V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Natural Resources Stewardship

☑ 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
111	Conservation and Efficient Use of Water	10%		5%	
112	Watershed Protection and Management	10%		5%	
121	Management of Range Resources	10%		5%	
122	Management and Control of Forest and Range Fires	9%		0%	
123	Management and Sustainability of Forest Resources	10%		0%	
124	Urban Forestry	5%		0%	
125	Agroforestry	2%		0%	
133	Pollution Prevention and Mitigation	5%		20%	
135	Aquatic and Terrestrial Wildlife	5%		15%	
136	Conservation of Biological Diversity	10%		10%	
213	Weeds Affecting Plants	5%		15%	
214	Vertebrates, Mollusks, and Other Pests Affecting Plants	2%		5%	
215	Biological Control of Pests Affecting Plants	5%		10%	
403	Waste Disposal, Recycling, and Reuse	5%		5%	
605	Natural Resource and Environmental Economics	2%		5%	
610	Domestic Policy Analysis	5%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	21.0	0.0	50.0	0.0

Actual Paid Professional	68.5	0.0	27.6	0.0
Actual Volunteer	4895.0	0.0	0.0	0.0

2. Institution Name: Washington State University

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
933870	0	162249	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
933870	0	162249	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
6559009	0	3283924	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Our work in natural resource stewardship was focused in the following areas: Develop innovative applied research and outreach for storm water management, including Low Impact Development techniques to reduce the level of pollutants in storm water runoff; proper planning and management of nonindustrial private forestlands; decreasing the threat of wildfire to property and people; increasing upland water quality; and increasing the production of hardwood biofuels in the Pacific Northwest. Numerous studies are examining habitat and environmental requirements of native and introduced species in relation to habitat conservation and agricultural practices. We are examining the interactions between native and agricultural predator and prey populations as they relate to biological stabilization mechanisms in insect and weed populations.

Extension educators worked with researchers and local communities to develop customized, science-based solutions to local problems and to educate target audiences about new tools to more effectively manage natural resources. This education will lead to behavior change and ultimately to an improved condition of the natural resource base. Additional information on some of these programs can found at the following websites: http://snohomish.wsu.edu/forestry; http://raingarden.wsu.edu http://county.wsu.edu/jefferson/nrs/water/courses/Pages/default.aspx; http://www.shorestewards.wsu.edu/resources.html; and

2. Brief description of the target audience

The target audiences include landowners and managers; state, federal and local natural resource agency personnel; K-12 educators, local and state governments; and the general public, including citizens interested in natural resource issues and the scientific disciplines that relate to them.

3. How was eXtension used?

Five faculty members participated in communities of practice.

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	190651	901134	33191	50728

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

Patent Applications Submitted

Year:	2012
Actual:	1

Patents listed

Composition and Methods for Wastewater Treatment. Zhange, T., K. Bowers, J. Harrison, and S. Chen. Particular aspects provide a method for recovering phosphate, comprising: obtaining an effluent or wastewater, etc. having calcium-sequestered phosphate; adding to the effluent or wastewater a calcium chelating or sequestration agent suitable to chelate or sequester Ca.sup.++ ions from the calcium-sequestered phosphate to facilitate release of phosphate from the calcium-sequestered phosphate; transferring, facilitated by said Ca.sup.++ ion capture and in the presence of sufficient concentrations of NH.sub.4.sup.+ and Mg.sup.2 ions, of the phosphate into struvite (magnesium ammonium phosphate hexahydrate or MgNH.sub.4PO.sub.4.6H.sub.2O), or hydrated magnesium ammonium complex of phosphate; and recovering the struvite, or the formed hydrated magnesium ammonium complex. Preferably, the method further comprises acidification of the effluent or wastewater to facilitate release of Ca.sup.++ ions from the calcium-sequestered phosphate and chelation of sequestration of the Ca.sup.++ ions by the calcium chelating or sequestration agent. Additional aspects provide a phosphate-containing fertilizer comprising struvite, and methods for making same. Patent # 8,158,089.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	21	88	109

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of extension workshops, demonstrations, and conferences conducted with a natural resources focus.

Year	Actual

2012	831

Output #2

Output Measure

- Number of peer-reviewed (official) WSU Extension publications produced on natural resource stewardship topics.

Year	Actual
2012	21

Output #3

Output Measure

- Number of graduate students with a significant professional orientation in the area of Natural Resources stewardship.

Year	Actual
2012	52

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning objectives.
2	Percentage of participants evaluated who applied knowledge acquired from WSU scientists or extension educators.
3	Number of streams and waterways exhibiting reduced levels of sedimentation or contamination by non-point source pollutants.
4	Number of acres of rangelands and forests exhibiting improved condition as a result of WSU programs or program partnerships.

Outcome #1

1. Outcome Measures

Percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning objectives.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Washington has a very rich natural resource base that supports the state's economy and contributes greatly to the quality of life in the region. These resources largely define our economy and lifestyles. However, they are under increasing pressure from several sources. Priorities for the program include water quality and non-point water pollution, reduced soil erosion, improvements in range and forestlands, reduced risk of wildfire, and habitat preservation.

What has been done
Program implementation utilized local, regional, statewide, and multi-state efforts in a coordinated effort that involved workshops, clinics, seminars, field days, field demonstrations, print and electronic publications, mass media, social networks, webinars, online learning modules, and other methods to disseminate research-based knowledge and other relevant information to targeted audiences.

Results
An average of 80% (range of 66 to 100% by event) of program participants increased their knowledge relative to one or more of the knowledge areas and awareness of natural resource stewardship. This impact represents an average across 831 educational events that were assessed for this program area. The overall assessment validates that program participants gained new knowledge and skills important to enhance natural resources and potentially improved water quality, forests and rangeland across the state.

4. Associated Knowledge Areas

KA Code	Knowledge Area

111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
122	Management and Control of Forest and Range Fires
123	Management and Sustainability of Forest Resources
124	Urban Forestry
125	Agroforestry
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
213	Weeds Affecting Plants
214	Vertebrates, Mollusks, and Other Pests Affecting Plants
215	Biological Control of Pests Affecting Plants
403	Waste Disposal, Recycling, and Reuse
605	Natural Resource and Environmental Economics
610	Domestic Policy Analysis

Outcome #2

1. Outcome Measures

Percentage of participants evaluated who applied knowledge acquired from WSU scientists or extension educators.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Washington State has an extremely rich natural resource base, which supports the state's economy and contributes to the quality of life in the state. These resources add greatly to our economy and enhance our lifestyles but are under increasing pressure from several sources including urbanization and population growth. Priorities for the program include water quality and

non-point water pollution, reduced soil erosion, improvements in range and forestlands, reduced risk of wildfire, risk of invasive species, and habitat preservation.

What has been done
Program implementation utilized local, regional, statewide, and multi-state efforts in a coordinated effort that involved workshops, clinics, seminars, field days, field demonstrations, print and electronic publications, mass media, social networks, webinars, online learning modules, and other methods to disseminate research-based knowledge and other relevant information to targeted audiences.

Results
Seventy-one percent of program participants applied one more of the principles gained through participation in this program effort. This impact represents an average across 831 educational events that were assessed for this program area. The overall assessment validates that program participants gained new knowledge and skills important to enhance natural resources and potentially improve water quality, forests and rangeland across the state.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
122	Management and Control of Forest and Range Fires
123	Management and Sustainability of Forest Resources
124	Urban Forestry
125	Agroforestry
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
213	Weeds Affecting Plants
214	Vertebrates, Mollusks, and Other Pests Affecting Plants
215	Biological Control of Pests Affecting Plants
403	Waste Disposal, Recycling, and Reuse
605	Natural Resource and Environmental Economics
610	Domestic Policy Analysis

Outcome #3

1. Outcome Measures

Number of streams and waterways exhibiting reduced levels of sedimentation or contamination by non-point source pollutants.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	15

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Stream quality, especially for streams entering coastal shellfish areas or that can be used for salmon spawning, is closely studied and water quality is monitored. Addressing the need for improvement in water quality through reduced soil erosion, septic tank contamination and the movement of pesticides and other non-point source pollutants into streams and other waterways was a priority for this program.

What has been done
Program implementation utilized workshops, clinics, seminars, field days, field demonstrations, print and electronic publications, mass media, social networks, webinars, online learning modules, and other methods for program dissemination. The WSU Low Impact Sustainable Development and Stormwater Research Center was a major source of applied research and outreach to address pollutant runoff into surface waters. A large base of trained volunteers was also used to teach and assist property owners in improving overall water quality.

Results
Fifteen waterways were positively affected, as indicated by reduced sedimentation and pollutants. Modifications to private septic systems improved the rating of 55 acres of shellfish beds in Puget Sound. These projects often involved local partnerships with other agencies and organizations to provide training, educational events, and restoration projects for a variety of individuals. The Rain Garden Campaign in 12 Puget Sound counties provided technical assistance on the installation of 766 rain gardens, and a new Low Impact Technical Guidance Manual for Puget Sound, was released. WSU Master Gardener volunteers taught 24,604 residents how to conserve water and protect water quality; 21,610 residents to use IPM methods; and 8,833 residents how to properly plant and maintain trees in the urban forest.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
122	Management and Control of Forest and Range Fires

123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
403	Waste Disposal, Recycling, and Reuse
610	Domestic Policy Analysis

Outcome #4

1. Outcome Measures

Number of acres of rangelands and forests exhibiting improved condition as a result of WSU programs or program partnerships.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	75600

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Washington State has an extremely rich natural resource base, which supports the state's economy and contributes greatly to the quality of life in the state. Washington is home to vast mountain ranges, major river systems, forests, agricultural and rangelands, coastal regions and the Puget Sound. Priorities for this outcome were to implement practices for improving range and forestlands, leading to greater biodiversity, reduced wildfire risk, and improved habitat.

What has been done
79 educational events were delivered to over 5200 participants representing over 450,000 acres of forest and range land. Program implementation utilized local, regional, statewide, and multi-state efforts in a coordinated effort that involved workshops, clinics, seminars, field days, field demonstrations, print and electronic publications, mass media, social networks, webinars, online learning modules, and other methods to disseminate research-based knowledge and other relevant information to targeted audiences.

Results
Over 80% of those surveyed indicated that they had gained new knowledge of management concepts that helped them to improve forest and rangeland health on over 75000 acres. A new program for 90 property owners addressed wildfire rehabilitation on an additional 25,000 acres of

land ravaged by summer and fall wildfires.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
122	Management and Control of Forest and Range Fires
123	Management and Sustainability of Forest Resources
124	Urban Forestry
125	Agroforestry
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
213	Weeds Affecting Plants
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403	Waste Disposal, Recycling, and Reuse
605	Natural Resource and Environmental Economics
610	Domestic Policy Analysis

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
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Ongoing concerns and limitations with the state and university budgets continue to impact our hiring and deployment of human and financial resources, resulting in the loss of faculty and administrative leadership. However, we appear to have reached a stable, albeit much lower, level of funding. This new level of baseline funding will now allow us to develop more concrete plans as we project our future. The uncertainty with state policy and funding for higher education clearly impacted our ability to take bold initiatives, given contingencies required for additional budget cuts from state and local governments. These "cuts" have moved our work in research and extension increasingly to be more dependent

on securing competitive grants to support our system and drive our programs forward. Competing priorities for limited funds and financial resources were clearly the most limiting factor encountered in 2012.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Our work in Natural Resources includes inter-related systems; water, forests, rangeland, and soils and integrates research and Extension education in disseminating research results. Most of our effort focuses on resource stewardship and is well accepted by stakeholders, multi-generational landowners, state and local government and non-governmental organizations was a positive way to manage our natural resources. Our educators sought to evaluate program impact in terms of knowledge gained by participants; application of this knowledge; and the number of range and forest acres exhibiting improvement in condition. Results were assessed using a variety of methods including pre and post event evaluations, surveys, feedback from advisory groups and stakeholder groups, and other individual assessments of program participants. Increased knowledge and adoption of improved natural resource systems that decrease soil erosion and improve water quality is a primary focus of our work. Clientele were very receptive to procedures, materials, and methods that they could implement on their land.

Key Items of Evaluation

Approximately 84% of program participants responding to evaluations indicated they acquired increased knowledge and skills relative to key learning objectives. This is a calculated average across program events with values that ranged from 68% to 100% of participants indicating they had benefited by increased knowledge or skill.

78% of program participants responding to evaluations indicated an intention to apply one or more principles gained from 79 educational events delivered in this program area. This suggested an increased willingness among clientele to use the information and recommendations provided.

The program impacted 475,000 acres, and over 75,000 acres of forest and rangeland were improved or enhanced through the adoption of one or more recommended practices or technologies related to stewardship of our natural resources. Additionally, 55 acres of shellfish beds were improved and 55,000 urban homeowners utilized one or more principles provided by Master Gardener volunteers to improve their local environment.