LARAMIE REGION

Laramie River Greenbelt Phase I (Goal 2) - Christina Barrineau

In 2008 a design plan was developed for the enhancement of the Laramie River by Habitech, Inc. and WWC Engineering. Channel and habitat surveys along the Laramie River indicated bank and bed instability. The degraded habitat conditions were characterized by a lack of quality pools, little effective streamside cover, infrequent and heavily embedded riffles and spawning bars, and an abundance of wide, shallow, sluggish runs with flat cross-section profiles and little habitat diversity. Historic low late summer base flows further aggravate these poor habitat conditions. The plan called for the stabilization and enhancement of aquatic and riparian habitat along 3.8 miles of the Laramie River through the City of Laramie over 3 years.

Phase 1 of the Laramie River Enhancement Project was completed in 2009. Habitat treatments in the river and along the streambanks consisted of rock deflectors, rootwad revetments, vegetated riprap with rootwad spurs, and longitudinal stone toe with rootwad spurs (Figure 1). Funding for Phase 1 was provided by the WWNRT, WGFD Fish Habitat Trust Fund, City of Laramie, Albany County, Laramie Rivers Conservation District, and USFWS. Additionally, numerous local volunteers participated in the cutting and planting of willow stakes at the treatment sites. Phases II and III of the project will be completed in 2010 and 2011. Project monitoring will also commence in late summer 2010.

Figure 1. Vegetated riprap with rootwad spurs habitat treatment along the Laramie River.

- Legume seedings completed on private lands in the Laramie Range to benefit mule deer.
- Russian olive control efforts completed in 2008 were evaluated in 2009.
- Prescribed burn planning continues in 2009, for projects to be completed in 2010.
- Fall livestock grazing treatments on the Wick WHMA result in improved forage conditions for wintering elk.
- Spike treatments applied in 2005 result in improved herbaceous production in 2009 on the Wick WHMA's upland benches.
- Phase 1 of the Laramie River Enhancement Project was completed in 2009.
- 3.5 miles of the Encampment River has been identified for habitat improvements and channel restoration.
- Channel stability was monitored at two sites on Wagonhound Creek on the Wick WHMA.
- 4 beaver transplanted from Dale Robbins property to Wagonhound Creek on the Wick WHMA.

Lower Laramie River Restoration Design (Goal 2) - Christina Barrineau
A conceptual design plan for the Laramie River west of Wheatland was developed for a landowner. On this property, the Laramie River is considered a transitional stream as it flows out of the canyon through the Laramie Mountains and onto the prairie. The river in this area is transitioning from the cold waters and confined reaches of the canyon to warm temperatures and lower gradient habitats of the plains.

Channel morphology measurements were collected throughout the 4,400 feet long reach in 2008 to describe the present habitat conditions within the reach. Overall, the reach was stable with no bank erosion observed. Following the survey, the reach was broken into 9 distinct segments. These segments were then broken into 3 types: 1) long, wide backwater pools; 2) single flowing channel with pool, riffle, and run habitats; and 3) multiple channels with pool, riffle, and run habitats.

The overall goal of the design plan is to narrow and deepen the habitat currently available in the river. Narrowing and deepening the channel should help improve transport of fine sediments in the reach to expose coarser substrates currently buried by silt and sand. The narrower, deeper channel and future development of more riparian shrub and tree species may also decrease summer stream temperatures. The three segments with the highest priority for stream improvements include the three long, wide backwater pool reaches. Structures recommended include rock deflectors, j-hook vanes, and cross-vanes. Overall, the habitat improvements will provide for more diverse habitat within the reach for all species.

Crow Creek – Griffin Park Design (Goal 2) - Christina Barrineau
A conceptual design plan for a reach of Crow Creek in Cheyenne was developed for TU. The design plan focuses on an approximately 2,300 feet reach of Crow Creek between I-25 and Westland Road. The channel can be described as a Rosgen type C channel with low sinuosity and stable streambanks. Most of the reach is wide and shallow with few deep pools, high fine sediments, and minimal habitat diversity for fish. There are some willows and mature cottonwoods within the riparian area, but these woody species are contributing little overhead cover for fish and shade for decreasing stream temperatures.

The design plan focuses on re-constructing the low-flow stream channel from a Rosgen Type C to a Rosgen Type E channel. The reconstruction would increase sinuosity, decrease the stream gradient, and narrow and deepen the channel. The new channel would also allow for more efficient transport of fine sediments. Any structures that would be placed in the stream for habitat enhancements would be placed in the low-flow channel so as not to impede the flood conveyance capacity of the channel.

Woody riparian vegetation plantings, such as willows and cottonwoods, are also strongly recommended in the riparian area throughout the entire project reach. The incorporation of riparian vegetation should be a major component of the habitat project. Woody riparian species provide bank stability as well as providing overhead cover for fish. The cover and shading provided by the trees and shrubs could also aid in lowering summer water temperatures.

Southeast Wyoming Cheatgrass Partnership (Goal 2) - Grant Frost
The Partnership met twice in 2009; February and December. Colorado State University (CSU), a partnership member, continues research and monitoring at several sites, and have expanded the project to begin the Rocky Mountain Cheatgrass Management Project. The Southeast Wyoming Cheatgrass Partnership brings together representatives from WGFD, BLM, USFS, county weed and pest districts, NRCS, Conservation Districts, researchers and university faculty, and private citizens to communicate, collaborate on projects, and learn. CSU credits the partnership with helping get funding for their current research and the newly initiated Rocky Mountain Cheatgrass Management Project.

Platte Valley Mule Deer Habitat Assessment (Goal 2) - Grant Frost
TSS was contracted to assess conditions on mule deer winter ranges and important transitional ranges in the Upper North Platte Valley. Monies used are as follows: $17,216 from the WGFD Trust Fund, $13,356 from the WWNRT, $20,000 from the MDF, and $10,135 of encumbered FY09 WGFD funds. $4,000 was originally donated by the WGBGLC. Because of being denied access to one large ranch in the assessment area, some funding was returned (a portion of WWNRT funding) and attempts are being made to transfer some of the department trust fund and WGBGLC funds to the Wyoming Range assessment also being done by TSS. Total expended in 2009 was $60,707 on 114,580 acres. A completion report will be available in 2010.

Encampment River below Riverside Restoration (Goal 2) - Christina Barrineau
In 2009, interest in restoring the Encampment River downstream of Riverside was expressed by several private landowners and Trout Unlimited. A 3.5 mile reach of river from the Highway 230 Bridge to just above Rainbow Canyon has been identified for future habitat improvements and channel restoration. Within this reach, the river has extensive depositional features (mid-channel bars) and bank erosion (Figure 2). Landownership within the reach is private, but this section of the Encampment River is popular for recreational floating and is rated as a blue ribbon trout fishery. At the upstream end of this reach, a series of cross-vanes were constructed in a short segment (approximately 0.5 mile) about 5 years ago (Figure 3). These structures have stabilized the river, created deeper pool habitat, and provided fish passage at one diversion structure through this segment. The continuation of the channel stabilization and reconstruction is needed throughout the rest of the reach.

In fall 2009, this project was selected to receive $50,000 for habitat project planning by the Director's Office. WGFD will work with TU and a consultant to survey the reach and develop a detailed habitat restoration plan in 2010. WGFD will then work with the private landowners, TU, and the Saratoga-Encampment River (S-E-R) Conservation District to secure additional funding for project implementation.

Figure 2. Channel conditions including bank erosion within the 3.5 mile reach of the Encampment River project area.

Figure 3. Cross-vane structure at an irrigation diversion at the upstream end of the Encampment River project area.

Comprehensive Management Plan for the Platte Valley Mule Deer Herd (Goal 2) - Grant Frost
TSS was able to complete an 114,580 acre habitat assessment of mule deer habitat northern focus areas (Northern portion of Saratoga Valley) in the summer of 2009. A larger area was planned, but one large ranch with 78,972 acres of habitat did not allow access. The draft report was received and comments were made, and a final report was issued in early 2010.

A sightability study using a helicopter was conducted in the Platte Valley, resulting in a population estimate below the estimates resulting from modeling the herd. Use of this estimate is still pending. All of this information, along with public participation, will be used to begin development of a comprehensive management plan for the herd as part oft he Wyoming Mule Deer Initiative.

Mountain Pine Beetle (Goal 2) - Grant Frost
Mountain Pine beetles continue to expand to new areas and increase the percentage of trees killed within previously impacted areas (Figure 4). The winter of 2009-10 doesn't appear to have the temperatures needed to kill the insects, so it is looking like the irruption will only end when the food supply is gone. The Medicine Bow National Forest has received additional funding to deal with the situation, but much of that will go toward dealing with hazard trees around roads, trails, camping areas and other places, and treatments in the Wildland/Urban Interface.

Figure 4. Pine Beetle affected forest, from Jelm Mountain looking west across the Snowy Range toward the Sierra Madres.

Red Mountain Aspen Enhancement (Goal 2) - Grant Frost
Department involvement in this project began in 2004. A project update has been included in the previous four annual reports. In 2009, aspen stands and other areas were treated to remove encroaching and dead conifers using a mechanical masticator on Jelm Mountain (Figures 5 and 6).

Figures 5 and 6. Mastication project to remove encroaching conifers on Jelm Mountain.

2009 Production and Utilization Surveys (Goal 2) - Grant Frost

Game wardens and population biologists assisted with collecting utilization and production information in the spring and fall. Utilization was measured for the winter of 2008-09 at 29 of the pronghorn and mule deer shrub winter range monitoring stations. A combination of ill-timed weather and illness prevented the habitat biologist from measuring the remainder. Utilization levels exceeded the recommended level of 35% at 7 transects.

Production for the growing season of 2009 was generally much better than previous years (Table 1) especially for bitterbrush and mountain mahogany, but not so much for big sagebrush. Measurements were taken at 45 transects.

Table 1. 2009 Shrub Leader Production - Percent Change From Previous Measurement.

2009 Shrub Leader Production - Percent Change from previous measurement.		
HERD UNIT	SHRUB	% CHANGE
Platte Valley Mule Deer	Bitterbrush	+45
	Mt. Big Sagebrush	+26
	Wy Big Sagebrush	-2
Laramie Mountains Mule Deer	Skunkbush Sumac	+66
	Bitterbrush	+19
	Mt. Mahogany	+82
Sheep Mountain Mule Deer	Wy Big Sagebrush	+1
	Mt. Mahogany	+90
	Mt. Big Sagebrush	+21
	Bitterbrush	+25
Goshen Rim Mule Deer	Mt. Mahogany	+61
	Skunkbush Sumac	NA
Shirley Mountain Mule Deer	Wy Big Sagebrush	-32
	Mt. Mahogany	+285
Medicine Bow Pronghorn	Wy Big Sagebrush	+49
Elk Mountain Pronghorn	Wy Big Sagebrush	-15
Iron Mountain Pronghorn	Wy Big Sagebrush	-34

Medicine Bow Pronghorn Prototype - Grant Frost

There has been little progress this year to develop a habitat and herd unit population sustainability prototype model for the Medicine Bow Pronghorn Herd. Although there is merit to the idea, implementation requires extensive team building across two WGFD regions and their respective administrations, numerous population biologists and wardens, and public buy-in.

Pennock Mountain and Wick WHMA Beaver Transplants - Grant Frost

The 5 beaver that were transplanted to South Lake Creek on the pennock Mountain WHMA in 2008 appear to have helped out the population that had been transplanted there the year before. Despite heavy runoff in the spring, dams held and there were some new developments. Heavy, sustained runoff in the spring removed many of the beaver along Wagonhound Creek on the Wick WHMA. Four beaver were transplanted there when a private landowner (Dale Robbins) wanted problem beaver removed from his ranch along Sheep Creek in northern Albany County.

Agency Collaboration Efforts (Goal 5) - Christina Barrineau
In 2009, an interagency group was formed to develop a pro-active approach to deal with the mountain pine bark beetle outbreak on the Medicine Bow National Forest. The group consisted of personnel from WGFD, USFS, State Forestry, and Laramie Rivers Conservation District. The Spruce Gulch area within the Upper North Platte Combined Crucial Habitat Area and Douglas Creek Watershed Aquatic Enhancement Habitat Area was selected for project focus due to the intersection of high wildlife values, intense beetle kill, and the completion of the NEPA process by the USFS. The group selected three topics to target for projects including watershed impacts, wildland urban interface, and trails and recreation. A timber sale was completed in late 2009, which will incorporate some of the topics identified by the group. Additionally, plans are underway for the replacement of three culverts along Pelton Creek in the project area to accommodate changes in flow and sediment and improve fish passage.

Regional Public Information and Agency Collaboration Efforts (Goals 1, 2, 3, 4, 5) - Ryan Amundson
The bighorn sheep herd in the Laramie Range continues to thrive, in part due to continued partnerships and cooperative efforts by the Department, BLM, USFS, and WY FNAWS. Annual meetings to discuss bighorn related habitat projects continue, and revision of the Laramie Peak Bighorn Sheep Habitat Management Plan is currently in the works. Data retrieved from the radio / GPS collars that hung on the necks of Montana transplanted bighorns proved to be extremely important, as lambing areas and important migration corridors were defined. The report titled "Distribution and Habitat Selection Patterns of Mountain Sheep in the Laramie Range" was released in June 2009, and will serve as an important decision making tool for future habitat improvement projects in the Laramie Range.

Changes to managed haying and grazing periods were proposed for the USDA's CRP in 2009. Considerable effort was expended to coordinate with WGFD, USFWS, PF, and other entities with strong ties to the program, to gather input to make informed decisions and comments concerning proposed changes that could negatively impact wildlife.

The NRCS's Brush Management Specifications for Russian olive control were revised by the habitat extension biologist in 2009. The Specifications were utilized by a number of private landowners, County Weed and Pest Districts, WGFD personnel, and NRCS offices. Treatment methods, herbicide rates and application periods were identified in the specifications that provide the best control.

Input was provided on the Department's 2009 State Wildlife Action Plan which will update the 2005. Information on current and potential threats to the Shortgrass Prairie Ecosystem and long term conservation measures to protect the ecosystem were provided.

In 2009, 22 major landowner contacts and field visits were made resulting in some level of project level assistance. Numerous other contacts were made as well while performing normal job duties, with projects to follow in 2010. Technical and cost share assistance was provided to private landowners who implemented projects including: permanent cover seedings (native and introduced species), water developments for livestock and wildlife, livestock grazing management plans, CRP management, prescribed burning in mountain shrub and CRP habitats, noxious vegetation (woody and herbaceous) management in riparian and upland areas, wetland restoration, food plots for game birds, and in-stream fisheries habitat.

Landowner interest in enhancement of CRP acreages has decreased significantly, as long term contracts near their expiration dates. Management advice was once again given to producers across three southeastern Wyoming counties on control of noxious weeds, insect control, and potential enhancements on thousands of acres. A few small scale enhancement efforts continue, including food plots, tree and shrub plantings, guzzlers, and prescribed burns. Livestock grazing plans for expiring CRP were also completed, which included addition of fences for rotational grazing systems and livestock / wildlife watering facilities.

Previously completed habitat enhancement projects were also monitored on WHMA's, including aerial Spike applications completed on the Wick WHMA three years ago (Figures 7 and 8). Fall livestock grazing treatments on the Wick WHMA continue, and 220 acres of meadow habitats were grazed in September 2009 by Sims Cattle Company livestock. The treatments are designed to provide improved forage quality for elk utilizing the WHMA in Fall, Winter, and Spring months.

Figures 7 and 8. Spike® herbicide applied aerially in 2005 to black sagebrush / three tip sagebrush dominated upland bench on the Wick WHMA. Sagebrush canopy reduced from 30% to 15% in four years, resulting in large increases in herbaceous (grass / forb) production, available for use by wintering elk herds. Left photo is treated area compared to adjacent untreated site.

Over 3,500 acres of mixed mountain shrubs have been scheduled to be burned through prescription, but burn windows have not been cooperative to date. In other cases, additional prescribed fire projects continue to be slowed due to complexities of the project, as well as the "wheels of government" moving slowly.

Legume and pasture renovation seedings were completed in 2009 to benefit mule deer and other wildlife, in part with assistance from cost share funding from the WGFD Trust Fund.

Extensive Russian olive removal was completed in 2008, so 2009 was dedicated to monitoring of successes and failures, as well as follow-up herbicide treatments of re-sprouts. Timing of herbicide application, as well as herbicide recipes and application techniques were also evaluated.

Permits required by the State Engineer's Office and U.S. Army Corps of Engineers were completed in 2009, for wetland projects slated for construction in early Winter 2010.

Dalmation toadflax and cheatgrass invasions in the Laramie Range continue to hamper success of prescribed fire treatments or limit where potential habitat work may take place. A large scale cheatgrass herbicide application project was completed in the Richeau Hills post-prescribed fire in March 2009, and some of the same acreages were treated again in Fall 2009 for invasions of Dalmation toadflax. Areas with higher burn frequencies (i.e. burned twice within last five years) seem to be more prone to invasion by Dalmation toadflax.

Two properties on the Laramie Range were evaluated in 2009 for potential aspen treatments in 2010 by means of prescribed fire and/or cutting.

Numerous EQIP applications have been reviewed by the habitat extension biologist prior to funding by NRCS. Recommendations are made within the Conservation Assistance Notes sections of the agricultural producer's application on "wildlife impacts to consider" when planning conservation practices. These comments are often incorporated into the plan, and are also addressed when requests are made to the Department through the NRCS ECS – 42 environmental commenting process.

Eighteen shrub transects continue to be read on an annual basis throughout the Laramie Range, where annual production and winter utilization rates are documented.

The habitat extension biologist coordinates with current participants in the Walk In Area program, potential landowner participants, and also provides technical habitat management recommendations to Private Land Public Wildlife (PLPW) staff as well as private landowners enrolled in the program in southeast Wyoming.

Efforts to inform private landowners and the general public about habitat needs and requirements of wildlife were performed throughout the year at a variety of events and workshops. Some of the topics discussed with over 300 individuals at 9 different planned events included: Irrigated Meadow Management for Wildlife, Grazing Management Principles and Plant Identification, Expiring CRP Management, Managing Wildlife Habitat On Small Acreages, Renovating Meadows Utilizing Livestock, and Elk Population and Habitat Management on Private Lands.

Several collaborative efforts were participated in by the habitat extension biologist in 2009 that helped to improve the strength of local, regional, and statewide management plans. Work continues to develop a Statewide Comprehensive Wetlands Development and Management strategy. In particular, input was provided on the value of the Goshen County wetlands complex and opportunities for enhancement, restoration, and development were identified. Cheatgrass invasion in Wyoming continues to worry habitat managers and ag producers. Participation in cheatgrass management focus groups continues, particularly with the Colorado State University led research effort.

An important meeting was held in late May 2009 with State Engineer's Office, NRCS, DU, USFWS, and WGFD, where the wetlands permitting business was discussed at length. It is hoped that through this cooperative effort the permitting process for wetlands creation, enhancement, and restoration can be streamlined and efficiencies improved by all cooperating agencies.

The role of "State Coordinator" and Western United States Project Advisor continues to be played by the SE Wyoming habitat extension biologist for the Water For Wildlife Foundation, based in Lander, Wyoming. The Foundation has been extremely successful in leveraging conservation dollars to install wildlife watering facilities in arid portions of Wyoming and the western states for the benefit of numerous wildlife species, both game and non-game.

Wyoming State Forestry's Living Snow Fence program, while facing large budget cuts for 2010 and beyond, still exists, and the habitat extension biologist continues to sit on a multi-agency advisory committee to review living snow fence sites across the state.

A cooperative effort between the Department, PF, NWTF, and the Goshen County Weed and Pest District was initiated in 2009 to develop a long range plan to control Russian olive infestations on the Rawhide WHMA near Lingle. The habitat extension biologist serves in an advisory capacity to this effort, bringing experiences and "lessons learned" from other projects in southeast Wyoming to the group for consideration when designing and planning treatments for the property.

In Winter 2009, the Department acquired the 465 acre Thaler Farm adjacent to the Springer WHMA. In 2010, portions of the property will be converted from cropland to dense nesting cover, while other portions will continue to be maintained as cropland. A property management team has been assembled, made up of persons from several disciplines, to assist in short and long term management of the farm. The property provides important habitat for upland game birds and migratory waterfowl, and future management will be focused on creating optimal habitat for these species, as well as big game and other wildlife.

A prescribed burn / natural fire plan continues to be developed cooperatively by the BLM and Department for Sugarloaf Mountain, located within the boundaries of the Laramie Peak WHMA west of Wheatland. Information gathered from the radio / GPS collared sheep has been instrumental in providing justification for treatment. Hopefully, on-the-ground enhancements will be seen in 2010 on this particular mountain.

Wildlife Habitat Management Areas - Ryan Amundson

Technical assistance was provided to Department personnel on management of croplands, rangelands, and riparian and wetland habitats in southeast Wyoming (Figures 9, 10, 11 and 12) Plans for cropland conversion to dense nesting cover, control of noxious vegetation, and livestock grazing management were all participated in.

Figure 9. Aerial application of Plateau herbicide to south facing aspects in the Richeau Hills post-prescribed fire, March 2009.

Figure 10. Russian olive control one year post-aerial Habitat® herbicide application on 62 acre wetland near Wheatland.

Figure 11. Laramie River Continuous CRP Riparian Forest Buffer, Year 1 of 15 year contract.

Figure 12. Seedling shrub planting in CRP tract near Guernsey, Wyoming, to provide winter cover for upland game birds.

North Fork Spring Creek - WLCI
Rock weirs were constructed to create a steepened riffle section that will provide irrigation water withdrawal and fish passage at all flow levels. Partners were NRCS and the landowner and they contributed $24,000.

Wagonhound Creek Channel Assessments - Christina Barrineau
Two channel stability monitoring sites were established on Wagonhound Creek on the Wick WHMA during summer low-flow conditions. The upper site was located approximately 0.5 river miles upstream of I-80, while the lower site was located approximately two river miles downstream of I-80. At each site the following information was collected: detailed sketch map of the reach, longitudinal profile, permanent cross-sections (pool, riffle, run, and glide) riffle pebble count, and reach pebble count. Scour chains were installed at riffle and glide cross-sections to measure bed scour after a high-flow event, as well as to validate sediment competence estimates for each reach. Bank erosion pins were placed on the outside bend of pool cross-sections to measure annual bank erosion rates. Additionally, the bank erosion hazard index and near bank stress was estimated for each reach, along with several other indices of stability (i.e., meander patterns and depositional patterns).

The upstream site was 430 feet in length and was classified as a C4 channel and was located within a wide valley (Figure 13). Bedrock substrate and two abandoned terraces were observed adjacent to the channel, indicating the river has cut into the valley over time. Initial sediment competence calculations using both critical dimensionless shear stress and dimensional shear stress indicate that the reach is stable, although areas of channel degradation were observed upstream and downstream of the monitoring reach. Bank erosion was estimated for the reach at 0.37 tons/year/foot, which indicates a moderate to high amount of erosion for this reach.

The downstream site was 528 feet in length and was also classified as a C4 channel (Figure 14). This reach was located in a more confined, narrow valley. Wagonhound Creek has downcut into the valley floor and now appears to be laterally adjusting due to the bank erosion observed within and outside of the monitoring reach. Initial sediment competence calculations using critical dimensionless shear stress indicate that the reach is aggrading, while dimensional shear stress estimates indicate that the reach is stable. Bank erosion was estimated at 4.3 tons/year/foot with one 220 feet long section of bank contributing to most of this estimate.

Both monitoring sites will be re-visited in 2010 following spring high flows. All data will be re-collected including the longitudinal profile and cross-sections. Additionally, information from the scour chains and bank erosion pins will be measured. In 2011, data from the two years will be analyzed to determine the overall stability of each reach and an administrative report will be written summarizing the results. These sites provide a baseline for channel conditions in this area of the state. In future years, data can be obtained to further monitor channel stability in the face of the mountain pine bark beetle outbreak and climate change.


Figure 13. Upper channel monitoring site on Wagonhound Creek on the Wick WHMA.


Figure 14. Collecting riffle pebble counts at the lower channel monitoring site on Wagonhound Creek on the Wick WHMA.

Wick WHMA - Dave Lewis
The second trial year of fall vegetative treatments on the hay meadows using cattle-grazing was performed during September. The treatment is designed to provide an area of early spring forage growth for elk and pronghorn. This vegetative treatment used 360 head of cattle to treat 150 acres of meadows. The Sims Cattle Company provided the personnel, livestock, electric fences, monitoring and herding of the cattle 24 hours per day during the fourteen-day grazing treatment. The cattle were contained with electric fencing on treatment paddocks of twenty to fifty acres in size. The grazing effectiveness is monitored against predetermined utilization goals. When the vegetative treatment goal is reached, the cattle and fences are moved from paddock to paddock.

Other projects on the Wick WHMA included:
- 950 acres of hay meadows were irrigated;
- 20 miles of fence were maintained; and
- 115 acres of noxious weed control were completed by the contractor.

Pennock Mountain WHMA - Dave Lewis
Activities on the Pennock Mountain WHMA included:
- Total irrigated acres to increased to 68;
- 132 acres of existing hay meadows were mown to decrease brush;
- 29 miles of boundary fence were maintained; and
- 27 acres of noxious weed control were completed by the contractor.

Red Rim - Daley WHMA - Dave Lewis
Activities on the Red Rim WHMA included:
- Two windmills converted to solar panels and pumps with water troughs and reservoirs (Figure 15);
- 49 miles of fence were maintained; and
- Daley WHMA livestock grazing 1,568 AUMs were used.


Figure 15. Solar pump and panel on well #6 at the Red Rim- Daley WHMA.

Red Rim – Grizzly WHMA - Dave Lewis
Activities on the Red Rim - Grizzly WHMA included:
- 88 miles of fence were maintained;
- Grizzly WHMA livestock grazing 3098 AUMs were used; and
- Six miles of woven wire fences in mule deer migration corridors were converted to four-strand wildlife friendly fence.

Tom Thorne / Beth Williams WHMA
Activities on the Tom Thorne / Beth Williams WHMA included:
- 8 acres of noxious weed control were completed by the contractor; and
- 7 miles of fence were maintained.