

V(A). Planned Program (Summary)

Program # 3

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	6%		10%	
102	Soil, Plant, Water, Nutrient Relationships	5%		10%	
104	Protect Soil from Harmful Effects of Natural Elements	6%		0%	
112	Watershed Protection and Management	6%		15%	
122	Management and Control of Forest and Range Fires	6%		0%	
123	Management and Sustainability of Forest Resources	6%		5%	
133	Pollution Prevention and Mitigation	5%		5%	
135	Aquatic and Terrestrial Wildlife	4%		6%	
136	Conservation of Biological Diversity	4%		2%	
141	Air Resource Protection and Management	5%		1%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	5%		5%	
213	Weeds Affecting Plants	5%		5%	
302	Nutrient Utilization in Animals	5%		5%	
306	Environmental Stress in Animals	5%		5%	
315	Animal Welfare/Well-Being and Protection	5%		5%	
402	Engineering Systems and Equipment	5%		5%	
403	Waste Disposal, Recycling, and Reuse	5%		5%	
511	New and Improved Non-Food Products and Processes	2%		1%	
723	Hazards to Human Health and Safety	5%		5%	
806	Youth Development	5%		5%	
	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	28.0	0.0	30.0	0.0
Actual Paid Professional	23.8	0.0	52.6	0.0
Actual Volunteer	15.7	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
690095	0	635114	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1530165	0	2861025	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
1293005	0	2821361	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Penn State's research in the Natural Resources and Environment planned program over the last program year included, among other topics, technical assistance and data contributed to the Pennsylvania Department of Environmental Protection for livestock nutrient management regulation; development of new compostable and edible coating for cellulose substrates; development of PaOneStop website for farm planning and nutrient management; quantification of effects of simulated increased temperature and precipitation on a central PA deciduous forest plot; studying how fish behavior changes in response to environmental stressors; supporting commercial development of a hen manure gasification plant through manure and ash analysis and testing the ash as a feed P/Ca supplement for poultry diets; and assessing the spread of herbicide-resistant weeds.

Highlights of Extension work in this planned program included pond management workshops; water test interpretation workshops; updated estimates of ownership of private forest land in PA and resulting emphasis on forest land legacy planning; experimental reclamation of abandoned mine land at the National Park Service Flight 93 Memorial site to support tree planting; and connecting youth to nature through the Junior Forest Steward program.

2. Brief description of the target audience

Ag producers/farmers/landowners; agriculture services/businesses; nonprofit associations/organizations; business and industry; community groups; education; general public; government personnel; human service providers; special populations (at-risk and underserved audiences); students/youth; academic researchers; forest managers; global change ecologists; ag media; volunteers/extension educators; consumers

3. How was eXtension used?

The Penn State Equine Extension Stewardship Program has used the national eXtension Horse Quest and My Horse University online sites for webinars, frequently asked questions, and as a resource for articles for their Equine PSU Horse Extension website. This and other projects have advertised programming and activities through the website's national events promotion. Team members have served on the national eXtension programming planning committee, chaired sections and communities of practice, and presented PSU research on national webinars.

Penn State Cooperative Extension supports faculty and staff use of eXtension and promotes communities of practice as a way of broadening sources of information and outreach. Penn State Cooperative Extension supports the professional development offered through eXtension.org. Pennsylvania is represented by 152 eXtension members in 47 of the 73 approved CoPs.

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	24065	468507	8652	30354

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

Patent Applications Submitted

Year: 2012
 Actual: 1

Patents listed

Serial No: 61/622,955; Filed 4/11/12; Title: Methods to Enhance Conversion of Cellulosic Biomass

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	0	0	195

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of invention disclosures submitted.
 Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Number of people enrolled and/or registered in programs.
Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of invention disclosures submitted in support of all programs related to Natural Resources and Environment

Year	Actual
2012	5

Output #4

Output Measure

- A. Number of people enrolled and/or registered in all programs related to Natural Resources and Environment

Year	Actual
2012	32622

Output #5

Output Measure

- A1. Number of people enrolled and/or registered in the Equine Environmental Stewardship program.

Year	Actual
2012	2765

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of participants who were evaluated and demonstrated increased knowledge and skills.
2	Number of participants who were evaluated in a follow-up and who implemented/adopted practices.
3	Number of volunteers that helped with program leadership or delivery.
4	Number of participants in all programs related to Natural Resources and Environment who were evaluated and demonstrated increased knowledge and skills.
5	Number of participants in all programs related to Natural Resources and Environment who were evaluated in a follow-up and who implemented/adopted practices.
6	Technical assistance and data contributed to Pennsylvania Department of Environmental Protection for livestock nutrient management regulation
7	Development of new compostable and edible coating for cellulose substrates
8	Development of PaOneStop website (https://www.paonestop.org) for farm planning and nutrient management
9	Quantified effects of simulated increased temperature and precipitation on central PA deciduous forest plot
10	Studying how fish behavior changes in response to environmental stressors
11	Assessing the spread of herbicide-resistant weeds
12	Percentage of participants in pond management workshops who were evaluated in a follow-up and who implemented and/or adopted recommended practices
13	Percentage of attendees of water test interpretation workshops who were evaluated on follow-up and had taken actions on their water supply
14	Updated estimates of ownership of private forest land in PA
15	Number of acres of abandoned mined land at the National Park Service Flight 93 Memorial site enriched with a mixture of manure and paper mill sludge to support memorial tree planting
16	Pennsylvania youth who participated in a forest stewardship activity and learned about forest stewardship through the Junior Forest Steward program
17	Supported commercial development of hen manure gasification plant

Outcome #1

1. Outcome Measures

Number of participants who were evaluated and demonstrated increased knowledge and skills.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number of participants who were evaluated in a follow-up and who implemented/adopted practices.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of volunteers that helped with program leadership or delivery.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of participants in all programs related to Natural Resources and Environment who were evaluated and demonstrated increased knowledge and skills.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	5273

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
122	Management and Control of Forest and Range Fires
123	Management and Sustainability of Forest Resources
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
141	Air Resource Protection and Management
403	Waste Disposal, Recycling, and Reuse
511	New and Improved Non-Food Products and Processes

Outcome #5

1. Outcome Measures

Number of participants in all programs related to Natural Resources and Environment who were evaluated in a follow-up and who implemented/adopted practices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	3901

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
122	Management and Control of Forest and Range Fires
123	Management and Sustainability of Forest Resources
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
141	Air Resource Protection and Management
403	Waste Disposal, Recycling, and Reuse
511	New and Improved Non-Food Products and Processes

Outcome #6

1. Outcome Measures

Technical assistance and data contributed to Pennsylvania Department of Environmental Protection for livestock nutrient management regulation

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Of the 31,000 operations housing horses in Pennsylvania, 75% are noncommercial and over 75% are on limited acreage, requiring intensive management. Horse farm operations have not been eligible for cost-share funding in the past and have not been regulated directly. Under newly

revised regulations, equine operations now fall under Act 38, Pennsylvania Nutrient Management regulations. Operations with more than 8 animal units per acre now need a nutrient management plan.

What has been done

Team members provided technical assistance to agency and legislative representatives initiating nutrient regulation. A webinar and four regional training workshops were held for 145 NRCS and conservation district personnel.

Results

Data collected on project farms were used to revise horse manure nutrient levels, served as baseline data for the PA Department of Environmental Protection Manure Manual, and were used in the PA Agronomy Guide animal body weight tables. 85% of those surveyed reported that the training increased their understanding of equine behavior and grazing patterns. 82% said the information would help them develop recommendations for pasture management and animal sacrifice areas. 78% stated that they developed a better understanding of the industry and horse owners.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #7

1. Outcome Measures

Development of new compostable and edible coating for cellulose substrates

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

As landfills fill up and are increasingly difficult to site, easily biodegradable disposable paper products are needed. A coating that works over a broad range of environmental conditions would find wide application.

What has been done

A new coating based on polysaccharides was developed. It dramatically improves the wet strength and liquid barrier properties of cellulose substrates.

Results

The coating works well over a pH range of 3 to 9 and from room temperature to 80 degrees C. The coating is completely compostable and edible. Commercialization activities are underway to develop new products in the food handling and packaging areas (e.g., disposable cups, plates, and other packages). Five patent disclosures have been filed.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes

Outcome #8

1. Outcome Measures

Development of PaOneStop website (<https://www.paonestop.org>) for farm planning and nutrient management

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In Pennsylvania, the need for online tools to assist farmers in meeting environmental regulations such as erosion and sediment control planning, nutrient management planning, manure management planning, and manure transfers is increasing. Farmers have traditionally found it difficult and/or relatively expensive to produce these plans because they needed tools that were not readily available to them. These types of farm plans will help to reduce agricultural pollution to Chesapeake Bay and other watersheds.

What has been done

PaOneStop provides tools that assist in meeting farm management requirements. The PaOneStop tool has been heavily supported by the Pennsylvania Department of Agriculture,

Department of Environmental Protection, and the State Conservation Commission as a tool for farmers and Conservation District personnel to help produce ag erosion and sedimentation (E&S) plans.

Results

The system has more than 1,800 registered users who have produced maps for more than 4,500 farms and 29,000 fields. Chapter 102 requires written ag E&S plans for all "agricultural plowing and tilling activities" greater than 5,000 square feet. The State Conservation Commission estimates that nearly 40,000 farms have no current written conservation or E&S plan. With nearly 60,000 farms in the state, this gives the PaOneStop site a significant market for farmers who need immediate assistance in producing plans. PaOneStop addresses a critical gap in Pennsylvania's Watershed Improvement Plan, which required significant reductions in agricultural pollutant loadings to the Chesapeake Bay watershed.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #9

1. Outcome Measures

Quantified effects of simulated increased temperature and precipitation on central PA deciduous forest plot

2. Associated Institution Types

- 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)

Experimental study of the effects of projected climate change on plant phenology allows us to isolate effects of warming on life-history events such as leaf-out.

What has been done

Researchers simulated a 2°C temperature increase and 20% precipitation increase in a recently harvested temperate deciduous forest community in central Pennsylvania, and observed the leaf-out phenology of all species for 2 years. Over 130 plant species were monitored weekly in study plots, but due to high variability in species composition among plots, species were grouped into

five functional groups: short forbs, tall forbs, shrubs, small trees, and large trees.

Results

Tall forbs and large trees, which usually emerge in the late spring, advanced leaf-out 14-18 days in response to warming. Short forbs, shrubs, and small trees emerge early in spring and did not alter their phenology in response to warming or increased precipitation treatments. Earlier leaf-out of tall forbs and large trees coincided with almost 3 weeks of increased community-level leaf area index, indicating greater competition and a condensed spring green-up period. Although phenology of large trees and tall forbs appears to be strongly influenced by temperature-based growth cues, our results suggest that photoperiod and chilling cues more strongly influence the leaf-out of other functional groups. Reduced freeze events and warmer temperatures from predicted climate change will interact with nontemperature growth cues to have cascading consequences throughout the ecosystem.

4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

Outcome #10

1. Outcome Measures

Studying how fish behavior changes in response to environmental stressors

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)

Understanding how animals react to changes in environmental stressors is key because climate change and anthropogenic changes are likely to make environments less predictable. So understanding how natural populations adjust and cope with such unpredictability through their behavioral responses provides us with important information.

What has been done

Researchers investigated the relationship between hormonal and behavioral stress responsiveness in populations of a tropical freshwater fish, *Brachyrhaphis episcopi*, that experiences different levels of predation and hence encounters different rates of stressful events. Predation can impose strong selection pressure, and living with high risk of predation is known to select for specific behavioral traits. Researchers quantified variation in stress responsiveness via cortisol release rates (exp. 1) and behavior in an open field test followed by cortisol release rates (exp. 2).

Results

Populations exposed to high levels of predation were consistently more exploratory and active and had lower release rates of cortisol in response to a stressor than fish of the same species sampled at sites with few predators. Fish adjust their decision-making strategies to cope with living in a dangerous environment. Fish from high predation populations make more rapid but less accurate decisions compared to fish from low predation environments. Fish from high predation sites are more impulsive, but they learn and remember information for longer than their low predation counterparts. This work on fish cognition has caught attention from the general media (newspapers, magazines and radio), and so we are also reaching the general public.

4. Associated Knowledge Areas

KA Code	Knowledge Area
306	Environmental Stress in Animals

Outcome #11

1. Outcome Measures

Assessing the spread of herbicide-resistant weeds

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)

Over-reliance on glyphosate-type herbicides for weed control on U.S. farms has created a dramatic increase in the number of genetically resistant weeds. About 95 percent of the current

soybean crop is modified by inserting herbicide-resistant genes into the plants. Projections are that herbicide use may double in the next decade, posing a threat to ecosystems, water quality, and human health.

What has been done

Our work on the spread of herbicide-resistant weeds has been underway for some 15 years now, and over the past year culminated in the publication of several high profile papers. Our work on genetically modified herbicide-resistant crops and integrated weed management was communicated in some 270 newspapers nationwide, on National Public Radio, and in a number of nationally distributed magazines.

Results

The evolution of glyphosate-resistant weeds has continued at a constant rate over the past 10 years. 22 species are now resistant to this widely used herbicide. From our own research and through a comprehensive meta-analysis, we conclude that introducing multiple herbicide genes in newly produced crop cultivars will only serve to accelerate the herbicide resistance problem. We therefore conclude that a much greater emphasis should be placed on more robust and sustainable integrated weed management methods to address the problem. We underscore the importance of integrated weed management. This involves implementing practices that effectively fragment the landscape for invasive plants and limiting connections that facilitate their recruitment success and spread.

4. Associated Knowledge Areas

KA Code	Knowledge Area
213	Weeds Affecting Plants

Outcome #12

1. Outcome Measures

Percentage of participants in pond management workshops who were evaluated in a follow-up and who implemented and/or adopted recommended practices

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	83

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The goal of the pond and lake management program is to provide educational resources on proper management of ponds and lakes in the areas of aquatic plants and algae, fisheries, pond structure, and water quality.

What has been done

Agents offered 15 face-to-face pond management workshops using PowerPoint presentations and hands-on instruction to assist participants in managing their pond/lake; 3 presentations at turfgrass management conferences; 2 webinars on pond management, fisheries, and management of aquatic invasive species; an online aquatic pesticide course; and consultation to 427 individuals through 1-on-1 education, phone, email, and pond visits.

Results

433 pond/lake owners representing approximately 1,322 acres of ponds/lakes attended programs. 98% of attendees rated the workshops as excellent, very good, or good. 83% of attendees indicated that they had never tested their pond/lake water quality. 100% of attendees indicated that they learned some new pond/lake management concepts at the workshop. 83% of participants were evaluated in a follow-up and had implemented and/or adopted suggested practices. The most common actions taken included managing a plant/algae (39%), testing pond/lake water (23%), installing buffer strip around pond/lake (33%), using barley straw for algae control (13%), and adding fish structure to the pond or lake (10%).

4. Associated Knowledge Areas

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

Outcome #13

1. Outcome Measures

Percentage of attendees of water test interpretation workshops who were evaluated on follow-up and had taken actions on their water supply

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	78

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Many owners of private water supplies have never had their water supplies tested. Many know essentially nothing about how the system works, how to maintain it, or what types of conditions might indicate a problem. Recent drilling for Marcellus shale natural gas has heightened the need for this type of programming.

What has been done

The Safe Drinking Water Extension specialist delivered 52 programs/workshops. Programs reached 5,756 private water supply owners. There were 622 attendees at nine water test interpretation workshops.

Master Well Owner Network volunteers provided direct assistance or presentations to 2,350 private water supply owners and indirect assistance to 10,777 private water supply owners.

Results

96% of attendees of the water test interpretation workshops felt comfortable in interpreting their water test report after attending the program. 95% felt the information presented was unbiased. A follow-up survey was emailed to 373 attendees (46% response rate). 78% had taken actions on their water supply, including water testing (5%), improved construction of water supply (16%), installation of water treatment devices (11%), shock disinfection to remove bacteria (21%), added lease stipulations to protect water (3%), and had water quantity documented before drilling (15%). Nearly 65% of respondents indicated that they shared what they learned at the workshop with others.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

Outcome #14

1. Outcome Measures

Updated estimates of ownership of private forest land in PA

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)

Forest parcelization, the ownership of ever smaller parcels of forest land, affects forest values and management. Areas of core forest, which are essential to many species, very often shrink.

What has been done

The third and final part of the Pennsylvania Forest Landowner study was completed to estimate landowner populations and to link findings to ownership patterns, decision-making, and issues affecting forest management and legacy.

Results

Pennsylvania now has 738,000 private forest land owners. This is approximately 200,000 more than the 2008 estimate by the U.S. Forest Service. Owners of small parcels (i.e., 410,000 owners), those of less than 20 acres, hold about 1 in 4 of Pennsylvania's private forest acres. The data now suggest that 1 in 7 Pennsylvania households owns an acre or more of woodlands. Unfortunately, the data suggest that the parcelization of private forests continues to be a major concern, as 56% of forest owners plan to leave their land to more than one heir. To stem the loss of working forests, the team embarked on a joint effort with Cornell University to develop resources for peer-to-peer and professional outreach to encourage forest owners to plan for their forest legacy.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources

Outcome #15

1. Outcome Measures

Number of acres of abandoned mined land at the National Park Service Flight 93 Memorial site enriched with a mixture of manure and paper mill sludge to support memorial tree planting

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	20

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In Pennsylvania excess manure nutrients in areas of intensive animal agriculture and severely disturbed mined lands can both contribute to degraded water quality.

What has been done

Research has been conducted on mined lands investigating using agricultural manure to achieve rapid improvement in mine soil quality and significant biomass production. Mine soil reclamation with a mixture of manure and paper mill sludge sequesters manure nutrients and organic carbon in the soil, allowing large applications with minimal risk of nutrient loss by leaching or runoff.

Research was initiated to implement a production cycle in which spent mushroom substrate is used for mine soil reclamation and annual nutrient supply to produce straw for mushroom substrate feedstock.

Results

Sustained switchgrass production of 5-6 Mg ha⁻¹ has been achieved with no annual fertilizer additions. Credits generated under PA's nutrient trading program have covered the cost of manure transport from production areas to mine sites and paper mills cover the cost of paper mill sludge transport, so these materials can be delivered to mine sites at no cost to the reclamation operation. This approach to mine soil reclamation was used at the National Park Service Flight 93 Memorial site to prepare ~20 acres of abandoned mined land for planting 20 of the 40 memorial groves, with plans to do the same for the remaining 20 groves. The potential for significant biomass production on mined lands is of interest to PA's mushroom producers, who are finding it increasingly difficult to source straw feedstocks for production of mushroom substrate.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
403	Waste Disposal, Recycling, and Reuse

Outcome #16

1. Outcome Measures

Pennsylvania youth who participated in a forest stewardship activity and learned about forest stewardship through the Junior Forest Steward program

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	341

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Junior Forest Steward Program offers youth (ages 8-12 years) an opportunity to learn about the forests of PA and the important concept of forest stewardship. PA youth often know very little about the forests and natural areas that cover the state. This educational initiative can get kids excited about and interested in Penn's Woods. The Pennsylvania Bureau of Forestry is a partner.

What has been done

Participation in the Junior Forest Steward Program is free and relies on cooperating adults (such as teachers, youth group leaders, 4-H volunteers, Scout leaders) to help facilitate learning. Adults need only an interest and willingness to learn right along with youth. The program works in both formal and non-formal educational settings. Youth read an interactive publication (individually or as a group), discuss the questions, and then participate in a forest stewardship activity led by the adult educator or helper. Youth then receive a Junior Forest Steward patch.

Results

341 youth across Pennsylvania participated in the Junior Forest Steward Program. 100% of these youth were reported by the adult volunteers to have increased their knowledge 'a great deal.' These same volunteers also reported that the program made a 'large' long-term impact on the youth involved (75%) or a 'medium' impact (25%), and they rated the usefulness of the program materials highly. Some of the stewardship projects included interviewing a PA Forest Steward or state land manager about land management practices used, constructing a brush pile for wildlife habitat, erecting bird boxes, eliminating invasive weeds, litter pickup, and tree planting.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #17

1. Outcome Measures

Supported commercial development of hen manure gasification plant

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The proliferation of concentrated animal feeding operations has raised issues of how to safely and efficiently dispose of the animal waste while protecting environmental and water quality. Turning the waste into a fuel and possibly a feed supplement greatly increases the efficiency of nutrient utilization and helps with energy source diversification.

What has been done

Researchers supported the commercial development of a hen manure gasification plant (3.24 megawatt) on a 5.6 million hen complex in PA with manure and ash analysis and testing the ash as a feed P/Ca supplement for poultry diets.

Results

This plant went online in 2012 and will remove 195,000 tons of manure annually from the Chesapeake Bay watershed.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
141	Air Resource Protection and Management
302	Nutrient Utilization in Animals
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Reduced State funding impacted both the research and extension functions of the College of Agricultural Sciences and resulted in retirements and layoffs of key faculty and staff across all areas of the College.

The summer drought and 2011 and 2012 fall floods had real impacts on some research projects, requiring the adjustment of time lines.

Attendance at pond/lake workshops continues to be strong. Increasing government regulation of pond/lake owners provides new opportunities to continue educational programs. Even in an economic downturn, pond/lake owners are willing to pay \$10-35 for quality educational programs. New federal National Pollutant Discharge Elimination System (NPDES) aquatic herbicide permitting and changes in available aquatic herbicides will provide even greater opportunities for education in this area.

Interest in safe drinking water programs is strong based largely on increased drilling for Marcellus shale gas. Demand for Master Well Owner Network programs is also strong, but external funding for this program has been minimal and flat, resulting in relatively constant numbers of volunteers reporting. Penn State Extension is the one of the few unbiased providers of safe drinking water programs in the state, especially regarding potential impacts of natural gas drilling. Increasing amounts of professional water testing of private water supplies in gas drilling areas will provide opportunities for education around water test interpretation and basic private water supply management. Private water supply owners have traditionally been unwilling to pay more than \$10 for educational programs, but natural gas programming has the potential to bring in greater revenue from this audience.

Afterschool events will always compete with other youth activities, especially sports. The limited number of personnel working on the Connecting Youth with Nature project are taxed to the maximum, and funding is extremely tight at both county and state levels.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The generation of outcomes from existing programs and the development of new programs require improved evaluation that identifies pre- and post- responses to

information and monitoring for long-term behavioral changes that result in improved environmental outcomes. The evaluations conducted thus far provide initial measures of implementation, but long-term monitoring is needed to ensure that the practices are successfully managed over time.

Based on program evaluations and information obtained from industry surveys, a strong need exists to continue to offer programs that address environmentally and economically sustainable farm management practices. Various growers, producers, and farmers have cited lack of information and knowledge and lack of funds as major barriers to implementing best management practices.

Key Items of Evaluation

See highlights of state-defined outcomes in this planned program.