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CSREES ANNUAL REPORT
FY 2003
Wyoming's Accomplishments & Results

Introduction:
As a land-grant institution and Wyoming's only state university, the University of Wyoming has a responsibility to serve the state. The College of Agriculture reflects the land-grant philosophy and tripartite responsibility of instruction, research, and outreach.

The productivity and efficiency of this trillion dollar a year enterprise is due, in large part to the contributions of land-grant colleges of agriculture. Agriculture faces complex challenges and opportunities as we move forward in the 21st century. Both industry and land-grant institutions are challenged to compete in a global economy while responding to the changing needs of a diverse population. Ensuring agricultural profitability and sustainability, while addressing the environmental concerns of the public, continues to place new demands on the food and fiber industry. Issues involving production agriculture, resource management, and quality of life, including the strength of families and rural communities who support agricultural production, generate diverse research and educational directives. The College of Agriculture must focus on priority agriculture, environmental, and human resource needs of the state. Stakeholders have been vital in identification and prioritization of needs.

The College of Agriculture has a mission to serve the educational and information needs of students, Wyoming citizens and communities, and global scientific community by pursuing and distributing unbiased, scientifically-based information on food and fiber systems, biological and human sciences, and natural resources. We will provide access to information from global sources, facilitate open and respectful dialogue, and encourage personal responsibility. The mission of the University of Wyoming Cooperative Extension Service is to provide lifelong learning opportunities for the people of Wyoming and empowers them to make choices that enhance their quality of life.

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 85 percent of agriculture's cash receipts of $982 million in 2001. 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. Drought continues to be a critical issue in the state impacting agriculture.

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, natural resource management and profitability. More than 5,200 producers attended various workshops regarding agricultural profitability that assisted them in making management decisions.

Inadequate nutrition during pregnancy can have serious postnatal and adult health consequences in livestock and in humans. The center for the Study of Fetal Programming is conducting research to identify specific genes that are expressed in undernourished versus nourished ewes and cows. Identification of genes that are differentially expressed under nutritional stress might lead towards development of diagnostics and biotechnologies that are designed to improve maternal nutrition and, consequently, fetal health and longevity. The concept of Fetal Programming and a description of the multidisciplinary effort to study this important research area can be found at: http://uwacadweb.uwyo.edu/healthyfetus/home.htm.

In 2003, throughout Wyoming and Montana, marked populations of wild sage grouse being monitored for several research projects began dying at an alarming rate. West Nile virus (WNV) was identified as the cause of death by diagnostic and wildlife disease experts at the University of Wyoming. In the next few years, additional research projects are planned to address WNV in sage grouse to get a better idea of what role sage grouse play in amplifying the disease in the field, and increased long term surveillance of sage grouse in the field to monitor the effects WNV and other diseases are having on population demographics.

Production agriculture continues to struggle both in terms of profitability and environmental/resource impacts. Profitability margins have been narrowed by rising input costs while crop and livestock prices have not kept pace. Environmental and natural resource issues include water quality, rangeland health, biodiversity and wildlife habitat. A continuing challenge is to identify integrated range/crop /livestock systems that will be profitable while sustaining or enhancing the natural resource base. Researchers at UW are involved in several collaborative projects to incorporate forages into irrigation and dry cropland systems. These systems investigate the potential to reduce inputs, provide forage for livestock and extend the grazing. The ability of researchers to conduct these integrated studies will be greatly enhanced with the development of the Sustainable Agriculture Research & Extension Center (SAREC). The College of Agriculture has purchased 3800 acres that include irrigated and dry cropland and rangeland. This land base will provide researchers with a field lab to conduct integrated range/crop/livestock systems research.

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. The UW Wyoming Seed Certification Service provides certification and other support services that allow Wyoming seed producers and seed companies to market value-added products. In 2003, inspectors examined 2,946 acres of alfalfa and miscellaneous legume seed, 7,600 acres of dry beans, 4,100 acres of small grains, and 1,179 acres of grass.

b. Impact – The Seed Certification Service provides a system by which national standards for certified seed production are met by Wyoming seed producers, which is also compatible with state and federal seed laws. Additional efforts include assisting seed producers in identifying profitable management practices and in locating stock seed. Seed crops have a greater value than the same crop produced as food or feed, providing value-added benefits that are paid directly to producers. Additional benefits to Wyoming occur as seed processing facilities, which provide jobs and bring money into the state with out-of-state seed sales. Changes in income from seed production or certified seed acres are affected by many factors, not just this program. In the long term, a program that serves the seed industry is critical to the ability of the seed industry to provide certified seed to customers, and thus provide a value added product that pays the added value directly to the producer.

c. Source of Funding – Smith-Lever, State

d. Scope of Impact – State specific
Multi-State Integrated Research and Extension (WY, NE)

Key Theme – Agricultural Profitability

a. The value of the agricultural sector output in Wyoming annually approaches or exceeds one billion dollars with cash income at $982 million in 2001. There are approximately 9,200 farms and ranches in Wyoming with a total land area of 34.6 million acres. Cooperative Extension Educators in Wyoming conducted 83 workshops, multi-day seminars, or classes reaching over 5,200 individuals. A sample of the topics ranged from Ag Profitability, Beef Quality Assurance, Importance of Winter Forages, Sustainable Cropping Systems and Living on Small Acreage.

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.

The beef industry is undergoing dramatic changes. Retailer consolidation, changing cattle

marketing strategies and health-conscious public perceptions are quickly transforming how cattle are produced and marketed. To remain competitive, Wyoming beef cattle producers need to better understand the inter-relatedness of all segments of the beef cattle industry, and how herd management decisions and herd health practices can have long-term impacts on the quality and safety of the beef they produce. The Wyobeef Shortcourse, a 3-day intensive hands-on training, was designed to give Wyoming producers a better understanding of all segments of the beef industry, and the important role that cow-calf producers play.

Precision farming has been evaluated for a number of years, but no reports are available on its use for controlling nematodes in sugar beets. Variable application of a high-cost input for a high-income crop seemed to be a good prospect for reducing costs, particularly since fields are usually very irregularly infested with SBCN. Using satellite receiving equipment, a tractor-mounted computer and equipment with variable rate capability, the application rate of nematicide can be varied according to the initial SBCN infestation level in the field, helping avoid over-application in some areas and under or ineffective-application in other areas of the field.

b. Impacts – Research and Cooperative Extension efforts resulted in the following impacts:

- Programming to change cow/calf production systems to match growth curves of plants resulted in two producers adopting three of the techniques taught. Three producers have created plans utilizing new technology and information that would fit into their management systems. Three producers are utilizing the use of stocker cattle and/or heifers to harvest the forages. This production method would completely eliminate feeding harvested forages during the winter months, when needs and costs are highest. One producer made this comment, “I wish I would have made these changes years ago, but now I might have a chance to save the ranch and provide a sustainable operation for my sons.”
- Program evaluations from two area Sustainable Cropping Systems and Alternative Forage Workshops indicated participants gained knowledge and skills and 45% planned to apply the information to their operations when making cropping decisions. One hundred percent of participants indicated the information on using alternative harvested forages for livestock feed would be used to establish irrigated pastures in their operations.
- Four hundred ninety seven producers participated in the CES sponsored agriculture profitability conference held in conjunction with Wyoming Stockgrowers, Woolgrowers and Soil and Conservation Districts mega-conference. Evaluations from the twenty sessions offered indicated participants increased their knowledge and over half indicated they planned to change management practices and incorporate the knowledge learned into daily practices.
- Program evaluations indicated short term impacts were increased awareness of information on sustainability and profitability; long term results 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.

- Drought continued for a third year. CES responded with educational programs across the state. One county reported producers were able to sustain 5% more livestock because of the benefit of the dry milk feed program and other management tips from educational programs. In that county there were 90,000 cows in 2001 before the drought started, that number dropped by 23% to 70,000 in 2003. The milk and education inputs saved about 10,000 cows that would have had to been sold had not alternative plans been implemented. This saved nearly $100,000 in cattle inventory in just one county.
- Six operations completed the Beef Quality Assurance test and committed to implementing the procedures of this program to provide a more wholesome product for consumers.
- Eighteen programs on forage production and analysis were held in FY-03. The number of producers testing their forage has increased by 200%. Individual producers have noted that they have saved from $2000-$5000 as a direct result of testing their forages.
- Multi-county workshops on Tools for Surviving Hard Times had evaluation results which indicated 100% of participants found the information useful in managing the business side of their operation. The Right Risk Management Simulation taught new tools for risk management (4.25 on a 5 point scale).
- Workshops on management of pest grasshoppers resulted in producers using RAATs reduced the cost of grasshopper control by 50 to 60%, depending on the agent and swath width. If a standard insecticide application costs $2.50 per acre, the equivalent RAATs program costs approximately $1.15 per acre protected. In 2003, about 400,000 acres of rangeland were protected from grasshoppers in Wyoming using RAATs, which saved the local producers over half a million dollars. Besides the economic advantages, RAATs strategy has tangible environmental benefits. Using RAATs, 60 to 75% less insecticide is applied to our rangelands for grasshopper control. Grasshopper control strategies developed at the University of Wyoming are applicable to grasshopper and locust control worldwide. Two faculty members shared information through a three day training for six Central Asian countries at the request of the Food and Agricultural Organization of the United Nations.
- 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 2003 demonstrated that properly timed applications of strobilurin chemistry reduced Rhizoctonia disease loss by 80% under severe disease situations. The current formulation of azoxystrobin (Quadris) reduced season-long disease by 83% compared to the nontreated check. A new formulation (Amistar) was

more effective and reduced season-long disease development by 93% compared to the nontreated check. 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.

- Since 1998, 114 "students" have completed the Wyobeef Shortcourse. Evaluations administered at the end of each Shortcourse, are uniformly enthusiastic and positive. The success of this program is also reflected in the continued popularity for the program. In the most recent exit evaluation, one 2003 participant commented, "Would there be any way to take part of this program to other parts of the state? People should have to pass this course before they can own cattle. That would solve many problems."
- An economic assessment showed that precision application of the soil fumigant, Telone II, could result in increased profit, ranging from $31/acre for heavily infested fields to $69/acre for lightly infested fields. The technology could be immediately employed, since agribusiness service providers have the equipment available for precision agriculture. Further savings in soil analysis could be realized if, as anticipated, the distribution of SBCN in a field does not change form one rotation cycle to the next. What are potential environmental benefits of precision application? If only 50% of a field is infested above the economic threshold, for example, precision placement in lieu of a blanket application of nematicide could reduce the amount of nematicide by one-half.

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

d. Scope of Impact – State Specific
Multi-state Integrated Research & Extension (W-1177)
(CA, CO, IA, NE, ND, OK, OR, SD, TX, UT, WA, WY)

Key Theme – Animal Health

a. The Department of Veterinary Sciences researchers investigated a variety of animal health-related problems. Vesicular stomatitis is a viral disease of cattle, swine, and horses that is clinically indistinguishable from foot-and-mouth disease. Vesicular stomatitis is endemic in parts of southern North America, Central America, and northern South America, and occurs as outbreaks in the western United States every 5-10 years. Outbreaks of this disease are associated with significant production and economic losses to producers and animal owners. Given the similarity between this disease and dreaded foot-and-mouth disease, there is an urgent need for rapid and accurate diagnostic tests that can differentiate between the two diseases. At present, there are no such tests available in standardized formats for the veterinary diagnostic community. Chronic wasting disease (CWD) of deer and elk is a member of the transmissible spongiform encephalopathies, which also includes the animal diseases bovine spongiform encephalopathy (BSE) and scrapie. Study of CWD is important because it may have detrimental effects on deer populations, it may change hunters' attitudes about and participation in hunting, it alters management of free-ranging deer and elk, it

affects commercial production of farmed cervids, and there are questions and concerns about the possible susceptibility of humans, livestock, and other animals. In collaborative studies with the Colorado Division of Wildlife and the Wyoming Game and Fish Department we have found that horizontal transmission readily occurs among mule deer and transmission from doe to fawn does not appear to be very important in the epidemiology of this disease. Cattle do not appear to be highly susceptible to CWD by oral exposure after more than 6 years of study. In 2003, throughout Wyoming and Montana, marked populations of wild sage grouse being monitored for several research projects began dying at an alarming rate. West Nile virus (WNV) was identified as the cause of death by diagnostic and wildlife disease research experts at the University of Wyoming. In one study area in north-central Wyoming, 13/15 adult female birds eventually died of WNV infection. A collaborative effort between the University of Wyoming, the University of Montana, the University of Alberta, and numerous state and federal wildlife and land management agencies (especially the Wyoming Game and Fish Department, Montana Fish Wildlife and Parks, and the Bureau of Land Management) was initiated to increase surveillance of sage grouse. Over 100 birds were tested for antibodies against WNV, including many birds from sites with known WNV mortality in sage grouse, and none of these birds demonstrated evidence of exposure to WNV.

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".

- The Public Health Security and Bioterrorism Preparedness and Response Act of 2002 requires that human and veterinary diagnostic laboratories are registered to isolate and hold select agents, and have appropriate facilities to work with these high impact infectious agents. A Select Agent laboratory was established at the Wyoming State Veterinary Laboratory. Funding was provided from a state bioterrorism grant obtained by the Wyoming Department of Health. The laboratory is a member of the Laboratory Response Network, a cooperating system of public health laboratories across the United States that can respond to suspected bioterrorism events by rapid, accurate laboratory testing and appropriate chain of custody of submitted samples. This is the second state funded Select Agent laboratory in the state of Wyoming. Formal commissioning is anticipated in January and February 2004.
- The development of rapid, accurate, and field deployable diagnostic techniques for vesicular stomatitis will greatly strengthen the diagnostic and response capabilities of the veterinary diagnostic and regulatory authorities in the United States. Collaborative studies between the University of Wyoming and two US Department of Agriculture facilities (the Arthropod Borne Animal Disease Research Laboratory in Wyoming and Plum Island Animal Disease Center in New York), has established a rapid real time polymerase chain reaction (PCR) test capable of detecting all of the common North and Central American isolates of vesicular stomatitis (including New Jersey and Indiana serotypes). The next phase of this research will be to validate this PCR test on a large

number of positive and negative samples, including as many different virus isolates as possible, and to compare these results to a gold standard test - virus isolation. The final phase of this research will be to transfer this new technology to veterinary diagnostic laboratories throughout the United States. Having rapid tests available to rule out foot-and-mouth disease are critical to the security and prosperity of livestock and other animal industries throughout the country.

- Documenting the modes of transmission of CWD is important in developing strategies for control of this disease. We know now that trying to block doe to fawn transmission will not control CWD. Lack of evidence of transmission of CWD to cattle so far in our work is reassuring that CWD will not readily infect cattle. This is especially important following recognition of a case of BSE in the US.
- West Nile virus is being recognized as an important cause of disease and death in native wildlife species in the United States, and possibly as a contributor to the decline of species of concern, threatened species, and endangered species, including greater sage grouse. In late 2003, the process to list greater sage grouse as an endangered species was initiated, and critical decisions in this process will be made during the year 2004. These decisions cannot be made accurately without a complete picture of the risks facing this species, including the risks associated with the spread of WNV throughout current sage grouse range.

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. Research projects designed to improve animal production are being conducted by researchers in animal science. Areas of emphasis in ruminant nutrition include optimal use of dietary protein and lipids to improve performance and quality of cattle and sheep. Research on forage-fed cows supplemented with vegetable oils has shown increased levels of vegetable oil fatty acids in the fat tissue of the cows and the calves. Also, milk fatty acids reflect the fatty acid composition of the diet. Plus, the fatty acid profile of the milk includes those acids modified in the GI tract of the cow that have shown significant health potential for animals consuming them. For example, conjugated linoleic and trans-vaccenic acids are greater in milk and fat tissue of cows, and fat tissue of the calves, when the cows are fed vegetable oils. Initial results suggest that diet formulation using supplemental lipids with unique fatty acids for lactating beef cattle may be used to differentially regulate production traits. Enhancing our knowledge regarding the differential effects specific fatty acids exert on adipose tissue fatty acid metabolism may afford beef cattle producers the unique opportunity to use natural feedstuffs as nutrient partitioning agents. Effects of early gestational nutrient restriction on offspring growth, development, and carcass characteristics of sheep and beef cattle is being studied by the Center for the Study of Fetal Programming. This is particularly important for sheep on rangeland that may lose a significant amount of weight from early to mid gestation, and even after supplementation later in gestation, the health and growth

potential of the lamb may have been compromised. Good evidence exists that under nutrition during the first half of gestation is detrimental to fetal-placental growth and development in several mammalian species including sheep**.** Research is being conducted to compare two groups of multiparous Western white-face ewes of similar size and breeding from 2 markedly different management systems in their ability to withstand maternal under nutrition during early gestation. While the nutrient restriction model led to a progressive decrease in body condition for both groups of ewes, group A ewes lost a greater percentage of body weight than group B ewes during the nutrient restriction period. In addition, there was a 30% reduction of fetal weight in the nutrient restricted vs. control fed group A ewes on day 78 and no effect of nutrient-restriction was seen on the fetal weight in group B ewes. Research results suggest that relatively severe (50%) nutrient deprivation during the first half of gestation has variable impacts on placentomal differentiation, as well as fetal growth and development, which appear to be dependent on the production system in their dams were raised**.**

Educational efforts have been directed towards assisting a localized dairy industry in western Wyoming. Nutritional management is being used to help address issue such as air and water quality and waste management which further complicate economic sustainability. This effort is in cooperation with Utah State University.

b. Impact – Research is being conducted to determine if type of lipid supplementation during early lactation will influence metabolic signals that mediate production responses of beef cows. Research has shown that conjugated linoleic and trans-vaccenic acids are greater in milk and fat tissue of cows, and fat tissue of the calves, when the cows are fed vegetable oils. Results of this research will help beef cattle managers identify lipid supplements that are suitable for thin and well-conditioned beef cows. Implementation of the proposed nutritional strategies may result in partitioning of nutrients to support economically important beef cattle production traits.

- There is a real potential for range sheep and beef cows in the High Plains and Intermountain West to experience prolonged periods of under-nutrition during the first half of gestation. Because early gestation is a crucial period for placental and fetal growth and differentiation, maternal nutrient deprivation during this critical period has a real potential to inhibit subsequent growth rate and carcass composition of their lambs and calves. Initial results suggest that ewes raised under different production systems alter their susceptibility to maternal stressors such as under nutrition, which can have markedly different impacts on placental and fetal growth and differentiation, and neonatal survival. Thus, it may advantageous to select replacement ewes from flocks with similar environmental stresses to maintain production efficiency. The successful completion of the proposed project will allow the development of new approaches to optimize fetal development and subsequent productivity and marketability of sheep and beef cattle.
- Dairymen in Northwest Wyoming involved in monthly on-farm visits have utilized or plan to utilize the dairy bulk tank monitoring system to get feed back when they make management changes.
- Six producers have implemented ration changes and are seeing marked changes on the

bulk tank system. In one particular case a producer was paying for enough protein for 85 lbs per cow production. However that producer was only milking about 55 lbs per cow. Through CES programming, a ration was formulated that saved him .50 per cow and his production increased 7 lbs per day. Seven pounds was a 13% increase in production.

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

d. Scope of Impact – State Specific
Multi-state Research (W-112)-(AZ, AK, CA, CO, HI, ID, KS, MI, MO, MT, NE, 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, projects are underway that are 1) investigating the genetic engineering of alfalfa to express spider silk as a strategy to add value to Wyoming's alfalfa crop and 2) characterizing novel protease enzymes from spiders that could lead to new biotechnological and biomedical application. The Plant Sciences Department is conducting studies to evaluate weed populations and weed shifts in glyphosate tolerant cropping systems. In the spring of 1998 research plots were set up at Torrington, WY; Scottsbluff, NE; Ft. Collins, CO; Colby, KS; and North Platte, NE to examine weed shifts and possible development of weed resistance from the continuous use of glyphosate. Continuous corn and a corn-sugarbeet-wheat rotation using glyphosate tolerant crops were established to monitor seed banks and weed populations. Within each crop rotation, four herbicide treatments were established: a high glyphosate treatment which is the recommended rate for glyphosate tolerant crops, a low glyphosate rate treatment which is half the recommended rate, an alternating glyphosate treatment where the high rate is applied every other year, and finally a no glyphosate treatment which receives only conventional herbicides.

b. Impact **–** Researchers are conducting studies to determine if plants can be used as biofactories for silk production. Alfalfa has been genetically engineered to produce one spider silk protein. Future impact is a potential new crop to produce spider silk for commercial use. After six years of data on possible weed shifts and development of weed resistance from the continuous use of glyphosate several trends have surfaced. Wild buckwheat, a weed difficult to control with the standard rate, has increased dramatically in the low rate continuous corn treatment but not in the rotation crop low rate treatment. Wild buckwheat that was not present at detectable quantities in 1998 has multiplied to more than 100 plants per 120 ft of row in 2003 in the continuous corn low rate treatment. Common lambsquarters also increased from less than one plant per 120 ft of row in 1998 to more than 150 plants in 2003. Unlike wild buckwheat, crop rotation had no effect on this weed. The wild buckwheat and common lambsquarters shifts were observed only when the rate of glyphosate was decreased. This serves as a caution to producers that even though cutting the rate may save money in the long term there may be negative consequences. Further, there is a benefit from rotating crops even though the herbicide selection pressure remained constant.

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) of alfalfa, caused by the soil-borne fungus (Phoma sclerotioides), causes a rot of the taproot of alfalfa resulting in winterkill and loss of plant stands. 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. Field surveys conducted in Wyoming have shown this disease to be widespread throughout the state. BRR has also been reported in Idaho and Montana and most recently in Minnesota, Wisconsin, and New York. A publication describing the symptoms of BRR and recommended control practices used in Canada has been developed. 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 has been has been developed for eventual release of a BRR-resistant variety for the U.S. With "Freedom to Farm" producers are seeking alternatives for replacing fallow with a crop. In this situation, pea could be a viable option. 'Forager' pea (Pisum sativum L. FABACEAE) is a re-selection from the Australian 'Dun' type grain pea and was developed by the Wyoming AES. Upon obtaining seed from South Australia a planting was made during the summer of 1994 by the Wyoming AES at Torrington, WY. Seed from the surviving plants was collected and cleaned. Off type seed was removed by hand sorting. This lot represented the naturalized selection. Dry grain yield was evaluated in 20 performance trials from 1995 to 1999 under dryland and irrigated conditions in Wyoming and the Nebraska Panhandle. Forager had a mean dry grain yield of 2,020 kg ha-1 which was equal in grain yield to Early Dun, out yielded Alma by 5%, Wirrega 5% and exceeded Miranda and Melrose by approximately 25% across the 20 environments. Forager was compared to Arvika for forage production from 2001 to 2003 (four environments). Forager exceeded Arvika forage pea in dry matter forage yield by 4,950 compared to 4,130 kg ha-1. Across three environments over the same period, Forager exceeded Poneka forage pea in dry matter forage yield by 5,470 compared to 4,500 kg ha-1. Forage quality was examined in 2001 and 2002 (two environments). Mean grain crude protein was 21.9, 20.9 and 22.0% for Forager, Poneka and Arvika, respectively. Mean in-vitro dry matter digestibility was 74.1, 73.1 and 76.2% for Forager, Poneka and Arvika, respectively. Mean acid detergent fiber was 32.1, 33.2 and 29.5% for Forager, Poneka and Arvika, respectively. Mean neutral detergent fiber was 36.5, 40.7 and 35.8% for Forager, Poneka and Arvika, respectively. These data indicate that Forager is comparable to Poneka and Arvika in forage quality. Forager was jointly released in 2003 by the developing institution and Nebraska AES.

b. Impact – Although surveys are not completed, an estimated 338,520 acres may be infested in Wyoming alone. Yield losses between the BRR-resistant variety Peace and BRR-susceptible variety Multi-Plier alfalfa in a BRR-infested field in Farson, Wyoming, where no other diseases were found, was 0.5 tons/acre/yr. 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 alone. Use of a BRR-resistant variety bred for the U.S. should result in a multi-million dollar savings to alfalfa producers. Forager pea represents a potential dryland annual legume crop option. The 1998 seed stock has been inspected for ascochyta spp. and the disease was not detected. This seed has been increased. In April 2003, the University of Wyoming entered into a three year license and royalty seed marketing agreement with Legume Logic of Crosby, ND. Crop variety registration and plant variety protection is currently pending.

c. Source of Funding – Hatch, State

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

Key Theme – Plant Production Efficiency

a. Researchers at the UW 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, the rapid adoption of Roundup Ready crops by farmers has made it important to have the capability to predict long term impacts this practice has on composition, density, and genetics of weed communities. A project was initiated in the spring of 1998 to address high and low rate continuous glyphosate use in a continuous corn or a sugar beet, corn, wheat rotation. Results of this research are reported under biotechnology. Diseases cause millions of dollars in losses to U.S. sugar beet growers**.** Cercospora leaf spot (CLS) affects 80,000 to 100,000 acres of sugar beets in the high plains. If unchecked, CLS can reduce sugar content by 2 percent costing sugar growers approximately $142 per acre. Surveys conducted in cooperation with Western Sugar have demonstrated that some production areas have Cercospora populations resistant to commonly used fungicides. Field demonstrations have been conducted for several years to provide growers with reliable information. In 2003, Cercospora leaf spot disease was reduced 91% by fungicide programs compared to the non-treated check. On average, there was a 135% increase in beet root yields.

b. Impact – Cercospora leaf spot study results in 2003 added data on new chemistries and provided information needed for product labeling and emergency use permits. Educational programs on IPM approaches for CLS management have been developed and are being delivered to growers. Increasing the efficacy of a single fungicide spray for CLS on 80,000 acres has a potential impact of $1 million regionally.

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, MN, MO, NE, NY, OH, OK, SD, VA, VT, WI, WY)

Key Theme - Invasive Species

a. The invasion of exotic species into rangelands in the West is problematic because of their impact on native ecosystems and difficulty of detection and control over extensive areas. To reduce herbicide use on rangelands, competitive native species are needed. Research is being conducted to assess the long-term potential of the few remnant plants to rebound following invasion of Russian knapweed. Extensive stands of Russian Knapweed were located in Wyoming, Idaho, and Colorado where native grasses remained after many years. These grasses were collected and returned for greenhouse grow-outs and experiments.

b. Impact –Research has been initiated using weedy invasions to select for competitive ability in native plant species. Native species were documented and seeds collected for studies to assess the competitive ability of these native plants. The value of competitive genetic seed sources of native plants for revegetation in western states cannot be overstated. The seed industry, public land managers, and reclamation efforts would all benefit from a form of biotic weed control derived from native genotypes that are competitive with exotic weed species.

c. Source of funding - State

d. Scope of Impact - State Specific

Key Theme - Plant Health

a. 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. Economic loss attributed to plant diseases is significantly reduced by prevention, early detection, and initiation of appropriate management practices.

b. Impact – Outside funding generated for regional plant disease research and plant pathology extension effort was $87,000. An additional $30,000 was received from the Homeland defense initiative. The Extension Plant Pathology Lab processed 271 plant disease samples during 2003. Responses included guidelines on management of the specific disease identified for that particular plant sample. Educational programs were delivered throughout the state, region, and U.S. These included training for the pesticide applicator program plus local,

regional, and national workshops to develop and report improved practices for disease management.

Annual losses attributed to Rhizoctonia root and crown rot (RRCR) are estimated at two-three percent total sugar loss for 185,000 acres of sugar beet grown in the irrigated High Plains region (CO, MT, NE, WY). This disease is reported to affect approximately 30 to 50 percent of Wyoming's acreage, depending on district. A one percent decrease in sugar content is lost revenue of approximately $71 per acre (2003 values). Field trials at Torrington during 2003 demonstrated that properly timed applications of "environmentally safe" strobilurin chemistry reduced Rhizoctonia disease loss by at least 80 percent under severe disease situations. A new formulation (Amistar) was more effective reducing season-long disease by 93% compared to the non-treated check. In effort to economize, a tank mix of Topsin (thiophanate-methyl) added to a half rate of azoxystrobin was tested. Results of the test showed improved disease suppression of 3 to 14% compared to azoxystrobin applied alone. Tank mixes will provide growers considerable cost saving associated with disease suppression and the combination of chemistries will aid in pathogen resistance management.

c. Source of Funding - Smith Lever, 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 - Home Lawn and Gardening -General Horticulture

a. Wyoming has only six counties with 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 2003, over 21,560 contacts were made regarding horticulture. Twenty four 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.
- Nine counties conducted Master Gardener training consisting of eight-ten sessions graduating 122 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 (6,227 hours) extends Extension's efforts with a value of over $95,833. 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 demonstration areas were planted with 26,000 plants. 430 individuals participated in seven XeroScape classes. Evaluations reported 98% of respondents are adapting XeroScape practices in their landscapes.
- Eight CES horticulture fact sheets were revised and rewritten: *Landscaping: Water-Wise Wyoming Gardens; Landscaping : Herbaceous Perennials for Wyoming; Gardening: Growing Herbs in Wyoming; Greenhouse Structures; Gardening: Extending the Vegetable Growing Season; Care of Flowering Potted Plants; Landscaping: Fertilizing Trees and Shrubs; Gardening: Hotbeds and Cold Frames.*

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 21 ongoing Hatch projects, and five out of the 21 are multi-state projects. Eleven of the 21 Hatch projects are integrated research and extension efforts. The approximate effort related to this program for the AES is 14.8 FTEs with expenditures of $.83 million Hatch and $3.5 million State.

Cooperative Extension Service FTE's	22.27
Goal 1 Allocated Funds	$2,077,593.53

Goal 1: IMPACTS

New Cropping Strategies Invigorate Wyoming Agriculture

Situation:

Ask for input from any advisory group across the state on crop management, and the number one response is nearly always that more information is needed on alternative crop production. Farmers in Wyoming want to be globally competitive, economically viable, and

environmentally sound with their production practices.

To tackle these issues, a series of educational programs were developed and implemented by the Cooperative Extension Service (CES) Sustainable and Profitable Agricultural Initiative Team. Specialists from the University of Nebraska, the USDA-APHIS Plant Materials Center, the Colorado Hay Growers Association, and the University of Wyoming were called upon to work with growers in Wyoming on alternative crop issues. The team utilized a $1,000 SARE grant, $1,200 from local agri-business, and $1,500 from the CES Profitable and Sustainable Agricultural Systems Initiative to develop and support the program offerings in the state.

During the sessions, grower and agri-business participants learned 1) how to prepare and package alfalfa and grass hay for specialty markets, 2) how to incorporate alternative planting strategies for irrigated pastures, 3) how to utilize pesticides efficiently and safely, 4) the economics of irrigated pasture and 5) recruitment and retention strategies in working with agricultural labor.

A total of 107 farmers, ranchers, and agri-businessmen attended the programs offered in Powell and Torrington. Dollars and cents hay issues, pesticide safety, hay profitability strategies, establishing quality hay, finding agricultural workers, and management for quality irrigated pasture and associated costs are just a few of the areas producers took the opportunity to learn more about.

Impacts:

Producers gained the knowledge to help diversify and add new enterprises to improve profitability and sustainability within their given operations. They also noted on evaluations that they gained an awareness of additional hay markets, knowledge about grass and legume species planting, sprayer calibration techniques, the cost of establishing irrigated pastures, and tips on labor management. Follow-up field tours are being planned by the team as a result of these programs. Producers have indicated that they would like the opportunity to look at things like different irrigated pasture management systems.

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Managing Landscapes through the Drought

Situation:

Since 1999, Wyoming has experienced four consecutive years of record-breaking drought conditions. The drought affecting Wyoming is a main concern in the state. Stored water in reservoirs and groundwater aquifers were at record low levels at the end of December 2002. Severe water restrictions, particularly for home and business landscapes, were implemented in an effort to conserve water usage. Whole communities, including those in Natrona County, had to

rethink ways to conserve water yet maintain attractive landscapes.

UW Cooperative Extension Service (CES) representatives in Natrona County recognized that they had the expertise to educate consumers on ways to conserve water in the urban/rural landscape. The agriculture and natural resources educator and horticulture program associate utilized various educational methods to assist people in making wise water-use choices in the landscape. Methods included statewide media campaigns for television, radio and newspapers, a UW fact sheet, multiple public classes, and the introduction of a display garden focusing on drought- tolerant landscape plants at the agriculture resource and learning center in Casper.

Delivering this kind of comprehensive programming required a concerted effort to build a relationship with statewide media outlets. Educational efforts helped focus Natrona County Master Gardener volunteers on drought issues. Grant funding established in 2000 of $3,000 from the U.S. Bureau of Reclamation was used to develop and print a multi-page university fact sheet for statewide release. Approximately 100 professionals and volunteers worked collaboratively to develop and deliver these programs.

A variety of methods were used to reach audiences with information on managing landscapes through the drought. The agriculture and natural resources educator delivered 18 episodes of "From the Ground Up" for K2 TV News on landscaping ideas for water conservation in the past year. K2 TV estimates that 30,000 people statewide watch this program weekly. CES provided weekly educational programming as part of the news for K2 Radio, the largest radio station in Wyoming with a listener ship of about 10,000 people. Twenty of those programs centered on wise water use in the landscape. One statewide article on lawn watering was written for a UW CES newspaper insert. Three different classes were developed to discuss water conservation in the landscape and collectively were presented six times – three in Casper and one each in Converse, Niobrara and Park counties. A total of 430 people attended these lectures. A "WyoScape" display garden was opened at the CES office in Casper, so that individuals could see xeric plants displayed and water conservation techniques employed. Also, the educator co-authored, along with a Master Gardener volunteer, a UW multi-page fact sheet titled "WyoScape, Landscaping for the Wyoming Climate," with 1,500 of the sheets in print.

Impacts

These programs individually and collectively were widely held as beneficial to the people of Natrona County and the state. Media efforts by their very nature are difficult to evaluate, yet consumers did respond.

A member of the College of Agriculture Advisory Board reported at a meeting that the "From the Ground Up" programs were very educational and timely and brought home to viewers ways to help people with their yard and garden water issues. Several people from Casper told the educator that his TV/radio programming was "insightful and timely" and they often employed the recommendations discussed the following day. A rural resident from Casper said this about the educator's radio programming: "He is mindful of the needs of the individual. We are all trying to make the best of this water crisis and his advice is heeded by me and my neighbors." About 5 percent of the people attending the classroom lectures were polled via phone and a mailed survey instrument was sent six months after the lectures. The surveys revealed that 98 percent of the respondents utilized the water-conserving practices taught and also told friends and neighbors about these conservation practices. One person wrote, "My lawn is the greenest it's ever been, even with the heat. I would estimate a savings of 1/3 in money

spent on water. Two neighbors as well as my children have adopted the deep watering method. All have reported positive results. They are happy with savings in water and time."

The WyoScape publication also hit the intended mark. A Laramie resident said this about the publication: "My wife and I had been researching ways to redo our landscape into one that requires less water. This publication, unlike the others, showed me how to do it."

Finally, the impact of the display garden brought home the message that water conservation and beauty can be demonstrated. As one garden visitor from Cheyenne stated, "Not only was I surprised over the beauty and variety of plants but also the appearance and size of the garden. I borrowed a camera and photographed the area to use for a possible program in Cheyenne."

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Marketing and Risk-Management Education

Situation:

Agriculture is important to the economy of the state and the welfare of its rural communities. Farms and ranches in Wyoming generated cash receipts of $954.5 million in 2000, up more than 11 percent from 1999. Approximately 84 percent was generated from livestock and livestock products, and 16 percent came from crops.

Income from the livestock industry in Wyoming is primarily derived from cattle and calves, followed by sheep and lambs. Crop income in the state comes mainly from forage crops, with hay leading all other crop categories. Cash crops include hay, sugar beets, wheat, barley, dry beans, and corn.

The 1996 FAIR Act along with recent trade agreements such as NAFTA and GATT have created a market environment for agricultural producers which will be more volatile and risky in the future. The gradual loss of government program payments and reductions in trade barriers means producers will have to improve their marketing and risk-management skills to be successful in the future.

The need for education on marketing and risk-management for agricultural producers was mandated in the 1996 FAIR Act, and its importance has been reaffirmed in the 2002 Farm Security and Rural Investment Act. A needs assessment done in Wyoming and Colorado indicated producers felt risk- management education was important to agricultural firm survival. Moreover, education regarding marketing ranked as important in that survey.

A number of the educational materials used in last year's risk-management education programs were developed via Cooperative Extension Service extension educators and specialists in the western region. Grant funds to develop web site, software, and educational materials were supplemented by travel funds from a Western Center for Risk-Management Education grant. Primary collaboration occurred between Colorado and Wyoming with help from a number of other states. The total grant dollars supporting the RightRisk education program in the western

region were $141,000.
Outputs for the year included:

1. The production of seven extension and popular press publications.
2. A total of seven CES programs reaching 172 constituents.
3. The designation of CES as an instigator in six grants awarded for multi-state projects relating to risk-management education for producers. The total funds received were $674,210 and the Wyoming contract or subcontract total was $405,340.
4. A total of 8,340 persons were served during 185 hours of visits to the UW Agricultural Marketing Information Web Site.
5. A total of nine interviews were conducted for newspaper, radio, and television stations.
6. Weekly e-mails were sent to CES offices on market outlook and marketing issues.
7. A total of 12 individual requests for information on agricultural trade, marketing, and risk-management topics received responses.

Impacts

Evaluations regarding niche marketing and market chain segmentation for the Wyoming Leadership Education and Development group indicated that on a scale of 1 (Low) to 10 (High) the overall average rating of the program was 8.9. Participants are training to be leaders in agriculture, and 87 percent responded that they would try to use the information to better their operations and communities. Overall, the educational impact was an increase in knowledge, and potential longer term impacts associated with local policy regarding agriculture exist from this program.

Evaluations regarding risk-management education in Wyoming and the western region indicate increased knowledge regarding risk-management alternatives and personal risk-management styles. Average scores on Likert scale questions regarding knowledge gained for use in their operation was 4.25 on a 5-point scale. Slightly more than 52 percent of respondents indicated they were going to make changes to the way they managed risk as a result of the educational information they received. Comments indicated that attendees overwhelmingly enjoyed the hands-on-learning associated with Right Risk. The average Likert score was 4.2 on a 5-point scale regarding the use of hands-on-computer simulations. Written comments included “I didn’t realize how I approached risk until this workshop” and “Great idea to do labs to help people manage risk.” William Taylor received a client letter of support for the Tri-County Ag Days risk-management program. That letter indicated that producers needed much more of this type of programming.

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West Nile Virus Impacts on Wildlife in the Western United States

Situation:

West Nile virus was first detected in the United States in the New York City area in 1999. Since 1999, West Nile virus (WNV) has spread rapidly across the country, reaching Wyoming and other states on the west coast in 2002. While the effects of this viral disease on humans and horses have been carefully monitored and well studied, the effects of WNV on wildlife populations remain largely unknown.

In 2003, throughout Wyoming and Montana, marked populations of wild sage grouse being monitored for several research projects began dying at an alarming rate. WNV was identified as the cause of death by diagnostic and wildlife disease research experts at the University of Wyoming. In one study area in north-central Wyoming, 13/15 adult female birds eventually died of WNV infection. A collaborative effort between the University of Wyoming, the University of Montana, the University of Alberta, and numerous state and federal wildlife and land management agencies (especially the Wyoming Game and Fish Department, Montana Fish Wildlife and Parks, and the Bureau of Land Management) was initiated to increase surveillance of sage grouse. Over 100 birds were tested for antibodies against WNV, including many birds from sites with known WNV mortality in sage grouse, and none of these birds demonstrated evidence of exposure to WNV. The preliminary assessment of this data is somewhat alarming - the data suggest that most (if not all) sage grouse that are infected with WNV will die, and that none of the birds survive infection and produce antibodies. In the next few years, additional research projects are planned to address WNV in sage grouse to get a better idea of what role sage grouse may play in amplifying the disease in the field, and increased long term surveillance of sage grouse in the field to monitor the effects WNV (and other diseases) are having on population demographics.

Impacts

West Nile virus is being recognized as an important cause of disease and death in native wildlife species in the United States, and possibly as a contributor to the decline of species of concern, threatened species, and endangered species, including greater sage grouse. Sage grouse are considered an indicator species for the overall health of sagebrush steppe habitat in the western United States, and as sage grouse populations decline, there is evidence that other critical animal and plant species in these habitats also are in decline. In late 2003, the process to list greater sage grouse as an endangered species was initiated, and critical decisions in this process will be made during the year 2004. These decisions cannot be made accurately without a complete picture of the risks facing this species, including the risks associated with the spread of WNV throughout current sage grouse range.

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Precision Farming Benefits Sugar Beet Producers and the Environment

Situation:

Although sugar beets are one of Wyoming's most profitable crops, they require the most inputs and, therefore, incur the most risk. One of the biggest costs of production is the need for nematicide to control the sugar beet cyst nematode (SBCN), which, if not controlled, can cut yields in half. Additionally, the most commonly used nematicide is very toxic and has been found in ground and surface water. Precision farming has been evaluated for a number of years, but no reports are available on its use for controlling nematodes in sugar beets. Variable application of a high-cost input for a high-income crop seemed to be a good prospect for reducing costs, particularly since fields are usually very irregularly infested with SBCN.

Using satellite-receiving equipment, a tractor-mounted computer and equipment with variable rate capability, the application rate of nematicide can be varied according to the initial SBCN infestation level in the field, helping to avoid over-application in some areas and under or ineffective-application in other areas of the field. An interdisciplinary team developed the idea for the study and numerous collaborations assisted with the demonstration. Simplot Soilbuilders conducted the grid sampling, using their GPS (Global Positioning System) equipment and computer, and applied variable rate Telone II to the 40-acre field. Dow Agriscience Technical Represenative provided nematicide product and product use expertise. Panhandle Cooperative provided use of a bedder, with fumigation attachment for band application of Telone II. Dr. Eric Kerr, nematologist, analyzed grid soil samples for SBCN population. Holly Sugar sponsored a summer field tour for producers, educators and others and provided sugar beet tare sample analysis.

Impacts

An economic assessment showed that precision application of the soil fumigant, Telone II, could result in increased profit, ranging from $31/acre for heavily infested fields to $69/acre for lightly infested fields. The technology could be immediately employed, since agribusiness service providers have the equipment available for precision agriculture. Further savings in soil analysis could be realized if, as anticipated, the distribution of SBCN in a field does not change from one rotation cycle to the next. It is not possible to ascribe a value to environmental benefits, however, if only 50% of a field is infested above the economic threshold. For example, precision placement, in lieu of a blanket application of nematicide, could reduce the amount of nematicide by one-half.

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Select Agent Laboratory at Wyoming State Veterinary Laboratory

Situation:

The Public Health Security and Bioterrorism Preparedness and Response Act of 2002 requires that human and veterinary diagnostic laboratories are registered to isolate and hold select agents, and have appropriate facilities to work with these high impact infectious agents. It is important that Wyoming has a veterinary laboratory that meets federal legal requirements and can isolate, work with, and store high impact infectious agents of animals that can also infect people.

A Select Agent laboratory was established at the Wyoming State Veterinary Laboratory. Protocols were established so that the agents can be held securely and that diagnosis can continue to be done on these diseases. Funding was provided from a state bioterrorism grant obtained by the Wyoming Department of Health. The laboratory is a member of the Laboratory Response Network, a cooperating system of public health laboratories across the United States that can respond to suspected bioterrorism events by rapid, accurate laboratory testing and appropriate chain of custody of submitted samples.

Impacts

This is the second state funded Select Agent laboratory in the state of Wyoming. Formal commissioning is anticipated in January and February 2004.

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Saving Our Alfalfa Stands

Situation:

Brown Root Rot (BRR) of alfalfa, caused by the soil-borne fungus (Phoma sclerotioides), causes a rot of the taproot of alfalfa resulting in winterkill 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 areas of Wyoming have now been attributed to this disease. Similar unexplained losses in other Rocky Mountain States may also be due to BRR.

Field surveys conducted in Wyoming have shown this disease to be widespread throughout the state. BRR has also been reported in Idaho and Montana and most recently in Minnesota, Wisconsin, and New York. A publication describing the symptoms of BRR and recommended control practices used in Canada has been developed. 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 has been developed at Wyoming. Using this screening method, a BRR-resistant breeding line has been developed for eventual release of a BRR-resistant variety for the U.S.

Impacts

Although surveys are not completed, an estimated 338,520 acres may be infested in Wyoming alone. Yield losses between the BRR-resistant variety Peace and BRR-susceptible variety Multi-Plier alfalfa in a BRR-infested field in Farson, Wyoming, where no other diseases were found, was 0.5 tons/acre/yr. 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 alone. Use of a BRR-resistant variety bred for the U.S. should result in a multi-million dollar 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. 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*], CES's food and nutrition program for limited resource audiences that combines EFNEP and the Food Stamp Nutrition Education Program [FSNEP]; in FY 2003, CNP educators in all 23 counties and 1 reservation office enrolled 2,013 participants in a lesson series, and 22,588 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 – Food resource management practices measured include planning meals, comparing prices, using grocery lists, providing food for the entire month, and monthly food costs. Twenty-three percent demonstrated acceptable practices at entry compared to 52% at exit. Forty-two percent of participants gained skills to make their food resources last the entire month. Forty-seven percent reported comparing prices more frequently and 45 percent reported using a grocery list more often. Households averaged a savings of $40.50 per month on groceries which represents $486 per year per family. This represents $702,756 saved by the 1,446 Wyoming graduates who completed the exit survey.

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. Consumers demand food that is readily available, affordable, and wholesome. By implementing future nutritional inputs into beef cattle production, both the consumer and the livestock producer should benefit from selective fatty acid supplementation. Research on forage-fed cows supplemented with vegetable oils has shown increased levels of vegetable oil fatty acids in the fat tissue of the cows and the calves. Also, milk fatty acids reflect the fatty acid composition of the diet. Plus, the fatty acid profile of the milk includes those acids modified in the GI tract of the cow that have shown significant health potential for animals consuming them. For example, conjugated linoleic and trans-vaccenic acids are greater in milk and fat tissue of cows, and fat tissue of the calves, when the cows are fed vegetable oils. What is unknown to date is how the calf will be affected by consumption of this milk.

b. Impact – The impact of the cow supplementation strategy on the health and performance of the calf will be realized following completion of current studies. The potential impact of these specialized fatty acids in the health of human consumers is not certain, but meat containing higher proportions of polyunsaturated fatty acids would be in line with current biomedical recommendations for a healthy lipid containing diet for consumers. The goal of this research endeavor is to reveal the potential that lipid supplementation may have for both the cow and the meat-producing offspring of the cow.

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 1183 food handlers through food safety workshops. In-house training in food service businesses reached 490 individuals. Consumer programs reached 1125 people and food safety displays were viewed by 2800 individuals. The *Cent$ible Nutrition Program* (CNP) had 2,013 participants enrolled in the program and presented 1,131 one-time presentations to over 22,588 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 1183 participants in *ServSafe,* Basic, Intermediate and Advanced *Going for the Gold* workshops, an estimated

   - 960 (97%) made at least one change related to cleanliness, for example, 625 (66%) wash

their hands more thoroughly.

- 772 (78%) made at least one change related to food preparation, for example, 502 (53%) keep raw meats, cooked foods, and fresh produce separated.
- 693 (70%) made at least one change related to cooking food, for example, 417 (44%) use a stove or microwave – not a steam table – to reheat food.
- 792 (80%) made at least one change related to cooling food, for example, 511 (54%) put food into shallow containers or cutting meat into smaller pieces before putting it in the refrigerator.
- 743 (75%) made at least one change related to other miscellaneous areas, for example, 313 (33%) monitor critical control points more closely.

Cent$ible Nutrition Program

- On entry surveys, 56% of participants demonstrated acceptable food safety practices in contrast to 83% on exit surveys.
- 61%of homemakers showed improvement in one or more of the food safety practices including thawing foods properly and storing foods properly.

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 .5 FTEs with an expenditure of $.08 million Hatch and$.16 million State.

Cooperative Extension FTEs	4.07
Goal 2 Allocated Funds	$379,694.96

Goal 2 – IMPACTS

Food is Safer in Wyoming Thanks to UW CES and Its Partners

Situation:

The microbial contamination of food is a serious public health problem. Each year in the U.S. foodborne diseases cause approximately 76 million illnesses, 325,000 hospitalizations, and

5,000 deaths. With approximately 60 percent of foodborne illness outbreaks nationwide attributable to food-service establishments, food-service personnel are the key to reducing the risk of foodborne illness.

The Wyoming Food Safety Coalition (WFSC) is a multi-institutional, multi-disciplinary partnership that has become the primary source of food-safety education throughout the state. The heart of WFSC is a core of locally trained teams, most of which include a county-based UW CES FCS educator* and a health inspector from either the Wyoming Department of Agriculture or a local city/county health department or both. These teams plan and conduct a wide variety of educational programs. With guidance from WFSC's board of directors, UW CES* has the primary role in coordinating and supporting team activities. U.S. Department of Agriculture grants helped establish WFSC, and workshop registration fees now fund WFSC along with supplemental grants from agencies like the Food and Drug Administration.

In fiscal year 2003,

- Coalition team members trained 1,183 food handlers in the following workshops: *Basic*—193, *Intermediate*—718, *Advanced*—100, and *ServSafe*—172.
- In-house trainings reached 490 individuals.
- Consumer programs and displays reached 1,125 and 2,800 individuals, respectively.

Impacts

Thanks to the Wyoming Food Safety Coalition and leadership from UW CES, hundreds of food workers statewide are handling food more safely. Based on data from a 2001 evaluation project conducted by UW CES for WFSC, this year's 990 participants in WFSC's Going for the Gold (intermediate and advanced) and ServSafe workshops are estimated to have made the following changes:

- 960 (97 percent) made at least one change related to cleanliness like washing their hands more often.
- 792 (80 percent) made at least one change related to cooling food like putting food into shallow containers or cutting meat into smaller pieces before putting it in the refrigerator.
- 772 (78 percent) made at least one change related to food preparation like preventing cross-contamination by keeping raw meats, cooked foods, and fresh produce separated.
- 743 (75 percent) made at least one change related to other miscellaneous areas like monitoring critical control points more closely.
- 693 (70 percent) made at least one change related to cooking food like using a stove or microwave not a steam table to reheat food.

Success story – A registered dietitian who received an intermediate level *Going for the Gold* disk as part of WFSC's Food and Drug Administration-funded project shared this reaction:

"I have used it for in-service training of food service personnel in nursing homes I work with in Wyoming. Recently I have taken the liberty of using it with some facilities I work with in Montana. I find it to be a great tool to use for small group, by using the PowerPoint program right on the screen of my notebook computer. I do not have access to a projector, but it works fine for the small groups. And now I have supplied a copy of the disk to each facility for its use in a similar manner for training new employees when they arrive and for review with current staff members annually. Thanks for a great tool!"

- Improved food-handling behaviors such as those estimated to have been made by workshop participants increase the likelihood that food served in Wyoming is safe and, therefore,

decrease the risk of foodborne illness.

- UW CES FCS educators who were members of the Wyoming Food Safety Coalition during all or most of the year included: Donna Birkholz, Barb Daniels, Patti Griffith, Vicki Hayman, Phyllis Lewis, Mary Martin, Stella McKinstry, Linda Melcher, Christine Pasley, Suzy Pelican, Virginia Romero-Caron, and Denise Smith. Beth Kamber is the Project Associate for the coalition.

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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.

The Molecular Biology Department is studying the roles of forked proteins in assembly of parallel actin fiber bundles. Forked proteins are involved in forming the very large, 100-400 um long diameter fiber bundles present in developing Dorsophila bristles. These actin based structures are also found in mammals including humans. These actin based structures are important in many specialized cell functions ranging from hearing to intestinal absorption.

Key Theme - Human Health

a. Researchers in the Department of Molecular Biology are studying the roles of the forked proteins in assembly of parallel actin fiber bundles. Forked proteins are involved in forming the very large, 100-400 _m long and 1_m diameter, fiber bundles present in developing Drosophila bristles. These fiber bundles appear in the electron microscope to have virtually identical structure to actin fiber bundles in intestinal and kidney microvilli and in the stereocila of the ear, which are 1-7_m long and .1-.2_m in diameter. Studying fiber bundle formation in Drosophila has the advantages that the actin fiber bundles in bristles are very large, and that mutants are available which are defective in fiber bundle formation. The results of these experiments will help in understanding how similar actin bundles are regulated in intestinal microvilli, kidney proicmal tubles, and ear stereocila. This may result in treatments for some forms of deafness, kidney failure, and intestinal absorption diseases.

   CES efforts are 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 - 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.

- Educational efforts from *WIN Wyoming* resulted in the following impacts: Delivered two training sessions at a multi-state CES training for Colorado and Wyoming reaching 128 educators. A total of 46 participants provided post-training assessment forms, and 29 participants responded to a follow-up survey. Short term outcomes included (based on a scale of 1–5, with 5 being the highest or most positive rating: increased knowledge (4.24); planned to use the information presented (4.59); session was helpful (4.88). Medium term outcomes reported: Of the 29 respondents to the follow-up survey, 89% have used their *Small Victories* notebook. Four respondents provided data on their audiences, and total worked with 397 individuals in class settings, for an average of 99 individuals per educator. Long term impact: as the tools are being used, the training and notebook can be seen as supporting educators in helping people achieve a healthy weight through a healthy lifestyle. “A New You” curriculum 4-week series was presented by CES educators in four counties. One hundred percent of participants reported adopting new practices including: quit dieting, focus on healthy eating, found ways to be more active. Participants stated: “I have been guilty of prejudice based on body size.” “This class got me started walking again.” 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 (CNP)* 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 2,013 individuals enrolled in lessons and 22,588 individuals participated in one time lessons as well as 5,027 youth in youth programs. Additionally, CNP is reaching underserved audiences state-wide through use of public television. Twelve 30-minute programs were developed and aired utilizing curriculum topics from CNP.

   Extension educators conducted 232 educational programs, classes, workshops, or health fair presentations reaching over 5,541individuals. Topics ranged from “Eat 5-a-Day” and “Preventing Diabetes” to “Eating for a Healthy Heart.” One educator presented TEAM Nutrition programs at various schools and in the community reaching 1300 youth.

   Previous studies have indicated that the fatty acid composition of the diet can influence the number of eggs released into the oviducts of a rat, specifically that omega-3 fatty acids at high levels enhance ovulation. Ongoing research in the Family Consumer Science Department is attempting to identify to what extent diet may play a role in regulating ovulation. To identify the underlying mechanism, a novel lipid know as steriadonic acid (SDA) was compared to eicosapentanenoic (EPA) typically found in fish oil. When (SDA) was provided in the diet of rats, SDA led to a 120% increase in the enzyme known as

cyclooxygenases (COX-1) when compared to the control or eicosapentanenoic (EPA) based diet. Two sister enzymes known as cyclooxygenases (COX-1 and COX-2) play a very important role in ovulation through metabolites they are responsible for producing**.** These data suggest that SDA works via a mechanism that differs from that of EPA.

b. Impact - Cent$ible Nutrition – Nutrition practices measured include planning menus, reading labels, making healthy food choices, preparing foods without adding salt, and serving children breakfast. Seven percent of participants demonstrated acceptable nutrition practices at entry compared with 33 percent at exit.

- Fifty-five percent of participants reported improvement in reading labels.
- Fifty-two percent reported improvement in selecting healthy foods.
- Thirty-nine percent reported improvement in not adding salt when cooking.
- Forty-one percent reported making improvement in feeding children breakfast daily.

Twenty-four hour food recalls showed 92.7% of graduates made a positive change in any food group.

- Fruit servings increased from 1.2 to 1.9 daily
- Vegetable servings increased from 2.6 to 3. 0
- Calcium/dairy servings increased from 2 to 2.3
- Servings from foods in the "other" group decreased from 21.5 to 16.9

The mean nutrient adequacy ratio (nutrient intake compared to the recommended dietary allowance) increased for all nutrients monitored. The goal is 100 percent of RDA or an NAR of 1.

- Protein increased form .92 to .96
- Iron increased from .78 to .82
- Calcium increased from .78 to .81
- Vitamin B6 increased from .76 to .84

The mean adequacy ratio for all 6 nutrients increased from .76 to .84.

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

Compromised fecundity has been an increasing issue since the early 1960's with reproductive failure influencing close to 5 million women in the US annually. While pharmacologic agents can be provided that may influence and can regulate reproduction, dietary behavior plays a dramatic role in altering reproduction. Research is ongoing to identify to what extent diet may play a role in regulating ovulation. 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.

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 (W-1003) (AL, AZ, CA, CO, HI, IN, MI, MN, 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 continuing 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 three Hatch projects and all three are Multi-state projects. The research effort in this area includes about .75 FTEs with expenditures of approximately $.08 million Hatch and $.18 million State.

Cooperative Extension Service FTEs 26.15
Goal 3 Allocated Funds $2,439,563.10

Goal 3 - IMPACTS

Achieving Food Security through the Cent$ible Nutrition Program

Situation:

Food security is defined as having access to an available, adequate, affordable, nutritious, and safe food supply. Approximately 10 percent of Wyoming's population lives at or below the poverty level. Forty-five percent of Cent$ible Nutrition participants report lacking enough food to last a month when they enter the program.

The Cent$ible Nutrition Program (CNP) receives funding to provide nutrition education to people living at or below the poverty level, which is approximately 40 percent of the households in the state. These audience members are not typically reached by traditional Cooperative Extension Service methods due to low self-esteem, lack of transportation, conflicting schedules, and lack of child care. In order to reach them, creative efforts must be used. Twenty-seven CNP educators and seven Family and Consumer Sciences educators provide lessons to pre-formed groups such as Head Start, WIC and POWER. They teach one on one in participants' homes or in small groups. Additionally, news articles, newsletters, and displays provide education.

Impacts

Marketing and recruiting efforts resulted in higher enrollments in both adult and youth programs. Agency collaborations resulted in 1,131 programs being presented, reaching 22,588 contacts with individuals attending one-time lessons. It also resulted in the formation of one new distribution site for TEFAP commodity foods and one county's SHARE program agreeing to accept food stamps. Efforts to reach minority and underserved populations resulted in

enrolling 463 (23 percent) individuals with minority status.

CNP provided training to 380 agencies working with low-income and Title I schools for a total of 10,914 contacts. As a result, 1,119 displays were placed with these agencies and referrals to CNP increased. Enrollment increased this year from 1,655 to 2,013. Youth enrollment increased from 2,831 to 5,027. The move from teaching only five core lessons to teaching the entire curriculum resulted in an increase in the number of lessons. The mean number of lessons taught increased to 8.3 from 7.1 last year. As a result, participants gained greater knowledge and skills in their nutrition practices, food resource management, and food safety.

Nutrition practices improved. Nutrition practices measured included planning menus, reading labels, making healthy food choices, preparing foods without adding salt and serving children breakfast. Seven percent of participants demonstrated acceptable nutrition practices at entry compared with 33 percent at exit.

Fifty-five percent of the participants reported improvement in planning menus, and 68 percent reported improvement in reading labels. Fifty-two percent reported improvement in selecting healthy foods with 39 percent reporting improvement in leaving out salt when cooking. Forty-one percent reported making improvement in feeding children breakfast daily.

Twenty-four-hour food recalls showed 92.7 percent of graduates made a positive change in their inclusion of a food group. Fruit servings increased from 1.2 to 1.9 daily and vegetable servings increased from 2.6 to 3.0. This nearly equaled the 5-A-Day goal set as a national priority.

Calcium/dairy servings increased from 2 to 2.3 per day. Servings of foods in the "other" group decreased from 21.5 to 16.9. Generally fats and alcohol decreased while dietary fiber increased. There was a shift from people eating too few and too many calories to eating within the normal caloric range.

The mean nutrient adequacy ratio which is the nutrient intake compared to the recommended dietary allowance (RDA) increased for all nutrients monitored. The goal is 100 percent of the RDA. This included protein (increased from 92 to 96 percent), iron (increased from 78 to 80 percent), calcium (increased from 78 to 79 percent), vitamin A (increased from 69 to 80 percent), vitamin C (increased from 76 to 87 percent), and vitamin B6 (increased from 76 to 84 percent). The mean adequacy ratio for all six nutrients increased from 76 to 84 percent.

Food resource management practices improved. Food resource management practices measured include planning meals (mentioned previously), comparing prices, using grocery lists, providing food for an entire month, and calculating monthly food costs. Twenty-three percent demonstrated acceptable practices at entry compared to 52 percent at exit. Forty-two percent of participants gained the skills to make their food resources last an entire month. Forty-seven percent reported comparing prices more frequently, and 45 percent reported using a grocery list more often.

Helping families and individuals eat better for less represents one area where CNP excels. One person praised the CNP educator for helping his family find additional food resources through the local food bank and the game and fish department. The majority of personal testimonies about how CNP helped participants revolved around how much money they saved each month. The mean dollars saved per family per month this year equaled $40.50, which represents $486 per year per family. This represents $702,756 saved by the 1,446 Wyoming graduates who completed the exit survey in just one year.

Youths gained knowledge and skills. A total of 5,027 youths participated in classes in their classroom, in after-school programs, and in summer day camps. Eighty-five percent of 2,193 youths from 107 groups now eat a variety of foods. Sixty-six percent of 2,243 youths from 104 groups increased their knowledge about nutrition. Sixty-six percent of 1,816 youth from 88 groups increased their ability to select low-cost, nutritious foods. Seventy-one percent of 1,976 youths from 94 groups improved their practices in food preparation and safety.

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Development of an Asthma Diagnostic Tool

Situation:

A patent submission is pending on a tool that would identify different subtypes of asthmatics and the ideal method of treatment for the different metabolic types of asthma that exist. As different types of asthma exist at the metabolic level, not all treatment methods will control the disorder uniformly. This diagnostic tool once developed would identify the presence of asthma, the subtype, and the ideal method of treatment for the type.

Partnerships in industry have been established and the development of the diagnostic prototype has been initiated.

Impacts

If development is successful it should reduce the overall cost of diagnosis and treatment of asthma with improved success 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. Based on the findings of the innovative applied grasshopper research at the University of Wyoming, a group of entomologists from UW developed a "Grasshopper Management Train-the-Trainers Workshop" and delivered this product at a state-wide meeting of the Wyoming Weed and Pest Districts in March 2002. In 2003, the workshop was delivered to the specialists in three neighboring states – Colorado, Nebraska, and Montana. The total attendance of the three workshops exceeded 120 specialists – predominantly weed and pest supervisors, USDA-APHIS personnel and extension educators. The workshops focused on the three-phase approach to integrated grasshopper pest management advocated by the National Grasshopper Management Board: prevention (via cultural management), intervention (via hotspot detection and control), and suppression (via reduced agent-area treatments /RAATs/ of infestations exceeding the economic threshold).

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. In 1977, a study was initiated in south central Wyoming to evaluate the effects of variable topsoil depth replacement on plant community establishment and production. Topsoil was replaced on a reclaimed coal-mining site at depths of 0, 20, 40 and 60 cm. This research site was re-evaluated in 2001 to determine differences in plant species richness, production, percent canopy cover and diversity between topsoil depths. In essence, species richness and diversity decreased, while production increased with increasing topsoil depth. There was higher percent canopy cover of grasses and lower forb cover with increasing topsoil depth. Variable topsoil replacement depths can influence long-term plant species composition and production on reclaimed mined lands, thereby offering management options to manipulate vegetation mosaics at the community, ecosystem, and landscape levels.

The integrity of Wyoming's natural resource base and the state's diverse ecosystems is a central focus of the UW'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 - 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 2003. Federal, state, and university personnel provide the training for commercial applicators. Approximately 675 private applicators received training and 525 were recertified. In 2003, 51 commercial applicators received training and were certified and 203 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 topics 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 50 educational workshops, classes or tours reaching over 2,256 individuals on topics ranging from "Mineral Content of Range Forage," "Range Monitoring," and "Living on a Few Acres". The Sustainable Management of

Rangeland Resources Initiative Team created natural resource educational spots which air twice weekly on K-2 TV which airs in most of Wyoming. In addition, programs targeting youth audiences reached over 672 children through school presentations and traditional 4-H.

Landowners, public policy makers, and ordinary citizens are interested in and affected by the future of rural lands in Wyoming. Important services such as scenic view sheds, wildlife migration corridors, and public access can also be adversely impacted by fragmentation of agricultural lands. All residents both urban and rural dwellers have a stake in managing growth to protect those public values. Land use planning is a persistent challenge for rural communities of the Intermountain West. A role for Land Grant Universities in planning activities is provided through lessons learned in four county projects. Focus groups and interviews were conducted to develop mail surveys concerning land use preferences and planning opportunities. Results were provided in a range of outlets including academic and applied refereed journals, agricultural experiment station bulletins, popular press and in presentations both professionally and at the county level. These survey results provide scientifically collected information usable in updating county land use plans. Inclusiveness, reciprocal communication, transparency, and objectivity are illustrated as keys to success in applied research and outreach programming. A large share of the state's income is generated from extraction of mineral and fossil fuels. Big sagebrush, if present in pre-mined areas, is required to be re-established following surface mining activities. Reclamation specialists have finally mastered techniques to successfully re-establish the shrub, however, long-term survival remains challenging due, in part, to the effects from heavy wildlife browsing. Since bond release depends on long-term establishment of big sagebrush, reclamation specialists are now concerned about the impacts of wildlife browsing on big sagebrush survival, and contemplating management practices to increase big sagebrush survivability by reducing browsing impacts. Newly reclaimed coal mine lands support relatively young, highly palatable, and nutrient-rich plant communities that attract wildlife. Restriction of public access and hunting on mine land property further encourages wildlife to habitually utilize these reclaimed sites. On some mine properties, impacts on big sagebrush and other seeded plant species from wildlife use is severe enough to prevent successful post-mining reclamation, which subsequently, can prevent mining companies from obtaining bond release money. To investigate the influence of wildlife utilization on big sagebrush growth and survival, a game-proof exclosure was constructed on a portion of reclaimed coal mine land at North Antelope Coal near Gillette, WY. Field data was collected inside and outside the exclosure for 2 years on percent browsed/unbrowsed big sagebrush plants, mean annual leader length (growth), big sagebrush density, percent plant species composition, and plant diversity. Results indicated higher mortality of big sagebrush seedlings outside the exclosure, greater percent of big sagebrush seedlings browsed outside (100%), significantly lower seedling density outside, significantly shorter leader lengths outside, and significantly lower big sagebrush seedling percent cover outside. Plant species similarity (percent species composition) and diversity were not different between inside and outside the exclosure. Project data suggested that browsing by rabbits (primarily), deer, and antelope had a significant impact on big sagebrush seedling survival in just 2 short years of this research effort.

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. Small acreage workshop evaluations showed that participants learned how to recognize the abuse and neglect land issues and learned how to return the land to healthy and productive landscapes. One hundred percent of the youth participants showed increased knowledge and skills as a result of educational efforts.

A role for Land Grant Universities in planning activities is provided through lessons learned in four county projects. As a result of the combined research/education project, Sublette, Uinta and Sheridan Counties had personnel that pursued land use planning training opportunities with the Sonoran Institute. All three are updating their county land use plans utilizing portions of the LGU research. In Moffat County wilderness and monument designation proposals are being addressed as a part of its comprehensive planning process. Moffat County has hired two individuals to its Natural Resources Management unit, has hired a county planner and has contracted for an economic base study from the LGU in order to further inform county decision-making. A follow-up phone survey was conducted in September 2002 with the county planning offices to determine the level of awareness about, and perceived usefulness of, the project work in each of the four counties. All four counties had planners in place. All four counties were or recently had updated their county land use plan and were aware of the University research report. All had seen the results and deemed them useful, although one planner indicated that some results were too politically sensitive to incorporate directly into the updated county land use plan. All planners agreed that information provided electronically and in state and regional forums were helpful in their planning. Inclusiveness, reciprocal communication, transparency, and objectivity are illustrated as keys to success in applied research and outreach programming. To investigate the influence of wildlife utilization on big sagebrush growth and survival, a game-proof exclosure was constructed on a portion of reclaimed land at North Antelope Coal near Gillette, WY. Project data suggested that browsing by rabbits (primarily), deer, and antelope had a significant impact on big sagebrush seedling survival in just 2 short years of this research effort. Reclamation specialists at North Antelope Coal mine (and several adjacent mines with similar wildlife problems) are realizing the magnitude of impact that browsing wildlife exert on big sagebrush seedlings. In response, these specialists are formulating post-reclamation management procedures and long-term planning to reduce seedling damage from wildlife. Possible management actions include: improving habitat on adjacent native rangeland (prescribed burning, mechanical treatments, chemical applications) to improve wildlife distribution; use of repellents and/or live traps in a traditional animal damage management scenario; removal of desirable habitat components for rabbits (e.g., rockpiles, brushpiles); and consideration of limited supervised hunting on mine property.

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

d. Scope of Impact - State Specific

Multi-state research (W-170) (AR, CA, CO, FL, GU, HI, IA, IL, IN, KS, OH, OK, MD, MI, MO, MT, NM, NY, OR, PA, TX, VA, WA, WY, Canada)
Integrated Research and Extension

Key Theme – Biodiversity

a. In a 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 the 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. The sites were visited and intensively inventoried during 2001 and 2002. A two year study was initiated in the summer 2002 to evaluate long-term effects of livestock grazing exclusion on plant and small mammal communities of semi-arid western rangelands using 40+ year old exclosures located in two different areas of western Wyoming. During June and July, 2002 and 2003, vegetation was sampled inside and outside eight exclosures in sagebrush dominated sites. Concurrently, small mammal communities were sampled using mark recapture live-trapping inside and outside exclosures. A large share of the state's income is generated from extraction of mineral and fossil fuels. Research and education programs on reclaiming disturbed sites benefit individuals, communities, and the state by enhancing the productivity and stability of reclaimed lands. In 1977, a study was initiated in south central Wyoming to evaluate the effects of variable topsoil depth replacement on plant community establishment and production. Topsoil was replaced on a reclaimed coal-mining site at depths of 0, 20, 40 and 60 cm. This research site was re-evaluated in 2001 to determine differences in plant species richness, production, percent canopy cover and diversity between topsoil depths.

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. Potential impacts of livestock grazing on wildlife and vegetation resources of western public lands have sparked debates across the United States. A two year study was initiated in summer 2002 to evaluate long-term effects of livestock grazing exclusion on plant and small mammal communities of semi-arid western rangelands using 40+ year old exclosures located in two different areas of western Wyoming. Base on the limited data from eight exclosures used in this project, it appears that there is no major impact on vegetation and small mammal communities from livestock grazing. This preliminary research effort is just a small initial contribution toward resolving the debate of livestock grazing impact on vegetation and wildlife resources of western rangelands. This study needs to be replicated again across a larger number of exclosures and study sites to verify the consistency of these results. Since reclaimed surface mining areas will most likely remain intact for years following mining, it is critical that reclamation specialists understand the effects of variable topsoil depth replacement on long-term plant community structure and function. These plant community characteristics will have significant influence on a multitude of natural resource components associated with these reclaimed areas for years after initial reclamation. Varying topsoil depth when reclaiming surface mined lands, especially on a site with irregular topography, can provide one opportunity to create mosaic vegetation patterns and diverse plant community characteristics. With recent interest in landscape-scale heterogeneity, this reclamation

approach has numerous beneficial management implications for a number of natural resources including wildlife, livestock grazing, recreational uses and aesthetic values.

c. Source of Funding – Hatch, State

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

Key Theme – Integrated Pest Management

a. Grasshoppers annually consume abut 25% of rangeland forages in the 17 western states at an estimated loss of $400 million. Because of dwindling federal funding, the responsibility for grasshopper control in the western U.S. is borne almost entirely by the producer. Therefore, there is a compelling need to develop economically and environmentally viable strategies of grasshopper management, which sustain profits, reduce the insecticide expense and preserve non-target fauna. 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 which dramatically reduces the amount of insecticide applied and the cost of control. Based on the findings of the innovative applied grasshopper research at UW, a group of entomologists from UW developed a "Grasshopper Management Train-the-Trainer Workshop" and delivered this product at a state-wide meeting of the Wyoming Weed and Pest Districts in March 2002. In 2003, the workshop was delivered to specialists in three neighboring states–Colorado, Nebraska, and Montana. The three workshops reached over 120 specialists–predominantly weed and pest supervisors, USDA-APHIS personnel, and extension educators. The workshops focused on the three-phase approach to integrated grasshopper pest management advocated by the National Grasshopper Management Board: prevention (via cultural management), intervention (via hotspot detection and control), and suppression (via reduced agent-area treatments /RAATs/ of infestations exceeding the economic threshold). At the request of the Food and Agriculture Organization of the United Nations (FAO UN), two UW entomologists conducted a three day training workshop on RAATs strategies for the National Locust Control Services of six Central Asian counties. Over 50 specialists from Uzbekistan, Kazakhstan, Turkmenistan, Tajikistan, Kyrgyzstan, and Afghanistan received hands-on training on effective RAATs approaches. In addition, researchers at UW have developed a sampling method to assess rangeland grasshopper infestations and determine if they are at densities that will threaten forage for wildlife and livestock.

b. Impact –The use of RAATs reduces the costs of grasshopper control by approximately 50 to 60%, depending on the agent and swath width. If a standard insecticide application costs $2.50 per acre, the equivalent RAATs program costs approximately $1.15 per acre protected. In 2003, about 400,000 acres of rangeland were protected from grasshoppers in Wyoming using RAATs, which save local producers over half a million dollars. Successful operational RAATs programs have been conducted in eight western states. Besides the economic advantages, RAATs strategy has tangible environmental benefits. Using RAATs, 60 to 75% less insecticide is applied to rangelands for grasshopper control. The RAATs 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." Due to impact on the profitability and sustainability of western agriculture, the train the trainer workshops conducted in 2003 will be expanded to up to six western states (North and South Dakota, Utah, Idaho, Oregon, and Washington). 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 – 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. Examples of such research reported earlier in this annual report are precision application of the soil fumigant, Telone II, Cercospora leaf spot study, the Reduced Agent-Area Treatments (RAATs), reclamation studies and efforts to establish an alfalfa variety that is resistant to Brown Root Rot. Drought of varying local intensity across Wyoming over several years has focused attention on the plight of livestock producers, grazing management on public and private lands, and grazing impacts on these lands. Drought is a catalyst for a number of issues involving grazing management strategies, monitoring of grazing use and impacts, and the livestock production systems and practices being used. The reductions in forage productivity associated with drought require monitoring as the tool that allows producers to adjust grazing practices, such as season and intensity of use, to be more effective at supplying forage for animals while conserving the condition of the forage resource. Drought is a recurring meteorological phenomenon that virtually dictates producers have flexible systems allowing adjustment of stocking to variable forage supplies.

b. Impact – A much larger number of producers, agency managers, and Extension educators are aware of the importance of monitoring resources and use of that information in identifying management options and decision points. Changes in practices are slower in developing, partly because of the continuation of drought limits change. Changes that have occurred include substantive (40-60 percent) destocking across much of Wyoming in response to lack of grazable forages, hays, or other low cost alternative feeds.

c. Source of Funding – Hatch, State

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

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. Wyoming coal contains large deposits of coalbed methane (CBM) that are being rapidly developed. Currently, about 16,000 wells are in production and this number is expected to go up to 60,000. It has been estimated that over the next 15 years CBM water production in the Powder River Basin (PRB) of Wyoming and Montana will exceed 366,000 ha-m. Often 2 to 10 extraction wells are combined together into one discharge point and product water region is being applied to rangelands and agricultural fields or released into unlined disposal ponds and/or stream channels. However, the potential use of CBM product water for irrigation in semi-arid environments requires a careful evaluation of its chemistry (pH and major elements), salinity (EC, electrical conductivity) and sodicity (SAR, sodium adsorption ratio). Water samples from northwest PRB in Wyoming were collected and analyzed for pH, EC, and SAR values. Water quality data indicated that water pH levels ranged from 7 to 8.9, EC from 1.83 to 3.95 dS m-1 and SAR from 15 to 38. Clearly, EC and SAR values of CBM water samples were greater than the recommended values for irrigation use (0.75 dS m-1 and <10 SAR) Impacts of these poor-quality CBM waters on soil physical and chemical properties were evaluated by collecting soil samples during the 2003 irrigation season from 6 depths from 6 sites that received CBM water applications for up to 3 years, which were compared to control sites The results of this study will be useful to CBM companies, federal and state regulatory agencies, private landowners and others in understanding the potential changes in soil properties due to land application of CBM waters and to develop possible mitigating criteria for preserving impacted PRB ecosystems.

b. Impact - This study found significant differences ($p = 0.05$) between fields receiving CBM water and control plots. The pH values were significantly greater in irrigated plots than control plots at depths of 0-5 and 30-60 cm in site 1 and 0-60 cm in site 4. The EC values were significantly greater in irrigated fields than control plots at 0-60 cm depth in Site 1, 5-30 cm in site 3, 0-60 cm in site 4, 0-5 cm in site 5 and 0-15 cm in site 6. SAR values were significantly greater in irrigated fields than control plots in the upper 60 cm in site 1, 0-5 cm site 4, 0-60 cm in site 5 and 5-15 cm in site 6. Infiltration values in control plots were significantly greater than irrigated plots in site 5. The research associated with CBM water quality is influencing the development considerations associated with this industry. Such information will help water users (landowners, agriculture and livestock producers, and ranchers) and water managers (state, federal, and local agencies) with the planning and management of CBM product water within the PRB.

c. Source of Funding – Hatch, State

d. Scope of Impact – State Specific

Multi-state Research (W-170,) (AZ, CA, Canada, CO, FL, GU, HI, IA, IL, IN, KS, MI, MD, MT, ND, NM, NV, NY, OH, OK, OR, PA, 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 seven Hatch projects and five of the seven are multi-state projects. The research effort includes 4.5 FTEs with expenditures of approximately $.19 million Hatch and $1.5 million State.

Cooperative Extension Service FTEs 10.72	
Goal 4 Allocated Funds	$1,000,080.97

Goal 4 - IMPACTS

UW CES Develops TV Programming for Wyoming Citizens on Natural Resources

Situation:

The UW Cooperative Extension Service (CES) established the Sustainable Management of Rangeland Resources (SMRR) Initiative Team because of the profound influence natural resource issues have on the economy, quality of life, and the "custom and culture" of Wyoming communities. CES had been conducting natural resource programs for farmers and ranchers for decades. Yet little if anything had been done to deliver programming on the importance, conservation, and preservation of natural resources to the general public.

Some extension advisory board members expressed dismay that agriculture is sometimes unjustly accused of poor stewardship of natural resources, and they encouraged CES to produce educational programs about the state's resources, to help counter this perception. With some out-of-the-box thinking, the SMRR team took action to develop a public/private approach to education by working with a statewide commercial TV station to run UW CES-produced videos on natural resources during a pre-selected news hour each week.

The SMRR team identified three people to take leadership in this endeavor: Tom Heald, Eric Peterson, and Gene Gade, all CES area educators. Heald, through his contacts with the media in Casper, developed the concept with the KTWO (K2) TV news director. He also contacted a private videographer to shoot, edit, and deliver the film to K2. Peterson and Gade developed the content and presented the programs on camera. Initially, it was agreed that 12 segments, each 70 seconds in length, would be created as a pilot to see how they played for

commercial television. After eight segments, both K2 and the SMRR team agreed to develop an additional 26 segments. They coined these segments "Wyoming's Natural Resources," and K2 TV aired them twice per week – on Wednesday evening and Thursday morning news broadcasts.

Twenty-one programs have been shot on location in Wyoming from November 2002 to October 2003. Topics have been as diverse as the resources in the state. Subject content ranged from how sagebrush has adapted to the harsh environment to why burning can promote aspen growth and comparing ancient Native American use of the land to today's oil economy.

Impacts

It is estimated that one or more of these TV spots reached more than 30,000 homes in Wyoming. The value of these spots cannot be calculated in the form of a dollar impact to the public in Wyoming. However, individuals who viewed the spots gained a better understanding and awareness of natural resource issues and how they impact the total state. CES is identified as a reliable source of information and education on natural resources. These TV segments generate an ongoing communication with a diverse audience that otherwise would be difficult to achieve.

In one concrete example of impact to viewers, a rural Natrona County landowner e-mailed Gade following a program on the differences between warm and cool-season native grasses, noting the relevancy of the topic to his situation and posing a question to Gade dealing with a specific problem. After subsequent follow up, the landowner professed his intent to alter his management practices.

The programs also give visibility to the University of Wyoming and CES representing a tangible response to advisory input from CES clientele.

To validate the effectiveness of media efforts, a literature review was conducted. Research studies by the Coast Guard and the National Cancer Institute have shown that TV public service announcements are the single most important medium for generating awareness. The Coast Guard, with two decades of information on the announcements, reported that 79 percent of all inquiries were a result of TV public service announcements while the National Cancer Institute found that 55 percent of their inquiries came from such TV announcements, double any other media.

Current data suggest that well conceived and soundly executed TV campaigns provide an effective communications technique for non-profit organizations. Television has had an important impact in getting the CES message heard and in generating the desired response.

The K2 news director responded to these Natural Resources Segments by writing, "Everyone who sees these segments really enjoys them. I'd like to continue that as long as possible."

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Cooperative Extension Service
University of Wyoming

Kates Basin Fire Rehabilitation Plan

Situation:

A fire occurred in Kates Basin in the summer of 2000. Kates Basin is an area east of the Absaroka Mountains and west of the town of Thermopolis. The fire destroyed 138,000 acres. Most of the burned area lies within the Wind River Indian Reservation and is managed by the Bureau of Indian Affairs. The predominant use or historical use of the area has been livestock grazing by eight permit holders. The fire destroyed all of the rangeland in the area and 82 percent of the timber. After the fire it was necessary to replace the entire infrastructure in the area (roads, fences, out buildings and livestock watering facilities). When the permit holders applied for federal disaster assistance, the managers for those programs wanted to see the long-range management plan. What plan? A long-range plan for the burned area did not exist.

The Wyoming Rural Development Council, the Wyoming Department of Forestry, the Bureau of Indian Affairs, and the University of Wyoming Cooperative Extension Service (CES) seized the opportunity to put together a long-range multi-resource plan. The Wyoming Rural Development Council under the leadership of Mary Randolph along with Jim Arnold of the Wyoming Division of Forestry had the necessary funding resources and took the lead on the project. The role of CES in the process was to partner with the lead agencies and assist in identifying and clarifying the issues to be covered by the long-range multi-resource plan, assist with the interview process, participate in the selection of a consultant to write the plan, and facilitate the process of keeping the permit holders at the table.

The process of keeping the permit holders or stakeholders involved in this process was the biggest challenge facing all of those who were involved in writing the plan. The permittees had never really talked together about coordinated management plans on common ground. Historically, the permit holders had always put livestock on the grazing allotments as early as they could and removed the livestock as late as they could. Until now this grazing method had been acceptable, but all of those involved in the long-range plan agreed that better methods would most likely benefit the entire area. The allotments have always been under utilized due to water placement resulting in poor livestock distribution during the grazing season. Those areas where livestock have been concentrated around water are over utilized and many are infested with invasive species of weeds. These conditions do not indicate that the producers holding grazing permits are poor producers but just that they have never really talked about the problem. What the conditions do reflect is a historical gap in planning that has allowed high-use areas to perpetuate conditions not conducive to sustainable range resource management.

Impacts

The major impact resulting from this event was that eight livestock producers holding grazing permits on a common grazing allotment came together in response to a disaster and developed a coordinated long-range multi-resource management plan that will ultimately result in the sustainable management of the rangeland resource for many years into the future.

The long-range coordinated resource management plan points to the following measurable goals on the common allotment:

- Control of invasive weeds species and management methods to prevent future infestations of new species.
- Development of and placement of livestock watering facilities within the allotment.

- Implementation of grazing management systems to better utilize the range resource in years of adequate moisture as well as in drought years.
- Management of endangered and threatened species within the allotment.
- Wildlife management and habitat improvement.
- Timber regeneration and management for sustainability.
- Protection of the riparian areas along the fragile watershed areas.
- Road placement and management to minimize the impact of roads on the allotment.
- Protection of archeological, historical, and culturally sensitive sites.
- Better wildfire management plans for future disasters.

The long-range plan enables livestock producers, resource managers, and tribal interests to be eligible for federal assistance necessary to implement the rehabilitation of the burned area. For example, the replacement of the 1,200 miles of fence at $5,000 per mile carries a 2.5 to 6 million dollar price tag depending on type of materials used. This process will take many years. Full rehabilitation excluding reforestation of the area will take 10 to 20 years. Restoring the timber resource will take a minimum of 60 to 75 years.

This situation is a powerful testimony to good land stewardship by eight permit holders who did not agree and do not agree today on all the management objectives for the area. However, each of the stakeholders had the courage to stay at the table and help develop a reasonable long-range management plan that has the potential to significantly improve the value of the management area and make it more sustainable for future generations.

One of the criticisms of the plan has been that the science is too basic and does not represent the most contemporary thought in coordinated resource management planning. It is important to realize that some of the current science is not always applicable under the range conditions at the site. It is also important to realize that some of the current resource management methodology is not always cost effective for the stakeholders. The management objectives are to practice responsible stewardship based on sound management, develop and maintain a vigorous rangeland resource to meet the needs of the tribal members and permittees, and protect and develop water resources while maintaining water quality. As time goes by some of the current methods will be implemented. The plan is a dynamic work in progress and to be effective it must change periodically to meet the changing needs of a sustainable rangeland resource.

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Eastfork Livestock a Model in Wyoming Environmental Stewardship

Situation:

Rangeland Monitoring has been an important issue for the Sublette County Cooperative Extension Service (CES) for a number of years. In 1996, the concept of rangeland monitoring

began catching fire in Wyoming. Fresh off of the controversies precipitated by "rangeland reform," extension monitoring workshops across the state were in great demand. In Sublette County, many forest service grazing permits are "common permits" in which several permittees share an allotment by banding together as a grazing association. Grazing associations commonly parcel out responsibilities for maintaining permits. If monitoring is to be accepted within an association, the chore needs to be an association responsibility.

For this reason the Sublette County CES initialized an effort with forest grazing associations to implement rangeland monitoring and to internalize the practice as an association responsibility. CES organized a meeting of the principal stakeholders of local grazing associations in the county with CES Specialist Kelly Crane to talk about having the associations accept a monitoring responsibility. Concurrently, Lincoln County permittee Truman Julian precipitated the formation of a monitoring committee for the Bridger-Teton forest consisting of cattlemen, sheepmen, forestry representatives, UW range specialists, and the Sublette CES educator. Two representatives from the associations CES recruited became part of a group that eventually developed a Bridger-Teton Forest Permittee Voluntary Monitoring protocol. It became the genesis for the state's multi-agency Permittee Monitoring Handbook.

Joel Bousman, owner of Eastfork Livestock, was part of that committee and was anxious to implement a monitoring program on his association's forest permit. A monitoring ride organized to the wilderness allotment drew 24 participants including a dozen permittees, CES county and state specialists, forest service representatives, and Bureau of Land Management, Natural Resource Conservation Service, and game and fish personnel. After "on the fly" monitoring training from CES, the group toured the allotment, developed monitoring objectives, and installed the first permittee monitoring locations. CES has been involved in every monitoring tour since, teaching, advising, and counseling permittees in the management and direction of the Silver Creek monitoring program.

Eastfork Livestock of Boulder has been a model cooperator for the University of Wyoming and the Sublette County CES monitoring program. Each year the Wyoming Stock Growers Association recognizes a ranch operation in the state as its annual "Environmental Stewardship Award" winner. This year the Eastfork Livestock operation was selected as the environmental stewardship winner because of its involvement in the voluntary permittee monitoring program and other stewardship and industry accomplishments. The Sublette CES educator and the Pinedale Natural Resource Conservation District's area conservationist nominated Eastfork for the award. A nomination package was developed detailing the ranch's operation and conservation efforts including supporting data and letters. As the award winner, Eastfork Livestock was open to tour for residents and dignitaries from across the state.

The award came as the result of CES initiated rangeland monitoring work done in the wilderness on forest service grazing allotments. Sublette County CES prepared a slide presentation to tell the story of the ranch's history, operation, and achievements.

Approximately 150 people attended the festivities. As part of the program, participants boarded busses to visit the ranch and to participate in a field demonstration of monitoring practices that CES had taught the family, to talk about issues facing the ranch and the ranch's plans for the future, which include expanding the monitoring program to BLM lands.

Impacts

In the Upper Green and Silver Creek associations, Sublette County now has about 25 to 30

permit holders with more than 9,000 permitted head of cattle involved in voluntary permittee monitoring programs. Joel Bousman's involvement in the Silver Creek monitoring program has lead to his participation as an instructor in many CES and industry educational programs. His accomplishments and commitment to promote the message of the importance of permittee monitoring has been admirable. The recognition of Bousman's leadership in permittee monitoring is well deserved, and the award is a validation of extension's effort and success in promoting permittee monitoring.

The tour and publicity generated by the award has increased the general public's knowledge of the stewardship of federal grazing permittees. As a direct result of participating in the stewardship tour, one permittee has initiated a cooperative monitoring program with CES and the Pinedale district of the forest service.

In addition to this long-term stewardship of the resource, an important outcome is the expansion of monitoring efforts onto Bureau of Land Management lands – a challenge made easier as a result of this effort. Additionally, the recognition given Eastfork Livestock for its stewardship and the recounting of the story behind the Bousmans' involvement in the monitoring effort has stimulated more forest service permittees to approach CES about launching their own monitoring efforts.

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UW CES Educates the West on the Best Strategies to Manage Pest Grasshoppers

Situation:

Grasshoppers annually consume about 25% of rangeland forages in the 17 western states of the U.S. at an estimated loss of $400 million. Because of dwindling federal funding, the responsibility for grasshopper control in the western U.S. is borne almost entirely by the producer. Therefore, there is a compelling need to develop economically and environmentally viable strategies of grasshopper management, which sustain profits, reduce the insecticide expense and preserve non-target fauna.

Based on the findings of the innovative applied grasshopper research at the University of Wyoming, a group of entomologists from UW developed a "Grasshopper Management Train-the-Trainers Workshop" and delivered this product at a state-wide meeting of the Wyoming Weed and Pest Districts in March 2002. The goal of the workshops was to provide pest managers in the western states with the principles and practices that allow them to deliver to the end-users (federal land managers, farmers and ranchers) the best, available rangeland grasshopper pest management systems in the context of the site-specific situations that they encounter. The project was funded through a grant from the USDA-APHIS. In 2003, the workshop was delivered to the specialists in three neighboring states – Colorado, Nebraska and Montana. The total attendance

of the three workshops exceeded 120 specialists – predominantly weed and pest supervisors, USDA-APHIS personnel and extension educators. The workshops focused on the three-phase approach to integrated grasshopper pest management advocated by the National Grasshopper Management Board: prevention (via cultural management), intervention (via hotspot detection and control), and suppression (via reduced agent-area treatments /RAATs/ of infestations exceeding the economic threshold).

Impacts

The use of RAATs reduces the costs of grasshopper control by approximately 50 to 60%, depending on the agent and swath width. If a standard insecticide application costs $2.50 per acre, the equivalent RAATs program costs approximately $1.15 per acre protected. In 2003, about 400,000 acres of rangeland were protected from grasshoppers in Wyoming using RAATs, which saved the local agriculturists over half a million dollars. Successful operational RAATs programs have been conducted in eight western states. Besides the economic advantages, RAATs strategy has tangible environmental benefits. Using RAATs, 60 to 75% less insecticide is applied to our rangelands for grasshopper control.

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Influence Of Variable Topsoil Replacement Depth On Plant Community Attributes 24 Years After Reclamation

Situation:

Achieving plant species alpha (community level), beta (ecosystem level), and gamma (landscape level) diversity on reclaimed surface mining sites is one of the more difficult aspects of mining reclamation requirements. Reclamation researchers have examined the effects of variable topsoil replacement depths on short-term plant production, but not on long-term production, species richness and diversity. Since reclaimed surface mining areas will most likely remain intact for years following mining, it is critical that reclamation specialists understand the effects of variable topsoil depth replacement on long-term plant community structure and function. These plant community characteristics will have significant influence on a multitude of natural resource components associated with these reclaimed areas for years after initial reclamation.

In 1977, a study was initiated in south central Wyoming to evaluate the effects of variable topsoil depth replacement on plant community establishment and production. Topsoil was replaced on a reclaimed coal-mining site at depths of 0, 20, 40 and 60 cm. This research site was re-evaluated in 2001 to determine differences in plant species richness, production, percent canopy cover and diversity between topsoil depths. Species richness was highest (7.5) at the 0 cm depth and lowest (5.6) at the 60 cm depth. Production was similar for the 40 (727 kg ha-1)

and 60 cm (787 kg ha-1) topsoil depths compared to the 0 (512 kg ha-1) and 20 cm (506 kg ha-1) depths. Mean percent canopy cover of grasses was greatest at the 60 cm (25%) depth and least at the 0 cm (15%) depth, while percent forb canopy cover was highest at the 0 cm (6%) depth and lowest at the 60 cm (2%) depth. Diversity, using the Shannon-Weiner diversity index, was highest (2.36) at the 0 cm depth and lowest (1.87) at the 60 cm depth. In essence, species richness and diversity decreased, while production increased with increasing topsoil depth. There was higher percent canopy cover of grasses and lower forb cover with increasing topsoil depth. Variable topsoil replacement depths can influence long-term plant species composition and production on reclaimed mined lands, thereby offering management options to manipulate vegetation mosaics at the community, ecosystem, and landscape levels.

Impacts

Varying topsoil depth when reclaiming surface mined lands, especially on a site with irregular topography, can provide one opportunity to create mosaic vegetation patterns and diverse plant community characteristics. With recent interest in landscape-scale heterogeneity, this reclamation approach has numerous beneficial management implications for a number of natural resources including wildlife, livestock grazing, recreational uses and aesthetic values. Most post-mining reclamation evaluation focuses on short-term results. More research is needed to evaluate the long-term benefits of various reclamation practices on natural resources associated with these sites.

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Impacts of Land Application of Coalbed Methane (CBM) Water on Soil Physical and Chemical Properties in Wyoming

Situation:

It has been estimated that over the next 15 years CBM water production in the Powder River Basin (PRB) of Wyoming and Montana will exceed 366,000 ha-m. Often 2 to 10 extraction wells are combined together into one discharge point and product water region is being applied to rangelands and agricultural fields or released into unlined disposal ponds and/or stream channels. However, the potential use of CBM product water for irrigation in semi-arid environments requires a careful evaluation of its chemistry (pH and major elements), salinity (EC, electrical conductivity) and sodicity (SAR, sodium adsorption ratio).

Water co-produced from many of the CBM wells in the PRB region is currently being applied to rangelands and agricultural fields. Water samples from northwest PRB in Wyoming were collected and analyzed for pH, EC, and SAR values. Water quality data indicated that water pH levels ranged from 7 to 8.9, EC from 1.83 to 3.95 dS m-1 and SAR from 15 to 38. Clearly, EC and SAR values of CBM water samples were greater than the recommended values for

irrigation use (0.75 dS m-1 and <10 SAR) Impacts of these poor-quality CBM waters on soil physical and chemical properties were evaluated by collecting soil samples during the 2003 irrigation season from 6 depths from 6 sites that received CBM water applications for up to three years, which were compared to control sites.

Impacts

This study found significant differences ($p = 0.05$) between fields receiving CBM water and control plots. The pH values were significantly greater in irrigated plots than control plots at depths of 0-5 and 30-60 cm in site 1 and 0-60 cm in site 4. The EC values were significantly greater in irrigated fields than control plots at 0-60 cm depth in site 1, 5-30 cm in site 3, 0-60 cm in site 4, 0-5 cm in site 5 and 0-15 cm in site 6. SAR values were significantly greater in irrigated fields than control plots in the upper 60 cm in site 1, 0-5 cm site 4, 0-60 cm in site 5 and 5-15 cm in site 6. Infiltration values in control plots were significantly greater than irrigated plots in site 5. Results of this study will be useful to CBM companies, federal and state regulatory agencies, private landowners and others in understanding the potential changes in soil properties due to land application of CBM waters and to develop possible mitigating criteria for preserving impacted PRB ecosystems.

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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 economy of Wyoming communities has 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 8 percent growth rate in jobs, while neighboring states enjoyed a 13 percent growth rate.

Community assessments conducted throughout Wyoming consistently identify community economics as a major issue or concern among residents, businesses, community leaders, elected officials and young people. Cooperative Extension is working to enhance Wyoming communities and the well being of households through relevant integrated educational and resource management programs. CES focuses on increasing the capacity of communities, enterprises and families to create communities in Wyoming which offer a sustainable future in which to live learn and work.

The Federal Government manages a significant amount of the land area in the Western United States. 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 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. Researchers are working with Wyoming communities, assisting them with identifying impacts of change, developing community network resources, and identifying growth opportunities for existing businesses. Multi-state projects interface retailers, small manufacturers, and home-based businesses; helping these businesses identify economic development and growth opportunities in their rural locations.

Key Theme - Family Resource Management

a. Cooperative Extension Family and Consumer Science Educators in five extension areas conducted 33 financial management classes reaching 502 individuals. Topics included credit, savings, insurance and risk management, financial security in later life, pocket change series, and basic budgeting. Of the 502 total participants, 408 attended single topic workshops and 94 completed in-depth financial management courses that entailed three to eight sessions in length.

b. Impact - Impact documented through evaluations on financial management programs included:
   - 60% of participants established at least one financial goal.
   - 80%better understand the costs of credit and dangers of making only the minimum

payment.

- 90% reported they learned new information in the classes.
- 45% have set a long term financial goal and have a written plan for managing debt.
- 70% will review their insurance policies to check level of risk management.
- 100% reported they were making changes in their money management practices.

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 - Farm Safety

a. 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. One farm safety day camps were held for 507 youth. Another county held safety programs reaching 560 children and developed a display used at the county fair which was viewed by over 3000 residents. Horse safety was the theme in one county with programs that reached 139 youth. 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. One county focused on equestrian helmet safety, where educational programs were presented and jointly with 4-H and other youth groups provided helmets for special needs youth, low income families or other youth in need. An additional two dozen helmets have been distributed.

b. Impact – A follow up survey sent to farm safety camp participants indicated:
   - Scores from a pre-test/post-test during farm safety day camp indicated sores increased from 65% to 86%.
   - 100% of youth participants were able to list at least one new thing they had learned as a result of the camp. A few of the responses were: "I make sure my animals and I are away and safe from the rivers." "Don't pick up an electrical wire off the ground from a telephone pole, it will zap you" and "Now I know I should talk to horses before you go

up to it, or it will spook. If you walk on the side of the horse they can see you."
- 100% reported at least one safety skill they had taught to someone else that they learned at day camp.

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

d. Scope of Impact - State Specific

Key Theme - Community Development

a. 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. Seven community economic development analysis projects were conducted and thirty three educational workshops, classes, and seminars reached over 650 individuals. Topics included facilitation skills, women in agriculture, mediation training, Immigration law, public speaking, and leadership development.

b. Impact - A total of seven community economic development analysis projects were conducted. Outcomes from the analysis included:
   - A pilot project on livestock grazing is currently being conducted comparing the impacts of livestock grazing to tourism in Fremont County.
   - Five counties benefited from analysis of the economic impact of endangered species listing for the Preble's Meadow Jumping Mouse. Data was submitted to the Governor to be used to modify the critical habitat designation of the mouse. The Fish and Wildlife Service has reduced the critical habitat acreage designation for Wyoming by 50 percent.
   - The BLM will use analysis of the Pinedale Resource Management Plan in making decisions regarding the future use of the Pinedale Resource Management Area.
   - BLM will use the economic analysis which considers livestock grazing, recreation, and mineral development on BLM land in Albany, Carbon, and Sweetwater Counties. This analysis will be used by the BLM in decisions regarding the future use of the Rawlins Resource Management Area.
   - The Medicine Bow National Forest will be able to consider economic importance of the Forest to Albany, Carbon, and Converse Counties as it revises the Forest Plan.
   - The Bighorn National Forest will able to consider the economic importance of the forest to Big Horn, Johnson, Sheridan, and Washakie Counties as it revises the Forest Plan.
   - Uinta County has been able to get the USFS to consider the effects of the Wasatch-Cashe Forest Plan Revisions on the local economy.

   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 82% of individuals were implementing some change in practice as a result of educational efforts. Specific outcomes include:

- 19 participants in a public speaking workshop now know how to use debriefing questions, how to get participation, and can identify adult learning styles.
- Leadership Institute participants in two counties reported the following short term outcomes: Communication, problem solving, decision making, building relations, and leadership abilities improved. Medium term outcomes measured six months following the 8 month program included: 1) WLI graduates are emerging as leaders in the community; 2) participants reported becoming active on city and county boards; 3) individuals reported goals set during the program were achieved; 4) graduates are demonstrating leadership skills in community organizations. Long-term impacts measured from follow-up surveys with 2002 graduates include: 100% of graduates are implementating teambuilding tools, 90% of participants are using communication and managing change tools. 100% of respondents are involved in the community at either the same level or more after the course.
- Facilitation training participants reported in a three month follow-up that the most significant things learned were: group stages are normal, facilitation tools, moving groups forward, valuing all points of view and being flexible, group dynamics, listening styles, and how to build consensus.
- Basic finance classes reported the following impacts: 1) 95% reported they understand where to begin in managing money. 2) 95% understand the role values play in spending. 3) 87% understand the role of emotions in money management and identified realistic short term money management goals and learned skills to improve communication about money. 4) 80% of class participants identified realistic intermediate financial goals.

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

d. Scope of Impact - State Specific
Multi-State Research (W-194) (NY, OR, WA, WY)
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, and decision making abilities, striving for excellence, leadership, and interpersonal relationship building. Wyoming had 6,775 youth and 1,912 volunteer leaders enrolled in the traditional

4-H youth program. Over 186 workshops, camps and clinics were held in counties throughout the state reaching over 9000 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 five 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. Traditional member's 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

a. State 4-H Youth Specialist, Extension Educators, and 4-H Program Associates presented training to the 1,912 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. Six hundred ninety five 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.

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 900 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.

b. Impact - Over 695 volunteer leaders, approximately 36% 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 89% 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%.

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

d. Scope of Impact - State Specific

Key Theme – Impact of Change on Rural Communities

a. 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 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 rural communities in Wyoming. As a result, federal management agencies, state government, and local governments in Wyoming and the West, all have a need for reliable information on the effects of federal land management decisions on the economies of local 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 – Several economic analyses associated with Federal land management planning efforts in Wyoming and the Western United States provide important information that is used to assist in the planning process to make decisions that are critical to the future of Wyoming. There is a regional effort that focuses on the relationship between Federal land policies and rural communities. A pilot project on livestock grazing is currently being conducted in Fremont County. As a part of this project, a paper comparing the economic impacts of livestock grazing to tourism will be presented as a part of a symposium regarding the change rangeland user at the Society for Range Management Meetings in Salt Lake City.

An analysis was conducted on the economic impact of endangered species listing for the Preble's Meadow Jumping Mouse on the economy of Southeastern Wyoming. Researchers gathered information from "Listening Sessions" in five counties about the cost that producers would likely incur as a result of the mouse listing. A preliminary analysis was conducted and a report submitted to the governor's office in May 2003. This report was used as a part of state and local government efforts to modify the critical habitat designation for the mouse. The Fish and Wildlife Service has reduced the critical habitat acreage designation in Wyoming by 50 percent. Ongoing work continues on a computer model that will estimate producers' costs and translate these to economic impacts on the regional

economy. These efforts have allowed the State of Wyoming and county governments in Wyoming to participate more effectively in the planning process associated with the management of federal lands located in Wyoming. These efforts have also assisted the federal management agencies in making better decisions regarding the lands under their jurisdiction.

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)
(W-192) (AK, CA, CO, ID, NM, NV, OR, UT, 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. Training was also provided to Experiment Station staff at their annual meeting.

b. Impact - all 27 Cooperative Extension county offices have gone through a comprehensive training and assessment review on Civil Rights and Diversity. Sixty 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 six Hatch projects and five of the six are Multi-State projects. The research efforts include about 1.75 FTEs and expenditures include $.29 million Hatch and $.35 million State.

Cooperative Extension Service FTEs	38.66
Goal 5 Allocated Funds	$3,606,635.15

Goal 5 - IMPACTS

LEADERSHIP INSTITUTES IN THE BIG HORN BASIN

Situation:

At a recent Great Plains Population Symposium, a national speaker said, "If they are to have a future, rural communities must begin to understand the function and critical importance of leadership. Communities must be inclusive in their approach to leadership and grow their own leaders by fostering leadership skills." Residents of Worland, Wyoming completed a community assessment in the year 2000. One of the recommendations made was a need for leadership development. The promotion of communication was cited as a major theme along with improving attitudes, planning, tackling conflict, encouraging smart growth, and securing media support.

County Cooperative Extension Service (CES) personnel and the area Enhancing Wyoming Communities and Households (EWCH) educator met with different groups on several occasions in Worland to determine if there was interest in a leadership development program and to identify willing partners and representatives to serve on a steering committee. The Big Horn Basin Ag Ambassadors in Worland lent their support by endorsing and underwriting the program. A steering committee was formed with nine representatives working with CES to create the first Washakie Leadership Institute (WLI). Start-up funds came from $1,000 granted by the Park County Leadership Institute (PCLI) which just completed class IV.

The WLI curriculum consisted of eight class days, a group project, reading assignments, and the development of a personal leadership philosophy. There were 13 committee members, 10 different instructors, 19 affiliates who provided community-based experiences, and 16 sponsors for a total of 58 people involved in making the Washakie Leadership Institute successful. Sponsorships totaled $2,400, and grants totaled $2,000.

Topics covered were teambuilding, communication, critical thinking, leadership, planning, conflict resolution, boards and coalitions, and social responsibility. Community-based experiences took place in connection with Big Horn Resort, TSI Communications, RT Communications, NW Daily News, KWOR, Fremont Beverages, Crown Cork and Seal, city/county/state legislators, the airport, Wyoming Gas, BLM, the National Guard, WESTI Ag

Days, Wyoming Sugar, schools, the hospital, and social services.

Impacts:

Twenty-two individuals graduated from the Washakie Leadership Institute. The class project was completed – a Washakie Leadership Institute Web site can be found at www.washakieleadership.com/index.htm. Evaluations were conducted after each class day for immediate feedback. Average daily ratings were 4.7 on a 1-5 scale with 5 being excellent. The final overall course evaluation was 4.9. Participants (n=19) were asked to rate how WLI had improved their skills in five areas (1= no improvement to 5 = great improvement):

• Communication = 4.2	• Building Relations = 4.4
• Problem Solving = 4.2	• Leadership Abilities = 4.3
• Decision Making = 4.2	

WLI participants identified the most significant things learned. They cited dealing with a variety of personalities, the social action process, methods for resolving conflicts, the impact of the Rowel Poverty Simulation, better communication skills, and the importance of trust in leadership. One participant wrote, "You should know it has been almost 50 years since I have been in a classroom. Most of my education came from behind the barn so to speak, from experience and doing. After only two sessions of Leadership Institute, I realize what I have missed over the years. I already look forward to the next class."

Evaluations also revealed helpful suggestions for the next course. Eleven graduates volunteered for the next WLI steering committee and are currently working with the UW CES area educator on the curriculum to be offered in the fall of 2004. Since WLI is now established, the committee granted $1,000 in start-up funds for the Big Horn County leadership program.

Six months after participation in the program, participants shared the following:

- The chamber director says he is excited about the program because in news stories in the local media today it is the WLI graduates who are emerging as the leaders.
- BG said because of WLI: "I am now very active on the sales tax committee, very active in the Washakie Development Association, and I am part of the governor's Local Government Coordinating Council. Most important is the fact that I am more comfortable taking stands and debating issues I think are important to our community and state. I have developed close friendships and respect for fellow classmates. As a matter of fact, I have called on some for their assistance at times."
- CB said: "Every day, I must depend on and utilize leadership skills to maintain a healthy learning environment for the success of my students. Also, because of the confidence I gained by attending and participating in the sessions presented at WLI, I am determined to continue to pursue an idea that I am sure will benefit our community with the help of a team of other interested community leaders who share my aspirations. WLI was the best treat to me in many years. I am so pleased to have been a part of the experience." Results from a six-month follow-up mail survey sent to PCLI 2002 class participants revealed the following outcomes:
- The skills most often used personally and professionally were:
  - ✓ Team-building tools – 100% of respondents
  - ✓ Communication tools and managing change tools – 90% of respondents

- The assessment day was a valuable day for 100 percent of the participants. Behaviors changed include being more direct and specific now while giving feedback or addressing concerns and altering styles to be more influential speakers. Gaining greater confidence was the most frequently cited benefit of participating in the class.
- A total of 100 percent of the respondents said the community-based experiences provided a greater understanding of issues, organizations, and agencies and helped build relationships.
- A total of 100 percent of the respondents are involved in the community at either the same level in which they were before or at a higher level.

Stories Shared from PCLI:
JF: "PCLI was very important in fine tuning my leadership, team building, patience, and listening skills. The first meeting concentrating on team building was outstanding. I relearned two important lessons that day which continue to help me. In the top right hand drawer of my desk, I keep the formal evaluation prepared after observations of me were made during Assessment Day. That single day was very powerful. I have volunteered to be a part of that day for future classes because of the tremendous personal growth I gained. I have received many quality hours of interpersonal training at my two previous banks - Wells Fargo and Citigroup. This series of classes rivals those trainings. My bank president told me the community is better off because of PCLI."
DR: It was one of the best courses of study I've ever engaged in and a lot of fun. Leadership skills that I learned have proven to be invaluable in both my professional and public life. In October of 2002, I assumed responsibility as president of the Kiwanis Club of Powell. PCLI has helped me step into this leadership role with confidence and enthusiasm.
The success of the Park and Washakie County Leadership Institutes has inspired Big Horn County to begin plans for implementation of a program in the fall of 2004.

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Community Assessment Successful for Northern Arapaho Tribe

Situation:

Gathering information to be used in a needs assessment is a difficult process when the culture of the people being surveyed, does not openly accept the idea of sharing conditions and problems with others outside that culture. This has been the situation on the Wind River Indian Reservation with the Northern Arapaho tribe. To better serve the people of the Northern Arapaho tribe, a community assessment needed to be conducted. To do this it was critical for the Cooperative Extension Service (CES) to provide leadership in developing a strong coalition of stakeholders. The Eastern Shoshone tribe was encouraged to conduct a concurrent assessment

but made the choice not to participate in the process.

The Wyoming Rural Development Center under the leadership of Mary Randolph has conducted more than 50 assessments in communities across Wyoming the past three years. The process uses a resource team of trained experts to come into the community and to use listening sessions to gather the information needed to write an assessment report. Milton Green, extension educator for the Wind River Reservation is one of seven CES educators from across the state trained as assessment team members. In addition to helping organize the assessment for the Northern Arapaho tribe, Green has participated as a team member for two other community assessments. The objective of the community assessment process is to provide trained experts in economic and community resource development and to increase access to resources to assist rural communities with locally conceived and locally driven development strategies.

The Northern Arapaho community assessment was organized by Patrick Goggles, of Northern Arapaho Tribal Housing, and Milton Green, of the University of Wyoming CES. The resource team leader was Larry Keown. The assessment took three days to complete. The first day was dedicated to a tour of the reservation to give the resource team the opportunity to ask questions and learn about the deep cultural heritage on the Wind River Reservation. Because many of the resource team members were not familiar with the culture of the Northern Arapaho tribe, an informative training offered vision and appreciation for tribal customs.

Impacts

A total of 10 listening sessions took place during the two days. During that time 75 tribal members and interested non-Indian members participated. The listening sessions addressed three questions:

- What do you think are the major problems and challenges facing the Northern Arapaho tribe?
- What do you think are the major strengths and assets of the Northern Arapaho tribe?
- What projects would you like to see completed in two, five, 10, and 20 years on the Wind River Reservation and in Northern Arapaho Indian country?

The 75 participants identified six themes or priority areas where assistance was needed. Those themes are:

- Building community capacity
- Improving infrastructure on the reservation
- Promoting economic development
- Improving education opportunities
- Improving social services
- Focusing on land and natural resource development and management

The common thread in all six of the theme areas is to break the cycle of poverty that is a predominant condition for Northern Arapaho people. High unemployment and low per-capita income were common issues discussed in all of the listening sessions.

At the post-assessment review the resource team member representing the Affiliated Tribes of Northwest Indians Economic Development group returned for the meeting. Here is what he said about the process: “Poverty is very common here. How does a tribe get to this state of poverty? By letting someone else manage the affairs of the tribe.” One of the Tribal Business Council members noted that as a result of the community assessment process the entire Tribal Business

Council was more aware of how important the sovereignty of the Northern Arapaho tribe is. “It is time to move forward.” Another Tribal Business Council member stated, “The Community Assessment has helped all of us see where we need to go. Now we need all of your help in getting us there.”

Within the six areas, those who participated in the listening sessions identified 65 projects that would benefit the people of the Northern Arapaho tribe. The assessment process generated $38,000 in in-kind contributions that have been used as leverage funding for two grant-funded projects since the completion of the assessment. It is anticipated that the 145-page resource document will generate many more grants and projects used to improve the overall quality of life for the people of the Northern Arapaho tribe.

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Economic Development Via a Festival

Situation:

Teton County, Wyoming, is surrounded by national parks and forests and finds itself uniquely dependent upon tourism for its financial viability. The UW Cooperative Extension Service (CES) program in the county has been involved in community development projects to help build the community and to enhance its economic viability. Because of the seasonal nature of tourism, local efforts have focused on building “shoulder season” events in the spring and fall. The Chamber of Commerce led efforts to develop the fall season through a Fall Arts Festival featuring the myriad of arts available in the valley. CES was part of the assessment process and was asked to participate in the development of the festival. The goal developing such “shoulder season” events was to keep people in the service industry employed longer, enhance revenues for the city and county, and provide an educational venue.

“Quilting in the Tetons” developed out of this shoulder season building effort. Quilting in the Tetons runs the week before Columbus Day and features nationally recognized teachers and publishers sharing their expertise with quilters throughout the world. Each year CES staff members work with the local Quilting in the Tetons Board of Directors determine the types of classes to be featured. The program has become a non-profit event and strives to cover operational expenses though workshop fees. At the 2003 gathering, 24 workshops were offered featuring nationally recognized instructors. A total of 314 classes were taken by participants, and a show featuring quilts from around the world hung for the week of the festival.

Impacts

- Quilting in the Tetons was taped and featured as part of a public television program from South Carolina. The show was aired nationally on April 5, 2003.

- To determine the economic impact of the quilting program on the Teton County economy, the CES conducted a survey of participants revealing they spent an average of $733.33 during their stay in the area.
- A total of $9,900 in sales tax revenue was generated during the quilting festival.
- The average distance traveled to attend was 522 miles.
- With 250 registered participants last year, Quilting in the Tetons was responsible for more than $183,300 in visitor expenditures. Considering the multiplier effect, the total economic activity resulting from these visitor expenditures was nearly $314,300.
- This economic activity supported the equivalent of 3.3 full-time jobs in the local economy and generated more than $74,400 in labor earnings.
- Expenditures by participants resulted in nearly $9,900 in sales tax revenue for local and state government.
- Roughly a quarter of the participants are instructors who earn family income from this art form.

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4-H Teaches Life Skills that last a Lifetime

Situation:

For more than 100 years, 4-H has been giving youths the opportunity to develop competencies that enable them to grow into mature, productive, and healthy adults. These competencies or life skills are built on the foundation of the four Hs: head, heart, hands, and health. The four cornerstones of the 4-H program are designed to promote competent, confident, compassionate, and connected youths who are able to contribute to the vitality of their communities.

Recent studies conducted by the Search Institute have shown that more than 60 percent of young people are lacking in the sufficient developmental assets needed for healthy development. Not only are youths lacking in developmental assets, but they are also making unhealthy choices that lead to at-risk behaviors. Research has shown that with continuous participation in a positive youth development organization such as 4-H, youths are less likely to participate in risky behaviors and more likely to possess the developmental assets needed to succeed as adults.

To support and promote positive youth development in 4-H members, Carbon County Cooperative Extension Service Educators teamed with members from the Home School Association, local school districts, Carbon County stock growers, cattlewomen, the conservation service, the Tobacco Prevention Coalition, the Community Interagency Coalition on Youth, and volunteer 4-H leaders to provide 21 educational opportunities reaching more than 2,400 youth participants. Financial resources including grants, donations, and budgeted allocations totaling $11,000 were secured to offset costs to participants and to develop educational resource

materials.

Impacts

By participating in a continuous, sustained program such as 4-H, young people are developing the necessary skills to grow into caring, contributing members of society. By using the four Hs as the foundation from which youths develop, people are able to see the impact 4-H has on youths and communities.

Head**:** 4-H provides opportunities for members to learn management and cognitive skills. Members learn oral and written language skills, problem solving, how to use resources wisely, and the ability to plan, evaluate, and make decisions.

"Being in 4-H has really boosted my confidence. I have learned how to set and reach my goals. I have improved my time management skills, and 4-H has given me an idea of what I plan on doing with my future." Sarah, 15, a six-year 4-H member

"Over the years I have taken many 4-H projects, but my favorite project has been shooting sports. I am an avid hunter and shooter, which led me to open Savery Creek Bow Shop. I sell bow equipment and set up bows for fellow archers. 4-H has taught me a lot about growing up, helping others, and becoming more responsible." Corby, 18, a 10-year 4-H member

Heart**:** 4-H provides opportunities for youths to develop social and interpersonal skills through cooperating, developing friendships, and learning responsibility. These skills allow members to work well with others and to engage in nurturing relationships.

"For me, 4-H is a gateway to meet new people and see new places. I have met many people who have been influential in my life. Through 4-H, I have learned to lead by example and show younger members the right way to go. Without 4-H I would never have been the great role model that I am." Jason, 16, an eight-year 4-H member

"4-H has taught me a lot of responsibility in raising animals. I have also learned that there is more to 4-H than competition. You can make friends and learn values you use every day. I really appreciate 4-H and what it has done for me and my future." Brandi, 18, a three-year 4-H member.

Hands: 4-H provides opportunities for youths to develop and apply vocational and citizenship skills by supporting and encouraging service learning. By participating in community service projects and serving as mentors and role models, 4-H members are able to contribute to the good of the community in which they live.

"4-H has made me a better person and allowed me to excel in school and sports. The leadership skills I received and the help from older members allowed me to pass that knowledge on to younger members. 4-H is truly a great program that has benefited thousands of kids. I can say with pride, that I was one of them." Jane, 17, a nine-year 4-H member

"Every year I help make my community clean and pretty. I help make it cleaner by picking up trash and I make it pretty by planting flowers. When I do something for my community, that makes me feel good about myself." Lilly, 10, a two-year 4-H member

Health: By creating opportunities for involvement, 4-H members identify and set goals that serve as a road map to success. By providing opportunities for achievement, 4-H members are able to feel better about themselves and their accomplishments.

"4-H has helped me in many ways. I have learned to accept things, win or lose, and to be a good sport. I also learned to get things done, be on time, and do my best. 4-H has made me feel good by accomplishing something I have started." Betsy, 14, a four-year 4-H member

"4-H has helped me by getting my self-esteem up. It is fun to set goals and reach them. It has also showed me it is better to do things as a team rather than alone. How else could you pick up all the trash on a ½-mile stretch of highway?" Joseph, 12, a four-year 4-H member

Positive youth development organizations not only provide enrichment opportunities for youths (life skill development and cognitive/creative skills) but also preventative help to reduce the likelihood of using drugs or alcohol or getting in trouble with the law. The combination of these two factors allows 4-H to make a definite difference for all those who participate. Members are learning to make decisions today that positively affect their future and those around them.

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In a Society All their Own

Situation:

With the recent emphasis on benchmarks and standards, teachers are finding it more and more difficult to find new and inventive ways to educate students on subjects such as mathematics, social sciences, and government. Teachers also struggle with the ability to relate real world experience to students to give them an understanding of money, business, making and enforcing laws, and the way that government runs.

The Albany County 4-H program associate and state 4-H program leader worked with the fifth grade teacher at Linford Elementary School in Laramie to prepare, implement, and evaluate the Mini-Society Program. A grant received from the Kauffman Center for Entrepreneurial Leadership Foundation provided funding for the program. Parents were notified and asked to take an active role in the Mini Society by charging/paying their children Mini-Society currency. Youths developed retail mini-society businesses which provided goods or services.

Ten 90-minute sessions were conducted at Linford Elementary School reaching 21 fifth grade students. Classes were team taught by the 4-H program associate and the 4-H program leader.

The project used an imaginary society to give students a real-life feel for business by having them each build and run a business, gaining an understanding of government by having a lawmaking body of a society council, and learn mathematics using a currency designed by the students and requiring students to keep records of receipts and disbursements as well as an income statement.

Students used a democratic system to name their society and chose its currency. They monitored business and laws individually and were put in charge of managing partnerships and dealing with unjust situations.

Impacts

An evaluation of the Mini-Society Program indicated that the fifth grade students who participated learned how to figure an income statement and have mastered record-keeping skills. All of them reported having a better understanding of counting money, taxes, laws, and government. Within the first three weeks of the program, students were policing each other and enforcing their own laws. They gained communication, decision making, social, and responsibility skills by operating their businesses. After the 10-week program the students had a general understanding of supply and demand.

One student said, "I understand why the things that companies don't make too many of are more expensive." Students learned the importance of loyalty and honesty when dealing with customers in their business and integrity in being on the honor system when making and enforcing laws. One girl said, "I know now why it is so important to follow the rules so that everyone can be treated equally." Within the fifth week students were demonstrating teamwork by forming partnerships in businesses. "What a great program!" was a comment made by Linford fifth grade teacher Mike Busch.

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Through a Hands-On Approach, Hispanic Youths Learn about Horticulture while Developing their English Vocabulary

Situation:

In Evanston the Hispanic population continues to grow. It has reached a high of 4 percent of the population and is still rising. According to local teachers, Hispanic students moving into the community are entering the school system with a limited English vocabulary and at low educational levels according to Wyoming school standards.

During the 2002-2003 school year, North Elementary School offered English as a second language to elementary youths who needed it. More additional educational efforts were needed, however, to increase their vocabulary and to push the students to reach the same level of education as their peers. Furthermore, according to the school principal, there was a need to teach the Hispanic youth life skills such as responsibility, ownership, and teamwork. These are skills that students need to learn and may not be gained through a traditional educational program.

So how does one accomplish such a huge, broad goal? There is much supportive research that showing that culture plays a huge role in the actions of Hispanic children and how they learn. Culture also takes into affect where one lives, values, beliefs and the way of viewing the world. According to a cultural learning styles report, "The concept of cultural learning styles finds its basis in learning styles theory. Learning styles theory contends that students prefer one way or style of learning over another. The theory suggests that designing educational experiences, curriculum, and instruction that match student learning styles may improve

academic achievement." The cultural learning styles concept goes a step further by maintaining that cultural upbringing plays a decisive role in determining a student's learning style. Thus, understanding the Hispanic population and its education needs requires considering learning styles and cultural backgrounds.

Cooperative learning tends to be the most recommended technique for students from diverse cultural backgrounds. Based on the research examined above, teachers and counselors should expect larger numbers of Hispanic students to prefer (1) a cool environment, (2) conformity, (3) peer-oriented learning, (4) kinesthetic instructional resources, (5) a high degree of structure, (6) variety as opposed to routines, and (7) a field-dependent cognitive style. Researches recommend cooperative learning involving the use of humor, drama, fantasy, modeling, and a global rather than an analytic approach to understanding concepts. Therefore, a CES horticulture program for the Hispanic students was conducted in much the same manner that traditional 4-H Club programs operate but it occurred during the school day. This allowed the use of a variety of teaching styles and a cooperative learning model.

Through a collaborative effort involving North Elementary School administrators, teachers, and paraprofessionals and the Uinta County CES 4-H and agricultural educators, a grant was written and secured from the Helen Miller Fund through the Wyoming State 4-H Foundation. Additionally, supporting dollars and in-kind contributions came from a North Elementary after-school grant, the Uinta County Parks and Recreational Board, Aspen Grove Nursery, the Uinta County Conservation District, and Snowy River Reclamation to help fund and carry out the program.

At the beginning of the project, 32 Hispanic youths in grades kindergarten through fifth started their own journals by setting goals and outlining what they wanted to learn. This was followed by a series of nine weekly classes that utilized a variety of curriculum materials with hands-on visual approaches to teach the students plant sciences while developing vocabulary words. Also, during the project time frame, they had the opportunity to go on a tour to visit the Aspen Grove Nursery in Evanston and to learn about the commercial aspect of horticulture.

The youths concluded the program by adding expenses and a project summary page to their journals and then exhibiting them to their parents and other school teachers and administrators.

With only 6 percent of the Evanston population directly involved in agriculture, this program was also a way to teach these students about the importance of agriculture and how it impacts everyone. The project taught a group of minority youths about the basics of plant sciences and horticulture while expanding their vocabulary and instilling a sense in them that agriculture is important to them.

In addition to programming outputs, a two-level record book was developed and tailored to the school setting. Curriculum materials are being developed that could be utilized and implemented by other educators.

Impacts

When the students entered the program, they completed a pre-test that measured their knowledge regarding plant science. Their score on the pre-test was 64 percent. At the conclusion of the program, the youths' post-test had a score of 91 percent, which showed a 27 percent increase in knowledge.

The students learned an average of 25 new words that they could define, recognize, and use in a sentence or visually relate to the actual item.

All 32 youths completed the entire program and submitted a completed journal record. The number one thing they said they learned was how to plant plants.

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4-H Reaches a Migrant Youth Population

Situation:

Although migrant education was started in the Big Horn Basin in 1967, the program did not reach Park County (Powell) until the past year. Due to the large farming industry within the county, the need for migrant workers is strong. The workers are employed on a seasonal basis and many times families are required to remove their children from school before the end of the year.

Approximately 200 migrant children between the first and sixth grade were identified as youths who needed remedial instruction in reading, writing, and math. Seventy of those youngsters signed up for the migrant education program, but only 35 attended on a regular basis.

The Park County 4-H program assisted in the educational effort by providing programming in citizenship, natural resources, and safe habits around dogs. The 4-H program associate collaborated with the migrant education coordinator and staff members to present introductory programs to migrant youths. The associate utilized 4-H curricula as well as materials donated by the American Kennel Club to teach lessons. Teachers and staff members of the migrant education program supervised the students during the informative sessions.

Three program topics were offered to an average of 27 migrant students during the time period of June 10th through July 11th. They were divided into the age categories of first through third and fourth through sixth. Materials on natural resources, water conservation, citizenship, self-pride, and safe mannerisms around household dogs and strange dogs were presented to each age group. Discussion and activities were interactive.

During the natural resource program, students took a pre-test to measure their knowledge of the subject matter. They then listened to a poster presentation which described the difference between renewable and non-renewable resources, water conservation, pollution, and product biodegradation. The youngsters were also asked to help demonstrate ground water pollution. Pollution discussion was related to poor farming practices that the youths might encounter. Each youth then participated in a question-answer period on product degradation. Recycling and waste limitation was stressed in this discussion. After a short review of the material taught, students took a post-test to measure their knowledge improvement.

Another program introduced a broad picture of citizenship, stressing that it occurs on the personal, local, regional, national, and world level. Discussion was generated amongst the students, and several provided their view of citizenship at each level. The focus was then

narrowed to the personal level. In order to be a good citizen, one must have qualities that lead to good character and amiable actions. In order to accomplish this objective, the participants were asked to make a "Me Tree." On a large piece of paper, they traced their hand to symbolize the trunk of a tree. Then they brainstormed several terms relating to good character or good citizenship, and then wrote on the leaves that were attached afterward to the trunk. Students were encouraged to take their "Me Tree" home to discuss it with their parents.

The American Kennel Club produced an educational video and packet on "Safety around Dogs." The program objectives were to teach youths how to greet dogs, what to do if they were approached by a loose dog or dogs, what to do if they saw a lost dog, how to understand a dog's body language, and how to respect any dog's space.

Impacts

Thirty students attended the natural resources program. Results from the pre-program test and a post-program test showed that the youths improved their knowledge about natural resources, water conservation, and pollution by 32 percent.

Twenty-seven students learned about citizenship and self-pride. They were instructed on levels of citizenship and then completed a "Me Tree." The "Me Tree" followed recommendations from Adventures in Learning: A School-Age Care Curriculum published by the North Carolina Cooperative Extension Service. The completed projects were sent home with the students.

Twenty-five students attended the "Safety around Dogs" program. They watched a video, reviewed concepts through the use of flash cards, and then completed a series of worksheets referring to the video's objectives. The youths were able to take the worksheets and informative pages home to their families.

All students were introduced to 4-H and received 4-H promotional materials. The migrant education program coordinator was positive about the school enrichment program and would like to partner with CES next year to teach more educational programs. Most youths (90 percent or more) were positive about participating in the activities and discussion. The Park County 4-H program hopes to increase the number of educational sessions for the next migrant season. The desired future impact is to improve the life skills of those youths in the program.

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Federal Land Policy Economic Analysis

Situation:

The federal government manages a significant amount of the land area in the Western United States. 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 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. One area of debate that is of particular importance to Wyoming is the economic implications for local communities of alternative federal land management decisions. As a result, federal management agencies, state government, and local governments in Wyoming and the West, all have a need for reliable information on the effects of federal land management decisions on the economies of local communities.

Impacts

The following is a listing of economic analyses associated with federal land management planning efforts in Wyoming and the Western United States during the past year. These efforts provide important information used to assist in the planning process to make decisions that are critical to the future of Wyoming.

- Review of Wasatch-Cache Forest Plan Revision as it relates to Uinta County. Participating in a collaborative effort between the U.S. Forest Service and the County Commissioners. These discussions have generated a separate economic analysis for Uinta County. We provided an economic analysis of both Forest Service grazing and the sawmill industry in Uinta County.
- W-192 Regional Committee – This committee is a regional effort that focuses on the relationship between Federal lands and rural communities. 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. As a part of this project, we have written a paper comparing the economic impacts of livestock grazing to tourism that will be presented as a part of a symposium regarding the change rangeland user at the Society for Range Management Meetings in Salt Lake City.
- An analysis of the economic impact of endangered species listing for the Preble's Meadow Jumping Mouse on the economy of Southeastern Wyoming. "Listening sessions" were held in each of the five counties affected by the mouse to give landowners and concerned citizens a chance to explain how the listing of the mouse has affect them. The researchers gathered information from these meetings about the cost that producers would likely incur as a result of the mouse listing. A preliminary analysis was conducted and a report submitted to the governor's office in May 2003. This report was used as a part of state and local government efforts to modify the critical habitat designation for the mouse. The Fish and Wildlife Service has reduced the critical habitat acreage designation in Wyoming by 50 percent. Ongoing work continues on a computer model that will estimate producers' costs and translate these to economic impacts on the regional economy. This work will be used to analyze the economic impacts of the draft recovery plan for the mouse once the Fish and Wildlife Service releases it.
- An economic analysis of the Bighorn National Forest Plan Revision for the U.S. Forest Service. The analysis considers livestock grazing, timber, recreation, and USFS operations in Big Horn, Johnson, Sheridan, and Washakie Counties. In addition an economic profile was developed for each county. This analysis will be used by the Forest Service in decisions regarding the future use of the Bighorn National Forest. This is a collaborative effort between the University of Wyoming, U.S. Forest Service, and the

State of Wyoming.

- 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. 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.
- 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. 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.
- An economic analysis of the Pinedale Resource Management Plan Revisions for the Bureau of Land Management. This analysis considers livestock grazing, recreation, and mineral development on BLM land in Lincoln, Sublette, and Sweetwater Counties. This analysis will be used by the BLM in decisions regarding the future use of the Pinedale Resource Management Area.
- An economic analysis of the Rawlins Resource Management Plan Revisions for the Bureau of Land Management. This analysis considers livestock grazing, recreation, and mineral development on BLM land in Albany, Carbon, and Sweetwater Counties. This analysis will be used by the BLM in decisions regarding the future use of the Rawlins Resource Management Area.

These efforts have allowed the State of Wyoming and county governments in Wyoming to participate more effectively in the planning process associate with the management of federal lands located in Wyoming. These efforts have also assisted the federal management agencies in making better decisions regarding the lands under their jurisdiction.

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B. Stakeholder Input

The UW CES is continuing the implementation of the strategic plan. Two AES sites have gone through a planning process similar to strategic planning. As a result of that process, a new combined southeast experiment station will be built to replace the two existing stations. Stakeholder input will come to the College of Agriculture Cooperative Extension Service and Agricultural Experiment Station through a variety of methods. A joint research and extension needs assessment process was completed as outlined in the Plan of Work written for Wyoming 1999-2004. A stratified sample was used to determine program and research needs in the state. In addition to the mail survey, a phone survey was conducted with a random sample of Wyoming residents. Both surveys also addressed preferred delivery methods by Wyoming citizens. Stakeholder input gathered through all methods is shared with CES initiative teams comprised of field educators, extension specialists, UW Department Heads and administrators. Information is used in development of CES programs and applied research.

As described in the CES strategic plan, advisory committees have formed in the nine Extension areas. These area advisory committees meet at least once annually to provide input on issues and program direction for CES. Advisory committee members are nominated by extension staff by subject matter interest. Selection to serve on advisory committees is based on gender, geographic representation, race, national origin, and underserved audiences. CES associate directors and local county commissioners provide approval of advisory committee members. In addition, the Director of CES has formed an advisory committee of County Commissioners who will meet during quarterly meetings of the Wyoming County Commissioner Association.

In the past year approximately 50 percent of Wyoming counties utilized advisory committees to determine county program direction. All counties have had targeted advisory meetings to gain stakeholder input on reaching limited resource audiences in the Cent$ible nutrition program (EFNEP and FSNP). County 4-H staff have established 4-H Expansion and Review committees to specifically address outreach efforts toward underserved youth audiences. Training has been provided for staff to encourage diversity in representation on advisory committees. 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 provide information on existing research and outreach programs and 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

The merit review process for extension programs covers all programs conducted by UW CES. A team leadership model is utilized to review program plans and direction for CES programs as outlined in the 2003 UW CES Strategic Implementation Plan. Program initiative teams develop and review programs on an annual basis. Teams make decisions to maintain, modify, or create new programs to meet the needs identified through external and internal stakeholder input.

Projects supported with formula funds (Hatch, Multi-State, McIntire-Stennis, Animal Health) must be approved projects. The project proposal is transmitted to the Department Head and the Head appoints a minimum of two scientific reviewers who are knowledgeable in the field to review the proposal. After a proposal is revised based on the above review, it is transmitted to the Experiment Station Director. The Director's office assigns three scientific reviewers who are knowledgeable in the field to review the proposal.

The Wyoming Agricultural Experiment Station administers an internal competitive grants program using a portion of its federal dollars. Proposals are reviewed by a ten member university-wide committee. Each proposal is also sent to external reviewers. Proposals are returned with comments to the ten member university-wide committee who submit to the AES director projects recommended for funding.

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 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 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 UW'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, 4-H educators have developed programs to work with children with limited English proficiency (LEP) 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 an on-line reporting system utilized by all CES employees.

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.

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multi-state Extension Activities and Integrated Activities
(Attach Brief Summaries)

Institution University of Wyoming

State Wyoming

Check one: ✓ **Multi-state Extension Activities**
_____ **Integrat ed Activities (Hatch Act Funds)**
_____ **Integrated Activities (Smith-Lever Funds)**

Title of Planned Program/Activity	**Actual Expenditures FY 2000**	**FY2001**	**FY2002**	**FY2003**	**FY2004**
Goal 1: Enhance Agricultural Systems that are highly Competitive in the Global Economy				101,924	
Goal 2: A Safe and Secure Food & Fiber System					
Goal 3: A Healthy Well Nourished Population				55,884	
Goal 4: Greater Harmony between Agriculture and the Environment				47,000	
Goal 5: Enhanced Economic Opportunity and Quality of Life for Americans				31,777	
Total				236,585	

Director

3-9-04
Date

Form CSREES-REPT (2/00)

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multi-state Extension Activities and Integrated Activities
(Attach Brief Summaries)

Institution University of Wyoming

State Wyoming

Check one: ____ **Multi-state Extension Activities**
____ **Integrat ed Activities (Hatch Act Funds)**
✓ **Integrated Activities (Smith-Lever Funds)**

Title of Planned Program/Activity	Actual Expenditures FY 2000	FY2001	FY2002	FY2003	FY2004
Goal 1: Enhance Agricultural Systems that are highly Competitive in the Global Economy				138,153	
Goal 2: A Safe and Secure Food & Fiber System					
Goal 3: A Healthy Well Nourished Population				42,900	
Goal 4: Greater Harmony between Agriculture and the Environment				45,793	
Goal 5: Enhanced Economic Opportunity and Quality of Life for Americans				23,905	
Total				250,751	

Director 3-9-04 **Date**

Form CSREES-REPT (2/00)

Appendix C

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multistate Extension Activities and Integrated Activities
(Attach Brief Summaries)

Institution University of Wyoming
State Wyoming

Check one: ____ **Multistate Extension Activities**
__✓ **Integrated Activities (Hatch Act Funds)**
____ **Integrated Activities (Smith-Lever Act Funds)**

Title of Planned Program/Activity	Actual Expenditures FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Goal 1: Enhance agricultural systems that are highly competitive in the global economy				402,983	
Goal 3: Enhance a healthy, well- nourished population				13,473	
Goal 4: Enhance greater harmony between agriculture and the environment				60,836	
Goal 5: Enhance economic opportunity and quality of life for Americans				196,774	
Total				674,066	

James J. Jacob — Director

3/8/04 — Date

Form CSREES-REPT (2/00)