V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Sustainable Management of Natural Resources

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	10%		10%	
103	Management of Saline and Sodic Soils and Salinity	5%		5%	
121	Management of Range Resources	20%		20%	
123	Management and Sustainability of Forest Resources	10%		10%	
124	Urban Forestry	5%		5%	
135	Aquatic and Terrestrial Wildlife	10%		10%	
136	Conservation of Biological Diversity	5%		5%	
403	Waste Disposal, Recycling, and Reuse	10%		10%	
405	Drainage and Irrigation Systems and Facilities	10%		10%	
605	Natural Resource and Environmental Economics	15%		15%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	7.3	0.0	14.3	0.0
Actual	8.3	0.0	18.9	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
653548	0	726848	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
653548	0	726848	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Intensive studies on the Pueblo of Acoma, indicate a nonmigratory population of elk, however, elk were distributed across a mosaic of adjacent private and public jurisdictions which require collaborative harvest policy development with neighboring properties. Female home range areas were from 85.7-113 km² in summer and spring. Average male home range areas ranged from 64-245 km² during winter and fall. Calving home range size ranged from 14-41 km². Habitat composition analysis indicated male and female elk select Pinyon-Juniper woodland annaully and during most seasons. Landscape scale thinning or removal of dense Pinyon-Juniper woodland to reduce risk of catastrophic fire, create habitat heterogeneity, and enhance forage availability is recommended.

Work on risk assessment for invasive species and other population-level risk assessmentshas helped the broader risk analysis/policy analysis community to understand the applicability of the regional and ecological risk assessment paradigms to environmental stressors other than chemical contaminants, and has begun to make ecologists and conservation biologists aware of how those paradigms provide an effective way to link science and policy. According to Web of Science, publications resulting from this project are cited an average of 9.43 times, with an h-index of 6.

As a result of research, we will be better able to sustainably manage our native vertebrate fauna and desert and plains grasslands. These projects will result in recommendations for grazing management that will incorporate measures of native biological diversity and ecological factors that influence diversity. Results from our research on burrowing owl ecology will directly effect the management of the USDA Forest Service Great Plains National Grasslands. Data collected for this project can also help alleviate future entanglements related to the management needs and status of specific species, and will contribute to enhanced wildlife viewing.

Research is pertinent to the conservation and sustainable use of our natural resources. Our large carnivore research will provide valuable information that state game agencies can use to manage their populations. Our work on examining the effects of climate change with respect to carnivore populations across North America will provide federal and state resource agencies with information necessary to plan future conservation efforts and identify lands important for purchase. This work, which also involves an analysis of habitat use across our border with Mexico, will shed light on how a border fence will influence connectivity of extant populations. Finally, our work examining how climate change is expected to influence the demography and distribution of species is valuable for building a wealth of evidence to convince the public and policy makers that we are having a major impact on our Earth.

A study has begun to elucidate the reproductive mode of the three presumed species. Triops longicaudatus "long" is thought to be gonochoric with separate sexes is approximately equal abundance in a population. Triops longicaudatus "short" is composed of either parthenogenetic females or hermaphrodites with no apparent males. Triops newberryi populations typically have a low percentage of "males" with the remainder of the population composed of either parthenogenetic females or hermaphrodites. With genetic analysis of the various reproductive forms, we expect to discern the reproductive modes. For example, if T. longicaudatus "short" is selfing hermaphrodite or automictic parthenogen, then it should have very little heterozygous individuals relative to T. newberryi which may have some fraction of outcrossing, and both of these species should have lower frequencies of heterozygotes than T. longicaudatus "long". A study has been initiated using 6 multiplexed microsatellites to genotype 50 individual "females" (or hermaphrodites) of T. longicaudatus "short" and T. newberryi. From these genotyped individuals, we will select a set of homozygous and heterozygous "females" and genotype 20-50 individual encysted embryos from each mother. Results of this study should enable identification of the apparent reproductive modes including apomictic parthenogenesis, automictic parthenogenesis (four different modes), selfing hermaphroditism, and selfing hermaphroditism with some outcrossing.

Assessment of climate change legislation impacts on New Mexico agriculture reveal that the agricultural economy will face likely be challenged by associated rises in energy costs though the negative impacts will be mitigated by increased revenues from rising commodity prices.

We determined tree canopy cover (TCC) and monitored cattle use of Pinyon-juniper (PJ) woodland during spring in a 146ha pasture at a site in central New Mexico. Half the research pasture had been cleared of PJ woodland in the 1980s. A subset of intact woodland grid cells containing cow locations (approximately 62% of these occurred in wooded areas) was used to describe the relationship between cattle spatial distribution and PJ canopy cover. We found a significant negative exponential relationship between TCC and relative use of grid cells by cattle. Tree cover explained 50.1% of the variation in relative use by cattle of the 1 ha woodland grid cells. Most cow positions recorded in PJ-dominated areas occurred in grid cells with 30-50% TCC. A sharp decline in woodland use occurred beyond an apparent threshold of 55% TCC. Our data suggest that PJ woodlands with up to 50% canopy cover could provide an adequate balance of shelter and forage for cattle during spring at our site. We investigated the relationships between stress coping styles, patterns of rangeland use, and performance of thirty six 3-year-old cows during two consecutive calving season (2006-07). We used Cluster Analysis and Discriminant Function Analysis to classify cows into two stress copying style groups on the basis of multiple behavioral traits. Compared to proactive cows (PR), reactive individuals (RE) tended to spend more time at water, explore smaller areas, and exhibit more concentrated search patterns. Reactive individuals also had lighter body weights, and weaned lighter calves. Cow-calf location relations measured in 2007 suggested that calves born to highly proactive cows (PR+) were lighter than their peers born to less proactive mothers (PR-). PR+ cows tended to spend less time near their calves and to travel further from their offspring and therefore tended to wean lighter calves than PR- mothers. Behavioral syndromes appeared to influence landscape use patterns and productivity of cattle in this study. Cows with intermediate stress coping styles (as defined in this study) appeared to be the best suited to the biophysical characteristics of our study site. Plots on rangeland infested with one-seed juniper were exposed to high (small patches; 10m2/AU/day) or low (large patches; 60 m2/AU/day) density stocking (vs control plots without grazing) of goats and goats plus sheep (2 replicates/treatment) during a summer targeted grazing experiment. Both deer (SI: 0.00) and cattle (SI: 0.40; $P < 0.001$) avoided large patches which had been grazed by goats + sheep. These patches received heaviest utilization of herbaceous vegetation (73.5%) the previous summer. Deer selected small patches that had been grazed by goats + sheep whereas cattle selected large patches and avoided small patches grazed by goats alone . Cattle exhibited greatest preference for grazed patches in summer, while deer avoided grazed patches in summer. The probability of mule deer presence on a given patch (y) was reduced by cattle (x) presence. Targeted grazing programs with small ruminants could be used to create contrasting patches of different sizes to improve habitat for multiple rangeland ungulates.

Ranchers should try to acquire cattle from rangeland and environmental conditions similar to those in their operation when restocking after drought. Compared to naïve animals, experienced animals may use almost two times larger area. When grazing extensive and rugged rangeland pastures, naïve cattle require time to become accustomed to novel pastures and vegetation. After time, naïve cattle begin to learn to forage more effectively, but still do not utilize the rangeland as efficiently as native cattle.

Brahman cattle are adapted to hot and dry environments and are able to walk farther each day than Brangus or Angus cattle. Although they walk farther each day, Brahman cattle do not use areas that are farther from water than Brangus or Angus. In addition, Brahman cattle appear to avoid areas that contain mountainous terrain, while Brangus and Angus cattle readily use rugged rangeland. Brangus are an excellent choice for grazing in the Chihuahuan Desert rangeland

Vegetation surveys in the 4 study pastures for herbage production and plant cover were completed in October of 2010. All 4 pastures were stocked with cattle in March 2006. Cattle weights and calf crop information were collected periodically in 2006, 2007, 2008, 2009, and 2010. Results show higher cow and calf weights in lightly stocked pastures than conservatively stocked pastures. Forage production has been higher in lightly than conservatively stocked pastures. Grazing use has averaged 29% in lightly stocked pastures and 40% in conservatively stocked pastures. A model has been developed and published relating long term forage production to precipitation on the steady pastures.This research has the potential to reduce the adverse impacts of livestock grazing on rangeland soils, vegetation and wildlife. Light stocking leaves more residual vegetation for protection of soils, watershed, and wildlife habitat. Light grazing appears to allow forage plants to maximize their productivity and it may be more beneficial than grazing exclusion. Light grazing lowers rancher risks and may increase monetary returns over conservative grazing based on preliminary results. This research has the potential to reduce rancher/environmentalist conflicts by providing better technology to maintain and improve vegetation and wildlife habitat. Increased rancher income could reduce rangeland losses to subdivisions and other development. In previous research from this project, we found conservative grazing was advantageous over moderate grazing in terms of maintaining forage production, drought, reducing rancher risk and providing higher net profits.

Investigations on desert soils have broad impacts because desert soils are vast and fragile. Desert soils cover about one-third of the Earth's land surface, so perturbations and management strategies will have major implications for carbon storage or emissions. Desert soils--especially sandy soils--are major sources of dust. If vegetative cover is disturbed a series of feedbacks begin to cascade causing drastic changes in vegetation, which in turn lead to changes in the entire ecosystem.

Total ET amounted to 42.0 inches while total application plus rainfall was 43.1 inches for the poplar trees. Clone OP-367 remains the tallest clone; after nine seasons reaching a mean height of 63.1 feet. Significantly shorter than OP-367 were the clones 311-93, 58-280, 49-177, and 195-529, but these were significantly taller than the remaining three clones. OP-367 had the largest mean DBH at 10.6 inches. This was followed by 311-93 and 58-280 with DBH greater than 8 inches. Maximum wood volume was obtained by OP-367 at 5,968 ft3/acre. Total ET amounted to 42.6 inches while total application plus rainfall was 43.2 inches for the Biosolids application trial. In 2009, the 10-ton treatment led for all growth parameters, but only height (62.1 ft) was significant greater than the other treatments. This trial was established to investigate four irrigation treatments (70, 80, 120, and 130% of replacement ET) on four top-performing clones from other trials. Total ET (at 100% replacement) for the 2010 growing season was calculated at 42.3 inches for fourth year hybrid poplar. Actual application for the respective treatments was 29.5, 35.8, 44.5, and 49.7 inches or 99.7, 105.9, 87.6, and 90.4 percent of calculated applications at the four treatment rates,respectively. Clone 433 led for all growth parameters. Also, while there is significant interaction between clones and irrigation treatments, the 120% ET irrigation treatment produced the most growth on average. An established xeric adapted plant demonstration garden consisting of about 100

drought tolerant, mostly native plant species was maintained during 2010. The garden was split into four differentially irrigated sections in 2004 after establishing at least one individual of each species in each section. Drip irrigation treatments were weekly water application volumes required to replace 0, 20, 40, and 60% of reference ET adjusted with a mean plant canopy area. Plant quality, height, and actual canopy area were measured in all irrigation treatments and preliminary crop coefficients were formulated. Most plants survived and exhibited acceptable quality when irrigated at canopy-corrected KC levels of between 0.2 and 0.4. An overall KC of 0.3, adjusted with canopy area, is suggested for scheduling irrigations on mixed-species xeriscapes in the Intermountain West. One water conserving measure receiving increased attention throughout the western U.S. is the use of catchment systems that collect and store precipitation runoff from roofs or other hard surfaces. If late summer water shortages occur because of accelerated snow melt as predicted by the climate models, the ability to store and use rainwater for irrigating could help mitigate the adverse effects of these shortages on plant growth and yields during a critical time of fruit set and development. Choosing suitable drip components that function adequately under these low heads (typically less than 10 feet or 4 psi) is problematic. PARTICIPANTS: Nothing significant to report during this reporting period.

A web interface allows residents to estimate their monthly or yearly water budget based on their vegetation type, landscaped area, or landscape species composition. Residents also can view aerial images (0.5 foot resolution) of their parcel property and digitize water consumptive landscape features which are subsequently used to estimate water budgets. Water budget calculator inputs include, plant coefficients (Kc's) for shrubs, trees and turf. Length of growing season, annual temperature and growing degree days were used to transfer landscape plants Kc's from California landscape irrigation guide and Farmington, New Mexico. Monthly and yearly historical evapotranspiration values were calculated. In addition, historical reference evapotranspiration values for El Niño, La Niñaand Neutral year are available and allow water budget to be modified based on the signal. This web interface will be an efficient tool to conserve landscape irrigation water, match different landscape categories with their water requirements, and it satisfies homeowners requirements in knowing their landscape water requirements. In addition, the interface offers different tools to satisfy residents and knowledgeable landscapers' accuracy levels of estimating landscape water requirements.

Progress has been made on developing effective propagation protocols for many native woody plant species which can be used in disturbed land or riparian restoration/ rehabilitation. On-going studies on several species of woody shrubs/trees are progressing. Specifically, work on overcoming seed and seed coat dormancy mechanisms in two native elderberry (Sambucas) species is beginning to yield results. Also, seed treatments of Cercocarpus ledifolious are on-going but generating less informative results. A pilot study relating the dormancy level, as measured by days to bud burst, on the ability of Symphorocarpus orientalis cuttings to root was conducted. The results of this pilot indicate a potential for successful rooting earlier in the dormant period than previously observed. Work, including securing extramural funding, was conducted on establishing a new transplanting trial for high elevation disturbed sites. The previous main focal point of this research, examiningin situ root system development over time using two approaches; a modified grow bag system for destructive analysis and an in situ rhizotron was abandon. A novel study building on early work on Robinia neomexicana seed scarification, was initiated. This project will look at the influence of seed scarification treatment on the ability to improve hydroseeding of this species. Use of Robinia neomexicana in such direct seeding operations was unsuccessful as previous scarification treatments left the seed coat softened and vulnerable to the physical pressures associated with the hydroseeding process. The work being proposed is based on earlier work on using an "impacting" process to overcome seed coat barriers to germination. Actual field trials of this work will begin in May of 2011. The progress on a ponderosa pine progeny test contrasting warm-dry conditions and more traditional planting sites included identifying seed lots within our seed inventory (67 sources from within New Mexico) as well as obtaining sources from other areas with the species range. Three progeny/provenance studies have been designed. The project sites identified in 2008, south central New Mexico and in north central New Mexico were chosen to based on the two sites ability to provide a testing

environment that emulates predicted changes in climate where ponderosa pine currently exists, specifically this is a lower elevation warm, dry site relative to much of this species current distribution in New Mexico and a more traditional site. The first progeny test will evaluate the baseline selection method used to identify superior trees in the field. The second evaluation will be region wide provenance test. This test will emphasize sources collected in New Mexico but also include sources from Arizona, Colorado, Utah, South Dakota and Montana. The third trial will be a trial comparing the progeny collected from trees in the original 1982 progeny test housed at the Mora Research Center with the parent trees.

Most of the larger pecan orchards in the Mesilla Valley with their own wood chippers are now chipping their pecan pruning wastes instead of burning. Many smaller farmers contract the chipping of their pecan wastes. Thus, burning of pecan pruning wastes has been drastically reduced which has reduced smoke and improved air quality in the Mesilla Valley. Research has clearly demonstrated that chipped pruning wastes can be incorporated into orchard soils without fear of nitrogen immobilization as long as the chips are large and unusually high amounts are not applied. Additional nitrogen fertilizer is not needed when incorporating wood chips.

The phytoremediation of uranium waste or uranium contaminated soil can be enhanced with the use of proper soil amendments. Citrate increases plant uptake of uranium, but manure decreases plant uranium uptake. Kochia appears to be a good choice for a plant that can phytoremediate uranium waste or uranium contaminated soil and can be agronomically grown.

Chile pepper germination and growth response to salinity was measured and reported at the annual Chile Pepper Conference in Las Cruces, NM. A paper was published (Niu et al., 2010) that reported chile pepper responses to salinity under field conditions. We are currently revising a manuscript describing greenhouse experiments that evaluated the response of several chile pepper varieties to salinity during germination, emergence and stand establishment.

Arsenic sorption by NM soils and calcium carbonate in the presence of wastewater effluent was evaluated in the lab and reported in a PhD dissertation (Nemmers, 2010) and MS thesis (Campos-Diaz, 2010). When wastewater effluent is present as in a municipal land application area, arsenic will tend to be more mobile through the soil than previously thought. Our testing of several plant species for their ability to accumulate uranium indicated that soluble uranium forms (e.g., uranyl nitrate) were more likely to be extracted from soil than schoepite or less soluble, weathered forms of uranium. Potential candidates for uranium extraction and phytoaccumulation that bear closer scrutiny include Desert marigold (Baileya multiradiata), Sacred Datura (Datura metaloides) and Coyote or Buffalo Gourd (Cucurbita palmate).

Water is a limited resource for crop production in arid and semi-arid areas. The purposes of this study were to estimate the amount and depth of water and nitrate-nitrogen (NO_3-N) fronts below the rooting zone for two onion (Allium cepa L.) fields under furrow and drip irrigation systems located in the Mesilla Valley of Southern New Mexico and determine how the current best management could be improved. Soil samples were collected during the last week of each month throughout the growing season from both fields. Soil samples were analyzed for NO_3-N and chloride concentration. The total amounts of N fertilizer applied to furrow and drip irrigated fields were 383 and 292 kg ha^{-1}, and total water applied was 95 cm and 81 cm, respectively.The amount of NO_3-N in the soil water estimated by chloride tracer technique was 165.9 ±0.97 mg L^{-1} (Mean ±SE) for furrow and 66.8 ±4.45 mg L^{-1} for drip irrigated fields for the 60-200 cm depth. The NO_3-N loadings below the rooting zone were 240 ±2.6 kg ha^{-1} for furrow and 79 ±6.9 kg ha^{-1} for drip irrigated fields. A leaching fraction of 0.20 ±0.006 was obtained from the furrow and 0.17 ±0.02 from drip irrigated field. The irrigation efficiencies were 80 ±0.60% and 83 ±2.0% and wet onion yields (moisture content 90%) were 45120 kg ha^{-1} and 50980 kg ha^{-1} for the furrow and drip irrigated fields, respectively. Project results demonstrate that about 11% of water is lost due to vapor flow. Therefore measures should be undertaken to control evaporation for conserving water. Small and delayed N fertilizer application until onion bulbing starts, frequent applications of fertilizer and water preferably through drip irrigation are recommended to reduce deep percolation and increase nitrogen and water use efficiencies.

A comprehensive, two-phase environmental impact assessment of four years of land application of salt-affected, treated industrial wastewater to a Chihuahuan Desert shrubland has been completed. In the first phase of influent and effluent water quality and soil compositional changes, land application increased soil N, P, and K fertility and increased the soil stress factors of pH, salinity, and sodicity. Twenty-seven tons of ionic land deposits--comprised mainly of sodium, chloride, and calcium carbonate equivalent alkalinity-- were recorded. In the second assessment phase of vegetation impacts, an additional two tons of combined vegetation biomass had accumulated on an irrigated (land application) plot as compared with an adjacent non-irrigated plot. Throughout four years of land application, there was no harm to the perennial shrub vegetation, although there was a significant change in intershrub space herbaceous species composition as the soil became increasingly sodic.

• 7,200 New Mexico residents increased their understanding of the role of trees in landscape and water harvesting practices. 60% of residents increased their knowledge by 73%.

• An increase in understanding of water conservation practices for farmers by 90% and a significant increase in the number of New Mexico producers implementing these practices resulted in a savings of $30million ($175 million if counting livestock of these crops).

• $1,500,000 in additional fire fighting equipment and wildfire education in Eastern NM have decreased range fires by 55%.

2. Brief description of the target audience

Target audiences include:ranchers, farmers, urban landscapers, park departments, state and federal agencies, private homeowners, and recreational users ofparks, forests, and waters.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2010
Plan: 0
Actual: {No Data

Patents listed
{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Plan	3	5	
Actual	3	5	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- The specific output measures will vary according to the specific project being monitored. The development of research procedures and technology, training of students, publishing research papers, and disseminating research results via educational workshops, conferences, and Extension media are important outputs for the various projects falling under this planned program.

Year	Target	Actual
2010	0	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of trained professionals
2	# of research publications
3	# of Extension publications
4	% of people adopting NMSU recommendations

Outcome #1

1. Outcome Measures

of trained professionals

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	3	18

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
103	Management of Saline and Sodic Soils and Salinity
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
135	Aquatic and Terrestrial Wildlife
405	Drainage and Irrigation Systems and Facilities
605	Natural Resource and Environmental Economics

Outcome #2

1. Outcome Measures

of research publications

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	5	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
103	Management of Saline and Sodic Soils and Salinity
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
135	Aquatic and Terrestrial Wildlife
405	Drainage and Irrigation Systems and Facilities
605	Natural Resource and Environmental Economics

Outcome #3

1. Outcome Measures

of Extension publications

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	3	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
103	Management of Saline and Sodic Soils and Salinity
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
135	Aquatic and Terrestrial Wildlife
405	Drainage and Irrigation Systems and Facilities
605	Natural Resource and Environmental Economics

Outcome #4

1. Outcome Measures

% of people adopting NMSU recommendations

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	70	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
103	Management of Saline and Sodic Soils and Salinity
121	Management of Range Resources
123	Management and Sustainability of Forest Resources
135	Aquatic and Terrestrial Wildlife
405	Drainage and Irrigation Systems and Facilities
605	Natural Resource and Environmental Economics

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)
- Case Study
- Comparisons between program participants (individuals, group, organizations) and non-participants
- Comparisons between different groups of individuals or program participants experiencing different levels of progra intensity.
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}