# ANNUAL REPORT

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# THE COOPERATIVE EXTENSION SERVICE

# AND

# THE AGRICULTURAL EXPERIMENT STATION

**College of Agriculture**
**University of Wyoming**

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## Table of Contents

**CSREES ANNUAL REPORT**
FY 2001
Wyoming's Accomplishments & Results

***Goal 1: Enhance agricultural systems that are highly competitive in the global economy***

**Overview:**

Wyoming is a rural state where agriculture is a key component of the economy of most cities and towns. Livestock and livestock products generated approximately 80 percent of agriculture's cash receipts of $852 million in 1999. The Wyoming livestock industry is forage based with both private and public lands providing forage for livestock production. It is important to note that these same private and public lands provide forage for game and other animals that are important to another pillar of the state's economy, tourism and recreation.

Due to high elevation (average of 6800') and climate over most of the state, Wyoming's agriculture faces unusual challenges. Improved animal and plant genetics, pest control, soil and water conservation, integrated resource systems, and domestic and international markets are needed to maintain sustainable and profitable agricultural systems. Stakeholder input suggests that all aspects of profitability and sustainability are important issues for research and extension including productivity, markets, and management of land, water, and wildlife resources.

The College of Agriculture conducts research and extension programs to provide knowledge and technology to maintain economically viable and sustainable forage, crop, and animal systems consistent with Wyoming's resource base. Research and extension efforts in the college range from biotechnology to home lawn and gardening with emphasis on animal production efficiency, plant production efficiency, and profitability. More than 3,600 producers attended various workshops regarding agricultural profitability that assisted them in making management decisions. The four state (CO, NE, SD, & WY) Range Beef Cow Symposium XVII was held in Casper, WY. During the two and a half day conference, producers had the opportunity to learn about cutting-edge technologies supported by research based information. More than 1,000 from 19 states and 2 Canadian provinces attended the symposium. A proceedings was distributed to the attendees and topics included Beef Cattle Health Issues, Genetics and Selection, Nutrition, Forage Management, Reproductive Management, Personnel Management, Meats, and Economics/Marketing.

A major focus for the Department of Veterinary Sciences is the study of emerging infectious diseases that are of common concern to both domestic and wild animals. Currently a study is investigating whether chronic wasting disease (CWD) of deer and elk is naturally hazardous to cattle. Studies underway are lifetime projects involving both oral administration of CWD containing material to cattle as well as providing immediate casual contact between affected wildlife and cattle. Information generated will aid wildlife managers, USDA regulators, and ranchers in their animal and disease management decisions. Specifically, the risk of transmission of CWD to other domestic species of food animals is of tremendous concern to producers, the livestock industry, and public health officials.

Genetic improvement of hard red winter wheat helps maintain and enhance winter wheat production in Wyoming. After field evaluation, the Wyoming Agricultural Experiment Station, Nebraska Agricultural Experiment Station, and USDA-ARS have approved the joint release of the hard red winter wheat variety Wahoo. Wahoo has performed well in Wyoming under dryland conditions. In statewide field trials, Wahoo

has out yielded Buckskin by an average of 3.6 bu/ac. If Wahoo, at the 2001 average price of $2.70/bu, had replaced Buckskin it could have provided an additional $1.1 M to Wyoming producers.

Sugar beets are grown on 58,000 acres and provide Wyoming producers with over $42,000,000 annually. Annual losses attributed to Rhizoctonia root and crown rot are estimated to exceed 2-3% sugar loss on 185,000 acres of sugar beets in the irrigated high plains region (CO, MT, NE, & WY). A 1% decrease in sugar content is lost revenue of approximately $78/ac. Field trials during 2001 demonstrated that properly timed applications of strobilurin chemistry reduced Rhizoctonia disease loss by 80% under moderate to severe disease situations. Results on timing and rates are being utilized by EPA to develop labels for this new fungicide chemistry class.

The focus of research and extension efforts on production practices and production systems is to enhance both their sustainability and profitability while maintaining the underlying resource base.

**Key Theme - Adding Value to New and Old Agricultural Products**

a. UW Wyoming Seed Certification Service provides certification and other support services that allow Wyoming seed producers and seed companies to market value-added products.

   Numerous statewide initiatives have been developed to encourage hay evaluation, improve quality hay, promote hay products, and provide marketing assistance to growers. Over 200 presentations on hay production, quality, and marketing have been delivered by educators and producers. The initiative has been an integrated approach which utilizes multi-state, multi-functional, multi-disciplinary participation.

b. Impact - Wyoming winter wheat producers, through the Wyoming Seed Certification Service, produced 1694 acres of certified winter wheat in 2001. This program is basic to the fundamentals of sustainable agriculture by providing winter wheat producers with a seed source that is genetically pure, weed and disease free, and adapted to their growing conditions. Certified seed is a value added commodity produced on approved fields. The increased value of certified seed over production wheat amounts to $1.50 to $3.00 per bushel depending on the variety and grower demand.

   Hay quality and marketing improved with a fee-based evaluation consisting of a standardized visual appraisal and chemical analysis. Cash premiums were documented for higher quality hay. A detailed list of forage tested hay was made available upon request and exposed to potential buyers at trade shows and other events. Some growers have been skeptical until they observe that higher quality hay trades more rapidly and commands cash bonuses. This program evolved from an electronic listing to a web-based hay listing for all hay products and related services. Recently, more out-of-state hay buyers are beginning to request quality assurances with documented forage tests, particularly when hay shortages push prices upward. Hay shows are increasing awareness of the impact of harvest management practices on hay quality and the importance of quality in marketing. Wyoming hay growers are gaining recognition in national hay show competitions. A specialized hay market has been developed to provide certified weed seed-free hay to forage-restricted areas in national parks and forests.

c. Source of Funding - Smith-Lever, State

d. Scope of Impact - Multi-State (WY, CO, MT, ID, UT, NE)
   Integrated

**Key Theme – Agricultural Profitability**

a. The value of the agricultural sector output in Wyoming annually approaches or exceeds one billion dollars with cash income historically around $800 million. In 2000, 9,200 farms and ranches were operating in Wyoming with a total land area of 34.6 million acres. Cooperative Extension Educators in Wyoming conducted 43 workshops, multi-day seminars, or classes reaching over 3600 individuals. A sample of the topics ranged from Ag Profitability, Beef Quality Assurance, Importance of Winter Forages, A-I school, and Living on Small Acreage. Agricultural profitability was also featured in programs presented to youth that reached over 1400 children.

Economic profitability is vital to the sustainability of agriculture since no practice or agricultural operation is sustainable unless it is first profitable. A system that examines all of the resources of the farm and ranch (land, labor, and capital) should provide for a more stable, long lasting, sustainable agriculture in the face of increasing change and numerous demands on agriculture's management. Several programs were developed and presented to educate individuals in the agricultural sector on ways to make agriculture profitable as well as sustainable.

Producers, regulatory agencies, and policy makers are concerned about the impacts of recent changes in the structure of U.S. agriculture. Laboratory markets have been designed to investigate the effects of changes in trading institutions and methods of delivery. The research contributes to understanding price discovery under alternative trading institutions and delivery methods.

Dryland winter wheat is grown on approximately 160,000 acres in Wyoming. Traditional wheat-fallow systems have created difficult winter annual grass problems and increased soil erosion potential in dryland wheat systems. Research on diversified dryland cropping systems (wheat-sunflower-millet-fallow or wheat-corn-millet-fallow) have shown increased profit and reduced winter annual grasses. Based on field evaluations the Wyoming Agricultural Experiment Station, Nebraska Agricultural Experiment Station, and USDA-ARS have approved the joint release of the hard red winter wheat variety Wahoo.

In sugar beet production, annual losses attributed to Rhizoctonia root and crown rot are estimated to be two-three percent total sugar loss for 185,000 acres of sugar beets grown in the irrigated high plains region (CO, MT, NE, & WY). Field trials during 2001 demonstrated that properly timed applications of strobilurin chemistry reduced Rhizoctonia disease loss by 80% under moderate to severe disease situations.

b. Impacts - Cooperative Extension efforts resulted in the following impacts:

- Thirty four growers adopted strategies to reduce risk including insurance options, and use of hold harmless agreements.
- Seventy seven producers utilized tax management strategies to create more non-farm profitability.
- Seven producers have adopted planting radishes on approximately 540 acres of sugar beet fields to control the cyst nematode in lieu of treating with a fumigating nematicide such as Telone. The fall planted radishes act as a trap crop to stimulate the hatching of nematodes ahead of the beet crop planted in the spring.
- Twenty one producers are increasing their net return by six percent adopting a cull-cow

strategy researched and proposed by UW Animal Science and Extension Beef Specialist.

- A windbreak tree workshop where participants were taught about soil and types of trees and shrubs that will grow at high altitude helped ranchers and homeowners better plan windbreaks to improve market value and reduce snow removal costs and heating costs.
- Program evaluations indicated that participants increased their knowledge, learned how to maintain and how to keep their cost down, and learned new trends in agriculture and to evaluate their marketing alternatives and choices.
- Nine operations completed the Beef Quality Assurance test and committed to implementing the procedures of this program to provide a more wholesome product for consumers.

Research results from studies on the profitability of individual production practices as well as crop and livestock systems ultimately influence the sustainability of the agriculture industry. Laboratory market research has contributed to the understanding of structural change issues in today's supply chain agriculture-market efficiency, buyer and seller earnings, and price bias compared to the competitive norm. This research also contributes to the development of methodologies (experimental economics) to investigate the impacts of structural change in agriculture. Results from the diversified dryland cropping systems indicated increased farm income of $7 to $10/ac annually and reduced winter annual grass populations 90-95%. In statewide field trials, Wahoo out yielded Buckskin by an average of 3.6 bu/ac. At the 2001 average price of $2.70/bu, if Wahoo had replaced Buckskin it could have meant an additional $1.1 M for Wyoming producers. Field trials during 2001 demonstrated that properly timed applications of strobilurin chemistry reduced Rhizoctonia disease loss by 80% under moderate to severe disease situations. It is estimated that Rhizoctonia disease causes a two-three percent loss in sugar content and a one percent decrease in sugar content is lost revenue of approximately $78/ac for sugar beets grown in the irrigated high plains region (CO, MT, NE, & WY). Results on timing and rates are being utilized by EPA to develop labels for this new fungicide chemistry class.

c. Source of Funding – Hatch, Smith-Lever 3 b&c, State

d. Scope of Impact – State Specific
Multi-state Research (W-177)
(AZ, CA, CO, IA, ID, KS, NE, NM, NV, OK, SD, TX, UT, VA, WA, WY)
Integrated Research and Extension

**Key Theme – Animal Health**

a. The Department of Veterinary Sciences researchers investigated a variety of animal health-related problems. A major thrust of those efforts has involved investigation of diseases that impact reproduction and immunity in livestock. Examples of diseases that have been investigated include the incidence of Malignant Catarrhal Fever (MCF) in feedlot bison. Chronic wasting disease affects deer and elk and raises questions about the impact of the disease on wildlife, susceptibility of domestic animals and food safety. There are several ongoing collaborative studies on the epidemiology, pathology, host range and pathogenesis of chronic wasting disease. Brucellosis in elk is an ongoing issue and researchers have validated a competitive ELISA to distinguish between vaccine titers and field exposure titers in elk. Wyoming's Animal Health and Disease website "Wyovet" provides timely information on disease diagnostics and animal health.

b. Impact - The impacts of these animal health investigations are both immediate and long-term. The immediate impacts have been to reduce the morbidity and mortality of ongoing disease problems by providing 24 hour access for veterinarians and producers to information on disease diagnostics, animal disease, and other animal health issues through the website "Wyovet". A cooperative effort between the Department of Veterinary Sciences and the Wyoming Game and Fish Department has resulted in the development and validation of a blood test to distinguish between elk that are infected with Brucella abortus and elk that have been immunized against this infectious agent. The assay will enhance efforts to reduce the prevalence of brucellosis in elk by immunization of young animals and is currently being used by the Wyoming Game and Fish Department. Longer term, a better understanding of these diseases will allow for better test development as well as improved control measures. A better understanding of MCF will help bison producers begin to manage this number one cause of feedlot losses of bison. Ongoing collaborative studies on the epidemiology, pathology, host range and pathogenesis of chronic wasting disease will assist in control and management of this disease.

c. Source of Funding – Hatch, State

d. Scope of Impact – State Specific, but results have broad implications
Integrated Research and Extension

**Key Theme – Animal Production Efficiency**

a. Active research programs dedicated to improving animal production primarily related to the areas of nutrition, reproduction, and wool science are being conducted by researchers in animal science at the University of Wyoming. Areas of emphasis in ruminant nutrition include optimal use of dietary protein and lipids to improve performance and quality of cattle and sheep. Reproductive studies emphasize the identification and development of methods to regulate fertility in domestic animals, particularly cattle and sheep. The scope of the research conducted ranges from fundamental experiments designed to discover underlying mechanisms to applied projects designed to evaluate the practical adoption of new knowledge and technologies. For example, improved production in ruminants could be achieved if livestock diets could be formulated to meet the animal's amino acid requirements. Data from a cattle digestion trial were used to develop two linear regression models. Using the level of forage organic matter intake as the variable, these models predict the amount and profile of microbial and total essential amino acids presented to the small intestine when cattle consume restricted amounts of forage. Early abortion causes losses to bovine industries totaling millions every year. Basic events that occur in the uterus in response to pregnancy are being studied so future technologies can be designed to detect pregnancy early and curtail early abortion. The Wyoming Livestock Board has enacted rules to help control bovine trichomonad abortion in Wyoming. Rules took effect in 2000, requiring the testing of all bulls in specific categories, based on laboratory testing of bulls for the agent.

Educational efforts have been directed towards assisting a localized dairy industry in western Wyoming faced with rising costs of production and low milk prices. Nutritional management is being used to help address issues such as air and water quality and waste management which further complicate economic sustainability. This effort is in cooperation with Utah State University. The four state (CO, NE, SD, & WY) Range Beef Cow Symposium XVII was held in Casper, WY. During the two and a half day conference, producers had the opportunity to learn about cutting-edge technologies

supported by research based information. More than 1,000 people participated from 19 states and 2 Canadian provinces. Proceedings were distributed to the attendees and topics included Beef Cattle Health Issues, Genetics and Selection, Nutrition, Forage Management, Reproductive Management, Personnel Management, Meats, and Economics/Marketing.

b. Impact – Because 50-75 percent of ruminant animal production costs are associated with feed, improving use of feed resources are of paramount importance in the competitiveness and sustainability of livestock enterprises. The prediction equations developed from the cattle digestion trial can be used to estimate the supply of essential amino acids when cattle consume limited quantities of forage. These prediction equations can be used as a tool to formulate protein supplements to compensate for potential amino acid deficiencies resulting from restricted forage intake. Similarly, the effectiveness in producing annual offspring dictates returns received by cattle and sheep enterprises. Researchers have identified a uterine protein called ISG17 that is expressed in uterine cross-sections from pregnant cows. This protein is hypothesized to function in preparing the uterine wall for adhesion and implantation of the embryo. It is anticipated that the study of uterine proteins that are induced by early pregnancy will lead to biotechnologies that will reduce the incidence of early embryo mortality in cows and humans. In addition, the Center for the Study of Fetal Programming was established at the University of Wyoming this past year. The center is being jointly funded by UW and New York University. Future studies on the impacts of under nutrition during early gestation in the ewe and cow on growth rate production efficiency and carcass quality of the offspring will have direct relevance to the Wyoming sheep and beef industries.

   The dairy program facilitated a five percent increase in milk prices paid by a local cheese factory.

c. Source of Funding – Hatch, Smith-Lever, State, County, Private

d. Scope of Impact – State Specific
   Multi-state Research (W-112)-(AZ, CA, CO, HI, ID, KS, MI, MO, MT, NM, NV, OH, OR, TX, WA, WY)
   Integrated Research and Extension
   Multi-state Extension (UT)

**Key Theme – Biotechnology**

a. In the Department of Molecular Biology at the University of Wyoming, projects are underway that are 1) investigating the genetics of an unusual symbiotic $N_2$-fixing bacteria, *Frankia* that can provide nutrients for plants, 2) characterizing novel protease enzymes from spiders that could be used as very rapid and effective agents for degrading complex materials such as biological waste or pathogens in the environment, cloning, and 3) characterizing heat stable enzymes from thermophilic bacteria useful in genetic manipulation and generating transgenic plants.

b. Impact – Frankia, are gram-positive, filamentous bacteria capable of fixing atmoshperic dinitrogen in symbiosis with a wide variety of woody plants and shrubs. The ability to do genetic manipulation of key ogranisms and understand how they select host plants depends on having vectors for introducing new genes. The characterization of resident plasmids opens the door for understanding how to accomplish this with organisms that occupy a key position in the nitrogen cycle. Nitrogen fertilizer is an integral part of modern agriculture and the use of biological alternatives could be a key part of

future crop production.

Researchers are conducting studies to determine if plants can be used as biofactories for silk production. A fast growing model plant Arabidopsis was transformed with a synthetic spider silk gene and transgenic plants were selected. The same gene was inserted into alfalfa and plants are being screened for silk expression. Because of potential commercial applications, it is anticipated that the demand for plant expressed silk could generate millions per year. The goal of this research is to genetically engineer alfalfa, a major crop in Wyoming, to stably express spider silk to enhance returns for Wyoming producers.

c. Source of Funding – Hatch, State

d. Scope of Impact – State Specific, but has far reaching impacts

**Key Theme – Plant Germplasm**

a. Brown Root Rot (BRR), a plant disease discovered in Wyoming, threatens productivity and persistence of alfalfa in the state. Field surveys in Wyoming have shown that this disease is widespread throughout the state. However, its distribution in other Rocky Mountain states is unknown. Researchers are developing a screening technique for selecting and evaluating for BRR resistance. Using this screening method, breeding lines are being developed and evaluated for an eventual BRR resistant variety.

b. Impact – In Wyoming, 54.6% of the alfalfa acreage surveyed are infected with BRR. It is estimated that 338,500 acres may be infested in Wyoming alone. Alfalfa yield losses in a BRR infested field, where no other diseases were found, was .5 tons/acre. Using a price of $70/ton and the estimated acres infested with BRR in Wyoming results in an annual loss of over $11 million. Having a BBR resistant variety bred for the U.S. has large potential benefits for alfalfa growers.

c. Source of Funding – Hatch, State

d. Scope of Impact – State Specific
Integrated Research and Extension
Multi-state (W-006) (AK, AS, AZ, CA, CO, GU, HI, ID, Micronesia, MT, NM, NV, Northern Marianas Islands, OR, UT, WA, WY)

**Key Theme – Plant Production Efficiency**

a. Researchers at the Wyoming Agricultural Experiment Station conduct studies on all major crops, forages, and rangelands. Major research efforts in the plant efficiency area are: 1) biology and control of weeds, 2) plant disease recognition and control, 3) crop production practices, and 4) crop/legume production systems. Specific projects range from basic research to elucidate mechanisms of plants to long-term applied research on cropping systems. For example, traditional wheat fallow systems have created difficult winter annual grass problems and increased potential soil erosion of dryland farming systems. Researchers have conducted field tests on alternative cropping sequences in dryland farming systems as a means to control weeds.

Sugar beets, a major cash crop in Wyoming, are grown on approximately 58,000 acres. Weed control is expensive and recent research indicates that over 60% of the kochia infesting sugar beet fields in the Big Horn Basin and over 10% in the North Platte Valley are resistant to ALS (amino lactase synthease) inhibitor herbicides.

The Extension Plant Pathology Lab (EPPL) is the University of Wyoming's source of plant pathology information. The EPPL provides information to Wyoming and regional producers on crop production and disease management. It also provides information to homeowners and deals with all plant species. The EPPL also provides a facility for submitting samples for disease diagnosis and receiving disease management recommendations. Educational programs include extension presentations, applied research, and demonstration plots.

b. Impact – The economic and environmental benefits of research being conducted in the Plant Sciences Department are enormous and wide spread. Field research trials on extended dryland cropping systems (wheat-sunflower-millet-fallow or wheat-corn-millet-fallow), compared to traditional wheat-fallow systems, reduced winter annual grass populations by 90-95%. In addition, the extended cropping systems increased dryland farm income by $7 to 10/acre annually and reduces the number of fallow acres. Without an ALS herbicide for kochia control in sugar beets, grower options involve hand labor or application of preplant herbicides which add over $70/acre to production costs. Field trails have shown that 99-100% control of kochia in crops preceding sugar beets reduces kochia populations in sugar beets by 85-90% greatly reducing the need for expensive weed management practices.

c. Source of Funding – Hatch, State

d. Scope of Impact – State Specific
Integrated Research and Extension
Multi-state Integrated Research and Extension (NC-226)
(IL, IN, KY, MD, MI, MO, NE, NY, OH, OK, PA, SD, VA, WI, WY)

**Key Theme - Invasive Species**

a. Western rangeland managers have difficulty monitoring expansive and inaccessible areas for weed invasions. Tools to enhance identification of problematic weed invasions and to monitor their spread are critical to public land management in the west. In Wyoming and the arid west, revegetation with perennial grasses following control of perennial weeds can be difficult. Revegetation can be particularly difficult where native species are desired but often not available. Using weedy invasions may provide a new approach to selecting native plant stock that is competitive with weeds to improve revegetation efforts.

b. Impact - Researchers have developed a Weed Invasion Susceptability Prediction (WISP) model. Working with BLM during 2001, five weedy invaders in the Jack Morrow Hills area were mapped and incorporated into GIS with other data to develop WISP. The WISP model is currently being used by BLM and other weed managers in Wyoming. The ability to predict the susceptability of rangeland to potential weed invasion and their spread has allowed managers to target weed control efforts. In 2001, research on identifying competitive native plant species was initiated by locating invasions of Russian knapweed and hoary cress that have been present for more than 25 years on Wyoming and

Idaho rangelands. Native species were documented and seed collected for studies to assess the competitive ability of these native plants. The ability to revegetate invaded lands using native species selected for competition with weeds would greatly enhance weed control efforts.

c. Source of funding - State

d. Scope of Impact - State Specific

**Key Theme - Plant Health**

a. The irrigated High Plains region represents an economy greatly dependent on the production of agronomic crops including sugar beets, dry beans, corn and potatoes. Small grain and forage crops have few options for disease management (due to economics) and therefore, rely on cultivar resistance for plant disease management. Plant diseases caused by viroids, viruses, bacteria, fungi, phytoplasmas, nematodes and parasitic plants cause significant losses in Wyoming's crop yield and quality each year. Economic loss attributed to plant diseases are significantly reduced by prevention, early detection, and initiation of appropriate management practices. The Extension Plant Pathology Lab processed 403 plant disease samples during FY 2001. Responses included guidelines on management of the specific diseases identified for that particular plant sample. Twenty six educational presentations were delivered throughout the state, region, and united states. Workshops and training reached 1,036 individuals helping them develop and report improved practices for disease management. A Sugar Beet Cercospora survey was preformed for the High Plains production region in cooperation with grower commodity groups. A survey of seed potatoes was performed for potato spindel-tuber-viroid and PVY-$^{N}$.

b. Impact - Outside funding generated for regional plant disease research and plant pathology extension effort was $78,963. Publications during the past year included:
Popular Press (1), Extension and Agricultural Experiment Station (3), Books (1), Book Chapters (6), Refereed Journals (1), and Other Reviewed Journals (5).

Growers are adopting methods that reduce pesticide use yet increase the control of potato late blight, potato early blight, sugar beet Cercospora, and bean rust. New fungicide chemistries that reduce environmental impact and are safer for the public and applicators, are proving to be effective sugar beet disease management tools under Wyoming growing conditions. Growers now have new tools for sugar beet Rhizoctonia management. Homeowners are adopting pest management practices that focus on integrated approaches for disease control and are considering environmental impacts on disease development. The Cercospora survey identified benzimidazole resistance in some production areas of the High Plains. Adopting modified disease management practices will enable more effective disease control through management of resistant populations. The pest survey in potatoes enabled producers to meet export requirements pertaining to plant pests.

c. Source of Funding - Smith Lever, Hatch, State

d. Scope of Impact - State Specific
Integrated Research and Extension

**Key Theme - Home Lawn and Gardening -General Horticulture**

a. Wyoming has only five counties with a year round horticulturists on staff. Other offices utilize part time summer help and volunteer Master Gardeners who work with agricultural educators to meet clientele needs in horticulture. In a recent study of the types of information Wyoming residents have used from extension, over half (53%) of respondents have requested information on home gardening and lawn care. It is estimated that the average household in Wyoming spends $800 per year on landscaping and gardening. Water conservation, community beautification, yard waste, and pesticide reduction are all issues affecting Wyoming residents in their horticultural efforts.

b. Impact - During FY 2001, over 4,442 contacts were made regarding horticulture. Twenty five educational programs were presented and community gardens were started through Cooperative Extension Service (CES) efforts in five counties to demonstrate what will grow in Wyoming's climate and altitude. Clients reported increased awareness and knowledge of horticultural skills as a result of educational efforts. Additionally homeowners demonstrated better management of their properties.

Eight counties conducted Master Gardener training consisting of eight-ten sessions graduating 63 new Master Gardeners. At a minimum, new Master Gardener graduates contribute 30 hours of volunteer time. New Master Gardener contributions in addition to experienced master gardeners volunteer time adds over $30,000 to Extension's efforts. Ninety-eight percent of Master Gardener participants showed an increase in knowledge from pre-test to post-test in the areas of water management, lawn care, and insect control.

Four UW CES horticulture fact sheets were revised and rewritten: *Landscaping: Recommended Trees for Wyoming, Landscaping: Recommended Shrubs for Wyoming; Iron Deficiency Chlorosis on Woody Landscape Plants in Wyoming;* and *Backyard Composting: Simple, Small-scale Methods.*

c. Source of Funding - Smith-Lever, State, County

d. Scope of Impact - State Specific

***Goal 1 Summary:***

The College of Agriculture conducts research and provides educational programs on agricultural systems and profitability throughout the state. A few of the college's on-going programs in the Goal 1 area are:

- Economics of farm/ranch systems with respect to profitability and risk
- Reproductive performance in domestic ruminants
- Brown Root Rot resistant alfalfa cultivars
- New and emerging animal diseases
- Extended cropping systems with emphasis on incorporating forages

In this program area, researchers have been active in 17 ongoing Hatch projects, and four out of the 17 are multi-state projects. Well over 50 percent of the projects are integrated research and extension efforts. The approximate effort related to this program for the AES is 19.9 FTEs with expenditures of $.91 million Hatch and $2.65 million State.

Cooperative Extension Service FTE's 17.62

Goal 1 Allocated Funds $1,558,202

**Goal 1: IMPACTS**

**ISSUE - Producer -driven research provides results**
The replacement heifer project was a grassroots-driven collaboration between cow-calf producers, University of Wyoming Cooperative Extension Service (UW CES) educators, and the University of Wyoming Torrington Research and Extension Center. The project provided an excellent opportunity for UW research and extension personnel to collaborate on producer-driven applied research.

**What has been done**
University personnel teamed with producers from five Wyoming counties and one producer from Colorado to implement a replacement heifer program that would keep animals productive for the longest possible time. The primary objectives of the project were: 1) to compare chelated forms of trace minerals versus non-chelated trace minerals in supplements to determine the effects on circulating blood levels of zinc, copper, iron, and manganese; 2) To identify any possible effects chelated or non-chelated trace minerals might have on the efficacy of vaccines and the immune response; 3) To compare two different weight-gain regimes to determine differences in both pregnancy rates and feed costs. Fifteen producers from six counties in Wyoming and Colorado placed 177 heifer calves in the project. Trials began November 15, 2000 and were completed May 20, 2001 when the heifers were synchronized and bred by artificial insemination.

**Impact**
Blood serum samples taken at the beginning and end of the project did not show a significant difference in circulating levels of copper, zinc, manganese, and iron whether they were fed a chelated or non-chelated form of trace mineral.

The feeding costs were slightly higher for heifers on constant rate-of-gain, averaging $185.36, while heifers placed on a reduced rate-of-gain for the first half of the feeding period and "flushed" during the second half averaged $173.83. The difference was an $8.53 per head savings for the feeding period.

Six heifers on the varied rate-of-gain did not show estrus compared to 13 heifers who cycled on the constant rate-of-gain.

When rating the overall heifer development program on a 1-10 scale (1=poor; 10=excellent), 11 of the 15 cooperators rated the overall value of the heifer development program at an average of 7.3. Knowledge gained through the heifer development program scored 7.1. Nine cooperators said they gained information through the program that will be useful to them in their cattle operations.
Throughout the course of the project, educational programs were presented at four field days and meetings. The topics discussed were related to heifer development, estrus synchronization using Expected Progeny Differences (EPDs), nutrition, and immune systems. The sessions in which producers and UW personnel engaged in interactive dialogue about livestock-related issues were among the most productive. Producers gained an appreciation and a better understanding of research projects and results. The project will continue as producers provide reproductive data on the lifetime production of the heifers tested.

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**ISSUE - Extended dryland rotations**
Traditional wheat-fallow systems have created difficult winter annual grass problems (feral rye, jointed goatgrass) and increased soil erosion potential in dryland farming systems. This affects farmers, their cropland, and their annual income.

**What has been done**
Research and testing of diversified cropping systems (i.e., wheat-sunflower-millet-fallow or heat-corn-millet-fallow) have increased dryland farm income $7 to 10/A annually while reducing fallow acres, reducing soil erosion potential and reducing winter annual grass populations 90-95%.

**Impact**
In 2002 the number of fallow acres will be reduced by 50-60,000 acres while increasing farm income ($350-420,000).

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**ISSUE - Establishment and Maintenance of Pregnancy**
Early embryo mortality causes a loss of $600 million dollars per year in reduced weaning weights and milk production in bovine industries. The basic events that occur in the uterus in response to pregnancy must be studied and understood so that future technologies may be designed to detect early pregnancy and curtail early abortion. Early embryo death also occurs frequently during human pregnancy so this research area not only has relevance to animal production efficiency, but it also is related to human health and medicine.

**What has been done**
UW researchers have identified a uterine protein called ISG17 that is expressed in uterine cross-sections from pregnant cows. This protein is hypothesized to function in preparing the uterine wall for adhesion and, subsequently, implantation of the embryo. Adhesion and implantation are required for survival of the embryo. Now that a monoclonal antibody against ISG17 is available, it may be used to examine function of ISG17 not only in uterine cross-sections, but also in other tissues from pregnant cows. A similar protein, called ISG15, also is found in human uterine tissues and is induced by pregnancy.

**Impact**
It is anticipated that the study of uterine proteins that are induced by early pregnancy will lead to biotechnologies that are designed to reduce the incidence of early embryo mortality in cows and in humans.

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**ISSUE - Saving Our Alfalfa Stands**

Brown Root Rot (BRR) of alfalfa, caused by the soil-borne fungus (Phoma sclerotioides), causes a rot of the taproot of alfalfa resulting in winter kill and loss of plant stand. First identified in the U.S. in Wyoming in 1996, it has been recognized as a problem in alfalfa in Canada for over 60 years. Severe stand loss in established alfalfa stands in several alfalfa growing areas of Wyoming have now been attributed to this disease. Similar unexplained losses in other Rocky Mountain states may also be due to BRR. Although the Canadian variety Peace has reported field resistance to BRR it is susceptible to other diseases present in the U.S. Also, since U.S. alfalfa varieties have not been selected for resistance to BRR they cannot be recommended for BRR control.

**What has been done**

Field surveys conducted in Wyoming have shown this disease to be widespread throughout the state. However, its distribution in other Rocky Mountain States is unknown. A publication describing the symptoms of BRR and recommended control practices used in Canada has been developed. This publication has been released to Wyoming counties where the disease has been identified. On-farm experiments are being conducted to evaluate the Canadian variety Peace for temporary use for BRR control in Wyoming. Also, a screening technique for selecting and evaluating for BRR resistance is being developed at University of Wyoming. Using this screening method, breeding lines are being developed for the eventual development of a BRR-resistant variety for the U.S.

**Impact**

So far, 54.6% of the alfalfa acreage surveyed in Wyoming is infested with BRR. Yield losses between the BRR-resistant variety Peace and BRR-susceptible variety Multi-Plier alfalfa in a BRR-infested field in Wyoming, where no other diseases were found, was 0.5 tons/acre. Multiplying the average price of alfalfa ($70.00/ton) times the estimated acres of alfalfa infested with BRR in Wyoming results in an annual loss of $11,848,200. The combination of proper crop rotation with grain crops and use of a BRR-resistant variety, adapted to Wyoming, will result in saving of almost 12 million dollars in Wyoming. Use of a BRR-resistant variety bred for the U.S. should result even greater savings to alfalfa producers.

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***Goal 2: Enhance a safe and secure food and fiber system***

**Overview**

Researchers at the University of Wyoming seek to improve the quality of life through research and education that fosters a safe and secure food supply, promotes enjoyment of food that is nutritious and affordable, and supports Wyoming residents' health.

Given the public's varied avenues for access to food, reducing the risk of food-borne illness necessitates comprehensive educational intervention from the producer to the consumer – truly a 'farm to table to plate' approach. At all levels, the food safety activities implemented through UW build on principles of HACCP, (Hazard Analysis and Critical Control Points), the prevention-based food safety system that identifies and monitors food-borne hazards. Agricultural producers, food processors, food-service personnel, and home food preparers are critical points of control for food-borne illness. Research addressing food quality and safety issues directed at these processing, handling and preparation sites is key to enhancing the food supply. Research supported educational programs that expose the expanding base of food-safety knowledge and emergence of new pathogens and more virulent strains of existing ones is necessary at all levels to reduce food-borne illness and increase food quality.

Researchers in Animal Science are conducting food quality studies designed to improve the nutritional value of beef and lamb, extend product shelf life, and control food-borne pathogens. It is anticipated that their results will lead to an enhanced nutritional value, extended shelf life, and reduce food-borne pathogens of meat products. Research and extension professionals at the University of Wyoming are also involved in projects focusing on issues of safe and secure food systems.

**Key Theme - Food Resource Management**

a. The *Cent$ible Nutrition Program* [*CNP*], University of Wyoming CES's food and nutrition program for limited resource audiences that combines EFNEP and the Food Stamp Nutrition Education Program [FSNEP];in FY 2001, CNP educators in 18 of 23 counties and 1 reservation office worked with 1232 households enrolled in a lesson series, and 17,275 persons participated in one-time lessons. Educators helped clients learn to plan meals, compare prices, use grocery lists, and provide food for the entire month.

b. Impact - Households averaged a savings of $30.16 per month on groceries, which over a one year period of time equals $445,885 savings for enrolled families. Fifty three percent of graduates of the program improved on planning meals. Forty five percent increased use of a grocery list; 40% now compare prices; and 43% provide food for a month, stretching resources to purchase food. One example of program success is a participant from Laramie County who stated what the program had done for her, "I have saved about $75.00 per month on food due to watching the series on meat. I now buy my roast and cut it myself in different ways to stretch my food dollars".

c. Source of Funding - Smith-Lever 3-D (EFNEP), USDA Food & Nutrition Service with local and state matching (FSNEP)

d. Scope of Impact: State Specific

**Key Theme – Food Quality**

a. The American public has become increasingly concerned with food quality and safety issues. Researchers in Animal Science are conducting studies to improve the nutritional value of beef and lamb, extend product shelf life, and control food-borne pathogens. For example, studies involve feeding ruminant livestock vegetable oils to increase conjugated linoleic acid content of the carcass. In another study, research is being conducted to compare total lipid composition, hypocholesterolemic value, and potential for improved immune response for bison, beef, chicken, and elk meat. Ten replicates each of bison, beef and elk muscle, and chicken breast were freeze-dried and then ground and homogenized. Samples were used to determine fatty acids and cholesterol content for each muscle.

b. Impact – Research results do not suggest that there is anything inherently different in bison meat when compared to meat from other species, except for leanness of the bison muscle. Thus, bison should not be considered inherently different from meat of other species based on the fatty acid profiles of the known fatty acids.

c. Source of Funding – Hatch, State

d. Scope of Impact – State Specific, but results would have broad implications.

**Key Theme – Food Safety**

a. Microbial contamination of food is a serious health problem. With approximately 60% of food borne illness outbreaks nationwide attributable to food-service establishments, food-service personnel are key to reducing the risk of food borne illness. Given that roughly one-third of food borne illness outbreaks can be traced to home settings, the general public also plays a critical role in reducing the risk of food borne illness. Extension Educators as part of the Wyoming Food Safety Coalition trained 950 food handlers through food safety workshops. In-house training in food service businesses reached 296 individuals. Consumer programs reached 864 people and food safety displays were viewed by 2000 individuals. The *Cent$ible Nutrition Program* (CNP) had 1,232 families enrolled in the program and presented 1,177 one-time presentations to over 17,275 clients. CNP educators helped clients learn how to thaw and store foods properly and to wash hands frequently and thoroughly.

b. Impact - Results from a state-wide survey conducted by UW CES for the Wyoming Food Safety coalition indicate that of the 730 participants in *ServSafe* and Intermediate and Advanced *Going for the Gold* workshops, an estimated

- 701 made at least one change related to cleanliness, for example, 540 wash their hands more thoroughly.
- 569 made at least one change related to food preparation, for example, 401 that thawed food in the refrigerator or under running water.
- 511 made at least one change related to cooking food, for example, 380 use a thermometer to check if a food is cooked or reheated enough.
- 584 made at least one change related to cooling food, for example, 394 put food into shallow containers or cutting meat into smaller pieces before putting it in the refrigerator.
- 548 made at least one change related to other miscellaneous areas, for example, 394 inspect incoming food more closely.

- 63% of homemakers showed improvement in one or more of the food safety practices including thawing foods properly and storing foods properly.
- 20% of homemakers showed improvement in both of the food safety practices.
- On entry surveys, 59% of participants demonstrated acceptable food safety practices in contrast to 82% on exit surveys.

c. Source of Funding - Smith-Lever 3(d) EFNEP and USDA Food & Nutrition Service with local and state match (FSNEP), state agencies

d. Scope of Impact – State Specific

***Goal 2 Summary***:

The College of Agriculture provides educational programs across the state; two of the ongoing programs are *Going for the Gold - Food Safety Training and Cent$ible Nutrition Food Safety Curriculum*. Research efforts focused on developing more effective means of protecting foods stored at low temperature as well as improving nutritional value of beef and lamb. The research effort in this area involves approximately .2 FTEs with an expenditure of $.1 million State.

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| Cooperative Extension FTEs | 4.55 |
| Goal 2 Allocated Funds | $402,638 |

**Goal 2 - IMPACTS**

**ISSUE - Food Safety**
National Restaurant Association figures show that a food borne-illness outbreak can cost an establishment thousands of dollars. In some situations it can even cause an establishment to close. With economic development as a critical issue in Wyoming, helping food service businesses remain viable is an important goal of the Laramie County Food Safety Coalition. With over 130 restaurants in Laramie County and high turnover of personnel in food service, ongoing training is necessary.

**What has been done**
Going for the Gold started in 1995 with compressed video training. County collaborative teams were formed and local training began in 1996. In Laramie County the coalition includes City/County Environmental Health Sanitarians, Wyoming Department of Agriculture Consumer Health Specialists, and Cooperative Extension. Since its inception 2,238 individuals have participated in food safety training. Classes cover personal hygiene, basic microbiology, receiving and storage, cleaning and sanitizing, preparation and service, and HACCP (Hazard Analysis Critical Control Point).

Each agency involved in the Laramie County Food Safety Coalition recognizes that individually, they do not have adequate staff, time, or resources to meet the food safety training needs in the county. Working together collectively, team teaching is utilized to expand resources and increase educational efforts.

**Impact**
Over 718 people were reached through Going for the Gold intermediate and advanced classes, and in-house restaurant training in 2001. Fourteen individuals participated in a two-day ServSafe® food safety certification class, where participants are tested and receive certification from the National Restaurant

Association Educational Foundation. Written evaluations conducted at the end of both the intermediate and advanced classes showed 98% of participants made a personal pledge to change at least one practice to improve food safety. A follow up survey conducted by UW was sent to a sample of state participants. Results from the survey indicate the following conclusions:

- 97% of participants made one or more changes in the area of cleanliness.
- 78% made changes in the way they prepare foods.
- 70% made changes in the way they cook food.
- 80% made one or more changes in the way they cool food.
- 75% indicated they made changes in one or more of the following: inspecting incoming food, labeling toxic chemicals, calibrating thermometers, keeping better records related to food safety and monitoring control points more closely.

Utilizing a team effort through collaboration allows the agencies involved to reach a broad scope of clientele with food safety education. Collaborative efforts do work and are making a difference in Laramie County.

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*Goal 3: Enhance a healthy, well-nourished population*

**Overview**

Many Americans have eating and exercise habits that are not in keeping with recommendations for optimal health. A recent survey indicated that Wyoming residents tend to be too sedentary and eat too few fruits and vegetables.

To improve the health of Wyoming residents, research and extension programs focus on eating and exercise habits based on recommendations for optimal health. The College of Agriculture conducts research and provides educational programs to adults and youth throughout the state that enables them to make health-promoting choices. Wellness in Wyoming (WIN Wyoming) is one new approach to promote people feeling good about whom they are and motivating them to maintain healthy behaviors.

University of Wyoming research in the area of human health has focused on cardiovascular stress, neuromuscular disorders and intracellular bacteria pathogens. Researchers are studying the interaction between PKR and p67 in regulating cell proliferations. This research has characterized a regulator of PKR termed p67 that is unregulated in breast cancer. P67 directly interacts with PKR and inhibits its activity.

Regulation of the assembly of actin into tightly packed bundles is critical in many cellular processes. Research is being conducted on the regulation of intracellular actin bundle construction. Over 25% of the population experience problems with asthma or breathing at some point during their life. Research has determined it is possible to differentiate between types of asthmatics based on compounds that are released into medium in cell culture and into their saliva in a pulmonary function test.

Nutrition research in rats who have diets high in omega 3 fatty acids of either marine or plant origin will increase the number of eggs released into the oviducts. Research is being finalized to determine if this same effect is borne out in humans. Further human nutrition research has focused on the bioavailability and metabolism of suitably tagged foods and nutrients. Wyoming's part of this multi-state research project investigated the effect of a number of dietary interventions on oxalate absorption and urinary excretion. Among the results was the finding that consumption of rich sources of calcium and magnesium with high oxalate containing foods exerts an effect against the formation of calcium oxalate kidney stones. It is recognized that obesity is one of the most potent predisposing factors for the development of diabetes. What is unrecognized is that the type of fat we consume influences the rate at which we lose peripheral sensitivity to insulin and thus become diabetic. Research is being conducted to determine the effect of different dietary fats on insulin sensitivity and the development of diabetes.

**Key Theme - Human Health**

a. Projects in the Department of Molecular Biology include studies on the interaction between PKR and p67 in regulating cell proliferation and research on the regulation of intracellular actin bundle construction.

   Over 25% of the population experience problems with asthma or breathing at some point during their life. Research has determined it is possible to differentiate between types of asthmatics based on compounds that are released into medium in cell culture and into their saliva in a pulmonary function

test.

Based primarily on *WIN Wyoming* [*Wellness in Wyoming*], a state-wide collaboration of more than 90 educators and health-care professionals representing over 75 public and private entities within and beyond Wyoming at the community, state, and university levels. Members educate people to respect body-size diversity and to enjoy the benefits of active living, pleasurable and healthful eating, and positive self-image.

b. Impact - The eIF2a phosphorylation pathway is important in regulating mammalian cell homeostasis. PKR is a key enzyme in the pathway. Understanding the basis of the PKR-p67 interaction will allow insight into the mechanisms by which cells respond to stress and regulate proliferation. Regulation of the assembly of actin into tightly packed bundles is critical in many cellular processes. Researchers have identified a protein called forked that is essential for bundle formation. Understanding how these proteins function may allow the development of drugs or gene therapy to restore damaged actin bundles in the kidney or the ear.

   Research has determined it is possible to differentiate between types of asthmatics based on compounds that are released into medium in cell culture and into their saliva in a pulmonary function test. Based on the compounds released, it would be possible to identify the correct method of medical treatment and potentially save millions on the treatment of asthma.

   Educational efforts from *WIN Wyoming* resulted in the following impacts: "Size It up!" presentation, which reflects WIN Wyoming's mission and principles, has been delivered to over 5000 youth and adults. Program participants report increased awareness and behavior change in self acceptance as a result of the program. An annual one day meeting of coalition members was evaluated on a Likert scale of 1 - 4, with 4 = highest and 1 = lowest. Members rated the meeting 3.6 for professional growth, 3.9 for professional motivation, 3.9 for useful information, and 3.7 for exchange of ideas. "A New You" curriculum was pilot tested by six UW CES educators in seven classes in four counties. Ninety-two percent of participants reported adopting new practices including: quit dieting, focus on healthy eating, found ways to be more active. Benefits reported from the program were: acceptance of body size and shape, changed attitudes toward eating, and increased activity levels.

c. Source of Funding - State,

d. Scope of Impact - State Specific

**Key Theme - Human Nutrition**

a. The *Cent$ible Nutrition Program* goal is to help limited resource families to improve nutritional well-being. Nutrition educators documented life changing behaviors with pre- and post-surveys, success stories and testimonials related to nutrition practices. Approximately 1,232 households enrolled in lessons and 17,275 individuals participated in one time lessons as well as 1,642 second, fourth, and sixth grade youth at 12 elementary schools completed 4-5 lesson series.

   Extension educators conducted 40 educational programs, classes, workshops, or health fair presentations reaching over 2600 individuals. Topics ranged from "Eat 5-a-Day" to "Eating for a Healthy Heart." One CES educator received a grant from the State Department of Education to

produce a statewide TEAM Nutrition newsletter which was distributed to 350 food service, school districts and Extension educators. One educator presented TEAM Nutrition programs at various schools and in the community reaching 1250 youth.

Research is being conducted to determine the effect of diet on ovulation. In feeding rats oils enriched in the shorter omega 3 fatty acids, linolenic acid, or olive oil, ovulation was enhanced to the same extent exhibited with fish oil ingestion when compared to a vegetable oil base. Results from ovulation studies and consumption of fish oil, in particular, the long-chain omega 3 fatty acids, imply that by altering the oils in our diets to include olive oil or those with higher levels of omega 3 fatty acids such as canola oil derived from rape seed, an improvement in reproductive success will be seen. In another dietary study, researchers are investigating the effect of different dietary fats on insulin sensitivity and the development of diabetes. It is not widely recognized that the type of fat we consume influences the rate at which we lose peripheral sensitivity to insulin and thus become diabetic.

A researcher in the Family and Consumer Sciences Department is focusing on human dietary studies to determine the bioavailability and metabolism of suitably tagged key foods and nutrients. Current studies are investigating the effect of a number of dietary interventions on oxalate absorption and urinary excretion. Among the results was the finding that consumption of rich sources of calcium and magnesium with high oxalate containing foods exerts an effect against the formation of calcium oxalate kidney stones.

b. Impact - *Cent$ible Nutrition* participants showed a 22% increase in nutrition practices as a result of lessons. Dietary improvements include nutrient intake of protein, iron, calcium, vitamin A, vitamin C, and vitamin $B_6$. Mean nutrient adequacy ratio for all nutrients increased from .74 at entry to .81 at exit (1.0 equals 100%). Intake of fats, oils and sweets decreased. A success story from Platte County noted *When the WIC nurse asked K to fill out a 24-hour food recall, the nurse was amazed to see how balanced K's diet was. The nurse commented on what good job the young woman was doing with her diet. K related to her that she had "gone through those classes that Karen teaches" three years ago. She learned how important diet is to her health, and now to the health of her unborn child.*

Participants in nutrition education programs conducted by CES educators reported making one or more changes consistent with the Dietary Guidelines. 100% of participants indicated they had gained knowledge and a greater awareness of the subject matter.

Reproductive failure impacts over 8 million women in the U.S. annually. Nutrition research in rats has indicated diets high in omega 3 fatty acids of either marine or plant origin will increase the number of eggs released into the oviducts. Research is being finalized to determine if this same effect in borne out in humans. Based on these results, there may be a nonpharmacologic means to improving human reproduction for women that could reduce the cost to women who have problems with conception.

In the U.S., the lifetime risk of kidney stone formation is approximately twelve percent for males and five percent for females. During the past five years, a series of studies completed at the University of Wyoming have investigated the effect of a number of dietary interventions on oxalate absorption and urinary excretion. Overall conclusions are consumption of rich sources of calcium and magnesium, in conjunction with high oxalate-containing foods exerts a protective effect against the formation of calcium oxalate kidney stones. A greater understanding of dietary factors which affect oxalate

absorption and excretion will lead to additional strategies for the prevention of kidney stone formation.

c. Source of Funding -Hatch, state, Smith-Lever 3(d) (EFNEP), USDA Food & Nutrition Service with local and state matching (FSNEP).

d. Scope of Impact - State Specific
Multi-state research (NC-167) (W-143)
NC-167 (CA, CO, IA, IN, KS, LA, MI, MN, ND, NE, OR, TN, TX, WI, WY)
W-143 (CA, CO, IN, MA, MI, NE, NM, OR, WA, WY)
Integrated Research and Extension

***Goal 3 Summary:***

The College of Agriculture conducts research and provides educational programs to adults and youth throughout the state, enabling them to make health-promoting choices. Wellness in Wyoming (WIN Wyoming) is a new effort and has been expanded to a multi-state project to promote people feeling good about whom they are and motivating them to maintain healthy behaviors. University of Wyoming research in the area of human health has focused on intracellular bacteria pathogens and studies on human nutrition and health. Researchers in this area participate in four Hatch projects and three are Multi-state projects. The research effort in this area includes about 2.3 FTEs with expenditures of approximately $.18 million Hatch and $.57 million State.

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| Cooperative Extension Service FTEs | 24.85 |
| Goal 3 Allocated Funds | $2,196,603 |

**Goal 3 - IMPACTS**

**ISSUE - UW CES program reshapes attitudes and lifestyles in Natrona County**
Wellness in Wyoming (WIN Wyoming) is a new program designed to teach people to respect body-size diversity and develop positive self-images while enjoying the benefits of active living and eating habits that are both pleasurable and healthful. University of Wyoming Family and Consumer Science extension educators in Natrona County volunteered to pilot test a four-part program series developed by the University of Missouri Cooperative Extension Service. “A New You: Living in a Healthy Body” was adopted as part of the WIN Wyoming project.

**What has been done**
“A New You: Living in a Healthy Body” introduced a framework for a health-centered approach to eating that replaces dieting with the concept of honoring hunger with gentle nutrition. Participants learned to enjoy active living, and to respect their bodies, no matter what size or shape. Each class was carefully evaluated and results were used to adapt the program to include additional activities and information.

Thirty-eight people participated in the four-part series “A New You: Living in a Healthy Body.” The participants learned to enjoy moving their bodies, to take pleasure in eating, and to identify different types of hunger. Participants said they benefitted from the class by learning to accept their body sizes and shapes while setting goals for healthy living.

**Impact**

Ninety-two percent of those who participated reported adopting new practices, including focusing on healthy eating and finding ways to be more active instead of dieting. "A New You: Living in a Healthy Body" had lasting effects for the workshop participants, as indicated by their responses to a follow-up survey conducted three months later. Three participants said they had increased their activity level, and others were keeping journals recording the amount of fruits, vegetables, and water consumed each day. One participant reported, "I am kinder to myself, more aware of real hunger and emotional hunger," and another said, "My thought process has improved. I'm okay to be who I am."

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**Goal 3 - IMPACTS**

**ISSUE - Cent$ible Nutrition Program helps limited resource families**

Cent$ible Nutrition has completed its fourth year in 18 counties in Wyoming. The program includes both the Extension Family Nutrition Education Program (EFNEP) and the Food Stamp nutrition Education Program (FSNEP). The goal of the Cent$ible Nutrition program (CNP) is to help families and individuals eat better for less.

*"This is the best thing (enrolling in Cent$ible Nutrition) I have done for myself and my kids since the divorce. Cooking with the cookbook is a family activity. We are eating healthier, saving time with the master mixes and the kids understand the importance of washing their hands and keeping the counter clean which is important to me. Since taking the Cent$ible Nutrition classes, we are saving $150.00 a month on our grocery bills."* - A single father participant in the Cent$ible Nutrition Program

**What has been done**

Reaching program goals is accomplished through presentations at cooperating agencies and by enrolling participants in a series of lessons. In the past year nutrition educators presented almost 1,180 one-time presentations reaching over 17,275 clients. A reporting sample indicated 82% of those receiving a one-time lesson intended to make a positive behavior change as a result of the lesson.

**Impact**

The number of families enrolled in the series of lessons was 1,232. As in previous years, enrolled clients show substantial change in behavior in food resource management practices; nutrition practices, and food safety practices.

Eighty one percent of homemakers showed improvement in one or more practices in food resource management. Participants showed an average savings of $30.16 per month on food purchases, an annual savings of $445,885 for all enrolled families. Entry and exit surveys are used to show client changes.

•Food resource management includes the following practices: plan meals, compare prices, does not run out

of food, uses grocery list. Surveys report a 26% increase of participants demonstrated acceptable food resource management practices at the conclusion of the lessons.

•Nutrition practices measured included planning meals, makes healthy food choices, prepares food without salt, reads nutrition labels, and children eat breakfast. Eighty nine percent of homemakers showed improvement in one or more nutrition practice.

•Food safety practices measured include: thawing foods properly and storing foods properly. Sixty three percent of homemakers showed improvement in one or more food safety practices.

One success story shared is about a client who was drinking six huge mugs of soda per day and eating non-nutritious foods. After completing the lessons she began to reduce her calories and eat more nutritiously. She lost 50 pounds helping her reduce her blood pressure from 198/100 to 150/86 without medication. She lowered her cholesterol from 300 mg to 150 mg also without medication. She cut her diabetes medication from $400.00 to $200.00 per month and her doctor is beginning to wean her off it completely. She is now exercising three times per week, and has improved her mental attitude. Grocery bills have been reduced from $350 per month to less than $142 which is within her food stamp allocation. She shares what the program has done for her:
*"Since completing my CNP classes, my high blood pressure and cholesterol have gone down. I can attribute that to reading the nutrition labels and staying away from prepackaged food, which now I know have a lot of salt. I'm cooking better now and have lost weight and feel better."*

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**ISSUE - The effect of diet on ovulation**
Reproductive failure impacts over 8 million women in the US annually. This number has risen sharply since 1960 and may be largely dietary in origin. In particular increases in reproductive failure may be due to the make-up of fats in our diet. If women could simply alter the fat in their diet to alter their potential of reproductive success they might do so.

**What has been done**
Studies in rats indicate that by including diets high in omega-3 fatty acids of either marine or plant origin will increase the number of eggs released into the oviducts. Research is being finalized to ascertain if this same effect is borne out in humans that consume diets high in marine fish, in particular in natives of Alaska. Attempts are now underway to obtain funding to determine if the same benefits may be realized in the pork industry.

**Impact**
There may be a non-pharmacologic means of improving human reproduction for women who have problems with conception. This could dramatically reduce the cost to women with reproductive failure annually in the US. In the pork industry, an improvement in the litter size could increase the financial viability of the industry.

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**ISSUE - Differentiation Between Asthmatics at the Response Level**

Over 25% of the population experiences problems with asthma or breathing at some point during their life. To date, asthma has been treated as a homogeneous problem with treatment reflecting this belief. Previous data from UW FCS laboratory indicates that this is not the case. It is possible to differentiate between types of asthmatics that exist based on compounds that are released into medium in cell culture and into their saliva in a pulmonary function test. Based on the compounds that are released, it would be possible to identify the correct method of medical treatment for an asthmatic.

**What has been done**

Cell culture work has been completed and initial saliva samples have been screened. An independent company has been contacted and a patent application has been filed to develop an asthma test tool.

**Impact**

The potential exists to save millions in incorrectly spent dollars for the treatment of asthma.

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*Goal 4: Enhance greater harmony between agriculture and the environment*

**Overview**

Management of natural resources and associated environmental issues permeate nearly every aspect of life in the state. Public demand and expectations often conflict when determining appropriate management strategies for Wyoming's wide-open spaces, wildlife, and public lands. The need for science-based information and expertise in evaluating public policy, and facilitating conflict resolution is ever increasing in Wyoming.

Wyoming's ecosystems, whether agro, range, or forest, have both plant and insect pests. The effective use and value of range, forest, and cropland resources depend on the appropriate management of noxious weeds, insect pests, and diseases. Research and extension education programs in integrated pest management, bio-control, and other environmentally friendly pest control techniques are important to the state's ecosystems. For example, the Reduced Agent-Area Treatments (RAATs) is a method of integrated pest management for rangeland grasshoppers in which the rate of insecticide is reduced and untreated swaths are alternated with treated swaths. This IPM approach allows predators and parasites to be preserved in untreated swaths and dramatically reduces the amount of insecticide applied and the cost of control.

A large share of the state's income is generated from extraction of mineral and fossil fuels. Coal, trona, and natural gas are examples of large extractive industries in the state. Research and education programs on improving rangeland and reclaiming disturbed sites benefit individuals, communities and the state by enhancing the productivity and stability of reclaimed lands.

The integrity of Wyoming's natural resource base and the state's diverse ecosystems is a central focus of the University of Wyoming's extension and research programs. Natural resource related research and extension programs are designed to foster an understanding of the functioning of Wyoming ecosystems as related to the people and economic viability of the state.

**Key Theme - Recycling**

a. The small size of Wyoming communities often impacts the ability of citizens to recycle. In Washakie County, a citizen group has organized a one day, county wide, recycling event to ensure residents will have greater harmony between the environment, safety of the population, and increase the awareness of the need of simple recycling habits. FY 2001 was the third year for the Washakie County Household Waste Collection Day held in conjunction with Washakie County Cleanup Week. Throughout the year coalition members spoke to a variety of businesses and wrote several grants which paid for the Collection Day expenses. A total of 40 volunteers worked the event.

b. Impact - In three years, the yearly Collection Day has resulted in 224 vehicles coming to the Landfill recycling the following: 85 gallons of usable paint (solidified 250 gallons out of the 1,181 containers collected; 3,205 gallons of used motor oil; 120 containers of pesticides; 182+ refrigerated units decommissioned; 111 vehicle batteries; 2 cubic yards paper products.

c. Sources of Funding - Smith-Lever, State
d. Scope of Impact - State Specific

**Key Theme - Pesticide Application**

a. Federal and state laws require that individuals using restricted pesticides become certified applicators. Private applicators must be recertified every five years, and commercial applicators must earn recertification every three years. The UW CES provides training for both initial certification and recertification of private and commercial applicators. UW CES cooperates with the Wyoming Department of Agriculture in the certification program. Private applicator training takes place at the county level, with each county holding one or two training sessions per year. Commercial applicator training takes place at the state level. An initial certification school, consisting of 24 hours of training and a 12-hour recertification school were held in 2001. Federal, state, and university personnel provide the training for commercial applicators. Approximately 600 private applicators received training and 500 were recertified. In 2001, 51 commercial applicators received training and were certified and 200 received training for recertification. The UW CES offers pesticide training materials via internet. Web site access has increased from approximately 50 times per week to 75. Twenty-four Pesticide Education Program Fact Sheets (MP-93.1 through MP93.14) and others that deal with various topis are available in both the private and commercial pesticide applicator training programs.

b. Impact - Approximately 1,100 private pesticide applicators and 200 commercial pesticide applicators adopted practices such as reading and understanding the pesticide label, wearing and using the proper safety clothing and equipment, applying pesticides only when needed, and using integrated pest management strategies. Due to the private and commercial pesticide applicator training programs, pesticide complaints to the Wyoming Department of Agriculture are minimal. Those that are reported are usually due to pesticide misuse.

c. Source of Funding - Smith-Lever 3(d)

d. Scope of Impact - State Specific

**Key Theme - Natural Resource Management**

a. Management of natural resources and associated environmental issues permeate nearly every aspect of life in the state. Public demand and expectations often conflict when determining appropriate management strategies for Wyoming's wide-open spaces, wildlife and public lands. CES educators and specialists conducted 24 educational workshops reaching over 680 individuals on topics ranging from "Financial and Natural Resource Conflict Mediation," "Range Monitoring," and "Backyard Wildlife Habitat" to "Living on a Few Acres". In addition, programs targeting youth audiences reached over 200 children through school presentations and traditional 4-H.

Important resources such as wildlife habitat, watersheds, and agricultural infrastructure can be adversely impacted by fragmentation of agricultural lands. Important services such as scenic view sheds, wildlife migration corridors, and public access can also be adversely impacted by fragmentation of agricultural lands. To assess rural property values, research was conducted using parcel specific production attributes combined with GIS data measuring parcel recreational and scenic amenities for 138 rural land sales in Wyoming. Results indicate that land values, as a dollar per acre amount, are nearly as statistically related with amenity measurements as with agricultural attributes. A new research project is looking at factors that control carbon sequestration on Northern Rocky Mountain

rangelands.

b. Impact - Participants reported increased awareness of natural resource issues affecting their agricultural operations, environmental issues, regulatory issues and the need for an integrated approach to problem solving. One hundred percent of the youth participants showed increased knowledge and skills as a result of educational efforts.

The exploratory research concerning attributes of rural land and their value suggests that economic values associated with amenity attributes may be estimated from market transactions. The ability to estimate values based on these attributes could improve rural land appraisal procedures, valuation of conservation easements, and policies related to agricultural lands. Seminars have been presented to state and county officials, planning offices, citizen groups, agricultural landowners, and county extension personnel. Understanding factors governing C sequestration are essential for addressing questions relating to rising atmospheric $CO^2$ concentrations, global warming and ecosystem C exchange.

c. Source of Funding - Smith-Lever, Hatch, State

d. Scope of Impact - State Specific
Multi-state research (W-133) (CA, CA-D, CO, CT, GA, IA, MA, ME, MI, MN, MT, ND, NH, NM, NV, NYC, OH, OR, PA, SC, TN, UT, WA, WV, WY)
Integrated Research and Extension

**Key Theme – Biodiversity**

a. Researchers have been studying the effects of thinning big sagebrush with tebuthiuron on plant and small mammal communities. Over several years, numerous rangelands dominated by mature big sagebrush were treated with reduced rates of tebuthiuron to thin big sagebrush. Research was conducted on these sites to document changes in plant community composition and production, and subsequent impacts on wildlife composition and abundance. In addition, educational field tours and workshops were conducted to demonstrate the effects of big sagebrush thinning. In another study using long term rangeland exclosures, research is being conducted to determine how precipitation, soil, and land use interact to influence ecosystem structure and function in general, and biodiversity in particular. The primary venue for these analyses is to use a statewide system of 40 year old livestock exclosures to analyze how presence or absence of livestock have influenced plant, small mammal, and soil microorganism composition and diversity. Researchers have identified and obtained records for 80 rangeland exclosures established in the 1960s. Twenty sites were visited and five sites were intensively inventoried during 2001.

b. Impact – Results of this ongoing research program are used to educate the public about the role of land use on biodiversity and species composition. Research results from thinning big sagebrush with tebuthiuron have shown a three-four fold increase in herbaceous grass/forb production with application costs around $10/acre. Wildlife and natural resource management agencies (Wyoming Game & Fish, Bureau of Land Management, U.S. Forest Service) are starting to employ this rangeland management practice to enhance biodiversity. These research findings are altering perceptions by the public and land managers about the roles of large herbivores on rangelands (i.e., light to moderate stocking rates

of livestock either do not influence or enhance biodiversity and control of invasive weeds).

c. Source of Funding – Hatch, State

d. Scope of Impact – State Specific
Integrated Research and Extension

**Key Theme - Biological Control**

a. Fusarium Yellows is a fungus that is particularly damaging to sugar beet growers in the Western U.S. Once a field is infested with this fungus, it causes losses every time sugar beets are grown. Chemical seed treatment and soil fumigation have been traditional means of attempting to control this disease. Recently, several varieties with resistance to Fusarium Yellows have been developed. Also, several bacterial and fungal organisms have been registered for application on seed for biological control of several soil-borne diseases including Fusarium spp. On-farm research, funded by the Washakie Beet Growers Association and Holly Sugar Corporation, has shown an increase in sugar beet yield with the combination of biological seed treatment and resistant varieties.

b. Impact – Sugar beet yields were increased from 16.6T/A to 22.4 T/A with the Fasarium Yellows resistant variety plus the biological seed treatment. With an estimated 1,700 acres infested in Wyoming, a potential increase of over one million dollars annually could be realized from these new control practices for this disease in Wyoming.

c. Source of Funding – Hatch, State

d. Scope of Impact – State Specific
Integrated Research and Extension
Multi-state Integrated Research and Extension (W-185)
(AZ, CA, GU, HI, ID, KS, MT, NM, NY, OR, UT, WA, WY)

**Key Theme - Endangered Species**

a. The majority of populations of Colorado Butterfly are in Wyoming where the species numbers have been in decline, resulting in its listing in 1999 as threatened status. A previous study found that removal of aboveground cover enhanced rosette recruitment of Colorado butterfly plant. Research was initiated in 2001 to evaluate practical management activities to remove aboveground cover, such as burning and mowing treatments.

b. Impact - This study has the potential of increasing the extant population so that the species does not become endangered.

c. Source of Funding - State

d. Scope of Impact - State Specific

**Key Theme – Integrated Pest Management**

a. Researchers and Extension educators at University of Wyoming are conducting studies to develop and evaluate integrated pest management systems. The primary focus of this research is to reduce the application of pesticides and enhance biodiversity of the natural resource. For example, the Reduced Agent-Area Treatments (RAATs) is a method of integrated pest management for rangeland grasshoppers in which the rate of insecticide is reduced and untreated swaths are altered with treated swaths. This IPM approach allows predators and parasites to be preserved in untreated swaths and dramatically reduces the amount of insecticide applied and the cost of control. In addition, researchers have been developing a reliable grasshopper assessment method by which nontechnical personnel can effectively assess rangeland grasshopper infestations and determine if they are at densities that will threaten forage for wildlife and livestock.

b. Impact – Results from the integrated pest management studies being conducted will impact crop production and range management across the west. In the last three years, over 100,000 acres has been treated in nine western states using RAATs. This has saved agriculture more than a quarter million dollars and reduced insecticide use by 50,000 lb relative the methods used just five years ago. This tactic has been endorsed by the National Grasshopper Management Board and has been selected by USDA as the "preferred alternative" in the 2001 Environmental Impact Statement for the "Rangeland Grasshopper and Mormon Cricket Suppression Program." In addition, a grasshopper sampling method to assess rangeland grasshopper infestations has been developed and is being used by Weed and Pest District supervisors in 15 of 16 grasshopper affected counties. The estimated cost of using this sampling method is $600 per county.

c. Source of Funding – State

d. Scope of Impact – State Specific
Integrated Research and Extension

**Key Theme – Soil Quality**

a. Research is being conducted with regard to restoration ecology and reclamation to understand how stability and function of degraded lands and plant communities can be re-established. Surface coal mining reclamation specialists and officials at government regulation agencies need to know if disturbed soils and substitute plant growth media can sustain plant growth in the long term. Research is being conducted to determine what minimum levels of organic matter in soil are required to sustain plant communities. In addition, a new technique (3-day $CO^2$ flush method) is being tested. Another area of interest to officials in regulatory agencies is phytoremediation of petroleum contaminated soils. Both greenhouse and field plot studies have been implemented to evaluate the potential to use native and introduced grasses along with soil microorganisms to reduce the concentration of petroleum contaminants in soil.

b. Impact – Research findings should result in recommendations for minimum levels of organic matter in soil or substitute plant growth material used in mined land reclamation. Also, the 3-day $CO^2$ flush method has the potential to provide a timely, cheap, and reliable method for evaluating a soils potential to sustain nutrient cycling and plant growth in the long term. Phytoremediation to clean petroleum contaminated soils has the potential to be effective and much less expensive than standard remediation techniques. An existing research project has contributed to the approval by regulatory agencies of a remediation plan for a specific site that relies primarily on phytoremediation.

c. Source of Funds – Hatch, State

d. Scope of Impact – State Specific
Multi state Research (W-170) (AR, CA, CO, FL, GU, HI, IA, IN, KS, OK, MI, OR, PA, TX, VA, WA, WY)
Integrated Research and Extension

**Key Theme – Sustainable Agriculture**

a. The focus of research being conducted on sustainability is to increase agricultural producers' understanding and adoption of agricultural practices and production systems that sustain and protect ecosystem integrity and biodiversity. Research efforts have focused on production practices and systems that reduce inputs, improve ecosystem diversity, and maintain profitability. The sugar beet cyst nematode (SBCN) *Heterodera schachtii*, is a widely occurring pest problem faced by Wyoming sugar beet producers. To address this problem, UW researchers, in cooperation with the sugar beet industry, have shown that trap crop radish grown as a second crop following small grains can effectively replace nematicides for sugar beet nematode control. Researchers have also conducted extensive studies to evaluate more diversified dryland crop rotations. The traditional wheat-fallow systems have created difficult winter annual grass problems and resulted in increased soil erosion potential. Applied research results of extended crop rotations including crops other than wheat (i.e., corn, millet, sunflower) have reduced fallow acres, reduced soil erosion potential, decreased weed problems, and increased farm income.

b. Impact – Results of research projects on sustainable agriculture demonstrate impacts that maintain or improve ecosystem diversity while increasing profitability. In a recent survey, 72% of the acreage in one county in Wyoming were above the economic damage threshold for nematodes. Using trap crops on approximately 7,200 acres of sugar beets in that county would result in about $1 million annually to those producers. In addition, sugar beets are an excellent example of a value-added commodity in Wyoming, providing between $200-250 million annually in economic activity. Dryland winter wheat is grown on approximately 160,000 acres in Wyoming. Results from the diversified dryland cropping systems indicated increased farm income of $7 to $10/ac annually and reduced winter annual grass populations 90-95%.

c. Source of Funding – Hatch, State

d. Scope of Impact – State Specific
Integrated Research and Extension
Multi-state Integrated Research and Extension (W-186)
(AR, CA, HI, ID, MI, NC, NE, NM, OR, WA, WY)

**Key Theme – Water Quality**

a. Water quality research and education programs are designed to provide information and technical guidance to clientele regarding the management of aquatic and terrestrial ecosystems to maintain

water quality.

A special area of focus is assessment of water quality associated with coal bed methane (CBM) development and how aspects of this product water would influence sodium adsorption ratio considerations associated with disposal of the water. To address concerns, research first evaluated well discharge chemistry and its storage in surface reservoirs. Because CBM product water may be discharged in stream channels, a second chemistry research effort was initiated using a column laboratory protocol for evaluating how stored channel sediments may react with rain and CBM product water. A third research thrust is evaluating how well discharge CBM product water changes during flow down channel and its contribution to the chemistry of Powder River.

b. Impact - The research associated with coal bed methane water quality is influencing the development considerations associated with this industry. In particular, the Wyoming Department of Environmental Quality and various industry consultants are relying on this research to guide the evolution of standards dealing with sodium adsorption ratio concerns and water quality of Powder River. The research results have broad application in understanding and developing management guidelines for this new product water supply.

c. Source of Funding – Hatch, State

d. Scope of Impact – State Specific
Multi-state Research (W-184,) **Note: need check on states**
(AZ, CA, CO, DE, FL, GU, HI, IA, ID, IL, IN, KS, MN, MT, ND, NM, NV, TX, UT, VA, WA, WY)
Integrated Research and Extension

***Goal 4 Summary:***

The integrity of Wyoming's natural resource base and diverse ecosystem is the focus of the College's extension and research programs. A few of the college's on-going efforts in the Goal 4 area are:
1. Integrated Pest Management
2. Natural Resource Education
3. Rangeland and Riparian Management
4. Biological Control

Researchers in this area participated in eight Hatch projects and six of the eight are multi-state projects. The research effort includes 5.6 FTEs with expenditures of approximately $.1 million Hatch and $1.1 million State.

| | |
|---|---|
| Cooperative Extension Service FTEs | 10.78 |
| Goal 4 Allocated Funds | $954,262 |

**Goal 4 - IMPACTS**

**ISSUE - UW CES: Maintaining leafy spurge at a tolerable level**
Leafy spurge is an extremely tenacious and competitive noxious weed that reduces agricultural

productivity and biodiversity on millions of acres in the northern United States and Canada. Crook County, Wyoming, has a heavy infestation of leafy spurge, primarily within a 10-mile radius of Devils Tower National Monument. Millions of dollars worth of herbicides and other treatments have been spent to control leafy spurge during the past 40 years, and the University of Wyoming has been a major contributor to research and education efforts throughout the state.

Leafy spurge will never be completely eradicated. This plant is a permanent part of North America's flora, and if it isn't kept under surveillance, it will surely cause more problems. For decades in Crook County, the strategy was to contain the weed and keep it from spreading but not to pour endless resources into the heavily infested area near Devils Tower. The acreage was so severely infested that the damage was irreversible ecologically and economically.

**What has been done**

Recently, there has been remarkable progress with leafy spurge control in Crook County. The beneficial insects Apthona nigriscutis and A. lascertosa, commonly known as fleabeetles, began the positive trend in biological control. UW Crook County CES staff members helped with the initial fleabeetle releases in 1989, and although it looked like nothing was happening for several years, the results improved dramatically as the beetle population established and achieved exponential growth and they were distributed to other appropriate sites.

**Impact**

Approximately four years ago, researchers began to see a decline of the leafy spurge infestation. They verified, with quantitative data, that leafy spurge was on the retreat and that native plants were reclaiming areas that had been near monocultures of leafy spurge for decades.

Working with UW CES, local producers and land management agencies can make much more sophisticated use of other weed control tools. In the past, treatments were expensive, had serious environmental side effects, and didn't last. Now, educators can recommend herbicide treatments that are much more effective than the traditional Tordon treatment of two quarts per acre. UW CES advises producers and land managers to use several chemicals (or combinations of chemicals) for weed and pest control and gives much more precise information about timing, application rates, and follow-up management. This means that the amount and cost of chemical treatments are reduced and the effectiveness is increased.

Producers are currently establishing and managing competitive species to determine which grass species are most effective against leafy spurge in a particular area. A number of Crook County producers have added sheep or goat enterprises to their beef operations, as well, because the small ruminants will eat leafy spurge while cattle will not. Most recently, UW has completed high tech research at Devils Tower using a device called a minirhizotron to take video images of leafy spurge roots in situ as they respond to above ground treatments.

In Crook County, there are positive trends. At least 30 producers, who collectively manage 100,000 acres in the county, and several agencies are using some or all of the recommended leafy spurge control practices. The infestation is shrinking and the perimeter is being held.

Having acknowledged that victory is conditional, the effort to control leafy spurge should nevertheless be listed on the success end of the continuum. It should be used as a model of what can be done with other

invasive weeds through a concerted, cooperative effort. The key has been an integrated use of multiple control tools, including improved herbicide management and release of millions of biocontrol agents, especially insects. Crook County land managers also have found that sheep and goat grazing, improved grazing management, re-vegetation with competitive grasses, fire management, sophisticated monitoring, and economic analysis are tools that work.

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**ISSUE - Effects Of Thinning Big Sagebrush With Tebuthiuron On Plant and Small Mammal Communities**

Older, mature big sagebrush communities in Wyoming and the West are characterized by a dominance of primarily big sagebrush, little understory herbaceous grass and forb production, low plant community diversity, poor conditions for livestock grazing, low quality wildlife habitat conditions, restriction of water runoff from sagebrush's ability to tie up available water, and poor nutritional quality of mature sagebrush. This late seral stage condition of sagebrush-grass rangelands impacts agricultural producers raising domestic livestock, compromises wildlife species diversity and production due to poor habitat quality, and reduces water quantity in ephemeral and permanent rangeland streams and drainages.

**What has been done**

Over the past several years numerous areas (primarily on privately-owned rangelands) dominated by mature big sagebrush were treated with reduced application rates of tebuthiuron to thin big sagebrush, thereby releasing the competitive suppression of herbaceous grasses and forbs. Several research projects, involving graduate students and individual investigations, were established on these sites to document changes in plant community production, composition, diversity, and subsequent impacts to wildlife population composition, diversity, and abundance (using small mammals, antelope, elk, and sage grouse). In addition to research efforts, several extension educational field tours and workshops were conducted to demonstrate the beneficial effects of thinning. Those attending field tours and workshops included ranchers, state/federal agency resource managers, environmental interest groups, county extension agents, and other interested parties.

**Impact**

Impacts from this effort have included increased use of this cost-effective range management practice by ranchers, agency resource managers, and other environmentally-aware interest groups. Thinning big sagebrush with tebuthiuron generally results in a 3-4 fold increase in herbaceous grass/forb production with application costs around $10/acre. Wildlife and natural resource management agencies (Wyoming Game & Fish Department, Bureau of Land Management, U.S. Forest Service) who were previously hesitant to use herbicides on public lands, are now starting to employ this rangeland management practice more often to enhance biodiversity on native western rangelands.

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**ISSUE - Coalbed Methane Product Water and Channel Sediment Interactions**
The Powder River Basin in north central Wyoming has been estimated to hold close to 31.7 trillion cubic feet of recoverable coalbed methane gas (CBM). With the development of this gas supply, ground water that is produced with the gas extraction process must be managed as a new surface supply. Consequently, managers of public and state lands, private landowners, water quality regulating agencies, and environmental quality interest groups are searching for scientific information to help manage the development of the CBM gas reserves and manage surface and groundwater supplies

**What has been done**
Our research program first evaluated well discharge chemistry and its storage in surface reservoirs from south to north along the coal mines between major drainage basins in the Powder River Basin. Because CBM product water may also be discharged in stream channels tributary to the Powder River, which flows into Montana, our second chemistry monitoring effort was initiated using a column laboratory protocol for evaluating how stored channel sediments may react with both rain and CBM product water. Our third research thrust is evaluating how well discharge CBM product water changes in actual flow down channel and its contribution to the chemistry of the Powder River.

**Impact**
These research data are being used by the Wyoming State Department of Environmental Quality, Wyoming Water Development Commission, CBM industry, BLM, and interested environmental quality interest groups for attempting to understand and forecast management of this new water supply. At this time research is behind the development of the coalbed methane gas industry in the western United States. Our publications will be some of the few to be first published in the scientific literature. Our column laboratory protocol appears to predict the outcome of channel flow in ephemeral streams draining into the Powder River and so may be used if needed to evaluate other western development across Wyoming.

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**ISSUE - Agricultural Land Values and Conservation**
Landowners, public policy makers, and ordinary citizens are interested in and affected by the future of rural lands in Wyoming. Important resources such as wildlife habitat, watersheds and groundwater, agricultural infrastructure and arable soils can be adversely impacted by the fragmentation (due to subdividing) of agricultural lands. Important services such as scenic view sheds, wildlife migration corridors, working landscapes, on-site recreation and access to public lands can be adversely impacted by the fragmentation (due to subdividing) of agricultural lands.

**What has been done**

Seminars have been presented to state and county officials, planning offices, citizen groups, agricultural landowners and county extension agents. They have been consulted as to the unique nature of issues and concerns about land use and planning in given counties. Several focus groups with multiple meetings of a wide range of citizens have been conducted. From these meetings, land use and planning preference surveys have been designed and ultimately administered on a county-specific basis. Bulletins and academic papers have been published with the former made available on the Department of Agricultural and Applied Economics Web site.

**Impact**
The Wyoming Open Space Partnership has been formed with Institute of Environment & Natural Resources, Wyoming Cooperative Extension Service, Department of Agricultural and Applied Economics, Wyoming Natural Diversity Database, Wyoming Geographic Information Systems Center on campus and various agricultural and resource interests around the state of Wyoming. This umbrella partnership is positioned to inform the discussion about open space, land use and planning with objective/policy neutral information and facts.

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**ISSUE - Relationship Between Organic Matter Content and Sustainable Nutrient Cycling in Reclaimed Soils**
Surface coal mining company reclamation specialists working to reclaim surface mined lands and officials at government regulatory agencies need to know if disturbed soils and substitute plant growth media can sustain plant growth in the long term. These same concerns need a rapid, inexpensive and reliable method to evaluate the capacity of a soil or substitute plant growth material to sustain a productive plant community over long periods of time.

**What has been done**
This research project is designed to determine what minimum levels of organic matter in soil are required to sustain plant community production. Soils at a number of surface coal mines in northeast Wyoming representing a range of soil organic matter contents have been sampled and analyzed to determine their nutrient and carbon content. Additionally, a number of assays designed to assay key nutrient transformations are being conducted. A new technique (3-day $CO_2$ flush method) is being tested which has the potential to provide a timely, cheap and reliable method for evaluating a soils potential to sustain nutrient cycling and plant growth in the long term.

**Impact**
This project will result in recommendations for minimum levels of organic matter in soil or substitute plant growth used in surface mined land reclamation. Also, the 3-day $CO_2$ flush method will be recommended as a reliable and inexpensive method to evaluate the potential of a disturbed soil to sustain nutrient cycling.

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**ISSUE - Rangeland exclosures: Plant and soil diversity in semi-arid shrublands**

Understanding native shrubland ecology in semi-arid shrublands will allow Wyoming and western states to better address the importance of herbivory in shrublands. Because many shrublands occur on public wildlands, research will inform management relative to recent requests for removal of domestic stock. Additional comprehension of soil biota under grazing and its removal will add to our ability to estimate rangeland health and sustainability.

**What has been done**

We have identified and obtained original records for 80 rangeland exclosures established in the 1960s. Twenty sites were revisited and 5 sites were intensively inventoried for vascular plants, biotic soil crusts and below-surface soil biota in summer 2001. Biotic crusts collected during the summer fieldwork are being identified and soil analyses are being conducted in the winter lab work associated with this research.

**Impact**

Arid and semi-arid land management depends upon informed decisions relative to the presence of domestic livestock. Rangeland exclosures offer an opportunity to document the effects of grazing removal from public land. This research documents changes in soil and vegetation in repeated measures over a 40-year history. The results of the study will greatly impact management decisions relative to livestock removal in the West. In addition, the results will provide important information for the assessment of rangeland health and shrub expansion dynamics.

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***Goal 5: Enhance economic opportunity and quality of life for Americans***

**Overview**

Money/personal finances and investment, family and child development, and economic issues were identified among the highest priorities for State of Wyoming residents when asked to identify the most pressing issues facing families in the next three to five years.

The economies of Wyoming communities have been at a critical juncture. Per capita income growth statewide from 1994 to 1996 was less than 60 percent of the national average, and Wyoming experienced an eight percent growth rate in jobs, while neighboring states enjoyed a 13 percent growth rate.

University of Wyoming researchers are working with Wyoming communities, assisting them with identifying impacts of change, developing community network resources, and identifying growth opportunities for existing businesses. Preliminary results from research concerning U.S. Forest Service (USFS) policy changes indicate that one national forest brings in $75.7 million to a three county area. Multi-state project interfaces retailers, small manufacturers, and home-based businesses; helping these businesses identify economic development and growth opportunities in their rural locations.

Children, youth, and families at risk have been a major foci of child and family studies researchers at the University of Wyoming. Researchers have been participating in multi-state projects involving welfare reform and at-risk youth resilience to violence. In-depth research on child health and safety provided the basis for curriculum development and training for child care providers statewide. In the past year 80 individuals including child care workers and nurses received the benefits of this research-based training.

**Key Theme - Family Resource Management**

a. Cooperative Extension Family and Consumer Science Educators in six counties and the State Family Economics Specialist conducted 20 financial management classes reaching 477 individuals. Topics included Money 2000 & Beyond: Credit, Savings, Insurance and Risk Management, Retirement Planning, Saving for College, Budgeting for a Baby, Pocket Change Series, and Using a Financial Calculator. Of the 477 total participants, 101 attended single topic workshops and 376 completed in-depth financial management courses that entailed three to five sessions in length. FCS educators also reached 46 individuals in three programs on "Transferring Non-titled Property." Consumer fraud was addressed in two programs reaching 97 individuals.

b. Impact - Individuals enrolled in Money 2000 & Beyond completed evaluations at the conclusion of the course and a follow-up evaluation was conducted nine months following the course. Impact documented through evaluations:
   - 91% of participants established at least one financial goal.
   - 96% better understand the costs of credit and dangers of making only the minimum payment.
   - One group of participants developed 59 ways to decrease expenses.
   - 42% have set a long term financial goal and have a written plan for managing debt.
   - 100% reported they were making changes in their money management practices.
   - 58% indicated they planned to re-evaluate their insurance needs.
   - One participant reported on the final evaluation "I cut up every one of my credit cards."

Another reported "The financial notebook idea was so good that I started notebooks for my two teenagers to begin teaching them money management skills."

Evaluations for the "Pocket Change" four week series were conducted at the conclusion of each class and a final evaluation at the end of the course. Participants reported an increase of their awareness of money issues and a change in attitude towards money. Seventy-five percent reported they changed their spending behaviors or skills such as: take only the amount of cash allotted, decreased use of credit cards, put more thought into purchases, don't buy on sale because of impulse, and pay credit card bills soon.

Evaluations from the "Transfer of Non-titled Property" indicated participants raised awareness of the importance of family discussions and making wishes known regarding non-titled property. Ninety-seven percent said they plan to discuss transfer of non-titled property with their children or make up a list for disposition.

c. Source of Funding - Smith-Lever

d. Scope of Impact - State Specific

**Key Theme – Child Care/Dependent Care**

c. Wyoming is faced with issues of rural isolation and decreasing numbers of licensed child care programs impact children across the state. Faculty in the area of child and family studies combined research with on-campus academic programs in order to address the needs of Wyoming families. Educational programs have been designed to strengthen individuals and families so as to prevent the development of children, youth, and family based social problems. Faculty used their research to develop training programs delivered throughout the state. One example of this effort is the "Healthy Child Care Wyoming" project. After extensive research and field testing with children, a curriculum was developed and delivered to child care providers and public health nurses throughout the state. Along with the curriculum several newsletter items and brochures have also been developed.

Online courses were developed for child care health consultant training. As a result, 67 child care providers and 13 nurses were trained. Nationally the numbers of non-traditional students in the university setting have increased steadily. As student-parents return to school, issues of child care become more evident. The need for affordable and accessible child care on the University of Wyoming campus became an issue in the past few years. With support from the Associated Students of the University of Wyoming, a project was developed to increase the availability and quality of school-age child care and evening child care on campus.

d. Impact – Wyoming is a national model for distance education as a training method for nurses and child care providers. Through the STARS system, 11,775 hours of training in health, safety and nutrition were received by child care providers in the state.

Through educational efforts, an increase in the number of well trained professionals available to families and youth will result in a strengthening of parent-child relationships and a reduction of problems experienced by children and youth.

e. Source of Funds – State

f. Scope of Impact – State Specific

**Key Theme – Children, Youth, and Families at Risk**

a. A faculty member is working with colleagues in India to provide educational materials and training for both professionals and lay persons in essential areas of family counseling, parent education, and youth development. When the nation's welfare policies were reformed in 1996, states were given more decision-making authority over their welfare policies. These social policy changes are being studied in urban communities, but data are limited on how the policy changes are affecting rural families and communities. A multi-state team of researchers has been collecting data for a longitudinal study of rural families after welfare reform. Over 400 families across 15 states are participants in the study.

Young people and families confront numerous risk factors, ranging from those that cause unhappiness or lost human potential to those that are life-threatening. One group that is particularly vulnerable are the "latch-key" children who are unsupervised during the period after school and before their parents or adults return home. UWCES, through the CYFAR project and in collaboration with schools, community and state agencies, provides training, materials, web resources on youth development, and workforce preparation skills (science, tutoring, life and job skills, community service, career exploration) and recreation activities to youth, adult professionals and volunteers. Through CYFAR, community educators offer after-school programs for children and youth at four grant funded community sites: Platte, Crook, Campbell, and Park counties; one grant-funded technical site: Sheridan; one YAR site: Wind River Reservation. CYFAR supports, through sponsorship, the largest youth assets conference in the state - Healthy Communities/Healthy Youth. Additionally youth at risk programs are conducted in Uinta and Goshen counties through county and outside funding.

SUCCESS Program - Wheatland High School - science and technology education; mentoring and study skills "In-Focus"; natural resource field experience. (43 students)
Kids Taking Care of Business (KTCB) - Moorcroft, WY - after school program featuring science activities using Wonder Wise; mentoring; study skills, recreation activities. (60 youth)
Keep Every Youth Successful (KEYS) - Gillette, WY - peer mentoring; asset building; assets camp; social responsibility training for youth. (Collaborative effort with Girls & Boys Club - (9 youth mentors - 13 mentee participants)
Just Say YES - Wyoming Girls School and Normative Services - Sheridan, WY; enrichment and animal care activities to assist residents in making positive life choices. (48 youth)
PC PEP - Countywide Third Gathering Assets celebration, and peer mentoring program - (15 peer mentors, 250 youth; assets celebration reached 1700)
St. Joseph's Children's Home program - Torrington, WY - 4-H program for at-risk youth taking animal science projects. (28 youth)
Uinta County programs: Tobacco education (900 youth); Six other youth programs ranging from after school programs to feeding the hungry grant project - (432 youth)

b. Impact - A recent USDA publication, Reforming Welfare: Implications for Rural America, emphasized that the stable employment of single mothers may depend on state child care policies.

Policy-makers from rural states will be able to use policy analysis from the multi state research project when establishing state child care policies.

Cooperative Extension programs resulted in:

- Student in two sites received tutoring and study skills assistance.
- In the Platte County project, 65% of students receiving assistance were successfully passing all classes after participating in "In-Focus". 100% of students returned to school for the fall semester. Six students toured Wyoming to learn about natural resource conflicts and strategies. Eight Platte County GIS students shared results of their learning with 400 professional scientists at a GIS regional convention in Fort Collins, CO.
- Crook County participants who were either "at-risk" or "latch-key" benefitted from at least 7,000 child-hours of educationally enriching, adult supervised activity. Individuals improved academically and the group served by CYFAR more than held its own in terms of academic achievement. When youth were at CYFAR sessions, the students were involved in active, mentally stimulating activity in a safe environment, while without this program, risk for some of them would have been much higher.
- In Campbell County, 100% of the youth reported feeling like they "belonged" to the KEYS group. They identified it with a "place" they felt they could be themselves and not be judged or picked on. For many of the youth current home living arrangements were not positive. One youth reported, "at home I don't feel love or like anyone cares about me, but when I come to KEYS, I know I am liked". Mentors reported on a Likert scale from 1-5 (1 low- 5 high) that the KEYS program helped them build their skills in working with younger youth as "4"; assisting in increasing their own self esteem as a "4"; and as an opportunity which they could use their skills to help others was rated "5".

One parent said, "I never realized that my son needed a place like this. We have a strong, close family, but he comes home from KEYS all pumped up that he has a place to go where he feels like he's important. I figured he thought he was important at home too. I plan to try to make sure he feels that way".

- Impacts reported from the activities conducted in Uinta County included:
- 100% of youth were able to identify the four things a plant needs to survive and explain how a terrarium works.
- After school program - a verbal pre-test was taken at the beginning of each week and a post-test at the end of the week. Scores were as follows:

Week 1 - Pre-test scores were 13%; Post-test scores 87%.

Week 2 - Pre-test scores 13%; Post-test scores 100%, 81% could explain parts of the flag. Youth demonstrated work on team work, sharing, communications, creativity, and group interaction.

- Clover program - at the completion of the program youth could identify new things they had learned over the summer.
- Bear River Weed Pull Day - 100% of the youth learn about the different types of weeds and pulled and chopped weeds that could not be sprayed because of their location in conjunction with water sources.
- Fifty-five collaborating relations were built to conduct these programming efforts. Sixty four percent of these were new collaborators. Seven new funding sources were secured to help fund the programming efforts resulting in $17,013 in contribution.

- A newspaper article published April 22, 2001 in Goshen County quoted Torrington Children's Home Director stating "The children feed and care for the animals every day, and

can see the success of the animals. We can see the success with the children too, some who aren't responding to therapy get involved with an animal, and that is helpful in their therapy. For some (children), it is the first time they've had to care for something other than themselves".

- Impacts from the Sheridan Girls' School 4-H program for at-risk youth included:
  - 86% of residents enrolled in the program completed a project.
  - The value of the horses increased due to the time the students spent training horses, validated through the sale of the horses.
  - The at-risk youth said the project taught them trust, patience, responsibility, and problem solving skills.
  - After hearing a motivational speaker brought in at the conclusion of the project, participant's comments: "Take time to think and do what you know is right. Pretty simple rules that I never followed in the past." (I learned), "that suicide is not a way out, that there are people who have it worse."
- In Park County the Second Gathering Youth Asset event brought in $11,000 in outside funding. 1700 youth and families participated in two community carnivals which featured 35 booths illustrating one of the 40 assets. 300 people identified a past asset-builder in their life; 100 people identified a current asset builder; 155 community leaders participated in asset building workshops. In addition, a Search Institute Survey was conducted in Park County under leadership of CES. Over 1,000 completed surveys were completed which indicated youth had a negative perception of adults as role models and adults utilizing youth as resources. Youth responded that 78% felt they had family support; 77% had positive peer influence; and 75% have a positive view of the future. A Peer Education Program started resulted in 15 older youth being trained who now work with over 250 younger youth on community projects.

c. Source of Funding - Smith-Lever 3b &3c, Hatch, State, County

d. Scope of Impact - State Specific
Integrated Research and Extension
Multi-state Integrated Research and Extension (W-193, NC-223)
(AZ, CA, CO, ID, IN, KY, LA, MA, MI, MN, MO, NE, NH, NV, OH, OR, UT, WY)

**Key Theme - Farm Safety**

c. Statistics show that agriculture is one of the most dangerous occupations. Since nearly all agricultural operations in Wyoming are operated by the family, those hazards affect all family members as well as any visitors to the agricultural environment. Three farm safety day camps were held for 955 youth in three Wyoming counties. Safety topics taught related to firearms, lawn mowers & equipment, wildlife, large animal handling fire, sun, PROs and pinch point hazards, flowing grain and grain bins, electricity, 4-wheelers and ARVs, exotic animals, chemicals, tractors, rural roads and railroad crossings, and hazard identification. Safe Kids Day programs were conducted in two counties through collaboration with over 70 community agencies, involving an estimated 1,200 youth. Other educational activities included booths at county fairs, tractor safety and roll-over prevention were taught at a school safety fair with 110 students grades K-12. Puppet shows on safety topics were staged in two counties for 320 students, with one show presented in Spanish; a Jeopardy game was produced in one county with 150 participants; a sun safety display was assembled and used at four events with 162 participants. An extension specialist developed a program on skin cancer prevention strategies which has reached 450 people at agricultural events.

d. Impact - $8000 was granted from NIOSH for farm safety programming in Wyoming. Program evaluations reported the following impacts:

- 12% increase in knowledge of farm safety practices was documented at a series of puppet shows.
- 100% of participants in a Jeopardy game agreed that asking safety questions helped them increase their farm safety knowledge.
- 80% of day camp participants at two day camps reported learning new information about farm hazards.
- 59% of day camp participants reported putting into practice at least one thing they learned at camp.
- 100% of campers identified at least one thing they learned at the day camp they will teach or share with someone else.
- 93% of day camp participants identified one important thing they learned at camp.
- 98% of day camp participants identified at least one thing they will do to be safer. The two most frequently identified safety practices were to wear closer fitting clothing and be safer around animals.

c. Source of Funds - Smith-Lever 3(d), State, County

d. Scope of Impact - State Specific

**Key Theme - Community Development**

c. The future of Wyoming communities depends, in great part, upon the sustainability of its economy, people and environment. Communities comprise many components that create a complex, interrelated system. Extension educators and specialists conducted programs to address issues of community infrastructure, social and family issues, citizen involvement, and the ability of each community to address resident issues. Fifteen community economic development analysis projects were conducted and educational workshops, classes and seminars reached over 435 individuals. Topics included facilitation skills, women in agriculture, customer service for business, public speaking, and leadership development.

d. Impact - A total of 15 community economic development analysis projects were conducted, which were supported by $256,000 in extramural funding. Outcomes from the analysis included: county commissioners in five counties were able to have concerns addressed in the U.S. Forest Service's Thunder Basin EIS; state government and Park County were able to show the economic importance of snowmobiling in Wyoming to the National Park Service; county, state and federal agencies now have a better understanding of the economic importance of recreation on BLM lands, forest, outfitting, and health care industries as a result of economic analysis. One city (Dubois) has reliable estimates of the potential future increase in residential housing demands to use in planning for infrastructure development.

Impacts from the workshops conducted include: new skills were acquired; participants had a better understanding of using criteria for determining resolution. 100% of participants felt they would use at least one skill learned in their workplace or desired to use them in community meetings. Participants in the Women's Ag Symposium indicated their knowledge improved (82%), their skill/ability improved

(56%) and their confidence improved (64%). Participants in workshops and classes could identify new knowledge gained, follow-up evaluations showed over 60% of individuals were implementing some change in practice as a result of educational efforts.

c. Source of Funding - Hatch, Smith-Lever, State, County, Private

d. Scope of Impact - State Specific
Integrated Research and Extension

**Key Theme - Youth Development/4-H**

a. Positive youth development is a process of growing up and developing one's capacities in positive ways. (Walker & Dunham, 1994). This development typically takes place in the context of family, peer group, school, and community. 4-H becomes part of the total contextual environment for positive youth development. The length of time keeping youth actively involved in 4-H makes a difference in terms of asset and skill development. UW CES has a proven track record of successfully teaching youth life skills through the 4-H program. Life skills were defined as communications, problem solving, planning ability, decision making abilities, striving for excellence, leadership, and interpersonal relationship building. Wyoming had 6292 youth enrolled in the traditional 4-H youth program. Over 130 workshops, camps and clinics were held in counties throughout the state reaching over 2300 youth.

b. Impact - Both formal and informal evaluations were used to determine success of program efforts in 4-H and youth. Participants reported skills had been enhanced after participating in 4-H judging programs including horse, livestock, meats, vegetable, and wool. Increased skills reported by youth included decision making, verbal communication, and team work. Ninety eight percent of youth indicated they had learned something new through clinics and workshops attended.

County, state, and regional camps helped members to increase skills, knowledge, increase self confidence, and develop interpersonal skills. One hundred percent of members could identify one thing they had learned and how they can use the information in their project work. Members demonstrated new skills learned through hands-on camp activities which were documented through written evaluations, observation, and leadership of youth sharing skills with others.

Project workshops and clinics held throughout the state resulted in members learning new skills, gaining knowledge, increasing communication skills, enhancing decision making, and the importance of following through on a project. Impacts were documented through pre and post test, written evaluations, follow-up contacts with participants and informal observation.

c. Source of Funds - Smith-Lever 3 b&c, State, County
d. Scope of Impact - State Specific

**Key Theme - 4-H Leadership Development**

d. State 4-H Youth Specialist, Extension Educators, and 4-H Program Associates presented training to the 2,633 volunteer leaders in Wyoming. Methods of training included subject matter project training, risk management through two hour workshops and home study courses, district, state, and regional

meetings, and printed materials. Two hundred ninety three leaders attended project workshops. Counties utilized training to recruit new and diverse volunteers to fill 4-H committee assignments and increase participation of new leaders. Volunteer recognition on state and county level was completed through certificates, plaques, leader appreciation in newsletters, and 'leader of the month' program.

Wyoming State 4-H Leaders Council hosted the Western Regional Leaders Forum which featured 93 workshops for 407 volunteers (121 Leaders from Wyoming) and junior leaders who attended from the 13 Western States.

4-H volunteer leaders are required to complete a screening process conducted by the Department of Family Services. This was the second year for the new component which included a potential criminal background check. Approximately 859 leaders were screened either for the first time as new volunteers or re-screened after the initial five year screening time frame. Leaders going through screening receive leader certification training on risk management and the 4-H program.

Three educational videos were produced and/or provided to each county for use in teaching Livestock Safety for Kids and showmanship for rabbits and poultry.

Wyoming hosted the National Wildlife Habitat Evaluation Contest in Jackson Hole, Wyoming which included 25 states sending teams and a large volunteer effort from Wyoming 4-H, and collaborating agencies including staff from Bridger Teton National Forest, Wyoming Game and Fish, The National Elk Refuge, US Fish Hatchery, Targee National Forest, National Rifle Association, Ducks Unlimited, and eight local agencies.

e. Impact - Over 593 volunteer leaders, approximately 25% of the total 4-H volunteer leaders enrolled in Wyoming received formal training. Counties documented increased volunteer participation where training was conducted. One hundred percent of leaders completing the screening certification indicated they gained new knowledge and 86% reported they better understand the structure of 4-H.

Volunteers participating in project workshops and training reported increased knowledge and skills in subject matter areas and a better understanding and confidence in teaching skills to youth. Leaders trained in the disciplines of horse and shooting sports increased volunteer efforts in counties by up to 75%.

Evaluations from the 93 workshops at Western Regional Leaders Forum were overall outstanding. One of the benefits noted by participants was the exchange of information between states through networking. One hundred percent of respondents indicated they had gained knowledge and skills through workshops presented.
A total of $73,140 was raised to host the National Wildlife Evaluation Contest. Evaluations rated the Coach Day Tour as a very educational opportunity. The contest was a success. Even one of the bus drivers who said he had been driving bus for groups in Jackson for over 12 years stated he had never learned so much on one of his trips. County staff indicated that the success of this contest would not have been possible without the work of volunteers.

f. Source of Funding - Smith-Lever, State, County

g. Scope of Impact - State Specific

Multi-state Extension
(CO, KS, OK, LA, FL, IL, DE, MO, VA, TN, MD, PA, NC, TX, GA,
MS, AR, AL SC, IN, MT, ID, NV, NM, AZ, WA, OR, CA, UT, WY,
HI, AK, and Guam)

**Key Theme - Workforce Preparation - Youth and Adult**

a. Wyoming's economy is weak, due in part to stagnation in the natural resource/mining industry, low wages in tourism and agriculture sectors, and lack of technology-based industries in the state, with few prospects for increasing per capita income, gross state product and valuation resulting in more revenues. Intentional efforts in economic development will be necessary to raise economic growth indicators to regional standards and build globally-competitive businesses.

Young adults, especially those with higher education, skills and initiative, are leaving the state, in spite of self-expressed preferences to remain in Wyoming to build the state's economy and enjoy its environment and lifestyle.

Youth entrepreneurship efforts were initiated with the formation of a Wyoming Youth Entrepreneurship Conference executive planning committee. A Wyoming Youth Entrepreneurship Network was also formed during the past year. The extension educator and state 4-H youth specialist jointly wrote and received a $59,616 School to Career grant to fund a school entrepreneurship effort in Lander, Wyoming. Extension 4-H staff in the Big Horn Basin of Wyoming successfully secured a $20,000 grant from the Kauffman Center for Entrepreneurial Leadership to conduct youth training. A technology camp with 19 participants was held in Fremont county. The camp was planned and put on by youth.

The Nx Level Business Course was conducted on the Wind River Indian Reservation with 12 Native American participants in the twelve week course.

According to the Rural Manufacturing Survey conducted by USDA's Economic Research Service, employers are reluctant to locate in rural areas because they feel workers may lack the skills needed for newer technologies, specifically, interpersonal, problem-solving, and teamwork skills. In addition, early childhood staff in Wyoming often live in rural communities with no direct access to degrees or course work. The Department of Family and Consumer Sciences has cooperated with the Head Start State Collaboration Project to secure grant funds to develop a pre-college credential for Family Service Workers, delivered by distance education. In addition, the Department's bachelor's degree/Child Development option is fully deliverable through distance methods.

b. Impact - An in-school effort was started in Lander, Wyoming to teach workforce and business skills to students through the creation of a student based/operated Lander Valley Tour Company. The nine students enrolled in the class wrote a five year business plan, learned about business structures, and designed and implemented a marketing plan. The experiential learning process provides the skills necessary to make the business successful. This will be an on-going program.

Nineteen individuals participated in the three day Cowboy Technology Camp. Camp participants reported increased awareness, knowledge and skills from courses at the camp. The success of the camp was noted by the proposal to support the effort for a second camp in 2002.

Twelve tribal business managers who participated in the Nx Level Business Course indicated they planned to incorporate their new skills and practices into the operation of the business they manage. Participants at the conclusion of the 12 week course were able to compare and contrast the differences between a sole proprietorship, corporation, partnership and tribally owned business. Instructors benefitted also by gaining a better understanding of the rules and regulations governing business operations on the reservation, as well as the challenges tribally owned businesses must resolve in order to conduct business.

The distance credential and degree will provide educational opportunities to many site-bound rural learners. There are currently 35 individuals enrolled as degree-seeking or director's certificate seeking students from 8 states.

c. Source of Funds – Smith Lever 3 b&c, State, County

d. Scope of Impact – State Specific

**Key Theme – Impact of Change on Rural Communities**

a. Due to its large land holdings, management decisions by federal land management agencies can have significant impacts on the economies and lifestyles of rural communities in Wyoming. As a result, federal, state and local agencies need reliable information on the impacts of federal land management decisions on rural communities. Research projects are being conducted to provide impact information that is used in the planning and decision-making process for these federal lands.

b. Impact – Economic analyses provide information on the significance of activities and policies on public lands to rural communities. For example, results from a recent study indicate that the economic activity associated with the Medicine Bow National Forest brings $75.7 million into the three-county economy (Albany County, WY; Carbon County, WY; and Jackson County, CO). This economic activity generates a total of $119.2 million in total economic impact in the three-county region. This economic activity supports a total of 1,656 jobs in the region and generates $21.9 million in labor earnings.

c. Source of Funding – Hatch, State

d. Scope of Impact – State Specific
Multi-state Research (W-133)
(CA, CA-D, CO, CT, GA, IA, MA, ME, MI, MN, MT, ND, NH, NM, NV, NY, OH, OR, PA, SC, TN, UT, WA, WV, WY)
Integrated Research and Extension

**Civil Rights - Diversity**

**Key Theme - Multi cultural and Diversity Issues**

a. The Extension Civil Rights coordinating committee conducted six county civil right training reviews during the past year. During reviews comprehensive training is provided to assure that all Extension employees are committed to serving all clientele and targeting underserved audiences when identified

or needed. Wyoming Cooperative Extension Service (CES) and Agricultural Experiment Station (AES) participated in a federal review which included two county offices, state CES administration and College of Agriculture and research efforts on campus.

b. Impact - all 27 Cooperative Extension county offices have gone through a comprehensive training and assessment review on Civil Rights and Diversity. The UW CES Guidelines for Affirmative Action was revised for the first time since it was originally written in 1982. Forty five percent of county CES staff have written civil rights into their individual or county plans of work. Other counties will be writing civil rights goals into plans of work as directed by state administration when performance appraisals are complete. Civil Rights is a component of annual performance appraisals. CES annually recognizes one staff member for diversity efforts.

c. Source of Funding - Smith-Lever

d. Scope of Impact - State Specific

***Goal 5 Summary:***

The economies of Wyoming communities, personal finances, and family and child development were identified as high priorities by Wyoming residents. University of Wyoming researchers are working with Wyoming communities, assisting them with identifying impacts of change, developing community network resources, and identifying growth opportunities for existing businesses. Children, youth, and families at-risk have been major foci of child and family researchers and educators at the University of Wyoming. Researchers in this program area participated in eight Hatch projects with six of the eight in Multi-State projects. The research efforts include about 1.2 FTEs and expenditures include $.11 million Hatch and $ .13 million State.

| | |
|---|---|
| Cooperative Extension Service FTEs | 34.28 |
| Goal 5 Allocated Funds | $3,029,516 |

**Goal 5 - IMPACTS**

**ISSUE - Farm safety impacts everyone**

Most people think information about farm safety applies only to inhabitants of rural areas, but farm safety topics (ranging from sun safety to lawnmower safety, ATV safety, and firearm safety) affect everyone, regardless of where they live.

According to the National Children's Center Fact Sheet on Childhood Injuries, 56 percent of children's agricultural injuries are non-work-related accidents. Machinery is the leading cause of fatalities and accounts for 36 percent of deaths for people under the age of 20. Drowning is the second leading cause of death, and the most common type of non-fatal injuries includes contusions or abrasions and lacerations. Being struck by falling or slipping objects or getting caught between pieces of equipment accounts for 56 percent of non-fatal injuries, and falling from structures or equipment accounts for 14.7 percent.

Uinta County has a population base of 19,742 people. Of these individuals, 41 percent are under the age of 18 years. Every day, 8,094 Uinta County youth run the risk of injury or death as the result of a farm-related accident. Most kids have contact with lawnmowers, boats, ATVs, firearms, snowmobiles, wildlife, and household cleaners. And because of the higher elevations throughout most of Wyoming, the sun must

be considered a direct threat to children. Considering this, educators believe farm safety should be continuously taught and reiterated to countywide youth.

**What has been done**

In collaboration with more than 45 local and regional supporters, two safety education programs were held last year in Uinta County: Safe Kids Day and the Farm Safety/Agriculture Day Camp. Two grants were secured to provide $6,108 in funding for these programs, along with more than $4,000 from in-kind donations.

More than 450 Uinta County residents attended the Safe Kids Day program and participated in demonstrations of the safe use of mechanical devices, from lawnmowers to semi-trucks; chemical, electrical, and fire safety; and safety around animals, from rabbits to emus. Each participant received a sun bracelet to gauge exposure to ultra violet rays as a reminder of the importance of safety in the sun.

The Progressive Farmer's Farm Safety/Agriculture Day Camp for third and fourth graders reached nearly 650 youth. The children attended a daylong camp where they participated in 18 workshops that highlighted different aspects of safety and agriculture. Workshop topics included large animal safety, sun safety, reaction time, chemical safety, lawnmower safety, and ATV safety. Area 4-H junior and volunteer leaders, FFA members, and community supporters led the sessions.

**Impact**

All workshop participants completed a pre- and post-test and questionnaire. The following survey results were encouraging:

- Ninety-three percent of the participants could identify an important lesson they learned from the camp.
- Ninety-eight percent of the participants could identify at least one change they will make to be safer.
- The average initial score on the pre-test was 72 percent, and the average post-test score was 88 percent. Theoretically, with a 16 percent increase in knowledge, there should be a 16 percent decrease in accidents.
- The two actions most often identified by youth as necessary changes for safer behaviors were wearing tighter clothes around machinery and being more careful around animals.

When asked what they learned from the two events, participants replied:

- Baseball caps are not the best hats to use for protection from the sun.
- Don't go around horses that aren't in fences, and never drink poisons.
- Wildlife can be dangerous.
- You should never play by a lawnmower, and don't wear loose clothing when mowing.
- Never stop wearing your helmet.
- If you can't see the mirrors of a semi-truck, the driver can't see you.
- Do not fly a kite near a phone wire.

When the youth were asked what they would do differently to make their lives safer they said:

- I won't sleep on the tractor anymore.
- I'll stay on the other side of the fence from animals.
- I will never drink things when I don't know what they are.
- Wear sunscreen.

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**ISSUE - Financial fitness programs help Natrona County residents make positive changes**
When Wyoming residents were asked to identify the most pressing issues facing their families during the next three to five years, money and personal finances rose to the top of the list. Surveys have shown that 70 percent of American families live from paycheck to paycheck, and locally, Natrona County participants in the Money 2000 & Beyond classes have confirmed this statistic. Sixty-seven percent of the individuals surveyed felt like they were "always in crisis" or "just getting by." Surveyed families also lacked the basic skills necessary for maintaining a household and balancing a budget. Fifty-two percent of the participants did not have a savings plan or an organized record-keeping system.

**What has been done**
The UW Natrona County CES addressed those issues with Money 2000 & Beyond , a series of four two-hour classes that focused on goal setting, saving, credit management, and insurance. In addition to the four beginning classes, participants received handouts, a workbook, a computerized debt analysis, a quarterly newsletter, and the opportunity to attend Pocket Change Programs, an ongoing series of financial management classes. The following Pocket Change topics addressed issues known to cause family financial problems: The Plastic Edge of Chaos; What Kind of Spender Are You?; Holidays: The Season to Spend; and The Six Month Lunch.

**Impact**
In 2001, 36 Natrona County residents enrolled in 16 Money 2000 & Beyond classes. At the end of the program, 100 percent of the participants reported they would change their money management practices. The changes mentioned included: rethinking spending practices, starting a savings plan, requesting a credit report, and reducing debt in order to be able to save more. Specifically, 36 percent of participants said they will pay off consumer credit debt, 19 percent will reevaluate how they spend money, 14 percent will increase their savings, and 44 percent will look into insurance policies to make sure they have the coverage they need. After attending the Pocket Change Programs, 71 percent of the participants indicated they would change their spending habits as a result of the class on spending, more carefully consider needs versus wants, plan shopping trips with a list, and limit impulse spending.
KTWO TV taped four 90-second television spots, using information from the Pocket Change Program. Utilizing KTWO TV will raise statewide awareness of CES educational efforts in financial management.

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**ISSUE - Tribal business managers benefit from completing Nx Level course**
Increasing the profitability of tribally owned businesses based on the Wind River Indian Reservation involves unique circumstances and challenges. Over the past few years, the Eastern Shoshone Tribal Council has decentralized its business affairs, delegating many of the administrative tasks involved in the operation of tribal businesses to department managers.

**What has been done**
The UW CES joined forces with the Wyoming Small Business Development Center and McCormick Management to design and teach a Nx Level Entrepreneur Course tailored to the specific needs of tribal business department managers on the Wind River Indian Reservation.

**Impact**
Twelve tribal business managers completed the 12-week course and indicated they planned to incorporate their new skills and practices into the operation of the businesses they manage. The participants identified some of the following impacts of the program:

- Participants were able to compare and contrast the differences between a sole proprietorship, corporation, partnership and tribally owned business.
- Instructors had the opportunity to better understand the rules and regulations governing business operations on the reservation, as well as the challenges tribally owned businesses must resolve in order to conduct business outside the reservation.
- Guest speakers representing a number of private businesses and public institutions provided valuable information about the opportunities and technical assistance available to tribally owned businesses.

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**ISSUE - UW CES helps Wyoming families manage finances**
Many families in Wyoming and nationwide live from paycheck to paycheck. In a state like Wyoming, the declining rate of personal savings is cause for great concern. Wyoming households with credit cards carry an average outstanding balance of $3,742 and have an average of 5.3 credit cards.

Money 2000 and Beyond™ is a financial resource management program offered by the UW CES. Designed to help Wyoming families increase their net worth through improved saving and spending habits. This personalized program gives participants information and educational support. Families set their own financial goals, while UW CES educators teach participants successful behavioral changes that lead to good money management practices. Money 2000 and Beyond™ is part of a national initiative developed in 1996 by Rutgers Cooperative Extension Service and launched by Cornell Cooperative Extension Service as a national campaign in 1997.

**What has been done**
In 2001, UW CES in Park County offered several programs under the Money 2000 and Beyond™ umbrella, including a one-day course, a series of classes, a short program, and news releases.

**Impact**
Twenty-four people completed the four-week Money 2000 and Beyond™ basic course. In addition to establishing financial goals and calculating the best ways to achieve them, participants learned about the underlying costs of credit and the importance of determining their debt-to-net ratio. They developed budgets and savings plans based upon skills learned during practice activities and, working as a group, came up with 59 ways that families might decrease expenses. The course also focused upon insurance needs and costs and provided participants with the terminology and skills necessary to re-evaluate their insurance needs. By the end of the course, ten participants had set long-term financial goals and had written plans for managing debt. Five participants paid off all of their credit cards in full by the conclusion of the course.

The following are a sampling of Money 2000 and Beyond™ participants' responses to questions asked as part of a nine-month follow-up evaluation:

How did the Money 2000 and Beyond™ classes help you save money?
- I started two educational IRAs, a Roth IRA, financial notebooks for John and Nicole (my children) and myself.
- The course helped me see the importance of paying off bad debt and looking for low interest rates.
- I now add expenses every few lines in my journal, rather than just adding at the end of the month, increasing my awareness of costs and reducing the chance of impulse buying.
- The course helped me to understand and utilize my thrift savings from my place of employment.

How did the Money 2000 and Beyond™ classes help you reduce debt?
- I have been paying off my credit cards. I have almost paid off the card with the highest balance.
- I paid off my computer, my medical bills, and the second mortgage on our house, and I consolidated my credit cards to a 36-month loan.
- I'm paying $10 more each month on my car loan, which will reduce that debt significantly, even though it doesn't affect my monthly budget.
- All of my credit cards will be paid off this month.

What was the most significant or most important concept you got out of the classes?
- Understanding interest rates and how credit card companies utilize them.
- Stopping small financial leaks here and there that add up, and putting cash in my savings account at the first of the month.
- Saving for the future, paying cash if possible, making a monthly budget, paying small bills first, getting out of credit-card debt, using only one credit card, and setting goals.
- Working toward financial goals instead of being afraid of money.

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**ISSUE - 4-H animal projects foster positive change in Wyoming Girls School residents**

The Wyoming Girls School is a state residential facility located in Sheridan, Wyoming. The girls, ages 12 to 18 years, have been court ordered to attend the school as a result of inappropriate behavior and/or addictions. Most residents lack appropriate skills in communication, teamwork, accountability, responsibility, and nurturing.

**What has been done**

In 2000, The UW Sheridan County Cooperative Extension Service initiated a 4-H program at the Girls School to help girls increase their self-esteem and make positive behavior changes. This program is partially funded through the Children, Youth, and Families at Risk (CYFAR) grant from USDA/CSREES. Although the program was implemented with only the horse project, the scope of projects and enrollment numbers increased in 2001.

The at-risk youth said the project taught them trust, patience, responsibility, and problem-solving skills. Fifty-four Girls School residents participated in the following activities:

- Workshops taught horsemanship skills in showmanship, halter, and obstacle classes.
- Nineteen girls participated in the miniature horse project, grooming, feeding, watering, and working their horses daily.
- Three residents cared for and milked the dairy goats they helped birth, while learning the grooming and showmanship skills necessary to show the goats at county fair.
- The rabbit project taught seven girls grooming and showmanship skills.
- Seven girls participated in two llama shows. They assisted with the birthing of the crias and established mentor relationships with other 4-H llama project members from Sheridan County.
- Three girls halter broke, cared for, and showed their breeding beef animals at county fair.
- In the home beautification project area, three girls exhibited bonsai trees at county fair. In caring for the trees, they learned responsibility and patience.
- Six youth learned basic fly tying, angling skills, habitat evaluation, species identification, and state fishing regulations through the aquatic ecology project.

**Impact**

The value of the horses used in the 4-H program increased due to the time students spent training the animals. This was validated through the sale of the horses in Billings, Montana. In addition, the 4-H programs were considered successful because they taught youth coping and communication skills, teamwork, increased patience, and commitment. For example, statistics show that 86 percent of the residents enrolled in the program completed a project and exhibited at county fair, and 100 percent of the girls believed the concluding motivational speaker, Jeff Yalden, would be a positive influence on their lives.

In reflection, one of the girls said she learned “that suicide is not a way out and that there are people who have it worse.”

Another student said, “I am a struggling teenager with many future but distant goals. Teenagers who enjoy an activity become determined and have the desire to devote as much time as possible, leaving out the opportunity to compromise morals and values.”

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**ISSUE - New and innovative camping experience teaches good stewardship practices**
Wyoming is known for its abundant outdoor recreation opportunities, and this makes sportfishing a perfect fit for the state 4-H curriculum. This relatively new program is designed to enhance natural resource education through a fun, hands-on, outdoor experience.

**What has been done**
To launch the sportfishing program, Carbon County initiated the Wildlife, Adventure, and Variety Experience (WAVE) Camp. The main goals of the WAVE Camp were to promote sportfishing and natural resource opportunities in 4-H, to reach a new and diverse audience, and to instill a sense of good stewardship in children through outdoor activities. As plans developed, UW Carbon County Cooperative Extension Service staff decided to expand the camp and offer activities in family and consumer science project areas.

Staff members worked with various agencies and local organizations to develop and present fun and educational workshops, which included fly tying, fish cleaning, Dutch oven cooking, designing polar fleece blankets, making scented candles and soap, predator tracking and identification, building bird houses, mapping with Global Positioning System (GPS) technology and using a compass, and foreign flavor cooking. Additional in-depth workshops gave participants an opportunity to fish at a local lake, practice their archery skills with life-size 3-D targets, or swim at the local hot springs. Grants totaling $3,239 were secured to help defray the cost of camp supplies and also to pay for trees that camp participants planted at the Carbon County Fairgrounds.

**Impact**
Eighty-two parents, leaders, and youth participated in the WAVE camp, and the 4-H philosophy of “learn by doing” was apparent. All workshops were hands-on experiences so that participants were able to practice new skills or techniques as they learned them. Workshops that had the strongest influence on participants were mapping with GPS and using a compass, foreign flavor cooking, and fly tying.

One camper said, “I always wanted to learn how GPS units work.” During the camp, he took part in a small scavenger hunt using only data from the GPS unit. In the foreign flavor cooking workshop, participants not only learned about Russian and Egyptian food but also about the two cultures and the influence food has on their customs. During the fishing trip, members who participated in the fly tying workshops passed out their flies so that other campers could fish with the new hand-made lures. And after an exciting day of sportfishing, participants from the fish-cleaning workshop impressed other campers by

helping them clean their fish. The overall success of the camp was evidenced by the demonstration of good stewardship practices by all who participated.

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**ISSUE - Facilitation training expedites community development in Park County**

Park County has experienced a surge in community development efforts, with individuals and groups struggling to come to a consensus on a variety of issues. Requests for facilitation have increased steadily over the years in an attempt to reconcile human, economic, and organizational goals. In response, UW CES educators implemented "Facilitation: The Science and the Art," an intensive two-day training.

**What has been done**

Twenty-two people attended the initial training session, including Chamber of Commerce directors, Wyoming Business Council personnel, staff members from Research and Extension Centers, economic development organization employees, and heads of numerous agencies. Group processes and facilitation techniques were woven into the training so those participants could learn to recognize, analyze, and evaluate the tools necessary for effective facilitation. The session focused upon the dynamics of group processes, methods of conflict resolution, the "ladder of inference," and techniques for diffusing difficult situations.

**Impact**

The participants rated the effectiveness of the training an average of 4.8 out of a possible score of 5.0, and indicated in written evaluations the manner in which they planned to implement the skills learned during the facilitation training session. Three months later, in a follow-up evaluation, the participants indicated that they were using facilitation skills on a regular basis and that the training was as informative as it was interesting:

- "I've used the ladder of inference at work and home. I've also used a lot of the info I learned in meetings."
- "At home I have been able to solve family issues easier because I know how to direct and redirect everyone's attentions in the right direction. At work I use some of the skills learned just getting a group to start working together."
- "The information has been very useful to me as chair of the Park County Health Coalition. Specifically, the stages of group development have helped me to focus on ways to motivate the group."
- "I love active, hands-on experiential learning. The ways to incorporate hands-on activities into programs are what stick out in my mind after three months."
- "The big idea I came away with is that I don't have to have all the answers and it's okay if I make a mistake."

The success of the first facilitation training prompted many other Park County residents to sign up for future sessions of "Facilitation: The Science and the Art."

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**ISSUE - Federal Land Policy Economic Analysis**

In Wyoming, the U.S. Forest Service, Bureau of Land Management, National Park Service, U.S. Bureau of Reclamation, and U.S. Fish and Wildlife Service control a combined 29.8 million acres or about one-half of the surface area in the state. Due to its large land holdings, management decisions by Federal land management agencies can have significant impacts on the economies and lifestyles of communities in Wyoming. In recent years, the management of Federal lands has become much more contentious with a number of interest groups with divergent concerns becoming more involved in the planning process. One area of debate of particular importance to Wyoming is the economic implications for local communities of alternative Federal land management decisions. Often these discussions are based on emotion rather than solid economic information.

**What has been done**

1. Analysis of the economic importance of recreation on BLM lands in the Western United States.
2. W-192 coordinating committee is a regional effort that focuses on the relationship between Federal lands and rural communities.
3. Review of the Thunder Basin National Grassland portion of the U.S. Forest Service's Northern Great Plains Management Plans Revision.
4. An economic analysis of snowmobiling in Wyoming for the Wyoming Department of State Parks and Cultural Resources.
5. Participated in a review of research related to the Winter EIS for the Wyoming Department of State Parks and Cultural Resources through the Institute for the Environment and Natural Resources. Reviewed the economic studies used in the Winter EIS for the National Park Service. Updated an analysis of the economic importance of winter visitors for the Park County Commissioners.
6. Updated the economic analysis of the Jack Morrow Hills CAP for the BLM to incorporate higher oil and gas prices. Currently advising the private consultants who are working on an additional alternative.
7. Provided an economic analysis of Desolation Flat's natural gas development for a private consultant who is developing an EIS for the companies involved on the project.
8. An economic analysis of the Medicine Bow National Forest Plan Revision for the U.S. Forest Service. The analysis considers livestock grazing, timber, recreation, and USFS operations in Albany, Carbon, and Converse Counties. In addition an economic profile was developed for each county.
9. Economic analysis of the outfitting industry in Teton County for the Jackson Hole Area Chamber of Commerce.
10. Payments in Lieu of Taxes (PILT) are an important source of revenue from the Federal government for county government in Wyoming. However, the calculation of PILT payments is not well understood and may be affected by Federal agency management decisions.
11. A regional investment analysis of coalbed methane development is being developed for a coalition of county governments in Northeast Wyoming.

**Impact**

1. The BLM will use this information in it budget-planning efforts both with Congress and internally.
2. The committee is working to combine firm and community level economic analysis with the social impact analysis. A pilot project on livestock grazing is currently being conducted in Fremont County.
3. The results of these discussions were incorporated into the final EIS for the Thunder Basin.
4. The information from this study was used by State government to respond to the National Park Service's Winter EIS for Yellowstone and Grand Teton National Parks. Study results are also being used in the on-going Medicine Bow National Forest Plan Revision and will be used in the upcoming Bighorn National Forest Plan Revision.
5. The county commissioners used the analysis of this report as part of their response to the National Park Service on the Winter EIS as a cooperating agency.
6. This analysis will be used by the BLM in decisions regarding natural gas development in the Jack Morrow Hills area of Wyoming.
7. This analysis will be used by the BLM in decisions regarding natural gas development in the area.
8. This analysis will be used by the Forest Service in decisions regarding the future use of the Medicine Bow National Forest. This is a collaborative effort between the University of Wyoming, U.S. Forest Service, and the State of Wyoming.
9. This analysis was used by the Chamber as a part of their response to the U.S. Fish and Wildlife Service regarding management plans for the National Elk Refuge.
10. To assist in the understanding of these payments a set of fact sheets have been developed annually for the last four years. These fact sheets summarized the PILT calculations for each county in Wyoming.
11. This analysis will be use by the counties to evaluate the fiscal impacts of coalbed methane development.

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**ISSUE - Welfare Reform and Rural Families: Research Information for Policy-Makers**

When the nation's welfare policies were reformed in 1996, states were given more decision-making authority over their own welfare policies, and individuals were limited to a maximum of 5 years of assistance in a lifetime. These dramatic social policy changes are being studied in urban communities through several large-scale research projects, but data are limited on how the policy changes are affecting rural families and communities. A recent USDA publication, Reforming Welfare: Implications for Rural America, emphasized that the stable employment of single mothers, in particular, may depend on state child care policies; therefore, child care policies are likely to affect the long-term effects of welfare reform in rural communities.

**What has been done**

A multi-state team of researchers, the USDA NC-223 project, has been collecting data for a longitudinal study of rural families after welfare reform. Two years of data collection has been completed in 15 states, and data for the first year's dataset is ready for analysis. Over 400 families are participants in the study. Wyoming has provided leadership for analysis of child care policy by developing foundation papers: comparing policies across the 15 states; analyzing national child care policy papers completed in 2001 to recommend comparison analyses from the rural dataset; and compiling an extensive annotated

bibliography and resource list.

**Impact**
Without data from the USDA NC-223 project, the 2002 Congressional re-authorization of the Personal Responsibility and Work Opportunity Act (PRWOA) will rely on predominantly urban data. Policy-makers from rural states will be able to use policy analyses from the NC-223 project, emphasizing food security, health, and child care.

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**B. Stakeholder Input**
The UW CES is continuing the implementation of the strategic plan. Two of the AES sites have gone through a planning process similar to strategic planning. Stakeholder input will come to the College of Agriculture Cooperative Extension Service and Agricultural Experiment Stations through a variety of methods. A joint research and extension needs assessment process is underway as outlined in the Plan of Work written for Wyoming 1999- 2004. Focus groups are being conducted in eight areas of the state to determine a vision for the College of Agriculture. During the same period, the Wyoming Department of Agriculture is developing a strategic plan and utilizing focus groups to determine agricultural research needs in the state. Information from both focus groups will be used to develop an issue based needs assessment survey instrument. The statewide mail survey is scheduled to be conducted fall 2002. A stratified sample will be used to determine program and research needs in the state. The survey will also address preferred delivery methods by Wyoming citizens.
With the implementation of the CES strategic plan, advisory committees are being formed in the nine Extension areas as defined in the plan. This is a change from Wyoming's original plan of work which described four regional advisory committees. The area advisory committees will meet at least once annually to provide input on issues and program direction for CES. In addition, the Director of CES has formed an advisory committee of County Commissioners who will meet during the annual meeting of the Wyoming County Commissioner Association. During the past year, new drafts of the CES strategic plan were placed on the web site to allow public input.

In the past year approximately 50% of Wyoming counties utilized advisory committees to determine county program direction. County personnel also utilize collaborative partners to learn needs within communities of the state. Each of the four Research & Extension Centers has an advisory committee that meets annually. These advisory committees are providing information on existing research and outreach programs and they provide input regarding priority needs for research and outreach. The College of Agriculture maintains a separate statewide advisory committee. The committee meets annually to exchange information on the college's programs and to seek input of future concerns and issues. Three departments, Animal Science, Family & Consumer Sciences, and Veterinary Sciences, have separate advisory committees that provide input on programs in those departments.

**C. Program Review Process**
Due to changes in organizational structure and movement to a team leadership model which is vital to the

UW CES strategic plan, the merit review process was not conducted with Utah as planned. Initiative teams in the past year have developed goals, program objectives, strategies, outputs, and outcomes. The plan of work continues to be used as a reference in program planning.

**D. Evaluation of the Success of Multi and Joint Activities**

(1) As outlined in the Stakeholder input section, the UW CES and two of the R&E Centers went through a strategic planning process. Because of the these two reviews, changes are currently in process that will affect the 5-Year Plan of Work. CES has received approval from the UW Presidents office to proceed with implementation of the strategic plan. AES will be closing two stations and building one in a new location that will accomplish the necessary research for the region. The CES strategic plan has identified five initiative areas which provide greater focus for extension personnel. Those initiatives redefined by stakeholders are Profitable and Sustainable Agriculture, 4-H/Youth Development, Nutrition and Food Safety, Rangeland Resources, and Enhancing Wyoming Communities and Households.

The programs identified in the University of Wyoming College of Agriculture's 5-Year Plan of Work address the critical issues of strategic importance for the state and region. These issues were identified through extensive input from research and teaching faculty, CES personnel, and college stakeholders during the college's strategic planning process. The five program goals listed in the 5-Year Plan of Work are consistent with those at the national level. Over 50 percent of the research projects identified in this report reflect an integrated effort between research and extension. Researchers at the University of Wyoming's College of Agriculture are involved in approximately 18 multi-state projects. These projects cover all but one of the identified program goals (goal 2). The college's researchers have also been successful with research involving multi-institutions. WIN the Rockies is an example of a successful multi-institution research effort which combines efforts of UW with Montana and Idaho. There is also on-going multi-institution research programming through the R&E Centers. In addition, researchers have been successful in integrating research programs with various federal and state agencies and organizations. These linkages, as well as campus wide multi-disciplinary research programs, are encouraged through the AES university wide competitive grants program.

(2) When developing the individual's plans of work, they either included a separate plan to address diversity or included diversity within each plan. UW extension and research professionals were committed to reaching the total population of Wyoming including the under-served and under-represented Native American and Hispanic population. Such activities include hiring two bi-lingual coordinators for the Cent$ible Nutrition program, preparing nutrition materials in Spanish, developing a business course for youth and adults on the Wind River Reservation, developing a gardening course for the Honor Farm incarcerated, and involving Girl's School residents in the 4-H program.

There are a limited number of on-going multi-state/multi-institution research projects involving University of Wyoming researchers that address the needs of under-served and under-represented populations, NC-223 and WIN the Rockies. However, researchers need to continue to seek ways to better address the needs of these population groups in their future efforts.

(3) The programs described the expected outcomes and impacts. Each of the educators and specialists wrote impact statements, some of which are used for the impact reporting to CSREES and others for county commissioners, state and national legislators, university administration, and clientele.

The College's 5-Year Plan of Work describes the expected outcomes and impact for each of the five

goals. Information concerning the outcomes and impacts is presented in an evaluative manner so that expectations have been made clear. Within each goal outcomes concerning work with external agencies including multi-state and multi-institutions are also addressed and encouraged.

(4) By focusing on specific outputs and outcomes as identified within the plan, there was more consistency in reporting program effectiveness. Through the college's strategic planning efforts there appears to be a more concerted effort to streamline research programs to address one of the identified goals. Research and extension personnel are seeking ways through the Plan of Work to work more closely together in order to address the needs of the state and region. As these efforts continue, the college can anticipate an improved effectiveness in its research and extension programs.

**E. Multi-state Extension Activities**

Cross-discipline activities, multi-state, and joint research have been common in the past, so these requirements are not new to Wyoming. However, the multi-state activities have not been auditable. Joint research can be audited through the projects that were at one time called regional projects. In the supplemental report to the Plan of Work 1999 - 2004, Wyoming suggested that 25 percent of its Hatch funds would be devoted to the integrated activities; but Extension listed zero (0 percent) of its Smith-Lever funds on integrated activities. The contradiction comes from the fact that Hatch funds can be audited, whereas the Smith-Lever funds could not be audited. Because of that concern, Wyoming added an auditable tracking of the Smith-Lever funds that are both multi-state and integrated with Hatch through AESIS (Accountability, Evaluation System Information Software).

**F. Integrated Research and Extension Activities**

The strategic plan for the College of Agriculture calls for collaboration in all three functions, instruction, research, and outreach. To encourage multi-disciplinary and collaborative research efforts, the Wyoming Agricultural Experiment Station established a competitive grants program that emphasizes research across disciplines and colleges.

Multi-disciplinary and integrated research efforts are quite common in the College of Agriculture. Over half of the research projects are integrated and the majority of those are multi-disciplinary. This is particularly true of the research efforts dealing with Goal 1 on competitiveness and profitability of agriculture.

Research efforts in areas under Goal 3 have been enhanced through projects on human nutrition and health. This has been most apparent with the increase in projects in the Department of Family and Consumer Sciences.

Initiative teams formed as a result of the CES strategic plan, have members representing CES educators, state specialists and faculty members and UW College of Agriculture department heads. The intent of the initiative teams is to build communication and develop a more integrated program for research and extension.