

**V(A). Planned Program (Summary)**

**Program # 3**

**1. Name of the Planned Program**

Natural Resource Management and Environmental Sciences in the Great Basin and Sierran Ecosystems

**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			6%	
103	Management of Saline and Sodic Soils and Salinity			12%	
112	Watershed Protection and Management			4%	
121	Management of Range Resources			2%	
133	Pollution Prevention and Mitigation			29%	
136	Conservation of Biological Diversity			3%	
302	Nutrient Utilization in Animals			14%	
304	Animal Genome			18%	
305	Animal Physiological Processes			10%	
311	Animal Diseases			2%	
	<b>Total</b>			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	0.0	0.0	7.0	0.0
Actual	0.0	0.0	3.9	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
0	0	285618	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	340535	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

To address issues in natural resource management and environmental sciences, NAES is conducting research on a multitude of issues.

Rangeland projects include: identifying barriers to successful establishment of post-fire seeding in the Great Basin; rehabilitation of a salt-desert shrub community by studying herbaceous plants response to shrub removal and establishment; reducing fuel load of key cheatgrass dominated range sites by the use of livestock; testing survival of seeds important to Great Basin rangeland rehabilitation that are digested by rumenal species.

Forestry projects include: studying the effects of broadcast and slash pile burning on soil, vegetation growth and water quality in sierras; developing adaptive management of sierra forest with understory controlled burns; controlling mountain pine beetle via hormone production.

Ecosystem projects include: investigating the of potential for methyl mercury production and inputs from irrigation drains in Nevada, expanding our understanding of the cross habitat energetic linkages in Sierran lakes, developing geographic distribution maps of genetic variation in Nevada bighorn sheep, and exploring health issues occurring in bighorn sheep.

### 2. Brief description of the target audience

Audiences include: livestock producers, veterinarians, environmentalists, local governments, native american groups and agency personnel.

## V(E). Planned Program (Outputs)

### 1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	1750	4000000	400	500000
Actual	4433	9573	805	436119

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

Patent Applications Submitted

Year: 2010  
 Plan: 1  
 Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2010	Extension	Research	Total
Plan	0	28	
Actual	0	56	56

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Peer reviewed scientific publications, publications in natural resource and environmental organization publications, presentations at scientific meetings, presentations at stakeholder, Native American and agency meetings.

Year	Target	Actual
2010	28	246

**Output #2**

**Output Measure**

- Demonstrations, Field Days, and Workshops Conducted

Year	Target	Actual
2010	{No Data Entered}	3

**Output #3**

**Output Measure**

- Leveraged Research Projects

Year	Target	Actual
2010	{No Data Entered}	66

**Output #4**

**Output Measure**

- Web Sites Created or Updated

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2010	{No Data Entered}	14

**Output #5**

**Output Measure**

- Manuals and Other Printed Instructional Materials Produced

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2010	{No Data Entered}	1

**Output #6**

**Output Measure**

- Number of Graduate Students or Post-Doctorates Trained

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2010	{No Data Entered}	66

**Output #7**

**Output Measure**

- Number of Undergraduate Students Involved in Research

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2010	{No Data Entered}	144

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Peer reviewed journal articles, presentations at scientific meetings, articles in natural resource and environmental science magazines, presentations at stakeholder, Native American and agency meetings.
2	Estimates of Predation by Double-crested Cormorants on Rainbow Trout in Northern Nevada Lakes.
3	Seasonal Livestock Grazing: Reducing Cheatgrass Fuel Loads

## **Outcome #1**

### **1. Outcome Measures**

Peer reviewed journal articles, presentations at scientific meetings, articles in natural resource and environmental science magazines, presentations at stakeholder, Native American and agency meetings.

Not Reporting on this Outcome Measure

## **Outcome #2**

### **1. Outcome Measures**

Estimates of Predation by Double-crested Cormorants on Rainbow Trout in Northern Nevada Lakes.

### **2. Associated Institution Types**

- 1862 Research

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2010	{No Data Entered}	1

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Double-crested cormorants (*Phalacrocorax auritus*) may have a profound effect on stocked fish populations, especially in small, managed reservoirs. The birds are voracious predators, diving up to 70 feet to hunt fish, from minnows to 15-inch trout. Each one can consume a pound or more of fish a day. They brazenly dive under boats, swooping past anglers' lures. "They're an in-your-face kind of bird," explained Russell McCullough, a state fisheries biologist.

In recent years, increasing populations of cormorants nationwide have led to growing concern from the public and natural resource management professionals about potential impacts of cormorants on various fish resources, prompting the US Fish and Wildlife Service to perform an environmental impact assessment. This project looks at the effects of predation by cormorants on stocked populations of rainbow trout in northern Nevada.

#### **What has been done**

Scientists from the University of Nevada, Reno evaluated the effects of predation by double-crested cormorants on stocked populations of rainbow trout (*Onchorhynchus mykiss*) using tag-recovery models and temporal symmetry capture-mark-recapture techniques to estimate monthly

survival probability and predation rate in an urban lake (Virginia Lake) in Reno, NV.

The team stocked the lake with 2,248 uniquely tagged rainbow trout on three separate occasions separated by approximately a month and sampled a double-crested cormorant nesting and breeding island in the lake weekly to recover tags.

Based on tag-recovery models, the team estimated that 19% of rainbow trout survived from the first to the second stocking event and 4% of rainbow trout survived from the second to the third stocking event. Accounting for the probability that we found tags deposited on the nesting island if they were present, we estimated that 100% of rainbow trout stocked in spring were eaten by double-crested cormorants.

### **Results**

Short-term efforts to reduce double-crested cormorant predation on trout involve non-lethal techniques such as hazing. Hazing strategies used by Nevada's Department of Wildlife (NDOW) include harassing the birds away from release points by watercraft, noisemakers and pyrotechnics. The problem lies in the fact that these strategies are short-term. When personnel depart from the scene, cormorants go to work.

Since cormorants were the predominant consumer of stocked rainbow trout and consumption increased as double-crested cormorants established a nesting and breeding colony, UNR scientists are suggesting that NDOW stocking success could be enhanced by scheduling stocking for fall months, after cormorants have migrated. This change in stocking regimes would allow rainbow trout to achieve a mass and size that potentially exceeds what double-crested cormorants can consume.

Because cormorants are also protected under the Migratory Bird Treaty Act of 1918, any management or control must be coordinated and approved through the federal government. By shifting stocking cycle to fall, a reduction in red-tape with the feds is achieved.

## **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
136	Conservation of Biological Diversity

### **Outcome #3**

#### **1. Outcome Measures**

Seasonal Livestock Grazing: Reducing Cheatgrass Fuel Loads

#### **2. Associated Institution Types**

- 1862 Research

#### **3a. Outcome Type:**

Change in Action Outcome Measure

### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	1

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

Several theories have prevailed through the years regarding grazing cheatgrass. But the predominate theory, according to BLM District Manager Jerry Smith, revolved around having to graze it in the spring when it was green. "Once cheatgrass dries out, it had no nutritional value to livestock and cattle would not eat dry cheatgrass."

Within the Intermountain region, grass biomass decomposes slowly and with little or no grazing activity, the cheatgrass in any given year may represent two or more production cycles. A review of current rangeland fire research suggests that two years of fuel accumulation is the optimal for grassland fires in the Intermountain West. With the increasingly higher cost of restoring or rehabilitation rangelands, finding solutions that benefit both the rancher and range is a high priority.

This project re-opens the debate on whether or not cheatgrass have any value, and if so, can a rancher afford putting livestock on it. The overall goal was to investigate the efficacy of fall grazing of cheatgrass by domestic livestock, as a large scale fuel reduction tool, without effecting livestock performance

#### What has been done

Over the last three years, the research team from the University of Nevada scored individual cows and sheep on body condition before and after feeding trials to determine the overall health of each animal. Trial pastures were also evaluated on total biomass available before animals were released into the pasture each fall and afterwards, approximately 60 days later.

After all data were collected, the results showed reductions in the amount of cheatgrass from 500 lbs. of cheatgrass biomass per acre to 90 lbs. of cheatgrass biomass per acre. With the reduction in wildfire potential, came improvement in perennial grass production. Over the course of the study, production of perennial grasses increased from 45 lbs. per acre to 577 lbs. per acre.

The research team also ruled out the notion that dry cheatgrass has no nutritional value. The protein content and energy of cheatgrass in the fall proved as good, if not better, than perennial grasses. And the results were consistent through the four-year study. Lab analyses revealed protein levels fluctuated between 3.5 and 6%. Energy levels also scored well, measuring 45% and above.

#### Results

To Jerry Smith, who has dedicated his 34-year career with the BLM to managing natural resources, the research shows great promise in the fight against cheatgrass.

Smith continues, "Cheatgrass presents a hazard from two perspectives." "It comes up earlier than most perennial grasses, stealing resources like water and nutrients needed by other grasses, which provide forage for wildlife. Secondly, once cheatgrass dries, it is highly flammable and becomes a fire hazard."

"According to our records, during the last four years nearly four million acres burned in Nevada," said Smith. "Cheatgrass was a contributing factor to large fire growth in 85 percent of these fires. Furthermore, cheatgrass invades burned areas. For example, a single stalk of cheatgrass can produce 1,000 seeds, and a single acre may contain hundreds of thousands of these plants." The BLM estimates that cheatgrass invades 4,000 acres a day.

Smith concludes, "without a doubt, the research that Dr. Perryman and Dr. Bruce conducted is proof there are other ways to win the fight against this invasive grass."

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
121	Management of Range Resources

#### 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 Programmatic Challenges
- Other (Faculty seeking job security elsewhere)

##### Brief Explanation

Current State budget shortfalls will narrow the breadth of research programs in Nevada Agricultural Experiment Station (NAES). Fewer research projects will be supported and recruiting graduate students will be difficult. Plus, due to the Governor's hiring freeze, State budget shortfalls, and two department closures within the College of Agriculture, Biotechnology and Natural Resources, NAES is prevented from moving forward and determining the areas of research most important to the state, nation and internationally.

Current cutbacks to our programs will also affect how we determine the most important direction of the College/NAES to remain competitive with current research issues. Several of our senior faculty will be retiring and potential layoffs are looming, will cutbacks affect our ability to fill these positions or will we be forced to cutback our research efforts to concentrate on teaching our courses.

Additionally, if \$17,000,000 is not secured by State Legislators this 2010 session, the College of Agriculture, Biotechnology and Natural Resources is proposed for closure and remaining departments will be moved to new homes. This action could significantly alter the NAES's organizational structure and cohesiveness.

All of these issues will determine the future of our research.

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

## 1. Evaluation Studies Planned

- Before-After (before and after program)
- During (during program)

## Evaluation Results

Faculty programs are evaluated annually and annual reviews of performance are prepared for each calendar year. We held a web based mini-symposium to learn of the research advances from each NAES research projects where each principle investigator or graduate student makes a power point presentation in a forum open to all faculty, staff, students and stakeholders as well as College and NAES leadership. Faculty are questioned and future goals are discussed for each research project t in the NAES research portfolio. The web cast has been saved and will be open for review for one year. Faculty have been productive and continued to carry out cutting edge research and in addressing natural resource and environmental issues in Nevada. Where appropriate future funding will continue where the results justify continued funding.

## Key Items of Evaluation

Publications in refereed journals, invited review articles, extension publications, invitations to talk at national and international meetings.