

2007 University of Nevada Research Annual Report

Status: Accepted
Date Accepted: 05/30/08

2007 University of Nevada Research Annual Report

I. Report Overview

1. Executive Summary

This Annual Report for the Nevada Agricultural Experiment Station (NAES) for 2007 reports on select program impacts which reflect unique benefits to a diversity of clientele and stakeholders in Nevada. No attempt was made to include all programs or all program impacts since they are too extensive. All programs are based on local or statewide formal and informal needs assessments.

The mission of NAES is to build and support research capacity to advance understanding of biological, environmental, natural resource and social systems to enhance agriculture, community and economic vitality in compliance with State and Federal Legislation. 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. Six 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 Plant Sciences Field Laboratory, which houses the experimental winery and vineyard and the brand new state of the art UNR Greenhouse Complex; Newlands Research and Extension Center; Gund Ranch Rangeland Research Center; and the Jay Dow Sr. Wetlands Research Laboratory. The NAES Priority grants program involves Hatch and Multi-state Research Programming which is driven by peer and stakeholder review and embraces the Federal State partnership directed by the Hatch Act and subsequent Farm Bill provisions. The overarching goals of the NAES include: 1. Agricultural Production in a Semi-Arid Environment; 2. Economic Development with Emphasis in Rural Areas; 3. Natural Resource Management and Environmental Sciences in the Great Basin and Sierran Ecosystems; 4. Nutrition and Health. The research program and facilities of the NAES provide the foundation for graduate training activities and undergraduate research opportunities for undergraduate students in Animal Biotechnology, Biochemistry and Molecular Biology, Natural Resource and Environmental Sciences, Resource Economics and Nutrition. Through an extensive outreach program involving town hall meetings, rural tours, impact reporting, news releases, web based reporting of research progress, pamphlet and annual reports 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.

Total Actual Amount of professional FTEs/SYs for this State

Year:2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	89.0	0.0
Actual	0.0	0.0	28.5	0.0

II. Merit Review Process

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

- 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 NAES web based application process and the individual contributing departments are responsible for obtaining scientific peer review. We have initiated a web based peer review process for department peer review and Experiment Station administrative use for evaluating the proposed research for the Nevada Agricultural Experiment Station. The department will submit their ranked evaluation of the research proposals for that respective department, and the Director, in consultation with the Associate Director, will approve the research projects based on the departmental recommendations, peer review rankings and 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

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, etc., to attend. We hold an annual "Field Lab Day" at our Main Station Field Laboratory and the Gund Range Research Station where there is an excellent dialog between stakeholders and NAES faculty and administrators.

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

Brief Explanation

We currently have a broadly based CABNR/NAES advisory committee that meets and provides advice 1-3 times per year. In addition, we have an associate dean for outreach and his office schedules and coordinates town hall meetings throughout the state with the purpose of obtaining direct input to the NAES research portfolio. The primary responsibility of the associate dean for outreach is to connect the CABNR/NAES teaching and research programs to the citizens of Nevada. Our partnership with Nevada Cooperative Extension provides assistance and access to stakeholders. Informal discussions with key stakeholders provides important input into our programs.

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

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Meeting specifically with non-traditional groups

Brief Explanation

Stakeholders include all federal, state and county non-governmental organizations that are involved in agricultural production and environmental stewardship. Individual stakeholders are identified through personal contact with producers, town hall meetings, attendees at field lab days, and connections with extension and college outreach personnel. Input is received verbally or written.

3. A statement of how the input was considered

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

Brief Explanation

The stakeholder input is relied upon to establish the research portfolio for NAES, and that includes identification of priority areas, identifying important new issues and the actual approval and funding of new and continuing projects.

Brief Explanation of what you learned from your Stakeholders

We learned of the priorities that are important to our various stakeholder groups and incorporated those into our programs.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	2126180	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	0	1454630	0
Actual Matching	0	0	2483195	0
Actual All Other	0	0	0	0
Total Actual Expended	0	0	3937825	0

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

V. Planned Program Table of Content

S. NO.	PROGRAM NAME
1	Agricultural Production in a Semi-Arid Environment
2	Natural Resource Management and Environmental Sciences in the Great Basin and Sierran Ecosystems
3	Economic Development with Emphasis in Rural Areas
4	Nutrition and Health

Program #1

V(A). Planned Program (Summary)

1. Name of the Planned Program

Agricultural Production in a Semi-Arid Environment

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			10%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			32%	
206	Basic Plant Biology			2%	
301	Reproductive Performance of Animals			3%	
303	Genetic Improvement of Animals			19%	
304	Animal Genome			7%	
305	Animal Physiological Processes			1%	
307	Animal Management Systems			4%	
308	Improved Animal Products (Before Harvest)			6%	
311	Animal Diseases			8%	
312	External Parasites and Pests of Animals			2%	
315	Animal Welfare/Well-Being and Protection			2%	
511	New and Improved Non-Food Products and Processes			4%	
Total				100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	21.0	0.0
Actual	0.0	0.0	11.9	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	628373	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	1252740	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, educate 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 a quarterly bulletin entitled "Insights" News from the College of Agriculture, Biotechnology and Natural Resources and the Nevada Agricultural Experiment Station, mail a quarterly postcard entitled "Research with Impact" featuring a specific research accomplishment of the Nevada Agricultural Experiment Station (this outreach piece received an award from the Association for Communications Excellence), Include publications on the CABNR/NAES web page, report impacts through a web based link entitled Nevada Dividends, and share results with extension faculty for inclusion 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 governmental organizations as well as students taking class or participating in research activities.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	1000	4000000	250	500000
2007	1100	3500000	250	500000

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

Patent Applications Submitted

Year	Target
Plan:	0
2007 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan			
2007	0	31	31

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	Target	Actual
2007	50	31

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O No.	OUTCOME NAME
1	peer reviewed journal articles, publications, in trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations
2	Peer reviewed journal articles, publications, in trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations.
3	Peer reviewed journal articles, trade journals, publications, presentations at scientific meetings, stakeholder, native american and agency presentations.
4	Peer reviewed journal articles, publications, trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations.
5	Peer reviewed journal articles, trade journals, publications, presentations at scientific meetings, stakeholder, native american and agency presentations.
6	Peer reviewed journal articles, publications, trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations.
7	Peer reviewed journal articles, publications, trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations.
8	Peer reviewed journal articles, trade journals, publications, presentations at scientific meetings, stakeholder, native american and agency presentations.

Outcome #1**1. Outcome Measures**

peer reviewed journal articles, publications, in trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	50	31

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

Scientists have puzzled for years to understand how plants pass signals of stress, due to lack of water or salinity, from chloroplast (photosynthesis apparatus) to nuclei (the cell's brain). They know that chloroplasts have at least three different signals that can indicate a plant is under stress. Given the challenges the environment will be facing over the coming decades through global warming, this puzzle piece has become more pressing for plant scientists, who hope that understanding the stress responses of plants will, in time, lead to new generations of plants that are, among other things, more drought- and stress-tolerant.

What has been done

A research team that includes University of Nevada and the Salk Institute has determined that multiple distress signals in plants converge on a single pathway, which then channels the information to the nucleus. Many of the nuclear genes that encode chloroplast proteins are regulated by a 'master switch' in response to environmental conditions. This 'master switch,' like a binary computer, can activate or de-activate certain sets of genes based on stress signaling processes. The team found the corresponding binding factor known as ABI4, which prevents light-induced regulatory factors from activating.

Results

The international community has recognized the discovery of a 'master switch' as an important step forward in the understanding of how chloroplasts communicate with a cell's nucleus when stresses such as drought, heat, salinity, or light become too great on the organism.

University of Nevada team member Dr. Shai Koussevitzky is suggesting that, 'ABI4 seems like a prime candidate to be the 'master switch.' It has a role in so many plant signaling processes, it might actually be the master switch that researchers have been looking for.'

'The discovery is critical to future research efforts in designing new generations of plants,' states UNR team member Dr. Ron Mittler. A lot of things that occur in the chloroplast are important for production, for growth, for response to the environment. So this is a very basic mechanism of communication between the chloroplast and the nucleus. It had been previously suggested that the elements in this process go through multiple pathways. This work shows that the elements actually go through this one particular route.

Added Dr. Koussevitzky: 'We're trying to put the signaling pathways in the context of the plant's stress response. It will take a little more tweaking, but at least knowing that it is going through a certain particular pathway will enable researchers to design what the targets should be downstream from these pathways.'

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms

Outcome #2**1. Outcome Measures**

Peer reviewed journal articles, publications, in trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	8

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

Nevada's arid climate makes it hard for farmers to grow non-native crops. Many farmers in the state rely on alfalfa as their main crop. While alfalfa grows well in Nevada, it uses about 3.5 acre-feet of water per acre each season -- that is, more than 1.1 million gallons of water for 1 acre of alfalfa. Nevada's farmers need a crop that grows as reliably as alfalfa, but uses less of the state's limited water supply. Researchers know that wine grapes use little water, but they needed to overcome the challenges of Nevada's harsh climate.

What has been done

In order to understand the synthesis of the RNA network (a chemical 'blueprint' for protein product under the direction of DNA) responsible for controlling berry development, a technique used to measure the activities of thousands of genes at once (mRNA expression profiling) was conducted on Cabernet Sauvignon berries using the Affymetrix GeneChip(r) Vitis oligonucleotide microarray, spanning seven stages of berry development from small pea size berries, through the onset of ripening (veraison), to mature berries. To understand the effect of the regulatory processes in RNA synthesis that ultimately influences the sensory properties of wine, we profiled metabolites (unique chemical fingerprints that specific cellular processes leave behind) in parallel with mRNA expression profiling.

Results

These results reveal the first high-resolution picture of the set of chemical 'blueprints' for protein dynamics that occur during seven stages of grape berry development. This work also establishes an extensive catalog of gene expression patterns for future investigations aimed at the dissection of the synthesis of RNA regulatory hierarchies that govern berry development in a widely grown cultivar of wine grape.

More importantly, this analysis identified a set of previously unknown genes potentially involved in critical steps associated with fruit development that now can be subjected to functional testing.

4. Associated Knowledge Areas

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

Outcome #3**1. Outcome Measures**

Peer reviewed journal articles, trade journals, publications, presentations at scientific meetings, stakeholder, native american and agency presentations.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Drought is the most prominent threat to agricultural production worldwide. Climate models have indicated that drought episodes will become more frequent because of the long-term effects of global warming, emphasizing the urgent need to develop adaptive agricultural strategies for a changing environment. Drought accelerates leaf senescence (aging), leading to a decrease in canopy size, loss in photosynthesis, and reduced yields. Assuming that senescence is a type of cell death program that could be inappropriately activated during drought, the multi-national team's goal was to enhance drought tolerance by delaying drought-induced leaf senescence.

What has been done

The research team (University of Nevada; UC, Davis; RIKEN, Japan; Technion, Israel; and Hebrew University of Jerusalem, Israel) generated transgenic plants (plants that possess gene(s) transferred from different species) expressing an isopentenyltransferase gene driven by a stress- and maturation-induced promoter. Transgenic plants along with control plants were allowed to grow for 40 days, and then were subjected to 15 days without water. After the drought treatment, plants were re-watered for seven days. The control plants did not recover and died. However, transgenic plants recovered and resumed their growth.

The water content of control plants was severely reduced during the drought period, reaching a value of < 60%. However, the water content of the transgenic plants was merely reduced from 92% to 86% during drought and returned to control levels after re-watering, showing that the transgenic plants were superior to the control plants in maintaining leaf water potential during drought, even though they partially wilted.

Results

Results showed that the suppression of drought-induced leaf senescence resulted in outstanding drought tolerance. The plants had vigorous growth after a long drought period that killed the control plants. These plants had minimal yield loss when watered with only 30% of the amount of water used under control conditions. These results are exciting because they indicate that, in addition to increased drought tolerance, the expression of this isopentenyltransferase gene in plants, with the simultaneous increased water use efficiency, could facilitate the development of transgenic crops able to grow with reduced irrigation without significant yield penalties, contributing to significant savings in irrigation water.

4. Associated Knowledge Areas

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

Outcome #4**1. Outcome Measures**

Peer reviewed journal articles, publications, trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	4

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

In the west, a substantial portion of cow-calf beef enterprises rely on open rangeland for feeding, breeding, and calving. Ranching operations that do open-range their cattle, in general, have minimal animal contact due to distances involved. Breeding typically is carried out by group mating and calving taking place on the range. Under these conditions, paternity (father) of calves is unknown. Most feed-lot operations have long used paternity tracking to improve their herds. It is our goal to create a paternity test that is accurate and cost effective for culling open-ranging bulls to improve calf weaning weights.

What has been done

DNA technologies allow for paternity testing. The DNA markers of choice in paternity testing are usually microsatellites (simple sequence repeats in DNA). Essentially, the typing of several microsatellites is carried out in the calf and in the alleged father. A bull is eliminated as a parent when the genetic information (genotype) of the calf is not compatible with the father genotype for at least one microsatellite. The probability of exclusion depends on the marker type (number of DNA sequences) and the DNA sequence frequencies in the population to be used for paternity testing.

Economic analysis, which incorporates not only the benefits of increased calf performance, but also the cost of genotyping, should be investigated before implementation of a DNA paternity testing program.

Researchers at the University of Nevada preformed economic assessment of DNA paternity testing in beef cattle operations by a benefit-cost analysis. This analysis required computation of probabilities of exclusion for a set of DNA markers. Highly polymorphic microsatellites, 15 in total, were tested across eight beef cattle ranches in the high desert of Nevada as an example of how this information can be incorporated into the cost-benefit analysis. Benefit-cost analysis with an incomplete DNA paternity identification program using a low number of microsatellites also was investigated.

Results

Researchers at the University of Nevada have begun advising cattle producers to consider the following when looking to increase their bottom line:

1. A DNA paternity testing program will boost profits when the benefits of an increase in overall calf weaning weight override the cost of doing a paternity test.
2. Producers will find that a DNA paternity identification program will increase profits when culling percentages of unproductive bulls are 20% or greater.
3. If a producer is looking at reducing the cost of the paternity test, a program using a low number of microsatellites is cheaper (lower genotyping cost), but it may not lead to full identification of paternities, and, consequently, might reduce accuracy of evaluation and response to selection (less benefit). However, researchers showed that incomplete DNA paternity identification may result in larger benefit-cost ratios (around a 20% increase for 10 vs. 12 microsatellites).
4. When dealing with large herds, subdivide bulls and cows into small units, because the cost of testing increases with the number of potential fathers (i.e. you must run more tests).

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals

Outcome #5**1. Outcome Measures**

Peer reviewed journal articles, trade journals, publications, presentations at scientific meetings, stakeholder, native american and agency presentations.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Beef production is a significant agricultural business in the western US. The reproductive process is central to beef productivity. One of the most important components in the cattle reproductive process is bull fertility. However, bull fertility has not been studied at a molecular level because of the lack of molecular genetic markers and diagnostic tools. Extensive molecular genetics and functional studies from humans and mice have identified a candidate gene DAZL (Deleted in Azoospermia like). Mutations in this gene have been linked to low sperm counts and infertility in several species including human, mouse, fly, and frog. To date, the DAZL gene has not been characterized in any farm animal species. Our goal is to determine if DAZL can be used as a fertility test in cattle.

What has been done

We have recently identified 16 single nucleotide polymorphisms (changes in DNA's building blocks, SNP) from the DAZL gene in cattle. For the very first time, we have associated DAZL SNPs as well as their haplotypes with bull fertility traits and demonstrated that the SNPs are linked with the level of fertility.

Results

University of Nevada researchers have indicated that this is an excellent means of selecting animals for high levels of fertility. The study has now turned towards developing a diagnostic kit that allows producers to cull bull at an early age -- that is, as early as newborn. This, in turn, will significantly reduce breeding costs, as bulls with sub-fertility or infertility are usually not identified until the age when they are expected to breed (18 to 24 months). This work also paves the way to find SNPs from other farm animals, such as pig, horse, sheep, etc., for male fertility selection.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals

Outcome #6

1. Outcome Measures

Peer reviewed journal articles, publications, trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There is significant opportunity to increase wool production in western range sheep production systems; yet, this is not economically feasible if increased wool production is at the expense of lamb production. Today's sheep industry focuses its attention on one of two markets: wool or meat. Generally, producers are forced economically to choose between which market will serve as their primary production system. However, if a producer could capitalize on both markets while using the same animals, production efficiency and net income would greatly improve. What investigators at the University of Nevada are developing is a breeding program that takes the best of both worlds and combines them into a single breed of sheep. This research defines the optimum level of wool production and lamb production per ewe for various range and forage management conditions in the western U.S.

What has been done

In order to improve wool production, Rambouillet ewes were crossed with pure Merino rams imported from Australia. Over the past 18 years, crosses and back-crosses between mixed lambs and pure Merino rams has resulted in more than 1,500 breeding ewes and 35 rams, which are essentially purebred Australian Merino status, a known high quality wool producing breed. The wool clipped on pre-shearing mid-side wool sample tests (OFDA 2000 system) and fleeces are marketed in 16.9 micron categories (superfine).

Results

Topping the U.S. wool market for the last seven consecutive years, wool clip from our flocks has continued to improve in production per sheep and quality. Producers utilizing our genetics are also realizing significant increases in wool production and income.

Sorting University of Nevada's Merino sheep prior to shearing on the basis of sample data collected by the OFDA 2000 resulted in a more than \$3,000 increase in the value of the Rafter 7 wool clip, with the cost of testing less than \$.25 per sample, or a total cost for Rafter 7 Ranch of \$435. Wool consultant Hudson Glimp stated, 'There is a huge difference in feel and warmth between 23 micron (the upper end for merino) and 16.9 micron. Finer wool feels softer and is also more resilient. Significantly for lots of people, finer wool is also less irritating against the skin than the coarser, thicker stuff.'

The genetics of University of Nevada's Merino flocks are having a major impact on range sheep production systems throughout the western U.S. range sheep industry. The flocks had the highest reproductive efficiency of any Merino flock in the U. S. and are resulting in increased lamb production by buyers who have utilized our genetic lines. A Field Day is held every year in connection with the Annual Ram and Ewe Sale, with attendance ranging from 80 to 120 people. In addition, numerous individual producers and tour groups regularly visit the ranch.

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals

Outcome #7

1. Outcome Measures

Peer reviewed journal articles, publications, trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Somatic cell counts (SCC) is a measure of the number of leucocytes and epithelial cells in milk, and an increase in milk SCC is indicative of mammary gland inflammation, which is often caused by intra-mammary infection. Inflammation of the mammary gland (mastitis) in sheep is predominantly subclinical (or hidden, with no swelling of the udder or milk abnormalities).

This study was undertaken to determine whether the PortaSCC(r) test (designed for use in cattle) could be used as a screening tool to identify infected mammary glands in sheep.

What has been done

Samples were drawn pre- and post-weaning from approximately 100 ewes located in Reno, Nevada. Each sample was then analyzed using the PortaSCC and compared against the same sample tested using reference lab techniques (flow cytometry) for accuracy of detection. We found that PortaSCC offers a close correlation with lab data.

Results

A cost effective on-farm test for determining udder health in ewes would benefit producers. Current on-farm test kits for cattle mastitis is the California Mastitis Test Kit (\$12.00/ewe). Our study showed that PortaSCC(r) was easy to use, provided excellent results for sheep, and was relatively inexpensive (\$1.80/ewe).

The 2002 Census of Agriculture, conducted by the USDA, reported that the average herd size for the US was 85 animals per farm. If our findings were used by the average producer, they would save an estimated \$867 per round of testing when compared with \$12.00/ewe treatments.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases

Outcome #8

1. Outcome Measures

Peer reviewed journal articles, trade journals, publications, presentations at scientific meetings, stakeholder, native american and agency presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Epizootic Bovine Abortion (EBA), commonly known as Foothill Abortion, is one of the major diseases responsible for reducing calf production on ranches in western and northern Nevada, California, southern Idaho, and southern Oregon. Although infected pregnant cows do not show visible signs of illness, many of them abort their fetuses at six to nine months of gestation. A significant number of infected cows carry their calves to term, but the calves delivered are weak, fail to thrive, and tend to die within the first weeks of independent life.

It's been known for 40 years that the disease is carried by ticks (*Ornithodoros coriaceus*), and that cows get their infections from tick bites. This study probes inside the tick for mechanisms that cause EBA.

What has been done

Ticks were collected from the local environment through the use of CO2 traps and removal from cattle. Each specimen was identified to species using existing taxonomic keys and the sex and life stage. The genomic extract of collected ticks was tested by PCR for infection with the agent of EBA. The extract was also screened for transmittable pathogens. Positive samples were identified to bacterial species. We have determined the species composition and identified pathogens of ticks found in association with cattle herds.

Results

Researchers at the University of Nevada have made an important contribution to the field of EBA through the discovery and identification of the bacterium responsible for EBA.

4. Associated Knowledge Areas

KA Code	Knowledge Area
315	Animal Welfare/Well-Being and Protection

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

Over the past five years, we have endured catastrophic fires at one of our remote field labs, and recently we had a flood in Reno that flooded our Main Station Field Lab in Reno, both of which directly impacted our research productivity, financial status, and available resources. A decrease in appropriations could directly impact our ability to address all of our research priorities as would public policy changes.

V(l). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

-

Evaluation Results

Key Items of Evaluation

Program #2

V(A). Planned Program (Summary)

1. Name of the Planned Program

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

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			5%	
104	Protect Soil from Harmful Effects of Natural Elements			10%	
111	Conservation and Efficient Use of Water			1%	
112	Watershed Protection and Management			12%	
121	Management of Range Resources			17%	
122	Management and Control of Forest and Range Fires			3%	
123	Management and Sustainability of Forest Resources			21%	
131	Alternative Uses of Land			2%	
133	Pollution Prevention and Mitigation			5%	
135	Aquatic and Terrestrial Wildlife			7%	
136	Conservation of Biological Diversity			2%	
206	Basic Plant Biology			4%	
213	Weeds Affecting Plants			4%	
302	Nutrient Utilization in Animals			1%	
307	Animal Management Systems			1%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources.			5%	
Total				100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	34.0	0.0
Actual	0.0	0.0	6.7	0.0

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

Extension		Research	
Smith-Lever 3b & 3c 0	1890 Extension 0	Hatch 356791	Evans-Allen 0
1862 Matching 0	1890 Matching 0	1862 Matching 474237	1890 Matching 0
1862 All Other 0	1890 All Other 0	1862 All Other 0	1890 All Other 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 the role of soil chemistry in natural production of perchlorate and 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.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	1000	4000000	250	500000
2007	1200	3750000	250	450000

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

Patent Applications Submitted

Year	Target
Plan:	0
2007 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan			
2007	0	75	75

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.

Year	Target	Actual
2007	20	75

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	Peer reviewed journal articles, in trade journals, publications, presentations at scientific meetings, stakeholder, native american and agency presentations.
3	Peer reviewed journal articles, trade journals, publications, presentations at scientific meetings, stakeholder, native american and agency presentations.
4	Peer reviewed journal articles, publications, trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations.
5	Peer reviewed journal articles, publications, in trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations.
6	Publications, peer reviewed journal articles, trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations.
7	Trade journals, publications, peer reviewed journal articles, presentations at scientific meetings, stakeholder, native american and agency presentations.

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.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	20	16

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

The EPA issued the Clean Air Mercury Rule in March 2005. This rule focuses on permanently capping and reducing mercury emissions from coal-fired power utilities. The agency also issued the Clean Air Interstate Rule, which focuses on reducing mercury pollution movement. Coal-fired power plants are the largest manmade source of atmospheric mercury (Hg). Mercury is considered a global pollutant with an atmospheric residence time of a year, allowing for global distribution. Though surprising to some, atmospheric mercury also is produced through natural sources.

This project focused on advancing our understanding of the exchange of Hg between the atmosphere and natural terrestrial surfaces, e.g. soil, rocks, and foliage.

What has been done

Work on this project involved field and laboratory studies. Estimation of mercury (Hg) releases from volcanoes and geothermal areas is difficult due to spatial and temporal variability and our overall lack of data. To fill this data gap, we collected and compiled data for three geologically representative geothermal areas. Emissions from volcanoes were estimated for the conterminous United States.

In order to better understand air-Hg exchange associated with low Hg containing soils and litter that cover broad terrestrial areas, we developed empirical data from soils in Oklahoma, Wisconsin, Colorado, California, North Dakota, Nevada, and Tennessee, and at five forested sites along the eastern seaboard. At several of these sites, long-term data sets were collected.

Because fire can be an important source of Hg to the atmosphere, one project characterized mercury pools for three different ecosystems and quantified that release due to fires from these ecosystems.

In addition, data was collected at sites that are naturally enriched in Hg, for one location including data on a seasonal time step, to help us better develop methods for scaling up emissions from these areas.

Mercury can be deposited and re-emitted from soils, and two studies in the project focused on investigating re-emission of Hg deposited in rainfall and that dry deposited to soils. The former entailed a field study, and the latter controlled laboratory experiments focused on investigating the effect of moisture, visible, and ultraviolet light on the emission and re-emission of mercury (Hg) from soil.

Meteorological parameters, especially light, temperature, and precipitation, are factors demonstrated to be important in influencing flux on seasonal and 24-hour time steps. Field and laboratory studies focused on characterizing the influence of these parameters with goals being to develop methods to scale up air-surface Hg exchange to broad terrestrial areas.

Data was collected in laboratory and field experiments to understand the potential for Hg uptake and assimilation and release by foliage and the whole plant. Plants were grown in naturally Hg-enriched substrates and those amended with HgCl₂. In addition, flux was measured for soil and litter in the field. Mercury flux also was measured from foliage associated with vegetation growing in artificial wetlands with four experimental designs.

We also focused on measurement of air Hg speciation in the field, collecting seasonal data at five areas, and focused on developing methods for estimating dry deposition. We are currently completing several regional scaling exercises focused on developing mass balances of Hg exchange.

Results

This project is one of the few in the world that has focused on quantifying the contribution of mercury (Hg) to the atmosphere that is derived from natural sources and background soils. University of Nevada researchers have scaled up emissions from Nevada and a variety of naturally enriched areas, resulting in changes in the estimates of natural source emissions in global models.

Researchers focused on measurement of reactive mercury and dry deposition of atmospheric mercury species. Both of these topics are on the cutting edge of current research.

This work will provide important information about the role of natural sources in the global Hg cycle and will help us to predict the effectiveness of regulatory controls. Currently, policymakers, scientists, environmentalists, state, and federal agencies are being made aware that if Hg from all sources is constantly being exchanged between the hydrosphere, atmosphere, lithosphere, and biosphere, controls on anthropogenic point sources may not be effective for many years to come.

4. Associated Knowledge Areas

KA Code	Knowledge Area
104	Protect Soil from Harmful Effects of Natural Elements

Outcome #2

1. Outcome Measures

Peer reviewed journal articles, in trade journals, publications, presentations at scientific meetings, stakeholder, native american and agency presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Nitrate is a naturally occurring compound that is formed in the soil when nitrogen and oxygen combine. Small amounts of nitrate are normal, but excess amounts can pollute supplies of groundwater. Knowing where and what type of risks to ground water exist can alert water-resource managers and private users of the need to protect water supplies. Although nitrate generally is not an adult public-health threat, ingestion in drinking water by infants can cause low oxygen levels in the blood, a potentially fatal condition

What has been done

Soil samples were collected from various locations in Nevada and California. While analyzing samples, a novel process for non-biological fixation of nitrogen to form nitrate was identified, based on thermal treatment of naturally occurring titanium dioxide, in the presence of air or pure nitrogen gas. This observation suggests that thermal fixation/formation of nitrate on arid lands soils may contribute to the elevated nitrate levels found in soils and groundwater in the western United States.

Results

This project has identified a new, naturally occurring process for fixing atmospheric nitrogen using arid lands soils or titanium dioxide. This process is novel and explains, in part, how high concentrations of nitrate are generated in desert soils. This has widespread implications for understanding the environmental generation and fate of an important nutrient and contaminant in the western United States.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #3

1. Outcome Measures

Peer reviewed journal articles, trade journals, publications, presentations at scientific meetings, stakeholder, native american and agency presentations.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	0

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

Leptospirosis -- a disease that is the common cause of severe jaundice, renal failure and lung hemorrhage -- is an increasingly important infectious disease that infects through contact with contaminated water across the animal kingdom. Recently, three deaths in Hawaii and the Pacific Trust Territories have been attributed to leptospirosis. Hospital data and surveys indicate more than 70% of human infections result from physical contact with contaminated freshwater supplies.

Currently, no methods exist to reliably isolate and detect these deadly bacterial spirochetes in natural waters. Standard lab culture-based methods of identifying *Leptospira* in water and soil sources are time-consuming, laborious, and usually unable to identify pathogenic *Leptospira* at all. The objective of this project was to develop and evaluate a freshwater test for *Leptospira* that could be useful for routine monitoring of freshwater streams.

What has been done

Researchers have developed a protocol to apply fluorescently labeled antibodies to water samples to detect disease causing family groups of *Leptospira*. Researchers then developed a protocol to isolate *Leptospira* spirochetes from water samples. Currently, our team is utilizing these techniques to assess the occurrence of *Leptospira* in recreational waters in watersheds on Oahu and Kauai, in the Hawaiian Islands.

Results

Our team of researchers has developed a real-time PCR test for the detection of *Leptospira* in environmental samples. This method appears to discriminate pathogenic from non-pathogenic organisms. This method should prove useful for the monitoring of *Leptospira* in freshwaters, and has the potential to become a valuable tool to the surveillance of leptospirosis in endemic areas, thus leading to enhanced public health protection.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #4**1. Outcome Measures**

Peer reviewed journal articles, publications, trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

A significant amount of rangeland planning, management, and policy development is based on responses of key grass species or groups of grass species to various management scenarios. It is imperative that stakeholders involved in these types of activities have a taxonomic guide to assist them in grass species identification. More specifically, there is a need for a photographic reference that also contains vegetative keys that can be used in the field, under field conditions.

What has been done

Species list were determined from USDA Natural Resource Conservation Service MLRA Technical Guides. Field samples were collected from appropriate areas in Nevada for close-up photography work of delineating characteristics. Field photographs of each species in its specific ecological habitat also were included. Taxonomic and ecological keys were developed as a companion to the photograph.

Results

Federal land management agencies (e.g., BLM, NRCS, USFS) are snatching up copies of the book (approximately 600 copies to date) in the six states comprising the Great Basin, as well as states like Colorado, Kansas, and Wyoming. Preliminary reports indicate that field biologists and resource managers who need to identify predominate rangeland grasses greatly appreciate the addition to their library, and many are planning to use it during the next field season.

Brad Schultz (member of the Society for Range Management and State Extension Educator) said the following in the Journal of Rangelands: 'I highly recommend this field guide for those with and without schooling in the identification of grasses, with relevance far wider than the originally intended Great Basin ecosystem.'

4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources

Outcome #5

1. Outcome Measures

Peer reviewed journal articles, publications, in trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

University of Nevada, Reno researcher Matthew Forister is among a group of scientists who has documented an unusual type of speciation in the Sierra Nevada, including a hybrid species of butterfly that can trace its lineage as far back as almost a half a million years. In a recently published article in the leading research journal Science, the discovery is noted as one of the most convincing cases of this type of species formation that has ever been demonstrated in animals.

What has been done

It has been known that two types of butterflies -- the Melissa Blue (*Lycaeides melissa*) and the Northern Blue (*Lycaeides idas*) -- live in the Sierra, with the Melissa Blue living on the eastern slope of the Sierra and the Northern Blue living to the west. University of Nevada's team found that a third species of Blue Butterfly has evolved in the upper alpine reaches of the Sierra. The team used molecular genetics to show that the 'new' species carries genes from both parental species. The scientists estimate that about 440,000 years ago, the Melissa Blue and Northern Blue came into contact in the Sierra. Their offspring, cut off from the rest of their clan, eventually evolved into a unique and genetically distinct species.

Though the climate is extreme at high elevations and the flying season lasts only a matter of a few weeks, the researchers noted that the still-unnamed species seeks out a certain plant at the higher elevations. They use this host plant to lay their eggs. Their 'parent' butterflies of the eastern and western Sierra do not show the same affinity for this particular host plant, the balloon pod milk vetch.

Results

The University of Nevada team's findings provide an important piece to the puzzle in the understanding of how animal species emerge. It is widely believed that plant species can be commonly created through such species crossing; hybrid species formation among animals, however, has been much less thoroughly studied. Dr. Forister said, 'Ultimately, what we've studied highlights the importance of natural selection, and the more general idea that we are still learning many of the ways in which species are formed.'

The discovery of host plant specificity was another critical illustration that a habitat and species shift had occurred. By understanding how the 'new' species lives, the research team also is adding to the scientific-based knowledge that could someday help preserve the butterfly's habitat, Forister added.

4. Associated Knowledge Areas

KA Code	Knowledge Area
136	Conservation of Biological Diversity

Outcome #6

1. Outcome Measures

Publications, peer reviewed journal articles, trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Why are big fish facing critical threats? A number of factors -- from over-fishing and dams to pollution and habitat destruction -- contribute to the dangers faced by different varieties of fish. As a result, many of these fish are on the path toward extinction, a warning sign of severe problems confronting river ecosystems.

The National Geographic Society, collaborating with the University of Nevada and the World Wildlife Fund, is launching the MegaFishes Project, an ambitious four-year effort to protect the Earth's largest freshwater fish, while raising awareness about the ecological status of the world's rivers.

What has been done

The MegaFishes Project spans six continents and entails expeditions to study 14 of the most diverse freshwater systems -- ecological treasures including World Heritage Sites and United Nations Environment Program Biodiversity Hotspots. Research is completed for Asia; this year will include Australia, Africa, and Europe; and the Americas in 2009. Project leader Dr. Zeb Hogan will be working with a network of more than 100 scientists in 17 countries to accomplish the project goals:

- * Conservation assessments of all species of giant freshwater fish, including gathering information about the life history, population status, geographic range, and threats associated with each species.
- * Identification of the world's largest freshwater fish.
- * Local, national, and global awareness-raising and education about the importance of freshwater conservation, including increased visibility for freshwater science.

Results

With the threat of extinction growing by the day for some megafishes, University of Nevada's researchers have redoubled their efforts to get the looming catastrophe to resonate with the public. The toughest crowd to reach may be the policymakers who are best positioned to protect the fishes. 'There's slow movement forward,' says UNR professor Zeb Hogan, who last year was appointed scientific councilor for fish for the U.N. Convention on Migratory Species. 'There's not a lot of concern, but there's more concern than there ever has been.'

As a result of project leader Dr. Hogan's work with the governments of Cambodia, Thailand, and Laos, it is now illegal to capture the Mekong giant catfish in those countries as of summer 2006. Dr. Hogan worked with the local organization Save Cambodia's Wildlife to produce a children's book on the conservation of freshwater biodiversity. The book intertwines a story of the seasons of a giant catfish's life with those of a young Cambodian boy. In Thailand, fishermen along the Mekong river agreed to stop fishing for giant catfish and put 68 fishing nets, worth more than 1.3 million baht (\$34,000 USD), on sale as a symbol of their commitment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
136	Conservation of Biological Diversity

Outcome #7

1. Outcome Measures

Trade journals, publications, peer reviewed journal articles, presentations at scientific meetings, stakeholder, native american and agency presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Overpopulation of wild horses is a significant concern in the western United States. In Nevada, where most of the wild horses are located, populations grow at a rate of 15-20% per year on state lands while their range continues to shrink. Current management strategies of removal and adoption are expensive, logistically challenging, and minimally effective.

Conflicting interests associated with increased movement of people into wild horse ranges, sympathy to maintain wild horse populations because of their historic and cultural importance, competition among horses and indigenous plant and wildlife species, as well as ranching interests are issues impacted by wild horse overpopulation.

Controlling fertility of free-ranging horses is considered a viable option for population control. Ideally, methods for contraception of wild horses should be safe and potentially reversible, effective for several years and have minimal effect on reproductive or harem behavior. Although fertility control of mares using existing porcine zona pellucida (PZP) vaccines is safe and effective for 1-2 years, revaccination involves considerable expense, manpower, and horse handling to maintain infertility. If long-acting contraceptives were available, it may be possible to achieve effective population reduction, and reduce costs and risks associated with frequent horse handling.

What has been done

The objective of this study was to evaluate the multi-year contraceptive efficacy of the GnRH vaccine GonaCon™, the PZP vaccine SpayVac™, and the human intrauterine device 380 Copper 'T'. We also observed any contraindications associated with treatments. In the fall of 2002 and the spring of 2003, the single-shot vaccines were administered with AdjuVac™ adjuvant. The Nevada Department of Agriculture provided mares that were captured on state lands and maintained at the Nevada State Penitentiary, Carson City. Eight untreated control mares were compared to 12 mares treated with SpayVac™, 16 mares treated with GonaCon™ and 15 mares treated with the copper-containing IUD. Rates of contraception for years 1, 2, 3 and 4 respectively for SpayVac™ were 100% (12/12), 83% (10/12), 83% (10/12), and 83% (10/12); rates for GonaCon™ were 94% (15/16), 60% (9/15), 60% (9/15), and 40% (6/15); and rates for IUD-treated mares were 80% (12/15), 29% (4/14), 14% (2/14), and 0% (0/14).

For mares given SpayVac™, but not GonaCon™, uterine edema was commonly observed. Mares treated with SpayVac™ were generally more difficult to manage during data collection. IUDs were visible by ultrasonography in non-pregnant mares, suggesting that pregnant mares did not retain their IUD. Ability of mares to retain an IUD may be a function of uterine size; our IUD studies with pony mares at Penn State University have high retention and contraception rates for 4-5 years.

Results

Researchers at the University of Nevada have demonstrated that long-term contraception of wild mares with a single shot of either the SpayVac™ or GonaCon™ vaccine is possible. They also concluded that long-term contraception of wild horse mares may also be possible with modifications to the IUD to achieve long-term retention.

Reduction of free-ranging horses by limiting fertility holds the greatest promise for economic, humane, and effective population control. Contraception in feral horses should be safe and potentially reversible, cost effective, efficacious for several years with minimal handling required, and should not affect normal reproductive and harem maintenance behavior.

To date, reproductive control by injectable contraceptive formulations, principally the PZP formulation, has not shown consistent effectiveness for more than 1-2 years, and involves much expense, manpower, and horse handling to maintain infertility. Long-acting contraceptive approaches are urgently needed for feral horse population control.

This study has added significantly to the understanding of the behavior effects and duration of two different long-term contraceptive products. Either product will potentially add an economical tool for range management of wild and feral horse populations when compared to round-ups and adoptions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal 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

Brief Explanation

Over the past five years, we have endured catastrophic fires at one of our remote field labs, and recently we had a flood in Reno that flooded our Main Station Field Lab in Reno, both of which directly effected our research productivity, financial status, and available resources. A decrease in appropriations could directly impact our ability to address all of our research priorities as would public policy changes.

V(I). Planned Program (Evaluation Studies and Data Collection)**1. Evaluation Studies Planned**

-

Evaluation Results

Key Items of Evaluation

Program #3

V(A). Planned Program (Summary)

1. Name of the Planned Program

Economic Development with Emphasis in Rural Areas

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			2%	
134	Outdoor Recreation			1%	
601	Economics of Agricultural Production and Farm Management			8%	
602	Business Management, Finance, and Taxation			6%	
603	Market Economics			3%	
604	Marketing and Distribution Practices			5%	
605	Natural Resource and Environmental Economics			28%	
608	Community Resource Planning and Development			26%	
610	Domestic Policy Analysis			6%	
802	Human Development and Family Well-Being			5%	
803	Sociological and Technological Change Affecting Individuals, Families and Communities			5%	
805	Community Institutions, Health, and Social Services			5%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	5.0	0.0
Actual	0.0	0.0	5.6	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	264799	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	469006	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 healthcare.

2. Brief description of the target audience

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

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	1000	4000000	250	500000
2007	1000	3600000	300	550000

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

Patent Applications Submitted

Year	Target
Plan:	0
2007 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan			
2007	0	15	15

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- peer reviewed scientific journal articles, publications on economic development , presentations at scientific meetings, presentations at stakeholder, native american, health care organizations, agency and local government meetings.

Year	Target	Actual
2007	20	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	Publications, peer reviewed journal articles, trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations.
3	Trade journals, publications, peer reviewed journal articles, presentations at scientific meetings, stakeholder, native american and agency presentations.

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,

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	20	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

According to Nevada Agricultural Statistics, 94.9% of all land in Nevada is devoted to farming and ranching activities. The most important agricultural products in Nevada include cattle and calf production, which accounted for 46.3% of total Nevada farm cash receipts in 2003, and hay production, which accounted for 19% of total Nevada farm cash receipts in 2003. There are currently 2,989 farms operating in the state of Nevada, with at least 1,600 producing cattle and at least 200 producing hay including alfalfa, timothy, and others.

Next to mining, the livestock and forage industries in Nevada are an essential component of the economic stability in rural communities. These products are underserved by current crop insurance programs and are susceptible to large annual price and yield variations due to market variations and drought conditions. For these reasons, agricultural producers are always looking to manage the various production, financial, and market risks they face.

What has been done

Based on producer program evaluations and surveys conducted between 2005 and 2006, University of Nevada faculty developed five separate programs providing needed educational opportunities to producers in the areas of production, marketing/price, and financial risk management. By partnering with producer associates to promote these educational programs, more than 825 participants were gathered during seven separate events across Nevada.

Results

As a result of these programs, participating producers will be able to more effectively manage their enterprises. Informed decisions regarding markets, pricing, and production based on strong financial analysis will lead to sustainable agricultural practices and enhanced quality of life for farmers and their surrounding communities. The researcher found that producer knowledge gain from attending the seminars ranged from 200 to 245%; the majority (67 to 90%) of program participants considered the seminars valuable to them and worth their time; between 31 and 80% of the participants felt they could apply their new knowledge and information in their job/operation; and between 92 and 100% of the participants would attend future risk management programming. Other results indicate that six months after the participants attended the seminars, 17 to 68% (depending on the program) had incorporated ideas, knowledge, and information from the seminar into their job/operation, and 44 to 80% (depending on the program) were directly applying production, legal, marketing, and range management techniques learned at the seminars.

Many program participants noted increased profits and financial benefits of 5 to 10%, while others gave non-financial benefits, including better-informed decision making, awareness of alternatives, and the desire to work with other producers to take advantage of niche marketing.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management

Outcome #2

1. Outcome Measures

Publications, peer reviewed journal articles, trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The establishment of a grower cooperative for local growers and buyers is a proven tool in helping the economy and its agricultural producers as well as the buyers in their market. The objective of this project was to increase the use of Nevada Grown food products in Nevada high-end (gourmet) restaurants and specialty food stores, resulting in growth in the small farm industry and economic development in rural communities.

What has been done

Agricultural producers in Nevada were surveyed. Based on focus group feedback we constructed a survey for each group (producers and chefs) and sent out by mail. We sent out and analyzed all survey responses. A conference for chefs and producers was held to present the study results, provide educational programming, and also to allow for discussion regarding purchasing arrangements. Workshops were held on such topics as agri-tourism, adding value to agricultural products, agricultural marketing techniques, farm finance, alternative crops production, cooperatives and marketing alliances, and coordination and contracting benefits for producers. Chefs gave presentations on quality requirements, packaging and labeling issues, casino contract and delivery considerations and product types of interest. The chefs also prepared various meal courses to demonstrate ingredient use and preparation and to illustrate the expectations of the restaurant consumer as far as quality, taste, and presentation.

Results

The goal of this program was to increase the use of Nevada Grown food products in Nevada high-end (gourmet) restaurants and specialty food stores. Six months after the Nevada Grown Connections conference, participants were mailed a follow-up survey. Fifty-seven percent of the respondents said that they have incorporated a great deal of the information they received in the workshop in their current operation/job, with the rest (43%) stating that they have incorporated some of the information. Additionally, 71% of people surveyed now use the market and/or price techniques learned at the conference in their operation.

Respondents listed financial benefits of 1-5% (increase in profits). As a result of the Caesars Las Vegas tour, 64% of the producers said they would incorporate the fine-dinning market into their marketing plan. The participants agreed that the Risk Management Seminar provided information for enhanced planning. The seminar helped them be 'more efficient and worry less about the future' and to 'better understand risk management' factors. Two participants mentioned that their operations increased net revenues/profits from 6 to 8 percent since attending the seminar. A farm service credit agent mentioned that all of her customers should attend this seminar. Two Reno based chefs and one chef from Truckee, CA are currently making purchases for their restaurants at Reno farmers markets and from the basket program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices

Outcome #3

1. Outcome Measures

Trade journals, publications, peer reviewed journal articles, presentations at scientific meetings, stakeholder, native american and agency presenations.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

For many counties in the state of Nevada, federal agencies administer or own most of the land area. For the Nevada counties of Esmeralda, Lander, Lincoln, Nye and White Pine over 90 percent of the county's acreage is under federal control. For these counties and others in the state of Nevada, changes in public lands management policies will impact local communities. Often changes in public land management policies are not researched or analyzed concerning consequences to the local economy.

What has been done

Development of a regional (Elko, Eureka and White Pine Counties) dynamic Computable General Equilibrium (CGE) model was developed providing information to the Nevada populace regarding future impacts of alternative public lands policies. Researchers extend regional level dynamic CGE modeling to address resource issues and their impacts on the local regional economy. Development of the model occurred in close cooperation with federal, state and local decision makers and is currently acting as an important extension education tool for providing information on the linkages of public lands and the local economy. As opposed to many so-called 'black-box models', the regional dynamic CGE model is open so that data, linkages, and modeling can be made available to federal, state and local decision makers. An extension education program was developed for understanding the model through the University Center for Economic Development.

Results

In terms of direct economic impact, Dr. Harris states that the grazing on public range has links to Elko County's local economy, from seeing more bankruptcies when cows are taken off the range, to the availability and price of hay when forage land is taken away, such as in the case of recent fires. Based on a typical Elko ranch, having 700 head of cattle, and extrapolating to total county AUMs, production would be valued at more than \$32.5 million, with an impact of more than \$57.2 million and labor earnings of more than \$11.4 million, employing more than 550. The study also looked at impacts of potential reductions in federal grazing land, reaching the conclusion that if all federal AUMs were eliminated, there would be a 96% chance of ranch failures, based on debt load. Model results are now being used by Elko County Commissioners and US Forest Service in the upcoming Environmental Impact Statement analysis of public land grazing in Elko County.

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics

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

Over the past five years, we have endured catastrophic fires at one of our remote field labs, and recently we had a flood in Reno that flooded our Main Station Field Lab in Reno, both of which directly impacted our research productivity, financial status, and available resources. A decrease in appropriations could directly impact our ability to address all of our research priorities as would public policy changes.

V(l). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

-

Evaluation Results

Key Items of Evaluation

Program #4

V(A). Planned Program (Summary)

1. Name of the Planned Program

Nutrition and Health

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			23%	
134	Outdoor Recreation			1%	
702	Requirements and Function of Nutrients and Other Food Components			15%	
703	Nutrition Education and Behavior			7%	
724	Healthy Lifestyle			7%	
802	Human Development and Family Well-Being			46%	
901	Program and Project Design, and Statistics			1%	
Total				100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	29.0	0.0
Actual	0.0	0.0	2.4	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	204667	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	287212	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 stem cell transplantation to treat human disease, 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 youth development.

2. Brief description of the target audience

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

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	1000	4000000	250	500000
2007	750	450000	300	500000

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

Patent Applications Submitted

Year	Target
Plan:	0
2007 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan			
2007	0	21	21

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.

Year	Target	Actual
2007	20	0

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O No.	OUTCOME NAME
1	Peer reviewed scientific publications, publications in natural resource and environmental organization publications, presentations at scientific meetings, presentations at stakeholder, nutrition and health, school board, local governmental and Federal and State agency meetings.
2	Publications, peer reviewed journal articles, trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations.
3	Trade journals, publications, peer reviewed journal articles, presentations at scientific meetings, stakeholder, native american and agency presentations.
4	Peer reviewed journal articles, trade journals, publications, presentations at scientific meetings, stakeholder, native american and agency presentations.

Outcome #1**1. Outcome Measures**

Peer reviewed scientific publications, publications in natural resource and environmental 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 Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	20	21

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

Approximately one in 5,000 males born in the United States has hemophilia. Hemophilia A is the most common type of hemophilia. It is also known as factor VIII deficiency or classic hemophilia. It is largely an inherited disorder in which one of the proteins needed to form blood clots is missing or reduced. Some clotting factor products are made from human blood products such as donated plasma. Others, called 'recombinant factor,' are made in a laboratory and do not use human blood products. Regardless of the method of treatment, regular treatments are required throughout the life of the patient. The objective of this research is to develop a treatment for hemophilia while in the mother's uterus that would correct the disease prior to onset, allowing for the birth of a healthy baby.

What has been done

Researchers at the University of Nevada focused their studies on examining the ability of different populations of stem cells to give rise to/differentiate into cells able to produce factor VIII by using a human-specific ELISA for detection of FVIII in plasma. While the above studies were ongoing, we used a variety of reproductive technologies to successfully obtain 20 female sheep carriers of hemophilia A who have increased anti-clotting levels. Researchers then performed in-vitro fertilization using eggs from these carriers and sperm from the original hemophilic donor male and obtained nine severely hemophilic lambs. Of these, two died at birth from severe bleeding, and seven are alive and have received FVIII replacement therapy. Five of these animals were transplanted in the uterus with mesenchymal stem cells (multi-potential stem cells).

Results

Researchers at the University of Nevada were able to re-establish a strain of sheep that exhibits spontaneous factor VIII deficiency with symptoms closely mimicking those of human hemophilia A. This large animal model will open new opportunities for not only the study of stem cell transplantation to cure hemophilia A, but it also can be used in the future to study gene therapy approaches to treat this disease.

Our researchers have also shown that a transplanted animal needing FVIII replacement therapy at birth and had multiple bleeding incidences during the first two months of life is now free of symptoms and the levels of FVIII have reached normal levels, suggesting that transplants in the uterus are curative. Although the results obtained with this animal are promising, researchers are awaiting long-term outcomes of the other animals in order to draw a definite conclusion regarding the overall efficacy of stem cell transplantation in the uterus as a therapy for hemophilia A.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

Outcome #2**1. Outcome Measures**

Publications, peer reviewed journal articles, trade journals, presentations at scientific meetings, stakeholder, native american and agency presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	0

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

In traditional colony-forming assays (CFA), cells are suspended in a semi-solid medium and are induced by a cocktail of growth factors, which is dictated by the type of cell to be assayed, to proliferate, divide, and differentiate to form colonies that are then viewed under a microscope and manually scored and counted.

This assaying technique has long been used in the University of Nevada's ongoing experiments in the sheep model as a means of quantifying blood stem/progenitor cells. However, despite its worldwide use in basic research, this assay is time-consuming, tedious, rather subjective, and very difficult to implement when large numbers of samples need to be assayed.

What has been done

Researchers at the University of Nevada took the traditional CFA methodology and redesigned the assay into an ATP-based bioluminescence proliferation assay readout. This was achieved by modifying and optimizing a newly described assay known as HALO (Hemotoxicity Assays via Luminescence Output [HemoGenix, Inc, Colorado Springs, CO]) to allow measurement of sheep immature or undifferentiated (progenitor) cells.

All results obtained by HALO were validated by manual scoring and counting, and these two data sets closely paralleled one another, confirming that luminescence readout can substitute for manual inspection and counting.

Results

Results show that, as with human, non-human primate, dog, rat, and mouse, sheep bone marrow cells can be stimulated with an appropriate combination of growth factors that allows detection and quantitation of seven different early hematopoietic cell populations at various stages of differentiation ranging from very primitive through to committed cell precursors while simultaneously using a sensitive, high-throughput bioluminescence readout-based assay.

The hematopoietic (stem cells that give rise to all the blood cell types) colony-forming assays allow test tube style detection of clonal expansion of stem, progenitor, and precursor cells, and as such, represent a fundamental tool in the experimental and clinical hematology laboratory.

These assays were pivotal to our current understanding of the biology and physiology of the blood-forming system and the process of hematopoiesis.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

Outcome #3**1. Outcome Measures**

Trade journals, publications, peer reviewed journal articles, presentations at scientific meetings, stakeholder, native american and agency presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	4

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

Because of the potential political and economic implications of smoking bans throughout the U.S. and the world where gaming is allowed, there is considerable interest in the actual percentage of gamblers who smoke. Those in the gaming industry have repeatedly claimed that the percentage is upward of 70%, while those with the health organizations have suggested that it should be more in line with the national average of smokers. This study was designed to look at the percentage of gamblers in the state of Nevada who smoke, which as the gaming capital of the world, should be reflective of gaming throughout the U.S. and the world.

What has been done

Teams of two people counted the number of smokers and total number of gamblers at various Nevada casinos. The total number of gamblers observed smoking was then multiplied by three to determine the total number of smokers. We observed a total of 14,052 gamblers at the three sites, of which a total of 947 were smoking. We estimated the percentage of smokers at three gaming tourist centers in Nevada (Las Vegas, Reno/Sparks, and Lake Tahoe). The percentage of smokers at Las Vegas (20.3%) and Reno/Sparks (21.5%) did not significantly differ from the U.S. population percentage of smokers (20.9%). However, at Lake Tahoe the percentage of smokers (16.4%) was significantly lower than the published U.S. population smoker percentage. Mean percentage of smokers by location did not significantly differ.

Results

The results of this study suggest that the percentage of gamblers who smoke was less than or not different than the overall U.S. percentage of a population who smoke. These findings provide additional evidence to refute the exemption to smoking bans for casinos based upon the supposition that a greater percentage of casino customers are smokers than the general population, and therefore a smoking ban for casinos may result in economic hardship.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

Outcome #4**1. Outcome Measures**

Peer reviewed journal articles, trade journals, publications, presentations at scientific meetings, stakeholder, native american and agency presentations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	6

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

Candida albicans is a form of yeast, which is a causal agent of opportunistic oral and genital infections in humans. Systemic fungal infections have emerged as important causes of morbidity and mortality in immuno-compromised patients (e.g., AIDS, cancer chemotherapy, and organ or bone marrow transplantation). In addition, hospital-related infections in patients not previously considered at risk (e.g. patients in an intensive care unit) have become a cause of major health concern.

What has been done

Our research team set out to identify the fungal surface protein and host cell receptors that mediate hyphae (filamentous branches of fungus) invasion of blood vessel cell walls and oral epithelial cells in a controlled environment outside of a living organism by inducing their own opening into the cell (an endocytosis). We found that a gene of *Candida albicans* (Als3) is required for the organism to be absorbed by human umbilical vein endothelial cells and two different human oral epithelial lines. Affinity purification experiments with wild-type and a mutant strain of *C. albicans* demonstrated that Als3 was required for *C. albicans* to bind to multiple host cell surface proteins on endothelial cells and on oral epithelial cells. Furthermore, latex beads coated with the recombinant N-terminal portion of Als3 were endocytosed by Chinese hamster ovary cells expressing human N-cadherin or E-cadherin, whereas control beads coated with bovine serum albumin were not. Molecular modeling of the interactions of a region of Als3 indicated that the binding parameters of Als3 to either cadherin (a protein important in cell adhesion) are similar to those of cadherin-cadherin binding. Therefore, Als3 is a fungal invasin (an enzyme that degrades cell walls) that mimics host cell cadherins and induces endocytosis.

Results

These results uncover the first known fungal invasin (an enzyme that degrades cell walls) and provide evidence that the gene *Candida albicans* Als3 is a molecular mimic of human cadherins (a protein important in cell adhesion, ensuring that cells within tissues are bound together), providing new insights into how *C. albicans* invades host cells.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

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

Over the past five years, we have endured catastrophic fires at one of our remote field labs, and recently we had a flood in Reno that flooded our Main Station Field Lab in Reno, both of which directly impacted our research productivity, financial status, and available resources. A decrease in appropriations could directly impact our ability to address all of our research priorities as would public policy changes.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

-

Evaluation Results

Key Items of Evaluation