V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Natural Systems, Biodiversity, and Wildlife Ecology

☑ 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
112	Watershed Protection and Management	10%	10%	10%	10%
123	Management and Sustainability of Forest Resources	10%	10%	10%	10%
135	Aquatic and Terrestrial Wildlife	20%	20%	20%	20%
136	Conservation of Biological Diversity	15%	15%	15%	15%
215	Biological Control of Pests Affecting Plants	15%	15%	15%	15%
216	Integrated Pest Management Systems	20%	20%	20%	20%
306	Environmental Stress in Animals	5%	5%	5%	5%
903	Communication, Education, and Information Delivery	5%	5%	5%	5%
	Total	100%	100%	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	1.4	1.8	3.3	2.5
Actual Paid Professional	1.4	2.0	3.7	2.1
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**
39844	91629	76258	148934
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
230841	91629	0	148934
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
109528	0	1023963	1058764

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research and extension programs will target: (1) Integrated Pest Management (IPM) - developing and delivering IPM programs, a "systems" approach using chemical, cultural, mechanical, and biological control to increase profits to producers and protect the environment; (2) Sustainable Agriculture/Forestry - developing and promoting efficient and sustainable agricultural, forestry, and other resource conservation practices and policies that ensure sustained ecosystem function and provide food and habitat for biodiversity, including crop diversification, agroforestry, native windbreaks, cover crops, living mulches, field border systems, and conservation buffers; (3)Wildlife, Woodlands, and Aquatic Resources - understanding and mitigating the impact of agricultural practices and urbanization on biodiversity, woodlands, and aquatic resources. Focus is on human impacts on the fundamental processes that create and maintain biodiversity, such as atmospheric nitrification of ecosystems, minimal habitat requirements, speciation, predator-prey interactions, community and ecosystem structure, and extinction processes. Approaches to develop and sustain biodiversity in agriculture, suburban landscapes, and natural habitats, will be studied; (4) Wetlands Ecosystems - improve understanding of wetlands restoration, protection, and preservation. Emphasis will be on seasonally saturated and non-seasonally saturated wetlands and the wildlife species that inhabit them; (5) Protection of Delaware's Native Species - research on non-indigenous invasive species, a leading cause of plant and animal extinction in Delaware, will focus on impacts of invasive species on ecosystem function and on methods of restoration after their removal; (6) Master Gardener Training - Extension programs will be developed and delivered on Wildlife Habitat Gardening, Waterwise Gardening, Rainwater harvesting, and use of native landscape plants in suburban gardens; (7) Human Activities and the Natural Environment - coupled environmental and socioeconomic modeling methodologies will highlight interactions between human activities (drivers), environmental impacts from those activities (stressors), potential changes to valued ecosystem components, and feedbacks experienced from the changes; (8) Wildlife Management - effects of human activity on migratory shore birds, box turtles in suburban habitat fragments, neotropical bird migrants in Delaware, Bobwhite quail in warm season grasslands, horseshoe crab ecology in the Delaware Bay, insect biomass production in suburban habitats, habitat restoration for bats and White-tailed deer populations and lead to recommendations for improved habitat management; (9) Fisheries - population status, spawning areas, and management of Atlantic sturgeon in the Delaware River; and (10) Apiculture - New research is underway on the evolutionary biology of honey bees, pollination ecology, the population genetics of honey bees in the Unites States; and the genetic characterization of unmanaged honey bee populations.

2. Brief description of the target audience

Farm owners and operators, aquaculture producers, recreational fisheries, seafood consumers, water quality managers, agribusiness and private consultants, horticultural professionals, city land use

planners and other policy-makers, home gardeners, childcare providers, environmental educators.

3. How was eXtension used?

In 2012, UD kick started efforts for a Delaware Extension Ask an Expert widget/feature on both the UD and DSU websites. Recognizing that 70% of the questions coming into the national system, including those questions funneled to Delaware from the national widget, are horticulture based, training has focused on gearing up Master Gardeners in all three counties to be able to navigate the system and answer questions. The feature will be released in 2013. Many Master Gardeners and UD/DSU Extension horticulture professionals have been added into the system and are joining Communities of Practice and communities of a horticulture nature.

Debbie Delaney, assistant professor of entomology at UD, is a member of the bee health community of practice, and has been working with other members on a grant to create a bee/pollinators app.

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	20142	86338	4793	105

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

Patent Applications Submitted

Year: 2012

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	2	21	23

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Competitive Grants Submitted

Year	Actual
2012	30

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2012	18

Output #3

Output Measure

- Number of Research Projects Completed

Year	Actual
2012	17

Output #4

Output Measure

- Number of Undergraduate Researchers

Year	Actual
2012	48

Output #5

Output Measure

- Number of M.S. Graduate Students

Year	Actual
2012	46

Output #6

Output Measure

- Number of Ph.D. Graduate Students

Year	Actual
2012	8

Output #7

Output Measure

- Number of Post-doctoral Research Associates

Year	Actual
2012	3

Output #8

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2012	23

Output #9

Output Measure

- Number of Books and Book Chapters

Year	Actual
2012	5

Output #10

Output Measure

- Number of Technical Reports

Year	Actual
2012	11

Output #11

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2012	13

Output #12

Output Measure

- Number of Invited Presentations

Year	Actual
2012	155

Output #13

Output Measure

- Number of Volunteered Presentations

Year	Actual
2012	65

Output #14

Output Measure

- Number of Websites Established

Year	Actual
2012	6

Output #15

Output Measure

- Number of Workshops Conducted

Year	Actual
2012	108

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increased number of farmers and other producers aware of the principles of integrated pest management and familiar with the practices and technologies needed for a systems-based approach to prevent and control problems with insects, weeds, and plant pathogens.
2	Educational programs for K-12 youth and teachers on ecosystems and natural resources that emphasize the importance of sustaining biodiversity for natural and managed land uses.
3	Through the Center for Managed Ecosystems, conduct research and outreach programs on restoring and enhancing biodiversity and wildlife habitat in suburbanized landscapes.
4	Increased number of farmers and other land managers adopting integrated approaches to pest management for insects, weeds, alien invasive plants, and plant pathogens in agricultural and natural ecosystems.
5	Increased participation by all stakeholders in educational programs on responsible environmental management of natural resources, nutrients, and pesticides.
6	Increases in the amount of agricultural and suburban land where wildlife habitat has been restored or enhanced.
7	Integrated Pest Management: basic and applied research will increase the effectiveness of a systems-based approach to prevent or control pests (insects, weeds, plant pathogens) that threaten agricultural productivity and damage natural, urban, and suburban landscapes. Extension programs will promote adoption of IPM by farmers and other land managers.
8	Ecosystem restoration: fundamental research on ecosystem processes will provide evidence of the full range of ecological, water quality, and economic benefits associated with sustaining and enhancing natural ecosystems such as wetlands, forests, riparian corridors, and tidal marshes, and lead to greater restoration and expansion of areas important for wildlife habitat and biodiversity.
9	Wildlife habitat and management: research will assess the impacts of human activity on wildlife habitats and develop management practices that can protect threatened or endangered species and lead to policies that protect and enhance wildlife populations.
10	Protection of native species: research and extension programs will quantify the ecological and economic benefits of protecting indigenous plant species and restricting the spread of invasive plants and animals.

Outcome #1

1. Outcome Measures

Increased number of farmers and other producers aware of the principles of integrated pest management and familiar with the practices and technologies needed for a systems-based approach to prevent and control problems with insects, weeds, and plant pathogens.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

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)
Agricultural growers and producers seek research-based information regarding weed management in their farming operations.

What has been done
Mark VanGessel, University of Delaware extension specialist and professor in the Department of Plant and Soil Sciences, and his team of weed science researchers, Barbara Scott and Quintin Johnson and summer students and interns organize Weed Science Field Day. Throughout the year UD Extension and research staff conduct unbiased studies on more than 70 trials (which amount to more than 700 comparisons) most are devoted to key agronomic crops, and evaluate their effectiveness of weed management. Chemical, mechanical and cultural practices are evaluated. Their findings are published in an annual guide of trial results that is made available to attendees and the results serve as the basis for educational programs throughout the year and provide the experience to answer questions from farmers and the agricultural industry. The goal of Weed Science Field Day is to deliver the latest research to the agricultural community. Communication to the industry is a key component in Delaware?s continued agronomic success and is part of Cooperative Extension?s outreach mission.

Results
More than 60 growers, pesticide applicators, crop advisers, and agricultural professionals from Maryland and Delaware attended the 2012 event to obtain information on the trial results and best practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
903	Communication, Education, and Information Delivery

Outcome #2

1. Outcome Measures

Educational programs for K-12 youth and teachers on ecosystems and natural resources that emphasize the importance of sustaining biodiversity for natural and managed land uses.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Through the Center for Managed Ecosystems, conduct research and outreach programs on restoring and enhancing biodiversity and wildlife habitat in suburbanized landscapes.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 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)
Homeowners, citizen groups interested in conservation and ecosystems, those concerned about how landscape management affects biodiversity and water quality.

What has been done
Taking a fresh look at water quality management, a University of Delaware College of Agriculture and Natural Resources (CANR) research team is studying how the replacement of urban lawns

with more diverse vegetation can help protect water quality and make our landscapes more sustainable.

Results
The researchers will be working at the Winterthur Gardens on their project. Shreeram Inamdar, CANR associate professor of plant and soil sciences, is the principal investigator and the research team includes Doug Tallamy, chair of the Department of Entomology and Wildlife Ecology; Susan Barton, associate professor in the Department of Plant and Soil Sciences and a Cooperative Extension specialist; Jules Bruck, assistant professor of landscape horticulture and design; and Joshua Duke, professor in the Department of Food and Resource Economics. One of the main goals of the three-year study, is to try to curb water pollution at its source ? preventing pollution in the first place rather than waiting to treat contaminated water before it enters waterways. The researchers believe they can keep water clean by shrinking the lawn and replacing it with more diverse vegetation, thus reducing fertilizer and herbicide inputs and enabling water filtration, which will lead to less storm water runoff and cleaner water. Diverse vegetation also is expected to provide other natural ecosystem services ? such as carbon sequestration, preserving biodiversity and natural pest control ? that are associated with mixed vegetation landscapes

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
903	Communication, Education, and Information Delivery

Outcome #4

1. Outcome Measures

Increased number of farmers and other land managers adopting integrated approaches to pest management for insects, weeds, alien invasive plants, and plant pathogens in agricultural and natural ecosystems.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

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)
Landscape management during the growing season for landscape maintenance professionals, public garden professionals, nursery personnel and garden center employees is a complicated topic. These landscapes contain hundreds of different plants, each with their own disease, insect or cultural problem. The industry is encouraged to practice an integrated pest management (IPM) approach, which means looking for pests at the appropriate life stage on the appropriate host plant, knowing what environmental conditions are likely to trigger disease and which cultural problems occur in response to drought, wet conditions or high temperatures. By practicing IPM, control measures are used only when needed, for the proper life stage of the pest, and by choosing the least toxic option.

What has been done
The technical information necessary to manage landscapes this way is provided on a weekly basis to Ornamentals Hotline subscribers depending on current pest and environmental conditions.

Results
A survey of Ornamentals Hotline was conducted at the end of the 2012 growing season. The survey response rate was 18.5%. The greatest number of respondents were landscape contractors (44%). Practices most often changed were: ?Correctly identify insects and diseases before deciding on control strategy? (61%); ?Replace problem plants with better adapted species? (53%); ?Scout for pests before deciding on control needed? (47%); ?Select least toxic pesticide available? (44%). Respondents said Ornamentals Hotline helped them implement these practices by: reminding them which insects and diseases to look for (most common response); providing information on why a practice should be implemented; providing staff training; providing information on which pesticides to use. When asked whether they have reduced the total volume of pesticides applied, most responded with some form of ?yes? (59%). The amount of reduction ranged from 10% to over 90%, with one respondent explaining they are now totally pesticide free. Only 15% of respondents have not reduced pesticide use at all. Most respondents (72%) think images of pests and diseases are extremely helpful with diagnosis and would like to see more images on the blog. As a result of this evaluation, the Ornamentals Task Force has decided to provide a link to a growing degree explanation at the bottom of the growing degree day box included in each issue. We will also provide a link to a blog that is updated weekly with pictures and additional resources. One of the additional resources will be a list of trade names of common pesticides.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
216	Integrated Pest Management Systems
903	Communication, Education, and Information Delivery

Outcome #5

1. Outcome Measures

Increased participation by all stakeholders in educational programs on responsible environmental management of natural resources, nutrients, and pesticides.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

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)
The Mid-Atlantic Region of the United States has been dealing with herbicide resistant weeds since 1972 when triazine resistance was identified in Maryland. Glyphosate- resistant horseweed was identified in 2000 in Delaware and, more recently, acetolactate synthase (ALS) -resistant smooth pigweed, ALS-resistant common chickweed , and glyphosate-resistant Palmer amaranth have been confirmed in the region. While, glyphosate-resistant weed species in grain crops have impacted the largest number of acres, ALS-resistant smooth pigweed remains a very big challenge for their vegetable industry (over 125,000 acres in the Delmarva region).

What has been done
The U.S. Environmental Protection Agency (EPA) and Weed Science Society of America (WSSA) have worked together in recent years on a number of weed management issues facing farmers, natural resource managers, and weed scientists. A one-day tour was organized to provide an opportunity for EPA staff and WSSA members to discuss herbicide resistant weeds and the impact they are having on agricultural production in this region. Twenty-seven EPA staff representing all of the divisions within the Office of Pesticide Programs participated on the tour along with 4 members representing the WSSA. The hosts of the tour were Dr. Mark VanGessel, University of Delaware, and Dr. Ron Ritter, University of Maryland. The objectives of the tour were: To demonstrate the complexity of herbicide resistant weed management; To demonstrate the severity of herbicide resistance in a variety of crops in the Mid-Atlantic region, including vegetable crops; To discuss how farmers in the Mid-Atlantic region are dealing with the problem, and discuss some of their constraints to management. To discuss how weed resistance has evolved to several herbicide families impacting all crops grown in the region; To discuss how approaches to weed management are often site and region specific. Four stops were included in the tour representing agricultural production and weed management issues on the Delmarva Peninsula. Stops included: University of Maryland?s Wye Research Farm where the group

viewed research plots evaluating weed control programs in conventional and herbicide-resistant crops; A commercial soybean field near the DE/MD state line where the group discussed the programs designed by the University of Delaware for management of glyphosate-resistant horseweed and the effect of environmental conditions on the success of that program; A commercial lima bean field near Greenwood, DE where the management of ALS-resistant smooth pigweed has become a challenge due to the limited herbicide registrations; A soybean field near Denton, MD that was planted with soybean rather than corn (original choice, higher income potential) because of the weed spectrum in the field.

Results
The tour participants were surveyed at the end of the tour to determine the usefulness of the tour: 83 % rated the overall educational portion of the tour as very informative; 74% indicated that they have a better understanding of issues related to herbicide-resistance; 65 % indicated that they will use the information gained during the tour in their duties with EPA.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
903	Communication, Education, and Information Delivery

Outcome #6

1. Outcome Measures

Increases in the amount of agricultural and suburban land where wildlife habitat has been restored or enhanced.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 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)
Accidentally introduced to the U.S. from China in the 1930s, stufies show mile-a-minute can grow six inches per day. Chemical control measures aren?t very effective and native insects don?t like to eat mile-a-minute.

What has been done
UD researchers are using weevils to check the spread of mile-a-minute weed. Judy Hough-Goldstein, professor of entomology, is using a weevil known as Rhinoncomimus latipes to help curb mile-a-minute weed. The itsy-bitsy Rhinoncomimus latipes, a native of China, is host-specific to mile-a-minute; it won?t eat any other plant.

Results
Since 2004, Hough-Goldstein and cooperators have released Rhinoncomimus latipes at numerous sites in Delaware and in Chester County, Pa. She was the first researcher in the world to obtain a permit to release a biological control agent of mile-a-minute weed. Today, her lab is still the only one in the U.S. ? and one of a handful in the world ? attempting to control this invasive plant through biological means.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
135	Aquatic and Terrestrial Wildlife
903	Communication, Education, and Information Delivery

Outcome #7

1. Outcome Measures

Integrated Pest Management: basic and applied research will increase the effectiveness of a systems-based approach to prevent or control pests (insects, weeds, plant pathogens) that threaten agricultural productivity and damage natural, urban, and suburban landscapes. Extension programs will promote adoption of IPM by farmers and other land managers.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 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)

Crop consultants and field workers require research-based information to make informed decisions in processing and fresh market vegetables.

What has been done

Joanne Whalen and Bill Cissel developed an Insect Trapping Systems for Integrated Pest Management (IPM) Decision Making in Processing and Fresh Market Vegetables. Thirteen black light traps and eleven corn earworm pheromone traps were placed on vegetable farms throughout Kent and Sussex counties in late April. A University of Delaware trap technician drove to each location twice a week from early May through mid-September and counted the number of corn borer and corn earworm moths in black light and pheromone traps. Information collected in the trapping program was sent to the University of Delaware?s Extension IPM Associate (Cissel) and Extension IPM Specialist (Whalen) on each trapping day to ensure that clientele received timely information. The use of multiple methods of dissemination of trap information allowed users to access the information 24 hours a day. A phone hotline was set up and received approximately 30 -70 calls weekly, mainly from consultants and field men who then used the information for a larger group of clientele. Links in the Weekly Crop Update provided information on a weekly basis to 300 subscribers.

Results

Survey results indicate that trapping information was used to make management decisions on the following crop acres: (a) Processing Lima Beans: 15,800; (b) Fresh Market Peppers: 180; (c) Fresh Market Snap Beans: 1350; (d) Processing Snap Beans: 1550 (includes some VA acres); (e) Fresh Market Sweet Corn: 4,000; and (f) Processing Sweet Corn: 12,500 (includes MD acres in adjacent counties to Delaware). Respondents indicated that the trapping program helped to prevent yield loss on over 35,000 acres of vegetables. They reported savings in terms of yield loss for fresh market and processing snaps beans and fresh market sweet corn averaging $44 per acre. Producers and consultants using trapping information to make spray decisions also reported improved quality of fresh market snap beans and sweet corn valued at an average of $50 per acre.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems
903	Communication, Education, and Information Delivery

Outcome #8

1. Outcome Measures

Ecosystem restoration: fundamental research on ecosystem processes will provide evidence of the full range of ecological, water quality, and economic benefits associated with sustaining and enhancing natural ecosystems such as wetlands, forests, riparian corridors, and tidal marshes, and lead to greater restoration and expansion of areas important for wildlife habitat and biodiversity.

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

Wildlife habitat and management: research will assess the impacts of human activity on wildlife habitats and develop management practices that can protect threatened or endangered species and lead to policies that protect and enhance wildlife populations.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 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)
Data is needed to determine how water and chemicals move through the forest canopy, soils and watersheds, and how future climate change may impact or alter such responses.

What has been done
An outdoor experimental watershed laboratory established by University of Delaware faculty members Shreeram Inamdar, associate professor in the Department of Plant and Soil Sciences, has investigated the role of soils, streams, and watersheds in leaching water and nutrients, while a professor in the Department of Geography, has studied the interactions of atmosphere and the forest canopy in leaching water and nutrients. Together, they have provided a complete picture of watershed hydrology and biogeochemistry. The two were awarded a grant in 2008 to study the

mechanisms behind the leaching and exports of carbon and nitrogen from watersheds and how these chemicals evolve as they change in space ? traveling through the forest canopy, soils, and stream drainage network ? and as they change in time through the different seasons. Climate change scenarios suggest that storms will become more intense with dry intervening periods similar to the conditions associated with the Hurricane Nicole event, and thus studying such extreme events provides a critical window into the future.

Results
Sampling for multiple years has provided insights into how water chemistry changes with seasons. These measurements have allowed for the researchers to investigate how unique seasonal events ? such as autumn leaf fall or spring emergence ? alter water quality in the stream.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
135	Aquatic and Terrestrial Wildlife
903	Communication, Education, and Information Delivery

Outcome #10

1. Outcome Measures

Protection of native species: research and extension programs will quantify the ecological and economic benefits of protecting indigenous plant species and restricting the spread of invasive plants and animals.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluation of the Natural Systems, Biodiversity, and Wildlife Ecology planned program

for FY12 (5.8 Research FTEs, 3.4 Extension FTEs) shows ongoing high quality efforts by research and extension scientists and educators to address the ecological and natural resources problems facing Delaware and of relevance to many other states and countries. Significant advances have been made in our understanding of wildlife ecology and management, the role of migratory birds in the transmission of avian diseases, applications of radar technology to track migratory birds, and the use of biocontrol strategies to manage invasive plants and problem insects. Evaluations of research and extension productivity showed that 18 grants were awarded and that faculty in this program supported the efforts of 105 graduate students, post-docs, and undergraduate researchers, that they published 28 refereed journal articles and book chapters, made 220 invited and volunteered presentations at national and international meetings, and conducted 108 workshops. Our evaluations have included annual internal administrative reviews, periodic University level Academic Program Reviews, and - for extension - surveys and other evaluations conducted with stakeholders participating in workshops and other extension programs. All evaluations and feedback from stakeholders have been positive in terms of the direction of research and extension programs, their relevance to Delaware, and their contributions to basic and applied science.

Key Items of Evaluation

There are no major items requiring NIFA attention at this time, other than the continued need for more federal funding for research and extension programs that seek to further expand our efforts to conduct research and outreach programs that meet the growing need to restore degraded ecosystems, protect biodiversity, and address the growing global problem of invasive species control.