

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Natural Resources and Environment

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	10%		8%	
102	Soil, Plant, Water, Nutrient Relationships	43%		19%	
103	Management of Saline and Sodic Soils and Salinity	0%		1%	
104	Protect Soil from Harmful Effects of Natural Elements	0%		4%	
111	Conservation and Efficient Use of Water	3%		3%	
112	Watershed Protection and Management	0%		10%	
121	Management of Range Resources	30%		12%	
131	Alternative Uses of Land	4%		1%	
132	Weather and Climate	0%		3%	
133	Pollution Prevention and Mitigation	10%		4%	
134	Outdoor Recreation	0%		1%	
135	Aquatic and Terrestrial Wildlife	0%		24%	
136	Conservation of Biological Diversity	0%		8%	
141	Air Resource Protection and Management	0%		2%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	2.7	0.0	52.8	0.0
Actual Paid	4.4	0.0	48.5	0.0
Actual Volunteer	0.1	0.0	0.0	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
170827	0	841476	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
170827	0	809857	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

- Conduct Field and Lab Research
- Collaborate with Other States
- Partner with South Dakota Game, Fish and Parks
- Partner with the South Dakota Grassland Coalition
- Partner with Business Organizations
- Collaborate with Non-profit Organizations
- Conduct Soil Health Workshops and Field Tours
- Conduct Training for Concentrated Animal Feeding Operations
- Partner with the South Dakota Department of Environmental and Natural Resources
- Partner with the Natural Resources Conservation Service

2. Brief description of the target audience

- Wildlife and Fisheries Managers
- Scientists
- Natural Resource Management Specialists
- State and Federal Agencies
- Environmentalists
- Outdoor Enthusiasts
- Farmers, Ranchers and Producers
- General Public
- Operators of Concentrated Animal Feeding Operations

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3469	776348	551	4019

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

Year: 2014
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	4	9	13

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Percentage of all Hatch Research Projects in Natural Resources and Environment

Year	Actual
2014	21

Output #2

Output Measure

- Increase Rancher's Knowledge of Grazing Techniques and Grassland Management

Year	Actual
2014	0

Output #3

Output Measure

- Number of CAFOs Participants

Year	Actual
2014	20

Output #4

Output Measure

- Create Soil Health Learning Opportunities

Year	Actual
2014	12

Output #5

Output Measure

- Conduct Field Research to Determine the Effectiveness of the Canada Goose Damage Program

Year	Actual
2014	0

Output #6

Output Measure

- Research Climate Variability and Management Impacts on South Dakota Grasslands

Year	Actual
2014	0

Output #7

Output Measure

- Number of Publications Posted on iGrow Website

Year	Actual
2014	24

Output #8

Output Measure

- Number of Articles Posted on iGrow Website

Year	Actual
2014	85

Output #9

Output Measure

- Number of Podcasts Posted on iGrow Website

Year	Actual
2014	4

Output #10

Output Measure

- Number of Radio Programs Posted on iGrow Website

Year	Actual
2014	45

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of Natural Resources and Environment Hatch Research Projects
2	Number of Grazing School Participants
3	Number of CAFOs Training Sessions
4	Increase Soil Management Knowledge to Participants
5	Increase Knowledge to Control the Canada Goose Population
6	Produce Knowledge to Implement a State-and-Transition Model for South Dakota Grasslands

Outcome #1

1. Outcome Measures

Number of Natural Resources and Environment Hatch Research Projects

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	28

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

South Dakota has a wide diversity of natural resources that depend on maintenance and good stewardship of the land. Too much grazing, urban sprawl, the creation of reservoirs, plant invasion, feedlot runoff, global warming, as well as the growing world economy all contribute to the degradation of our natural resources.

What has been done

Within the College of Agricultural and Biological Sciences, there are 28 Hatch projects that are categorized in the Planned Program of Natural Resources and Environment. The research activities in this program are primarily supported by our Department of Natural Resource Management. Projects include but are not limited to research studies in climate variability, crop impact from Canada geese, watershed management, soil productivity, bioenergy, wildlife habitat, carbon sequestration, pollution prevention, and range management.

Results

Through research, our Department of Natural Resource Management continues to build a scientific knowledge base to improve and understand the management of natural resources in South Dakota. Examples include:

Atmospheric nitrogen deposition on native prairie, anthraquinone effectiveness on soybean plants, prevention of nitrates through tile drainage, newly discovered insect species, construct elemental fingerprints of reservoir ecosystems, climate change effects on beaver-created wetlands, and biomass yield from switchgrass land. In addition, graduate students gain valuable knowledge and skills while collaborating on research projects.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
132	Weather and Climate
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
141	Air Resource Protection and Management

Outcome #2

1. Outcome Measures

Number of Grazing School Participants

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	30

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There are approximately 22 million acres of permanent pasture and rangeland in South Dakota. Rangeland is the lifeline of streams, ponds and lakes, and it is a source of wildlife habitat, recreation and scenic beauty. Rangeland is fragile and is profoundly impacted by management. The grazing lands of the Northern Plains are recognized as one of the most threatened ecosystems globally. As grazing lands are predominantly privately owned and managed, principally for livestock production, secure and profitable ranching is necessary to conserving this vital resource.

What has been done

In cooperation with the South Dakota Grasslands Coalition and several other entities, SDSU Extension has partnered in grasslands management training to more than 265 ranchers for the last 11 years. An additional 30 participants were trained in 2014. Ranchers participated in classroom presentations as well as hands-on field activities. Additional events include the Rangeland Bird Tour, Range Management Ranch Tours, and the annual Rangeland Days and Soil Days. A climate variability workshop series is also underway in response to the need for more management information dealing with drought, blizzards and floods.

Results

With its partners and the South Dakota Grazing School, SDSU Extension has helped producers of all ages become more skilled at reading their landscape. As new participants are reached, there is an increase in knowledge of many topics, including managing diversity on rangelands, pasture allocation, holistic management, soil health and infiltration, plant identification, and concepts of grazing. By better understanding the grassland conditions of their property, ranchers develop the skills needed to detect important information both beneficial and detrimental to their grasslands. The workshops and activities also allow producers to network, sparking creativity to help find solutions to their own challenges.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
121	Management of Range Resources

Outcome #3

1. Outcome Measures

Number of CAFOs Training Sessions

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Large-scale livestock producers, known as Concentrated Animal Feeding Operations (CAFOs), create potential water and air quality conflicts for rural communities in South Dakota. There is a need for the development of these operations, but environmental laws must be followed and good will with neighbors is imperative for the sustainability of large operations. Any CAFO that is applying for a General Permit must attend the course.

What has been done

SDSU Extension, the South Dakota Department of Environment and Natural Resources, and the Natural Resources Conservation Service provide training two-three times a year for federal and state water pollution and control programs. The training sessions included topics on livestock production, manure management and land application practices. In addition, SDSU Extension Specialists discuss the management of nitrogen and phosphorus content of manure and air quality and odor.

Results

Approximately half of the participants were required to be at the training sessions and about half of them attended for the learning experience. The sessions represented approximately 4,000 animals in the beef industry, 500 animals in the dairy industry, and 10,200 animals in the swine industry. Survey results show a 20% to 30% increase in the overall understanding of the topics and an 92% overall satisfaction rate with the program. Over sixty-five percent of the participants who had not already adopted some of the practices demonstrated said they plan to adopt certain practices they learned.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

Outcome #4

1. Outcome Measures

Increase Soil Management Knowledge to Participants

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	871

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

With the increase in demand for global food production, it is essential to promote soil health. The same management practices that can improve soil health can also damage soil health if not done correctly. Producers need access to all available tools and information to remain environmentally sound, profitable, and sustainable.

What has been done

SDSU Extension conducted multiple workshops, field days, agronomy courses, no-till demonstrations, and Integrated Pest Management training throughout South Dakota. Research is being conducted for state-wide recalibration of corn nitrogen recommendations and long-term no-till involving cover crops and no cover crops. Numerous articles have been written and posted on the iGrow learning platform.

Results

Producers and landowners gained knowledge that will not only encourage them, but will also challenge them to incorporate production practices that will help promote soil health. The increases in knowledge of fertilizers, pesticides, cover crops, and tillage practices help South Dakota's soil stay productive and profitable. The citizens of the state also benefit from better water quality and a better environment overall.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

Outcome #5

1. Outcome Measures

Increase Knowledge to Control the Canada Goose Population

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Since the early 1900's, there has been a rapid decline in Giant Canada geese in South Dakota. Through restoration programs, Canada geese populations today have increased to the point that farmers register complaints that the geese are damaging crops, particularly soybeans. Research is needed to generate harvest parameters and survival rates estimates for the Canada goose population.

What has been done

The SDGFP Canada goose damage program allows landowners that file a complaint free access to abatement techniques. Little research has been conducted on flightless Canada geese that cause crop damage during the brooding and molting period. Currently, South Dakota AES is evaluating the effectiveness of several commercial chemical goose deterrents on soybeans in northeast South Dakota. New methods to reduce crop damage caused by Canada geese are being identified.

Results

Several chemicals were examined to determine if the substances were effective at reducing damage to soybeans caused by Canada geese. The chemical anthraquinone was found to be effective when sprayed on soybean plants. Field research continues to refine treatment rates and application processes. Information has been provided to chemical companies, wildlife managers and producers. One graduate assistant was trained in application of anthraquinone.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife

Outcome #6

1. Outcome Measures

Produce Knowledge to Implement a State-and-Transition Model for South Dakota Grasslands

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Climate variability complicates our ability to manage invasive plants and pests, rangeland quality, and livestock production. Changes in grazing pressure are triggers that lead to alterations in rangeland productivity and plant community structure. To better describe these changes, a State-and-Transition Model for South Dakota Grasslands is needed.

What has been done

Research is ongoing to determine the impacts of climate variability, increased nitrogen deposition, and management on resistance and resilience to plant community change and primary production of eastern South Dakota grasslands. SDSU AES will also continue to apply the clipping, fire, and simulated atmospheric nitrogen deposition to the long-term native plant community plots in eastern South Dakota.

Results

A manuscript was published on the findings of increased atmospheric nitrogen deposition on native prairie under management of fire and simulated grazing. A new study was initiated to test the resistance and resilience of plant community to drought using automated rainout shelters. Additional funding was received from NRCS-CIG to conduct a project to demonstrate the resistance and resilience of well managed plant communities versus poorly managed plant communities to drought in a joint South Dakota and Nebraska project.

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
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

Western South Dakota experienced one its worst blizzards on record, killing an estimated 50,000 or more livestock. Valuable man-hours and resources had to be redirected for both livestock and non-livestock issues.

Salary and benefit increases have eroded the impact of federal funds, deferring vacancy fills in both SDSU Research and SDSU Extension.

Many of the research facilities at SDSU have exceeded their useful life and no longer accommodate the needs of the scientists in the Agricultural Experiment Station. Deferred maintenance and repair of facilities remain a serious limit to research, faculty recruiting and retention.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Concentrated Animal Feeding Operations

Pre and Post Surveys

12 of 20 Participant Responses

92% - Overall Participant Satisfaction with the Program

Understanding of the Topic before Program

55% - Water Quality

57% - Permit

66% - Land Application

65% - Worksheets

68% - Conservation

50% - Nutrition

49% - Air Quality

Understanding of the Topic after Program

81% - Water Quality

86% - Permit

93% - Land Application

85% - Worksheets

91% - Conservation

78% - Nutrition

78% - Air Quality

Participants that Have Already Adopted Practices

30% - Land Application

30% - Conservation

45% - Nutrition

10% - Air Quality

Percentage of Remaining Participants that Plan to Adopt Practices

90% - Land Application

82% - Conservation

85% - Nutrition

67% - Air Quality

Key Items of Evaluation

Concentrated Animal Feeding Operations

The CAFOs sessions represented approximately 4,000 animals in the beef industry, 500 animals in the dairy industry, and 10,200 animals in the swine industry. Survey results show a 20% to 30% increase in the overall understanding of the topics and an 92% overall satisfaction rate with the program.