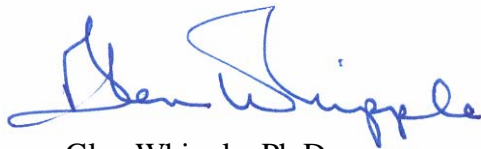
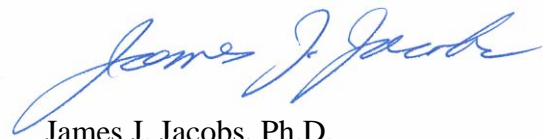


**ANNUAL REPORT
SUBMITTED TO CSREES
BY
COOPERATIVE EXTENSION SERVICE
AND
AGRICULTURAL EXPERIMENT STATION
College of Agriculture
University of Wyoming**

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Glen Whipple, Ph.D.
Associate Dean and Director
Cooperative Extension Service



James J. Jacobs, Ph.D.
Associate Dean and Director
Agricultural Experiment Station

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**CSREES ANNUAL REPORT
FY 2004
Wyoming's Accomplishments & Results**

Introduction:

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 agriculture 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. 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. The College of Agriculture must focus on priority agriculture, environmental, and human resource needs of the state. The mission of the University of Wyoming Cooperative Extension Service is to provide lifelong learning opportunities for the people of Wyoming and empower them to make choices that enhance their quality of life.

A. National Goals

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 communities and towns. Livestock and livestock products generated approximately 83 percent of agriculture's cash receipts of \$870 million in 2003. 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 are important to another pillar of the state's economy, tourism and recreation.

Due to high elevation (average of 6800') and arid climate over most of the state, Wyoming's agriculture faces unusual challenges. 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 6,100 producers attended various workshops regarding agricultural profitability that assisted them in making management decisions.

Production agriculture continues to struggle both in terms of profitability and environmental/resource impacts. 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 season. 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 3,800 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 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. During 2004, the Wyoming Seed Certification Service provided seed certification services for over 14,000 acres and 13 major crop types. Ninety-five certified seed producers received documents identifying issues in their fields that could affect their profitability in the current crop or in future crops. The training of Seed Certification Service field inspectors in the recognition of disease symptoms in the field is a critical component to maintaining markets for Wyoming dry bean seed. The training is a 2.5 hour classroom session on disease cycles, hosts, other bean production issues that produce similar symptoms, and a hands-on, in-field section to identify bacterial bean diseases of concern. In 2004 five Wyoming inspectors, three Colorado inspectors, and three Montana inspectors received training
- b. Impact – The Seed Certification Service provides a system by which national standards, also compatible with state and federal seed laws for certified seed production are met by Wyoming seed producers. Seed crops consistently have a higher value than the same crop grown as a commercial crop for food or feed. Dry beans, as an example, have typically been worth \$3 more per 100 lbs. for seed vs. beans grown for food. In 2004, 5,003 acres of dry beans were enrolled in certification and using the state average yield of 25 cwt. per acre, the additional value of seed production vs. commercial bean production was \$375,225 paid directly to producers. Protection of the Wyoming dry bean seed industry through the prompt and accurate identification of seed borne bacterial diseases is significant. Using average yields and prices, the 2004 dry bean seed crop was worth \$2.9 million to Wyoming producers. Additional benefits to Wyoming occur as seed processing facilities that provide jobs and bring money into the state with out-of-state seed sales.

- 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 \$870 million in 2003. Economic profitability is vital to the sustainability of agriculture since no practice or agricultural operation is sustainable unless it is first profitable. Several programs were developed and presented to educate individuals in the agricultural sector on ways to make agriculture profitable as well as sustainable. Cooperative Extension Educators in Wyoming conducted 179 workshops, multi-day seminars, or classes reaching over 6,100 individuals. A sample of the topics ranged from Ag Profitability, Beef Quality Assurance, Importance of Winter Forages, Sustainable Cropping Systems, Risk Management for Ag Families, and Living on Small Acreage.

The gradual loss of government program payments and reductions in trade barriers all mean producers need to improve their marketing and risk management skills to be successful in the future. A needs assessment done in Wyoming and Colorado indicated producers felt risk management education was important to agricultural firm survival (Fetsch et al., 2001). Given the importance of management skills in improving agricultural firm viability, an integrated marketing and risk management program was developed and presented in a series of educational programs for producers in Wyoming, South Dakota, North Dakota, and Montana. In January of 2004, training of Extension professionals from the four states took place in preparing them to deliver the producer workshops. In spring of 2004, ag producers from the four states took part in a series of workshops, taught by Extension specialists and educators, on General Risk Management through Right Risk, Surviving Ag, Family Finance, and Risk in Family Business. Producers completed a pre-and post-workshop survey for each workshop, in addition to an overall pre- and post-risk management and follow-up survey. Sixteen workshops were presented. Forty producers completed the general Risk Management pre-survey and twenty-six responded to the follow-up survey mailed 30 days after participating in the workshops.

Drought continues in Wyoming with adverse management and economic consequences to a wide variety of land users ranging from recreation and wildlife interests to ranchers and public land managers. Rangeland forage production and water yields have been reduced. Land users and managers have responded, usually too late to avoid resource or economic damage, with livestock reductions, land management restrictions, providing alternative livestock water, or not using resources. Unfortunately, there are limited tools to predict impending forage shortages. In the major rangeland areas of the intermountain region, agricultural drought affects range forage production when precipitation shortages occur in spring months. Advance warning of impending forage shortages allow timely planning of grazing use to minimize the adverse consequences to animal performance, rangeland

resources, and the economics of producers. Producers, researchers, and federal land management agencies have provided sites and/or data for the development of predictions describing the best temporal window of spring moisture influencing forage production for the growing season. Producers and agencies have volunteered time and resources at 20 sites to foster the development and dissemination of information on drought and predicting forage production.

- b. Impacts – Research and Cooperative Extension efforts resulted in the following impacts:
- ▶ Winter feed represents more than 60 percent of total livestock production costs in Wyoming. CES driven forage programs have resulted in an increased number of producers doing hay testing (over 50 percent increase in one county) which reduces gross costs, net profits are increased, translating into a higher standard of living for the families. Attendees at a state hay meeting indicated they would make changes in their operations using value-added marketing as a result of the meeting.
 - ▶ Noxious and invasive weed identification training reached over 900 people in 2004. Immediate impacts have included detection and reporting of two new serious weed problems in Wyoming. Eradication and containment efforts were implemented. Weed identification training is critical to early detection and response to new invaders.
 - ▶ Three hundred producers participated in the CES sponsored agriculture profitability conference held in conjunction with Wyoming Stock Growers and Wool Growers 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 from the agriculture profitability conference 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.
 - ▶ Four Beef Quality Assurance programs were held reaching 68 adults and 75 youth with a total of twenty-five operations committed to implementing the procedures of this program to provide a more wholesome product for consumers.
 - ▶ Fourteen programs on forage production and analysis were held in FY-04. The number of producers testing their forage has increased by 200 percent. Participants indicated they would make changes in their operation using value-added marketing as a result of programs. Individual producers have noted that they saved from \$2000-\$5000 as a direct result of testing their forages.
 - ▶ Workshops on management of pest grasshoppers resulted in producers using RAATs reduced the cost of grasshopper control by 50 percent, 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 2004, emphasis of workshops included ATV-RAATs strategies. This strategy was applied by USDA-APHIS to manage grasshoppers in such sensitive areas as National Elk Refuge, where alternative chemical applications are not possible. Total acreage protected in 2004 with ATV-RAATs statewide can be estimated to at least 3,000 acres. Besides the economic advantages, RAATs strategy has

tangible environmental benefits. Using RAATs, 60 to 75 percent 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 presented workshops to specialists in five western states – Colorado, Nebraska, S. Dakota, Oregon, and Montana. Total attendance of the workshops exceeded 150 specialists including weed and pest supervisors, USDA-APHIS personnel, and extension educators. A trained infrastructure of local, state, and federal workers is key to effective grasshopper management in Wyoming.

- ▶ Twenty-five producers participating in sessions on “Evaluation Your Winter Feeding” program who were given tools to help them balance nutrient requirements and evaluate cost, reported through evaluation that the sessions provided valuable information to help them make change and implement new procedures. Comments from producers:
 - › “I now save money because we don’t buy as much protein supplement because my cows don’t need it.”
 - › “I will be more proactive in ration balancing.”
 - › “I will try to reduce my risk and manage better, including changing my feed strategy.”
 - › “I will refine my management plan and sample hay more.”
- ▶ Since 1998, 172 beef producers, extension professionals, chefs, industry personnel, and students have completed the Wyobeef Short Course. The course is limited to 25 individuals annually to ensure participants receive personal instruction throughout the course. Evaluations administered at the end of each Short Course, are uniformly enthusiastic and positive. The success of this program is also reflected in the continued popularity for the program.
- ▶ 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. Annual losses attributed to Rhizoctonia Root and Crown Rot (RRCR) are estimated at 2-3 percent total sugar loss for 185,000 acres of sugar beet grown in the irrigated High Plains region (CO, MT, NE, and WY). This disease is reported to affect approximately 30 – 50 percent of Wyoming’s acreage, depending on the district. A 1 percent decrease in sugar content is lost revenue of approximately \$71 per acre (2003 values). Field results for 2004 indicated that under severe Rhizoctonia disease pressure, one application of trifloxystrobin (Gem®, Bayer) at the time of inoculum introduction was essentially ineffective. A new product, JAU6476, significantly improved disease suppression (50 percent disease suppression) compared to the untreated check. Results from fungicide timings and efficacy are being utilized by regulatory agencies in developing label use.
- ▶ Evaluations regarding risk management education in Wyoming using RightRisk indicate increased knowledge regarding risk management alternatives and personal

risk management styles. Nearly 78 percent of respondents indicated they were going to seek additional information from the RightRisk website to help them manage risks in their operation. Preliminary analysis of pre- and post-surveys of the producers taking the “Risk Management for Ag Families” curriculum in Wyoming, South Dakota, North Dakota, and Montana indicates that the majority agreed that an integrated approach to risk management was best, that assessing risk is helpful in developing a plan and that developing a risk management plan improved their ability to stay in business. Follow-up survey results indicated that 42 percent of those responding had evaluated risk and developed a strategic plan for their operation since attending the workshops. Nearly 67 percent of producers indicated they had evaluated risk management alternatives since attending the workshops. The top alternatives investigated were reducing costs, adopting new technology, and crop insurance. The majority of respondents also indicated that they have looked at ways to reduce their market risk since their attendance at the workshops, with gathering market news and analysis and crop insurance as their top ways of reducing their market risk.

- ▶ Drought continues to be a major concern in Wyoming. Individual producers and state and federal agencies at 20 sites continue to cooperate in the productivity study to relate early spring precipitation with forage production on rangelands. Additionally, producers have been identified that were taking actions to address their animal number-forage relationships early enough to avoid future impacts on the resource base and forage supply. In addition, availability of this knowledge of forage production/precipitation relationships has changed the reporting of drought information to concerned citizens of the state. As an example, the state climatologist’s Web site presented a Wyoming state map in late April with above, average, and deficit precipitation for the month outlined and identified the prospective forage yields. Actions by land management agencies have been more realistically tied to predicted forage yields and hydrologic conditions in the last couple of years.
- ▶ Cercospora Leaf Spot (CLS) affects 80,000 to 100,000 acres of sugar beets in the High Plains. If left unchecked, CLS can easily reduce sugar content by 2 percent, costing growers approximately \$142 per acre. Costs of control are estimated at approximately \$20 to \$40 per acre (2003 values). The cost of fungicide in the SE Wyoming District is approximately \$250,000 to \$490,000, with great variability among years due to disease pressure. Surveys done by the Extension Plant Pathology program in 2004 in cooperation with Western Sugar revealed that approximately 68 percent of the sugar beet fields have fungus isolates resistant to a commonly used fungicide. Educational programs on IPM approaches for Cercospora management and the proper use of fungicide have been developed and are being delivered to growers. Increasing the efficacy of a single fungicide spray on 80,000 acres will have a potential annual impact of \$1 million regionally. A five-year study in which high-elevation meadows have been harvested and forages left in windrows showed that nutrient value of hay in windrows is not significantly different from that of baled hay. Cows grazing from November through February perform similarly to those fed baled hay. Other studies show that one of the best crops to stockpile for winter grazing is corn. Foxtail millets have also been effectively used for winter grazing, however, swathing and leaving in windrows greatly improves nutritional value of winter forage. Brassicas, including

turnips and rape, can produce very high quality early winter forage and can be a very inexpensive source of nutrients if grown as a second crop following cereal grain or forage harvest. Several opportunities exist, depending on land and resources available, for winter grazing of forages that meet animal nutritional needs. With 800,000 cows in Wyoming, saving just a few cents per cow per day can result in significant cost saving for the beef industry.

- 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, OR, SD, TX, UT, WA, WY)
 - Multi-state Extension (MT, ND, SD, WY)

Key Theme – Animal Health

- a. The Department of Veterinary Sciences researchers investigated a variety of animal health-related problems. *Brucella abortus* infection in cattle and wild ungulates is of major concern for the State of Wyoming. During 2003-2004, the disease had a major impact on animal health, the economic viability of domestic livestock production, and wildlife management. The Governor's Brucellosis Coordination Team was formed to address the issue of controlling and eliminating brucellosis from domestic animals and wildlife. A list of recommendations has been completed and sent to the Governor. Currently, there are no simple solutions to the problems of interspecies transmission of infectious agents such as *B. abortus* between wildlife and domestic animals. In cattle, vaccination of calves with strain RB51 has been the accepted practice for the industry in preventing and eradicating brucellosis from the cattle. As the experience with brucellosis in Wyoming during 2003 - 2004 would indicate, vaccination of calves is no assurance of protection from infection. Booster vaccination of adult cattle using the currently available vaccine strain RB51 has been proposed as a means to enhance protection from infection. At least two states are currently practicing adult vaccination of high risk nonpregnant cattle. There is little, however, in the way of substantive studies to show that adult vaccination is efficacious and safe for pregnant cattle. To address this gap in the current knowledge of *B. abortus* vaccinology, the Veterinary Sciences Department in collaboration with Dr. Steve Olsen (National Animal Disease Center) has submitted a CSREES research proposal to study in vitro parameters of the immune response and safety of RB51 vaccination in adult pregnant cattle that had received an initial vaccination as calves. In February 2004, a lichen called *Xanthoparmelia Chlorochroa* was implicated as the probable cause of close to 300 mysterious elk deaths southwest of Rawlins. Researchers in the College of Agriculture are undertaking studies to determine how it caused the largest recorded die-off of free-ranging elk in Wyoming. Chronic Wasting Disease (CWD) of deer and elk continues to spread in Wyoming and has been diagnosed in other states. 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 researchers 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 six years of study.

- 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 Web site "Wyovet."
 - ▶ 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 is reassuring that CWD will not readily infect cattle.
 - ▶ During 2004, brucellosis has had major economic impacts on the state through livestock and wildlife losses and diagnostic and treatment costs. Recommendations made by the Governor's Brucellosis Coordination Team could lead to the eventual elimination of this disease in the state. Adult vaccination of cattle for *Brucella abortus* may enhance protection in high risk cattle herds. The proposed research is an initial and requisite step in validating the efficacy of booster vaccination and safety in pregnant cattle. The proposed research is needed to make informed decisions regarding the use adult vaccination for high risk cattle in the State of Wyoming.
 - ▶ The Red Rim elk die-off episode has been estimated to have a \$4 million impact on tourism in Wyoming.
- 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 impacting animal production are focused on ruminant nutrition and reproduction. 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 cows and calves. 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. Enhancing 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.

Ranchers on the high plains, in states such as Wyoming with forage based production systems, tend to under-nourish ewes and cows during early gestation. Research conducted by faculty at UW's newly established Center for the Study of Fetal Programming have linked early maternal under nutrition at a level often experienced

by these females, to changes in offspring quality. Thus, a lot of the variation we see in growth efficiency and health status of lambs and calves may be acquired in utero rather than after birth as has been previously thought. Western white face ewes selected to a nomadic existence over many years under harsh range conditions and limited nutrition near Baggs, Wyoming (Baggs ewes) maintained normal fetal weights when subjected to a constant 50 percent global nutrient restriction (NR) from day 28 to day 78 of gestation when compared to control fed (CF) Baggs ewes. In contrast, NR ewes of similar breeding, age, weight, and body condition score from the University of Wyoming flock (UW ewes), whose prior selection involved a sedate lifestyle and above adequate nutritional inputs, experienced a 30 percent decrease in fetal weight, under the same 50 percent nutrient restriction when compared to CF UW ewes. Further, skeletal muscle from growth retarded fetuses from NR UW ewes contained a significantly lower number of secondary myofibers than CF UW fetuses. Since the number of muscle fibers is determined during pre-natal development, this decrease in secondary myofibers in NR UW fetuses is expected to decrease skeletal muscle mass. By two months of age, lambs born to NR UW ewes, but not CF UW ewes, exhibited an increased release of insulin, and a decreased glucose uptake (Insulin Resistance) in response to an i.v. infusion of glucose. By eight months of age, however, lambs born to NR UW ewes exhibited a marked reduction of insulin release (pancreatic failure?) and a decreased glucose uptake to a similar i.v. infusion of glucose compared to the lambs from CF UW ewes. These data suggest that these lambs may be predisposed to exhibit Type II diabetes in later life. Further, lambs from NR UW ewes also ate more, grew faster, were fatter, and had markedly higher blood pressures at eight months of age when compared to lambs from CF UW ewes. We have observed no differences in growth rate, fatness, insulin sensitivity, pancreatic function, or blood pressure between lambs from NR and CF Baggs ewes, suggesting that they were unaffected by maternal under nutrition. The symptoms exhibited by the lambs born to NR UW ewes are consistent with a predisposition of these lambs to develop health problems later in life such as type II diabetes, hypertension, obesity and cardiovascular disease. It also appears that females selected under markedly divergent production environments can respond differently to maternal stressors such as under nutrition, with different consequences to the health of their offspring. These results have significant implications for both livestock production and human health.

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

- b. Impact –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.
 - ▶ These results will provide information to livestock producers that will lead to a greater understanding of how to produce healthy lambs and calves, with improved

growth efficiency and carcass quality. The results also demonstrate that the production system under which a female is selected can have an impact on how a pregnant female responds to a maternal stressor such as under nutrition, with implications on subsequent offspring health, survival, and growth potential. They also have significant implications on improving the health status of human infants at birth through a greater understanding of the optimal nutrient requirements for fetal growth and development during early pregnancy.

► Dairy producers in western Wyoming who participated in monthly on-site visits from CES educators and specialists from Utah State University have implemented practices which have resulted in the average number of days in milk per cow come down to a more profitable number. Dairy men involved in monthly on-farm visits have utilized or plan to utilize the dairy bulk tank monitoring system to get feedback when they make management changes.

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, ME, MI, MN, MO, MT, ND, NE, NM, NV, OH, OR, TX, WA, WY)
Integrated Research and Extension
Multi-state Extension (UT)

Key Theme – Plant Germplasm

a. First identified in the U.S. in Wyoming in 1996, Brown Root Rot (BRR) of alfalfa, caused by the soil-borne fungus (*Phoma sclerotoides*), causes a rot of the taproot of alfalfa resulting in winterkill. Field surveys conducted in Wyoming have shown this disease to be widespread, with BRR also reported in Idaho and Montana and most recently in Minnesota, Wisconsin, and New York. A screening technique for selecting and evaluating for BRR resistance has been developed and a BRR-resistant variety for the U.S. has been released.

b. Impact –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. Use of a BRR-resistant variety bred for the U.S. should result in a multi-million dollar savings to alfalfa producers.

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, 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. Plots were established under irrigation at Torrington, WY in 1998 to determine if glyphosate use pattern in glyphosate tolerant crops influences weed control by placing selection pressure on weed species, alters weed population dynamics or leads to the development of glyphosate resistant weeds. A substantial amount of research has shown crop yields are increased when grown in rows less than 76 cm. In addition to improved yields, several researchers have reported the crop is more competitive with weeds. Row spacing trials have been conducted under both dryland and irrigated conditions at Torrington the last three years. Corn, dry beans, sunflowers, and sugar beets were grown in 38, 56, and 76 cm rows. Light interception readings were taken throughout the season and end of season weed biomass and crop yields were determined.

- b. Impact – After seven years there has been no evidence that any species has developed resistance to glyphosate. However, common lambsquarters and wild buckwheat have increased in treatments receiving only the low rate of glyphosate. Rotating glyphosate with conventional herbicides was no more effective in slowing this population increase than the use of the high glyphosate rate. Growing crops in narrow rows (less than 76 cm) reduced weed biomass and light interception by the crop was increased especially early in the season. Sugar beet and sunflower yields were increased dramatically when grown in narrow rows, while row spacing had no consistent impact on corn or drybean yields.
- 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. Weeds are a common problem for landowners both large and small throughout Wyoming and much of the West. While many people consider weeds to be an agricultural problem, the reality is that weeds also have serious impacts on rangelands, wildlands, roadsides, and suburban areas. The invasion of exotic species reduces habitat quality and forage availability for wildlife and livestock, strongly compete with native plants, inhibit recreational activities, increase wildfires, and use limited water resources. Extensive stands of Russian Knapweed were located in Wyoming, Idaho, and Colorado where native grasses remained after many years. Research is being conducted to assess the long-term potential of the few remnant

plants to rebound following invasion of Russian knapweed. While certain weeds such as Canada thistle and field bindweed are well known throughout Wyoming and much of the Western United States, land managers often need training for proper identification of uncommon or new invaders. Training is crucial for early detection and rapid response to new invaders. Stopping new weeds before they become a problem is an effective strategy that may save millions of dollars in future weed control costs. With this strategy in mind, the UW CES Weed Specialist is working to train land managers on invasive plant identification not only in Wyoming, but throughout the Western U.S.

- 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. Overall, over 900 people were trained in 2004 for noxious weed identification. Immediate impacts to this training have included detection and reporting of two new serious weed problems in Wyoming. In Teton County yellow starthistle, an invasive plant that is toxic to horses, was found and identified. Eradication efforts were initiated immediately and the problem appears to have been caught. In other western states, yellow starthistle infests several million acres and costs millions of dollars annually in economic losses and control costs. In Laramie County, blueweed, also known as Viper’s bugloss was found and identified in August of 2004. Blueweed is a poisonous plant that has caused serious problems in Canada and Australia and is noxious in the State of Washington. Wyoming Cooperative Agriculture Pest Survey immediately mapped the infestation, which was found over several miles. Eradication and containment efforts are being planned for 2005, when blueweed emerges in the spring.
- c. Source of funding - State
- d. Scope of Impact - State Specific

Key Theme - Plant Health

- a. Plant diseases caused by viruses, bacteria, fungi, and nematodes cause significant losses in Wyoming’s crop yield and quality each year. Economic losses attributed to plant diseases are significantly reduced by prevention, early detection diagnostics, and initiation of appropriate integrated pest management practices. Modern disease diagnostic methods are needed to supplement traditional diagnostics for certain pests, especially select agents of quarantine concerns. Development of a Molecular Plant Pathology Laboratory (MPPL) was initiated in 2003 and continued during 2004. A thermocycler (2003) for performing PCR and an RNA/DNA-capable spectrophotometer (2004) to evaluate PCR products were major equipment purchases. A card-swipe key lock will be installed to improve security and record traffic into the MPPL when (if) select pathogens are involved. The MPPL also houses an ultra-low freezer that serves as a repository for plant pathogen culture collections, thus, it also has special requirements for culture

security.

- b. Impact - An Introduction to Plant Pathology provided training focused on disease detection using images of plants with signs and symptoms for the major classes of plant pathogens. The pathogens covered were viruses, bacteria (PLOs), fungi, nematodes, and parasitic seed plants. Instruction on abiotic diseases was provided to distinguish biotic diseases from those caused by environmental effects. In addition to the general plant pathology introduction, focused training was offered on disease recognition for select agents and pests of quarantine concern to the audiences that included USDA APHIS PPQ, Wyoming Department of Agriculture, and select University of Wyoming Cooperative Extension personnel.
- c. Source of Funding - Smith Lever, Hatch, State
- d. Scope of Impact - State Specific
Integrated Research and Extension

Key Theme - Home Lawn and Gardening - General Horticulture

- a. Wyoming has only 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. Water conservation, community beautification, yard waste, and pesticide reduction are all issues affecting Wyoming residents in their horticultural efforts.
- b. Impact - During FY 2004, over 27,182 contacts were made regarding horticulture. Twenty-three educational programs were presented and community gardens were started through Cooperative Extension Service (CES) efforts in three 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.
 - ▶ Twelve 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. In addition to new graduates of the program, Wyoming has over 200 active veteran Master Gardeners. New Master Gardener contributions, in addition to experienced Master Gardener volunteer time (7,814 hours), extend Extension's efforts with a value of over \$117,210. 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.
- 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 ongoing 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 16 ongoing Hatch projects, and five out of the 16 are multi-state projects. Seven of the 16 Hatch projects are integrated research and extension efforts. The approximate effort related to this program for the AES is 11.5 FTEs with expenditures of \$.96 million Hatch and \$3.1 million State.

Cooperative Extension Service FTEs 26.21

Goal 1 Allocated Funds \$2,198,393

Goal 1: IMPACTS

Agriculture Producers Attend Management Course

Situation: Agriculture is the foundation industry of southeast Wyoming, producing \$212.8 million in cash receipts in 2003. The sustainability and economic well-being of agriculture producers in this area of Wyoming is vital to the local economies. These producers are facing many challenges including changing technology, production advances, passing on the business to future generations, coping with family issues within the business, managing the risk of agriculture, and understanding the new Farm Bill programs. The southeast Wyoming area advisory committee identified these and other issues as information that should be addressed in the region by the University of Wyoming's Cooperative Extension Service (CES).

The southeast area educator realized that the in-depth skills and knowledge required to effectively teach these topics would require a structured course that would be offered several times over a season. The U.S. Department of Agriculture's Farm Service Agency (FSA) was in need of a course that would meet the requirements for their "Borrower Training" certified program required of all borrowers of FSA funds. The expertise of a cadre of state CES specialists and area educators was assembled to cover these topics.

A nine-session, five-month course was organized by the southeast area educator and presented in three locations. It provided 31 producers with material relevant to their particular needs.

Impacts: The course proved to be very effective in reaching area producers in a meaningful and applicable way. When asked what changes they made as a result of attending the course, participants said:

- › "I'm now feeding more efficiently and economically."

- > “I have prepared a will.”
- > “We have implemented a family trust.”
- > “We are balancing rations and looking at futures markets.”
- > “I now listen more to other ideas. I think ‘outside the polygon’ and ask more questions.”

In a follow-up survey conducted six months after the conclusion of the programs, participants rated their knowledge of issues before attending the course as a 2.0 (1 equals poor; 5 equals excellent) and after the course a 3.8. The respondents ranked the course a 4.3 overall, and many made comments that they hoped similar classes would be taught in the coming years.

This course provided participating families with the tools and skills they need to help the economic and social aspects of their businesses so that they may remain a viable and contributing part of the local economy.

Dallas Mount
 University Extension Educator
 Southeast Area/Platte County
 (307) 322-3667
 e-mail: dmount@uwyo.edu
 Cooperative Extension
 University of Wyoming

Noxious and Invasive Weed Identification Training: Reaching out to Wyoming and Beyond

Situation: Weeds are a common problem for the owners of both large and small tracts of land throughout Wyoming and much of the West. While many people consider weeds to be an agricultural problem, the reality is that weeds also have serious impacts on rangelands, wild lands, roadsides, and suburban areas. Many weeds reduce habitat quality and forage availability for wildlife and livestock, strongly compete with native plants, inhibit recreational activities, increase wildfires, and use limited water resources. While certain weeds such as Canada thistle and field bindweed are well known throughout Wyoming and much of the western United States, land managers often need training for proper identification of uncommon or new invaders. This training is crucial for the early detection and rapid response to new invaders. Stopping these weeds before they become a problem is an effective strategy that may save millions of dollars in future control costs.

In Wyoming, weed identification training sessions were conducted in 2004 in Laramie, Newcastle, Green River, Jackson, Casper, Wheatland, and Riverton. These sessions were associated with numerous groups including the Bureau of Land Management, U.S. Forest Service, U.S. Department of Agriculture’s Animal and Plant Health Inspection Service, Wyoming Weed and Pest Control Districts, Master Gardeners, University of Wyoming Pesticide Training, and UW Cooperative Extension Service (CES) county educators.

Two key training programs outside of Wyoming that the UW CES weed specialist is

committed to include the Southwest Noxious Weed Short Course held annually in Farmington, New Mexico, and the Western Society of Weed Science Noxious Weed Short Course held each year in Pray, Montana. In 2004, participants were from 14 different states, and more than 900 people were trained for noxious weed identification.

Impacts: Immediate impacts to this training have included the detection and reporting of two new serious weed problems in Wyoming. Yellow starthistle, an invasive plant that is toxic to horses, was found and identified in Teton County. Eradication efforts were initiated immediately, and the problem appears to have been stopped. In other western states, yellow starthistle infests several million acres and costs millions of dollars annually in economic losses and control costs.

In Laramie County, blueweed, also known as Viper's bugloss, was found and identified in August 2004. Blueweed is a poisonous plant that has caused serious problems in Canada and Australia, and it is a designated noxious weed in the state of Washington. Agricultural organizations associated with Wyoming's Cooperative Agricultural Pest Survey immediately mapped the infestation, which was found over several miles. Eradication and containment efforts are being planned when blueweed emerges in the spring of 2005.

Weed identification training is critical to the early detection and rapid response to new invaders. The full impact of this training will be an increased detection and awareness of the new weeds that have already been found in Wyoming and will likely be located in the surrounding western states.

Stephen Enloe
Weed Specialist
Department of Plant Sciences
(307) 766-3113
e-mail: sfenloe@uwyo.edu
Cooperative Extension Service
University of Wyoming

Governor's Brucellosis Coordination Team

Situation: Brucellosis is a disease that has major economic impact on the state of Wyoming because it affects both wildlife and domestic stock. The loss of Brucellosis-free status has resulted in significant costs to the state through the loss of livestock and the increased costs of handling and testing animals. The coordination team met each month during 2004 to address the issue of controlling Brucellosis in both domestic animals and wildlife and the report with a list of recommendations has been sent to the Governor. I was involved in all aspects of the discussions, but my major input was in the development of research priorities and in submission of the minority report supporting a plan to reduce the infection rate in elk and slowly close elk feeding grounds.

Impacts: Recommendations, which if implemented, could lead to the elimination of this disease in Wyoming and have major economic benefit. As a result of the Governor's Brucellosis Coordination Team, there is much more interaction and cooperation amongst

producers and federal and state agencies addressing concerns and developing plans. Bills have been introduced in the Wyoming legislature to fund studies on reducing the occurrence of this disease in elk.

Kenneth Mills
Department of Veterinary Sciences
307-742-6681 Ext. 131
e-mail: kmills@uwyo.edu
University of Wyoming

Risk Management for Ag Families (RMFAF): Evaluation of an Integrated Educational Program for Producers in Wyoming, South Dakota, North Dakota, and Montana

Situation: Agricultural producers face a dramatically more risky business environment with the trade agreements and farm policy changes of the 1990s. Given the importance of management skills in improving agricultural firm viability, a marketing and risk management education program which addresses topics in an integrated and complimentary manner, rather than a traditional didactic approach, could improve agricultural producers' knowledge retention and their abilities to manage for and survive the risky business environment they face.

In January of 2004, training of Extension professionals from the four-state consortium took place in preparing them to deliver the producer workshops. In spring of 2004, Ag producers from Wyoming, Montana, North Dakota, and South Dakota took part in a series of workshops, taught by Extension specialists and educators, on General Risk Management through Right Risk, Surviving Ag, Family Finance, and Risk in Family Business. Producers completed a pre-and post-workshop survey for each workshop, in addition to an overall pre and post risk management and follow-up survey. Sixteen workshops were presented. Forty producers completed the general Risk Management Pre-Survey and twenty-six (26) responded to the follow-up survey mailed 30 days after participating in the workshops.

Impacts: Twenty-six producers responded to the follow-up survey mailed 30 days after participation in the workshops. On average, producers have evaluated their risk management plan since attending the workshops. Producers indicated that they have evaluated their risk in their operation and the strategic plan for their operation. Producers further indicated that reducing the costs, adopting new technology and crop insurance are their top priorities. They also indicated that they have looked at ways to reduce their market risk since their attendance at the workshops, with gathering market news and analysis and crop insurance as their top ways of reducing their market risk. Survey results also show that producers have evaluated their family finance risk after attending the workshop. Developing family goals for family finances was the top priority, with developing a plan for transferring the estate and having multiple family members included in family finance decisions following as priorities. Producers indicated that they have evaluated their ways to reduce the business's financial risk and family business risk in their operation. Responses for business risk alternatives were evenly distributed among the four options (preparing budgets, developing financial statements, analyzing changes

in net worth, and ways to improve net income) showing a wide awareness of the topics since attending the workshops.

Gail Gordon
Dept. of Agricultural and Applied Economics
307-766-5373
e-mail: ggordon@uwyo.edu
University of Wyoming

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

Overview

Researchers at the University of Wyoming (UW) 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. Research and extension professionals at UW are also involved in projects focusing on issues of safe and secure food systems.

A critical need was identified to address agro-bio terrorist threats and protect the food supply in Wyoming after the events of September 11, 2001. A collaborative effort of the CES Profitable and Sustainable Agriculture and Nutrition and Food Safety initiative teams with representatives of the Wyoming Departments of Agriculture, Health, Homeland Security and State Livestock Board, State Veterinarian, and Wyoming Stock Growers and Wool Growers Associations planned and implemented a statewide conference to address the issue. Twenty different topics were presented including food security, bio-security, plant bio-terrorism, domestic preparedness, and homeland security.

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] helps families eat better for less. In FY 2004, CNP educators in all 23 counties and one reservation office enrolled 1,993 participants in a lesson series, and 18,712 persons participated in one-time lessons. Thirteen new half hour television programs were produced and past episodes aired twice a week for 38 weeks with a potential to reach 190,000 low-income individuals. 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 percent 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 \$33.00 per month on groceries that represents \$396 per year per family. This represents \$638,352 saved by the 1,612 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 Safety

- a. Microbial contamination of food is a serious health problem. With approximately 60 percent 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 971 food handlers through food safety workshops. In-house training in food service businesses reached 664 individuals. Consumer programs reached 550 people and food safety displays were viewed by 864 individuals. The CNP had 1,993 participants enrolled in the program and presented 1,196 one-time presentations to over 18,712 clients. CNP educators helped clients learn how to thaw and store foods properly, prevent cross contamination, and to wash hands frequently and thoroughly.

Diarrhea remains one of the main causes of morbidity and mortality worldwide, a large proportion of which is caused by diarrheagenic E. coli. There are many methods used to detect E. coli in food and water. However, most of these tests are designed to detect only one serotype of diarrheagenic E.coli, E. coli O157:H7, which causes a large amount, but not all, food and water borne illnesses due to E. coli in the USA. Additionally, these methods require a combination of long incubation times and sample manipulation prior to, or during, the testing process. Therefore, there remains a need for very sensitive, rapid, and simple methods capable of detecting all serotypes of diarrheagenic E. coli. The goal of this research is to develop an assay for the rapid detection of diarrheagenic Escherichia coli. Such an assay should be capable of producing accurate results from complicated samples containing mixtures of microorganisms. This research will address the current limitations of the available methods for detection of diarrheagenic E. coli through the development of a system that will be capable of detecting E. coli isolates that have been implicated in foodborne disease.

- b. Impact - Results from a state-wide survey conducted by UW CES for the Wyoming Food Safety Coalition indicate that of the 971 participants in *ServSafe*, Basic,

Intermediate and Advanced *Going for the Gold* workshops, an estimated

- ▶ 534 (97 percent) made at least one change related to cleanliness, for example, washed their hands more thoroughly.
- ▶ 429 (78 percent) made at least one change related to food preparation, for example, prevented cross contamination by keeping raw meats, cooked foods, and fresh produce separated.
- ▶ 385 (70 percent) made at least one change related to cooking food, for example, used a stove or microwave – not a steam table – to reheat food.
- ▶ 440 (80 percent) made at least one change related to cooling food, for example, put food into shallow containers or cut meat into smaller pieces before putting it in the refrigerator.
- ▶ 413 (75 percent) made at least one change related to other miscellaneous areas, for example, monitored critical control points more closely.
- ▶ 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. Diarrheagenic *E. coli* are bacterial pathogens with significant public health interest. These pathogens cause significant morbidity and mortality worldwide. A simple colorimetric test, designed to detect diarrheagenic *E. coli* in a rapid and sensitive manner will help alleviate the disease caused by these pathogens.

Cent\$ible Nutrition Program

- ▶ Forty-three percent increased their ability to store foods properly on exit surveys.
- ▶ Fifty-nine percent of homemakers showed improvement in their knowledge of how to thaw food properly.
- ▶ Forty-nine percent increased their knowledge to prevent cross contamination.
- ▶ Thirty-five percent improved their knowledge and practice of hand washing.

Agro-Bio Terrorism

- ▶ Participants gained awareness, knowledge and training on recognizing potential threats. In an evaluation conducted at the close of the conference respondents stated:
 - “I will pay more attention to my surroundings and what is going on.”
 - “I did the facilities security self test and we are adjusting our operation for greater security.”
 - “We will increase our surveillance and add more security to our facilities.”

In a nine month follow-up survey participants reported changes in practices as a result of the conference which included: implementing increased security for stored pesticides and developing a plan for response to any focus of terrorism.

- c. Source of Funding – State, Hatch, 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. Three of the ongoing programs are *Going for the Gold - Food Safety Training*, *Cent\$ible Nutrition Food Safety Curriculum*, and *Agro-Bio Terrorism*. Research efforts focused on developing more effective means of protecting foods stored at low temperatures as well as improving nutritional value of beef and lamb. Researchers in this area participated in one Hatch project. The research effort involves approximately .67 FTEs with an expenditure of \$.02 million Hatch and \$.1 million State.

Cooperative Extension FTEs	5.62
Goal 2 Allocated Funds	\$471,384

Goal 2 – IMPACTS

Keeping Wyoming Safe and Secure

Situation: September 11, 2001, started as just another day as people around the globe prepared for work. Terrorists hit New York City and Washington, D.C., but the horror and shock struck every city, town, and community across the country. People in Wyoming were glued to their TVs or radios as they heard and watched the tragic events unfold.

During a planning meeting in 2002, members of the University of Wyoming’s Cooperative Extension Service (CES) Profitable and Sustainable Agricultural Systems (PSAS) initiative team discussed the need to address agriculture and bioterrorist threats and how to protect the state’s food supply. A coalition was organized to address the issues identified during the meeting. Members of the coalition included the PSAS and Nutrition and Food Safety initiative teams, representatives of the Wyoming Departments of Agriculture and Health, Wyoming Office of Homeland Security, and Wyoming Livestock Board, state veterinarian, and the Wyoming Stock Growers and Wool Growers associations. The goals of the conference were to use a proactive approach to provide education for CES professionals, clients, businesses, and agency personnel on what terrorist threats are and how to deal with them. More than 200 people attended the fall 2003 event. Twenty topics were presented ranging from food security, bio-security, and plant bioterrorism to domestic preparedness and homeland security.

Impacts: Those attending gained awareness, knowledge, and training on recognizing potential threats. In an evaluation conducted at the end of the conference, respondents commented that they planned to:

- › Pay more attention to their surroundings and what is going on
- › Complete a facilities security test and adjust their operations accordingly
- › Increase their surveillance and add more security to their facilities

A follow up survey was sent nine months later to determine how participants had used the information shared at the conference. Participants rated the conference 3.3 on a scale of four for adding to their understanding of agro/bioterrorism. On use of information, they rated the conference 6.2 on a scale of 10. Participants said the conference provided them with a better understanding of the seriousness of agro-bioterrorism and the consequences if the state is not adequately prepared. They learned that planning is critical

to being successful in thwarting an attack. They said they:

- › Are utilizing the training in local Unified Organization for Agencies during Disasters planning group meetings
- › Have increased security measures relating to pesticide storage
- › Have implemented a plan to respond to acts of terrorism

“I have a better understanding of the seriousness of the risks of agro and bioterrorism facing our state, cities, and agriculture,” one participant stated.

Ron Cunningham
University Extension Educator
Fremont County/Wind River Reservation Extension Area
(307) 332-1044
e-mail: ronc@uwyo.edu
Cooperative Extension Service
University of Wyoming

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.

Key Theme - Human Health

- a. “Poor diet and physical inactivity may soon overtake tobacco as the leading cause of death in the United States.” This statement from a March 2004 article in the Journal of the American Medical Association underscores the importance of good nutrition and physical activity, but it also reflects an emphasis on lifestyle habits. A health-based (rather than a weight-based) approach to well being has been a cornerstone of Wellness IN the Rockies (WIN the Rockies), a research, intervention, and outreach project in Wyoming, Montana, and Idaho. With funding from USDA, a wide range of research and educational activities have been carried out. One of the research endeavors was a cross-sectional survey conducted in fall 2001 and fall 2003 in the six project communities (two communities in each of the three states). Results include identification of factors associated with higher body weight and findings related to body dissatisfaction in men and women. The project’s education specialist spearheaded development of a range of resources and intervention materials for youth and adults, many of which are accessible via www.uwyo.edu/wintherockies. Youth

materials include posters, youth lessons, interactive games, high-energy youth activities, and a walking activity booklet. Adult materials include a ten-session health-centered curriculum (*A New You: Health for Every Body*), family mealtime programs, a walking program facilitator's guide, and prescriptions for health for use by primary care providers. Asthma continues to grow in the population at a rate greater than 5% annually, with the primary growth found in the young. While many treatments continue to be developed, they all treat asthma as a homogenous disease and thus many of the treatments are ineffective for many asthmatics. Development of an asthma diagnostic tool is underway that will initially differentiate between the two major subclasses of asthmatics, i.e., those that are primarily leukotriene-based and those that are cytokine-based.

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. Other priority programs include diabetes education, and nutrition in relation to health.

- b. Impact – Research results indicate that individuals with a higher body mass index (BMI) were more likely to do the following:
- Drink sweetened beverages such as soft drinks
 - Order super-sized portions
 - Eat while doing other activities, such as watching TV
 - Report a lower frequency of participation in physical activity
 - Perceive themselves as not getting as much exercise as needed.

Each of the above findings suggests interventions to help individuals develop healthier lifestyles, for example, to be mindful or mentally present while eating, to overcome barriers to being physically active. Web-based resources generate high levels of activity every month. The exceptional quality of the resources is reflected in *A New You: Health for Every Body*, which was evaluated for inclusion on the CYFER network website and the National Network for Health website. The evaluators consistently gave the resource their highest marks. Comments included “. . . an outstanding resource – a fine example of quality material with useful information that incorporates techniques and strategies . . . to facilitate learning and behavior change.”

► Educational efforts from *WIN Wyoming* resulted in the following impacts “*A New You*” curriculum 4-week series was presented by CES educators in eight 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.

► *WIN Steps* was implemented in six counties with over 200 participants. Data collected from 162 participants who completed the eight-week walking program. The

goal of increasing the amount of physical activity through walking was evaluated by the number of steps above the baseline number. Individual steps per day increased by an average of 974 steps or about on-half mile. One participant reported, “It made me much more aware of how sedentary my job is and encouraged me to find new ways to add steps.” Health benefits to participants included toning their muscles, helping to control their appetites, and increasing the number of calories expended. Additional benefits reported after participation in the program included sleeping better, less stress, feeling good about themselves, having more energy, and enjoying life.

► Once developed, this diagnostic tool will identify the type of asthma that will lead to proper asthma treatment. The potential impact is a reduction in incorrect treatment and a reduction in overall cost of treatment for asthma to the individual and to insurance providers.

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 1,993 individuals enrolled in lessons and 18,712 individuals participated in one-time lessons as well as 10,826 youth in youth programs. Additionally, CNP is reaching underserved audiences state-wide through the use of public television. Thirteen 30-minute TV programs were produced and past episodes aired two times per week for 38 weeks resulting in 190,000 low-income contacts.

Extension educators conducted 202 educational programs, classes, workshops, or health fair presentations reaching over 5,374 adults and 1,922 youth. Topics ranged from “Nutrition for Special Needs”, and “Preventing Diabetes” to “Basic Nutrition.”

Reproduction difficulties continue to grow in the U.S. Much of this effect may be ascribable to the effect of the unbalanced diets consumed by the population. The omega-3 research being conducted in Family and Consumer Sciences continues to indicate the importance of these dietary fats and their involvement in ovulation. More importantly, previous studies have demonstrated that elevated levels of intake are pro-ovulatory while the low levels being currently examined do not enhance ovulation and may in reality be suppressive. This is important in that the recent DRIs established by the USDA recommend diets that contain omega-3 fatty acids be present at levels that we have found to suppress ovulation in rats. This data indicates what many experts in the field of omega-3 fatty acid metabolism believe to be an underestimation of the omega-3 fatty acid needs for normal physiologic function for the populace. Studies are now underway to ascertain if this same effect is exerted in testicular development and function in adolescent rats.

- 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. Overall there was an increase from 5 percent at entry to 34 percent at exit on nutrition practices of participants.

- . Seventy-three percent of participants reported improvement in reading labels.
- . Sixty-eight percent reported improvement in selecting healthy foods.
- . Seventy-two percent reported improvement in planning meals.
- . Sixty-three and sixty percent respectively reported serving more than one kind of fruit or vegetable each day.

Twenty-four hour food recalls showed 94 percent of graduates made a positive change in any food group.

- . Fruit servings increased from 1 to 1.9 daily
- . Vegetable servings increased from 2.5 to 3.0
- . Calcium/dairy servings increased from 1.9 to 2.2
- . Fiber increased from 13.2 to 16.7
- . Servings from foods in the “other” group decreased from 22.1 to 15.5

The mean nutrient adequacy ratio (NAR) (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. Based on participant 24-hour food recalls at entry and exit, mean nutrient intake (percent of RDA) increased from .75 at entry to .84 at exit. Program participants showed improvement in every nutrient measured including protein, iron, calcium, vitamin A, vitamin C, and vitamin B6.

- ▶ Results of 5,055 youth participants enrolled in Grazin’ the Food Guide Pyramid with Marty Moose and WIN Kids curriculum:
 - . Ninety percent now eat a variety of foods
 - . Seventy-three percent increased knowledge of human nutrition
 - . Seventy-four percent increased their ability to choose low-cost, nutritious foods
 - . Seventy-five percent improved practices in food preparation and food safety
 - . About one-third showed a 90–100 percent increase in physical activity
 - . Most reported at least a 50 percent increase in water consumption
- ▶ 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 percent of participants indicated they had gained knowledge and a greater awareness of the subject matter.
- ▶ With proper dietary balance of essential fats, reproductive success may be improved in the general population. When omega-3 fatty acids are present at levels approximately 3-fold higher than the DRI, and easily achievable in the diet, ovulation is not suppressed.

- 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 extension (MT, ID, 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 a Hatch project and it is a multi-state project. The research effort in this area includes about .25 FTEs with expenditures of approximately \$.01 million Hatch and \$.1 million State.

Cooperative Extension Service FTEs 30.15
Goal 3 Allocated Funds \$2,528,865

Goal 3 - IMPACTS

WIN Steps for Life

Situation: Obesity is the most widespread and complex health problem facing Americans including Wyoming residents, according to the Centers for Disease Control and Prevention. Approximately 64 percent of adult Americans are overweight or obese, with 41 percent being overweight and 23 percent being obese. Overweight and, particularly, obesity increase the risk of chronic diseases and conditions including type 2 Diabetes, heart disease, hypertension, and osteoarthritis.

Physical activity is now recognized as one of the most important health behaviors because of its role in the etiology of chronic disease. Unfortunately, 60 percent of Americans are not regularly active, and 25 percent are not active at all. Twenty-one percent of Wyoming adults report no leisure-time physical activity.

The Wellness in Steps (WIN Steps) program was implemented in Uinta and Sweetwater Counties to tackle this issue. The goals of the program included focusing on the physical activity of walking, promoting the benefits of walking, increasing the awareness of movement by the use of pedometers to keep track of the number of daily steps, and boosting the amount of physical activity each day.

Pedometers and step logs were distributed to all participants. Pedometers record the number of steps taken. The educational program showed participants how to determine their baseline using an average number of steps taken for three days prior to starting the walking program. Steps taken over a defined time period or steps per day are the most appropriate units of measure, so increased steps above the baseline were used to determine program success. Participants were encouraged to start walking more and given suggestions for ways to increase their total steps.

Impacts: Participants in the WIN Steps program gained awareness, knowledge, and skills. They learned about physical movement, reasons to become more active, the long-

term health benefits of walking, and how to use pedometers. Data was collected from 162 participants who completed the eight-week walking program. The goal of increasing the amount of physical activity through walking was evaluated by the number of steps above the baseline number. Individual steps increased per day by an average of 974 steps or about one-half mile. One participant reported, “It made me much more aware of how sedentary my job is and encouraged me to find new ways to add steps.”

Health benefits to participants included toning their muscles, helping to control their appetites, and increasing the number of calories expended. Additional benefits reported after participation in the program included sleeping better, less stress, feeling good about themselves, having more energy, and enjoying life.

Nina Romero-Caron
University Extension Educator
Desert West Area/Sweetwater County
(307) 352-6775
e-mail: vromero@wwcc.cc.wy.us
Cooperative Extension Service
University of Wyoming

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.

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

The integrity of Wyoming’s natural resource base and the state’s diverse ecosystems is a central focus of the 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. An initial certification school, consisting of 24 hours of training and a 12-hour recertification school were held in 2004. Approximately 700 private applicators received training and 525 were recertified. In 2004, 72 commercial applicators received training and were certified and 210 received training for recertification. UW CES offers pesticide training materials on the Internet. Web site access is approximately 50 times per week.
- b. Impact - Approximately 1,200 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), State
- 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. Wyoming residents and visitors highly value the state's big game and wildlife. Wildlife is an important part of residents' quality of life and a reason visitors come to 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 46 educational workshops, classes or tours reaching over 1,626 individuals on topics ranging from "Forage Nutritional Components and Palatability Factors," "Range Monitoring," and "Living on a Few Acres". The Sustainable Management of Rangeland Resources Initiative Team created 63 seventy-second natural resource educational spots which air twice weekly on statewide commercial television reaching a potential 30,000 households. Over 500 producers and agency personnel participated in Range Monitoring Workshops. In addition, programs targeting youth audiences reached over 1,446 children through school presentations and traditional 4-H.

Landowners, public policy makers, and individual 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. The Wyoming Open Spaces Initiative is a multi disciplinary project that spans multiple colleges on campus, and includes environmental and agricultural organizations. We have also had strong support from certain mineral interests. The project's objective is to raise awareness of the importance of private lands for wildlife and fiscal balance. UW publications, located at <http://www.uwyo.edu/openspaces/index.htm>, identify the scope of the research and outreach. Grass identification is a challenging experience to the untrained observer. Ranchers, public land management agencies, environmental groups, real-estate agents, youth groups, teachers, and students continue to request CES provide programming on identifying grasses of western landscapes. In addition, requests for learning about plants and habitat associated with volunteer water quality monitoring programs within the Northern Plains and Mountain Regional Water Quality Program was prevalent. The Sustainable Rangeland Resources Initiative Team of the University of Wyoming Cooperative Extension Service asked the Renewable Resources Department to develop a deck of playing cards that would present 54 of the West's most common grass species. Criteria included these grasses be presented in color and with technical photos describing differences between species, and for each, dominant ecological traits. As a member institution of the Northern Plains and Mountains Regional Water Quality CREES 406 Grants Program, the Renewable Resources Department published Western Grasses - Marked Deck Playing Cards for marketing in June 2004.

- 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.
- ▶ Fifty producers, natural resource agency staff, and representatives from interest groups participating in the Wyoming Rangeland Management School reported they had gained knowledge. Thirty five percent of evaluation respondents indicated they would improve range monitoring practices.
 - ▶ Small acreage workshop evaluations showed that participants learned how to recognize the abuse and neglect of land resources and how to return the land to healthy and productive landscapes.
 - ▶ Two new cooperative range monitoring efforts were established. Permittees and agency managers who are involved in monitoring programs say that two of the major benefits are reduced stress levels and improved working relationships. Monitoring programs also provide agency managers with a record of their stewardship. Permittees may also realize economic benefits. Participants in the Silver Creek Monitoring Program estimate that their monitoring and associated management saves them approximately \$5,000 each year.
 - ▶ One hundred percent of the youth participants showed increased knowledge and skills as a result of educational efforts.
 - ▶ The first printing of 2,900 decks of Western Grasses were sold out before October 2004. Requests and distribution included the entire western U.S. The second printing is due for delivery during January 2005. This pocket size deck of playing cards remains a popular tool for field surveying habitat for wildlife, livestock grazing, real-estate value, and assessing environmental quality of western landscapes. Use of the cards and photos for developing aids for classroom and field instruction is

progressing because of the playing cards' popularity.

► Results from the Wyoming Open Spaces Initiative was partly responsible for encouraging the governor to support and promote a state fund that will assist in protecting wildlife habitat on private open spaces.

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, MI, MO, NM, NY, OR, PA, TX, VA, WA, WY, Canada)

Multi-state research (W-1133) (AL, AZ, CA-B, CA-D, CO, CT, GA, IA, KY, LA, MA, MD, ME, MI, ND, NH, NY, OH, OR, PA, TX, UT, WA, WV, WY)

Integrated Research and Extension

Key Theme – Integrated Pest Management

a. In 2003, large areas of pasture and hay fields in Uinta, Sweetwater, and Fremont Counties were infested with grasshoppers. Some areas of these counties had not suffered a grasshopper outbreak for more than 50 years so land managers were not familiar with the modern decision-support approaches and the latest techniques of grasshopper management. Landowners in those counties requested help from UW CES. In eastern Wyoming (Niobrara and Goshen Counties), severe grasshopper infestations devastated native rangeland. In the late winter and early spring of 2004, county CES extension educators and county Weed & Pest supervisors determined that public meetings would help answer their clients' grasshopper management questions and determine the best course of action. Managing grasshoppers is expensive and controversial, and there is little room for error when making such a management decision. UW has developed a reliable grasshopper assessment method by which non-technical personnel can easily and effectively assess rangeland grasshopper infestations and determine whether they are at densities that will threaten the forage and, hence, wildlife and domesticated livestock.

b. Impact – It is estimated that this method costs \$600 per county (including transportation, labor, and subsistence), which is far less than the cost of a mistaken management effort. Verbal and written feedback from participants and meeting organizers both indicated that the information presented helped ranchers dealing with grasshopper infestations make informed decisions on the best course of action. Those ranchers that needed to control grasshoppers saved over a dollar per acre by using the latest technique in grasshopper control developed at UW (Reduced Area-Agent Treatments) rather than traditional, blanket spraying of infestations with broad-spectrum insecticides. Just as important were the thousands of acres that were determined to have sub-economic populations of grasshoppers in 2004 and weren't treated. The long-term impact of the public meetings is that attendees now know that grasshopper outbreaks can be economically controlled with minimum adverse environmental impact.

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 the Reduced Agent-Area Treatments (RAATs), efforts to establish an alfalfa variety that is resistant to Brown Root Rot, and the Wyoming Open Space Initiative. 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. Diseases cause millions of dollars in losses to U.S. sugar beet growers. One disease that is particularly damaging in the western U.S. is Fusarium Yellow. Due to long-term survival structures, this fungus causes losses every time sugar beets are grown. Chemical seed treatments and soil fumigation have been the traditional means of attempting to control this disease. Recently, several varieties with resistance to Fusarium Yellow have been developed. Both are currently grown on a limited basis in Wyoming. Also, several bacterial and fungal organisms have been registered for application on seed for biological control of several soil-borne diseases including Fusarium spp. On-farm research conducted in Wyoming has shown an increase in sugar beet yield can be realized with the combination of biological seed treatment and Fusarium Yellow-resistant sugar beet varieties.
- b. Impact – Sugar beet yields were increased from 13.6 T/A up to 22.4 T/A with the Fusarium Yellow-resistant variety WS91 plus biological seed treatment. With an estimated 1,700 acres infested with this disease, a potential savings of over one million dollars annually could be realized from these new control practices for this one disease in this one sugar beet growing area of Wyoming. A much larger number of producers, agency managers, and Extension educators are aware of the importance of monitoring resources and the use of that information in identifying management options and decision points.
- 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. Arsenic (As) enters water supplies from natural deposits in the earth's crust and/or anthropogenic activities (e.g., mining, coal burning power plants, copper smelters). Arsenic in natural water is found in two oxidation states, arsenite (+III) and arsenate (+V). The predominant arsenic species found within the pH range (5.5-8.5) of natural waters are arsenite and arsenate, with arsenite the most toxic. Removal of arsenic species from water is complicated by the pH and other ions commonly found in water. Recent studies suggest that high concentrations of arsenic in drinking water are found in many countries throughout the world including the United States. One estimate suggests that more than 13 million people are exposed to arsenic through drinking water in the United States. Long-term exposure to arsenic contaminated drinking water, in excess of 50 ug As/L, causes increased risk of skin, lung, bladder, and kidney cancer including skin-related problems such as hyperkeratosis and pigment mutations. Arsenic consumption also promotes cardiovascular and nervous system malfunctions, eventually resulting in death.

After reviewing the arsenic crisis, the U.S. National Research Council recommended lowering the human drinking water limit of 50 ug As/L. Subsequently, the U.S. Environmental Protection Agency (EPA) proposed a new limit of 10 ug As/L for human drinking water, effective January 26, 2006. The World Health Organization (WHO) also recommends 10 ug As/L as a limit for human drinking water. Arsenic contamination of groundwater is a problem of global dimensions. Different physical, chemical, and biological methods are used in an attempt to remove arsenic species from water. Most methods work well for arsenate but removal of arsenite, which is most toxic, from water has had limited successes. The arsenic removal method developed in the Renewable Resources Department can remove both arsenic species from water to less than 10 ug/L in compliance with the new EPA human drinking water ruling. This unique method is rapid, inexpensive, does not require pH adjustments, is not affected by the presence of most other components found in water, and produces no harmful byproducts.

- b. Impact – Research findings of this study will significantly improve the health of many people worldwide by improving drinking water quality. This arsenic removal process attracted interest from several national and international water treatment industries.

- c. Source of Funding – Hatch, State

- d. Scope of Impact – State Specific

Multi-state research (W-128) (AL, AZ, Australia, CA, FL, GU, HI, IA, ID, IN, KS, MN, NM, NY, OR, PR, TX, VA, VI, WY)

Multi-state research (W-188) (AZ, CA-B, CA-D, CA-R, CO, CT, DE, FL, IA, IL, IN, KS, KY, MT, ND, NY, TN, UT, WA, WY, USDA-ARS)

Integrated Research and Extension

Goal 4 Summary:

The integrity of Wyoming's natural resource base and diverse ecosystem is the focus of the College's extension and research programs. A few of the college's on-going efforts in the Goal 4 area are:

1. Integrated Pest Management
2. Natural Resource Education
3. Rangeland and Riparian Management
4. Biological Control

Researchers in this area participated in eight Hatch projects and five of the eight are multi-state projects and five are integrated research and Extension. The research effort includes 6.2 FTEs with expenditures of approximately \$.28 million Hatch and \$1.8 million State.

Cooperative Extension Service FTEs 13.48

Goal 4 Allocated Funds \$1,130,650

Goal 4 – IMPACTS

Expansion of Cooperative Rangeland Monitoring Programs

Situation: Managers of public rangelands and those who use them to support their livelihood must ensure their management decisions take proper care of basic rangeland resources. The only way to ensure management decisions provide for the proper care of rangeland resources is through monitoring. Monitoring is the orderly collection of data and information to support short-term and long-term management decisions. In the past, public land management agencies have been primarily responsible for monitoring rangelands. In recent years, it has become obvious that these agencies do not have the time or resources to conduct all of the monitoring that is necessary. The University of Wyoming Cooperative Extension Service (CES) has been working closely with public land management agencies and livestock grazing permittees to increase the number of cooperative rangeland monitoring programs.

The CES range specialist presented eight talks in 2003 and 2004 that focused on the benefits of monitoring. They provided a description of established cooperative monitoring programs. In some instances, permittees involved in established monitoring programs helped with the presentations. Four hands-on monitoring workshops were also offered. Extension specialists and CES educators accompanied agency managers and permittees and helped with the establishment of two additional cooperative monitoring programs in western Wyoming. CES is responsible for initiation of several successful cooperative rangeland monitoring programs including the Silver Creek program.

Impacts: The Tosi Allotment Monitoring Program began when an interested agricultural producer who holds a permit to graze livestock on public land contacted the area extension educator in Sublette County and expressed an interest in starting a cooperative

monitoring program. As a result, CES facilitated meetings to help agency managers and permittees identify and establish objectives to guide their program. CES personnel accompanied the permittees and agency managers on a two-day ride over the U.S. Forest Service allotment where the cooperative monitoring effort was initiated. Extension range specialists were requested by the Fremont County Cattlemen's Grazing Task Force to conduct a hands-on monitoring workshop in the Lander area. Twenty-five livestock producers and permittees participated in the workshop. Five individuals held grazing permits for the Atlantic City Common Allotment managed by the Bureau of Land Management (BLM). Following the workshop, the permittees and a BLM range specialist contacted UW extension range specialists to request help establishing a cooperative monitoring program on the BLM allotment.

The establishment of two new cooperative monitoring efforts in the past year represents significant progress, and the fact that one of these programs is on a BLM grazing allotment in the Lander area is especially encouraging as a start to improving the working relationship between producers and BLM. Permittees and agency managers who are involved in monitoring programs say that two of the major benefits of participating in such a program are reduced stress levels and improved working relationships. Monitoring programs also provide permittees and agency managers with a record of their stewardship. In more than one instance, agency managers have used monitoring reports compiled in part or entirely by their permittees to alleviate environmental concerns expressed by individuals or public-interest groups. Permittees may also realize economic benefits. Participants in the Silver Creek Monitoring Program estimate that their monitoring and associated management saves them approximately \$5,000 each year.

Paul Meiman
Extension Range Specialist
Department of Renewable Resources
(307) 332-1840
e-mail: pmeiman@uwyo.edu
Cooperative Extension Service
University of Wyoming

A Novel Method to Remove Arsenic from Drinking Water

Situation: Arsenic (As) enters water supplies from natural deposits in the earth's crust and/or anthropogenic activities (e.g. mining, coal burning power plants, copper smelters). Arsenic in natural water is found in two oxidation states, arsenite (+III) and arsenate (+V). The predominant arsenic species found within the pH range (5.5-8.5) of natural waters are arsenite and arsenate, with arsenite the most toxic. Removal of arsenic species from water is complicated by the pH and other ions commonly found in water. Recent studies suggest that high concentrations of arsenic in drinking water are found in many countries throughout the world including the U.S. One estimate suggests that more than 13 million people are exposed to arsenic through drinking water in the U.S. Dissolve arsenic in water is acutely toxic. Long-term exposure to arsenic contaminated drinking water, in excess of 50 ug As/L, causes increased risk of skin, lung, bladder, and kidney cancer including skin-related problems such as hyperkeratosis and pigment mutations. Arsenic consumption also promotes cardiovascular and nervous system malfunctions,

eventually resulting in death.

After reviewing the arsenic crisis, the U.S. National Research Council recommended lowering the human drinking water limit of 50 ug As/L. Subsequently, The U.S. Environmental Protection Agency (EPA) proposed a new limit of 10 ug As/L for human drinking water, effective January 26, 2006. The World Health Organization (WHO) also recommends 10 ug As/L as a limit for human drinking water. Arsenic awareness of drinking water skyrocketed during the 1990's after several million people in Bangladesh and India were poisoned by drinking contaminated water. Arsenic contamination of groundwater is a problem of global dimensions. Different physical, chemical, and biological methods are used in an attempt to remove arsenic species from water. Most methods work well for arsenate but removal of arsenite, which is most toxic, had limited successes. The arsenic removal method developed in UW Department of Renewable Resources Water Quality Laboratory can remove both arsenic species from water to less than 10 ug/L in compliance with a new EPA human drinking water ruling, which is scheduled to go into effect January 2006. This unique method is rapid, inexpensive, does not require pH adjustments, is not affected by the presence of most other components found in water, and produces no harmful byproducts.

Impacts: UW's applied-oriented water quality research on arsenic culminated in an elegant and practical method to purge poisonous arsenic from water: (uwadmnweb.uwyo.edu/news/2004/august/uwnews18.htm). Research findings of this study will significantly improve the health of many people worldwide by improving drinking water quality. This arsenic removal process attracted interest from several national and international water treatment industries and brought significant recognition to our water quality program from around the world following articles in local, regional, national, and international news. A United Nations TV show on our arsenic removal process was produced in January 2005, where we discussed the arsenic removal process for underdeveloped countries.

K.J. Reddy
Department of Renewable Resources
307-766-6658
e-mail: katta@uwyo.edu
University of Wyoming

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.

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 that 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 Forest Service, Bureau of Land Management, National Park Service, Bureau of Reclamation, and 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 six extension areas conducted 53 financial management classes reaching 718 individuals. Topics included credit, savings, insurance and risk management, financial security in later life, pocket change series, and basic budgeting. Of the 718 total participants, 515 attended single topic workshops and 203 completed in-depth financial management courses that entailed three to five sessions. Estate planning issues such as transferring non-titled property were addressed in six programs reaching 116 individuals.
- b. Impact - Impact documented through evaluations on financial management programs included:
 - ▶ 67 percent of participants indicated they had learned at least one new method for decreasing their expenses.
 - ▶ 62 percent better understand the costs of credit and dangers of making only the minimum payment.
 - ▶ 90 percent reported they learned new information in the classes.
 - ▶ 45 percent have set a long term financial goal and have a written plan for managing debt.
 - ▶ 100 percent reported they were making changes in their money management practices.

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. Seventy-eight percent who completed evaluations rated their knowledge as “greatly improved.”

- c. Source of Funding - Smith-Lever
- 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. Forty-four educational workshops, classes, and seminars reached over 912 individuals. Topics included facilitation skills, mediation training, conflict management, teambuilding, and leadership development. Leadership is an important foundation for effective community development. Studies and surveys repeatedly document the need for leaders in rural communities. There are a few leadership programs in the state and very few exclusively locally based. The leadership program developed seeks to get communities involved in producing their own cadre of local leaders. This program differs from traditional programs in three ways: First, the programs are locally run with UW acting as a partner. The university helps guide the process of development, but community participants own the program. We provide technical expertise when local expertise cannot be found. Second, the curriculum is defined not by outside experts but a local steering committee. Finally university personnel assist in assessment. Leadership Institutes that meet monthly for six to eight sessions and run six hours in length have been initiated in seven counties in Wyoming with over 150 participants.

- b. Impact - Impacts from the workshops conducted include: new skills were acquired; participants had a better understanding of using criteria for determining resolution. 100 percent of participants felt they would use at least one skill learned in their workplace or desired to use them in community meetings. Specific outcomes include:
- ▶ Results from mediation training included conflicts resolved. Workplace mediation program evaluations indicated participants learned tips for calming unhappy customers and improved skills in conflict management.
 - ▶ Leadership Institute participants in two counties reported the following short term outcomes: On a scale of 1-5 (1=no improvement to 5=greatly improved), skills improved in communication – 4, problem solving – 4.1, decision making - 4, building relations – 4.3, and leadership abilities – 4.4. Medium term outcomes measured six months following the eight 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 2003 graduates include: 100 percent of graduates are implementing teambuilding tools, 90 percent of participants are using communication and managing change tools. One hundred percent of respondents are involved in the community at either the same level or more after the course.
 - › Twenty percent of participants in anger management classed indicated they would practice and use the control techniques presented.
 - › Twenty-five percent of respondents who participated in Identity Theft seminars ordered copies of their credit reports after the workshop.
 - › 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.

Spectra-fan analyses rated reactions to the facilitated sessions. The results were (1 equals low to 7 equals high):

	<u>Rating</u>
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• “Overall, how would you rate the meeting?”	6.4
• “How well was the meeting goal accomplished?”	6.2
• “How well will the work accomplished at this meeting assist you in your leadership or decision-making role?”	5.9
• “How well did this group work collaboratively toward accomplishing today’s goal?”	5.2
• “Were appropriate processes and methods used?”	6.4
• “Was progress made as a result of this meeting?”	6.7

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. Life skills were defined as communications, problem solving, planning ability, decision making abilities, striving for excellence, leadership, and interpersonal relationship building. Wyoming had 11,745 youth and 3,267 volunteer leaders enrolled in the traditional 4-H youth program. Over 372 workshops, camps and clinics were held in counties throughout the state reaching over 26,587 youth. Over 10,572 youth participated in 4-H school enrichment programs during the year. In 2004 the first military 4-H club was formed in cooperation with F.E. Warren Air Force Base.

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.

Junior Leader age members (13–19) who received training have conducted clinics and field days for club project members, and taken over adult leadership responsibilities. Members have become more involved in community service

projects and demonstrated that they had learned the meaning of team work and cooperation. A major impact of the program is the skill demonstrated in organization, team work, communication, public speaking, time management, and critical thinking. Youth reported increasing their ability to accept responsibility as well as being more thorough in project completion.

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 3,267 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 forty 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 levels was completed through certificates, plaques, leader appreciation in newsletters, and 'leader of the month' program.
- b. Impact - Over 640 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 percent 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 percent.

- 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 Forest Service, Bureau of Land Management, National Park

Service, Bureau of Reclamation, and 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. In recent years, the management of federal lands has become much more contentious with a number of interest groups with divergent concerns becoming more involved in the planning process. One area of debate that is of particular importance to Wyoming is the economic implications for local communities of alternative federal land management decisions. Often these discussions are based on emotion rather than solid economic information. 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 U. S. provide important information that is used to assist in the planning process to make decisions that are critical to the future of Wyoming. The following is a listing of activities associated with federal land management planning efforts in Wyoming and the Western U. S. during the past year. These efforts provide important information that is used to assist in the planning process to make decisions that are critical to the future of Wyoming.
- ▶ W-192 Regional Committee – This committee is a regional research/extension 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 social impact analysis. A report on a pilot project on livestock grazing in Fremont County has been completed.
 - ▶ An analysis of the economic impact of endangered species listing for the Preble’s Meadow Jumping Mouse on the economy of Southeastern Wyoming was conducted. This is a continuation of a project from last year. A paper on the preliminary analysis was presented at the annual meeting of the Western Regional Science Association in February 2004. Further analysis included a computer model to estimate producers’ costs due to protection of the mouse and translate these to economic impacts on the regional economy. The final report was submitted to the governor’s office in September 2004. This report will be used as a part of state and local government efforts to modify the critical habitat designation for the mouse.
 - ▶ Economic analyses of the Big Horn National Forest Plan Revision and the Medicine Bow National Forest Plan Revision were conducted 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 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 has been developed annually for the last five years. These fact sheets summarized the PILT calculations for each county in Wyoming.

► Economic analysis of four Resource Management Plans was conducted for the Bureau of Land Management, including Pinedale, Rawlins, Kemmerer, and Casper Districts. These analyses consider the local economic importance of livestock grazing, recreation and mineral development on BLM lands. Affected counties in Wyoming include Lincoln, Sublette, Sweetwater, Carbon, Albany, Uinta, Natrona, Converse, Platte, and Goshen. Field specific analyses are also being conducted for the Jonah Infill, South Piney, and Atlantic Rim projects. These are collaborative efforts between UW, BLM, and various private consulting firms contracted with by the BLM.

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
- c. Scope of Impact – State Specific (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 rights 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.

When developing plans of work, individuals either include 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 staffing bi-lingual coordinators for the Cent\$ible Nutrition Program (CNP), preparing nutrition materials in Spanish and Braille, and 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 programs specifically for children of migrant workers. In 2004 CNP expanded collaborative efforts with the Eastern Shoshone and Northern Arapaho tribes that enabled CNP to increase funding for nutrition education on the Wind River Indian Reservation. Two nutrition educators and a coordinator were hired to

serve this area.

- 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 had 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 are 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:

Wyoming residents identified economies of Wyoming communities, personal finances, and youth development as high priorities. University of Wyoming researchers are working with Wyoming communities, assisting them with identifying impacts of change, developing community network resources, and developing leadership capacity for community leaders. Researchers in this program area participated in two Hatch projects. One project is multi-state and one is integrated research and extension. The research efforts include about 1.4 FTEs with expenditures of approximately \$.19 million Hatch and \$.3 million State.

Cooperative Extension Service FTEs 41.65
Goal 5 Allocated Funds \$3,493,440

Goal 5 - IMPACTS

Value of Third-Party Assistance

Situation: Third-party assistance is recognized as a useful and valid mechanism for helping groups achieve their goals. Any group that has a task to accomplish can benefit from facilitation, either as third-party assistance or as individual members contributing their personal facilitation skills to a group. Facilitation is fast becoming a core competency for anyone who is on a team, leading a group, heading up a committee, or managing an organization. Interest in refining personal-facilitation skills has also increased. Group members with facilitation skills can create group settings where people collaborate, plan, and make sound decisions.

Eleven group sessions, retreats, and meetings were facilitated or mediated as a third-party by the area extension educator. Groups consisting of eight to twelve members met for between five to nine hours. Goals guiding the sessions were to develop a new five-year strategic plan, determine and prioritize plan-of-work goals and assignments, explore new public facilities, create an action plan as a result of strategic planning, and prepare for the codification of town laws.

A two-day Level I training session with 20 participants and two Level II trainings with

seven participants were held to help individuals develop personal skills in facilitation. Level II trainings require students to conduct 30-minute facilitation.

Impacts: Spectra-fan analyses rated reactions to the facilitated sessions. The results were (1 equals low to 7 equals high):

	<u>Rating</u>
• “Overall, how would you rate the meeting?”	6.4
• “How well was the meeting goal accomplished?”	6.2
• “How well will the work accomplished at this meeting assist you in your leadership or decision-making role?”	5.9
• “How well did this group work collaboratively toward accomplishing today’s goal?”	5.2
• “Were appropriate processes and methods used?”	6.4
• “Was progress made as a result of this meeting?”	6.7

Follow-up comments indicated an appreciation for third-party assistance. A Powell Research and Extension Center representative said, *“We can’t thank you enough for facilitating the initial steps to the revision...you got us through the tough part.”* A member of the Big Horn County Economic Development said, *“We will accomplish more now that we are more focused.”* A Cody Chamber of Commerce spokesperson said, *“Thank you for your professionalism and creative approach in guiding our retreat.”* A representative of the Thermopolis Economic Development Council said, *“Thanks so much for your brilliant performance under a time pressure...we made real progress! We have a very aggressive plan.”* A participant from the Riley Ice Arena commented, *“If it was not for your help and guidance, the program could not have been finished.”*

Facilitation Training – Level I training was rated 4.7 on a 5-point scale overall as well as for usefulness of the information. In Level II training, participants identified strengths of the program as: focus, transitions, reinforcement, engagement, paraphrasing, probing questions, flexibility, and summarization. They learned more tools relating to facilitation, time efficiency, and conducting a productive meeting.

Rhonda Shipp
 Area Community Development Educator
 Park County/Big Horn Basin Area
 307-527-8560
 e-mail: rshipp@parkco.wtp.net
 Cooperative Extension Service
 University of Wyoming

Money Management Skills Lead to Financial Security in Later Life

Situation: Teton County’s growth since the development of its tourism industry in 1960 has grown more than six fold in its year-round population. The four most recent U.S. Census Bureau counts show that between 1970 and 2000, Teton County’s population grew at more than four times the rate of both Wyoming and the United States. The county’s rapid population growth in the past three decades is due in large part to

people moving to the area for its recreational opportunities rather than its economic ones. In recent years, investment income and the increasing flexibility to work from remote locations has played a major factor in the population growth.

Teton County's mean adjusted gross income per tax return increased from \$62,052 in 1995 to \$113,739 in 2000. These figures help to explain the disparity among household incomes in the county. The service-sector jobs are being filled increasingly by immigrants moving into the area.

Financial security is the ability to meet future needs while keeping pace with day-to-day obligations. Preparing for retirement and potential long-term care costs takes planning, savings, and debt control. The University of Wyoming Cooperative Extension Service seeks to help people improve personal financial behaviors leading to better consumer decision-making skills in the short term and financial security in later life.

Impacts: All About Money is a five-week course that was offered in Big Piney, Pinedale, Jackson, and Alta. The classes attracted 31 participants. The course offered tips on basic money management including: "Why and Where the Money Goes," "Stop Spending Leaks," "Credit Cards as the Financial Tool they Should Be," "Keeping your Papers and Records in Order," and "Retirement Planning." The series was also modified to meet the needs of a group of single mothers.

Evaluations were received from 24 individuals indicating a:

- › 100 percent response that they strongly agree to understand how to begin to manage their money.
- › 100 percent response that they strongly agree to understand the role values play in spending behavior.
- › 91 percent response that they strongly agree they understand how they "emotionally" use money.
- › 91 percent response that they strongly agree they have identified realistic short-term money management goals.
- › 83 percent response that they strongly agree they have identified realistic intermediate-term financial goals.
- › 75 percent response that they agree they have learned skills to improve communication skills regarding money.

One participant indicated that the budget her family developed was allowing them to put \$200 a month into savings. Another participant has begun saving \$30 a month. They said they had been non-savers prior to the program.

Mary M. Martin
University Extension Educator
Mountain West Area/Teton County
(307) 733-3087
e-mail: mmartin@tetonwyo.org
Cooperative Extension Service
University of Wyoming

4-H Leader Development

Situation: Volunteers are essential to the Cooperative Extension Service (CES). Nearly 625,000 volunteers deliver 4-H/Youth development programs to America's youths annually, according to National 4-H Headquarters. Life skills for youths and the ability to nurture and guide youths were identified as top priorities in the 2004 College of Agriculture's Extension and Research Needs Assessment. Wyoming's youths are the state's most valuable resource. In order to provide them with the best training possible, CES must provide adult volunteers with the most current research on learning styles of youths and subject matter information. CES has a responsibility to provide volunteers with the tools necessary to succeed and reward the volunteers for their efforts.

Volunteer leader training had not been offered for many years in Natrona County. The 4-H Leaders Council and the 4-H Foundation raised more than \$5,000 to support the "Essence of Leadership" training sessions. The youth council provided subject matter priorities and identified the needs for clubs and members. Funds were used to provide leader handbooks, clinics, project materials, speakers, and library resources. Videos and compact discs (CDs) of the sessions were made. In-depth training in various subject matter areas were held over two years with 170 individual clinics offered.

Impacts: The first year, 78 percent of Natrona County leaders received face-to-face training and through the videos and CDs, now 83 percent of leaders have now been through certification. Volunteer youths and adults contributed \$121,260 in in-kind dollars through training members. A county commissioner stated, "The volunteering of leaders has an enormous impact on our community." This impacted the staff's effectiveness, and surveys of youth attending indicated they changed practices in working with youths as a result of the educational offerings.

In a survey of Natrona County leaders, two-thirds of the volunteers stated that community awareness was a skill that had increased as a result of being a 4-H leader. Close behind was the ability to teach youths and the ability to help youths with decisions, which led to an increase in their self confidence. The leaders had experience ranging from two to thirty-one years and spent an average of 15.5 hours per month volunteering. One ten-year leader noted that watching every child learn, grow, and mature into independent young adults was the aspect of 4-H that gave her the most satisfaction.

Formal exit evaluations of leaders receiving the "Essence of Leadership" training revealed that 96 percent of them would use the techniques taught on meeting the needs of youths through "active teaching-active learning" guidelines. 4-H leaders want to make a difference and provide the most up-to-date information available to youths while nurturing and guiding them. 4-H is giving them the tools required to do that.

Colleen Campbell
4-H Program Associate
Natrona County
(307) 235-9400
e-mail: ccampbell@natronacounty-wy.gov

4-H Judging Programs Develop Life Skills

Situation: 4-H judging programs have had a positive impact on the development of youths for decades. Little has been done in Wyoming to document the effect judging programs have on the development of life skills or career choices.

Two Cooperative Extension Service educators designed a survey based on a project completed at Iowa State University to assess the impact that judging programs had on the development of life skills in 4-H members who had been or currently were involved in a 4-H judging program using a model targeting life skills provided by the 4-H program. Skills included critical thinking, decision making, leadership, teamwork, communication, cooperation, self motivation, social, and marketable to name a few.

Meetings were conducted in four counties by focus groups consisting of past and current judging program members, parents of members, and parents who had been involved in a judging program and who currently had children involved in judging. Questions focused on what value judging programs had on the development of life skills, the level of education, and career choices. Approximately 130 individuals participated in the four focus groups.

Surveys were mailed to 488 current and past 4-H members from six counties who participated in livestock, meat, wool, horse, dairy, vegetable, or family and consumer sciences judging programs.

Impacts: Forty-six percent of the surveys were returned. Survey results showed that 87 percent of the respondents said that their 4-H judging experiences had impacted their career choices. More than 98 percent reported that 4-H judging had influenced their decision to volunteer time for worthy causes or organizations.

Individuals were asked to rank the impact that 4-H judging programs had on the development of twenty life skills, with the rankings being 1 (no impact) to 5 (strong impact). Results showed the following: oral communications (4.5); desire to continue learning (4.4); self-confidence, decision making, dealing with competition, leadership, and ability to verbally defend a decision (4.3); critical thinking and social skills, and ability to analyze and apply knowledge (4.2); positive attitude, teamwork, accepting responsibility, and setting and achieving goals (4.1); problem solving, organizational skills, self motivation, and ethical behavior (4.0); and self-discipline and volunteerism (3.9).

Subject matter questions were also ranked on a scale of 1 to 5. Results reported were: ability to distinguish differences (4.6); economic benefit-selecting high quality products/animals (4.5); consumer “buymanship” (4.2); industry knowledge (4.0); and industry trends (3.8).

Written comments included the positive influence these programs had on decision-

making skills, public speaking and communication, the ability to compete, educational experiences related to traveling around the United States, and the friendships gained and the social skills developed with other youths from their own county as well as across the state and nation.

Tamra R. Jensen
University Extension Educator
CNN Area/Niobrara County
(307) 334-3534
e-mail: trjensen@uwyo.edu

Wayne R. Tatman
University Extension Educator
Southeast Area/Goshen County
(307) 532-2436
wtatman@uwyo.edu

B. Stakeholder Input

The UW CES is continuing 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 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.

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 has 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. In the past year CES has partnered with the Natural Resource Conservation Service (NRCS) with representatives meeting quarterly to assess joint needs and work cooperatively in development and delivery of programs. Each of the three Research & Extension Centers has an advisory committee that meet annually. These advisory committees provide information on existing research and outreach programs and input

regarding priority needs for research and outreach. In 2004, meetings were held across the state, in addition to a written survey, asking for input on research priorities for the new Sustainable Agricultural Research and Extension Center located in SE Wyoming. 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 and 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. The committee submits recommendations for project funding to the AES director.

D. Evaluation of the Success of Multi and Joint Activities

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. 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.

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, including 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.

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.

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. In addition, CES specialists report multi-state and integrated activities through the UW College of Agriculture faculty update, which are submitted annually.

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
 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					132,865
Goal 2: A Safe & Secure Food & Fiber System					
Goal 3: A Healthy Well Nourished Population					81,279
Goal 4: Greater harmony between Agriculture and the Environment					76,785
Goal 5: Enhanced Economic Opportunity and Quality of Life for Americans					59,188
Total					350,117


 Director

3/25/05
 Date

Form CSREES-REPT (2/00)

U.S. Department of Agriculture
 Cooperative State Research, Education, and Extension Service
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 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)

Actual Expenditures

Title of Planned Program/Activity	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
<u>Goal 1: Enhance Agricultural Systems that are highly competitive in the Global Economy</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>143,538</u>
<u>Goal 2: A Safe & Secure Food & Fiber System</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>Goal 3: A Healthy Well Nourished Population</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>100,037</u>
<u>Goal 4: Greater harmony between Agriculture and the Environment</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>70,000</u>
<u>Goal 5: Enhanced Economic Opportunity and Quality of Life for Americans</u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>30,519</u>
Total	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>344,094</u>


 Director

3/25/05
 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
 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					687,250
Goal 2: A Safe & Secure Food & Fiber System					
Goal 3: A Healthy Well Nourished Population					
Goal 4: Greater harmony between Agriculture and the Environment					237,432
Goal 5: Enhanced Economic Opportunity and Quality of Life for Americans					197,800
Total					1,122,482

James J. Peck 3/30/05
 Director Date

Form CSREES-REPT (2/00)