

# Wyoming (University of Wyoming) Annual Report - FY2021

## Report Status: Approved as of 07/08/2022

### Contributing Organizations

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University of Wyoming

### Executive Summary

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#### Overview

Wyoming is the least populated state in the nation with 576,851 people spread out across 97,089 square miles, 99.8 percent of which is rural. Cheyenne, the capital and largest city, has a population of 65,132. The state is divided into 23 counties and the Wind River Indian Reservation. Fifty-three percent of land in Wyoming is owned by the federal or state government. Most of the state's economy is concentrated in three sectors: agriculture, minerals, and tourism. The state is also a major producer of beef, sheep, wool, wind energy, coal, and natural gas. The University of Wyoming is the only university in the state.

The University of Wyoming Extension (UWE) and the Wyoming Agricultural Experiment Station (AES) are housed within the College of Agriculture and Natural Resources. The vision of the College of Agriculture and Natural Resources is to support thriving agriculture, natural resources, people, and communities through integrating quality education, innovative research, and impactful engagement. UWE and AES are concerned with finding solutions to contemporary issues affecting Wyoming and the region through high-quality research and creative scholarship, responsive service, and statewide engagement, empowering the people of Wyoming to make choices that enhance their quality of life.

UWE will enhance capacity for success and the resiliency of Wyoming people, communities, organizations, and businesses through educational opportunities. A team-based approach to educational program leadership revolves around three focus areas, which assess the needs of Wyoming residents and communities and then prioritize and develop educational programs around those needs. The three focus areas are: Agricultural and Natural Resources, Community Vitality and Health, and 4-H Youth Development. UWE will continue to engage community members and organizations as partners and collaborators in educational efforts to build capacity in local communities throughout Wyoming.

AES supports fundamental and applied research on agricultural, natural and community resource issues related to the current and future needs of Wyoming, the region, the nation, and the world. Four Research and Extension (R&E) Centers within AES focus on regional research and services of interest to farmers, ranchers, consumers, and communities. AES seeks to increase research engagement by collaborating with diverse research partners with mutual interests; increasing research integrated with other college mission areas; and enhancing research relevance by continuing to update and expand the Wyoming Production Agriculture Research Priorities. Research projects conducted at R&E Centers will continue to have strong educational and community engagement components.

#### Critical Issue: Communities, Families & Youth

Extension programming areas addressing this critical issue include Civic Health, Community Economic Vitality, Individual and Family Resource Management, Consumer Horticulture, Volunteer Support and Engagement, and Teen Programming and Engagement. An overview of these Extension programming areas is included below.

**Civic Health** - Specific programs included Board Governance and Training; Basic Mediation Trainings; Land Use Codes for the Teton Food & Farm Coalition; Facilitation of Leadership Institutes; Health Forums; Wyoming Peer Learning Network; and NRCD. Extension educators and specialists taught 111 programs which reached 410 direct adult contacts.

Evaluation responses directly related to NIFA Outcomes in Civic Health included:

- # of participants who adopted best practices to increase civic engagement = 312
- # of community collaborations = 21

**Community Economic Vitality** – Specific programs included Economic Opportunity Maps; Wyoming First Grains Project; Water Demand Management Feasibility Investigation; Economic Impacts of Water Demand Management; Strategic Management; Commercial Horticulture; Entrepreneurship; Economic Impact analysis of Wyoming Nonprofit Network; and Tri-state Agritourism. Extension educators and specialists taught 80 programs and reached 1,355 direct adult contacts.

Evaluation responses directly related to NIFA Outcomes in Community Economic Vitality included:

- # of participants who indicated improved business management skills = 294
- # of youth who demonstrated entrepreneurial spirit = 44
- # of existing businesses who indicated improved capacity to compete = 801
- # of new business ventures developed = 7

**Individual and Family Resources Management** – Specific programs included Money Talk; Wyoming Saves; and Financial Literacy. Extension educators and specialists taught 44 programs and reached 1,618 direct adult contacts.

Evaluation responses directly related to NIFA Outcomes in Individual and Family Resources Management included:

- # of participants who improved financial behavior and resource management skills = 456
- # of participants reporting an increase in consumer awareness, savings, and spending habits = 80
- # of participants reporting reduced personal debt = 71
- # of participants reporting improved decision making skills = 90

**Consumer Horticulture** – Specific programs included Geodesic Domes; Season Extenders; Barnyards and Backyards LIVE!; Yard and Garden home visits; Master Gardener trainings; Container Gardens; Fruit Trees; Soil and Compost; in addition to employee training at nurseries and garden centers. Extension educators and specialists taught 688 programs reaching 4,521 direct adult contacts and 789 direct youth contacts.

Evaluation responses directly related to NIFA Outcomes in Consumer Horticulture included:

- # of retail employees trained = 60
- # of participants whom indicated money was saved by access to resources = 58

**Volunteer Support and Engagement** – Specific programs include Master Gardener Trainings for the general public, Master Gardener certification and support of volunteer hours; the 4-H Youth Development Program through County 4-H Leaders' Councils, adult volunteer driven 4-H project committees, 4-H Coaches, trainings for 4-H adult volunteer leaders, and Junior Leader activities for older 4-H members. Extension educators and specialists taught 542 programs and reached 5,427 direct adult contacts and 3,107 direct youth contacts.

Evaluation responses directly related to NIFA Outcomes in Volunteer Support and Engagement included:

- # of training opportunities provided to adult volunteers = 130
- # of adult volunteers trained = 1,226

**Teen Programming and Engagement** – Specific programs include Career Nights; 4-H Camp Counselors; Teaching Project Workshops and Clinics; Rocky Mountain Youth Entrepreneur Series; Club Officer Training; Leadership Development Events; Wyoming Youth Leadership Team; and Community Service Events. Extension educators and specialists taught 270 programs and reached 1,408 direct adult contacts and 5,785 direct youth contacts.

Evaluation responses directly related to NIFA Outcomes in Teen Programming and Engagement included:

- # of learning experiences offered to teen age youth on personal or leadership skill development = 1,149
- # of youth enrolled in 4-H teen leadership clubs or groups = 1,428

## **AES research projects relevant to this critical issue: 2**

### **Critical Issue: Community Socio-economic Prosperity**

Extension programming areas addressing this critical issue include Livestock Health and Infectious Disease; Maintaining Viable and Progressive Ag-Operations; and Crop Diversity. An overview of these Extension programming areas is included below.

**Livestock Health and Infectious Disease** – Specific programs include Spring Vaccines; Wyoming Ranch Camp; Ag & Hort Online Conference; poisonous plants in drought situations; and various livestock seminars. While Extension educators and specialists taught 8 programs and reached 118 direct adult contacts significant evaluation results were not captured.

**Maintaining Viable and Progressive Ag-operations** – Conferences featuring multiple topics were delivered via Farm and Ranch Days; Ag & Hort Online Conference; Barnyards and Backyards Live!; Westi Ag Days; Integrated Pest Management; and Wyoming/Utah Ag Days. Educational topics delivered through multi-day conferences and as stand-alone workshops included specialty crops; growing grapes; meat school; trends in red meat consumption; live animal evaluation; poultry; hair sheep; lamb quality, fabrication and preparation; sheep and goat webinar series; livestock production; artificial insemination; forage production, quality, and management; assessment, management, and restoration of Wyoming soils; cover crops and carbon sequestration; no-till farming; rangeland soil health; risk management for Wyoming ag producers; and drought planning and mitigation. Extension educators and specialists taught 307 programs reaching 7,311 direct adult contacts and 255 direct youth contacts.

Evaluation responses directly related to NIFA Outcomes in Maintaining Viable and Progressive Ag-operations included:

- # of ag producers who increased diversification of enterprises = 1,274
- # of clientele who successfully transferred management of ag operation to different generation = 6
- # of new ag-based start ups = 15
- # of clientele who adapted new management practices that enhance sustainability = 205

**Crop Diversity** – Specific programs included Barnyards and Backyards LIVE!; Wyoming/Utah Ag Days; Crop Field Trial Day; Effects of Minimum-tillage Practices in Wyoming Irrigated Sugarbeet-Dry Bean-Barley Rotations; Fruit Production and Demonstrations; Cover Crops; Hemp Workshops; and Bromegrass Seed Midge IPM. Extension educators and specialists taught 43 programs reaching 669 direct adult contacts and 43 direct youth contacts.

Evaluation responses directly related to NIFA Outcomes in Crop Diversity included:

- # of acres planted in diverse crops – 515
- # of producers who reported growing a multitude of crops = 39
- # of producers who indicated economic value was added to their operation = 40
- # of producers who adopted different practices = 40

**Community Economic Vitality** – Specific programs included Economic Opportunity Maps; Wyoming First Grains Project; Water Demand Management Feasibility Investigation; Economic Impacts of Water Demand Management; Strategic Management; Commercial Horticulture; Entrepreneurship; Economic Impact analysis of Wyoming Nonprofit Network; and Tri-state Agritourism. Extension educators and specialists taught 80 programs and reached 1,355 direct adult contacts.

Evaluation responses directly related to NIFA Outcomes in Community Economic Vitality included:

- # of participants who indicated improved business management skills = 294
- # of youth who demonstrated entrepreneurial spirit = 44
- # of existing businesses who indicated improved capacity to compete = 801
- # of new business ventures developed = 7

#### **AES research projects relevant to this critical issue: 4**

##### **Critical Issue: Human Health, Wellness & Nutrition**

Extension programming areas addressing this critical issue include Health Promotion and Education, Healthy Environments, and the SNAP-Ed programs.

**Encouraging Healthy Environments to Support Lifestyle Changes and Improve Nutrition of Wyoming Residents** – Specific programs include Cent\$ible Nutrition Programs; Food Preservation; ServSafe Certification Trainings; State Health Improvement Forums; Healthy Eating and Cooking Skills; Home Gardening; Community Gardens; Unlocking Community Health Access Together Project; and The Hunger Initiative. Extension educators and specialists taught 281 programs and reached 31,389 direct adult contacts and 382 direct youth contacts. Results from the Policy, Systems, and Environmental changes in SNAP-Ed programs are reported separately.

Evaluation responses directly related to NIFA Outcomes in Health Promotion and Education included:

- # of participants reporting an increase in physical activity and strength training = 6
- # of participants who report an increase in their intake of fruits, vegetables and whole grains = 51
- # of participants who report a decrease in foods to limit such as added salt, sugar, and fat = 6
- # of participants who report following USDA/FDA food safety recommendations = 432

Evaluation responses directly related to NIFA Outcomes in Healthy Environments included:

- # of participants exposed to environmental changes = 12
- # of community partners adopting recommended physical activity and nutrition practices/guidelines = 0
- # of community partners making environmental changes (e.g. walking path, stairway posters) = 65

Results from the Policy, Systems, and Environmental changes in SNAP-Ed are highlighted below:

Cent\$ible Nutrition educators created or maintained 39 partnerships with groups focused on increasing access to local foods. Partners included local food producers, farmers markets, UW Extension, UW Agriculture Experiment Station, community gardens, food pantries, and the Wyoming First Lady's Wyoming Hunger Initiative. A total of 18,829 pounds of produce were donated statewide.

The Grazing with Marty Moose curriculum was implemented in 15 sites with 58 nutrition and physical activity supports adopted, reaching 3,147 youth. These supports include healthy celebration proclamations, hand washing, increasing drinking water accessibility, incorporating physical activity into the school day, eating breakfast, and healthier lunchroom changes.

Cent\$ible Nutrition educators partnered with the Wyoming Department of Health, Chronic Disease Prevention Program to work with Early Childcare Education Centers sites to implement the *Healthy Policies Toolkit*. This toolkit was adapted for Wyoming from the Nemours technical assistance manual *Let's Move Childcare*. The *Healthy Policies Toolkit* was implemented in 7 new sites with 47 nutrition and physical activity changes being adopted, reaching 184 youth.

The Healthy Food Pantry Project toolkit was implemented at 12 sites with 43 nutrition changes being adopted.

- A total of 1,290 DFS referrals were received with 83 referrals enrolling Cent\$ible Nutrition Program classes. Of the total adults enrolled in Cent\$ible Nutrition Program classes, 6.4% came from DFS referrals.

### **AES research projects relevant to this critical issue: 3**

#### **Critical Issue: Natural Systems, Food & Fiber Production**

Extension programming areas addressing this critical issue include Maintaining Viable and Progressive Ag-operations, Invasive and Noxious Weeds, General Public Range Education, and Access to and Demand on Rangelands.

**Maintaining Viable and Progressive Ag-operations** – Conferences featuring multiple topics were delivered via Farm and Ranch Days; Ag & Hort Online Conference; Barnyards and Backyards Live!; Westi Ag Days; Integrated Pest Management; and Wyoming/Utah Ag Days. Educational topics delivered through multi-day conferences and as stand-alone workshops included specialty crops; growing grapes; meat school; trends in red meat consumption; live animal evaluation; poultry; hair sheep; lamb quality, fabrication and preparation; sheep and goat webinar series; livestock production; artificial insemination; forage production, quality, and management; assessment, management, and restoration of Wyoming soils; cover crops and carbon sequestration; no-till farming; rangeland soil health; risk management for Wyoming ag producers; and drought planning and mitigation. Extension educators and specialists taught 307 programs reaching 7,311 direct adult contacts and 255 direct youth contacts.

Evaluation responses directly related to NIFA Outcomes in Maintaining Viable and Progressive Ag-operations included:

- # of ag producers who increased diversification of enterprises = 1,274
- # of clientele who successfully transferred management of ag operation to different generation = 6
- # of new ag-based start ups = 15
- # of clientele who adapted new management practices that enhance sustainability = 205

**Invasive and Noxious Weeds** – Specific programs include Pesticide Applicator Trainings; Commercial Pesticide Applicators; Integrated Pest Management Training; Invasive Grasses Tour; Invasive Plant Ecology; Popo Agie Weed Management Area; and the Wyoming Naturalist Program. Extension educators and specialists taught 98 programs and reached 2,061 direct adult contacts and 14 direct youth contacts.

Evaluation responses directly related to NIFA Outcomes in Invasive and Noxious Weeds included:

- # of verified reports of invasive/noxious weed locations = 13
- # of individuals who participated in noxious weed pull days = 12
- # of participants reporting reduced areas infested with invasive/noxious weeds = 34

**General Public Range Education** – Specific programs include Discover Native Plants; Wyoming Naturalist Program; field visits with ranchers; Monitoring and Grazing Management Planning; Wildland Fire Programming; Pasture Management for Smaller Acreages; and Western Soils and Their Challenges. Extension educators and specialists taught 65 programs reaching 2,085 direct adult contacts and 10 direct youth contacts.

Evaluation responses directly related to NIFA Outcomes in General Public Range Education included:

- # of participants reporting a greater understanding of issues related to multi-use lands = 118
- # of participants reporting that the atmosphere around contentious subjects improved = 180
- # of organizations who report addressing similar issues with the general public = 7

**Access to and Demand on Rangelands** – Conferences featuring multiple topics were delivered via Wyoming/Utah Ag Days; WESTI Ag Days; and Wyoming Ranch Camp. Educational topics delivered through multi-day conferences and as stand-alone workshops included BLM permit grazing compliance; grazing and hay field management; vegetation management; range reclamation; soil management; cover crops; drought planning and mitigation; seeding grass; range monitoring; livestock and wildlife pasture; predation on livestock; and brand and livestock health. Extension educators and specialists taught 65 programs and reached 451 direct adult contacts and 48 direct youth contacts.

Evaluation responses directly related to NIFA Outcomes in Access to and Demand on Rangelands included:

- # of participants who reported an increase in knowledge gained= 490

**AES research projects relevant to this critical issue: 21**

## **Merit and Scientific Peer Review Processes**

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### **Updates**

Extension educators on the University of Wyoming Extended Term and Promotion (ET&P) Track participate in a peer review process regardless of the initiative team in which they are affiliated. Geographically, Wyoming is divided into 5 Extension areas with 3 to 5 counties in each area. The first level peer review is conducted at the area level and all Extension educators on the Extended Term and Promotion track in that geographic area have the professional responsibility to review the documents submitted by their peers. Reviewers annually receive an orientation and training for their role in the peer review process. Each educator submits his or her vote and written comments as part of the review process. The second level peer review is a state level review. Each Extension area elects one representative to serve a 3-year term on the state ET&P review committee. Campus specialists also elect one representative to serve a 3-year term on the state ET&P committee. Each member of the state ET&P committee submits his or her vote and written comments also. Candidates are encouraged to participate in their review to receive positive feedback and constructive suggestions from their peers at both the first and second level review.

Research projects supported with formula funds (Hatch, Hatch-Multistate, McIntire-Stennis, Animal Health) must be approved projects. The project proposal is transmitted to the Wyoming Agricultural Experiment Station and the director appoints a minimum of two scientific reviewers knowledgeable in the field to review the proposal. After a proposal is revised based on the anonymous peer reviews, it goes through organizational review and is submitted to NIFA .

## **Stakeholder Input**

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### **Actions to seek stakeholder input that encouraged their participation with a brief explanation**

Geographically, Extension is divided into 5 regions. Each region contains three to five counties. Formal stakeholder input for Extension is conducted in each of these five geographic areas and rotates annually to a different county. An initial personal contact is made with potential participants to describe the purpose of stakeholder input and to invite the individual to join a specific program area focus



group. Second, a formal invitation is sent to the potential participants along with the questions that will guide each focus group. Finally, each potential participant receives a reminder phone call/e- mail a few days before the stakeholder input session. Lunch and a small incentive are provided for participants.

A formal on-line statewide needs assessment for UW Extension is currently being developed and will be deployed in 2022 replacing the geographic area stakeholder input sessions. Current plans involve geographic stakeholder input sessions resuming in 2023.

AES has four Research & Extension Centers located across the state. Each center has an active advisory board, and these members are encouraged to participate in at least one meeting each year at the center. Emails are sent to the advisory committee members prior to annual meetings, and the advisory committee chair is encouraged to further contact participants to attend meetings. The College of Agriculture and Natural Resources advisory board meets twice a year and provides feedback and suggestions on AES programs.

#### **Methods to identify individuals and groups and brief explanation**

Educators coordinating the geographic stakeholder input session for their county are asked to thoughtfully identify and recruit participants from a diverse audience taking into consideration underserved populations in their county. The selection of participants is based on characteristics that relate to the initiative team programming area of the focus group - "Who can provide the greatest insight about needs related to the programming area?"

Research and Extension Center and College of Agriculture and Natural Resources advisory committees are represented by industry leaders, producers, landowners, government officials, and educators from throughout the state. Advisory committee members are nominated by UW Extension, AES, and College administrative personnel and meet one to two times per year.

In addition to these systematic methods of gathering stakeholder input, AES and UW Extension draw on individuals and groups throughout the state to identify relevant issues of critical importance. Some examples include WY Wool Growers, WY Stock Growers, WY Wheat Growers, WY Bean Commission, WY Crop Improvement Association, local and state nutrition councils, County 4-H Leaders Councils, youth organizations such as Big Brothers, Big Sisters, and school districts. These groups and individuals provide input through both formal and informal discussions with both research and extension personnel.

#### **Methods for collecting stakeholder input and brief explanation**

The geographic stakeholder input sessions for Extension include modified focus groups for the following focus areas (programming areas): Agricultural and Natural Resources, Community Vitality and Health, and 4-H Youth Development. Identical questions and consistent processes are used in each focus group so that the results can be analyzed for similar themes and compiled into a statewide summary which annually identifies emerging issues across Wyoming. The Wyoming County Commissioners Association has formed an advisory committee of county commissioners who also include UW Extension Administrators during quarterly meetings of their association.

Research and Extension Center and College advisory committees routinely provide input at annual meetings. These meetings help identify station-specific needs as well as contribute to the list of Wyoming Production Agriculture Research Priorities, which are stakeholder driven priorities aimed at enhancing the competitiveness, profitability, and sustainability of Wyoming agricultural systems.

In addition to statewide efforts, AES and Extension employees conduct informal needs assessments on a regular basis to remain current on local emerging needs. This includes key informant interviews with community partners, attending meetings of local agencies/organizations, and targeted outreach to new and often underserved audiences. Employees also review needs assessment data from local and state sources pertinent to their programming areas. Written and on-line surveys with stakeholders are also utilized to identify program needs. Relevant input from professional colleagues in Wyoming and across the nation is also gathered by faculty and UW Extension specialists.

#### **A statement of how the input will be considered and brief explanation of what you learned from your stakeholders**

Focus group results from Extension geographic stakeholder input sessions are compiled and shared with each focus area for prioritization of statewide issues in their programming area: Agricultural and Natural Resources, Community Vitality and Health, and 4-H Youth Development. Consideration is given to the development of educational programs to address the statewide needs. Issues that are cross programmatic in nature are discussed by the respective teams to develop comprehensive efforts to address the need. Issues unique to a particular county – that do not arise in other focus groups – are shared with the educators in that county to be addressed locally.

Results from advisory committee and stakeholder meetings results in redirection of research programs, both at R&E centers and across the state. By using this information in setting research priorities, this information is also used to set action and strategic plans for R&E centers and AES. Further, the information in strategic and action plans informs hiring decisions, both on- and off-campus.

Critical Issue

### Communities, Families & Youth

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#### **Building Capacity to Address Consumer and Household Economic Issues Through Individual and Family Resource Management Programs**

Project Director

Kimberly Reaman

Organization

University of Wyoming

Accession Number

7000343



#### **Money Talk helps individuals and families stabilize and improve their financial well-being**

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##### **In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

The economic implications of COVID-19 added more uncertainty to the already precarious financial situations that many Wyoming residents find themselves in. With the pandemic, the low levels of preparedness became clearer. Many people have little or no emergency savings, no household budget, underfunded retirement accounts, unclear household priorities, etc. and were motivated to improve their knowledge.

##### **Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

Money Talk was a five session live online class delivered over the lunch hour. The Money Talk class provided guidance to help individuals and families stabilize and improve their financial well-being as they experience income loss and anxiety about the future.

Two-hundred and one (201) individuals registered for one or more of the Money Talk sessions. One hundred and thirty-two (132) of those registered were from Wyoming and 77% of them were females.

Educational topics, along with the number of participants in each session are highlighted below:

Financial Basics – 101 participants

- Financial freedom – what is it?
  
- Your relationship with money
  
- Setting goals

Managing Money – 78 participants

- Building a better budget
  
- Paying down debt

- Record keeping (home filing, important papers)

- The power of compounding

#### Investing – 67 participants

- Developing an investment plan
- Finding low cost index mutual funds
- Buying a fund; building a portfolio
- Other investment vehicles

#### Insuring security: Retirement and insurance – 49 participants

- Paying for retirement
- Life expectancy
- Retirement investing
- Expenses in retirement
- Types of insurance
- Recommended insurance levels

#### Planning for future life events – 43 participants

- Life situations that you might encounter, and how to prepare for/recover from them
- Estate planning essential tools
- Estate planning questions
- Fair vs equal distributions

Most of the exercises, to reinforce the educational topics, were drawn from Barbara O'Neill's book *Money Talk, A Financial Guide for Women*, Rutgers University (2018). Participants found the exercises very useful. They were selected to help focus users on actions, but they also provided perspectives and detail that was impossible to provide in a one-hour class session.



Each session was recorded and circulated to all registered participations. This courtesy was well received by those who were unable to attend the live session.

**Briefly describe how your target audience benefited from your project's activities.**

Sixty-nine (69) individual survey responses were received and reported the class was worth \$9,300 to them. One hundred percent (100%) of those respondents indicated the following:

- improved financial behavior and resource management skills
  
- an increase in consumer awareness, savings, and spending habits
  
- reduced personal debt
  
- improved decision-making skills

An evaluation survey to gather feedback on each topic was solicited after the session. Evaluation results for each session follows:

**Financial Basics** had 101 participants. Twenty-two (22) survey results were received for a 22% response rate. Twenty (20) of the 22 respondents reported gaining knowledge and 21 of the respondents reported they will probably or definitely use the information from the session.

**Managing Money** had 78 participants. Nineteen (19) survey results were received for a 24% response rate. Fourteen (14) of the 19 respondents reported gaining knowledge and 100% of the respondents reported they will probably or definitely use the information from the session.

**Investing** had 67 participants. Ten (10) survey results were received for a 15% response rate. Nine (9) of the 10 respondents reported gaining knowledge and 9 of the respondents reported they will probably or definitely use the information from the session.

**Insuring Security** had 49 participants. Seven (7) survey results were received for a 14% response rate. One hundred percent (100%) of the 7 respondents reported gaining knowledge and they will probably or definitely use the information from the session.

**Life Events** had 43 participants. Eleven (11) survey results were received for a 23% response rate. Ten (10) of the 11 respondents reported gaining knowledge and they will probably or definitely use the information from the session.

**Briefly describe how the broader public benefited from your project's activities.**

Financial education can enhance financial literacy by improving knowledge, skills, and attitudes. This, in turn, can help individuals (including vulnerable and low income) participate in financial and social life. And financial education can also complement the development of micro and small businesses, thus leading to greater individual financial stability and broader economic development.

**[Civic Dialog and Community Engagement](#)**

Project Director

Kimberly Reaman

Organization

University of Wyoming

Accession Number

7000338



**In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

Rural communities can be isolated and information sharing often takes place by word of mouth. On-line learning experiences as well as regional and statewide networks provide easy access to resources and increase the efficiency of information sharing to be responsive to dynamic community concerns.

**Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

UW Extension efforts to help rural Wyoming communities connect via technology focused on two programs: The Wyoming Peer Learning Network and the County-Appointed Board Member On-line Training.

**Wyoming Peer Learning Network:**

The Wyoming Peer Learning Network was created as part of the WeCAN Peer Learning Network in December 2020 to create a place for community leaders to ask for advice, share successes, and learn with like-minded people who understand the challenges of rural community development work. The peer learning network is designed specifically to help leaders connect with peers from other communities in Wyoming, Idaho, and Montana. UW Extension organized a statewide network of support to find information, share, learn, and collectively troubleshoot community challenges. The Laramie County UW Extension Community Development Educator facilitated six conversational meetings via web conferencing which involved recruiting content experts as needed. The conversations also engaged participants in intentional community building and dialogue to support leadership. Participants were introduced to the idea of false consensus, the work of leadership expert Brene Brown, and a multitude of resources that were compiled from all three states into a peer learning network newsletter.

**County-Appointed Board Member On-line Training:**

The Wyoming County Commissioner Association and the UW Extension Community Development Education team renewed their collaboration to provide a handbook and an online learning experience for the Wyoming Board of County Commissioners Appointed Boards. This partnership developed the original handbook in 2008. The current focus of the collaboration was to review use of the handbook, update learning materials as needed, and create an on-line learning experience for county appointed board members.

Working with the Wyoming County Commissioner Association's Elections, Land Use, and Government Operations Committee, UW Extension developed an online survey to gather ideas from Commissioners to begin the improvement process. The survey was conducted in the late fall of 2018. Of the 93 Commissioners in the state, 55 participated in the core elements of the survey. This represents nearly a 60 percent response rate (59.1%). Furthermore, 20 of the 23 counties in the state are represented in the survey results, with 14 counties having multiple responses. This is an exciting level of participation and may indicate a strong interest by Commissioners in supporting their Appointed-Boards. The second part of the survey dealt specifically with the 2008 Handbook and as expected the response rate dropped a bit for these questions (about a 45% response rate). However, both response rates are large enough to infer a good deal of reliability to the results.

Selected comments from survey respondents include:

- "Significant importance of appointed boards and the volunteers that serve on them"
  
- "Good volunteers are hard to find"
  
- "Need for training and support to these boards"
  
- "UWE/WCCA Handbook remains a relevant resource"

- o "Increasing utility of the online board training approach"

Beyond confirming the importance of county appointed-boards and the value of training for the success of such boards, the survey results provide sound guidance to update the UW Extension's County-Appointed Board Member Handbook and the online learning activity. On the plus side, the materials seem relevant, and few changes appeared needed. On the negative side, it appears that over time these resource materials have become overlooked in many counties. It seems like an appropriate time for UW Extension to reconnect and enhance their work on this topic.

**Briefly describe how your target audience benefited from your project's activities.**

**Wyoming Peer Learning Network:**

Through the peer learning network leaders in the three-state region discovered they were experiencing similar difficulties and addressing similar concerns, particularly rural housing. The Wyoming Peer Learning Network proposed the idea of a housing summit which was positively received by the other peer learning networks. Members of the Wyoming Peer Learning Network proceeded to participate, with members from the peer learning networks in Idaho and Montana, are planning an online housing roundtable for January of 2022.

Although the Wyoming Peer Learning Network is still in its infancy, communities have more knowledge, professional networks, regional partnerships, plans of action and support for leadership activities across the state. Twenty-three Wyomingites, in community leadership positions, adopted best practices to increase civic engagement.

**County-Appointed Board Member On-line Training:**

The on-line course is recognized and used by several Wyoming County Commissioners as their primary training course for newly appointed board members. In 2021, 78 individuals successfully completed the course quiz with 100% correct answers and obtained their course certificate. Sixty-two adult participants indicated they have adopted best practices to increase civic engagement.

**Briefly describe how the broader public benefited from your project's activities.**

Communities are better prepared to meet the challenges of quickly changing needs in their communities when individuals in leadership roles understand their roles and responsibilities and how to effectively engage community members in finding solutions to make their communities stronger.

**[Entrepreneurship Programming Improves Vibrancy of Wyoming's Economic Environment](#)**

Project Director

Kimberly Reaman

Organization

University of Wyoming

Accession Number

7000340



**[Economic Opportunity Map Aids Decision Making for Wyoming Community and Business Leaders](#)**

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**In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

Economic development strategies are often made in isolation. In reality, local economic development is dependent on a community's relationship with other local economies. It is important for economic development practitioners, local leaders, and policy makers to understand these nuances so that they may better guide their communities in economic development decisions.

**Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

Ninety adult participants at the Wyoming Association of Municipalities, Wyoming Association of County Officers and the Wyoming Economic Development Association conferences learned about the Economic Opportunity Mapping Tool created by the UW Extension Community Development Specialist. Audiences included city councilors, managers, planners, and mayors; county clerks, treasurers, and county commissioners; as well as business council members, and community business leaders. The Economic Opportunity Mapping Tool is an online tool designed to provide visual spatial relationships demonstrating how twenty industries within the healthcare, retail, and banking sectors are connected across geographic regions. Specifically, the tool makes comparisons between the expected number of establishments and the actual number of establishments within each industry for all counties mapped (contiguous US). Expected establishments were estimated using economic models calibrated using restricted-access federal administrative data.

Specific economic concepts in the Economic Opportunity Mapping tool include:

- Under investments – the identification of gaps in economic investments that are not being taken advantage of, such as unmet demand for a certain industry. Used as a planning tool, it helps identify barriers that may prevent potential industries from investing in the community.
- Overinvestments – changing local needs and market forces may lead to some industries that cannot be financially sustained without public resources. For example, a rural community may only have demand for 0.7 hospitals, but a full hospital is built to meet the need. Long term, the hospital is not financially feasible and is at risk of closure.
- Retail leakage – residents who live in the community but shop elsewhere. Retail leakage is often influenced by commuter patterns when residents work in a neighboring community and shop where they work rather than where they live.

This integrated activity involved UW Extension Specialist in the research and development of the Economic Mapping Tool. The educational program was collaboratively delivered by the specialist and a UW Extension Educator. The specialist covered the technical aspects for how the tool works and demonstrated multiple scenarios using the tool in real time to explore topics like retail leakage and at-risk industries. The UW Extension Educator discussed community capitals and provided context for participants to understand how the tool could be used in making community economic decisions.

### **Briefly describe how your target audience benefited from your project's activities.**

The program is in its infancy and informal evaluation was gathered from the participants at each of the conferences. One primary purpose was to create awareness of the Economic Mapping Tool and its potential use for decision making. Participants felt the tool was useful and understood how they could use it to better inform economic development strategies. Examples of decisions that could be influenced by information in the mapping tool include thinking about the local economic development in a regional context; to help communities identify struggling industries and create supporting government policies; and allocate scarce public resources effectively. Almost all participants said they would likely use the tool in the future.

Additionally, the participants suggested multiple other industries that may be added to the tool as well as some feature layers to highlight state infrastructure and tourist attractions. These suggestions will be incorporated into a planning tool next year.

Programming in future years includes an evaluation component to measure results and impacts.

### **Briefly describe how the broader public benefited from your project's activities.**

Communities would at minimum have a better understanding of their economy's relationship with neighboring economies, and at best be able to identify over- or under-investments in specific industries and prepare for or correct the current industry or market inertia.

**Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.**

Increasing data privacy concerns have led the Census Bureau to increase data suppression and statistical noise infusion. This results in unreliable county-level public data starting in 2017. Therefore, the UW Extension Specialist is working to identify other data sources that may be used to accurately update the Economic Opportunity Maps. Unfortunately, this means updates to the mapping tool cannot be made until reliable business data can be identified.



## Rocky Mountain Youth Entrepreneur Series

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### **In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

The Rocky Mountain Youth Entrepreneur Series (RMYES) was developed in response to a need. Not only has the COVID-19 pandemic changed the outlook for the food service industry, but many youths are choosing to return to the farm/ranch/small acreage and carve out their enterprise. Livestock prices are down, and producers are looking for local sources to market their product and diversify their income streams.

### **Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

The Rocky Mountain Youth Entrepreneur Series was geared towards youth 14 and older to develop a business plan for a farm stand, farmers market booth, or food truck. Seven youth from three counties began the program in February 2021. Over the course of the year, eight meetings were conducted using a combination of Zoom and in-person learning. Each session built upon the next with tasks for the youth to work on before the next class. The first year was completed with a capstone project.

Workshops were led by industry professionals explaining to the participants the need to have a solid business plan, know your costs, managing risk, marketing, and business sustainability. One of the presenters is a past 4-H member, who now is a successful business owner marketing products he began learning about in 4-H.

Funds from the University of Wyoming John P. Ellbogen Foundation Wyoming Communities, Agriculture, and Rural Living Project were used to supply materials, support travel, and provide program support. In-kind contributions came in the way of meeting space, speaker fees, and travel support from 4-H.

### **Briefly describe how your target audience benefited from your project's activities.**

Three youth completed the development of a marketable product.

One of those was showcased at the capstone event for the Rocky Mountain Youth Entrepreneurship Series. One young entrepreneur pitched her project. .Slime. Although this didn't fit the initial project idea, she progressed through her presentation and convinced the panel that the development of her product filled a market-based need. That need was having something for younger kids to have and play with while at a Farmer's Market as parents wandered. She was able to develop her product, did the labeling and marketing of the product, and then allowed those in attendance to play with the slime while answering questions. She had put so much thought into her product that you immediately wanted to buy it! It was a great way to conclude the program.

The other two marketable products are in different stages of product readiness but were not showcased at the capstone event. One entrepreneur has created handmade jewelry with a proposal to sell her product at her local farmer's market and potentially on ETSY. The other has proposed a bagel food truck.

### **Briefly describe how the broader public benefited from your project's activities.**

According to data from the Bureau of Labor Statistics, approximately 20% of small businesses fail within the first year and by the end of the second year, 30% of the businesses will have failed. Providing youth an opportunity to develop a small business, in the process learning from their successes and failures, in a safe, structured environment will provide them with valuable experience should they pursue starting a new business as an adult.

**Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.**

Moving forward into year two of the Rocky Mountain Youth Entrepreneur Series, the program has been restructured based upon input from previous youth participants. Decreased participation as the program progressed was attributed to the length of time between each in-person or ZOOM meeting. Instead of a multi-series program that runs the course of a year, an intensive, activity driven two-day format will be conducted. Identical programs will be offered on the west and east sides of the state. Curriculum from VentureLabs will be introduced and the most relevant outside speakers addressing specific content that relates to the youth entrepreneur will be featured. Much of the content will be delivered by the University of Wyoming 4-H Educator team and enhanced by outside experts with real world entrepreneurial experience. These changes will strengthen the program as youth participants will be committing to a content rich, weekend versus eight sessions spanning a year.

### Youth and Adult Volunteer Development

Project Director

Kimberly Reaman

Organization

University of Wyoming

Accession Number

7000344



### **MakeHER Camps expose middle school aged children to science and technology fields**

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**In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

Million Girls Moonshot movement has found that female scientists and engineers are concentrated in different occupations than are men, with relatively high shares of women in the social sciences (62%) and biological, agricultural, and environmental life sciences (48%) and relatively low shares in engineering (15%) and computer and mathematical sciences (25%). Women make up half of the total U.S. college-educated workforce, but less than one third of the science and engineering workforce.

For students in elementary through high school, more than 80% of their time is spent learning outside of school at afterschool and summer programs, in libraries, museums, science centers, or at home or in the community. Microsoft has also found that girls either identify with or lose interest forever in STEM activities between the ages of 11 and 15, and girls are most receptive to STEM education between 9 and 11 years old.

**Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

Carbon County 4-H received at least five requests for STEM project programming in 2020/21. An afterschool STEM camp for girls ages 9-11 would allow a new 4-H audience in Carbon County to be introduced to the Maker Movement and the design thinking process.

The UW 4-H Educator in Carbon County offered the 4-H MakeHER camp with the purpose of teaching girls ages 9-11, how to use the design thinking process to solve problems and develop valuable skill sets in science and engineering. These skills help campers understand their world and empowers them with the confidence to make, create, and try, try, try!

Two 5-day camps, in different locations, were conducted using the same curriculum. Each day, campers worked through the engineering design process to make projects described below.

**Day 1 - Bouncy Ball Factory:** Campers became product engineers in a bouncy ball factory as they learned about polymers and used the engineering design process to prototype a polymer bouncy ball that met specific requirements and aesthetic considerations.

**Day 2 - E-Textile LED Mask:** Campers defined, recognized, and assembled components in a parallel circuit. Campers explained the path of electrical charge through a circuit and described an example of how engineers apply their understanding of circuitry to the design of artistic products by sewing LEDs into a felt mask.

**Day 3 - Suminagashi Cards:** Campers defined water surface tension and explained how surface tension can affect objects such as paperclips and ink. They described why ink forms circular shapes when applied to the surface of water and applied this scientific knowledge to create beautiful works of art using the suminagashi technique.

**Day 4 - Engineer A Machine:** This was a design and building challenge to test campers design thinking and creative limits. They used the engineering design thinking process they had learned through previous activities to create a machine that moves on its own using a DC motor.

**Day 5 - Vinyl Heat Press Bandana:** Campers reflected on their experience at MakeHER Camp and designed a camp bandana to represent the group, then printed, cut, and applied the vinyl design on a bandana.

Camp one was a partnership with the Boys & Girls Club of Carbon County. Eight (8) girls in grades 4 and 5 enrolled in the camp. Campers met at the Boys & Girls Club from 3:00 to 5:30 pm Monday through Thursday, and 1:00 to 5:00 pm on Friday.

Camp two was in partnership with Hanna Elementary School and the Hanna Recreation Center. Lunch for campers was provided by Carbon County School District #2. Three (3) girls and two (2) boys in grades 5 and 6 enrolled in the camp. Campers met at the recreation center from 1:00 to 4:00 pm Monday through Thursday and 1:00 to 5:00 pm on Friday.

The camp was funded by the Wyoming Afterschool Alliance as part of the Million Girls Moonshot Initiative, and overseen by the UW Coe Student Innovation Center with support from Wyoming 4-H.

### **Briefly describe how your target audience benefited from your project's activities.**

All campers were very engaged in the projects, but ages and background experience varied so each camper had a different experience. Two campers were ESL students, two were older and had been exposed to some concepts in science class at school, one was much younger than the rest of the group, and with the last camper it was apparent they had a lot of STEM enrichment at home and got a little frustrated with the rest of the group when we had to review concepts.

For most of the projects, two and a half hours was not enough time and campers took their projects home to finish them. However, they were often so excited with the results that they brought their projects back to show the other campers.

Campers were given a twenty-one question pre-post-test worth 42 points. The pre-test was administered to the eight campers who initially enrolled, however the post-test was only given to the six that consistently attended all five days. Of the post-test respondents, there was a 100% knowledge increase and an average score increase of 13.3 points.

Comments made by campers were noted and examples are shared below.

#### Boys & Girls Club of Carbon County Camp

- Camper #1: "Look! I MADE this!"
- Camper #2: "I didn't think I could do it, but I just kept trying and I DID it!"
- Campers #3 and 4: "Can you believe we're sewing? I know how to sew now!"

#### Hanna Elementary Camp

- Camper #9: "No, I want to finish it, it's MINE. Look at how cool it's gonna be."
- Camper #11: "Ooooo, now I just need to solder it. I think I fixed it; it's going to work this time!"
- Camper # 9: "I bet we could make like, five more combinations today that would work better." (In response to Bouncy Ball failures)

### **Briefly describe how the broader public benefited from your project's activities.**

Exposure and experiences with science and technology at a young age can influence choices about post high school education and career paths encouraging more females to enter those fields which are currently dominated by males.





**In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

UW Extension has county-based Master Gardener Coordinators in six counties, but there is interest in the Master Gardener program in all 23 counties. Gardening in Wyoming is rife with struggles. The growing season is short, with 100 days or less, the soil is poor, there is extreme cold, and extremely dry conditions. Participants in the Master Gardener program are interested in information that will help them be successful in the uniquely challenging growing environments found across Wyoming.

Prior to COVID, in person Master Gardener trainings were coordinated at the county level. Six to ten Master Gardener trainings were conducted annually. The time commitment and structure of the in-person Master Gardener Training created challenges for some participants who were unable to participate 100%. If a session was missed, the participant was unable to review the content and fully complete the training. Travel restrictions due to COVID had a significant impact on the Master Gardener program, both in terms of how Master Gardeners are trained and how certified Master Gardeners volunteer in their communities.

**Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

Influenced by COVID restrictions and the uncertainties and health concerns associated with face-to-face settings an online Master Gardener training was created to address this need. Master Gardener trainings included two tracks. Master Gardener training is open to the public and anyone who wishes to increase their knowledge about gardening in Wyoming is welcome to participate. Master Gardener Volunteer Certification is an option for individuals who would like to complete the course and be a resource for others in their community.

Online Master Gardener Training, hosted in the spring and the fall, included 3-hour trainings for 14 weeks. Individuals could choose to participate in the live zoom session or watch the recorded session when it was convenient in their schedule. Participants seeking volunteer certification were required to successfully complete the weekly quiz based upon content presented that week.

Topics taught by UW Extension educators and specialists included Basic Botany, Soil Health and Composting, Extending the Growing Season, Growing Vegetables and Herbs, Fruit Trees and Berry Crops, Site Analysis and Landscape Design, Herbaceous Plants, Woody Plants, Lawn Care, Integrated Pest Management and Understanding Pesticides, Plant Pathology and Diagnosing Plant Problems, Weed Management, Entomology, and Volunteering in the UW Extension Master Gardener Program.

The online training also made the class more inclusive through its easy accessibility and had numerous benefits for participants, instructors, and the Master Gardener Program. It provided easy access for participants when it was convenient for them to participate, it allowed the participants to choose how they would like to be involved (live or recorded sessions), and live interaction was still possible through zoom. Additionally, the online training allowed instructors to reach the entire state in one class rather than traveling to teach the same class multiple times in different locations.

Certified volunteers are expected to provide 40 hours of volunteer service which are educational in nature. During the training UW Extension Master Gardener coordinators were invited to talk about their volunteer programs and encourage volunteers to connect with local UW Extension offices and programs. The areas most reported for volunteer service included plant sales, beautification projects, community and demonstration gardens, school gardens, garden tours, and farmer's markets. Produce donations were incorporated into the volunteer service options to accommodate COVID restrictions and concerns about face-to-face interactions. One pound of donated produce, grown in personal garden, equaled one volunteer hour.

**Briefly describe how your target audience benefited from your project's activities.**

In general, all the classes were highly rated by the participants. The chart below highlights participant feedback for the spring and fall online Master Gardener Training. The majority of participants indicated that the online format is preferable to face-to-face programs because it allows flexibility to access the class materials when it fits their schedule. The convenience of joining from home, not having to travel to a classroom, and being able to watch a recording if unable to attend the live class was mentioned frequently. Almost equal numbers attended the live zoom classes as those who attended the live zoom classes and watched the recordings. Participants liked the variety of speakers and most felt the 3-hour block of time was sufficient to cover the material in-depth and the expectations for the class were met or exceeded in all instances. Regarding the on-line delivery, participants found the virtual platform easy to navigate and the technology compatible with their device.

Participant feedback for the online Master Gardener Training:	Spring Class =	Fall Class =
	196 adults	93 adults
Prefer online class	82%	89%
Primarily attended live zoom classes	42%	26%
Attended live zoom classes AND watched recordings	44%	44%
Primarily watched recorded sessions	14%	30%
Class exceeded expectations	76%	61%
Class met expectations	23%	35%
Class did not meet expectations	1%	4%
Number of participants who indicated an interest in volunteering	60	41
Number of volunteers who reported volunteer hours in 2021	20	0 *
Number of volunteers who earned Master Gardener volunteer certification (40+ volunteer hours)	6	0 *
Total number of volunteer hours reported in 2021	596.5	0*

\* Of the 93 people enrolled in the fall class, 39 indicated they plan to pursue Master Gardener volunteer opportunities. Since the class ended in December of 2021, there has not been adequate time to volunteer so responses have not been collected at this time.

When asked about the strength of the training, common responses included the variety of instructors, access to campus-based specialists, the broad spectrum of topics covered, and the Wyoming focus of the content through photos showing specific examples and issues with Wyoming plants.

When asked how the training could be improved, several responses indicated a desire for more hands-on activities during the class but recognized the limitations inherent with online delivery.

Regarding subject matter knowledge gained, participants said they learned more about building healthy soils, selecting plants suitable for growing in Wyoming, identifying pests and problems, identifying plants, composting, pruning, watering, planting gardens, fertilizing, lawn care, promoting pollinators, planting trees, and pesticide safety. Several also indicated they intend to change practices they have used in the past based upon what they learned.

Many instructors indicated that the online Master Gardener training is their preferred method for delivery. The statewide, online training standardized the curriculum, ensuring that all participants received the same information and level of training, regardless of their location and local resources which benefits the Master Gardener Program.

**Briefly describe how the broader public benefited from your project's activities.**

Volunteers in the master gardener program donated 1,622 pounds of fresh produce to local food pantries. Additionally, UW Extension employees and UWE Master Gardener Volunteers partnered with Wyoming State Forestry to plant 2,300 trees throughout Wyoming. Master gardener volunteers identified private and public locations and helped plant 100 trees in each county.

Two hundred and twenty-eight (228) certified Master Gardener Volunteers recorded 8,278 volunteer hours reaching 23,991 contacts in 2021.

## Enterprise Diversification to Promote Economic Value and Sustainability of Wyoming Agriculture

Project Director

Kimberly Reaman

Organization

University of Wyoming

Accession Number

7000364



### **Integrating Annual Forages into Sugar Beet and Barley Rotations**

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#### **In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

Sugar beet and barley rotations are destructive to soil health because of intensive tillage, long periods of bare soil, and the every-other-year frequency of heavily consumptive sugar beets. Sugar beets require a lot of water and fertilizer, and their harvest causes significant disturbance to the soil. Farmers are becoming more aware of the role of healthy soil in sustaining crop yields in an increasingly unpredictable climate, but they need information about benefits of soil health practices in irrigated annual cropping systems.

#### **Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

Barley is a great cover crop. It grows rapidly, competes voraciously with weeds, is very salt tolerant, and has prolific fine roots that improve soil tilth and organic matter content. Overall, replanting barley after barley harvest in sugar beet-based rotations looks to be an excellent way to save soil, cycle nutrients, and integrate livestock grazing into sugar beet production systems. The benefits might be even greater if legumes and other cover crops are mixed with the barley seed. Expanding rotations to include perennial crops like alfalfa also has clear benefits for soil health and productivity.

Educational efforts, including individual consultations with farmers, and trials on five farms in Wyoming and three in Montana influence approximately 8,000 acres. Farmers involved in these efforts are adopting practices to increase soil health, reduce production costs and increase profitability. Examples include the following:

- Planting forage immediately following the mid-summer barley harvest for livestock grazing or hay production in the fall.
- Lengthening the rotation of sugar beets and diversifying the rotation of crops, including two to three years of alfalfa for seed or forage.
- Eliminating bare soil by planting cover crops to reduce erosion and increase soil health.
- Some farmers are converting to a sprinkler irrigation system which allows them to also implement reduced tillage practices.

These results have been presented through the on-line UW Extension Ag and Hort Conference, articles in Wyoming Round Up as well as future UW Extension bulletins.

#### **Briefly describe how your target audience benefited from your project's activities.**

Farmers improved soil health by integrating annual forages into sugar beet and barley rotations. Planting forages for fall grazing provides an additional income stream through grazing leases or harvesting the crop for hay.

Farmers also maximized profitability by increasing yield and reducing production costs by growing forage, through better nutrient and water use efficiencies, improving resistance to disease and insect damage, and by reducing tillage passes.

**Briefly describe how the broader public benefited from your project's activities.**

Consumers and the public are interested in farming systems that conserve natural resources and biodiversity. Reduced tillage practices have many environmental benefits including carbon sequestration which may slow climate change, water conservation, and reduce wind and water erosion.

**Maintaining Viable, Resilient, and Sustainable Ag-operations**

Project Director

Kimberly Reaman

Organization

University of Wyoming

Accession Number

7000362



**Assisting small-scale cattle producers with artificial insemination**

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**In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

An increasing amount of meat and milk is being produced by smaller-scale producers that want to become more self-sufficient and know the source of their food. The cost of owning and maintaining a bull is a financial barrier for many small-scale producers and limits their ability to make precise breeding decisions. Artificial insemination makes the complication of owning and raising your own cattle on a small-scale more feasible.

**Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

Artificial insemination is a tool that allows cattle producers to make decisions about genetics and animal management. Additionally, synchronization protocols with artificial insemination give cattle producers the ability to breed their animals at a predetermined time and shorten their expected calving timeframe. Perhaps the greatest benefit to artificial insemination is its implications for genetic progress. Beef and dairy cattle bulls used for artificial insemination have generally sired an ample amount of progeny and therefore, predictions can be made with a high degree of accuracy about their ability to pass along specific traits to their progeny.

Utilizing artificial insemination also gives producers the ability to specialize their product. Access to different breeds and traits can be bought and stored in the form of frozen semen for many uses. Calves can be bred to maximize meat quality by artificial inseminating with unique breeds known for marbling and tenderness. Sire selection can play a large role in the milk composition of dairy cows and sexed semen can nearly guarantee the sex of the calf. Valuable purebred herds can be started by utilizing sires that possess ideal genetic traits for their breed. Additionally, sires with high accuracy calving ease traits are another very important consideration while breeding heifers and smaller framed cows to ensure safely delivered calves.

The artificial insemination process requires a skilled technician and access to equipment needed for semen storage and handling. The Fremont County University of Wyoming Extension office has possession and allows public-use of a liquid Nitrogen semen storage tank, semen thaw boxes, artificial insemination guns, and all the equipment needed for the artificial insemination process. This allows producers the ability to purchase and store semen until breeding without the requirement of purchasing everything up front.

In 2021, 16 adults and 8 youth consulted with the UW Extension Agricultural Educator, who is an experienced artificial insemination technician. The educator met with clientele several times prior to artificial insemination to discuss individual breeding plans, sire selection, purchasing drugs, and miscellaneous materials needed for the process. The estrous cycles are then synchronized through a series of hormonal manipulations (injections and implants) to determine a specific breeding date and time. Assistance is given with cattle handling, injections, and the application of implants. When the time is right for artificial insemination, assistance is also given with the semen thawing and insemination process.

**Briefly describe how your target audience benefited from your project's activities.**

As a result of these consultations, six new ag-based enterprises started, and three clientele adapted new management practices to enhance sustainability of their business.

Through utilizing the artificial insemination process, they were able to know exactly when the breeding was taking place, what genetics were being used, and roughly when their calves would be born. Each producer had different goals, but this process had many positive impacts for their herds. Below are few examples of those positive impacts:

A family in Hot Springs County diversified their small farming operation by introducing Wagyu genetics into ten of their crossbred heifers in the Spring of 2020. Calves were born on-time and without difficulty. They retained the calves and fed them until they were finished and ready for processing. They marketed their specialty product to specific buyers that were willing to pay a premium for the product. All beef was sold immediately, and a new source of income was realized for their operation. In 2021, the family was able to expand their farm and increase their cattle numbers.

A family in Fremont County acquired two Jersey cows to produce their own milk due to their son's sensitivity to certain proteins found in conventional milk. They decided to increase their cow numbers to have enough milk to share and sell privately within the community. With assistance, they were able to artificially inseminate their cows with female sexed semen to produce heifer calves that they retained as future cows. It was important to them to use a sire that contained A2/A2 milk protein genetics to produce milk that is digestible for people who are sensitive to A1 proteins commonly found in conventional milk (including their son). The family also uses their milk to produce their own butter and cheese products.

Youth with 4-H/FFA breeding beef projects from across the state were able to get their heifer projects artificially inseminated. For many, this was the start of their own cow herds and entry to the beef industry. A 4-H member from Hot Springs County involved breeding registered purebred Hereford heifers to low-birth-weight Hereford bulls to start her own seedstock herd. Some youth in Fremont County were interested in breeding a small portion of their mature cows to produce club calves for future show projects.

Many new cattle owners simply have interest in becoming more self-sustainable. A family recently moved from California and purchased 40 irrigated acres in Fremont County. They also initially acquired two mature crossbred cows from the sale barn in Riverton. In the Summer of 2021, they artificially inseminated their cows to a sire that has high-accuracy genetics for both calving-ease and growth traits. They plan to retain heifer calves and feed out steer calves to raise their own grass-fed and grain finished beef. In the future, extra beef will be sold in quarters, halves, and wholes and marketed as locally raised.

Artificial insemination can be a very impactful tool to people in many ways. Following artificial insemination consultations with UW Extension, many producers have attended artificial insemination schools to learn the technique themselves and/or have purchased their own equipment. Regardless, access to an experienced technician and artificial insemination equipment amounted to large up-front cost savings for many small-scale producers getting their start.

**Briefly describe how the broader public benefited from your project's activities.**

Consultations for artificial insemination have allowed small-scale producers an inexpensive way to get started in the industry by producing a high-quality product that they desire and/or has value to others in their community.



**Wyoming Ranch Camp prepares young adults for unique challenges on Wyoming ranches**

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**In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

Wyoming ranchers face many challenges to operating a sustainable ranch. Wyoming's climate creates unique challenges and necessitates that a ranch manager be extremely competent in managing range and pasture resources. Limited access to markets and end consumers also increases the amount of management skill and commitment needed from a Wyoming rancher. Additionally, Wyoming's unique landscapes and terrain require producers to pay close attention to their genetic base. Finally, land prices and values, make it very difficult to get started in ranching and can reduce the margin for error as a rancher. Experienced producers facing the challenges can be daunting. It is imperative that young and beginning producers be given opportunities to hone and practice their skills to better prepare them for these challenges.

**Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

The Wyoming Ranch Camp targeted young adults with an interest in further developing their ranch management skills. Twelve young adults participated in the 2021 Wyoming Ranch Camp. Many of the participants came from family ranches and this camp proved valuable in expanding the depth and breadth of their knowledge and skills. Other participants had very little agricultural experience and the Wyoming Ranch Camp helped prepare them for careers working with ranchers.

The educational format of the Wyoming Ranch Camp included a week-long, intensive hands-on program, aimed at providing education, training, and experience on ranch management, range management, agricultural economics, ranch recreation, and meat and animal science. UW Extension educators, specialists, and industry partners presented content specific workshops and conducted hands on activities throughout the week. For example, in the meat and animal science section, participants learned the importance of understanding end product quality and processing, key considerations in managing herd genetics, nutrition and health. The hands-on activity for meat and animal science included meat cutting, artificial insemination and calving techniques.

To provide real life examples the camp was conducted at Broadbent Ranch, a ranching enterprise that allowed participants to observe successful strategies in an extremely diversified ranching operation. The location provided participants with direct access to ranch owners and managers during the week to discuss ideas and ask questions.

To reinforce learning, participants were placed in teams at the beginning of the week and instructed to develop a complete ranch plan from the information they were taught. Ranch plans were evaluated by principal educators as well as ranch managers. Member of the winning team each won a \$500 scholarship to the University of Wyoming.

### **Briefly describe how your target audience benefited from your project's activities.**

Each participant completed an exit interview at the conclusion of the camp. Examples of their comments include:

- “Having specialists out here talking about what they are passionate about is way better than staying through a professors lecture.”
  
- “It’s [topics presented] are all applicable to the lifestyle of ranchers.”
  
- “Seeing progressive and proactive management strategies and seeing how well it’s worked for them.”

A short video (3:34) of the testimonials captured in the exit interviews can be viewed at <https://youtu.be/y1uJBWipEeo>

Several participants indicated that they would implement grazing strategies, livestock marketing, and natural resource management ideas on their home ranch.

The ranch business plan completed by each team also served as a valuable evaluation instrument. One evaluator on the panel reviewing the ranch business plans shared “*It was evident during the ranch management plan presentations that participants had increased their understanding of the complexity of ranch management, how to utilize the ranch management and budgeting tools, range science and management, sheep production and management, and beef cattle production and management.*”

Wyoming Ranch Camp participants are more prepared to work in their respective communities following this program. Several indicated that they had a new appreciation for the work that livestock producers across the country accomplish. Additionally, several of the participants have new jobs and they reported that Ranch Camp helped prepare them for their new roles.

Through the Wyoming Ranch Camp many young adults were trained to handle the challenges of ranching more effectively in Wyoming. Not only will this help them to understand the challenges that lay ahead in their chosen career, but it also has the potential to help them excel in subsequent college classes.

Follow-up interviews will be conducted with participants through-out the life of the Wyoming Ranch Camp to better understand the long-term impacts of the camp.

### **Briefly describe how the broader public benefited from your project's activities.**

Helping ranchers meet these challenges is not only important for the individual ranchers but is also critical to the sustainability of Wyoming communities. Recently several regional economic impacts studies of been completed that look at the impacts to Wyoming communities when ranch enterprises are lost. These regional impact analyses have made it very clear that many, if not nearly all, Wyoming communities would struggle without vibrant ranching enterprises.

Critical Issue

## Human Health, Wellness & Nutrition

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Closing Out (end date 09/07/2023)

### [Enhancing Microbial Food Safety by Risk Analysis](#)

Project Director

Bledar Bisha

Organization

University of Wyoming

Accession Number

1022378



### [Paper-Based Microfluidic Detection of \*Listeria monocytogenes\*](#)

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**In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

*Listeria monocytogenes* is a pathogen associated with deadly foodborne outbreaks. Due to the virulence, distribution, growth characteristics and environmental persistence of *L. monocytogenes*, rapid detection of the pathogen is critical. Paper-based diagnostics ( $\mu$ PADs) are an attractive option for rapid detection, including colorimetric-based assays.  $\mu$ PADs are a rapid detection platform amenable to low-cost, user-friendly, portable diagnostics.

**Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

We developed and optimized a  $\mu$ PAD platform specific for the colorimetric detection of the *Listeria* genus following recovery from food contact and non-food contact surfaces. This study demonstrated the ability of the  $\mu$ PAD-based method to detect potentially stressed and injured cells at low levels of environmental contamination.

**Briefly describe how your target audience benefited from your project's activities.**

The developed tools have potential for adoption in field-based diagnostics, helping mitigate major food safety risks.

**Briefly describe how the broader public benefited from your project's activities.**

Results have been shared in scientific meetings and through peer-reviewed publications, reaching an audience of food safety researchers, regulatory agencies, and industry representatives.

### [Encouraging Healthy Environments to Support Lifestyle Changes and Improve Nutrition of Wyoming Residents](#)

Project Director

Kimberly Reaman

Organization

University of Wyoming

Accession Number

7000365



### [Policy, Systems, and Environmental changes in SNAP-Ed](#)

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**In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

The UW Extension Cent\$ible Nutrition Program works to improve the health of people with limited resources. CNP's mission is to provide opportunities for positive change in nutrition and physical activity for the limited resource audience through education, multi-level interventions and community engagement. To accomplish this mission, CNP takes a multi-level approach that works across the socio-ecological model to affect change at the individual, organizational, and community level.

**Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

Cent\$ible Nutrition educators partner with local agencies to adopt nutrition and physical activity supports to make the healthy choice the easy choice in Wyoming communities. This work is referred to as Policy, Systems, and Environmental changes in SNAP-Ed. Areas of emphasis for policy, system, and environmental changes are:

1. Local Food/Gardening-

- Partnered with 39 organizations around Wyoming on local food and gardening efforts to increase access to fresh fruits and vegetables.
  
- Collaborated with the First Lady's Wyoming Hunger Initiative, Master Gardeners, and UWE to Grow a Little Extra
  
- Partnered with the Wyoming Hunger Initiative to develop lamb recipes for lamb donations to a Converse County food pantry
  
- Developed 22 educational flyers for distribution with produce donations
  
- Created garden signs for SNAP-Ed funded gardens with QR code linking to Cent\$ible Nutrition Program website for additional information harvesting your own vegetables, food preparation, food preservation and a healthy lifestyle.

2. Elementary schools and Early Care & Education sites -

- Implemented *Grazing with Marty Moose* nutrition and physical activity interventions at 15 qualifying elementary schools
  
- Partnered with seven early childhood education centers to implement the Healthy Policies toolkit resulting in nutrition and physical activity changes

3. Food Pantries

- Partnered with 12 food pantries to implement the Healthy Food Pantry Project toolkit resulting in increased nutrition and physical activity supports available to people with limited resources
  
- Coordinated with the Wyoming Department of Family Services and Wyoming Food Bank of Wyoming to create and distribute monthly newsletters with recipes for Commodity Supplement Food Program food boxes, totaling reaching 230 people each month

4. Department of Family Services referrals (DFS)- Increase number of DFS referrals enrolled in CNP classes.

**Briefly describe how your target audience benefited from your project's activities.**

Results from the Policy, Systems, and Environmental changes in SNAP-Ed are highlighted below:

Cent\$ible Nutrition educators created or maintained 39 partnerships with groups focused on increasing access to local foods. Partners included local food producers, farmers markets, UW Extension, UW Agriculture Experiment Stations, community gardens, food pantries, and the Wyoming First Lady's Wyoming Hunger Initiative. A total of 18,829 pounds of produce were donated statewide.

The Grazing with Marty Moose curriculum was implemented in 15 sites with 58 nutrition and physical activity supports adopted, reaching 3,147 youth. These supports include healthy celebration proclamations, hand washing, increasing drinking water accessibility, incorporating physical activity into the school day, eating breakfast, and healthier lunchroom changes.

Cent\$ible Nutrition educators partnered with the Wyoming Department of Health, Chronic Disease Prevention Program to work with Early Childcare Education Centers sites to implement the *Healthy Policies Toolkit*. This toolkit was adapted for Wyoming from the Nemours technical assistance manual *Let's Move Childcare*. The *Healthy Policies Toolkit* was implemented in 7 new sites with 47 nutrition and physical activity changes being adopted, reaching 184 youth.

The Healthy Food Pantry Project toolkit was implemented at 12 sites with 43 nutrition changes being adopted.

A total of 1,290 DFS referrals were received with 83 referrals enrolling Cent\$ible Nutrition Program classes. Of the total adults enrolled in Cent\$ible Nutrition Program classes, 6.4% came from DFS referrals.

**Briefly describe how the broader public benefited from your project's activities.**

The vision is to empower Wyoming's adults and youth with limited resources to be leaders in healthy nutrition and physical activity changes for themselves, their families, and their communities resulting in decreased chronic disease and obesity in Wyoming.



**State Health Improvement Forums seek public input to address priority health challenges in Wyoming**

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**In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

Wyoming has high rates of substance abuse, the highest rate of suicide in the nation, and the sixth highest rate of low birthweights in the nation. These health challenges are coupled with costly air ambulance transportation, financial barriers to healthcare, and community barriers to health, including public attitudes, social and economic factors, and a lack of a community connection.

While the Wyoming Department of Health Public Health Division has previously worked to develop a state health assessment and a state health improvement plan, efforts have fallen short. In recent years, the public health division has redefined its approach and worked collaboratively with partners and communities to develop a state health assessment and establish priorities for the state health improvement plan.

**Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

UW Extension Community Development Educator who serves on the Wyoming Department of Health, Public Health Division state health assessment and state health improvement plan steering committee provided guidance on developing group processes to engage the public in identifying and prioritizing strategies and action to address those prioritized health issues. A process known as deliberative dialogue was introduced to engage the public in decision making and the license for Common Ground for Action, an online text based deliberative dialogue platform was purchased.

Wyoming Public Health Division steering committee members and Extension personnel participated in roughly 45 hours of trainings and practice sessions to ensure readiness to conduct live CGA forums. During the training, participants were introduced to deliberative dialogue principles, facilitation best practices, and given multiple opportunities to moderate practice forums.

In 2021 eighteen two-hour time slots were made available for the public to participate in Common Ground for Action forums on three prioritized health issues: 1) access to health care, 2) behavioral health, 3) and unintentional injury). Six time slots were allocated to each of the topics. Individual forums were limited to 12 participants with multiple forums conducted simultaneously when enough volunteer moderators were available. A total of 26 forums (52 hours) were held with 130 participants from 20 of Wyoming's 23 counties. Behavioral health forums had 46 participants, access to health care forums had 52 participants, and unintentional Injury forums had 32 participants.

**Briefly describe how your target audience benefited from your project's activities.**

Following the forums participants were asked to complete a survey to gauge their reactions to the process and the software used. Preliminary results from 83 completed surveys follow:

Among the 83 respondents:

- 83% reported they were somewhat or much more confident that the beliefs and needs of residents would be incorporated into the final SHIP because of participating in the forum.
- 64% reported their opportunity to influence the decisions made regarding the SHIP was above average or excellent because of participating in the forum.
- 65% reported they found it somewhat less or much less difficult to participate using the platform as compared to other methods of public engagement. However, it should be noted that nearly one in five respondents found it more difficult.
- 89% agreed they had a better understanding of others' perspectives and views on what should be done to improve health issues.
- 81% reported they believed more appropriate strategies and actions were prioritized because of deliberating together, compared to other methods of public input.
- 90% reported they believed the Department of Health would make better recommendations regarding improving health in Wyoming.

**Briefly describe how the broader public benefited from your project's activities.**

UW Extension partnered with Wyoming Department of Health, Public Health Division to conduct public participation forums for participants to deliberate on what should be done to address Wyoming's priority health challenges. Having a well-developed and actionable plan presents greater opportunity for improving population health across Wyoming, especially as it relates to the priority issues identified through the state health assessment process.

Critical Issue

## Natural Systems, Food & Fiber Production

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### Increased Efficiency of Sheep Production

Project Director

Whit Stewart

Organization

University of Wyoming

Accession Number

1025808



## Estimating sheep nutrient intake on dormant winter range

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**In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

Extensive sheep production systems experience nutritional management shortfalls due to their reliance on rangeland resources. Periods of lowest forage nutritional quality correspond with the fall and winter months when breeding and gestation take place. Efforts to quantify nutritional shortfalls during these periods can inform mineral supplementation protocols and thereby reduce production losses.

**Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

Winter range sites (27 ranches) were included in sampling for nutritional composition of common plants in addition to estimates of dietary composition using fecal DNA. Using plant nutrient content combined with estimates of dietary intake indicated that quality of winter diets is improved with higher proportion of shrub-like plants in diets of grazing sheep. Still, mineral supplements containing phosphorus, sulfur, sodium, zinc, and cobalt are warranted to meet shortfalls during pregnancy.

**Briefly describe how your target audience benefited from your project's activities.**

Participating data collection sites (sheep ranches) were able to fine-tune their nutritional management from the information generated thereby avoiding production losses. Furthermore, information generated has been used for extension/outreach programs throughout the Western U.S. with a combined reach of producers managing over 90,000 ewes collectively.

**Briefly describe how the broader public benefited from your project's activities.**

Lamb and wool consumption continues to increase and efforts to ensure that producers meet this demand in a sustainable manner is important for U.S. food and fiber security. Utilizing precision livestock management strategies like those described in the current study strengthen rural economies while maintaining natural resources.

### Diseases occurring in Wildlife and Livestock in the Intermountain Region

Project Director

Jonathan Fox

Organization

University of Wyoming

Accession Number

1024117



## Mycoplasmosis in Pronghorn (*Antilocapra americana*)

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**In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

Pronghorn are highly susceptible to *Mycoplasma bovis* infection. Disease outbreaks are associated with high mortality rates, raising concerns about the effect of this common bovine pathogen on pronghorn populations. This is an emerging infection in pronghorn and there is little understanding of modes of transmission, pathogen maintenance, and the strains involved.

**Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

Our work on *Mycoplasma bovis* in pronghorn has demonstrated that two epizootics occurring one year apart were caused by a single *M. bovis* sequence type that is unique among all sequence types identified in North America. We also used controlled experiments to show that *M. bovis* can remain viable for 6 hours following inoculation of shaded water, and for up to 3 hours in direct sunlight. These results indicate that transmission of *M. bovis* from livestock to pronghorn through the environment is possible, and that seasonality of infection could be due to shared resources during late winter. Bison are also very susceptible to *Mycoplasma bovis* infection and the ongoing study will incorporate data from this species.

**Briefly describe how your target audience benefited from your project's activities.**

Understanding how *Mycoplasma bovis* is maintained in the environment and or transmitted will indicate potential approaches to reduce the risk of transmission to pronghorn.

**Briefly describe how the broader public benefited from your project's activities.**

This project raises general awareness of the potential threat of *Mycoplasma bovis* to pronghorn populations in the intermountain west region of the USA.

**Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.**

This work was recently accepted for publication in *Journal of Wildlife Diseases* (February 2022 - Source and seasonality of mycoplasmosis in pronghorn).

**Public Rangeland Education for Diverse Users and Values**

Project Director

Kimberly Reaman

Organization

University of Wyoming

Accession Number

7000366



**Discover Native Plants fosters stewardship of native plant communities and landscape productivity**

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**In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

A University of Wyoming Small Acreage survey of landowner needs indicated a strong interest in “protecting natural resources on the land” and “growing native plants”. This survey and the experience of UW Extension specialists and educators led to the development of the Discover Native Plants, a program to meet the needs of Wyoming landowners and foster knowledge and stewardship of native plant communities and landscape productivity.

**Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

The purpose of Discover Native Plants is to introduce native and non-native plants and their ecology to the public and provide opportunities to learn plant identification skills relevant for Wyoming flora. Activities include public outdoor walks and workshops to improve plant identification skills and discuss ecological aspects of vegetation management, including the control of weedy species. Workshop collaborators included members of the Rocky Mountain Herbarium, the Biodiversity Institute and UW Extension.

Thirty-two (32) adult participants in Sheridan County and 25 adult participants in Laramie County attended plant identification workshops. Each workshop was two hours and included a plant walk to introduce native plants and opportunities to look at different species using a 10x hand lens while instructors assisted with plant ID. The BioBlitz (<https://rockies.audubon.org/naturalist/wyoming-bioblitz>) was held at the Brinton Museum near Sheridan, Wyoming.

Discover Native Plants program partners include local plant enthusiasts, non-profit organizations, and local governments. Venues included sites managed by the Johnson County Youth Camp, Cheyenne Botanic Gardens, Laramie River Conservation District, Thomas the Apostle Retreat Center in Cody, Wyoming, Brinton Museum near Buffalo, Wyoming, and the Antelope Butte Ski Area in the Bighorn Mountains.

Through participant surveys it has been discovered the primary audience are “plant enthusiasts” who have a general interest in plants and their identification. However, attendees also have significant interests in weed control, horticulture and landscaping, and wildlife conservation.

**Briefly describe how your target audience benefited from your project's activities.**

Workshops improve knowledge of native plants and local ecosystems among Wyoming landowners and other stakeholders, who learn about the benefits of native and desirable plants, as well as the problems with introduced, invasive weeds.

Evaluation conducted with 25 adults attending the Laramie County workshop at the Cheyenne Botanic Gardens had the following responses out of a total of 5 points:

- Ninety-seven (97) percent of the respondents rated the overall workshop at 4.85 and indicated the workshop answered their questions (a score of 4.83).
- Eighty-four (84%) percent of the respondents indicated that the information provided would improve their experience at work (a score of 4.2).
- Ninety-one (91) percent of the respondents shared that the experience at the workshop would lead them to pursue new learning opportunities in plant identification and related fields (score of 4.53)

Participant feedback from the 32 adults in Sheridan County was also positive. Nine participants indicated their plant identification knowledge was limited, however the majority responded that the instruction level of the workshop(s) was "just right."

Nearly all respondents indicated they would like to see more plant identification workshops in the future and several attendees had the desire to learn more about flowering plants. A few attendees suggested that they would like assistance with plant identification terminology and more hands-on activities in workshops.

Participants were also asked about their interests and ideas for future workshops. On this occasion, most participants identified themselves as plant enthusiasts with interests in private lands, horticulture, education, and wildlife. Participants requested additional workshops to continue learning plant families, tree and shrub identification, medicinal plants, and conservation-focused topics such as low-water lawns. These focal areas represent the potential to expand the Discover Native Plants program and reach a broader audience in Wyoming.

**Briefly describe how the broader public benefited from your project's activities.**

Plant identification represents a foundational skill relevant for many activities from landscaping to natural resource monitoring and contributes to the local economy via weed control and successful rangeland production.

Closing Out (end date 09/07/2023)

**[Beneficial Use of Residuals to Improve Soil Health and Protect Public, and Ecosystem Health](#)**

Project Director

Urszula Norton

Organization

University of Wyoming

Accession Number

1021413



**Lead contamination in urban calcareous soils**

**In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

Urban gardening has become very common in many regions. Urban gardeners, small scale specialty crop producers, and local food consumers face an increased risk of exposure to soil contaminants including heavy metals such as lead.

**Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

A greenhouse experiment examined the effects of biochar, compost, and common inorganic fertilizer on soil lead (Pb) availability for radishes (*Raphanus sativus*, L.) grown in a calcareous soil containing excessively high Pb, and Pb accumulation in radish tissue. The soil that contained excessively high Pb concentrations was found in one of Laramie's back alleys. Results indicate soil amended with biochar and planted with radish saw an 18 percent reduction in available Pb and an 11 percent decrease in plant tissue content when compared to the control. Compost showed an 8 percent reduction in available Pb but a 19 percent increase in tissue content. In contrast, soil with inorganic fertilizer planted to radish increased soil Pb availability by 11 percent and Pb tissue content by 40 percent. Adding water-soluble inorganic fertilizers to contaminated calcareous soils without added organic matter enhances soil Pb availability and often asymptomatic plant Pb bioaccumulation.

**Briefly describe how your target audience benefited from your project's activities.**

Local gardeners and specialty crop producers were made aware of risks associated with growing food in areas of unknown heavy metal concentrations and were encouraged to test their soils for contamination and apply biochar in combination with compost.

**Briefly describe how the broader public benefited from your project's activities.**

The cultural, ecological, and health benefits of gardening are well-documented, and such spaces are especially important in urban centers, in which gardening can play a critical role in food access and community-building. However, these benefits must be evaluated against potential exposure risks to industrial and anthropogenic pollutants, including heavy metals, common to city spaces. Our work helps to improve public awareness about heavy metal contamination by educating local growers about small-scale management practices that can help reduce soil contamination.

Closing Out (end date 09/07/2023)

### Maintaining Resilient Sagebrush & Rural Communities

Project Director

Jeffrey Beck

Organization

University of Wyoming

Accession Number

1019991



### **Feral horse movement, habitat selection, and effects on pronghorn and greater sage-grouse habitat**

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**In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

Feral horses (*Equus caballus*) and burros (*E. asinus*) are managed on 177 BLM Herd Management Areas and 53 Forest Service Wild Horse and Burro Territories across the western United States. Populations of feral equids (i.e., collectively, horses and burros) have greatly increased in recent years with numbers exceeding by more than threefold the appropriate management levels of 26,715 for BLM lands in 2020 and 2021. Greater sage-grouse (*Centrocercus urophasianus*) and pronghorn (*Antilocapra americana*) are two iconic wildlife species of the sagebrush (*Artemisia* spp.) biome. Sage-grouse, in particular, are a species of concern with populations declining by 80% rangewide since 1965 and nearly 40% since 2002. Given the overlap of feral equids with sage-grouse, pronghorn, and other native species, there is a need to better understand the impacts of feral horses. Our project was designed to answer multiple questions about the impacts of feral horses in the Red Desert of Wyoming on sage-grouse, pronghorn, elk (*Cervus elaphus*), and mule deer (*Odocoileus hemionus*).

**Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

This project relates mainly to Objective 1: Prioritize threats to sagebrush systems and construct a prioritization framework. Within this objective, it is recognized that threats to sagebrush systems result in a loss of ecosystem services for dependent species and local communities throughout the West. Thriving wildlife populations are indicative of the resilience of sagebrush habitats to disturbances including the impacts of large numbers of feral equids grazing on these lands.



1. We conducted a global synthetic review of available data on use of telemetry transmitter collars on wild and feral equids and compared that to an equal number of studies (n=48) in North America where these same collars have been used on elk, mule deer, and pronghorn. We found a low incidence of injuries and mortality in equids (0.09% of collared equids died as a result of use of collars), similar to no collar-related deaths in the three wild ungulate species. We concluded that use of transmitters is safe for wild and feral equids. This study is critical as it supports use of new technology to study feral equids to better understand their movements, space use, resource selection, and impacts on ecosystems. (Hennig et al. 2020 in Wildlife Research)
2. We evaluated the impacts of feral horse use along a gradient of use on metrics of sage-grouse habitat quality for nesting and brood rearing in the Adobe Town BLM Herd Management Area in south-central Wyoming. We compared utilization distributions of horses generated from densities of locations from GPS-marked horses as well as dung counts at transects and found dung counts to be a better fit to response variables than utilization distributions. We found that dung density of feral horses was linearly correlated with bare ground. We also found a threshold response in grass height that declined as feral horse dung density exceeded 638 fecal piles per hectare. We concluded that reducing horse numbers will reduce the potential for soil erosion and also increase concealing cover for sage-grouse. (Hennig et al. in Journal of Arid Environments)
3. We used motion-sensitive cameras established at eight water sources in the southern Red Desert of Wyoming to evaluate timing and overlap of visits to water from feral horses, cattle, pronghorn, mule deer, and elk. Feral horses, cattle, pronghorn overlapped timing of use at watering sites >79%, with the highest overlap between pronghorn and horses (88.1%, 95% CI = 86.5–89.6%). Mixed-effects linear modeling indicated that number of conspecifics (i.e., within the same species) was the strongest predictor of visit duration for pronghorn and horses, whereas, hour of day and group size of heterospecifics (i.e., different species) were informative, but less important. There was no difference in peak visitation time for any species between sites of high versus low horse or cattle use. Despite temporal overlap, we did not find evidence of interference competition between feral horses, cattle, and pronghorn. We concluded it is important to conduct future research to evaluate whether there is interference competition between feral and domestic ungulates with ungulates at water sources in relation to water sources of different sizes, with varying feral equid population levels, and livestock stocking rates. (Hennig et al. 2021 in Journal of Wildlife Management)

**Briefly describe how your target audience benefited from your project's activities.**

Our target audience includes livestock producers, natural resource agency managers, energy company personnel, and the general public. We have presented our results at numerous state, regional, and national meetings. These results will assist natural resource managers in better managing sagebrush ecosystems for the perpetuation of native wildlife in the face of impacts caused by increasing numbers of feral horses.

**Briefly describe how the broader public benefited from your project's activities.**

The broader public has benefited through our project's activities because we have furthered the investigation of impacts of one public resource (feral horses managed for the American public on federal public lands) on important wildlife species that co-occur in sagebrush, an ecosystem with variable resilience to disturbances. There are 350 vertebrate wildlife species known to occur within the sagebrush biome. Some of these species are enjoyed by the public through consumptive uses such as hunting and fishing, while others are enjoyed by sectors of the public that visit these landscapes to view wildlife. Our results will assist in the future conservation of wildlife resources, in maintaining biodiversity, and in helping managers maintain ecological resilience in sagebrush systems, which are critical ecological services of sagebrush habitats.

**Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.**

We published three papers as well as advised a PhD student to complete their dissertation (J. D. Hennig 2021) on this topic during the course of the reporting period (FY 21).

Literature cited from this project:

Hennig, Jacob, D. 2021. Feral horse movement, habitat selection, and effects on pronghorn and greater sage-grouse habitat. Dissertation, University of Wyoming, Laramie, Wyoming, USA. 154 pages.

Hennig, J. D., J. L. Beck, C. J. Duchardt, and J. D. Scasta. 2021. Variation in sage-grouse habitat quality metrics across a gradient of feral horse use. *Journal of Arid Environments* 192:104550. <https://doi.org/10.1016/j.jaridenv.2021.104550>

Hennig, J. D., J. L. Beck, C. J. Gray, and J. D. Scasta. 2021. Temporal overlap among feral horses, cattle, and native ungulates at water sources. *Journal of Wildlife Management* 85:1084–1090. <https://doi.org/10.1002/jwmg.21959>

Hennig, J. D., J. D. Scasta, J. L. Beck, K. A. Schoenecker, and S. R. B. King. 2020. Systematic review of equids and telemetry collars: Implications for deployment and reporting. *Wildlife Research* 47:361–371. doi: 10.1071/WR19229

Closing Out (end date 09/07/2023)

## **Identifying Optimal Irrigation, Weed Control, and Other Management Strategies to Increase Yield, Crop Productivity, Profitability, and Seed Quality in Wyoming's Bighorn Basin**

Project Director

Jim Heitholt

Organization

University of Wyoming

Accession Number

1018793



### **Chickpea Varieties and Drought Tolerance**

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#### **In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

Best management practices for chickpea production in Wyoming are relatively unknown. If optimal chickpea production practices can be identified, it could provide an option for producers to diversify planting rotations to include crops that do not require nitrogen fertilization. Reducing nitrogen fertilizer use has been shown to decrease greenhouse gas emissions and improve water quality, among other environmental benefits.

#### **Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

Chickpea trials were conducted at the Powell Research and Extension Center in 2020 and 2021, looking at factors such as phosphorus fertilization and irrigation rates. Results averaged across six cultivars and six fertilization rates showed that reducing irrigation water by 20% only slightly affected yield compared to full irrigation. Two cultivars, Frontier and Orion, had the highest yields under deficit irrigation and may prove to have good drought tolerance across environments.

#### **Briefly describe how your target audience benefited from your project's activities.**

The results to date indicate chickpeas have good agronomic potential in the Big Horn Basin, and could provide an option for producers to diversify their plantings and lower their input costs.

#### **Briefly describe how the broader public benefited from your project's activities.**

Growing chickpea has the potential to reduce environmental impacts by replacing crops that require higher water and fertilizer inputs.

**Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.**

The results from 2020 and 2021 have been shared with the Pulse Crop Working Group and with chickpea seed company. Our group submitted a grant proposal seeking to look at additional chickpea genotypes for drought tolerance.

## **Biological Control in Pest Management Systems of Plants**

Project Director

Timothy Collier

Organization

University of Wyoming

Accession Number

1015888



### **Hyperparasitoid relationship with biological control in alfalfa**

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#### **In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

Alfalfa weevil is the most problematic pest in Western alfalfa cropping systems. Insecticide use, the most common control method, has negative environmental and economic impacts. Although biological control provides an important alternative with great potential, interference with biological control by hyperparasitoids could reduce efficacy. Hyperparasitoid prevalence and impact in these systems is largely unknown.

#### **Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

In 2021, cocoons of the parasitoid wasp *Bathyplectes curculionis* were collected from farmer fields in Wyoming, Montana, and Colorado. Cocoons were incubated to determine how common or how extensive hyperparasitism was in producer fields. In the course of our work, we have determined that at least 4 families of hyperparasitoids kill the beneficial *B. curculionis* wasp. Future analyses will determine if hyperparasitism prevalence relates to biocontrol rates within a field.

#### **Briefly describe how your target audience benefited from your project's activities.**

The results to date indicate hyperparasitism has the potential to interfere with biological control in alfalfa. Alfalfa producers are more aware of the complexities of biological pest control and can better plan for effective management.

#### **Briefly describe how the broader public benefited from your project's activities.**

Optimizing biological control will reduce insecticide use and its non-target effects and externalities in communities.

#### **Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.**

Carabajal-Capitán, S., Kniss, A., and Jabbour, R. 2021. Seed predation of interseeded cover crops and resulting impacts on ground beetles. *Environmental Entomology*. <https://doi.org/10.1093/ee/nvab026>

## **Mitigating Invasive and Noxious Weeds**

Project Director

Kimberly Reaman

Organization

University of Wyoming

Accession Number

7000018



**In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

Ventenata and medusahead are two invasive annual grasses on the state designated noxious weed list. First identified in 2016, both invasive grasses are currently confined to northeast Wyoming. Rangelands infested with ventenata and medusahead negatively impact the prosperity of producers by decreasing the quality and quantity of forage, decreasing the biodiversity of the rangeland, and increasing the risk of wildfires.

**Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

The goal of UW Extension Northeast Wyoming Invasive Grasses Working Group is to reduce the presence of ventenata and medusahead in northeast Wyoming as well as prevent the spread of these invasive grasses throughout the state. Major collaborators in research and educational programs for private landowners and governmental agencies include the Weed & Pest, Natural Resources Conservation Service (NRCS), and Game and Fish.

The Northeast WY Monitoring Network works with these major collaborators to identify invasive grasses. Management decisions, based upon the information gathered through monitoring, reduces the spread of invasive grasses which decreases management costs for producers.

Educational programs targeted to hay producers help producers identify and eliminate ventenata and medusahead in their hay fields. Hay found to contain invasive grasses included on the state designated noxious weed list can not be sold as certified weed free hay which reduces income for the producer.

One example of an educational program conducted by the Northeast Wyoming Invasive Grasses Working Group is the Sheridan County Invasive Grasses Tour. The classroom component provided updates on annual grass treatments and collaborative successes in the Northeast Wyoming Invasive Grasses Working Group. Additionally, the results of two research projects were presented:

- Forage quality of treated and non-treated rangelands infested with invasive annual grasses
  
- Restoration of annual grass lands following herbicide treatment

The field tour included instructional time in the field to help attendees identify invasive grasses. Management decisions, based upon the information gathered through monitoring on demonstration plots reduces the spread of invasive grasses which decreases management costs for producers.

**Briefly describe how your target audience benefited from your project's activities.**

The Sheridan County Invasive Grasses Tour targeted private landowners and personnel in government agencies that cooperate to manage invasive annual grasses in northeast Wyoming. Fifty-two (52) individuals participated in the field tour. Individuals gained experience identifying invasive annual grasses, learned about the effectiveness of herbicide treatments on annual grasses and instructions on when herbicide treatments and retreatments should be conducted for long term control. Participants learned about upcoming research projects:

- Seed Bank Depletion Study – determine an accurate way to measure the presence of seeds from annual invasive species which will establish the need to retreat the area
  
- Grazing Project – ascertain if grazing is a viable management option for reducing annual invasive species
  
- Mule Deer Migration – monitor the movement of mule deer through areas infected with annual invasive grasses

Participant quotes from the invasive grasses tour include:

*"As a student, I was extremely excited to be on the field tour because it was a great opportunity to connect information I had learned in the classroom to a tangible situation. It was such a unique experience to see the strategic application of science to rangeland management in a real-life scenario. One of the key moments for me, was listening to the speakers explain the benefits of different treatment types and number of treatments on this particular piece of land, while keeping a dedicated timeline of application over the course of that project."*

University of Wyoming Student

*"NEWIGWG's 4th Annual Invasive Annual Grass Tour was a little more intimate this year, but still a great success. We were able to work with landowners and land managers on a 1 on 1 basis in the field as well as in the classroom. The University had excellent posters and presentations displaying research results from over 5 years' worth of data."*

Sheridan County Weed and Pest

The Northeast WY Monitoring Network is responsible for 90,000 acres treated with herbicide to reduce invasive annual grasses in Sheridan County and 50,000 acres monitored which will help improve decision making in the future.

### **Briefly describe how the broader public benefited from your project's activities.**

Government agencies are using management practices to treat public lands so that it continues to be high quality and attractive for public use.



## **Removal of invasive and noxious species in the Popo Agie Weed Management Area**

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### **In 2-3 sentences, briefly describe the issue or problem that your project addresses.**

The Popo Agie watershed covers 513,562 acres in Fremont County. According to the Popo Agie Conservation District, the majority (63%) of the land within the Popo Agie Watershed is publicly owned federal lands managed by US Forest Service and Bureau of Land Management. Wind River Indian Reservation tribal lands cover approximately 7% of the watershed and 7% is State owned. The remainder (23%) of the watershed is either privately owned, county or municipal. Russian Olive trees were originally planted as an ornamental windbreak, but they have escaped cultivation and are starting to encroach on the riparian areas throughout the watershed out competing native riparian vegetation and creating a habitat which is inhospitable to wildlife. Russian Olive trees also consume a lot of water in an arid environment where water resources are needed for irrigation.

### **Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.**

The Popo Agie Weed Management group, a collaborative partnership of 32 agencies and organizations including UW Extension, focuses on invasive species within the Popo Agie watershed. The group provides education at events such as garden expos and outdoor days to inform the public and landowners about noxious weeds and invasive species. One of their goals is to help participants identify and then alert officials of the location of invasive species in the watershed.

The group also undertakes weed management projects. The two Play Clean Go stations on the reservation are located near lakes. Others in the watershed are in parking lots near trail heads and lakes. The Play Clean Go stations have an informational kiosk which describes how invasive weeds are transported and how the public can help reduce the spread. Foot brushes to clean footwear are also provided to prevent unintentional spread of invasive weeds by users.

Additionally, inventories which identify the locations of invasive weeds on the reservation are maintained and allow for ongoing monitoring and treatment as necessary.

Removal of Russian Olive trees is a designated committee under the Popo Agie Weed Management group. The process to remove Russian Olive trees takes several years because the trees propagate even after being treated with herbicides. The first step is to cut the trees and then paint herbicide on the stumps. Communication about the application process of herbicides is an important part of the public campaign to reduce fear about herbicide drift and pollution. Expenses to remove the Russian Olive trees is cost shared with Fremont County Weed and Pest, Wyoming Game and Fish, and Fremont County Fire Prevention.

**Briefly describe how your target audience benefited from your project's activities.**

Sixty-five landowners and personnel from federal and state organizations and agencies benefitted from the programs conducted by the Popo Agie Weed Management group.

Almost 20 acres of Russian Olive trees were removed from individual properties within the Pop Agie Watershed. The removal of the Russian Olive, in particular, created open spaces allowing for easier wildlife migration and healthier riparian habitats as well as making more water available for irrigation and in-stream flows.

Twelve properties with Russian Olive encroachment were identified within the watershed. Treatment plans were approved, removal of Russian Olive trees and herbicide treatment were completed on these 12 properties. Eliminating the Russian Olive trees create conditions to replant native species such as willows and cottonwood trees or encourage the return of the native grasses and forbs to make the ecology of the landscape healthier.

Additionally, three acres of noxious weeds were sprayed at a local pond that is known to have knapweed, leafy spurge, and Russian Olive. Lucky pond is a small fishing and recreation pond located just outside of Lander to provide a fishing and recreation opportunity for youth near town. Lucky Pond is stocked yearly with a variety of fish by the Wyoming Game and Fish Department. The 3 acres surrounding Lucky pond has become a recreational location for many in the community with picnic tables, shelter, walking paths and benches.

**Briefly describe how the broader public benefited from your project's activities.**

The removal of Russian Olive trees reduced seed stock for further encroachment; increased wildlife habitat; created conditions for healthier ecosystems in streams; provided easier access for the public to enjoy the natural resources in the area; and made more water available for irrigation and instream flows.

Type

Projects / Programs

**Projects / Programs without a Critical Issue**

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Not Provided