have also developed an integrated ranch level linear programming, a stochastic rangeland fire model, and an integrated ranch level and Social Accounting Matrix model to estimate economic and distributional impacts of changes in public range grazing. Lastly, a supply determined interregional SAM model has been developed. From all these models, a paper was developed to estimate the distributional impacts of reduced public land grazing in rural Nevada on rural and urban Nevada.

#### **Results**

This project essentially is a policy-oriented regional project and the short-term outcomes are primarily decisions made by various government or policy groups related to public lands and their relationship to local communities and states. In many cases, the information and data provided as a result of this project are used as the primary source of data in the decision-making process.

The analysis of intensive management has provided federal land managers with a clearer understanding of their duties and responsibilities and provided state managers with a better understanding of the laws that constrain their federal counterparts.

Wildfire limits ranchers access to public grazing land and causes the economic losses of \$20 million ~ \$65 million per year in the near future, equivalently about 0.2%~0.5% of the total value of regional production. The value of agricultural and hay production decrease by \$1.7 million ~ \$5.1 million directly due to wildfire and indirectly due to reduction of cattle sector production.

Results of Elko County Commissioner's Office study have been accepted as input by U.S. Forest Service in their development of an EIS. These finds have led to an additional study to estimate the county-wide economic impacts of rangeland fires in Elko County, as well as a study investigate potential economic impacts of changes to Elko and Eureka counties from proposed changes in the 1872 Mining Law.

The study has been accepted by BLM offices for incorporation into rangeland plans. In addition, study and procedures are being incorporated into Rangeland Five studies.

#### 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

Formation of the Western Nevada Development Program

##### 2. Associated Institution Types

- 1862 Research

##### 3a. Outcome Type:

Change in Action Outcome Measure

##### 3b. Quantitative Outcome

Year	Actual
2012	0

##### 3c. Qualitative Outcome or Impact Statement

###### **Issue (Who cares and Why)**

Western rural places were originally settled by people whose livelihoods depended upon natural resource extraction (mining, timber harvest, fisheries, etc.). In an increasingly integrated global economy, farm employment has declined by 70%, and other resource industries have declined by 50% since 1900s. Traditional jobs in resource extraction and manufacturing have largely been replaced by service industry jobs.

Entrepreneurism offers a solution to rural economic challenges. Entrepreneurism takes place when individuals mobilize their assets, capital, and networks to meet market demands. Communities play a role in fostering the emergence of entrepreneurial activity. If community networks are diverse and dense, and if there is a sense of shared risk, entrepreneurs are more likely to take risks that may result in success.

The goal will be to provide a platform for focused community development leading to strengthened rural economies.

###### **What has been done**

The University of Nevada's Center for Economic Development research team completed socio-economic data analysis for the Stronger Economies Together workshops. This data was shared

with participants in the Western Nevada Development district. Publications were made and a final strategic plan was adopted for the Western Nevada Development District.

**Results**

An outcome was the development of a strategic regional economic development plan for the Western Nevada Development District. Also with understanding of regional economic linkages, Washoe County, Nevada is now a member of the Western Nevada Development District.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics
607	Consumer Economics
608	Community Resource Planning and Development
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
903	Communication, Education, and Information Delivery

**Outcome #5**

**1. Outcome Measures**

Economics of Rangeland Invasive Weeds Control - A Cost and Benefit Analysis at the Ranch Level

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	0

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

The fact that there is variation among rangeland landscapes, ecological conditions and ranch types suggests that a ranch-level model for assessing strategies for invasive weeds and rangeland management effort would generate different outcomes if parameterized to accommodate various combinations of conditions. Development of policies to engage public and private partnerships to address the invasive weed problem across the Great Basin requires an ability to predict how variations among ranch types and rangeland conditions generate variation in economic incentives across private ranchers.

Thus, what are the costs to Nevada ranchers of rangelands infested with invasive annual weeds, what does it cost ranchers to battle invasive weeds and what are the expected returns at the ranch level for investments in reducing the impacts of invasive weeds? How do these costs and benefits vary with ranch type, vegetation conditions, and biophysical rangeland characteristics as they vary throughout the state? The purpose of this research is to generate the means to answer these questions by developing a sophisticated ranch simulation model that takes into account the ranch-level dynamics of cow-calf operations, the dynamics of economic conditions, and the dynamics of ecological conditions of rangelands.

#### **What has been done**

UNR's team of talented economists have developed conceptual models to estimate costs and benefits of invasive weed management, and have implemented the application of these models to (1) non-market valuation of environmental costs and benefits from public lands, (2) benefits and costs for a demonstration ranch, (3) development of policies and institutions to coordinate management goals and actions among private ranchers and public sector rangeland managers, (4) measurement of benefits and costs of invasive weeds management by private sector cooperators in five watersheds in the Great Basin, and (5) compilation of research results of these projects in a decision support tool that addresses spatial variations in vegetation and private and public benefits of the ecosystem.

#### **Results**

This is the first dynamic optimization model of resource management that allows for the possibility that only a portion of the system crosses an irreversible ecological threshold, and where there are both reversible and irreversible thresholds.

These innovations permit analysis of a situation characteristic of western rangelands, where at the landscape level a patchwork is observed where some rangelands have crossed an irreversible ecological threshold to an annual grass dominated state while others have not - even while similar livestock management rules and environmental conditions occur; and where management effort can be expended to maintain healthy rangeland and to rehabilitate degraded rangeland that risks crossing an irreversible threshold.

Ecological models for a wide variety of ecosystems predict that changes in management and/or environmental conditions result in non-linear, discontinuous changes in plant community structure, with multiple stable states existing under similar ecological conditions. Our analysis has provided insight into dynamic economic modeling of ecosystems with similar characteristics.

The model considers ecosystem management where management and natural triggers (wildfire and invasive annual grasses) cause rapid shifts between ecological states (where some are reversible and others not) involving significant economic costs. The focus of ecosystem management and policy in these situations is to avoid undesirable transitions between states. Our framework allows analysis of regulation/policy to avoid undesirable transitions in an optimization model that accounts for the manager's private economic incentives.

Many ecosystem management problems consider areas so large that it is not appropriate to assume that transitions between ecological states affect the entire area. When the area managed is a mosaic of lands in different ecological states, the land manager's decision problem involves determining how best to direct management resources and effort to rangelands in different states. This research analyzes this aspect of ecosystem management in the context of a dynamic optimization model.

#### 4. Associated Knowledge Areas

<b>KA Code</b>	<b>Knowledge Area</b>
122	Management and Control of Forest and Range Fires
401	Structures, Facilities, and General Purpose Farm Supplies
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development

#### V(H). Planned Program (External Factors)

##### External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Programmatic Challenges

##### Brief Explanation

Another year of State budget shortfalls continue to narrowed the breadth of NAES's research programs. Fewer research projects will be supported and recruiting graduate students will be difficult.

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 our economic development program will be severely diminished.

Our economic development program was one of the hardest hit after circular review. The department Resource Economics was closed and with that the loss of 11 faculty positions. Three faculty were retained and transferred to the College of Business while holding partial experiment station appointments. This has resulted in very limited output.

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, all faculty changing from 12 month to 9 month appointments, and the uncertainty regarding administrative changes (Dean/Director).

#### V(I). Planned Program (Evaluation Studies)

##### Evaluation Results

- Leveraged over \$340,000 in extramural funding
- Published four peer-reviewed journal articles
- 15 presentations to Western Nevada Development District and Stronger Economies Together workshops

##### Key Items of Evaluation

The economic models developed and refined have been incorporated into the Food and Agricultural Policy Research Institute baseline projections for the Western U.S. cattle and alfalfa sectors, as well as by U.S. Forest Service in their development of an EIS in Northern Nevada.

**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			20%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			34%	
204	Plant Product Quality and Utility (Preharvest)			20%	
206	Basic Plant Biology			16%	
502	New and Improved Food Products			10%	
	<b>Total</b>			100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual Paid Professional	0.0	0.0	2.6	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	249636	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	227389	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**

Scientists are currently determining best algal species (survival and growth rates, fat and starch content) for production of oils that will then be processed into biofuels. 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 feedstocks (i.e. biodiesel and cellulosic-based liquid fuels. Camelina is being evaluated as an alternative crop for biofuel and other plant derived products.

**2. Brief description of the target audience**

Those most effected 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**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	158	0	370	200

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

**Patent Applications Submitted**

Year: 2012

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2012	Extension	Research	Total
<b>Actual</b>	0	11	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

<b>Year</b>	<b>Actual</b>
2012	2

**Output #3**

**Output Measure**

- Number of Graduate Students or Post-Doctorates Trained

<b>Year</b>	<b>Actual</b>
2012	1

**Output #4**

**Output Measure**

- Number of Undergraduate Students Involved in Research

<b>Year</b>	<b>Actual</b>
2012	18

**Output #5**

**Output Measure**

- Research Projects Conducted

<b>Year</b>	<b>Actual</b>
2012	4

**Output #6**

**Output Measure**

- Leveraged Research Projects

<b>Year</b>	<b>Actual</b>
2012	7894043

**Output #7**

**Output Measure**

- Web Sites Created or Updated

<b>Year</b>	<b>Actual</b>
2012	1

**Output #8**

**Output Measure**

- Presentations

<b>Year</b>	<b>Actual</b>
2012	14

**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	Camelina as a Feedstock for the Biofuels Industry

## **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**

Camelina as a Feedstock for the Biofuels Industry

### **2. Associated Institution Types**

- 1862 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	0

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Currently, over 35% of the world's land surface is considered to be arid or semi-arid, experiencing precipitation that is inadequate for most agricultural uses. Drought and salinity are two of the most important environmental stresses affecting the crop productivity of agricultural. Understanding the fundamental mechanisms that contribute to the response to abiotic stress and the enhancement of yield stability in the face of environmentally variable and stressful conditions have therefore become a critical priority area for agricultural research agencies and corporations.

#### **What has been done**

Test different varieties of Camelina for growth performance over the next five years. 700 lines of a M2 population have been screened. Industry has requested that a line of Camelina be developed that does not have the gummy outer coating. Thus far four lines have been established with little or no sticky polysaccharide coats. These particular lines also seem to contain more seed oil than standard lines.

The team synthesized the agrobacterium gene. Produced "Roundup Ready" resistant genes constructs, with transformance into the plant being tested currently.

Transcriptome analysis, have sequenced 4.3 million reads, providing assemble characteristics of the Camelina genome. The team has also compared Camelina's genome to Arabidopsis (model organism) and Brassica napus (canola) 74-88% similar.

### **Results**

Camelina is proving to be a viable option as a fuel crop in Northern Nevada. Having a short growing season of four months and reasonable degree of cold tolerant to begin with, this plant can be planted in the early spring or fall. By request of a local biofuel company, four varieties of Camelina are now being scaled up that produces little or no sticky residue, while increasing oil content.

This project also established drought thresholds for Camelina, with a minimum of 7.8 inches of rain per year. Under drought conditions, the Celine variety proved to be one of the top performers in both biomass and seed production.

## **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)

## **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
- Populations changes (immigration, new cultural groupings, etc.)

### **Brief Explanation**

Another year of State budget shortfalls continue to narrowed the breadth of NAES research programs. Fewer research projects will be supported and recruiting graduate students will be difficult.

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 sustainable energy program will be 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, all faculty changing from 12 month to 9 month appointments, and the uncertainty regarding administrative changes (Dean/Director).

This past year has seen yet other new obstacles affecting NAES's ability to conduct research that supports the biofuels community. NAES's Main Station Field Lab (MSFL), situated along the Truckee River, provides high quality agricultural opportunities and is an

easy commute from UNR's main campus. However, MSFL has seen 168 acres sold to the city based upon eminent domain. Surplus water rights were sold by the university, but proceeds were not returned to NAES. And, the university is seeking to rezone another 110 acres (some of the richest soils) for commercial use, opening the door for the future sales of another section of MSFL.

### **V(I). Planned Program (Evaluation Studies)**

#### **Evaluation Results**

- Trained 19 students
- Leveraged over \$7.8 million in extramural grants
- Produced eleven peer reviewed publications

#### **Key Items of Evaluation**

The cultivation of camelina in Northern Nevada is a tricky business, however, our team of scientists have completed a number of varietal trials and selected four varieties that excel in our climate.

**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
602	Business Management, Finance, and Taxation			7%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins			37%	
723	Hazards to Human Health and Safety			28%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities			28%	
	<b>Total</b>			100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.5	0.0
Actual Paid Professional	0.0	0.0	0.6	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	66649	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	46836	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**

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. In-depth cattle handling workshop are being performed that targets the Spanish speaking workers to increased production and improved animal health through decreased stress. A child and adult/elderly caregivers training programs was created to reduce foodborne illnesses and improve food safety education in this industry.

**2. Brief description of the target audience**

This program is targeting Nevada's agricultural producers with emphasis on Spanish speakers 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**

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	52	0	231	0

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

**Patent Applications Submitted**

Year: 2012

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

<b>2012</b>	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Actual</b>	0	4	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

<b>Year</b>	<b>Actual</b>
2012	1

**Output #4**

**Output Measure**

- Number of Undergraduate Students Involved in Research

<b>Year</b>	<b>Actual</b>
2012	5

**Output #5**

**Output Measure**

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

**Output #6**

**Output Measure**

- Web Sites Created or Updated

<b>Year</b>	<b>Actual</b>
2012	2

**Output #7**

**Output Measure**

- Presentations

<b>Year</b>	<b>Actual</b>
2012	1

**Output #8**

**Output Measure**

- Demonstrations and Workshops

<b>Year</b>	<b>Actual</b>
2012	3

**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	Providing Caregivers Workshops for Safe Food Handling Practices

**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**

Providing Caregivers Workshops for Safe Food Handling Practices

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2012	0

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Nevada has been one of the fastest growing states in the US for the past two decades and such growth is associated with increases in population that faces relatively large food safety hazards (elderly and young children). In many situations, the caregiver for young and elderly are their first line of defense in preventing foodborne illnesses.

Based on two major surveys conducted in Nevada, there is a strong need for educators to be proactive in providing extensive food safety education to caregivers. We believe that University of Nevada, Reno can use its expertise to assist caregivers in achieving safe food handling practices and that will assist Nevada in reducing foodborne illnesses.

**What has been done**

This project developed an online food safety education program for caregivers. We have developed a number of food safety education modules, based on the needs of Nevada care facilities that are interactive and include short videos, live discussions, questions and answers, and self-assessments tools. These modules were then appended to an interactive and onsite workshop formats and to provide assistance in HACCP development. We have also translated our modules into Spanish in order to help promote ethnic participation. And, working with the

State of Nevada Division of Health, Washoe District Health Department, and the Nevada Food Safety Task Force, the UNR team has initiated a marketing campaign that promotes these educational foods safety programs.

**Results**

This project developed the means whereby caregiver facilities are more empowered to prevent or prevail over outbreaks of foodborne illnesses. Participants are able to access this fully narrated and animated curriculum whenever they choose, rather than at a specific time and location. The UNR team is also providing onsite food safety workshops for those caregiver facilities who desire such and for those caregivers who do not have easy access to the internet.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

**V(H). Planned Program (External Factors)**

**External factors which affected outcomes**

- Economy
- Public Policy changes
- Government Regulations
- Populations changes (immigration, new cultural groupings, etc.)

**Brief Explanation**

Another year of State budget shortfalls continue to narrowed the breadth of NAES research programs. Fewer research projects will be supported and recruiting graduate students will be difficult.

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 food safety program will be ran by only one faculty member.

The department of Nutrition has endured a number of significant changes. Mainly, the absorption of remaining faculty retained after circular review. This action has diluted the department's primary focus of nutrition and dietetics to include agricultural and veterinary sciences.

**V(I). Planned Program (Evaluation Studies)**

**Evaluation Results**

- Creation of 18 web based training modules designed to assist in HACCP

**Key Items of Evaluation**

An on-line course is now up and running, providing Nevada's caregiver and facilities management assistance in food safety training.

**V(A). Planned Program (Summary)**

**Program # 8**

**1. Name of the Planned Program**

Childhood Obesity

- Reporting on this Program  
Reason for not reporting

Faculty responsible for obesity studies were lost due to University mandated budget cuts.

**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: 2012	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**

2012	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: 2012

Actual: {No Data Entered}

**Patents listed**

{No Data Entered}

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2012	Extension	Research	Total
Actual	0	2	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**

2012 0

**Output #2**

**Output Measure**

- Newsletters Procuded

<b>Year</b>	<b>Actual</b>
2012	0

**Output #3**

**Output Measure**

- Research Projects Conducted

<b>Year</b>	<b>Actual</b>
2012	0

**Output #4**

**Output Measure**

- Web Sites Created or Updated

<b>Year</b>	<b>Actual</b>
2012	0

**Output #5**

**Output Measure**

- Number of Graduate Students or Post-Doctorates Trained

<b>Year</b>	<b>Actual</b>
2012	0

**Output #6**

**Output Measure**

- Number of Undergraduate Students Involved in Research

<b>Year</b>	<b>Actual</b>
2012	0

**Output #7**

**Output Measure**

- Demonstrations and Workshops Conducted

<b>Year</b>	<b>Actual</b>
2012	0

**Output #8**

**Output Measure**

- Leveraged Research Projects

<b>Year</b>	<b>Actual</b>
2012	0

**Output #9**

**Output Measure**

- Manuals and Other Printed Instructional Materials Produced

<b>Year</b>	<b>Actual</b>
2012	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**

<b>Year</b>	<b>Actual</b>
2012	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**

<b>KA Code</b>	<b>Knowledge Area</b>
{No Data}	null

**V(H). Planned Program (External Factors)**

**External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Public Policy changes
- Government Regulations
- Populations changes (immigration, new cultural groupings, etc.)

**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

Two faculty position involved in climate change were vacated due to retirements.

**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: 2012	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**

2012	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: 2012

Actual: {No Data Entered}

**Patents listed**

{No Data Entered}

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2012	Extension	Research	Total
Actual	0	10	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
2012	0

**Output #2**

**Output Measure**

- Leveraged Research Projects

<b>Year</b>	<b>Actual</b>
2012	0

**Output #3**

**Output Measure**

- Number of Graduate Students or Post-Doctorates Trained

<b>Year</b>	<b>Actual</b>
2012	0

**Output #4**

**Output Measure**

- Number of Undergraduate Students Involved in Research

<b>Year</b>	<b>Actual</b>
2012	0

**Output #5**

**Output Measure**

- Web Sites Created or Updated

<b>Year</b>	<b>Actual</b>
2012	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**

<b>Year</b>	<b>Actual</b>
2012	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**

<b>KA Code</b>	<b>Knowledge Area</b>
{No Data}	null

**V(H). Planned Program (External Factors)**

**External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Public Policy changes
- Government Regulations
- Populations changes (immigration, new cultural groupings, etc.)
- 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}