

V(A). Planned Program (Summary)

Program # 11

1. Name of the Planned Program

Climate Change: Soil, Water, Waste and Air Management.

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%		10%	
102	Soil, Plant, Water, Nutrient Relationships	10%		15%	
111	Conservation and Efficient Use of Water	10%		20%	
132	Weather and Climate	10%		10%	
133	Pollution Prevention and Mitigation	10%		10%	
205	Plant Management Systems	10%		10%	
307	Animal Management Systems	10%		5%	
312	External Parasites and Pests of Animals	0%		5%	
403	Waste Disposal, Recycling, and Reuse	10%		5%	
405	Drainage and Irrigation Systems and Facilities	10%		10%	
601	Economics of Agricultural Production and Farm Management	10%		0%	
	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	4.2	0.0	6.5	0.0
Actual Paid	6.4	0.0	12.0	0.0
Actual Volunteer	0.0	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
149174	0	544559	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
149174	0	544559	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
134140	0	2918637	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Members of the SWWAM team reported 2,039 direct educational contacts through Extension programs and 152,468 indirect contacts. Team members published 10 articles in refereed journals, four peer reviewed Extension publications; three articles published as proceedings, and participated in projects supported by \$1,264,518 in grant funds.

The Soil, Water, Waste and Air Management team is highly integrated, participating in active projects to discover new knowledge, demonstrate and transfer new technologies, and work to understand local variants that impact resource-based enterprises and the environment. Research activities include irrigation efficiency, water use efficiency, cover crop and green manure, nitrogen release and mineralization rates, composting and compost use, manure application studies, and development and testing of biofilters in a range of settings that are the subjects for field days and tours and have been communicated through professional journals. A wide variety of best practices are demonstrated on cooperator fields and were shared with producers and consultants through 24 field days and educational tours. Field and greenhouse experiments help to understand the effects of various compounds in dairy waste water on soils and crops, plant responses to organic nutrients, and composting of farm waste.

Much of our educational effort relies on field demonstrations to help growers and other stakeholders understand local conditions related to nitrogen uptake and fertilizer efficiency, use of cover crops and green manures, water quality monitoring, on-farm composting, manure application, and recycling. In addition, 85 presentations were delivered at workshops, conferences, and classes, providing education to 4,750 adult learners on industry-critical topics as well as those topics that are relevant to communities and to individual stakeholders. Forty-eight presentations for youth audiences reached 2,500 learners about topics related to water quality and ecosystem integrity. Individual faculty reported consultations and farm visits reaching more than 1,130 individual stakeholders.

The IDAH₂O program was delivered through 11 workshops reaching 168 stakeholders and resulted in a new cohort of IDAH₂O Master Water Steward volunteers who are working with watershed-scale research and monitoring programs. Faculty participated in a range of multistate activities including the animal production climate change working group, and several efforts associated with the American Society of Agricultural and Biological Engineers. Extension hosted the Idaho Nutrient Management Conference for the sixth consecutive year.

2. Brief description of the target audience

- Producers, processors and professional consultants provide input and feedback about programs,

cooperate on demonstration trials and research, and participate in educational programs.

- The public affected by water and waste management issues provide input and feedback about programs and participate in educational programs.
- Local and/or state officials who either develop or implement rules and regulations related to environmental quality.
- Homeowners
- Small landowners (including but not limited to: recreational properties, small tracts of forest land, seasonal lake homes, etc.)
- Natural Resource Professionals

3. How was eXtension used?

use of eXtension was not reported 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	13449	150930	3061	1538

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	5	31	36

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Educational workshops, seminars and presentations to producer groups: number of events.

Year	Actual
2014	74

Output #2

Output Measure

- Applied and basic laboratory and field research experiments, number of projects

Year	Actual
2014	28

Output #3

Output Measure

- Newsletters distributed (number of issues) and number of articles submitted for other newsletters

Year	Actual
2014	21

Output #4

Output Measure

- Tours and Field Days

Year	Actual
2014	12

Output #5

Output Measure

- Professional development credits awarded for participation in courses

Year	Actual
2014	12

Output #6

Output Measure

- Professional presentations; number of invited and volunteer papers presented.

Year	Actual
2014	47

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Participants use best practices for water, pesticide, nutrient, or waste management. I: Number of program participants indicating adoption of recommended practices (follow-up survey data) or indicating intention to adopt recommended practices (post-program questionnaire)
2	Producers are aware of issues and knowledgeable of practices that affect the environmental and economic sustainability of crop production. I: Number of participants reporting that their knowledge had been increased because of their participation in program.
3	Participant surveys collect biological and human dimension measurements that help to understand the relationship between mandated and voluntary actions used to improve water quality.

Outcome #1

1. Outcome Measures

Participants use best practices for water, pesticide, nutrient, or waste management. I: Number of program participants indicating adoption of recommended practices (follow-up survey data) or indicating intention to adopt recommended practices (post-program questionnaire)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	595

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Odor and gas emits from manure applied land. Both the animal farmers and neighbors care about the odor and gas emissions. Gas emissions cause N losses which reduces the manure N fertilizer value. Odors make surrounding people unhappy which negatively impact sustainability of animal agriculture. Application of Best Management Practices (BMP) and nutrient management practices are needed to reduce the environmental impact of livestock and crop agricultural activities. Pesticide sprayers not properly cleaned may lead to poor weed control and potential pesticide resistance problems. These practices impact water quality and result in excessive pesticide usage. Cover crops are targeted to producers throughout the U.S. to mitigate soil nutrient loss. However, cover crop adoption has primarily been targeted to producers in the eastern U.S., leaving a lack of research- based information on cover crop use in high-desert environments. University of Idaho Extension helped Idaho producers adopt cover crops to conserve soil and water resources and contribute to the cover crop national goal.

What has been done

BMP and other nutrient management practices were presented at the 2014 Idaho Nutrient Management Conference organized by the University of Idaho Extension. A presentation based on the evaluation results from a field demonstration of dairy manure deep injection conducted last year was delivered at the conference, also a video about dairy manure deep injection has been developed and has been shown and distributed. Seminars on current research for proper sprayer cleanout stressed the importance of good cleanout to avoid pesticide resistance and potential runoff and excessive usage. In winter of 2014, the Idaho cover crop research was presented at four UI Extension Cereal Schools in eastern Idaho where 332 participating producers were surveyed on current use and future adoption of cover crops.

Results

91% of survey respondents at the Idaho Nutrient Management Conference indicated that they will be adjusting their practices based on what they learned during the conference. Among the 150 producers surveyed in pesticide equipment classes, using post class survey and TurningPoint clickers, 70% indicated they would change their current sprayer cleanout practices. Currently, 16% of producers at the cereal schools use cover crops. After presenting Idaho cover crop research, 48-79% are willing to adopt cover crops with one-third of these producers planning to adopt by the 2015 growing season. The participating producers indicated they would adopt cover crops to achieve multiple management goals, including minimizing soil wind erosion loss, supplementing soil organic matter and nitrogen levels, and scavenging soil nutrients. If one-third of the participants implemented cover crops by 2015, an estimated 94,500 acres of cover crops would be planted in eastern Idaho.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
133	Pollution Prevention and Mitigation
307	Animal Management Systems
403	Waste Disposal, Recycling, and Reuse
405	Drainage and Irrigation Systems and Facilities
601	Economics of Agricultural Production and Farm Management

Outcome #2

1. Outcome Measures

Producers are aware of issues and knowledgeable of practices that affect the environmental and economic sustainability of crop production. I: Number of participants reporting that their knowledge had been increased because of their participation in program.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
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2014

274

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Several situations can produce runoff water volume that exceeds the capacity of the existing waste lagoon system. These include abnormally large winter precipitation, particularly on frozen soils, leaking livestock drinking water systems, excessive accumulation of sludge in the lagoon system. Land application of lagoon effluent / sludge mixtures produces strong odor downwind of the application area when surface applied. Manure injection can significantly reduce this odor. Idahoans have expressed a need for greater adult and K-12 watershed and water science education. In addition, agencies cannot keep up with adequate water quality data collection across Idaho. The Idaho trout industry is an important economic enterprise in south central Idaho. With the rapid rise in feed ingredient costs likely to continue for the foreseeable future, and the finite source of fish meal, alternative aquafeed ingredients are necessary to minimize feed costs and sustain the industry.

What has been done

Winter Wastewater Lagoon and Slurries Management' was presented at the 2014 UI Nutrient Management Conference. IDAH2O trained 70 citizen scientists in a set of water quality data collection methods related to the greatest pollution threats to public waterways. 22 of these adults were K-12 teachers, who pass on their knowledge to their students through inquiry-based educational programming and lesson planning. Based on a \$359,728 WRAC/UDA grant, four years of research were conducted determining the suitability of alternative proteins for trout diets. In addition to the research, a 125 day demonstration feed trial was conducted in 2012/2013 accompanied by several consumer sensory taste tests of trout fed different feeds. A workshop for this targeted audience was held to summarize the findings and applicability of the findings.

Results

Clicker feedback following the winter wastewater session indicated that knowledge about lagoon capacities had been increased by 54% of attendees. 68% of the respondents indicated increased knowledge about odor and ammonia reduction benefits of subsurface manure injection relative to surface application. 4,573 individual water quality monitoring data points were added to the publicly accessible online interactive IDAH2O Hydrologic Information System. For every K-12 teacher enrolled in the IDAH2O program, a minimum of 30 K-12 students are taught water science, and participated in hands-on, investigative projects that result in development of 21st Century Skills. Trout growers can be confident that alternative proteins can be used for trout diets without negatively impacting performance and quality; and they have the tool to compare returns over feed cost for any feed, thus enabling them to make informed decisions regarding feed, which accounts for 50 ? 70% of production costs. Feed manufacturers have received new open feed formulas based on the experimental diets that they can use or modify to manufacture alternate protein trout feed based on prevailing ingredient costs.

4. Associated Knowledge Areas

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

111	Conservation and Efficient Use of Water
132	Weather and Climate
133	Pollution Prevention and Mitigation
205	Plant Management Systems
307	Animal Management Systems
403	Waste Disposal, Recycling, and Reuse
405	Drainage and Irrigation Systems and Facilities
601	Economics of Agricultural Production and Farm Management

Outcome #3

1. Outcome Measures

Participant surveys collect biological and human dimension measurements that help to understand the relationship between mandated and voluntary actions used to improve water quality.

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)

Over 90% of Pacific Northwest residents consider clean rivers and effective river basin management to be important issues in the Pacific Northwest. The large Columbia-Snake River Basin provides irrigation water to 5,000,000 ha, water for navigation, drinking water to more than 5,000,000 people and electricity (hydropower) to more than 8,000,000 people within Washington, Idaho, Oregon and British Columbia. The purpose this work is to document public perceptions, attitudes, and concerns about the Columbia-Snake River Basin.

What has been done

Two identical statistically designed regional surveys were conducted in 2011 and 2014.

Results

Approximately 98, 98, 90, 80, 80 and 54% of the survey respondents considered the Columbia-Snake System important for providing water for mountain snowpack, power generation, agriculture, recreation, drinking, and commerce, respectively. A majority of the public also rated quality and quantity aspects of the river system as good or excellent. A majority of residents in 2011 (52.0%) and 2014 (62.1%) felt that climate change should be addressed regardless of cost. The percentage of survey respondents that believed scientific merit of climate change to be good or overwhelming increased from 47.1% in 2011 to 71.1% in 2014. The loss of mountain snowpack was the most frequently cited critical issue associated with climate change in the Columbia-Snake River Basin. A majority of urban and rural residents were worried about the impact of climate change on agriculture - particularly irrigated agriculture. Compared to 2011 respondents to the 2014 survey were more concerned about climate change and its potential impact on both dryland and irrigated farming.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
132	Weather and Climate

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Other ()

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

With the rapid rise in feed ingredient costs for aquaculture likely to continue for the foreseeable future and the finite source of fish meal, alternative aquafeed ingredients have been identified as necessary to minimize feed cost. However, a lack of information regarding the identification of suitable alternatives and questions regarding the ability of alternative protein diets to support optimal growth, health and product quality was identified by industry partners as a hurdle to adoption. To address this lack of information in this WRAC funded project, novel and commercially available alternate ingredient were identified and analyzed for their available nutrient content. Subsequently various combinations of these ingredient were fed to rainbow trout in eight laboratory feeding trials and one on-farm trial wherein various growth efficiency, health and product quality response variables were documented. Data from these studies demonstrated that fishmeal protein is not necessary in rainbow trout feeds and that an assortment of alternative ingredients including plant-based proteins and animal protein can be used in combinations

to meet the nutritional needs of the fish. These data thus support that fish meal levels in commercial feeds can be reduced without impacting performance when suitable alternatives and supplements are used. The studies also demonstrated that total protein can be reduced in the feeds from 45 to approximately 38 CP without impacting growth when rainbow trout diets are formulated on an available amino acid basis and amino acid targets are met. These results have been presented in scientific and trade meetings and communicated to feed industry representatives. Results from the studies have also garnered national attention through newspaper articles and industry webpages. An improved understanding of a wider variety of ingredients now available in the digestibility database can improve formulation security and help buffer feed price fluxes by providing nutritionists a variety of ingredients to choose from while still meeting nutrient demands when competition for high protein ingredient occurs and/or a currently utilized ingredient becomes unavailable. Balancing limiting dietary amino acids on an ideal protein basis can reduce total protein levels in feeds while maximizing protein retention and minimizing feed conversion ratios. Ultimately, this will minimize environmental impact through reducing feed waste and total solids in waste streams as well as nitrogen excretion by the fish.

Key Items of Evaluation