

2008 University of Nevada Research Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

This Annual Report for the Nevada Agricultural Experiment Station (NAES) for 2008 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.

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 NAES 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 Resources and Environmental Sciences, Resource Economics and Nutrition. Through an extensive outreach program involving town hall meetings, rural tours, impact reporting, news release, 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:2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	92.0	0.0
Actual	0.0	0.0	24.4	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
- Other (Conduct Field Lab Days at our Field Stations)

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
- Needs Assessments
- Other (Informal discussions with key stakeholders)

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
- Other (Conduct Field Lab Day for stakeholders)

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 Staff Hiring Process
- 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	1257666	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	0	1929224	0
Actual Matching	0	0	3280195	0
Actual All Other	0	0	0	0
Total Actual Expended	0	0	5209419	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous years				
Carryover				
	0	0	671554	0

V. Planned Program Table of Content

S. NO.	PROGRAM NAME
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

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
121	Management of Range Resources			2%	
201	Plant Genome, Genetics, and Genetic Mechanisms			12%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			21%	
206	Basic Plant Biology			10%	
301	Reproductive Performance of Animals			5%	
303	Genetic Improvement of Animals			19%	
304	Animal Genome			4%	
305	Animal Physiological Processes			2%	
307	Animal Management Systems			4%	
308	Improved Animal Products (Before Harvest)			5%	
311	Animal Diseases			5%	
312	External Parasites and Pests of Animals			1%	
315	Animal Welfare/Well-Being and Protection			1%	
511	New and Improved Non-Food Products and Processes			8%	
601	Economics of Agricultural Production and Farm Management			1%	
	Total			100%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	22.0	0.0
Actual	0.0	0.0	8.9	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	736979	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	1662101	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 the CABNR/NAES web page, 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	1200	4000000	300	500000
2008	1150	3500000	250	500000

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

Patent Applications Submitted

Year	Target
Plan:	1
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	94	
2008	0	17	17

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
2008	55	55

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 publications, journal articles, 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 publications, journal articles, trade journals, presentations at scientific meetings, Native American, stakeholder and agency presentations
5	Peer reviewed publications in trade journals, journal articles, presentations at scientific meetings, stakeholder, Native American and agency presentations
6	Presentations at scientific, stakeholder, Native American and agency meetings, peer reviewed journal articles, publications and trade journals

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
2008	55	55

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

Biodiesel: Native Plant Shows Potential for Cultivation in Nevada

Biofuels, particularly biodiesel, are actively being examined as alternative fuels. The University of Nevada, for example, currently uses B20 (20% biodiesel) for UNR bus transportation.

Most of the biodiesel production in Nevada utilizes waste vegetable oil, primarily from restaurants, as a source of the triglycerides that are converted to biodiesel. However, this source of biodiesel raw material is being effectively consumed by current biodiesel manufacturers, and new sources of bio-based hydrocarbons are needed.

Nevada's arid lands can potentially contribute to biofuel production, particularly for crops that have relatively low water requirements and are adapted to Nevada's Great Basin growing conditions. We will investigate curly top gumweed, a plant that grows in the wild, but produces up to 20% of its dry weight in hydrocarbons.

What has been done

Harvesting of both wild and field-grown gumweed has been accomplished. Collected gumweed plants have yielded an average of 19.8% oil (bio-crude) by mass, with similar concentrations found for both wild and cultivated gumweed. Attempts were made to estimate the effect of additional irrigation on gumweed production, with approximately 4-6 irrigations during the summer of the first growing season.

Researchers have determined that the most efficient conversion method of gumweed to biodiesel is through the use of a sulfuric acid catalyzed methylation, followed by hexane extraction of the methylated biofuel.

Results

Scientists obtain approximately 70% ready-to-use biofuel during conversion. The resulting biofuel has a viscosity that is sufficiently high, meaning that it cannot be used directly as a diesel substitute. However, combined with diesel fuel, both a B5 (5% biofuel blended with diesel fuel #2) and a B20 (20% biofuel in #2 diesel) blend have been successfully produced from gumweed and have passed specifications for flash point, kinematic viscosity, and sulfur content, based on tests completed by the Nevada Division of Agriculture.

If five tons of whole plant can be obtained per acre, with a 20% oil content, the potential production of biodiesel using this plant is great (over 200 gal/acre).

In addition, gumweed's water requirements, based on its ability to grow in the wild, should be less than 10 inches per year for optimal growth, falling within annual average rain falls for Northern Nevada.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes

Outcome #2**1. Outcome Measures**

Peer reviewed publications, journal articles, 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
2008	{No Data Entered}	0

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

Evaluate Salt Loving Algae Potential as Feed Stocks for Biofuel Production: Existing oilseed feed stocks derived from terrestrial plants (e.g. soybeans) cannot satisfy the current or projected transportation fuel needs of the U.S. Biofuel producing algae are one of the only avenues available for high-volume capture and reuse of CO₂ generated in biomass-, coal- or natural gas-fired power plants and can provide the intermountain west with a major new 'cash crop' without putting additional demands on freshwater supplies needed for residential, industrial and agricultural use. Nevada researchers and producers are uniquely enabled to leverage the geothermal, high solar radiation, ample land area, and salt basins to produce algae in a scalable and economically viable manner. The goal of this research is to develop salt-loving algae as alternative biofuel feed stocks.

What has been done

The oil and starch production testing for nineteen strains of *Dunaliella*, a pink micro-alga, were completed. Analysis of growth rates, lipid content, and insoluble starch content has been completed. From these findings, the top performers were sent for DNA sequencing, allowing for the production and quality control of the choice strains. Two growth ponds have been put into production as 'proof-of-concept' facilities. The 3,000-liter ponds, as of December 2008, produced an average of 0.128 grams of algae (based on dry weight) per liter of pond water collected.

Results

Our research has identified a number of elite strains with high lipid contents that will be potentially very useful as feed stocks for biodiesel. Also identified were a number of strains with high starch production, a potential feed stock for bio-ethanol production. With the completion of the raceway ponds, researchers are now educating other scientist, investors and the general public about the potential feasibility of the algae-to-biodiesel conversion process and related technologies. These systems will be readily scalable with a minimum of capital investment in contrast to closed bioreactor systems that are capital intensive and not readily scalable.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes

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
2008	{No Data Entered}	0

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

Improving Shee Production Profits by Implementing Spring and Fall Breeding Programs: Lamb production across the state of Nevada is generally restricted to fall breeding, leading to spring lambing. Mother Nature has created a natural fluctuation in the market for fresh lamb products. This seasonality constitutes a major opportunity for Nevada's producers to fill an open niche in the market place. This project evaluated the feasibility and profitability of altering the breeding season so that profits are distributed across the year.

What has been done

Using two ranches in Nevada, ewes were divided into four groups: a control group receiving no implants, and three groups receiving different types of implants designed to boost spring breeding responses. Data was collected on pregnancy rates, and blood samples were collected from parents and offspring to determine if a genetic predisposition exists for spring breeding.

Results

Thus far, this project has shown that using an implant greatly improves pregnancy rates during the spring. This information is now being passed on to not only Nevada producers, but also to producers in the Western United States.

4. Associated Knowledge Areas

KA Code	Knowledge Area
308	Improved Animal Products (Before Harvest)
307	Animal Management Systems

Outcome #4

1. Outcome Measures

Peer reviewed publications, journal articles, trade journals, presentations at scientific meetings, Native American, stakeholder and agency presentations

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

First Signs of Finding a Vaccine for Foothill Abortion (EBA) in Western Cattle: Epizootic bovine abortion (EBA) has a major impact on beef calf production in the western United States. In California, there is an estimated annual loss of 5-10% of the potential calf population due to EBA. The soft tick *Ornithodoros coriaceus* has been identified as the primary vector of EBA.

Following an abortion due to EBA, the affected cow appears to be refractory to subsequent abortion for an undetermined period. This protective immunity appears to wane unless the cows are periodically re-infected by the tick vector. The purpose of this project is to determine the length of time that this immunity remains protective following an EBA-induced abortion.

What has been done

Researchers are determining the duration protective immunity against the agent of EBA in cattle following experimental infection and abortion. The level of immunity against abortion within a herd following experimental infection is also being determined. Utilizing the material generated by this research, researchers are developing a blood-diagnostic assay to identify cattle exposed to the agent and developing cell culture lines that may enable the growth of the bacterium in laboratories.

Results

This information will aid farmers and extension agents in developing effective management strategies. Researchers at the University of Nevada, Reno have made an important contribution to the field of EBA research through the discovery and identification of the bacterium responsible for EBA. This has been the second year that an experimental microorganism vaccine, using infected white blood cell from mice, has been used successfully to induce abortion in susceptible cattle. The data generated from this research has led to the production of an inoculum (the microorganism used in an inoculation) that will be tested for use as a 'stop gap' method of vaccination and protection in susceptible heifer calves.

4. Associated Knowledge Areas

KA Code	Knowledge Area
312	External Parasites and Pests of Animals

Outcome #5

1. Outcome Measures

Peer reviewed publications in trade journals, 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
2008	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The study of non-living chemical and physical factors in the environment that stress plants (abiotic stress) has advanced considerably in recent years. However, the majority of studies testing the response of plants to changes in environmental conditions have focused on a single stress treatment applied to plants under controlled conditions. In contrast, in the field, a number of different stresses can occur simultaneously. These may include conditions such as drought, extreme temperature or high salinity and may alter plant metabolism in a novel manner that may be different from that caused by each of the different stresses applied individually.

Drought and heat shock represent an excellent example of two different stresses that occur in the field simultaneously, especially in semi-arid or drought-stricken areas. Although drought stress and heat shock have been extensively studied, relatively little is known about how their combination impacts plants. This gap might explain why many of the genetically modified plants with enhanced tolerance to a particular stress condition have failed to show enhanced tolerance when tested in the field.

What has been done

Researchers identified sucrose accumulation as a possible defense mechanism of plants against this stress combination. Their long-term objective was to develop different plants and crops with enhanced tolerance to a combination of drought stress and heat shock.

Using a systems biology approach to identify novel genes, gene networks and pathways that specifically respond to a combination of two different abiotic stresses, researchers found key activation information in plant DNA.

Researchers identified 45 different proteins that specifically accumulated in plants in response to the stress combination. These included enzymes involved in reactive oxygen detoxification, malate metabolism, and the Calvin cycle.

Results

Abiotic stresses such as drought, heat or flooding can have a devastating economical and sociological impact. Recent studies have linked the frequency of occurrences of severe abiotic stress events with global warming, underlining the urgent need to develop plants and crops with enhanced tolerance to abiotic stresses. These enhancements are expected to prevent annual losses of billions of dollars to agricultural production worldwide, as well as to decrease the impact of potentially catastrophic future weather events. Our research team stimulated the production of the hormone cytokinin, which prevents senescence, in tobacco plants through genetic modification, 'tricking' them into 'returning to life' after a simulated drought of 15 days. This discovery was then transferred into soybean plants, enhancing tolerance to stress combination.

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Presentations at scientific, stakeholder, Native American and agency meetings, peer reviewed journal articles, publications and trade journals

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Developing Human Embryonic Stem Cell Therapy for Liver Patients: The adult mammalian liver has a natural capacity to regenerate itself and replace lost cells after a severe injury. This involves propagation of all existing mature cells constituting the intact organ. In the case of a diseased liver, the local cell population can be out-competed by repopulating the liver with cells that generate healthy, functional tissue. The focus of this study was to determine if certain cells derived from human embryonic stem cells have the potential to engraft the liver and differentiate into liver cells that make albumin (blood plasma).

What has been done

This work was carried out in four stages. Researchers first had to culture cells from the human embryonic stem cell line. They then transplanted these cells into the peritoneal cavity of embryonic sheep. From the lambs that showed positive results for stem cells capable of growing and reproducing themselves within the liver, these special cells were re-harvested and injected into new fetal sheep. Analyses followed to determine how well stem cells differentiated into liver cells.

Results

This work has opened the door to using human embryonic stem cells to treat diseased livers. Our scientists have shown that a certain line of cells derived from stem cells can be accepted by recipient livers and differentiate into liver cells. Furthermore, these cells after being accepted by the liver can be used again in other patients.

4. Associated Knowledge Areas

KA Code	Knowledge Area
305	Animal Physiological Processes

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 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 indirectly 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

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Evaluation Results

Key Items of Evaluation

Program #2

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
307	Animal Management Systems			12%	
601	Economics of Agricultural Production and Farm Management			12%	
602	Business Management, Finance, and Taxation			17%	
605	Natural Resource and Environmental Economics			16%	
608	Community Resource Planning and Development			33%	
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: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	6.0	0.0
Actual	0.0	0.0	4.1	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	316669	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	426587	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	1200	4000000	300	500000
2008	1150	3500000	250	500000

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

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	87	
2008	0	8	8

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
2008	22	25

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	Peer reviewed journal articles, publications, trade journals, scientific meetings, presentations at stakeholder, Native American, health care, agency and local government meetings.
3	Peer reviewed publications in trade journals, presentations at scientific, stakeholder, Native American, agency and local government meetings.

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
2008	22	25

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

Matching Businesses to Rural Communities' Goals and Assets: The area in Anaconda, Montana has been under a long economic downturn given it is an EPA superfund site. The towns of Laughlin, Nevada and Bullhead City, Arizona have had similar economic problems, driven in part by the closure of the Mohave Power Plant because of air pollution problems in the Grand Canyon.

Typically, communities and businesses have similar goals. Communities seek businesses that will help the locality improve and business returns to increase. This project identifies community goals and assets and matches businesses that are consistent with their goals and assets.

What has been done

The Community Business Matching (CBM) model was developed and refined to focus economic development efforts to diversify the western rural economies and build out their industrial park.

The CBM derives desirability and compatibility indices. Desirability measures how much business matches the development goals of a community. Compatibility measures how a community meets the demands of a business. By deriving desirability and compatibility indices, a community can target desired industries and/or targeted community resource developments to meet business demands.

Results

Anaconda, Montana has used the Community Business Matching (CBM) model to focus on the construction industry and has focused industry location to its industrial park. The CBM has also enabled a four-county economic development agency to be developed in Montana. Also because of CBM activities, a four-county group has organized to focus on economic development opportunities. This is the first time a multi-county organization has been developed in Montana.

CBM results also have helped both Bullhead City, Arizona and Laughlin, Nevada in the successful location of industries to their industrial parks and to develop economic diversification plans to address economic impacts from the shutdown of the Mohave Power Plant.

The CBM provides an instrument where similar community and business goals can be estimated and targeted for economic development. The CBM model helps communities to focus on their economic development efforts and address asset deficiencies in location of businesses. The CBM model helps businesses to focus on communities that likely match both the industries' and communities' economic development goals.

The University Economic Development Association awarded the CBM activities a second place national award in Economic Development Research.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

Outcome #2

1. Outcome Measures

Peer reviewed journal articles, publications, trade journals, 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
2008	{No Data Entered}	0

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

Working with Teens: A Study of Youth Worker Characteristics and Promotion of Youth Development: Youth work is often characterized as an entry-level position with low pay and a lack of professional distinction. Problems in the recruitment, selection and retention of qualified program staff continue to plague the field.

Although extensive literature has developed surrounding the elements needed to effect positive change in youth, little is known about the characteristics of people who work directly with youth to enhance positive youth development.

This project examines youth workers to better understand what characteristics, education/training, and experience contribute to job satisfaction, retention, and job competencies.

What has been done

This research project builds on an established line of research by members of the study team to use a web-based survey to assess youth workers. Specific assessments addressed in this study included: Examining the degree to which youth workers base their work on youth development concepts and theory; determining to what degree youth voice/participation is incorporated into youth workers programming, and how this relates to measures of job role, self-reported competencies, satisfaction, and retention; and examining how youth worker characteristics, compensation, education, training, and experience relate to competency, satisfaction, and intent on remaining in the field. Another thrust was drawn from self-categorization theory to examine how youth worker roles and organizational fit affect the above issues.

Results

This study provides further insight into youth worker characteristics and their link to staff's self-reported competency in promoting the features of positive youth development. Current results may be used to help guide and improve youth program staff recruitment and retention efforts and highlight the importance of youth worker professional development in ensuring the success of youth programs.

These findings provide direction to youth-serving agencies when recruiting and selecting youth workers and highlight the growing challenge of attracting candidates with the right education and experience to succeed in positions viewed as stepping stones to other, more prestigious and better paying jobs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
805	Community Institutions, Health, and Social Services

Outcome #3**1. Outcome Measures**

Peer reviewed publications in trade journals, presentations at scientific, stakeholder, Native American, 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
2008	{No Data Entered}	0

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

Illuminating the Market Potential for Nevada Teff Products: Originating sometime during the early part of the tenth century in northeastern Africa, teff (*Eragrostis tef*) has typically been a staple cereal crop for inhabitants of the region. The plant, which has a relatively short growing season, produces a tiny seed similar to millet that is traditionally ground into flour. Today the flour is also gaining popularity as both a naturally gluten-free alternative to wheat flour and a nutrient-rich ingredient in the baby food industry.

Currently, there are only seven teff flour providers in the U.S. Nevada holds great potential as the eighth producer of teff, with its suitable climate and well-situated location to supply the entire west coast.

What has been done

Competitive analysis looked into opportunities that relate to access to transportation routes, product targets, and regional markets, while also calculating possible threats. Market analyses were also conducted on ethnic restaurants and groceries, along with specialty-diet restaurants, bakeries and groceries. Plus, a market survey was performed on more than 100 restaurants and grocery outlets.

Results

Producers are currently in discussion with regional restaurants to establish purchasing arrangements for teff flour products, and grants from USDA have been given to Teff producers to purchase milling machinery.

4. Associated Knowledge Areas

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

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 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**

Program #3

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
111	Conservation and Efficient Use of Water			2%	
112	Watershed Protection and Management			15%	
121	Management of Range Resources			23%	
123	Management and Sustainability of Forest Resources			10%	
131	Alternative Uses of Land			4%	
133	Pollution Prevention and Mitigation			2%	
134	Outdoor Recreation			3%	
135	Aquatic and Terrestrial Wildlife			14%	
136	Conservation of Biological Diversity			2%	
206	Basic Plant Biology			4%	
213	Weeds Affecting Plants			2%	
301	Reproductive Performance of Animals			1%	
302	Nutrient Utilization in Animals			3%	
304	Animal Genome			1%	
305	Animal Physiological Processes			3%	
306	Environmental Stress in Animals			1%	
307	Animal Management Systems			1%	
311	Animal Diseases			7%	
605	Natural Resource and Environmental Economics			2%	
	Total			100%	

V(C). Planned Program (Inputs)

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

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	27.0	0.0
Actual	0.0	0.0	7.8	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 572770	Evans-Allen 0
1862 Matching 0	1890 Matching 0	1862 Matching 752255	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	1200	4000000	300	500000
2008	1150	3500000	250	500000

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

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	176	
2008	0	59	59

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
2008	22	25

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 and trade journals, presentations at scientific, stakeholder, Native American, agency and local government meetings.
3	Peer reviewed journal articles and publications, presentations at scientific and stakeholder meetings, Native American, agency and government meetings
4	Peer reviewed publications in trade journals and articles, presentations at stakeholder, Native American, government agencies and scientific meetings
5	Presentations at scientific, stakeholder, Native American and agency meetings, peer reviewed journal articles, publications and trade journals
6	Peer reviewed articles and publications, presentations at stakeholder, Native American, agency and scientific meetings
7	Presentations at stakeholder, government agencies, scientific and Native American meetings, peer reviewed publications in trade journals
8	Presentations at scientific, local government agencies, Native American and stakeholder meetings, peer reviewed journal articles and publications in trade journals

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
2008	22	25

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

Management Tools for Riparian Ecosystems: Although they occupy a relatively small area of the entire landscape, riparian areas are of fundamental importance to numerous plant and animal species, and to the transport of water, sediments, nutrients, and propagules (i.e., any plant material used for the purpose of plant propagation) through catchments or drainage basins.

Landowners, managers, and others are increasingly held accountable for proper management of relatively scarce riparian services (water, habitat, heterogeneity, forage, recreation, fish, etc.). Many people are looking for information on how to identify the different types of riparian areas and how they function at various scales.

Federal agencies, like NRCS, have long developed ecological site descriptions for upland rangeland and forestland sites; development and classifying ecological site descriptions in riparian areas requires a different approach that identifies fluvial geomorphology (the study of landforms and the processes that shape them), hydrology, and transported materials as the primary drivers of vegetation change.

The primary drivers of upland sites, climate and soils may be of secondary importance in riparian sites. In addition, a new way of looking at the often patchy mosaic of riparian plant communities and procedures and protocols to measure them is needed.

What has been done

This project looked at the outcomes and progress of a concerted interdisciplinary effort to develop concepts, procedures, protocols, and guidance in developing complex riparian sites and to develop ecological site descriptions on selected perennial streams in the west.

The researcher developed state-and-transition models for upland sites based on groupings of ecological sites by soil depth, texture, aspect, soil temperature, plant community, and plant-available moisture present.

State-and-transition models are a required component of ecological site descriptions and are an integral part of the Natural Resource Conservation Service, pasture and rangeland management activities.

Results

State-and-transition models show vegetative community change in response to various disturbances and help Natural Resource Conservation Service (NRCS) and their clients in determining practical and feasible courses of action that lead to resolution of resource concerns.

The completion of these 11 models allows Oregon NRCS to post the ecological site descriptions for Major Land Resource Areas 23 and 24 on its web-based ecological site inventory system. This web site is used by public land management agencies, private landowners and managers, wildlife managers, etc. to gain knowledge of soils, plants, disturbance response plus other attributes of areas important to their objectives.

The state-and-transition models are enhancing public knowledge of land management and the options available to managers for restoration of degraded sites.

4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources
136	Conservation of Biological Diversity

Outcome #2

1. Outcome Measures

Peer reviewed journal articles and trade journals, presentations at scientific, stakeholder, Native American, 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
2008	{No Data Entered}	0

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

Using Water Reclamation Facility's Sludge as an Alternative Fertilizer: Currently, both the City of Reno and the City of Sparks, like many cities around the country, reuse water from their jointly managed regional water treatment facility. A treated form of wastewater, known as effluent, is typically used for irrigation of public open spaces, such as parks or golf courses, especially during the summer. The University researchers are helping the area's two major municipalities take a closer look at a byproduct of the water reclamation process called centrate.

What has been done

The researchers are conducting two studies, running in parallel fashion, on how centrate can be used as a fertilizer to supplement the water reused by the Truckee Meadows Water Reclamation Facility in agriculture and landscaping. Researchers have tested the effect of centrate on several plant species with significance to the northern Nevada economy and are comparing it to commercial fertilizers, looking for possible toxic effects as well as its performance in relation to commercial fertilizers.

Results

Few commodities are as precious as water in arid western Nevada, and our researchers are helping the cities of Reno and Sparks improve the effectiveness of their use of treated wastewater. Using centrate for agriculture and landscaping is improving the efficiency of the Truckee Meadows Water Reclamation Facility and reducing the use of commercial fertilizers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water

Outcome #3**1. Outcome Measures**

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

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Cleaning Up Acid Mine Drainage Using Biodiesel Waste Products: Mining brings to the surface rock that has been buried for millions of years, exposing it to air and weather. This weathering causes the rock to oxidize, which forms sulfuric acids that lower the pH of water running over the rock to toxic levels. The acidic water then leaches metals out of the rock and poisons the waterways.

Bioreactors, like a sewage treatment plant, collect the toxic water before it flows into nearby streams and add certain bacteria (sulphur-reducing bacteria). These bacteria are typically fed ethanol to power a series of biological processes. The bacteria turn the sulfuric acid back into sulfides, which combine with the leached toxic metals and pull them out of the water. This produces sludge at the bottom of the bioreactor ponds, which is later hauled away, while the clean water flows freely over the top.

The only problem with this system is that ethanol can cost up to \$4 per gallon. This project investigated alternative solutions to feed the bacteria.

What has been done

Researchers investigated the use of biodiesel waste as a food source for sulfate-reducing bioreactors. To determine the operational response of the bioreactor to supplementation with different alcohol substrates, the original ethanol was removed and replaced with biodiesel waste fluid. Researchers found that waste fluid remaining after biodiesel fuel production contains primarily methanol and glycerol, alcohols utilized by sulfate-reducing bacteria, and the leftover potassium hydroxide neutralizes acidic water.

The bioreactor successfully transitioned to biodiesel waste over a 55-day pilot test. Sulfate reduction was maintained at 10-12% and metals were successfully removed below regulatory limits under normal operating conditions.

During the transition, the microbial community profile was tracked. The profiles indicate an unchanging community in the acclimated ethanol-fed bioreactor and a changing community upon exposure to bio-diesel waste. The profile technique may offer an inexpensive method for tracking changes in bioreactor microbial populations.

A laboratory-scale, sulfate-reducing bioreactor column study was used to investigate removal of arsenic, selenium, and sulfate in neutral to alkaline simulated mine water.

Results

Bently Nevada, a Gardnerville corporation, manufactures about 300,000 gallons of biodiesel fuel each year by recycling used french fry oil. This process leaves about 20,000 gallons of waste. This waste, which was originally food-grade oil with potassium hydroxide and methanol added to convert it to biodiesel fuel, appears to be as good as ethanol as a food for the bacteria and also raises the pH.

Professor Glenn Miller states, 'If Bently Nevada can ultimately be paid for its waste product, the company could make biodiesel fuel more financially attractive. It's a win-win-win.'

'While all of these carbon sources do the job, we feel that biodiesel waste has the most promise, because it is not only inexpensive, but it works well and is readily available as a waste product.'

Researchers have also developed methods to assess the acclimation and health status of the bioreactors using molecular methods, and found methods that show promise for quickly evaluating the status of the bioreactors.

Professor Miller claims that, 'This system is cost-effective and is very likely the method of choice for treating acid mine drainage in remote locations where power is limited.'

Given the potential for serious environmental damage and burdensome reclamation costs, it is practical to seek long-term, cost-effective treatments for acid mine drainage. The potential advantages of passive treatment are lower costs, fewer site visits required, ability to work in remote areas, opportunities to use recycled or waste materials, and more natural appearance.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

Outcome #4**1. Outcome Measures**

Peer reviewed publications in trade journals and articles, presentations at stakeholder, Native American, government agencies and scientific meetings

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	{No Data Entered}	0

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

Development of an Inexpensive Atmospheric Mercury Sampler: Mercury exists in the atmosphere both as a gas and bound to particulate matter. Mercury can enter the ecosystem in precipitation and as dry materials. Mercury in precipitation is measured across the U.S. at more than 100 sites by the National Atmospheric Deposition Program. However, little is known about the amount of mercury dry deposited to ecosystems.

Current assumptions are that in semi-arid landscapes like Nevada, dry deposition is the most significant input of mercury to ecosystems. One of our goals was to develop a method that is both cost effective and reliable for collecting dry atmospheric samples.

What has been done

Reactive gaseous mercury, particulate mercury and elemental mercury concentrations in air were measured in Reno, Nevada, almost continuously using the commercially available Tekran Mercury unit. Dry deposition of elemental mercury, reactive gaseous mercury and particulate were also directly measured using an in-house designed field flux chamber, and ion exchange filters located at three heights, respectively. Data was collected to assess the efficiency of the ion exchange membranes for measurement of dry deposition of mercury and the best deployment method. Other materials such as Teflon filters were also tested.

Results

The development of a passive mercury sampler will have significant economic benefits to the larger commercial Tekran units. Materials to build a passive sampler are relatively cheap. No electricity is required for data sampling, making passive samplers a good choice for remote locations. And with simple materials in constructing passive samplers, field technicians will not need intensive training to operate samplers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

Outcome #5**1. Outcome Measures**

Presentations at scientific, stakeholder, Native American and agency meetings, peer reviewed journal articles, publications and trade journals

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	{No Data Entered}	0

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

Lake Tahoe: Controlling the Spread of Invasive Clams, Mussels & Snails: Asian clams have spread rapidly in lakes, canals, streams, rivers, and reservoirs since their introduction to the Western United States through the Columbia River Basin in 1938. High densities of clams caused a bright green bloom at Marla Bay reported last July and another that appeared a few months later at El Dorado Beach. The clams release nutrients that in large quantities spur algae growth, diminishing the lake's clarity.

Dense beds of clamshells can also release large amounts of calcium, enough to support the dreaded zebra and quagga mussels. And the shells themselves make an ideal landing pad for the mussels, providing a hard surface for attachment on the lake's otherwise sandy bottom.

'We are finding out that there are serious ecological, economic, and recreational impacts from exotics,' said Rick Vacirca, a U.S. Forest Service biologist at Lake Tahoe.

What has been done

The objective of this study is to conduct a preliminary risk assessment of mussel invasions in Lake Tahoe. Researchers are using a preexisting model to: 1) determine near-shore concentrations of calcium during potentially low and high concentrations periods, and 2) create a risk based map for each location based on existing models published in the scientific literature.

Researchers are testing two new ways to eradicate the clams: Laying tarps over the large colonies and thereby suffocating them; or equipping divers with suction devices, essentially vacuuming the clams out of the lake. Researchers are also asking, 'Can New Zealand Mud Snails survive in the Truckee River or Lake Tahoe? What are the potential ecological effects of a New Zealand Mud Snails invasion on the benthic community of these ecosystems?'

Results

The quagga and zebra mussel have caused billions of dollars of damage to Midwestern waterways. The mussels damaged water pipelines and screens, reducing pumping for power and water treatment facilities. Recreation industries were also impaired by their presence on docks, buoys, beaches, and boats where they can clog engines and hinder steerage.

'We don't want an invader of this type in our lake. We want to be the first lake to successfully prevent them from coming,' said Dennis Oliver, spokesman for the Tahoe Regional Planning Agency.

Under a new agency rule that took effect Nov. 1, 2008, boaters must drain, dry and clean their equipment and pass an invasive species inspection before launching. Ramps are closed when inspectors are not present.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
135	Aquatic and Terrestrial Wildlife

Outcome #6

1. Outcome Measures

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

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Controlling Arsenic in Groundwater: Effectiveness of Household Reverse-Osmosis Systems: It is well known to the public in Lahontan Valley in rural Nevada, USA, that local aquifers produce water with varied, but sometimes very high concentrations of arsenic. As a result, many residents of the area have installed household reverse-osmosis (RO) systems to produce drinking water.

However, because RO-treated water had arsenic concentrations that exceeded the drinking-water standard, UNR researchers concluded that investment in an RO system could lead to a false sense of security because contaminants such as arsenic cannot be readily sensed by taste or odor.

What has been done

The purposes of this research were to characterize concentrations of arsenic in drinking water from wells treated with RO in an area with high groundwater arsenic, and to evaluate the factors affecting the efficiency of arsenic removal by RO systems. A secondary goal was to identify reasons users of RO systems may mistakenly conclude that treated water meets drinking-water standards.

These goals were accomplished by examining performance of RO systems and factors associated with arsenic removal efficiency in 59 households in Lahontan Valley where water tested for arsenic in excess of EPA safety limits. Thirty percent of those systems tested failed to remove arsenic to safe levels.

Results

Field trials have demonstrated that RO systems episodically fail and must be regularly maintained to ensure that rejection efficiency remains at a maximum.

Simple field measurements, such as specific conductance (i.e., how well water conducts electrical current), are commonly used to evaluate whether RO systems are functioning properly. Some RO systems use an indicator light that illuminates when specific conductance reaches an upper threshold (conduction is increasing), indicating that efficiency is declining and the RO membrane should be replaced.

Since efficiencies in reducing specific conductance and arsenic are not correlated (low conduction but high levels of arsenic), reliance on specific conductance as a measure of RO systems' performance can lead to the erroneous conclusion that the treated water meets drinking-water standards.

These findings point out that for users of RO systems, actual measurements of treated water are necessary to assure that arsenic concentrations are indeed being reduced to safe levels. This is particularly important in areas where groundwater has high arsenic concentrations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

Outcome #7

1. Outcome Measures

Presentations at stakeholder, government agencies, scientific and Native American meetings, peer reviewed publications in trade journals

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Nevada's Walker River Basin: Taking its Temperature: Many hydrologic, geologic and environmental processes are governed by temperature. In the Walker Basin, we can use temperature to indicate areas where subsurface irrigation return flows are entering the river. The dynamics of the mixing of Walker Lake are important for understanding habitat and refuges. We can also use it to measure seedbed temperatures during transition to different irrigation strategies.

What has been done

The fiber optic cable serves as the thermometer, with a laser serving as the illumination source. Measurements of temperature every 1-2 yards for as long as 20 miles can be resolved every 10 seconds to 60 minutes, with temperature resolution of 0.02-1.0F.

Researchers are using fiber optic technology to measure stratification and mixing in Walker Lake to understand fish habitat development, monitor Walker River temperatures to assess habitat and restoration, develop improved irrigation scheduling by monitoring soil moisture status and assess the impacts of increased flows on downstream temperatures and salinity.

Results

Fiber optic temperatures are supporting many of UNR's Walker Basin projects. The low cost and detail of information in the lake, river and soil offer unique opportunities to monitor both current conditions and the impacts of future decisions on the Walker Basin.

The system has benefits beyond the current applications, specifically improving water use efficiency of irrigation. Fiber optic methods offer an unparalleled ability to continuously monitor temperatures. Cost of fiber optic cable is very low (\$0.20-\$1/yard). Cable is easily deployed, removable and completely repairable.

Nevada is one of the leaders in this technology.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water

Outcome #8**1. Outcome Measures**

Presentations at scientific, local government agencies, Native American and stakeholder meetings, peer reviewed journal articles and publications in trade journals

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	{No Data Entered}	0

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

Keeping the Truckee River Water Supply Safe for Drinking: Over 75% of the water supplied by the Truckee Meadows Water Authority (TMWA) to its 78,000 customers comes from surface water sources and storage. Almost all of the surface water sources are linked to the Truckee River, which originates in the pristine Lake Tahoe area, flowing 100 miles through the mountains and metropolitan areas of Reno and Sparks to its terminus at Pyramid Lake.

Surface water supplies from the Truckee River are treated at the Chalk Bluff and Glendale Water Treatment Plants. One of the concerns for efficient management of drinking water treatment is the fate and behavior of contaminants that may be spilled or discharged into the Truckee River. In particular, TMWA would like to be able to estimate when a contaminant would arrive at each of the treatment plants to prepare for either diverting the contaminated flow or treating it appropriately.

What has been done

University of Nevada scientists developed a new spill model based on the US Geological Survey's One-Dimensional Transport with Inflow and Storage model. The new model was calibrated with data collected during a dye study on the Truckee River for flows in the river. A user-interface was designed to enable users to quickly plot the results of model runs for spills at different locations up and down the Truckee River.

As part of this study, 15 cross-sections of the river in the reach between Tahoe City and Reno were surveyed, and sediment samples were analyzed for size fraction and composition.

Results

The results of the project are now used by operators at the Truckee Meadows Water Authority in the event of a spill to make management decisions for altering treatment plant operations in response to a spill on the Truckee River. This has value in protecting citizens of the Truckee Meadows from adverse water quality impacts due to a spill on the river.

The study also provided additional information about the hydrodynamic and geomorphic properties of the river between Tahoe City and the Glendale intakes in Reno.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

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 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 #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
102	Soil, Plant, Water, Nutrient Relationships			8%	
133	Pollution Prevention and Mitigation			24%	
134	Outdoor Recreation			1%	
703	Nutrition Education and Behavior			13%	
724	Healthy Lifestyle			4%	
802	Human Development and Family Well-Being			47%	
803	Sociological and Technological Change Affecting Individuals, Families and Communities			1%	
901	Program and Project Design, and Statistics			2%	
	Total			100%	

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	13.0	0.0
Actual	0.0	0.0	3.6	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	302806	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	439252	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 personnel, 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	1200	4000000	300	500000
2008	1150	3500000	250	500000

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

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	26	
2008	0	4	4

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
2008	22	25

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.

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
2008	25	25

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

New Dietary Assessment Tool to Evaluate School Nutrition Education Programs: It remains unclear if children alter their dietary behavior in response to education programs. Limitations in the application of dietary intake assessment tools commonly used in adults (food frequency questionnaires, food diaries, and dietary recall) hinder the evaluation of interventions targeting children. Without a suitable robust tool, identification of best practices in nutrition education and school policies is problematic.

What has been done

A new Point-of-Purchase Dietary Assessment Tool (POS-DAT) sensitive to the cognitive development and social influences of children was developed. The POS-DAT incorporates the familiarity of grocery check-out stations. A staff member generates a computer inventory of a child's food selection by scanning package bar codes and weighing bulk food items. Food on their returned tray is weighed and subtracted from their inventory to calculate actual nutrient intake.

By removing the burden of data entry from the subject, the POS-DAT is especially well suited for studying the school intake of children. The advantages of the POS-DAT include: 1) it places no literacy or memory requirements on the child; 2) it overcomes the bias towards enrolling educated (motivated) participants; 3) it is non-intrusive, therefore subjects are less cognizant of meal tracking, reducing alteration in normal mealtime behavior; and 4) intake is based on weighed information, thereby improving data accuracy.

The POS-DAT is undergoing pilot testing at an inner-city elementary school in Reno, Nevada to evaluate changes in cafeteria intake following a 20-week garden/nutrition education curriculum. The POS-DAT offers a noninvasive, cost efficient, accurate method for program evaluation.

Results

Study findings indicated that the new Spears POS-DAT is a valid method of dietary assessment, offering a noninvasive, cost efficient, accurate method for program evaluation.

The findings revealed where breakfast was served significantly impacted school lunch intake. Breakfast intake when served in the cafeteria was substantially lower than breakfast served in the classroom. Eating school breakfast significantly decreases the total calorie intakes of the lunch program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
703	Nutrition Education and Behavior

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 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

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Evaluation Results

Key Items of Evaluation