2018 University of Nevada Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

University of Nevada Cooperative Extension (referred to as "Extension" throughout this report) efforts that were partially funded by NIFA directly reached at least 90,806 adults and 44,764 youth; and 5,88,470 adults and 90,779 youth indirectly. Extension faculty also were able to leverage over $5.6 million in extramural funds, publish 148 articles/fact sheets/curriculum and participated in 856 presentations/workshops.

Cooperative Extension contributed to the National Institute for Food and Agriculture's (NIFA) planned programmatic areas of:

Global Food Security and Hunger efforts reached by Cooperative Extension faculty partially funded by NIFA included 11 programs involving 12 NIFA-funded faculty. Programs included:

- Field evaluations of low-water-input crops for semi-arid environments to help rural communities in Southern Nevada with limited access to water resources to develop new revenue streams through the production of a new food, forage and biofuel feedstock crops on drylands.
- Grow Your Own, Nevada! provides information to help Nevadans successfully grow their own food.
- Master Gardeners trains local gardeners to provide research-based horticulture information to Nevadans.
- Commercial Landscape Horticulture provides training for green industry workers on how to landscape in the Nevada desert. It teaches commercial landscape horticulture industry professionals in Nevada, whose needs vary among counties and between northern and southern Nevada.
- Urban Integrated Pest Management Program teaches IPM strategies to manage pests efficiently and protect human health and the environment. It seeks to increase awareness and adoption of IPM strategies by the public and the green industry to manage pests efficiently.
- Rural Integrated Pest Management, IR-4 and Pesticide Safety and Education programs research and tests pesticides and teaches agricultural producers and public land managers how to manage pests.
- Teff, Alternative Crop Production in Nevada being tested as an alfalfa alternate, using less water while returning equal or higher economic returns.
- Agriculture Innovation Forum Series provides practical information and expertise needed for agricultural producers and small-acreage owners to optimize their land-use potential and maintain agricultural open spaces.
- Irrigation Efficiency and New Technologies program helps producers maintain or increase their economic returns during times of drought and other water shortages by research new irrigation technologies and manage irrigation efficiently.
- Progressive Agriculture Safety Day is designed to teach youth and their families how to be safer in various circumstances around farms and ranches.
- Southern Nevada Research Center and Demonstration Orchard explores investigates fruits and vegetables that might grow well in desert environments and trains backyard and commercial growers.

Climate Change, Natural Resource Management and Environmental Science efforts reached by

Cooperative Extension faculty partially funded by NIFA included 10 programs involving 21 NIFA-funded faculty. Programs included:

- Integrated Riparian Management / Creeks and Communities teaches about the physical functioning of riparian areas to effectively manage them for multiple uses.
- Range Management School teaches local and international rangeland resource management personnel, livestock permittees and other land users. It integrates sound science, collaboration and common sense to provide education on managing rangeland resources.
- Nevada Youth Range Camp is a week-long event that provides an opportunity for youth ages 14-18 in Nevada and eastern California to learn about Nevada's desert, mountain rangelands and diverse ecosystems.
- Nevada Naturalist is an environmental education program for adults created to certify education naturalist volunteers to serve in southern Nevada, to educate others and engage in environmental restoration and enhancement projects.
- Rangeland Resources and Range Management Education Program teaches natural processes and management of Great Basin rangelands. It provides education regarding plant growth, plant response to grazing, ecological site potential, the processes of vegetation change, and the role and effect of fire and other disturbances on Great Basin rangelands.
- Native Waters on Arid Lands program aims to enhance the climate resiliency of tribal agricultural water resources and food systems.
- Eagles and Ag is a multiday celebration that helps people learn about agriculture and the benefits it provides to wildlife and the community. It encourages the conservation and prosperity of ranching in western Nevada, teaches participants about wildlife and the local history of agriculture, and creates an agritourism model that enhances the profitability of local farming and ranching businesses.
- Water for the Seasons works with diverse water use communities in the Truckee-Carson River System in northwestern Nevada to assess climate resiliency and adaptation for arid lands dependent on snow-fed rivers.
- Living With Fire is a multiagency program coordinated by Extension that teaches Nevadans how to live more safely in high-wildfire-hazard environments.
- Nevada Wildfire Awareness Month is a collaborative month-long effort coordinated by Extension to encourage homeowners to reduce the wildfire threat.

Childhood Obesity, Nutrition and Health efforts reached by Cooperative Extension faculty partially funded by NIFA included 3 programs involving 5 NIFA-funded faculty. Programs included:

- The Veggies for Kids is an in-school program that teaches youth how to grow vegetables and about nutrition.
- Veggies for Seniors is an expansion of the Veggies for Kids program providing fresh fruits and vegetables to rural community seniors with disabilities.
- Eating Smart Being Active is a curriculum providing education on diet quality, physical activity, food resource management, food safety and food security to boost nutrition through building basic skills.

Community and Economic Development efforts reached by Cooperative Extension faculty partially funded by NIFA included 6 programs involving 15 NIFA-funded faculty. Programs included:

- Lincoln County Workforce Development helps underemployed adults ages 18 and older and at-risk youth ages 17-21 in rural Nevada's Lincoln County gain education, training and sustainable jobs.
- Agriculture Innovation Forum Series provides discussions to offer options and solutions to help small-acreage producers sustain their businesses.
- Leadership Douglas County teaches adults to focus on critical county issues and builds leadership skills and networking
- Nevada Risk Management Education teaches agricultural producers ways to mitigate risks to increase

sustainability and availability of local food. It helps producers understand five areas of risks they face in agricultural production and teaches strategies to mitigate those risks in order to increase the probability of economic survival and sustainability of Nevada's farms and ranches. This in turn, also helps to address the problem of Nevada's food deserts, and helps to provide healthy local produce and meat for Nevada citizens.

- Native Waters on Arid Lands is a multistate collaborative program that aims to enhance the climate resiliency of tribal agricultural water resources and food systems.
- Nevada Business Development Service Program breaks down silos of existing business development organizations, providing consistent data support that improves access to capital, help launch businesses and place employees.

Children, Youth and Family Development efforts reached by Cooperative Extension faculty partially funded by NIFA included 7 programs involving 11 NIFA-funded faculty. Programs included:

- Keeping Kids Safe: Recognizing, Reporting and Responding to Child Maltreatment Training educates those working with youth or providing child care about how to recognize, respond to and report possible child maltreatment to help protect children and youth, and helps child care providers and those working with youth comply with state regulations.
- Heart and Shield: Rural Domestic Violence Prevention Program works to promote resiliency, strengthen positive future relationships, and stop the domestic violence cycle.
- GEAR UP (Gaining Early Awareness and Readiness for Undergraduate Programs) is a federal program that prepares low-income students to have an interest and succeed in STEM and postsecondary education.
- Family Storyteller is designed to enhance the reading time parents and children spend together and boost school readiness and parent engagement. The programs is provided in both English and Spanish.
- Let's Discover STEM is designed to provide enriching foundational Science, Technology, Engineering and Mathematics experiences for Latino children who likely would not have such experiences; teach parents how to nurture children's curiosity by encouraging and supporting their children's STEM learning at home, in school and throughout the community; and build a connection between homes and schools to support children's STEM success as they enter and progress through school.
- Little Books and Little Cooks program for preschool-age children (3-5 years old) and their parents is designed to promote healthy eating, family literacy, parent-child interaction and school readiness skills.
- Youth for the Quality Care of Animals is a curriculum that teaches youth to raise quality swine, beef and dairy cattle, sheep, goats, dairy goats, rabbits and poultry.

Food Safety efforts reached by Cooperative Extension faculty partially funded by NIFA included 1 programs involving 1 NIFA-funded faculty. Program:

- Food Preservation and Security teaches U.S. Department of Agriculture food preservation and security guidelines through hands-on training.

Nevada Agricultural Experiment Station (referred to as "Experiment Station" throughout this report) contribution to the NIFA 2017 Annual Report will focus on select programs that reflect the unique benefits to a diversity of clientele and stakeholders in Nevada.

Experiment Station is focused on improving the quality of life for all Nevadans through education, research and outreach that support the agricultural enterprise; foster community health and well-being; promote natural resource sustainability; and stimulate statewide economic development.

This past year, the Experiment Station formula-funds grant program included Hatch, Multi-State, McIntyre-Stennis, and Animal Health funding opportunities, driven by peer and stakeholder review, and embraces

the Federal-State partnership directed by the Hatch Act and subsequent Farm Bill provisions.

One of Experiment Station's state performance metrics is external funds leveraged per dollar of formula funds funding. In 2018, $2.25M in federal-state appropriations were leveraged by faculty to generate $15.77M in external fund (a return of $7 for every $1 invested). Our faculty published 125 peer-review journal articles (+25% over last year), trained 108 graduate and 191 undergraduate students (+27%), gave 294 presentations (+18%), conducted 65 workshops, and filed for 2 patents.

Some of this year's research highlights include:

Global Food Security and Hunger

- Understand how the interaction of tomato plants nutritional status and water availability affects young root development and physiology under drying soil and upon rewatering.
- Determining novel traits in tomatoes that can improve whole plant response and growth under high salinity and boron toxicity and ultimately benefit growers through better genetics and higher yields.
- Gaining a better understanding of the drought and salt tolerance mechanisms that lead to improved grapevine rootstocks and enable increased grape production and quality in suboptimal environments in Nevada, California and other semi-arid regions.
- Genetic modification and field trials to improve the relative drought tolerance and lodging resistance of a gluten-free grain tef (or teff).
- Working to improve the health and growth performance of calves raised in semi-arid climates by optimizing milk and dietary carbohydrates intake as well as omega-3 supplements.
- The dissection of the molecular and biochemical bases of wound healing due to harvesting damaged potatoes that dramatically impact the quality, storability, and marketability.
- Building the basic understanding of how beneficial antimicrobial compounds produced naturally in carrots make carrots more resistant to pathogens like stem rot and blossom blight.
- Developing technologies to elucidate functions of signaling neuro-hormones in insects for use in a chemical screening program to identify specific disruptors of the endocrine system in insects to be used as insecticides, or behavior-modifying compounds that could contribute to insect pest management.
- Evaluating forage-related characteristics of improved and alternative forages for pasture and rangeland conditions under grazing in the arid conditions of Nevada.
- Assessing how quinoa and amaranth (highly salt-tolerant plants) would serve as an alternative crop in Nevada and the potential for them to improve the environmental soil quality in dryland ecosystems.
- The characterization, development, and enhancements of lignocellulosic biomass (arguable the most economical and highly renewable natural resource in the world) that thrive in the unique arid environment of Nevada.
- Assessing genetic diversity, identifying taxa that were difficult to classify with morphological characteristics, and associating DNA differences with variations of drought-tolerant sorghum.

Climate Change, Natural Resource Management and Environmental Science

- Identifying community-level traits that are resilient to climate change and will perpetuate ecosystem functioning and services across forest and woody plant communities of the Great Basin.
- Improving water management decision-making by identifying Great Basin watersheds that are most at-risk for altered ecological functioning and downstream water availability as a consequence of changing snowpack dynamics.
- Building a better understanding of different grazing (feral horses versus livestock) regimes on vegetation and key sage grouse population parameters, including nest success, chick survival, hen survival, and habitat use in the Great Basin.
- Measuring how a meadows' state of degradation and restoration influence soil carbon stocks, soil carbon fluxes, vegetation growth and composition, and forage for Greater Sage Grouse in the Great Basin.

While also quantifying the economic opportunities or possible incentives that could be associated with carbon sequestration in meadows associated with restoration in voluntary carbon markets.

• Quantifying the effects of feral horses and livestock management practices (e.g., duration of grazing, recovery periods after grazing occurs and rotation of grazing animals among pastures) on riparian and wet meadows used by sage grouse.

• Determining how much precipitation (snow and rain) is intercepted and used by two of the most common trees in the Great Basin (pinyon & juniper), as well as the sagebrush ocean that dominates Nevada's rangelands.

• The spatial reconstruction of rate of carbon storage in vegetation (aka, net primary productivity) and net ecosystem production for Nevada, the USA, and North America's drylands for the last 300 to 500 years.

• Tracing the sources of the aerosol, ozone, mercury and heavy metals being used to facilitate the development of environmental policy to reduce ozone and mercury pollution to the State of Nevada.

Sustainable Energy

• The evaluation and selection of highly water-use efficient and drought tolerant crop, prickly pear cactus and two related species, best suited for food, forage, and bioenergy production in the dryland environments of Nevada and the western U.S.

• Increasing Camelina (aka False Flax) biomass, seed size and oil continent by creating transgenic lines that show great carbon sequestering, along with improving oil quality to meet the highest standard of biofuel production. Also, work is being done to reduce gooeyness in the oil extracts and reduction in bitterness favor profile.

Childhood Obesity, Nutrition, and Health

• The investigation into the role of histone deacetylases (a catalyst that brings about a specific biochemical reactions) as activators of heart enlargement and stiffness, with emphasis on the function of histone deacetylases in controlling obesity-induced heart dysfunction. In addition, focus is being directed towards dietary food components that block histone deacetylases and therefore would protect against heart enlargement and stiffness.

Community and Economic Development

• Development of a regional model that is designed to estimate the potential impacts of removal of multi-use public lands into singe use military lands.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	12.4	{No Data Entered}	8.5	{No Data Entered}
Actual	17.6	0.0	8.1	0.0

II. Merit Review Process

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

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

2. Brief Explanation

University of Nevada Cooperative Extension merit review process
Extension's merit review process comprises multiple steps. Annually tenure-track Extension faculty prepare a Role Statement detailing their teaching, research, and service activities for the coming calendar year. Extension faculty review their individual Role Statements with their Area Director and/or Department Chair who ensures the quality and relevance of planned programming efforts effectively address formally identified program goals. Both the Area Director and the Nevada Extension Dean/Director review and approve the plan.

Annually, Extension faculty evaluate their peers' teaching, research and service activities to assess overall performance and program quality. Peers consider the results of formal needs assessments, programs developed in response, and the substance of documented outcomes and impacts in rating peer performance and providing narrative feedback. Area Directors also conduct an annual review of faculty performance and provide narrative feedback. Area Directors then meet individually with faculty to discuss the documented results of the peer review and Area Director's review. The Extension Director also reviews and signs off on the evaluation documents.

Finally, some Extension efforts are a part of the Multi-state Review Committee (MRC) process and are documented, reviewed and approved by the sponsoring regional association. These committees are responsible for the review, evaluation, and recommendation of western multi-state programs which may involve research, academic programs, extension, and/or international programs.

Experiment Station's merit review process
Scientific peer review drives the initial selection of research projects that comprise the Experiment Station research portfolio. Experiment Station administration solicits applications from Experiment Station/College of Agriculture scientists in a general call for proposals that identifies annual priority areas. Faculty submit proposals through an in-house, web-based content management system. Based upon research priority area, expert peer reviewers are assigned by Experiment Station administration to rate proposals based upon merit in the field of research, PI's qualifications, projected outcomes, degree of multi-disciplinary activity, and budget feasibility. The Experiment Station administration concurrently sends proposals to its external advisory board panel representing stakeholder interests for evaluation and ranking based upon their constituents' inputs.

Tabulated results, comments, recommendations and proposals are then sent to the PI's home department administration for internal review. Departmental recommendations are then send forward to Experiment Station administration. All findings are then compiled by Experiment Station administration and final decisions are made based on the rankings, comments and stakeholder input.

III. Stakeholder Input

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

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals
- Other (Use of social media; conduct field days at our University field stations)

Brief explanation.

Faculty target traditional and non-traditional stakeholders through email and postal mail invitations to participate in public meetings, focus groups, and individual interviews. Poster announcements are placed in public places frequented by traditional and non-traditional audiences.

Formal needs assessments serve as another means for contacting stakeholders. Faculty continually assess stakeholders' perceived program priorities in order to efficiently allocate resources and to identify and develop partnerships for program implementation and delivery.

Primary data-collection methods include postal mail and internet surveys, focus groups, and individual interviews. Results of Cooperative Extension community needs assessments are published and made available to other university faculty and the broader public via the Extension website (www.unce.unr.edu/publications/assessments).

Frequently, faculty develop partnerships with a variety of stakeholder groups as part of program planning, development, and implementation. These community and organizational partnerships provide an ongoing venue for receiving stakeholder input and feedback for the life of a program.

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

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

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions

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

Brief explanation.

Experiment Station currently has a broadly based advisory board committee that meet and provides input multiple times per year. In addition, we have faculty members that schedule and coordinate meetings throughout the state with the purpose of obtaining direct input to the Experiment Station research portfolio.

Experiment Station's partnership with Cooperative Extension provides assistance and access to stakeholders through joint efforts like the annual Cattlemen's Update - a program designed to bring the researcher to the rancher - and Beginning Famers and Rancher events held throughout the state. With Experiment Station administration abiding by an "open door policy", informal discussions with key stakeholders provides important input into our research programs and resident instruction. Comments are also received through the Experiment Station website.

Cooperative Extension's stakeholder input is routinely used to identify emerging issues, to direct and redirect programs and also in the hiring process. Stakeholders include local elected and appointed officials, community leaders, citizens, under-served groups and individuals, university leadership, university academic departments, and Extension faculty and staff. Therefore, the areas to be emphasized reflect the views of a broad set of stakeholders. Stakeholder input is used to determine the necessary qualifications of those hired and/or to create new positions, as new funding becomes available. Stakeholders also participate in Extension faculty searches. Additionally, stakeholder input is used to help establish program priorities and to acquire necessary funding.

Use of local newspapers and radio, through public-service announcements, encourage stakeholders to participate in public meetings and listening sessions. Extension also sponsored exhibitor booths at annual meetings held by numerous commodity groups and local/state agencies.

Both Experiment Station and Cooperative Extension faculty target traditional and non-traditional stakeholders through email and postal mail invitations to participate in public meetings, focus groups, and individual interviews. Poster announcements are placed in public places frequented by traditional and non-traditional audiences. Formal needs assessments serve as another means for contacting stakeholders. Faculty continually assess stakeholders' perceived program priorities in order to efficiently allocate resources and to identify and develop partnerships for program implementation and delivery.

Cooperative Extension's primary data-collection methods include postal mail and internet surveys, focus groups, and individual interviews. Results of community needs assessments are published and made available to other university faculty and the broader public via the Nevada Extension website.

Frequently, both Experiment Station and Cooperative Extension faculty develop partnerships with stakeholder groups as part of program planning, development, and implementation. These community and organizational partnerships provide an ongoing venue for receiving stakeholder input and feedback

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
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Survey of the general public
- Meeting specifically with non-traditional groups
- Survey specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Survey specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public

Brief explanation.

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

Experiment Station will also hold several other public events during the year to gather information from stakeholders. Whenever it is feasible, efforts are made to coordinate relevant activities with extension to avoid duplication. Research project participants obtained direct and indirect stakeholder input through varied avenues. Projects with social science components frequently used questionnaires and surveys. Stakeholder input to some basic science and some applied projects occurred in the form of reviewer inputs to proposals, and from questions, comments and discussions at regional, national and international conferences. Stakeholder input for other projects was collected through comments and questions at workshops and topical meetings for end users.

Cooperative Extension meets frequently with stakeholders throughout the state. This includes formal presentations to county commissions, the Nevada Association of Counties and community groups. It also includes participation as a member in state panels and commissions and executive boards, such as the Nevada Sagebrush Ecosystem Council, the Nevada Governor's Drought Forum, the Nevada Governor's Council on Food Security, and the Food Bank of Northern Nevada. County-based Extension Educators and Nevada Extension administrators meet formally and informally with county commissioners, and public service groups, such as Rotary Clubs. Extension Educators also conduct formal needs assessments involving survey instruments.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs

- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities
- Other (Strategic planning)

Brief explanation.

The Nevada Agricultural Experiment Station collected information from stakeholders to adjust issue areas that are influencing Experiment Station's future direction. These stakeholder priorities also directly influenced applied research activity, while influencing which departments or areas of expertise get hiring priority. Successful strategic hires enable us to meet existing needs and at the same time reposition for those on the horizon.

Our stakeholders help us see into the future to identify those emerging issues. For example, in the past year the decision to hire faculty focused on remote sensing, plant breeding, and livestock reproduction. Input from Nevada's cattle and sheep industry reinforced this decision, and the industry was represented on the search committee.

Experiment Station used stakeholder input to make more immediate decisions, such as where to invest funding to direct current faculty and their research into emerging issues such as drought tolerant vegetables, alternative biofuel feedstock and sustainable water sources derived from annual snow pack. Stakeholder input was utilized in other activities such as annual budget allocation, providing feedback to the college, departments and faculty, and most importantly, in setting priorities for our Formula Fund research Call for Proposals and deciding how to allocate these funds.

University of Nevada Cooperative Extension used local, regional and state needs assessments to design, deliver and evaluate programs. Cooperative Extension used reports from public meetings and processes, participation on commissions and boards of directors, participation in state and regional conferences to:

- allocate funds from all of Extension's sources
- identify emerging issues to be addressed with new or expanded programs
- redirect Extension programs
- hire staff
- develop action plans and set priorities

Brief Explanation of what you learned from your Stakeholders

The most common direction Experiment Station's stakeholders wanted was expansion of the plant sciences and related agronomy/horticultural disciplines. This input has prompted the Dean and Directors to begin hiring more faculty that specialize in plant science (two positions this past year), along with hydrologist specializing in groundwater irrigation (open search underway).

Cooperative Extension's stakeholder base is deeply divided in how funds are distributed around the state. Large demographic areas in the south (Las Vegas) are concerned that county funds might be misappropriated and used to support activities in the north (Reno, Carson City) and rural areas (geographically 90% of the state). There must be great efforts place on making sure financial transparence is upheld.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
{No Data Entered}	{No Data Entered}	{No Data Entered}	{No Data Entered}

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	840092	0	1742024	0
Actual Matching	840092	0	2254525	0
Actual All Other	0	0	0	0
Total Actual Expended	1680184	0	3996549	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	0	862511	0

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Global Food Security and Hunger

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	0%		15%	
103	Management of Saline and Sodic Soils and Salinity	0%		3%	
111	Conservation and Efficient Use of Water	18%		0%	
121	Management of Range Resources	15%		0%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		13%	
202	Plant Genetic Resources	0%		4%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		24%	
204	Plant Product Quality and Utility (Preharvest)	0%		3%	
205	Plant Management Systems	20%		7%	
206	Basic Plant Biology	0%		4%	
211	Insects, Mites, and Other Arthropods Affecting Plants	0%		13%	
216	Integrated Pest Management Systems	5%		0%	
302	Nutrient Utilization in Animals	0%		3%	
306	Environmental Stress in Animals	0%		2%	
307	Animal Management Systems	8%		7%	
721	Insects and Other Pests Affecting Humans	0%		2%	
806	Youth Development	13%		0%	
903	Communication, Education, and Information Delivery	21%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890

Plan	3.5	0.0	3.0	0.0
Actual Paid	3.8	0.0	3.6	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
136468	0	1260162	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
136468	0	1297623	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

Cattle
Substantial amount of work was done to prepare the Main Station Field Lab cattle facilities. Everything from new squeeze chute construction, to installation of cameras, scales, data logging stations and automated watering trough.

Plant Genetic Improvements
Wallace created transgenic plants that contain Cellulose Synthase A subunits that cannot be phosphorylated by certain enzymes and demonstrated that these modified plants exhibit increased cellulose content (meatier cells - better skin on say a potato for storage).

The Harper lab has produced transgenic False Flax (aka Camelina) expressing a protein construct that improves carbon fixation in model plants (aka Arabidopsis) and soybean.

The Harper lab has created transgenic Camelina with an oil quality more suitable for biofuels.

Food & Forage Production
The Harper team has developed best management practices for establishing Camelina in Nevada's fields.

The Kosma lab has continued working on improving post-harvest storage of potatoes. They have identified molecular regulators involved in wound healing and shown that they regulate deposition of a lipid polymer (suberin) known to play critical roles in desiccation and fighting infection. They have also discovered compounds in the wound periderm of potato tubers that likely contribute to differential resistance of short and long-storage life potato cultivars.

The effects of symbiotic fungi in relation proximity to root system (presence vs absence) were completed and data analysis is under way.

Work on alternative forages for arid conditions is midway through its funding. Fourteen tall fescue, six grass and five ryegrass cultivars are being tested for persistence correlated with grazing preference and

total biomass production.

Development of sorghum and pearl millet varieties best adapted to Nevada's growing condition has begun.

Teff plots were harvested to determine grain yields, biomass and quality.

Grow Your Own, Nevada! offered an eight-class session in spring and a four-class session in fall improving food security through home and small-scale production.

The Agriculture Innovation Forum Series provided practical information and expertise to agricultural producers and small-acreage owners.

The southern Nevada research center offered 30 hands-on classes reaching 160 homeowners and commercial clientele and two field trips serving 350 students

Extension, in partnership with the University of Idaho, held an irrigation workshop to help 25 Diamond Valley irrigators redesign irrigation infrastructure, implement irrigation scheduling, and use advanced irrigation technologies to conserve water and retain production.

Pest Management
Antibodies were developed for several neurotransmitters in Hornworms.

IPM-specific Weed Warriors Invasive Weed Training, educated 67 people who attended the two-day event.

2. Brief description of the target audience

Agricultural producers, homeowners, community gardeners, small-scale food production, green industry professionals, Master Gardeners, pesticide applicators, commercial landscape professionals, government officials, policymakers

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	32557	5048101	1569	0

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	2	44	46

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Undergraduate Students Involved in Research.

Year	Actual
2018	95

Output #2

Output Measure

- Number of Graduate Students or Post-Doctorates Trained.

Year	Actual
2018	41

Output #3

Output Measure

- Workshops, Demonstrations, and Presentations

Year	Actual
2018	350

Output #4

Output Measure

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

Year	Actual
2018	22

Output #5

Output Measure

- Brochures, Bulletins, Fact Sheets, Newsletter, and Surveys

Year	Actual
2018	13

Output #6

Output Measure

- Manuals and Other Printed Instructional Materials Produced

Year	Actual
2018	4

Output #7

Output Measure

- Digital Media and Web Sites Created or Updated

Year	Actual
2018	10

Output #8

Output Measure

- Leveraged research funds generated.

Year	Actual
2018	2828570

Output #9

Output Measure

- Databases, Models and Protocals

Year	Actual
2018	20

Output #10

Output Measure

- Germplasm

Year	Actual
2018	2

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of clientele who gain knowledge about improved human, plant, and animal management systems for sustainable agriculture.
2	Number of clientele who implement improved human, plant, and animal management systems for sustainable agriculture.
3	Advance research knowledge, both basic and applied, in the areas of production agriculture to existing and emerging industry and consumer demand regarding genetics, biology, seed production, nutrition, and related topics.
4	Grow Your Own, Nevada!
5	Urban Integrated Pest Management
6	Commercial Landscape Horticulture
7	Fruits and vegetables that grow well in Nevada's desert environments
8	Irrigation Efficiency and New Technologies

Outcome #1

1. Outcome Measures

Number of clientele who gain knowledge about improved human, plant, and animal management systems for sustainable agriculture.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Historically, Nevada has underused crop and livestock policies offered under the 2014 Farm Bill. Farmers and ranchers face five main areas of risk: legal, marketing, financial, human resources, and production risk. This program helps farmers and ranchers to know what policies and programs are available to help reduce their risk in each of the five main areas.

What has been done
The program's team worked with the U.S. Department of Agriculture's Risk Management Agency and insurance agents to create scenarios, advertise, and provide outreach on closing dates and insurance products available in Nevada. Each workshop, depending on the area and audience, combined insurance program information and scenarios with production and marketing information, and all business planning and marketing programs included the use of risk management tools. In 2018, there were 418 attendees at the seven Cattlemen's Update meetings, 32 at the Nevada Agriculture Outlook: Managing Ag Risk workshop, and 77 at the Nevada Cattlemen's Association Livestock Insurance Program. There were 826 students in the Risk Management Agency High School Education Program. Other, smaller programs were also offered.

Results
For the following three programs, participants indicated increases in knowledge and behavior in post-program evaluations and follow-up reporting:

Cattlemen's Update: 109 reported they would save over $900 because they attended the update; 184 planned to make changes based on the program.

Nevada Agriculture Outlook, Managing AG Risk results: 24 reported the workshop helped them

understand the impacts to Nevada based on changing federal policies and a new farm bill; 18 planned to make changes to their business.

Risk Management Agency High School Education: 100 students were taught the Youth Quality Beef Assurance program to qualify for 4-H and FFA projects;- 694 more students better understood the five areas of risk; 603 students understood agricultural risk in Nevada.

4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources
216	Integrated Pest Management Systems
307	Animal Management Systems
806	Youth Development
903	Communication, Education, and Information Delivery

Outcome #2

1. Outcome Measures

Number of clientele who implement improved human, plant, and animal management systems for sustainable agriculture.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nevada agricultural producers often contend with drought, and there are increasing demands for water for both urban expansion and environmental uses. Surface irrigation water supplies have been greatly reduced, and groundwater levels are dropping in many locations. Needs assessments have identified issues related to water quantity as the highest priority need for Nevada agricultural producers. Therefore, there is a need to identify, evaluate and commercialize crops that use less water than traditionally grown forage crops, such as alfalfa, while returning equal or higher economic returns than these forage crops, currently grown on over 90 percent of Nevada farmlands. The establishment of various applied research and demonstration trials is

critical to building the knowledge base regarding potential alternative crop production systems in Nevada.

What has been done
In 2017, in partnership with researchers from agricultural experiment station, the team planted in a field setting 10 teff varieties that had demonstrated the needed tolerance and resistance. These plots were harvested to determine grain yields, biomass and quality. In 2018 the data from these initial teff field trials was analyzed to identify the varieties best exhibiting drought tolerance and resistance to lodging in a field setting.

Results
The past few years, Extension has also worked to identify and get approval for effective pesticides to use on teff. Extension personnel helped the Nevada Department of Agriculture submit an emergency pesticide exemption request to the U.S. Environmental Protection Agency for permission to use a teff insecticide to combat outbreaks. During 2017, working closely with the Western Region IR-4 program personnel, a petition was submitted to the EPA requesting a supplemental label for the insecticide Prevathon, which was granted. This label allows Prevathon to be used on teff and quinoa fields until the end of 2019. Approximately 75 percent of Nevada teff acreage has been treated with Prevathon. A population studies on adult and larval armyworms in Churchill and Washoe Counties were completed in an attempt to develop an integrated pest management program for the primary insect pest of teff.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
216	Integrated Pest Management Systems

Outcome #3

1. Outcome Measures

Advance research knowledge, both basic and applied, in the areas of production agriculture to existing and emerging industry and consumer demand regarding genetics, biology, seed production, nutrition, and related topics.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Potato is the third most-consumed food crop in the world and one of the five most important crops in Nevada. It is estimated that climate change will result in up to 32% losses in US potato yields over the next 30 years unless measures are taken to improve plant tolerance to conditions like drought stress. About 18% of the potato crop is lost each year due to damage to potato tubers both during and after harvest and other post-harvest issues.

One of the major components of the potato skin is a complex polymer called suberin. Suberin is also produced as scab-like structures in potato wounds and some types of ?bruises?. In fact, all plants produce suberin to cover wounds. These scab-like structures and bruises make potatoes less desirable and marketable as food, with significant economic impacts for farmers and consumers alike.

Despite their significant protective roles, very little is known about how plants synthesize and assemble cutin and suberin. Even less is known about how plants make these polymers during stressful conditions such as drought. Virtually nothing is known about the genetics and biochemistry.

What has been done
Researchers have identified the first transcriptional regulators (gene transcription factors) of the wound healing process using the agronomically-relevant species Solanum tuberosum (common potato chip variety). The team determined that the gene expression level and Single Amino Acid Polymorphisms (SAAPs) in these transcription factors are likely major determinants of the differential wound-healing capacity and storage of life of these potatoes. Using chemical, biochemical, and physiological assays the team has basically demonstrated that these transcription factors regulate deposition of suberin that is not only ubiquitous throughout the plant kingdom but is also know to play critical roles in plant defense against the environment including wounding and associated desiccation and pathogen infection.

Results
Potato breeders at Michigan State University are utilizing Neavada's data on SAAPs to move good genes from the model plants to improved wound healing traits and resistance to rots into multiple potato varieties.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Grow Your Own, Nevada!

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	850

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A major area of program emphasis for Cooperative Extension is to "improve food security through home and small-scale production." Many communities (40 out of 687 census tracts) in Nevada are considered food deserts: they have limited access to fresh food. Many Nevadans desire to grow their own food to gain access to safe and healthy produce and to become more self-sufficient. A statewide needs assessment published by Extension in 2012 reported home and local food production as a top horticultural need and emerging trend for the state.

What has been done
Grow Your Own, Nevada! offered an eight-class session in spring and a four-class session in fall. Classes were held at the Washoe County Cooperative Extension office and offered via interactive video at Cooperative Extension offices throughout the state in nine other counties. Each class was two hours, and topics covered greenhouses and hoop houses, soils, integrated pest management (IPM), fruit tree selection and pruning, composting, pollinators, saving seeds, cover crops, and raised beds. Participants who attended all classes in a session received a USB flash drive containing gardening resources.

Results
Total attendance across both sessions in 2018 was 850. In a survey of the spring participants, the 510 respondents reported an average of a 60 percent gain in knowledge. In a survey of the fall participants, the 234 respondents reported an average of a 67 percent gain in knowledge.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
204	Plant Product Quality and Utility (Preharvest)

211 Insects, Mites, and Other Arthropods Affecting Plants
216 Integrated Pest Management Systems

Outcome #5

1. Outcome Measures

Urban Integrated Pest Management

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	6615

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Data from the National Water Quality Assessment Program published in 2006 revealed that the Truckee River had only one pesticide detected in water samples upstream from Reno-Sparks, but 10 compounds were detected downstream of the two cities, suggesting urban inputs to the pesticide load. Historically, studies have shown that homeowners use as much as 10 times more chemicals per acre on their lawns than farmers use on agricultural land. The goal is to train the green industry, Master Gardener volunteers and others who advise the public in pesticide safety practices to help the public improve their skills in selection, use and disposal of pesticides to minimize pesticide pollution of water.

What has been done
Master Gardeners (25 people completed the 60-hour training in 2018); the Commercial Horticulture Program (1418 people attended one of 10 trainings offered);the Grow Your Own, Nevada! and Bartley Ranch series of classes (with 1440 attendees in 2018); and, IPM-specific Weed Warriors Invasive Weed Training, educated 67 people who attended the two-day event.

Additional 2018 activities included: 18 articles on IPM-related topics published in Reno Gazette-Journal newspaper; 844,959 total website hits for two websites in 2018; 1,101 television public service announcements; and, 221 radio public service announcements.

Results
2018 Weed Warrior Invasive Weed Training attendees completed pre- and post- tests. Results include: 39 percent were able to identify six more noxious weeds than before the program; overall, participants showed a 23 percent perceived increase in knowledge; and, 94 percent of

participants said they intended to use the information they learned in the workshop in their weed control efforts.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
216	Integrated Pest Management Systems

Outcome #6

1. Outcome Measures

Commercial Landscape Horticulture

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Extension's 2012 statewide Horticulture Situational Analysis and the 2011 Comprehensive Regional Water Management Plan by the Northern Nevada Water Planning Commission cite the need for more professional education in the green industry. Surveys of those working in the green industry showed demand for short seminars, nursery worker training and continuing education opportunities for professional certification, all during the off-season or at noon. Topics deemed important included diagnosing plant problems, plant insects and diseases, plant identification, integrated pest management, weed management, soil fertility and plant nutrition, native plant landscaping, pruning, and pesticide certification/safety training.

In southern Nevada, the University of Nevada, Las Vegas received requests to offer a class on fundamentals of horticulture. In addition, the rapid growth of the Hispanic population created a

need for bilingual training related to landscape maintenance.

What has been done
Northern Nevada?s Green Industry Training Program had its eighth basic training series of eight classes for industry workers in 2018, with a total attendance of 68. Topics included plant diseases, weeds, soils, insects, landscapes, turfgrass, integrated pest management, pesticide safety and plant identification. Northern Nevada Extension also taught 12 advanced classes in 2018, with a total attendance of 324, for continuing education credits for certification and licensing, including four in English and Spanish. Some topics included pesticide safety, integrated pest management, hands-on pruning and planting techniques, and incorporating native plants into the landscape.

In addition, northern Nevada Cooperative Extension adopted a new program called Qualified Water Efficient Landscaper (QWEL), a training and certification program certified by the Environmental Protection Agency as a WaterSense program. The training consisted of 18 hours of classroom and hands-on training on water-efficiency in the landscape, including information on sustainable landscapes, soils, irrigation systems and irrigation auditing, troubleshooting and maintenance. Twenty professionals passed the exam to be QWEL certified in October.

Southern Nevada's Basic Principles of Landscape Management taught 420 commercial clients in 2018, including 85 Spanish speakers. Topics included pruning trees, integrated pest management and general landscaping.

Results
In northern Nevada, 68 people attended the Green Industry Training basic training series, with: Participants reporting an average increase in knowledge of 45 percent; 35 of 41 attendees who went on to take the Green Industry Training certification exam receiving a passing score of at least 70 percent.

27 green-industry professionals attended the Qualified Water Efficient Landscaper certification program, with: 19 of 21 attendees who went on to take the certification exam received a passing score of at least 75 percent; and, Participants had a 25 percent gain in confidence in capturing and retaining water on the landscape and utilizing irrigation systems for water efficiency.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
103	Management of Saline and Sodic Soils and Salinity
111	Conservation and Efficient Use of Water
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
216	Integrated Pest Management Systems

Outcome #7

1. Outcome Measures

Fruits and vegetables that grow well in Nevada's desert environments

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Most of the information about backyard and small-scale fruit growing comes from commercial orchard production in nondesert environments. High-quality backyard and small-scale fruit production must be planned and managed differently than traditional large commercial production. Available information about fruit growing for small-scale production in desert environments is very limited.

Urban dwellers have less space for fruit trees, less time to take care of them, and less time to process or preserve large amounts of food. Recent trends in food purchasing by consumers embrace organic or natural production techniques as well as local sources of fresh foods. There is more concern now with "carbon footprints" and global warming due to the long distances that food is transported from "farm to plate." The need for locally produced food products in southern Nevada is shown by the popularity of programs taught at the orchard and with other programs such as "Gardening in Small Spaces."

Cooperative Extension, Ag Experiment Station and the University of Nevada, Las Vegas established the Southern Nevada Research Center and Demonstration Orchard over 20 years ago to study edible plants that will grow well in desert environments.

What has been done
The orchard team has conducted trials; trained Extension faculty, staff and volunteers; and taught courses for school-age students, and for backyard and commercial producers. In 2018, trials conducted on 184 fruit tree varieties, four tomato varieties, goji berries and 15 vegetables. Three of the larger projects include the Hops Project, which is in its seventh year and testing eight varieties; the Table and Wine Grape Project, which is in its third year testing two grape varietals with six different rootstocks in partnership with University of California, Davis; and the Growing

Tomatoes in the Shade Project, which completed its second year.

At least 700 people visited the center to get produce or mulch. Thirty hands-on classes were offered reaching 160 adult students, 350 school age students visited the Youth Garden to learn about sustainable gardening practices through their field trip sessions, and 50 Boy Scouts of America volunteered.

Results
Overall impact was measured based on the 700 people who visited to purchase produce or learn. Results of the classes are included in the Commercial Horticulture, Master Gardener, Urban Integrated Pest Management, Nevada Naturalist, and Food Preservation and Security Program impact statements.

Other 2018 impacts include: Hops varieties were given to breweries for evaluation; 150+ pounds were donated to charitable groups; 500+ yards of organic recycled mulch were given to the public for free; and 1,250+ pounds of produce and 200 bare-root fruit trees grown at the center were sold to the public.

4. Associated Knowledge Areas

KA Code	Knowledge Area
103	Management of Saline and Sodic Soils and Salinity
111	Conservation and Efficient Use of Water
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
903	Communication, Education, and Information Delivery

Outcome #8

1. Outcome Measures

Irrigation Efficiency and New Technologies

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	25

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Nevada agricultural producers faced a record-breaking drought 2012-2016, and demands for water for both urban expansion and environmental uses are increasing. Surface irrigation water has been greatly reduced, and groundwater levels are dropping in many places. Needs assessments identified issues related to water quantity as the highest priority need for Nevada producers. Water is a limiting factor in relation to population growth, economic stability and expansion, and quality of life. In the town of Eureka and in the Diamond Valley, the decline of groundwater is especially problematic. In 2015, the Nevada Division of Water Resources state engineer designated the Diamond Valley Basin as a Critical Management Area (an area where annual groundwater replenishment fails to meet demand), which allows the engineer to restrict water use and require producers make a groundwater conservation plan. Diamond Valley is currently the first and only Critical Management Area in Nevada. In addition, in 2018, the State Water Engineer began requiring irrigators to install totalizing meters on all irrigation wells. The irrigators also passed a petition to adopt a water conservation plan and the Water Engineer adopted the plan, which will begin 2019.

What has been done

Extension, in partnership with the University of Idaho, held an irrigation workshop to help 25 Diamond Valley irrigators redesign irrigation infrastructure, implement irrigation scheduling, and use advanced irrigation technologies to conserve water and retain production. In addition, four producers signed up to share information and data that would assist future adaptors in the valley. The irrigators assistance program should see increased use in 2019 given the new regulatory requirements placed on irrigators and water use. Extension is also investigating soil health as a long-term practice to improve water efficiency and retain production capacities on lands that will either see significant reductions in irrigation or complete elimination of irrigation. Extension has also worked closely with the Agricultural Experiment Station to establish an Agricultural Research and Extension Station in Diamond Valley.

Results

Due to Extension's help applying for the Nevada Department of Agriculture Drought Initiative Grant in 2017, three farmers were successful in obtaining grants, and four pivots were refitted to Low Elevation Spray Application (LESA) systems, improving irrigation efficiency by 20 percent on each pivot.

Of the 25 participants in the Diamond Valley irrigation workshop, 13 participants completed an evaluation questionnaire. Their average rating of the usefulness of the workshop was 4 on a scale of 1 (least useful) to 5 (most useful). All 13 respondents indicated that they would implement some portion of the workshop information into their operation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
121	Management of Range Resources
204	Plant Product Quality and Utility (Preharvest)
903	Communication, Education, and Information Delivery

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 Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Cattle

• Due to the time spent to prepare facilities and IACUC approval, milk replacer studies will be conducted during the winter and will not evaluate the effects of warm and dry weather. The project will evaluate the response of diets that will be fed to calves during a cold and wet season.

Food & Forage Production

• Weeds are a serious threat to Camelina production because there are no appropriate herbicides available.
• Broadleaf weeds were prevalent and may have affected overall forage production of the grazing preference experiments.
• Determined that the published genomic sequences of sorghum used in the other Genomic-Wide Association studies are surprisingly poor in quality.
• The local economy in some Nevada counties is not back to normal, which means that people are interested in growing their own food to supplement the food they buy, thus boosting attendance in the Grow Your Our program.
• The Ag Innovation Forum program saw improvement as the economy improved. Participants were more willing to adapt some of the more expensive processes and ideas discussed at the forums.
• With the growing Hispanic and Middle-Eastern populations in Las Vegas, NV, Extension has needed to diversify cultural food offerings and adjust trainings accordingly to meet cultural differences.

Water

• One of the older ranches that has the oldest water rights in the valley was purchased a few years ago by out-of-area people. Over pumping since the late 1960s has diminished the ranch's spring flow. The new ranch owners sued farmers and ranchers of Diamond Valley and the Nevada Division of Water Resources state engineer for immediate curtailment and mitigation of the loss of their prior water right. As a result, the state engineer began working with farmers to create a groundwater conservation plan that allows them to curtail their water use back to Nevada's annual-perennial water yield. The Program Director/PI changed this past year. Grant funding for these types of capital/infrastructure

improvements is very limited and competitive. Additionally, the way grant funding is currently structured, larger farmers tend to have a competitive advantage, simply on scale, further challenging the small producers who really need the assistance.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Researchers have produced transgenic False Flax (aka Camelina) expressing a protein construct that improves carbon fixation in model plants (aka Arabidopsis) and soybean. This construct also improves the oil seed yield in soybean.

Researchers have also created transgenic Camelina with an oil quality more suitable for biofuels. This line is being further edited to make plants with less erucic acid (making seed meal unpalatable and possibly dangerous to livestock) and glucosinolates (imparts a bitter flavor). From this they have also developed a protocol to rapidly screen for increased oil content and reduced glucosinolates.

Post-harvest storage of potato work has identified molecular regulators involved in wound healing. Potato breeders at Michigan State University are utilizing the data to move good genes from model plants to improved wound healing traits and resistance to rots into multiple potato varieties.

Development of sorghum and pearl millet varieties best adapted to Nevada's growing condition were planted with over 200 cultivars (varieties).

Work on a chemical screening program to identify specific disruptors of insect hormones to be used as insecticides have developed antibodies that will attach to several neurotransmitters in model insects.

Plant Genetic Improvement team has created a database of post-translational modifications in plant systems allowing users to investigate quantitative post-translational modification data associated with their proteins of interest or examine post-translational modification data in the context of larger metabolic pathways to understand how abiotic stress potentially impacts plant metabolism at a systems level.

Key Items of Evaluation

Researchers have also created transgenic Camelina (aka, False Flax) with an oil quality more suitable for biofuels. As well developed a line of transgenics that has improved carbon fixation - translation, bigger plants with bigger seeds.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Climate Change, Natural Resource Management, and Environmental Science

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	0%		4%	
102	Soil, Plant, Water, Nutrient Relationships	0%		17%	
111	Conservation and Efficient Use of Water	15%		3%	
112	Watershed Protection and Management	0%		5%	
121	Management of Range Resources	27%		40%	
123	Management and Sustainability of Forest Resources	0%		15%	
132	Weather and Climate	9%		0%	
136	Conservation of Biological Diversity	0%		3%	
141	Air Resource Protection and Management	0%		3%	
211	Insects, Mites, and Other Arthropods Affecting Plants	0%		10%	
216	Integrated Pest Management Systems	18%		0%	
602	Business Management, Finance, and Taxation	5%		0%	
605	Natural Resource and Environmental Economics	21%		0%	
901	Program and Project Design, and Statistics	5%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	3.0	0.0
Actual Paid	2.0	0.0	3.8	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
151663	0	54918	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
151663	0	477642	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

Forestry
Predicting changes to Nevada's forest community stability under drought and ongoing climate change the team mapped and recorded tree and understory composition from high-elevation forests. Mapped climatic water deficit gradients in the Great Basin and overlay these with plant communities.

Hydrologic and vegetative response work to pinyon-juniper tree removal at the watershed scale is entering phase 2. Rainfall simulations on big sagebrush were completed, along with data collection on tree mastication and age determination. Several areas still continue from phase 1 like ground water measurements, soil erosion and annual green-up date collection.

In order to reconstruct the past climate for Nevada and US's arid lands the development of the project's geodatabase was assembled from tree ring width data, Nevada's climate dataset, 30 meter Landsat images and National Elevation Dataset.

Water
Hydrologists quantified the response of Sierra snowpack dynamics and streamflow partitioning to short and long-term climate variations. The team quantify short-lived, ephemeral snowpacks and their variation with climate and topography. They then overlaid the effects changing ephemeral snowpacks onto vegetation maps to show which watersheds are most at risk for change.

Rangeland Management
County level locations were measured for vegetation in both the spring and fall prior to grazing and mowing treatments. Seed bank studies were completed along with post-fire vegetation measurements. Numerous workshops on post-fire grazing and state-and-transition models were held for agencies and private landowners on the utility of STMs for land management.

The greenhouse gas study obtained annual estimates of soil methane flux in five Great Basin ecosystem types arranged across an elevation gradient in central Nevada. They also performed laboratory experiments designed to identify the physical and chemical controls over methane flux in arid and semiarid soils.

The Range Management Education team finished revising the Nevada Rangeland Monitoring Handbook, taught two sagebrush ecology modules at the Nevada Youth Range Camp and taught at least eight other

workshops that provided input toward vegetation management issues on rangelands throughout Nevada and in southeast Oregon.

Creeks and Communities team taught classes and workshops across the state; wrote and distributed articles and publications; and collaborated with landowners, public land users, and public interest groups and agencies to help steer riparian management plans, policies and work.

Wildlife and Associated Habitat
Assessment the soil carbon stocks, vegetation composition, and forage available for sage-grouse in degraded conditions and under different restoration conditions began this year.

The four-day Eagles & Agriculture event included live birds, ranch and bus tours, photography workshops, a nature hike, and a photo contest.

Wildfire
Developed and distributed educational materials, organized and conducted community workshops, promoted wildfire-threat-reduction techniques at community events, maintained two websites, provided educational programming support.

2. Brief description of the target audience

The target audience includes water managers, emergency planners, scientific agencies, general public, biochemists, molecular biologists, chemical ecologists involved in insect pest management, livestock producers, domestic and foreign agency resource management staff

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	19389	797817	3461	0

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	1	68	69

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Graduate Students or Post-Doctorates Trained

Year	Actual
2018	64

Output #2

Output Measure

- Number of Undergraduate Students Involved in Research

Year	Actual
2018	143

Output #3

Output Measure

- Workshops, Demonstrations, and Presentations

Year	Actual
2018	204

Output #4

Output Measure

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

Year	Actual
2018	34

Output #5

Output Measure

- Brochures, Bulletins, Fact Sheets, Newsletter, and Surveys

Year	Actual
2018	9

Output #6

Output Measure

- Manuals and Other Printed Instructional Materials Produced

Year	Actual
2018	2

Output #7

Output Measure

- Digital Media and Web Sites Created or Updated

Year	Actual
2018	10

Output #8

Output Measure

- Leveraged research funds generated

Year	Actual
2018	6775757

Output #9

Output Measure

- Databases, Models and Protocols

Year	Actual
2018	18

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of individuals who gain knowledge about improved human, plant, and animal management systems that relate to climate change and/or natural resource use.
2	Number of clientele who implement improved human, plant, and animal management systems as related to climate change and/or natural resource use.
3	In conjunction with companion agencies and organizations, advance research in rangeland and forest management and ecology to promote advances in best management practices
4	Reduce ecological losses due to wildfires and invasive weeds that destabilize the health of Nevada's rangelands
5	Meet federal and state needs for research data related to Nevada ecosystems as the demand arises.
6	Advance research knowledge, both basic and applied, in the areas of rangeland and forest management to existing and emerging industry and consumer demand regarding genetics, biology, seed production, nutrition, and related topics.
7	Meet local groups, community, USDA, USDI, and other stakeholder demands for scientific knowledge to inform existing and emerging issues/practices in wildlife including wildlife health, human wildlife use/conflicts, and human to human conflicts related to wildlife and use.
8	Living With Fire
9	Nevada Youth Range Camp

Outcome #1

1. Outcome Measures

Number of individuals who gain knowledge about improved human, plant, and animal management systems that relate to climate change and/or natural resource use.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Management of large-scale river systems in the Western United States has taken on critical importance in the last decades due to increasing and diverse demands for water use, urban population growth, and variable water supplies. Arid river systems in the Great Basin, such as the Truckee-Carson River System, that depend on spring snowmelt to supply water for agriculture, urban communities and natural resource protection, are expected to be impacted significantly by climate change.

Since 2014, Ag Experiment Station, Cooperative Extension, Desert Research Institute and the U.S. Geologic Survey, worked with the Water For the Seasons Stakeholder Affiliate Group (12 local water managers who serve as key informants and represent diverse water-use communities that rely on the river system) to study the Truckee-Carson River System's climate resiliency and adaptation for land dependent on snowmelt for water in the Western U.S. The team met semi-annually with the stakeholders to assess local water supply challenges, discuss climate implications for water management and get input on adaptation strategies. The team then used hypothetical scenarios to test stakeholder's current climate adaptation strategies, created models to show how hypothetical climate conditions affect stream flows, and simulated strategies developed by the collaboration between the researchers and stakeholders. Results were presented to stakeholders at biannual workshops. Each year, models and simulations were refined to address the needs of the river stakeholders.

What has been done
In 2018, there were 12 phone interviews with stakeholders and one workshop. Faculty, post-doctoral fellows and graduate student researchers published two journal articles, one book chapter, one dissertation, two fact sheets and one annual impact report; and gave 11 presentations at national and international professional meetings. In February, there was a

Stakeholder Affiliate Group workshop attended by 24 stakeholders and 16 researchers.

Results

Student, post-doctoral fellows, faculty and local water managers increased their awareness of adaptation options to address water scarcity issues. Workshops provided opportunities to exchange information, establish relationships, build trust in the research process and findings, and support social learning around climate resiliency and adaptation. Workshop evaluations indicate that Stakeholder Affiliate Group members who are strengthening working relationships with project scientists, improving coordination with other stakeholders, and following the project are more likely to continue working with other stakeholders to increase climate resiliency. Members also reported that they now better understand current climate resiliency of the river system, and the impacts of prolonged drought and warming temperatures. As a result, they are improving their respective adaptation planning and water management operations to enhance resilience.

Analyses in 2018 provide evidence supporting the potential benefits of relaxing institutional water management regimes to adapt to a changing climate. Preliminary econometric analyses examining the efficiency of prior appropriation-based water management institutions governing the river system show that water right transfers occur over time to match agricultural lands with more senior water rights. Results also show that, when comparing water rights that remain on initial places of use with relocated water rights, relocating water rights improves the efficiency of water allocation where the manner of use (agriculture) remains the same. Thus, analyses show permitted water rights transfers can contribute to water allocation efficiency.

Hydrologic and operations modeling activities continue to evaluate the implications of stakeholder-informed climate scenarios on river system function. Low- and high-frequency climate scenarios were developed to explore how interannual precipitation variability affects groundwater and surface water supply, and subsequently water users across the Truckee and Carson River Basins. These scenarios include increasing winter temperatures, resulting in more rain than snow. Preliminary hydrologic modeling suggests the overwhelming effect of warming on the timing of snowmelt and streamflows. Researchers continue to explore the implications in terms of water management. Researchers continue to explore viable adaptation strategies, including managed aquifer recharge in the Carson Valley to mitigate timing impacts and enhance groundwater sustainability. Local stakeholder knowledge has been instrumental to evaluate the on-the-ground potential and improve model parameterization.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
605	Natural Resource and Environmental Economics
901	Program and Project Design, and Statistics

Outcome #2

1. Outcome Measures

Number of clientele who implement improved human, plant, and animal management systems as related to climate change and/or natural resource use.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The wildfire threat to Nevada communities is significant and increasing, with wildfires burning a total of 1,007,036 acres in Nevada in 2018. Key to reducing this threat is an aware and proactive public who implement the necessary pre-fire activities, those actions that improve house survivability during wildfire. In Nevada, there is a diverse group of entities who have a role in promoting wildfire awareness and assisting in the adoption of pre-fire activities, including homeowners, firefighting organizations, elected officials, schools, Cooperative Extension, landscape management professionals, community leaders and others. Cooperative Extension's Living With Fire Program established Nevada Wildfire Awareness Week/Month as a means to expand the education program and launch a coordinated, statewide wildfire awareness campaign each year. The efforts are continued throughout the year.

Nevada Wildfire Awareness Month began as a week-long statewide effort in 2005 and expanded in 2014 to the entire month of May. It's a collaborative effort coordinated by Cooperative Extension?s Living With Fire Program, with participation by program partners including local, state and federal firefighting agencies and many others. Activities are designed to build awareness and encourage homeowners to take action to reduce the wildfire threat. The 2018 message, communicated at events and via a coordinated marketing campaign, was "Prepare Now! Wildfire Knows No Season." This emphasized that wildfire can threaten Nevadan communities any time of the year and focused on the importance of preparing for wildfire throughout the year.

What has been done
A total of 11,930 people attended one or more of the 196 events, and marketing efforts extended into all 17 Nevada counties. 10 other states joined Nevada in securing a multi-state proclamation in observance of Wildfire Awareness Month. 13 proclamations were issued, including 11 from Nevada counties and one from a fire protection district.

Results
177 households followed the recommendation of the sponsors and removed all juniper bushes from around their homes. Amounting to over 374 truckloads of flammable materials removed. Also, 176 runners participated in the Nevada Wildfire Fire Awareness Multi-hour Trail Run, which raised $5,823.40 for the Nevada L.A.S.T. (Local Assistance State Team) Program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #3

1. Outcome Measures

In conjunction with companion agencies and organizations, advance research in rangeland and forest management and ecology to promote advances in best management practices

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	236

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Many livestock producers, domestic and foreign agency resource management staff and administrators, policy developers, land managers, and other individuals and organizations interested in rangeland resources have insufficient knowledge about the concepts of plant growth, plant response to grazing, ecological site potential, the processes of vegetation change, and the role and effect of fire and other disturbances on Great Basin rangelands. Management decisions that do not incorporate the full research base can adversely affect the range livestock industry, a suite of wildlife species, other resource attributes, and local economies that depend upon access to federally administered rangelands. Many rangeland resource decisions occur at the field office or higher administrative levels; therefore, significant portions of educational components need to be directed toward management efforts that occur at that level.

What has been done
The program's faculty and staff finished revising the Nevada Rangeland Monitoring Handbook, taught two sagebrush ecology modules at the Nevada Youth Range Camp, and taught at least

eight other workshops that provided input toward vegetation management issues on rangelands throughout Nevada and in southeast Oregon. Additional efforts included at least 20 meetings, field days or field tours, and at least four conference presentations. Across these activities, eight formal education presentations were provided to at least 485 students. Topics included sage-grouse habitat requirements; interactions of sage grouse and wild horses on meadows; plant growth, development, physiology and grazing; statistical aspects of rangeland monitoring; and differentiation between degraded sagebrush sites and annual grasslands with sagebrush.

Faculty and staff provided input on the Great Basin Fire Science Delivery Project's new proposal and co-led a field workshop about the resistance and resilience of sagebrush rangelands to disturbance, particularly fire. In addition, Extension assisted Oregon State University Extension with preparation and submission of a multistate (Oregon, Nevada, and Idaho) proposal to address invasive annual grasses with dormant season livestock grazing. Work continued for rephotographing hundreds of historic photos on the Santa Rosa Range District.

Faculty and staff also completed a statewide Forage Production/Loss Assessment (excluding Clark County) for the U.S. Farm Services Agency using precipitation data from about over 70 National Oceanic and Atmospheric Administration affiliated sites, 21 Snow Telemetry locations and flow data from U.S. Geologic Survey stream gages. The agency uses this report to determine eligibility for insurance payments.

Results

Participants who completed a survey rated the resistance and resilience workshop an average of 4.2 on a scale where 5 is excellent. The 17 respondents strongly agreed they learned new material, had a better understanding of the concepts for sagebrush rangelands, and could apply what they learned, rating all evaluation questions at 4.6 of 5. Most also stated they met new professional with whom they could stay in touch. Statements about what they liked best at the workshop included: great information; all instructors provided great insight; learning about a field I know little about; understanding fire severity better; and the conversations and discussions.

Participants in the grazing response index workshops stated they now have a better understanding for how to use this assessment tool, have a better understanding of factors that lead to improper grazing (time of year, duration of grazing, frequency of defoliation, and short recovery periods).

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Reduce ecological losses due to wildfires and invasive weeds that destabilize the health of Nevada's rangelands

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Wildfires burning in plant communities invaded or dominated by cheatgrass and other annual invasive weeds can be difficult and costly to control, making fuels management desirable. Much of the acres burned in 2012 were federally managed by the Bureau of Land Management or Forest Service. The permittees that graze livestock on these public lands will likely lose their ability to graze for at least the next two years, under the premise that bunchgrasses need rest from grazing to survive and recover after fire. Rangelands that have been invaded by cheatgrass may have marginal perennial bunchgrass response due to subsequent competition with annual invasive weeds. However, cheatgrass will continue to grow each year and increase the fine fuel load; which after two years could easily prime these burned and rested lands for another catastrophic wildfire.

This project tests the vegetative response of post-burn plant communities to different grazing treatments at the disturbance response group (DRG) level. A DRG is a group of ecological sites that respond similarly to disturbance, although the rate of change or recovery may vary between sites. DRGs bring ecologically based management to a scale relevant for land managers. This project also parameterized the state-and-transition model developed for each selected DRG.

What has been done
State-and-transition models for the Loamy 8-10 and the Claypan 12-14 were updated using results from this project. Burned/unburned vegetation data was collected in June 2018 to characterize the ecosystem on the Squaw Valley Ranch sites before and after the area burned in 2012. A seed bank study was completed from the plots in McDermitt to determine if 3 years of grazing/mowing treatments were significantly influencing the seedbank.

Results

Numerous workshops on post-fire grazing and state-and-transition models were held for agencies and private landowners have led to increased opportunities for training on the utility of state-and-transition models for land management. Collaboration among Oregon State Extension, University Nevada Cooperative Extension, USDA Agricultural Research Service, Bureau of Land Management, private land owners, and University of Nevada, Reno has benefited from this project. Additionally, awareness of the rangeland management research activities at UNR by private land ranchers and other stakeholders has increased significantly.

Work conducted at UNR has led to the National Bureau of Land management initiative on targeted grazing for cheatgrass management (Secretarial Order 3336, Section 6 Rangeland Task Force). BLM is also writing a state-wide Environmental Assessment based upon this work. DOI is now allocating funds to develop state-and-transition models across Nevada and some areas of Oregon.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
121	Management of Range Resources
136	Conservation of Biological Diversity

Outcome #5

1. Outcome Measures

Meet federal and state needs for research data related to Nevada ecosystems as the demand arises.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	250

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As the most biologically diverse and the most frequently overused component of Nevada rangelands, riparian areas have attracted a great deal of management attention. Different groups,

such as ranchers, recreationalists and federal agencies, have varying uses for the areas, which leads to a considerable need for educating and focusing people on proper management to allow the continued diversity of uses while preserving the areas. Generally, if riparian areas function properly, all land users benefit, and this provides a great opportunity for teaching about riparian restoration, including enhancement of water quality, habitat for listed or important species, forage for livestock, and water for agriculture. Repeatedly, riparian management is identified as a top need in natural resource-oriented needs assessments, especially in northern Nevada.

What has been done
The Creeks and Communities Team taught classes and workshops; worked with landowners, public land users, and public interest groups and agencies. Activities include: taught three two-day Riparian Proper Functioning Condition Assessment for Integrated Riparian Management courses, one in Carson City, one in Battle Mountain and one in Susanville, California; taught one one-day and one four-day Stockmanship class in partnership with the National Riparian Service Team and the Nevada Department of Agriculture; taught a three-day riparian grazing management class; worked with Environmental Protection Agency scientists from the Las Vegas Office of Research and development on the use of riparian proper functioning condition assessments; continued work on pond and plug meadow restoration projects; proposed the use of Riparian Multiple Indicator Monitoring to study the response of riparian areas after wildfire; and worked with the Shoesole Holistic Management Team to incorporate riparian proper functioning condition concepts into their land management work. Efforts extended to Stewardship Alliance of Northeast Elko, Nevada.

Results
The Environmental Protection Agency has embraced Proper Functioning Condition as a fundamentally useful tool for improving water quality and has taught Proper Functioning Condition to tribes in California and Arizona and hosted regional Proper Functioning Condition class in Las Vegas. The work of the Shoesole Holistic Management Team and the work of Carol Evans, BLM Elko fish biologist and active Team member, have been highlighted by several national awards.

Students of the Battle Mountain class rated the following questions on a scale of 1 (disagree) to 5 (agree). Average scores were: 4.48 for the workshop increased my knowledge of this topic; 4.24 for this workshop was worth my time; and 4.67 for I plan to use information learned at this workshop

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
136	Conservation of Biological Diversity

Outcome #6

1. Outcome Measures

Advance research knowledge, both basic and applied, in the areas of rangeland and forest management to existing and emerging industry and consumer demand regarding genetics, biology, seed production, nutrition, and related topics.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
605	Natural Resource and Environmental Economics

Outcome #7

1. Outcome Measures

Meet local groups, community, USDA, USDI, and other stakeholder demands for scientific knowledge to inform existing and emerging issues/practices in wildlife including wildlife health, human wildlife use/conflicts, and human to human conflicts related to wildlife and use.

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Living With Fire

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
One of Nevada's most pressing natural resource issues is the threat of wildfire to human life and property. During the 1990s, more acres burned in Nevada than in the previous 40 years combined. Much of Nevada is considered a high-wildfire-hazard environment, possessing all the ingredients necessary to support intense, uncontrollable wildfires. And within this environment, are homes, subdivisions and entire communities. Unfortunately, many homeowners are not prepared for their homes to survive wildfire. Research indicates that pre-fire activities performed by the homeowner, such as creating defensible space, removing debris from rain gutters, and screening vents, significantly improve home survivability. Prior to the Living With Fire Program, there was no organized effort to teach Nevadans how to reduce the wildfire threat. Consequently, it was unlikely that they would implement the practices necessary to reduce this threat to their families, properties and communities.

What has been done
Program activities in 2018 included: distributed 11,543 copies of 19 different publications; 21,939 online visits to view 42 different publications and educational tools, including nine to Spanish-language publications; granted permission to 3 entities from 3 states to use program materials;

presented exhibits at 9 events; presented The Ember House and Juniper Toss youth activities at 10 events, resulting in 1,813 direct contacts; conducted four radio interviews and three television interviews; delivered 14 wildfire-threat-reduction presentations to 537 individuals; and collaborated with 220 entities.

Results
Program materials and social media have been used in 25 other states and in 25 countries. Of the 54 participants who submitted a post-conference evaluation: 96 percent reported having a better understanding of a Community Wildifre Protection Plan; 98 percent reported having a better understanding of Fire Adapted Communities; and 65 planned to take some form of action as result of attending the event.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
132	Weather and Climate

Outcome #9

1. Outcome Measures

Nevada Youth Range Camp

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	210

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A needs assessment performed by Cooperative Extension in 2001 indicated that the public places very high importance on natural resources education for youth. However, most of Nevada's youth live in large urban environments, with little exposure to rangelands, forests or agricultural environments, and the products and services rangelands provide. Limited exposure to

these environments suggests that Nevada?s youth are increasingly less likely to seek education, careers or experiences in natural resources, particularly on rangelands common in the Western U.S. In addition, the number of people with knowledge about rangeland resource issues is declining; yet national law, regulation and policy seek public input toward the management of rangeland resources.

What has been done

Nevada Youth Range Camp was developed in response to and with input from stakeholders, and has been offered for 58 years, teaching over 1,500 students. In 2018, 25 campers from eight Nevada counties were taught using a curriculum emphasizing plant identification; ecology and management of sagebrush, pinyon/juniper, and stream ecosystems; soils; and wildlife habitats. They also learned map and compass use; toured a ranch; did a conservation project; hiked to a Natural Resources and Conservation Service weather station for predicting snowmelt runoff; simulated coordinated resource management and planning; and engaged in other learning and activities, including hiking, volleyball, horseshoes, campfires and photography.

Results

Each year, camp participants submit a written evaluation at the end of the week that specifically asks campers to rate questions from 1 (poor) to 5 (excellent) about each of the instructional modules and the overall camp experience, as well as answer open-ended questions about what knowledge they gained. The written evaluations are read, then given back to the campers. In 2018, all 25 campers indicated gains in knowledge and rated the overall camp experience as 4.64. The average of individual session ratings was 4.37. Several campers have attended the University of Nevada, Reno's College of Agriculture or other universities in the western United States and pursued careers in natural resources management. Some have gone on to hold positions of leadership in agencies or own or manage ranches. Some report that Range Camp was a life-changing event.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
121	Management of Range Resources

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 Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Forestry

- Ability to sample field sites are being hindered due to private property restrictions.
- Cone crops and subsequent ripening may limit our ability to quantify seed traits and viability. The team is working with the USFS to secure seed from other sources, but this seed is unlikely to match our field site locations.
- The extremely wet year of 2018 created very difficult and at time impossible conditions for riparian monitoring.
- The Eagles & Ag program saw a drop in attendance because eagles are migrating earlier in the season. They previously migrated through during Carson Valley's calving season, but now they're passing through before calving season.

Rangelands

- Reductions in staff due to retirements and unexpected death slowed the process of performing research and updating the curriculum for the Range Management School.
- Public lands and range management issues compete for resources and attention.

Water

- Since the "Water For The Seasons" program is driven by the observations of water managers, when weather affects the amount of available water, economic research focuses on what the water managers need help with.
- U.S. Fish and Wildlife Service transferred money to the Nevada Bureau of Land Management for a riparian wild horse research project that will be overseen by the Riparian PI. The funding was going to be administered through the existing partnership with the Nevada Bureau; however, due to Bureau of Land Management policy changes, the money needed to be vetted by the Washington, D.C. office of the Bureau before being applied, which caused a delay in funding.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Hydrologists quantifying the response of Sierra snowpack dynamics and streamflow partitioning to short and long-term climate variations have found important linkages in the role of humidity variation in controlling snowmelt.

Hydrologic and vegetative response work to pinyon-juniper tree removal at the watershed scale has successfully leveraged phase I data into a second phase.

Genomics work on small mammals has been leveraged into a $2M grant from NSF to study the genomics that underlies toxin tolerance. The team has also establishing a captive woodrat population, and establishing our microbiome sequencing protocols.

A database was created that contains all locations, of radio-tagged sage-grouse marked in northern Nevada hand been made publicly available. Population dynamics studies are also being used by Nature Conservancy and Barick Mining to prioritize area for wildlife mitigation.

Bureau of Land management is writing a Environmental Assessment state wide based upon State-and-Transition models developed to better understand the condition in which rangelands is placed.

Key Items of Evaluation

Work conducted at UNR has lead to the National Bureau of Land management initiative on targeted grazing for cheatgrass management. That is, Secretarial Order 3336, Section 6 Rangeland Task Force.
DOI is looking at funding the State-And-Transition effort across Nevada and some areas of Oregon.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Sustainable Energy

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		19%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		38%	
204	Plant Product Quality and Utility (Preharvest)	0%		18%	
702	Requirements and Function of Nutrients and Other Food Components	0%		25%	
	Total	0%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.0	0.0
Actual Paid	0.0	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.4	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	315796	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	316535	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

Kosma lab has provided the first, most in-depth characterization of the cuticle of the extremely drought tolerant prickly pear species Opuntia ficus-indica.

Evaluation on the field performance of prickly pear cactus (Opuntia ficus-indica) and two related species) under three different irrigation regimes is in its fourth year. New information about the effect of irrigation levels on Prickly Pear Cactus (Opuntia) biomass or fruit production in a field setting in the U.S. was gathered. Information about the selection of the best species or cultivars of Opuntia to use for biomass and fruit production was also been gained.

2. Brief description of the target audience

Target audiences include scientists, agricultural producers, general public, citizen and special interest groups, related industries, and federal, state, and local government agencies.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	1	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Graduate Students or Post-Doctorates Trained

Year	Actual
2018	4

Output #2

Output Measure

- Number of Undergraduate Students Involved in Research

Year	Actual
2018	5

Output #3

Output Measure

- Workshops, Demonstrations, and Presentations

Year	Actual
2018	3

Output #4

Output Measure

- Abstracts, Books, Book Chapter(s), Proceedings, Research Reports, and Technical Publications
  Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Brochures, Bulletins, Fact Sheets, Newsletter, and Surveys
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

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

Output #7

Output Measure

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

Output #8

Output Measure

- Leveraged research funds generated

Year	Actual
2018	1000000

Output #9

Output Measure

- Databases, Models and Protocals

Year	Actual
2018	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of individuals who gain knowledge about sustainable energy and environmentally responsible lifestyles.
2	Number of individuals who implement practices related to or in support of sustainable energy and environmentally responsible lifestyles and practices.
3	Programs in this area will develop strategies to engage producers, industrial partners, and consumers groups resulting in effective leadership-oriented partnerships.
4	Annually the program will report, in conjunction with industrial partners, non-proprietary research gains made to the consuming public to garner interest in adoption of new products and processes when released.
5	Increased understanding of energy alternatives, resources and project support.

Outcome #1

1. **Outcome Measures**

Number of individuals who gain knowledge about sustainable energy and environmentally responsible lifestyles.

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Number of individuals who implement practices related to or in support of sustainable energy and environmentally responsible lifestyles and practices.

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Programs in this area will develop strategies to engage producers, industrial partners, and consumers groups resulting in effective leadership-oriented partnerships.

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Annually the program will report, in conjunction with industrial partners, non-proprietary research gains made to the consuming public to garner interest in adoption of new products and processes when released.

Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

Increased understanding of energy alternatives, resources and project support.

Not Reporting on this Outcome Measure

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 Public priorities
- Competing Programmatic Challenges

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Kosma lab has provided the first, most in-depth characterization of the cuticle of the extremely drought tolerant prickly pear species Opuntia ficus-indica.

Completion of the genome sequencing of the common or crystalline ice plant (Mesembryanthemum crystallinum) to be incorporated into food and forage crops to improve drought tolerance.

Genetically engineering of tissue succulence in a model plant (Arabidopsis).

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Childhood Obesity and Human Health

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
501	New and Improved Food Processing Technologies	8%		0%	
702	Requirements and Function of Nutrients and Other Food Components	0%		100%	
703	Nutrition Education and Behavior	50%		0%	
724	Healthy Lifestyle	30%		0%	
802	Human Development and Family Well-Being	12%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	1.1	0.0	0.5	0.0
Actual Paid	2.5	0.0	0.1	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
109271	0	57055	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
109271	0	40925	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

Work into anti-inflammatory/tumor cell growth through the use of emodin (a naturally occurring chemical found in rhubarb and aloe vera) has continued. With work specially focused on inhibiting the HDAC enzyme and reducing swelling in heart cells. The team is also creating molecular models through a process of sequencing RNA (a mirror of DNA used to make proteins) to show a global effect on heart cell genetic material.

During the 2017-2018 school year, 1,007 students participated in the Veggies for Kids Program at 13 elementary school statewide. In addition, six four-day summer institutes were held, incorporating the educational themes of Veggies for Kids.

EFNEP Eating Smart Being Active program was delivered to 359 people at 20 sites, including Las Vegas, Henderson, Moapa Valley and Mesquite, and was delivered in both English and Spanish.

2. Brief description of the target audience

Children, low-income families, rural communities, seniors with disabilities and SNAP (Supplemental Nutrition Assistance Program)-eligible adults.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	5994	4072	2777	0

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	10	10

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Graduate Students or Post-Doctorates Trained

Year	Actual
2018	12

Output #2

Output Measure

- Number of Undergraduate Students Involved in Research

Year	Actual
2018	28

Output #3

Output Measure

- Workshops, Demonstrations, and Presentations

Year	Actual
2018	61

Output #4

Output Measure

- Abstracts, Books, Book Chapter(s), Proceedings, Research Reports, and Technical Publications
  Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Brochures, Bulletins, Fact Sheets, Newsletter, and Surveys
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Manuals and Other Printed Instructional Materials Produced

Year	Actual
2018	1

Output #7

Output Measure

- Digital Media and Web Sites Created or Updated

Year	Actual
2018	3

Output #8

Output Measure

- Leveraged research funds generated

Year	Actual
2018	757292

Output #9

Output Measure

- Databases, Models and Protocols

Year	Actual
2018	2

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of individuals who gain knowledge about nutrition and health.
2	Number of individuals who implement behaviors to improve health and nutrition.
3	Apply new knowledge to programs at the field level with a goal of significant long term weight loss and overall improvement of health in those who participate.
4	To identify research activities such as new data sources, improved techniques for data analysis, and improved hypotheses for obesity research questions.

Outcome #1

1. Outcome Measures

Number of individuals who gain knowledge about nutrition and health.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Children and senior citizens are below the national average in eating the daily recommended amounts of fruits and vegetables, increasing the risk of obesity and related chronic diseases. Efforts to boost fruit and vegetable consumption in the U.S. population have generally been unsuccessful, possibly due to the limited access to and affordability of fruits and vegetables. According to the U.S. Census, 24 percent of the Mineral County population is 65 years and older, and 18 percent of the population is under 18. The per capita income in Mineral County is $22,257. There is limited access to fresh fruits and vegetables with one small supermarket located in the town of Hawthorne. Public programs in Mineral County, such as the Women, Infant, and Children (WIC) and the Senior Farmers Market Nutrition Programs, are provided by the nonprofit Consolidated Agencies for Human Services and the senior center.

What has been done
During the 2017-2018 school year, 1,007 students participated in the Veggies for Kids Program at 13 elementary school statewide. In addition, six four-day summer institutes were held, incorporating the educational themes of Veggies for Kids. The institutes taught children how to plant, grow and care for their own homegrown vegetables, as well as about eating healthy, drinking water and being physically active. Children planted starter seeds and took their plants home at the end of the week.

The Veggies for Kids Program team submitted a kindergarten-grade-level Veggies for Kids curriculum for peer review.

The Veggies for Seniors Program served seniors with disabilities in all townships within Mineral County, which include Mina, Luning, Hawthorne, Walker Lake and Schurz. Seniors had 13 weeks of vegetables, and a turkey or ham for Christmas delivered to their home.

Results
For Veggies for Seniors, 32 seniors reported that because of their involvement with the program: their access to fresh fruits and vegetables increased; their eating habits improved; their health improved; their health care costs decreased; their quality of life improved.

Measurable increases were seen in the recognition and taste of vegetables presented during the program. Differences between pre- and post-test scores for identifying MyPlate food groups were: 66 percent increase for naming fruits; 66 percent increase for naming vegetables; 66 percent increase for naming dairy; 55 percent increase of naming protein; 52 percent increase for naming grains.

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #2

1. Outcome Measures

Number of individuals who implement behaviors to improve health and nutrition.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Food insecurity exists when the availability of nutritious and safe foods OR the ability to acquire those foods in an acceptable manner is limited or uncertain. In 2016, an estimated 12.7% of Nevada residents were food insecure, with about 12.8% of Clark County residents being food insecure. In Clark County that amounts to about 264,000 people.

Statistics from the Feeding America Survey indicate that more than half of food-insecure adults choose between food and things such as utilities, transportation, medical care and housing. Many of them also sell or pawn personal property, and receive help from friends or family. And, in an effort to stretch their dollars further, 40 percent of them water down food or drinks, and more than three-quarters of them end up purchase unhealthy, inexpensive food.

What has been done
Food insecurity is being addressed in Clark County in many ways. Extension is coordinating efforts with several partners and is delivering many programs, including the EFNEP Eating Smart Being Active program. The nine-lesson curriculum for adults provides education on diet quality, physical activity, food resource management, food safety and food security to boost nutrition through building basic skills. Participants learn cooking skills, how to read food labels, save money on groceries, plan meals, safely handle food, make healthy food choices, and be more active. Each lesson is 90 to 120 minutes long. In 2018, it was delivered to 359 people at 20 sites, including Las Vegas, Henderson, Moapa Valley and Mesquite, and was delivered in both English and Spanish.

Results
In Moapa Valley and Mesquite, the 14 participants showed significant improvement in many behaviors, including drinking fewer sugar-sweetened beverages, eating fewer refined grains, eating more than one kind of fruit, and eating more than one kind of vegetable. In the other 18 Clark County locations, in Henderson and Las Vegas, 216 of the 345 participants participated in the evaluation, and showed similar progress using average calculations, including: whole grain consumption increased from 0.86 to 1.48 servings per day; fruit intake increased from 1.6 to 1.9 servings per day; the number of days participants exercised for at least 30 minutes each week increased from 3.3 to 5.0; and the number of days participants did strengthening exercises each week increased from 2.3 to 3.7

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

Apply new knowledge to programs at the field level with a goal of significant long term weight loss and overall improvement of health in those who participate.

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

To identify research activities such as new data sources, improved techniques for data analysis, and improved hypotheses for obesity research questions.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (Grant availability)

Brief Explanation

The Veggies for Kids program is only allowed to work with low-income SNAP-Ed participants, and can only partner with schools where more than 50 percent of students receive free or reduced lunches.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The Veggies for Kids & Seniors helped over 1,000 participants.

The Eat Smart Being Active program severed over 350 people who show improvement in everything from reduced intake of sugary drinks, to including whole grains into their daily diet, to increasing the number of days of they exercised.

Key Items of Evaluation

The Veggies for Seniors program is helping by: their access to fresh fruits and vegetables increased; their eating habits improved; their health improved; their health care costs decreased; and their quality of life improved.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Food Safety

☐ Reporting on this Program

Reason for not reporting

Currently no faculty working in the field of food safety that are funded through Hatch or Smith-Lever accounts.

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	0.2	0.0
Actual Paid	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Volunteer	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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

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

V(D). Planned Program (Activity)

1. Brief description of the Activity

2. Brief description of the target audience

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2018

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	{No Data Entered}	{No Data Entered}	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Graduate Students or Post-Doctorates Trained

Year	Actual
2018	0

Output #2

Output Measure

- Number of Undergraduate Students Involved in Research

Year	Actual
2018	0

Output #3

Output Measure

- Workshops, Demonstrations, and Presentations

Year	Actual
2018	0

Output #4

Output Measure

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

Year	Actual
2018	0

Output #5

Output Measure

- Brochures, Bulletins, Fact Sheets, Newsletter, and Surveys

Year	Actual
2018	0

Output #6

Output Measure

- Manuals and Other Printed Instructional Materials Produced

Year	Actual
2018	0

Output #7

Output Measure

- Digital Media and Web Sites Created or Updated

Year	Actual
2018	0

Output #8

Output Measure

- Leveraged research funds generated

Year	Actual
2018	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of individuals who gain knowledge about foodborne illness, farm/ranch food safety, and quality assurance.
2	Number of individuals who implement practices to prevent foodborne illness, which include farm/ranch food safety plans and quality assurance practices.
3	Reduce food borne pathogens in the food supply chain.

Outcome #1

1. **Outcome Measures**

Number of individuals who gain knowledge about foodborne illness, farm/ranch food safety, and quality assurance.

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Number of individuals who implement practices to prevent foodborne illness, which include farm/ranch food safety plans and quality assurance practices.

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Reduce food borne pathogens in the food supply chain.

Not Reporting on this Outcome Measure

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 Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Community and Economic Development

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
601	Economics of Agricultural Production and Farm Management	2%		0%	
602	Business Management, Finance, and Taxation	14%		0%	
603	Market Economics	25%		0%	
608	Community Resource Planning and Development	17%		0%	
610	Domestic Policy Analysis	0%		100%	
805	Community Institutions and Social Services	12%		0%	
903	Communication, Education, and Information Delivery	30%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	1.3	0.0	0.2	0.0
Actual Paid	2.4	0.0	0.3	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
93508	0	54093	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
93508	0	121800	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

To address the ramifications of changing public land management polices work has begun on developing a state- and county-level fiscal matrix model that will provide information pertinent to Nevadan with regards to distributional impacts on local economies and government budgets. The primary focus is on the potential impacts of removal of multi-use public lands into single use military lands.

The Lincoln County Workforce Development Program helped 25 underemployed or unemployed adults ages 18 and older and 33 at-risk youth ages 17-21 gain education, training and sustainable jobs.

The risk management program's team worked with the U.S. Department of Agriculture's Risk Management Agency and insurance agents to create scenarios, advertise, and provide outreach on closing dates and insurance products available in Nevada.

Classes are held one day a month for 11 months and cover topics such as leadership skill building, networking, focusing on critical community issues and learning about many important aspects of the county. Cooperative Extension then conducted a survey of individuals who had completed the program.

Working directly with Clark County, Nevada's Small Business Development Center counselors provided relevant data to assist small businesses.

2. Brief description of the target audience

Underemployed adults, adults seeking self-efficacy, at-risk youth, small business located in southern Nevada.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	4753	1975	1094	4167

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	5	2	7

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Graduate Students or Post-Doctorates Trained

Year	Actual
2018	6

Output #2

Output Measure

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

Output #3

Output Measure

- Workshops, Demonstrations, and Presentations

Year	Actual
2018	91

Output #4

Output Measure

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

Year	Actual
2018	4

Output #5

Output Measure

- Brochures, Bulletins, Fact Sheets, Newsletter, and Surveys

Year	Actual
2018	4

Output #6

Output Measure

- Manuals and Other Printed Instructional Materials Produced

Year	Actual
2018	1

Output #7

Output Measure

- Digital Media and Web Sites Created or Updated

Year	Actual
2018	1

Output #8

Output Measure

- Databases and Models

  Not reporting on this Output for this Annual Report

Output #9

Output Measure

- Leveraged research funds generated

Year	Actual
2018	6834465

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of individuals who gain knowledge about community and economic development.
2	Number of individuals who implement knowledge about community and economic development.
3	Stakeholders will have the necessary models that will improve on the forecasting of risk, demand, and prices in various commodity sectors leading to enhanced decision making, increased profits, and reductions in uncertainty.
4	Research finding on valuing environmental resources, e.g. lakes, wetlands, river restoration, and how it applies to stakeholder needs for demonstrated gains in profits, resources sustained, and/or actions mitigated.
5	Biological complexity analyses to understand human-nature interactions at the landscape level that informs human enterprises, leading to demonstrated profitability, environmental protection, and/or improvements in quality of stakeholders' lives.
6	Market and non-market valuation of environmental resources that have often lacked economic justification that meets client needs, and informs individual, group, and government decision making.
7	Building Leadership Skill
8	Nevada Business Development Services Program

Outcome #1

1. Outcome Measures

Number of individuals who gain knowledge about community and economic development.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number of individuals who implement knowledge about community and economic development.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nevada's Lincoln County has many underemployed residents. In a 2016 survey by the county, residents identified creating more jobs as the top priority. According to the 2015 third-quarter report by the Bureau of Labor Statistics, the county had the lowest average weekly wage in Nevada. Residents have difficulty leaving and living in urban settings due to a lack of skills needed to work and live in those environments. Many underemployed or unemployed residents have barriers to finding jobs in both urban and rural settings, such as being unable to fill out an application, not knowing what jobs fit their interests and skills, lacking confidence, or lacking the knowledge or abilities needed to make a plan or career path. In addition, many young adults ages 17-24 are not advancing academically, are struggling to identify and make career paths, and are not finding sustainable jobs or careers. Finally, the county needs to increase economic development and make more sustainable jobs.

What has been done
The Lincoln County Workforce Development Program helped 25 underemployed or unemployed adults ages 18 and older and 33 at-risk youth ages 17-21 gain education, training and sustainable jobs in 2018. The project held one-on-one consultations with participants to gauge skills, interests, education levels and social barriers. Extension helped adults make education plans

based on their needs. Participants learned how to identify a fulfilling career and received on-the-job training and employment counseling. Youth learned how to make and follow career plans. Businesses created work experience positions for participants, and 36 participants received tutoring.

Extension also collaborated with the Lincoln County Regional Development Authority to help with economic development, increase job opportunities, and obtain funding. In addition, Extension worked with the Lincoln Communities Action Team on efforts to increase tourism and use education to build businesses and sustainability.

Extension evaluated progress for both groups in meetings at least every 30 days, and recorded progress in the One Stop Operating System outlined by the U.S. Department of Labor, which measures gains of employment job training and education.

Results
Extension charted progress for the at-risk young adults by measuring math and reading improvement, high school diplomas or equivalents earned, employment, and on-the-job training and post-secondary education completed.

Of the 25 adult participants: 14 became employed; 11 completed; occupational training; 4 received on-the-job training.

Of the 33 at-risk youth: 6 achieved their high school diploma or equivalent; 9 enrolled in occupational training; 26 received work experience training; 1 began attending a 4-year college; 8 gained employment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

Outcome #3

1. Outcome Measures

Stakeholders will have the necessary models that will improve on the forecasting of risk, demand, and prices in various commodity sectors leading to enhanced decision making, increased profits, and reductions in uncertainty.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Research finding on valuing environmental resources, e.g. lakes, wetlands, river restoration, and how it applies to stakeholder needs for demonstrated gains in profits, resources sustained, and/or actions mitigated.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Biological complexity analyses to understand human-nature interactions at the landscape level that informs human enterprises, leading to demonstrated profitability, environmental protection, and/or improvements in quality of stakeholders' lives.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Market and non-market valuation of environmental resources that have often lacked economic justification that meets client needs, and informs individual, group, and government decision making.

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Building Leadership Skill

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Douglas County performed a community needs assessment in 2009 and identified six community priorities including economic vitality; managed growth and development; preservation of natural environment, resources and cultural heritage; reliable, well-maintained infrastructure; community safety; and governance. The county wanted to improve the quality of live in regards to these priorities by developing more informed, knowledgeable and involved leaders for every aspect of

the community.

What has been done
Classes are held one day a month for 11 months and cover topics such as leadership skill building, networking, focusing on critical community issues and learning about many important aspects of the county. In 2018, Cooperative Extension conducted a survey of individuals who had completed the program between 2010 and 2018.

Results
Responses to the 2010-2018 survey covered individual impacts, community-level impacts and overall impacts.

For individual impacts, because of the program: 56 were able to better lead and facilitate a group; 37 were able to better work with a diverse group because of the program; 36 were able to better take on a leadership role in the community; and additional impacts included knowledge gained about county government, local services and community resources available to help solve problems.

For community-level impacts, after participating in the program: 31 increased their involvement in local organizations; 40 became involved in local non-profits, with 21 taking a leadership role such as chair or president; 23 ran for local office or were appointed to government offices; and 23 served on local advisory committees, with 9 taking a leadership role such as chair or president.

Overall program impacts showed that: 42 graduates developed new community relationships; 38 graduates learned new information about their community; and 31 graduates created new community networks.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

Outcome #8

1. Outcome Measures

Nevada Business Development Services Program

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual

2018 683

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Economic development is a priority in Nevada. Clark County represents over 73 percent of the state's population and 70 percent of business licensees. Over the next five years, Clark County is projected to add 193,000 residents, 6,000 business and 87,000 jobs. Municipalities in Clark County report they are issuing and renewing nearly 10,000 business licenses monthly.

Business education and counseling programs in Clark County are fragmented, with only a handful of organizations providing any consistent education and counseling to the business community. Programs have been created and operated in silos, often resulting in duplication and ineffectiveness. Collaboration is needed to better serve Clark County businesses.

What has been done
Extension's primary activities with BDS included providing secondary data support for new and existing small businesses. Extension works directly with SBDC counselors to provide relevant data to assist small businesses. This included:

- Compiled secondary demographic data used for site analysis and customer profiles.

- Compiled secondary industry data used to compare individual business operations against industry norms.

- Compiled secondary industry data to assess economic impacts.

- Quarterly engaged local municipalities? business licensing departments to market BDS services.

- Continually encouraged new resource providers to join the BDS program.

- Provided a quarterly newsletter highlighting the BDS activities.

- Received SBIR training to help small businesses receive innovation grants. This training was in person, Washington DC, and weekly webinars (six weeks).

- Conducted two SBIR workshops for researchers and small businesses.

Results
The partnership organizations that makeup program achieved the following milestones:

- increased business start-ups by 56% (goal 25, actual 39)

- increased business access to capital by 34% (goal $6.5M, actual $10M)

- increased jobs by 140% (goal 75, actual 180)

4. Associated Knowledge Areas

KA Code	Knowledge Area

602 Business Management, Finance, and Taxation

608 Community Resource Planning and Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

In Elko, the District Attorney put a high priority on any child abuse case, which places prevention programs such as Keeping Kids Safe as a higher priority in the public eye.

County level Leadership Development program was not full analyzed due to the retirement of the principle investigator.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The Nevada Business Development Services Program met or exceeded their goals of adding more workshop for the public; increasing the number of small business start-ups in Clark County, NV; and increased the number of jobs being offered.

Workforce development in rural Nevada's Lincoln County helped 58 young adults gain employment.

Key Items of Evaluation

The Nevada Business Development Services Program met or exceeded their goals of adding more workshop for the public; increasing the number of small business start-ups in Clark County, NV; and increased the number of jobs being offered.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Human and Family Development

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
703	Nutrition Education and Behavior	4%		0%	
704	Nutrition and Hunger in the Population	11%		0%	
723	Hazards to Human Health and Safety	2%		0%	
802	Human Development and Family Well-Being	52%		0%	
805	Community Institutions and Social Services	5%		0%	
806	Youth Development	26%		0%	
	Total	100%		0%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	3.4	0.0	0.0	0.0
Actual Paid	6.8	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
349182	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
349182	0	0	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

Over 170 law enforcement officers and agency personnel were educated about the field guide publication and optimal response strategies (first component, law enforcement education). In addition, 17 adults and 25 youth participated in a nine-week series of classes and monthly family activities for survivors, as part of the second component (direct education/intervention). As part of the third component (community education), the program provided 37 community education presentations.

Working with youth or providing child care about how to recognize, respond to and report possible child maltreatment to help protect children and youth, and help child care providers and those working with youth comply with state regulations. Trainings were delivered five times in Elko and Humboldt, seven times in Clark County and once in Nye Counties.

Nevada Youth Range Camp taught 25 campers about Nevada's desert, mountain rangelands and diverse ecosystems.

Extension helped with Clawbot and Robotics Programs, multi-session activities using Carnegie Mellon University curriculum. Extension institutionalized the robotics programs, passing operations to the schools. Extension also worked with University of Nevada, Reno's College of Engineering to plan and run a weeklong STEM camp for 24 urban and rural students. Also in 2018, Extension continued to analyze data for a longitudinal study on the role that relationships play in academic self-identity. Data from spring and fall were collected from 46 students in eight of the GEAR UP schools.

Extension faculty and staff developed and pilot-tested the curriculum for Let's Discover STEM. Extension also hosted a site visit by federal Children, Youth and Families At Risk Coach Autumn Guin. Guin visited program workshops in both Reno and Las Vegas; met with program staff; talked with key project partners; met with the program's evaluation team; and shared ideas for program improvement, evaluation strategies and sustainability.

The Little Books and Little Cooks program's seven-week series was delivered 50 times statewide totaling 350 two-hour workshops, reaching families at at-risk elementary schools, libraries and Head Start sites. To promote children's healthy eating and physical activity, 18 events throughout the state were held providing trainings and delivered information sheets, handouts, promotional displays, posters and newsletters in English and Spanish, reaching at least 3,837 people.

2. Brief description of the target audience

Law enforcement, surviving families, local agencies, human services providers, childcare providers, K-12 school teachers, lower-income families, ethnically diverse families, children in Head Start, children to attend at-risk schools, seniors with disabilities

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	28683	37077	34568	0

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

Patent Applications Submitted

Year: 2018

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	19	0	19

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Undergraduate Students Involved

Year	Actual
2018	27

Output #2

Output Measure

- Number of Graduate Students or Post-Doctorates Trained

Year	Actual
2018	15

Output #3

Output Measure

- Workshops, Demonstrations, and Presentations

Year	Actual

2018	564

Output #4

Output Measure

- Leveraged funds generated

Year	Actual
2018	3175323

Output #5

Output Measure

- Brochures, Bulletins, Fact Sheets, Newsletter, and Surveys

Year	Actual
2018	62

Output #6

Output Measure

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

Year	Actual
2018	7

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of youth, families, and professionals who gain knowledge about positive human and family development.
2	Number of youth, families, and professionals who implement positive human and family development behaviors.
3	Family Storyteller
4	Let's Discover STEM
5	Little Books and Little Cooks

Outcome #1

1. Outcome Measures

Number of youth, families, and professionals who gain knowledge about positive human and family development.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	2220

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Preventing child abuse and neglect was ranked as the second-highest priority in a "Results of a Mailed Survey: Priorities for Elko County" needs assessment published in 2012. Very few resources are available to child care givers and youth workers to help them fully understand their reporting requirements and role in preventing child abuse and neglect. Child care givers, youth workers and volunteers working with children and youth are mandated by state law to complete training on recognizing and reporting suspected child maltreatment within three months of beginning employment, as well as to report suspicions of child abuse.

What has been done
Extension created the Keeping Kids Safe Program to teach those working with youth or providing child care how to recognize, respond to and report possible child maltreatment to protect children and youth, and help child care providers comply with state regulations. Extension developed a training based on the Kids Deserve a Safe Place to Grow: What child care providers can do about child abuse and neglect curriculum in 2005 and has taught it many times.

In 2018, it was taught five times in Elko County (one of which was shared via interactive video in Humboldt County), seven times in Clark County and offered online statewide, reaching 2,185 providers from 13 counties in Nevada. Program goals are that participants better understand the four types of child maltreatment; how to recognize maltreatment; how, when, where and what to report when one suspects maltreatment; how to respond when a child discloses abuse; program policies to protect children and staff; and caregivers' responsibilities and rights related to maltreatment.

Results
Program impact in Elko, Humboldt and Nye was measured by a 15-question pre- and post-test questionnaire. Participants rated statements 1 to 5, with 1 as No Confidence and 5 as Complete

Confidence, or with 1 as Not At All Aware and 5 as Very Aware. Post-test scores for the 35 participants in 2018 ranged from 4.69 to 4.97, and gains over the pre-test ranged from 1.3 to 3.21.

Results of the post-program survey show the following improvements compared to the pre-program survey:

4.69, a 1.3-point increase in confidence in recognizing indicators of child abuse and/or neglect of a child; and

4.69, a 1.48-point increase in confidence in being able to make a report of suspected child abuse and/or neglect of a child

Some participants' comments when asked, "How can we improve this training" included:

This presenter is awesome! This was one of the best presenters I've seen. Interaction was great.

Although the topic of the presentation was no fun, I learned a lot. I was very impressed by your ability to make the presentation not only palatable, but also interesting. Statewide, participants must get a 100 percent on the final test to pass the online course, and 2,185 did so in 2018.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

Outcome #2

1. Outcome Measures

Number of youth, families, and professionals who implement positive human and family development behaviors.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	384

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nevada's domestic violence rates are some of the highest in the nation. Needs assessments in Elko and Churchill Counties showed that domestic violence prevention is a high-priority issue. Children living in violent homes have an increased risk for abuse. Research shows that as children witness violence in the home, they develop attitudes about violence and power in relationships that can be passed on to future generations. Children who witness violence also experience long-lasting problems such as adult depression, anxiety, trauma-related symptoms, and increased tolerance for and use of violence in relationships.

What has been done
Extension worked with law enforcement to create training on optimal law enforcement response to domestic incidents. In 2018, Extension created and began testing a smartphone app to help with the training.

Overall, 95 adults and 181 youth completed the third part of the program, including 17 adults and 25 youth in 2018. Extension also gave 37 community education presentations in 2018. In addition, the Elko Convention and Visitors Authority selected the program as one of five partners for the Festival of Trees.

Results
Overall, participating parents recognized that how they respond in the aftermath of violence affected their children's resilience. In addition, participants rated 20 of 27 activities four or more, out of five, in terms of how helpful the activities were. In answers to three open-ended questions after the direct education and noncrisis intervention series, parents and children indicated improved communication, increased ability to handle frustration and an enhanced understanding of each other.

Program staff noted that families adopted positive routines, and that parents responded more calmly, firmly and kindly to children's challenging behaviors. Leadership skills and attention to personal care also improved.

In addition, many families chose to continue with the monthly activities or to repeat the series. With repeating families, staff observed even greater levels of family cohesiveness and communication and fewer disagreements between parents and children.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

Outcome #3

1. Outcome Measures

Family Storyteller

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	220

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Literacy is the fundamental skill on which school and future work success are based. Unfortunately, barely one-quarter of Nevada's school-age children are reading at or above proficiency, placing Nevada's children at extremely high risk for developing literacy-related problems, such as grade retention, school failure and dropout, delinquency, and unemployment or underemployment. It is estimated that the price tag of illiteracy in America is in the billions as a result of school dropout and grade retention, criminal and incarceration costs, health care costs, low productivity in the workplace, and strains on the welfare system. The foundation for literacy begins in the years before school, and parents can play a big role in helping children develop those skills. A 2005 needs assessment confirmed the need for early literacy and school readiness programs that include both parents and children in Nevada.

What has been done
Family Storyteller began in 1998 to enhance the reading time parents and children spend together and boost school readiness and parent engagement. Now it has English, Spanish, English Language Learner, Infant/Toddler (English and Spanish) and Native American versions. At six weekly classes, attendees learn the importance of literacy for children; learn and discuss reading techniques; practice reading; learn activities to enhance reading; and receive children's books and materials to take home. Books were chosen to boost literacy and academic skills. In 2018, in Clark County, 283 families, including 283 adults and 307 young children, participated, 67 percent of them being Spanish-speaking and/or Hispanic. In Washoe County, 15 Spanish-language classes were taught, reaching 27 families, including 36 Spanish-speaking adults and 48 Spanish-speaking children.

Results
A pre- and post-test also found an increase in how often parents read to their children and an increase in the number of picture books for the children's use at home. After completing the program, 99 percent of parents reported they would recommend this program to their friends and family.

Clark County, parents took knowledge and behavior pre- and post-tests. For the pre- and post-preschool program tests, 142 parents showed improvement in the following areas: have the child sit close to you, talk about book cover; change your voice while reading; ask the child to name or point to something on the page; point to words as you read the books; help the child learn new words or names for things; ask the child questions about the books; help the child connect things

in story to real life; read slowly enough for the child to ask questions and chime in; ask the child what happened at the end of the book; and let the child ask questions and do fun activities after reading books.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

Outcome #4

1. Outcome Measures

Let's Discover STEM

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1212

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nationally, in 2015, only 38 percent of fourth-grade students achieved a score of "At or Above Proficient" on the science portion of the National Assessment of Educational Progress exam, and only 40 percent were at or above proficiency in mathematics. The statistics are worse in Nevada, where only 23 percent of fourth-graders were at or above proficiency in science, and 32 percent were at or above proficiency in math. Latino children are particularly at risk for not developing strong STEM skills and attitudes. In 2015, nationally, only 24 percent of Latino fourth-graders scored at or above proficiency in math and only 12 percent did so in science. Only 12 percent of Nevada Latino fourth-graders scored at or above proficiency in both math and science. As adults, Latinos are underrepresented in STEM professions.

What has been done
Extension faculty and staff developed and pilot-tested the curriculum for Let's Discover STEM at four sites, reaching 44 parents and 52 children. The curriculum was revised over summer, and the program was fully implemented in the fall at seven community sites: four in Las Vegas and three in Reno, reaching 100 Spanish-speaking adults and 103 children. The weekly half-hour

workshops include a brief lesson, a book to take home, and take-home STEM activities.

Extension also hosted a site visit by federal Children, Youth and Families At Risk Coach Autumn Guin. Guin visited program workshops in both Reno and Las Vegas; met with program staff; talked with key project partners; met with the program's evaluation team; and shared ideas for program improvement, evaluation strategies and sustainability.

Results
Parent support of STEM (post reflective), weekly take-home activities worksheets and parent program evaluation were used to evaluate the effectiveness of the Let's Discover STEM Program. After the program, the post-reflective survey showed that parents: were significantly more confident about using STEM skills to teach their children; believed their children could learn from them; were significantly more confident about helping their children succeed in school; and felt that they were significantly better prepared to help their children learn.

The weekly take-home activity worksheet showed that out of 55 parents who responded: 88% of parent reported spending 30 minutes to more than 2 hours with the nature of science and life science take-home activities; 90% reported spending 30 minutes to more than 2 hours with the physical science take-home activities; 100% reported spending 30 minutes to more than 2 hours with the technology take-home activities; 87% reported spending 30 minutes to more than 2 hours with the engineering take-home activities; 80% reported spending 30 minutes to more than 2 hours with the numbers and counting take-home activities; and 89% reported spending 30 minutes to more than 2 hours with the patterns, shapes and measurement take-home activities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #5

1. Outcome Measures

Little Books and Little Cooks

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	5968

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
For many children, academic difficulties begin before they start school. In a national survey, teachers reported that 35 percent of kindergarten children were not ready for school. Poor academic skills in the early years place children at risk, often leading to grade retention, school failure and dropout, delinquency and running away, as well as unemployment and underemployment in adulthood. Children gain critical school readiness skills by engaging in real-life, meaningful activities. Cooking with parents is one educational activity that can help to increase children's abilities in math, science, reading, language, motor development and social skills in a meaningful and appealing way. The Little Books and Little Cooks Program also offers the opportunity to teach parents healthy nutrition and physical activity ideas to prevent childhood obesity.

What has been done
In 2018, for direct family education, a seven-week series was delivered 50 times statewide totaling 350 two-hour workshops, reaching families at at-risk elementary schools, libraries and Head Start sites. Those reached include 286 parents and 341 children in Clark and Lincoln Counties, and 210 parents and 249 children in Washoe County.

The community education component involves community activities to promote children's healthy eating and physical activity. In 2018, at 18 events throughout the state, program faculty hosted activities, provided trainings and delivered information sheets, handouts, promotional displays, posters and newsletters in English and Spanish, reaching at least 3,837 people. Extension also taught 37 one-time one-hour Cooking With Children workshops, reaching at least 400 families.

Results
Program impacts were measured with pre- and post-parent surveys, a pre- and post-observation checklist, and post-program evaluations.

Of 168 parents who did pre- and-post- tests: 126 matched the foods to the correct food groups; 166 plan to continue using what they learned in the future; 155 report their children help prepare food more often; 151 report their children try new and unfamiliar foods at home more often; and 155 report their children feel more confident about using cooking equipment during cooking.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (Grant funding availability)

Brief Explanation

In Elko, Nevada, the District Attorney put a high priority on any child abuse case, which places prevention programs such as Keeping Kids Safe as a higher priority in the public eye.

Deferred Action for Childhood Arrivals (DACA) - GEAR UP targets low-income students around the state, many of whom are undocumented. The political issues surrounding the decision to end DACA created a large amount of fear and anxiety with the program's students.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Over 170 law enforcement officers and agency personnel were educated about optimal response strategies to domestic violence situations.

Nevada Youth Range Camp continues to attract young people to the program and post camp surveys are indicating a fair number of students follow a natural resources bachelor degree track.

The Little Books and Little Cooks program's seven-week series was delivered 50 times statewide totaling 350 two-hour workshops, reaching families at at-risk elementary schools, libraries and Head Start sites.

The Keeping Kids Safe Program saw over 2,100 participants their final test on how to recognize, respond to and report possible child maltreatment.

Over 283 Family Storyteller participating families showed improvement in improving the parent-child interactions while reading books.

Key Items of Evaluation

Over 170 law enforcement officers and agency personnel were educated about optimal response strategies to domestic violence situations.

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
0	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
0	Number of new crop varieties, animal breeds, and genotypes whit climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
0	Number of participants adopting best practices and technologies resulting in increased yield, reduced inputs, increased efficiency, increased economic return, and/or conservation of resources.
Global Food Security and Hunger (Outcome 2, Indicator 1)	
0	Number of new or improved innovations developed for food enterprises.
Food Safety (Outcome 1, Indicator 1)	
0	Number of viable technologies developed or modified for the detection and
Sustainable Energy (Outcome 3, Indicator 2)	
0	Number of farmers who adopted a dedicated bioenergy crop
Sustainable Energy (Outcome 3, Indicator 4)	
0	Tons of feedstocks delivered.