2014 Rutgers Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

The New Jersey Annual Report of Accomplishments and Results is an integrated report reflecting Cooperative Research and Cooperative Extension programs. The report addresses all of the requirements regarding the use of Hatch Funds, Smith-Lever 3 (b) and (c) and required nonfederal funds. As recommended we have streamlined our report to focus on significant qualitative outcomes. The report reflects the work of the New Jersey Agricultural Experiment Station (NJAES). The mission of NJAES is to enhance the vitality, health, sustainability, and overall quality of the life in New Jersey by developing and delivering practical effective solutions to current and future challenges relating to agriculture; fisheries; food; natural resources; environments; public health; as well as economic, community, and youth development. NJAES through station supported Cooperative Research and Cooperative Extension focuses on innovative approaches to applying the land grant model to address the diverse needs of a highly urbanized state. Stakeholders have been active partners in identifying critical issues to be addressed.

NJAES values the contributions that stakeholders make to ensure that all research and extension projects and programs are relevant and responsive to the needs of New Jersey residents. Cooperative Extension continues to expand its programmatic outreach to fully engage new audiences with a special focus on reaching those who have traditionally been underrepresented and/or underserved. Emphasis is given to increasing our urban audience base and to deliver programs which are culturally appropriate to meet the diverse needs of our many publics.

Planned programmatic focus areas which are being reported against are:

- Climate Change-Water Quality & Quantity
- Childhood Obesity-Youth/Adult Obesity
- 4-H Youth Development
- Global Food Security and Hunger-Agricultural Viability
- Climate Change-Home, Garden and Environment
- Global Food Security and Hunger-Integrated Pest Management
- Global Food Security and Hunger-Aquaculture
- Food Safety
- Sustainable Energy

NJAES researchers and extension faculty and staff have concentrated on these focus areas with relevant, innovative science-based educational programming and research solutions to address critical needs identified by New Jersey residents. NJAES has an organizational commitment to diversity which transcends the work of both Cooperative Research and Cooperative Extension. It is evident as we serve the needs of an environmentally, economically, geographic and ethnically diverse state. We meet the needs of agricultural producers who farm on the urban fringe, youth who are challenged by circumstances such as poverty and risks which impede their success, families who are faced with workforce employment issue and a growing number of families who are food insecure. We strive to implement RCE educational programs to meet the needs of underserved and underrepresented audiences and reduce any real or perceived barriers to participation.

Rutgers Cooperative Extension (RCE) is committed to meeting the needs of a diverse Latino community in New Brunswick. Programs span the scope of 4-H Youth Development and life skills to urban gardening

and environmental issues with an emphasis on lead abatement of soil. NJAES shared leadership with the New Jersey Farm to School Network to provide youth with healthy foods through school gardens and farm to school access.

In addition NJAES plays a significant role in the State's economic growth by:

Funding Cutting-edge, innovative research
Fostering technology and innovation transfer to industry
Launching start-up enterprises through incubators and business development support
Providing a well-educated highly skilled workforce
Developing sustainable growth strategies for urban and rural communities.

Many of New Jersey's municipalites are highly urbanized with numerous stormwater and combined sewer issues. During dry weather, the sewage flows to the wastewater treatment plant with no issues, but during wet weather, the system can become overwhelmed and the combined sewage and stormwater is often discharged untreated to a local waterbody. This event poses a risk to both human health and to the water quality of the receiving waterway. Many municipalities in the state have received grant funding to implement green infrastructure projects such as rain gardens, but continue to implement traditional engineering approaches to stormwater management. The program educates municipal officials, engineers, decision-makers, and others about green infrastructure and to provide support for communities that need technical assistance in the design and installation of those systems for improved stormwater management, reduction of impervious cover, and reduction of stormwater volume entering the sewer system and local receiving waters.

Monmouth County faces several major natural resource and environmental issues related to land use and water supply. These concerns include residential, industrial and open space needs, water quantity/quality for irrigation and recreation, non-point source pollutants, stormwater runoff, healthy food, and drinking water supplies. Over 75% of county streams are rated as moderately to severely impaired by the NJ Department of Environmental Protection. As a result of the work of the County Agricultural Agent, over 300 of his farmer clients have adopted approved practices that build soil fertility, improve water infiltration, re-charge aquifers, provide streamside buffering and/or aid flood control. Soil analysis recommendations that have reduced excessive phosphorus fertilization by 85,000 pounds each year from 2006-2009 and 800,000 pounds total on 2,000 acres from 2010 through 2014. Sixty-five public rain gardens were completed by the end of 2014 and 550 private rain gardens. Over 4 million gallons of rainfall were recaptured to groundwater and aquifers by these small bio-detention basins.

An NJAES Extension Specialist recognized that a myriad of environmental and individualized factors can influence eating behavior and lifestyle choices, tailored intervention strategies that have both an environmental and individual focus can begin to be developed. Additionally, identification of the individual factors and the necessary environmental factors to support the individual change is the first step in the development of indexes for comparisons and benchmarking to support policies and programs for behavior change on college campuses and communities. This project, a collaboration among multiple institutions, uses established research techniques (the PRECEDE-PROCEED model for community-based participatory research) with communities of young adults to: 1) Develop instrument(s) and strategies to assess and evaluate individualized factors associated with eating behavior and health outcomes; 2) Refine and validate environmental assessment instruments for evaluating environmental factors that influence eating behavior and health outcomes; 3) Explore mechanisms of interaction between the identified individualized factors and environmental factors in influencing eating behavior; and 4) Use the findings to develop a Healthy Campus Index that can be used by higher education institutions around the nation to determine the how supportive their campuses are of promoting healthy weight among their students as well as identify areas of strength and areas needing improvement so that campuses can make meaningful changes that better support young adult health.

Childhood obesity continues to be a major challenge in NJ. The Grow Healthy FCHS School Wellness Initiative, a comprehensive wellness partnership with school districts throughout the state has resulted in a corp of volunteer FCHS wellness champions who teach nutrition, lend food and garden clubs, and support Youth Advisory Councils (YAC).

NJAES has an organizational commitment to diversity and meeting the needs of underserved

communities. Major attention is given to youth from urban communities who have lower graduation rates, higher rates of poverty and unemployment, all of which contribute to educational deficiencies. The Rutgers 4-H Samsubg Summer Science Program trains teens to teach activities based on topics they explored throughout a week long Rutgers science experience. This programming addresses the Science Initiative, which is one of the National 4-H Mission Mandates.

Strawberries are a high value crop and can be very profitable for eastern United States farmers. Unfortunately the climate and pest problems of strawberries in the region create challenges for local production. Farmers seek strawberry varieties which are better adapted to the region, are pest resistant, and produce high quality fruit with excellent flavor for local markets. University field research and on-farms trials resulted in plant patents applications for three of the Rutgers NJAES strawberry selections. One of the selections was released for commercial production and named 'Rutgers Scarlet'TM. Two nurseries have requested licensing agreements to begin commercial production of 'Rutgers Scarlet'TM' and have expressed interest in agreements for other selections. One commercial nursery got orders for over 30,000 of the 'Rutgers Scarlet'TM strawberry plants.

NJAES researchers are breeding improved, disease- and pest-resistant woody ornamental plant cultivars of dogwood, hazelnut, holly, and other species that are both attractive and hardy. Hazelnut, in particular, has potential agricultural applications within the eastern United States if varieties that are resistant to eastern filbert blight disease can be developed. NJAES researchers report that a project to fingerprint the NJAES collection of Cornus (dogwood) germplasm with SSR markers is nearing completion, which will help determine genetic relationships between these plants and those available in the trade, and for added intellectual property rights protection. Progress is also reported on optimizing the use of tissue culture techniques as a means to efficiently and effectively propagate new hybrid dogwoods. A patent application was filed in 2014 for a new dogwood variety.

Researchers from the NJAES Center for Turfgrass Studies gather and analyze turfgrass samples from around the United States, as well as from Europe, Africa, and Asia, to identify and evaluate grass germplasm with desirable traits that can be incorporated into our turfgrass breeding program. Some of the newly released perennial ryegrasses with grayleaf spot resistance released in 2014 were Reenvair, Vision and Manhattan 6 perennial ryegrasses. New promising Kentucky bluegrasses hybrids that were released in 2014 were Waterworks, Zinger and Dautless. Continued developments of turf-type tall fescue were being released in 2014 with improved brown patch resistance. Six new ones were Rambler II, Slate, Leonardo, Rockwell, Michelangelo and Reflection tall fescue. In 2014 the new creeping bentgrass released was Cobra II. Over 40 new cultivar and germplasm agreements were executed in 2014 with turfgrass seed organizations. Eighteen new varieties were increased and named in 2014. During 2014, there were 16 U.S. Plant Variety Protection (PVP) Applications made and 17 U.S. PVP certificates were issued. This will directly benefit golf course superintendents, sod farmers, and turfgrass seed companies. The environment and public at large will also benefit from a reduction in chemicals used to maintain quality turf.

New Jersey has the highest veteran unemployment rate in the nation. RCE of Essex County has partnered with the East Orange Veterans Affairs Hospital to expand a job skills program to the Rutgers Veterans Environmental Technology and Solutions Program (Rutgers V.E.T.S.). Veterans are trained in urban agriculture, stormwater management, landscaping, and a fish exchange program. Veterans have engaged in several community enhancement projects and have earned state licenses in fertilizer and pesticide application which enables them to enter agribusiness careers.

Base funding from the State of New Jersey and from USDA-NIFA formula funds provides NJAES with a foundation for program development and delivery, while competitive grants, contracts, and gifts increase the scope and impact of research and education programs. "Other" funding includes restricted and unrestricted gifts, income from sales and service activities, and patent and plant licensing income. County appropriations include salaries paid by counties to Rutgers Cooperative Extension (RCE) faculty and staff. We gratefully acknowledge the personnel, facilities, and other support that each county provides to Rutgers Cooperative Extension. . Increased funding from grants and contracts allowed NJAES to maintain research and extension programs. Grant income is the primary source of support for our nutritional assistance programs, national pesticide testing and pest management services, and continuing

professional education programs for New Jersey's farmers, businesses, and residents. Grant income in FY14 also supported important research and extension initiatives in horticulture and plant pathology, climate change, water quality, and other environmental research as well as basic research into metabolic and other influences on human and animal health and wellbeing.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	156.0	0.0	65.0	0.0
Actual	164.1	0.0	44.6	0.0

II. Merit Review Process

1. The Merit Review Process that was Employed for this year

- Combined External and Internal University External Non-University Panel
- Expert Peer Review

2. Brief Explanation

Peer institutions in the Northeast had an opportunity to review the 2014 Plan of Work update. They are asked to comment on the merit and scientific quality of the plan. In addition to the peer review, both the extension and research committees of the NJ Agricultural Experiment Station Board of Managers serve as internal reviewers.

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged their participation

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey of the general public
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals
- Survey of selected individuals from the general public
- Other (focus group sessions)

Brief explanation.

A variety of methods were utilized to engage our many publics in the program planning and budget process. During 2014 county stakeholder meetings were held throughout the state. The Director and

Associate Director of Extension attended a selected number of these meetings. These meetings serve as an open forum for state residents to identify critical issues and needs. Attendees of stakeholder meetings were representative of the diversity of the state's population. Efforts Are made to ensure that underserved and/or non-traditional groups and individuals were actively engaged. These meetings also engaged strategic collaborative partners in identifying research needs and extension program direction. Input from these meetings was used to identify emerging issues and guide the program and the budget process.

2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys

Brief explanation.

At the county and state levels faculty and staff engage partners and potential clientele in a variety of processes to collect input. Individuals who participate in these processes are those who serve on advisory boards, special research and extension committees, leaders of commodity groups, partners who participate on government and service related boards, and individuals who participate in programs. Opportunities to participate in the process of gathering input are widely publicized through newsletters, websites, mass media and word of mouth. Engagement of input from groups and individuals who are underrepresented is proactively done to ensure that extension programs and research initiatives are relevant, responsive and address the diverse needs of our many publics.

2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Survey of the general public
- Meeting specifically with non-traditional groups
- Survey specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Survey specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public

Brief explanation.

Through our county stakeholder meetings individuals participate in open forums where current issues and concerns which impact the county are identified. Stakeholders are active participants in strategic planning processes conducted to identify priority needs which guide research and extension programming. Surveys sent to a variety of different audiences are also utilized to gather data. Extension Specialists engage stakeholders, collaborators, commodity groups, public, private and government officials to identify research needs both applied and basic. Stakeholder meetings and other processes result in the identification of priority needs on the local and state levels that could benefit from Cooperative Extension programs and or Cooperative Research solutions. Our partners in the educational process are key to helping faculty and staff identify effective methods for providing the research-based information which is the core of the land grant mission of transformational education that impacts individuals, communities, the environment and the quality of life of all.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities

Brief explanation.

NJAES truly values the input of our stakeholders. We have created welcoming environments where stakeholders feel comfortable and trust what is shared will be carefully considered and as policies are set, programs are developed, research direction is set and budget priorities are identified. Stakeholders are critical partners, and their input is necessary to ensure that the work we engage in is relevant and responsive. The Research and Extension Committees of the NJAES Board of Managers are stakeholders who are actively engaged in the process of providing input on an ongoing basis throughout the year. They attend regular meetings with the Extension and Research Directors to share their knowledge of their local county or special interest areas they represent. They are true
representatives of the diversity of research and extension that NJAES extends to the residents of NJ and beyond. Not only do they provide invaluable feedback on issues they also function in supportive roles as advocates for our research initiatives and extension educational outreach.

Brief Explanation of what you learned from your Stakeholders

Stakeholders were very vocal about the need to fill production agriculture vacancies.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
2717636	0	3392411	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	2661188	0	3523459	0
Actual Matching	13417077	0	12642809	0
Actual All Other	2511280	0	8119543	0
Total Actual Expended	18589545	0	24285811	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	0	0	0

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Climate Change - Water Quality & Quantity

☑ 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
102	Soil, Plant, Water, Nutrient Relationships	10%		10%	
111	Conservation and Efficient Use of Water	20%		20%	
112	Watershed Protection and Management	40%		40%	
133	Pollution Prevention and Mitigation	20%		20%	
605	Natural Resource and Environmental Economics	10%		10%	
	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	15.0	0.0	4.0	0.0
Actual Paid	10.3	0.0	3.6	0.0
Actual Volunteer	185.0	0.0	1.0	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**
156974	0	249638	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
913479	0	929801	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
152900	0	166735	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

• Work with municipalities to help them meet their regulatory responsibilities on stormwater management and watershed restoration
• Perform experiments to investigate what the current nutrient loads are in NJ water
• Determine the best methodologies for developing Total Maximum Daily Load (TMDL) values for NJ waterways
• Examine the effectiveness of alternative onsite wastewater treatment systems
• Provide scientifically sound advice to state regulatory bodies on water quality issues
• Math modeling of contamination transport in surface and groundwaters
• Create a program comprising of faculty, staff, volunteers, industry partners and government officials

2. Brief description of the target audience

• Municipalities
• State Department of Environmental Protection
• Staff and students who gain valuable scientific experience
• Industry partners who learn ways to meet water quality standards
• Communities who learn watershed restoration methods
• NJAES Faculty and Staff involved in water research/outreach
• School age youth
• Residents

3. How was eXtension used?

eXtension was used in this program through participation in the animal waste CoP. Faculty answered ask the expert questions, developed collaborative educational products and provided leadership to the CoP.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1506	3000	96	0

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	6	22	28

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- A variety of strategies will be implemented to reach target audiences. This will include and not be limited to workshops, field visits, classes, newsletters, media releases, electronic communications,and publications.In addition a trained volunteer teaching base will be developed. Quantitative reports of participation will be collected.

Year	Actual
2014	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Short term - Knowledge of nutrient loads in various NJ waterways. Find the best methodologies for determining TDMLs
2	Medium term - To identify representative pollutants and aquifer systems in New Jersey. To develop equilibrium isotherms to quantify the adsorption/desorption kinetics for the pollutant/soil/water systems. To develop breakthrough and leaching data for the pollutant/soil/water systems.
3	Long Term - A safe and secure water supply for all communities and industries in the state. An effective and efficient nutrient-trading program that meets the needs of industry and meets the standards set by the state regulatory bodies.
4	Transformations and Bioavailability of Mercury in Aquatic Ecosystems - Medium term - To identify representative pollutants and aquifer systems in New Jersey. To develop equilibrium isotherms to quantify the adsorption/desorption kinetics for the pollutant/soil/water systems. To develop breakthrough and leaching data for the pollutant/soil/water systems.
5	Green Infrastructure for Municipal Officials - Medium term - To identify representative pollutants and aquifer systems in New Jersey. To develop equilibrium isotherms to quantify the adsorption/desorption kinetics for the pollutant/soil/water systems. To develop breakthrough and leaching data for the pollutant/soil/water systems.
6	Biodegradation of Petroleum Contaminants in Groundwater Aquifers - Long Term - A safe and secure water supply for all communities and industries in the state. An effective and efficient nutrient-trading program that meets the needs of industry and meets the standards set by the state regulatory bodies.
7	Climate Change and Atmospheric Forcing of Water Quality Changes in the Mullica River-Great Bay Estuary, NJ - Long Term - A safe and secure water supply for all communities and industries in the state. An effective and efficient nutrient-trading program that meets the needs of industry and meets the standards set by the state regulatory bodies.
8	Natural Resources Management - Long Term - A safe and secure water supply for all communities and industries in the state. An effective and efficient nutrient-trading program that meets the needs of industry and meets the standards set by the state regulatory bodies.
9	Community Based Stormwater Education - Long Term - A safe and secure water supply for all communities and industries in the state. An effective and efficient nutrient-trading program that meets the needs of industry and meets the standards set by the state regulatory bodies.
10	Earth-Wise Lawn and Landscape Care Educational Program - Long Term - A safe and secure water supply for all communities and industries in the state. An effective and efficient nutrient-trading program that meets the needs of industry and meets the standards set by the state regulatory bodies.
11	Cluster Rain Garden Program - Long Term - A safe and secure water supply for all communities and industries in the state. An effective and efficient nutrient-trading program that meets the needs of industry and meets the standards set by the state regulatory bodies.

Outcome #1

1. Outcome Measures

Short term - Knowledge of nutrient loads in various NJ waterways. Find the best methodologies for determining TDMLs

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Medium term - To identify representative pollutants and aquifer systems in New Jersey. To develop equilibrium isotherms to quantify the adsorption/desorption kinetics for the pollutant/soil/water systems. To develop breakthrough and leaching data for the pollutant/soil/water systems.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Microbially Mediated Dehalogenation of Organohalide Contaminants in Anaerobic Environments

Halogenated organic compounds constitute one of the largest groups of environmental pollutants. These toxic, bioaccumulating pollutants include legacy industrial chemicals, such as polychlorinated biphenyls (PCBs), ubiquitous polychlorinated dibenzo-p- dioxins and polychlorinated dibenzofurans (PCDD/Fs) which continually enter the environment via anthropogenic and natural inputs, as well as current commercial manufacturing chemicals including the brominated flame retardants (BFRs). These pollutants are problematic due to their recalcitrance and toxicity, and furthermore, are often present as complex mixtures. Remediation of soils and sediments contaminated with these toxic chemicals continues to be a major challenge.

What has been done
An NJAES researcher is using laboratory studies of contaminated river sediments to identify the microbial communities and processes responsible for anaerobic reductive dehalogenation of

organohalide compounds, including brominated flame retardants, polychlorinated dibenzo-p-dioxins, polychlorinated biphenyls and diverse pesticides.

Results
Results from micro- and mesocosm experiments using contaminated sediments (e.g., Anacostia River MD, Hackensack River NJ and Kymijoki River Finland) have revealed diverse communities of dehalogenating microorganisms. Although Dehalococcoides species are the most likely candidates for PCDD/F and PCB dechlorination, there are other Chloroflexi microorganisms that have been shown to be active in dechlorination. The addition of halogenated co-amendments might be one tool to enhance dechlorination of PCBs and PCDD/Fs in historically contaminated sediments.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
605	Natural Resource and Environmental Economics

Outcome #3

1. Outcome Measures

Long Term - A safe and secure water supply for all communities and industries in the state. An effective and efficient nutrient-trading program that meets the needs of industry and meets the standards set by the state regulatory bodies.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Water Allocation

All producers who irrigate crops must complete paper work to register their irrigation intakes and establish a water use allocation deemed acceptable by the New Jersey Department of Environmental Protection (NJ DEP). Those who irrigate less than 3.1 million gallons a month (MGM) are required to apply for an agricultural water use registration whereas those who irrigate above 3.1 MGM must apply for an agricultural water use certification. Once approved, this permit is effective for a five year period and annual water use form must be submitted to NJ DEP by February 28 of the year following the one when the water was utilized.

What has been done

Producers who irrigate and need to establish and/or maintain an agricultural water use registration or certification must obtain documentation as well as approval from the county agricultural agent. One-on-one assistance with filling out the application is provided when needed since the paperwork can prove to be overwhelming to producers. Assistance can be anything from helping calculate water use, to creating maps or diversion sources, to helping interpret unclear language on the application forms.

Results

With permits numbered up to SA0217, the rules of NJ DEP regarding water use and allocation effects a majority of the farming operations in Salem County. Since Salem County is one of the largest agricultural counties in the state, outreach to the farmers who utilize irrigation in their operation about water allocation has been a priority for the Salem County Extension office. In November of 2014, a one day workshop was held with representatives from NJ DEP, Division of Water Supply and Salem County Extension personnel where appointments were established and Salem County farmers with Agricultural Water Usage permits were able to renew and/or modify their permits. These workshops were very effective, having the participation of about twelve producers resulting in the renewal and/or modifications of nearly forty Agricultural Water Usage permits. Beyond the updating of the permits, the interaction between extension personnel, NJ DEP representatives and agricultural producers helped establish understanding and a positive relationship between all parties involved. Overall, in 2014, sixty-four total permits were processed for Salem County. Four Salem County farmers were approved for new agricultural water use certifications, forty-nine farmers were approved for permit renewals, and eleven farmers had modifications (both major and minor combined) processed on their agricultural water use certifications. Due to the result of DEP studies in watersheds within Salem County, much of the county has been deemed a critical area for water use. In a deemed critical area, any producer applying for water use rights from the NJDEP Bureau of Water Supply will be limited to receiving an agricultural water use registration (less than 3.1 MGM) regardless of the size of the operation or crop water needs. Producers who own Farmland Preserved properties where no water use rights have been established and want to receive an agricultural water use certification are limited to an agricultural water use registration as well. Assisting in obtaining and maintaining agricultural water use certifications and registrations has proven to bring great relief to producers who irrigate and who may be intimidated by the formal process of application.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
605	Natural Resource and Environmental Economics

Outcome #4

1. Outcome Measures

Transformations and Bioavailability of Mercury in Aquatic Ecosystems - Medium term - To identify representative pollutants and aquifer systems in New Jersey. To develop equilibrium isotherms to quantify the adsorption/desorption kinetics for the pollutant/soil/water systems. To develop breakthrough and leaching data for the pollutant/soil/water systems.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Transformations and Bioavailability of Mercury in Aquatic Ecosystems

Mercury is a potentially serious public health concern due to its accumulation in aquatic and terrestrial food chains. The consumption of marine and freshwater fish containing elevated concentrations of mercury by women of child-bearing age has been linked to adverse health outcomes for their children. Recent research results point to a need for greater understanding of the bioaccumulation of mercury at the base of aquatic food webs and the mercury isotopic fractionation associated with mercury transformations in aquatic environments.

What has been done
NJAES researchers are examining the biological and abiotic mechanisms that lead to the mobilization, transformation, and bioaccumulation of mercury in subsurface, estuarine, and marine environments. Understanding the fate of mercury in some of the most densely populated states in the U.S. will link process studies focused on biological cycling, speciation, and bioaccumulation to environmental management of the nation's aquatic natural resources. Through collaborations with microbiologists, geochemists, and marine ecologists, the bioavailability of methylated mercury in aquatic food webs, the effects of environmental factors during photochemical reductions of Hg (II) and MeHg in aquatic systems we examined these areas through the field work and laboratory experimentation.

Results
Ongoing research examined the photochemical reduction of mercury inside marine phytoplankton cells, the mercury isotopic composition of methylmercury in estuarine sediments, mercury isotopic

fractionation during microbiologically-catalyzed mercury methylation, mercury concentrations in Antarctic krill, and the physiology and biochemistry of inorganic carbon acquisition in marine diatoms. Results include the following findings:
Photochemical reduction of intracellular mercury in marine phytoplankton is an important pathway of mercury reduction in coastal waters. A method for the separation of methylmercury from estuarine sediments for mercury isotope analysis was developed and tested. The mercury isotope signature of methylmercury from estuarine sediments indicated that there is spatial and temporal variation in the extents of methylmercury recycling through demethylation. The mercury isotope fractionation factor associated with mercury methylation by the ubiquitous iron-reducing anaerobe Geobacter sulfurreducens was determined. Dissolved elemental mercury concentrations in surface waters along the West Antarctic Peninsula increased with proximity to the shore. Along the West Antarctic Peninsula, concentrations of methylmercury were higher in juvenile krill, which undergo development near shore and feed on sea-ice algae during overwintering, compared to concentrations found in adult krill. Pyruvate carboxylase (PYC) from the marine diatom T. pseudonana was shown to be able to catalyze the decarboxylation of oxaloacetate in vitro. In addition, activities of PYC in T. pseudonana were suppressed in cultures acclimated to high CO2. This chloroplastic enzyme may therefore help diatoms fix inorganic carbon in the ocean as part of a biochemical carbon concentrating mechanism.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
605	Natural Resource and Environmental Economics

Outcome #5

1. Outcome Measures

Green Infrastructure for Municipal Officials - Medium term - To identify representative pollutants and aquifer systems in New Jersey. To develop equilibrium isotherms to quantify the adsorption/desorption kinetics for the pollutant/soil/water systems. To develop breakthrough and leaching data for the pollutant/soil/water systems.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual

2014 0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Green Infrastructure for Municipal Officials

Many of New Jersey?s municipalites are highly urbanized with numerous stormwater and combined sewer issues. During dry weather, the sewage flows to the wastewater treatment plant with no issues, but during wet weather, the system can become overwhelmed and the combined sewage and stormwater is often discharged untreated to a local waterbody. This event poses a risk to both human health and to the water quality of the receiving waterway.

What has been done
Green infrastructure is an approach to wet weather management that infiltrates, evapotranspires, captures and reuses stormwater to maintain or restore natural hydrologies within a watershed (www.epa.gov/greeninfrastructure). Many municipalities in the state have received grant funding to implement green infrastructure projects such as rain gardens, but continue to implement traditional engineering approaches to stormwater management. The program educates municipal officials, engineers, decision-makers, and others about green infrastructure and to provide support for communities that need technical assistance in the design and installation of those systems for improved stormwater management, reduction of impervious cover, and reduction of stormwater volume entering the sewer system and local receiving waters. Seminars and workshops have been given in 2014 with programs in Newark, Haworth, Toms River, and Paterson.

Results
Passaic County recently committed to a Green Streets Initiative that includes permeable pavement and is out to bid for rain gardens, rainwater harvesting, and permeable pavement systems for 2 locations in Paterson (Grand St. and Haledon Ave.). Passaic County has also expressed interest in partnering with RCE to create a GI best management practices manual for the County.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
605	Natural Resource and Environmental Economics

Outcome #6

1. Outcome Measures

Biodegradation of Petroleum Contaminants in Groundwater Aquifers - Long Term - A safe and secure water supply for all communities and industries in the state. An effective and efficient nutrient-trading program that meets the needs of industry and meets the standards set by the state regulatory bodies.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Biodegradation of Petroleum Contaminants in Groundwater Aquifers

Water quality for human, agricultural and environmental uses can be impacted by contaminants from many different sources. Groundwater is a critical resource needed for drinking water, irrigation and environmental sustainability and is being overexploited and undervalued. In New Jersey it provides almost 50% of the water supply of the state. One of the major concerns for groundwater quality is contamination by organic solvents and petroleum components. These come from leaking underground storage tanks found under gas stations and industrial areas, legal and illegal waste disposal as well as non-point and point source contamination.

What has been done
By advancing the research in biodegradation, NJAES researcher can expand our understanding of the microorganisms, their physiology, genetics and the biochemical mechanisms of degradation for many organic compounds of interest (including benzene, toluene, xylenes, naphthalene, phenanthrene, other polycyclic aromatic hydrocarbons and alkanes). We studied the biodegradation by naturally occurring microorganisms of these compounds under the conditions likely to occur in groundwater. More than just serving as a treatment option, knowledge about the biodegradation of these compounds also provides insight into the natural attenuation processes that these microbes can carry out in situ. The overall goal of the work is to understand the microbial processes involved in the metabolism of monocyclic, bicyclic, polycyclic aromatic hydrocarbons (PAH) and alkanes in the absence of oxygen.

Results

Our investigations have shown that the anaerobic biodegradation of petroleum components can occur naturally in anoxic groundwaters in NJ. These processes are not rapid, but are specifically identifiable as taking place anaerobically through the identification of specific and unique metabolites of the degradation pathway. Furthermore, specific genes known to be responsible for anaerobic activation and degradation of petroleum components are also a key identification mechanism unique to anoxic habitats. In previous studies we demonstrated that at a NJ MGP contaminated ground water site, natural attenuation was demonstrated by the presence of specific hydrocarbon metabolites produced by specific hydrocarbon degrading anaerobes. Since these compounds are unique and cannot be produced by other means, it provides strong evidence for natural attenuation of the contamination taking place over time. The concentrations also decrease with distance from the source, further supporting the natural attenuation process. In this current project we were able to gain access to the same site 9 years later to examine changes in conditions over this time period. Furthermore, we now have biomolecular tools that can be used to detect and measure the specific genes that are responsible for the attack on the hydrocarbon molecule during its degradation under anaerobic conditions. By measuring the metabolic biomarker and also the genetic biomarker the site conditions can be comprehensively described. The observations show that both the biomolecular and the chemical metabolite data support each other give stronger support and further credence to natural attenuation taking place in the subsurface. These data support the ongoing discussion on using natural attenuation as a means of groundwater cleanup. With this knowledge we can better manage, treat and clean up our valuable groundwater resources. On a national level 40% of the water supply comes from groundwater with agriculture using most of it, and in NJ more than 300,000 wells provide water to more than 4.3 million residents (USGS 2007). As the population of the state grows, maintaining a safe and reliable water supply for state residents, for agriculture and the environment is vital to the welfare and security of the State. With knowledge gained from this work, we provide improved remediation tools for State and local water quality officials.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
605	Natural Resource and Environmental Economics

Outcome #7

1. Outcome Measures

Climate Change and Atmospheric Forcing of Water Quality Changes in the Mullica River-Great Bay Estuary, NJ - Long Term - A safe and secure water supply for all communities and industries in the state. An effective and efficient nutrient-trading program that meets the needs of industry and meets the standards set by the state regulatory bodies.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Climate Change and Atmospheric Forcing of Water Quality Changes in the Mullica River-Great Bay Estuary, NJ

The Mullica River-Great Bay Estuary is the most pristine estuarine system in New Jersey. Water quality in this estuary has historically been excellent, and therefore it can serve as an ideal reference for assessing human impacts on other shallow coastal bays in New Jersey and elsewhere. Changes in the frequency and intensity of storms and droughts influence hydrologic and water quality conditions in the estuary that can significantly affect biotic communities and habitats. Collection of spatial and temporal data from this estuary with respect to meteorological forcing factors will be useful to resource managers tasked with making critical decisions involving the condition of New Jersey's coastal waterbodies, habitats, and commercial and recreational fisheries.

What has been done
An NJAES researcher oversees a data collection of water quality and meteorological measurements consistently in the Mullica River-Great Bay Estuary over the study period from October 1, 2013 through September 30, 2014. A series of water quality parameters (temperature, salinity, DO concentration, DO percent saturation, pH, and water depth) are recorded continuously (every 15 minutes) at four long-term sampling stations (i.e., Lower Bank, Chestnut Neck, Buoy 139, and Buoy 126) along the Mullica River-Great Bay estuarine gradient using an integrated system of moored, automated YSI 6-series data loggers. On a monthly basis, nutrients (nitrogen and phosphorus) are monitored by collecting discrete water samples at these four stations and analyzing them for nitrogen and phosphorus concentrations along the estuarine salinity gradient. In addition, one day a month, nitrogen and phosphorus concentrations are determined every two hours over a 24-hour period via an ISCO sampler deployed at Buoy 126. A Campbell weather station located at the Richard Stockton College Marine Field Station on the Mullica River concurrently provides continuous recordings of wind speed, direction and velocity, solar radiation, barometric pressure, and humidity in the area to correlate with water quality parameters collected at the moored estuarine sampling sites. Precipitation measurements are obtained at the U.S. Weather Bureau Station in nearby Atlantic City. Two of the water-quality monitoring platforms (Chestnut Neck and Buoy 126) are equipped with telemetry capability that broadcast the water quality data collected at both stations to a GOES satellite, which will post the data on the World-Wide Web in near real-time for public use.

Results

These data are being used to assess the temporal and spatial trends of physicochemical conditions in the estuarine system and to document relationships between meteorological conditions (e.g., precipitation, temperature flux, storms and extreme events) and water quality in estuarine waters (dissolved oxygen, nutrients, etc.). The data are also useful for the analysis and assessment of habitat conditions and habitat utilization by commercial and recreational fish species and other organisms in the estuary. The data collected in this project therefore will have value not only to these investigators but also to recreational and commercial fishermen who utilize these waters. Resource management programs in estuarine and marine waters of the region will also benefit since these data can be useful in the development of new strategies to sustain biotic resources. Environmental monitoring employed in this project is part of the Life on the Edge Exhibit of the Tuckerton Seaport, a venue visited by more than 10,000 people each year. There are many education and outreach programs, websites, workshops, conferences, ecological tours, and other events which serve as vehicles for the dissemination of project results to millions of potential project users in New Jersey and nationwide. The data are also accessible for use by people in other countries.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
605	Natural Resource and Environmental Economics

Outcome #8

1. Outcome Measures

Natural Resources Management - Long Term - A safe and secure water supply for all communities and industries in the state. An effective and efficient nutrient-trading program that meets the needs of industry and meets the standards set by the state regulatory bodies.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Natural Resources Management

Monmouth County faces several major natural resource and environmental issues related to land use and water supply. These concerns include residential, industrial and open space needs, water quantity/quality for irrigation and recreation, non-point source pollutants, stormwater runoff, healthy food, and drinking water supplies. Over 75% of county streams are rated as moderately to severely impaired by the NJ Department of Environmental Protection. Monmouth is unique within the state in having the headwaters of six watersheds originate within its boundaries. These important watersheds draw their water from lands used by rural and suburban populations, farms, golf courses, parks, state forests, light industry, commercial fisherman, commercial boaters and recreational activities. The Jersey Shore of Monmouth County is a major destination site. Important beaches, rivers and lakes for residents and tourists are frequently closed due to pollution that prevents swimming, fishing, clamming, crabbing and other recreational and commercial activities. Climate change has created extreme weather patterns such that storm damage and rainfall events are much more of a hazardous problem- fooding, saltwater intrusion and stormwater pollution coastal areas is an ever increasing threat. These economic impediments threaten a one hundred million dollar revenue stream of the county economy and over 1 billion dollars of the entire coastline economy.

What has been done
A two book final report was prepared by the Wreck Pond technical working group. This 200-page document included a two-year agricultural characterization of the Wreck Pond watershed conducted by Rutgers Cooperative Extension of Monmouth County which was summarized at 7 municipal and county meetings. This report was utilized in 2011-2014 by the U.S. Army Corps of response to a need for East Coast farmers to remain economically viable, a U.S. Department of Engineers to begin their remediation planning and estimated resource investment. 2. 76 stormwater and rain garden seminars, 12 town meetings and 18 community sessions were provided for municipal officials, landscapers, environmental organizations, home owners and the general public from 2007 to 2014.

Results
RCE has effectively engaged and assisted the key target audiences - a diversity of natural resource interests and organizations. Over 300 of his farmer clients have adopted approved practices that build soil fertility, improve water infiltration, re-charge aquifers, provide streamside buffering and/or aid flood control. The Agent has provided soil analysis recommendations that have reduced excessive phosphorus fertilization by 85,000 pounds each year from 2006-2009 and 800,000 pounds total on 2000 acres from 2010 through 2014. Sixty-five public rain gardens were completed by the end of 2014 and 550 private rain gardens. Over 4 million gallons of rainfall were recaptured to groundwater and aquifers by these small bio-detention basins.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

605 Natural Resource and Environmental Economics

Outcome #9

1. Outcome Measures

Community Based Stormwater Education - Long Term - A safe and secure water supply for all communities and industries in the state. An effective and efficient nutrient-trading program that meets the needs of industry and meets the standards set by the state regulatory bodies.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Community Based Stormwater Education

Due to the dense population and intense development within New Jersey, stakeholders face many problems with water quantity and quality issues as well as groundwater recharge.

What has been done
The Community Based Stormwater Education and Outreach Program I?ve educated community members, citizens, schools, churches, municipal centers (including Department of Public works), and developers, on watershed management and conservation in order to implement best management practices for sustainable communities. Community outreach was increased through training and joint efforts with Master Gardeners, Cooperative Extension 4H volunteers , AmeriCorps Watershed Ambassadors and AmeriCorps Transitional Education and Employment Management Gateway Volunteers.

Results
This program is continually under evaluation through the rain water harvesting follow-up online survey. This survey will evaluate the utilization of rain barrels for water conservation by the attendees following training. To date, of the survey responders, 82% have installed their rain barrels at home and 24 % have installed additional barrels; 94% reported no difficulty installing the rain barrel; 19% have implemented additional stormwater runoff conservation practices; and 59% have adopted additional water conservation mechanisms following the training. Input will also be used to structure future workshops. Has participating in a rain barrel workshop made you

more interested in other environmental actions? ?Native plants 55% ?Composting 68% ?Reduce energy use 55% ?Recycle more 55% ?Driving less 30% Detention Basin Management, Maintenance and Enhancement Program Cherry Hill Public Works supervisor estimates that the five basins that have been naturalized in his area, has reduced maintenance costs by $20,000 annually. Based the success of reduce maintenance within the stormwater basins, the DPW has started implementing "no-mow" zones on other Township properties. Watershed Restoration for Healthy Ecosystems Use of the installed aeration system at Hopkins Pond, severely reduce the occurrence of cyanobacteria blooms during the first summer of operation. Oxygen levels were within 0.25ppm from surface to bottom (14 feet deep), demonstrating that the system is circulating water properly. There was no fish kill during 2014.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
605	Natural Resource and Environmental Economics

Outcome #10

1. Outcome Measures

Earth-Wise Lawn and Landscape Care Educational Program - Long Term - A safe and secure water supply for all communities and industries in the state. An effective and efficient nutrient-trading program that meets the needs of industry and meets the standards set by the state regulatory bodies.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Earth-Wise Lawn and Landscape Care Educational Program

Maintaining a healthy lawn and landscape while reducing the unnecessary use of pesticides, fertilizers and water is essential to the preservation of the environment.

What has been done
Master Gardeners and landscapers throughout the sate are provided with 2 to 3 hours of training. Students make a commitment to make positive behavioral changes to reduce unnecessary pesticide, fertilizer and water use. Also students learn how to properly manage landscape plants to insure health.

Results
90% of 275 students have made commitments to reduce their unnecessary use of pesticides, fertilizers and water use. Students have committed to recycle grass clippings to the lawn and utilize clovers to add Nitrogen back to the lawn. A total of 75 acres of lawns are now being managed using principles outlined in this program. Nitrogen inputs reduced by over 3,000 pounds to local landscapes. Over 22 million gallons of water via irrigation is reduced to theses landscapes. Over 40,000 pounds of grass clippings are recycled onto lawns and do not end up clogging landfills.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
605	Natural Resource and Environmental Economics

Outcome #11

1. Outcome Measures

Cluster Rain Garden Program - Long Term - A safe and secure water supply for all communities and industries in the state. An effective and efficient nutrient-trading program that meets the needs of industry and meets the standards set by the state regulatory bodies.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Cluster Rain Garden Program

Stormwater runoff is a significant issue in the Troy Brook watershed in Morris County. A Stormwater Management Plan has been developed by Rutgers Water Resources Program that identified a specific neighborhood, the Hills of Troy neighborhood, as an area that both contributed to, and suffered from increased flooding and water quality impairments due to increased impervious surfaces in the watershed.

What has been done
Partnerships developed with the President of the Homeowner's Association of the Hills of Troy neighborhood were utilized to assist with outreach regarding the 2014 initiative along with mailed flyers. The goal was to double the number of rain gardens in the neighborhood to 10 rain gardens. Each homeowner attended a design studio with an engineer and landscape architect to help design their own rain garden. Each resident who received a rain garden received a calendar with pictures of Hills of Troy rain gardens for each month and a note reminding them of maintenance along with an individual maintenance manual.

Results
12 additional rain gardens have been installed with at least three more scheduled for the spring of 2015, bringing the total to 20 rain gardens. This will achieve 10% of the home in the Hills of Troy neighborhood have their roof and/or driveway runoff disconnected by a rain garden. This achieves a reduction of 354,747 gallons of stormwater annually and 15,320 square feet of impervious surfaces disconnected.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
605	Natural Resource and Environmental Economics

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

External factors did not affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

NJAES research and extension outcomes related to this planned program were evaluated utilizing a variety of evaluation methods appropriate for each initiative to determine effectiveness on both a qualitative and quantitative level. For KASA and practice change we included the measurement of knowledge gained as measured by pre/post Likert-scale assessments. Surveys were used to measure increase in skills acquired, behavior change and practice adoption. For process evaluation we focused on program delivery, participation, relevance and timeliness. Data was collected at appropriate times for each initiative that supports this planned program. IRB approved evaluation instruments were used to collect research and extension data. Data analyses and comparisons relevant to basic and applied research and demonstration were collected and analyzed and reported utilizing a variety of data collection methods appropriate to each research question. The major goal of evaluating is the demonstration of social, economic, behavior and environmental changes in conditions that contribute to improved quality of life as a result of participation in programs and benefits of research solutions. See state defined outcomes for detailed results of each initiative.

Key Items of Evaluation

None to report.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Childhood Obesity - Youth/Adult Obesity

☑ 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
701	Nutrient Composition of Food	10%		10%	
702	Requirements and Function of Nutrients and Other Food Components	10%		10%	
703	Nutrition Education and Behavior	25%		25%	
704	Nutrition and Hunger in the Population	15%		15%	
724	Healthy Lifestyle	40%		40%	
	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	6.0	0.0	5.0	0.0
Actual Paid	26.0	0.0	8.0	0.0
Actual Volunteer	391.0	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**
452066	0	487455	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1546254	0	2265668	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
546400	0	1742208	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

• To identify the factors that promote excessive weight gain as well as protect against childhood obesity
• Measure how children born small for age are different with respect to body composition and risk for diabetes prior to developing diabetes or obesity.
• Investigate how perilipin A works in adipocytes to control fat storage and fat breakdown.
• Collect and analyze data on obesity-related measures (i.e., BMI) in adults and children
• Examine how weight loss affects calcium absorption and bone mass
• Create a multidisciplinary program comprising of faculty, staff, the medical community, industry partners and government officials
• Conduct adult/youth education and deliver targeted messages on healthy food choices and increased physical activity education using the following strategies:

Direct Methods:
• Educate Youth
• Educate Parents
• Educate Volunteers
• Food and Fitness Ambassadors
• Educate Child Health Summit Professionals
• Educate Teachers/School Nurses
• Educate Communities

Indirect Methods:
• Website
• Social Marketing

2. Brief description of the target audience

• Clinicians, Physicians and Nurses
• Health Care Professionals
• Hospitals (including teaching hospitals)
• Staff and students who gain valuable scientific experience
• Industry partners that benefit from fundamental and applied research in obesity and related chronic diseases
• Communities that benefit from increased knowledge about the mechanisms involved in obesity
• Other faculty and staff working on similar research
• Health-related organizations and foundations interested in obesity/nutrition issues
• School Age Youth
• Teens
• Teachers
• After School Providers
• Parents
• Volunteers
• Extension Professionals
• State and County Agencies and Organizations
• Schools

3. How was eXtension used?

RCE faculty used the following CoPs: Family Food and Fitness; Evaluation; Creating Healthy Communities; Healthy Food Choice in Schools;Community Nutririton Education; Diabetes and the Learning Network. Faculty answered ask the expert questions, developed collaborative educational products,conducted learn professional development sessions and provided leadership to CoPs.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	11167	29588	33500	0

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	7	47	54

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- A variety of strategies will be implemented to reach target audiences. This will include and not be limited to workshops, field visits, classes, newsletters, media releases, electronic communications,publications. In addition a trained volunteer teaching base will be developed. Quantitative reports of participation will be collected

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Short Term - Individuals gain awareness, knowledge, skills related to: Attitudes about healthy eating for adults/youth. Healthy food choices for adults/youth. Selection of healthy foods for adults/youth. Benefits of physical activity (reduced overweight and obesity, reduced risk of diabetes, heart disease and cancer.) Physical activity recommendations for health for adults/youth. Identify factors that promote excessive weight gain and protect against childhood obesity. Understand the molecular mechanisms of lipid transport in the intestinal cell. Demonstrate the affects on calcium absorbtion and bone mass by weight loss
2	Medium Term - Individuals incorporate skills/change behaviors related to: Increased adoption of healthy food practices. Increased consumption of fruits, vegetables, whole grains and low-fat dairy. Increased participation in family meals. Increased participation in physical activity. Increased participation in family-related physical activity. Increased use of new 'campaign' website. Improved understanding of the relationship between early nutrition and later risk for chronic disease. Understanding the process by which perilipins at the surface of lipid droplets control how much energy is released from the adipocyte at times of need. Understanding how the intestines and body uptake and process dairy fat. Identify genes, their protein product and how the proteins influence the way the body processes fat.
3	Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.
4	Taste Genetics, Obesity and Weight Loss - Medium Term - Individuals incorporate skills/change behaviors related to: Increased adoption of healthy food practices. Increased consumption of fruits, vegetables, whole grains and low-fat dairy. Increased participation in family meals. Increased participation in physical activity. Increased participation in family-related physical activity. Increased use of new 'campaign' website. Improved understanding of the relationship between early nutrition and later risk for chronic disease. Understanding the process by which perilipins at the surface of lipid droplets control how much energy is released from the adipocyte at times of need. Understanding how the intestines and body uptake and process dairy fat. Identify genes, their protein product and how the proteins influence the way the body processes fat.
5	Evaluation and Characterization of Novel Botanical Extracts for the Prevention and Treatment of Metabolic Syndrome and Diabetes - Medium Term - Individuals incorporate skills/change behaviors related to: Increased adoption of healthy food practices. Increased consumption of fruits, vegetables, whole grains and low-fat dairy. Increased participation in family meals. Increased participation in physical activity. Increased participation in family-related physical activity. Increased use of new 'campaign' website. Improved understanding of the relationship between early nutrition and later risk for chronic disease. Understanding the process by which perilipins at the surface of lipid droplets control how much energy is released from the adipocyte at times of need. Understanding how the intestines and body uptake and process dairy fat. Identify genes, their protein product and how the proteins influence the way the body processes fat.
6	Changing the Health Trajectory for Older Adults through Effective Diet and Activity Modifications - Medium Term - Individuals incorporate skills/change behaviors related to: Increased adoption of healthy food practices. Increased consumption of fruits, vegetables,

	whole grains and low-fat dairy. Increased participation in family meals. Increased participation in physical activity. Increased participation in family-related physical activity. Increased use of new 'campaign' website. Improved understanding of the relationship between early nutrition and later risk for chronic disease. Understanding the process by which perilipins at the surface of lipid droplets control how much energy is released from the adipocyte at times of need. Understanding how the intestines and body uptake and process dairy fat. Identify genes, their protein product and how the proteins influence the way the body processes fat.
7	Creation of Meals on Wheels Emergency Plan - Medium Term - Individuals incorporate skills/change behaviors related to: Increased adoption of healthy food practices. Increased consumption of fruits, vegetables, whole grains and low-fat dairy. Increased participation in family meals. Increased participation in physical activity. Increased participation in family-related physical activity. Increased use of new 'campaign' website. Improved understanding of the relationship between early nutrition and later risk for chronic disease. Understanding the process by which perilipins at the surface of lipid droplets control how much energy is released from the adipocyte at times of need. Understanding how the intestines and body uptake and process dairy fat. Identify genes, their protein product and how the proteins influence the way the body processes fat.
8	Kids in the Kitchen 4-H Summer Enrichment Program - Medium Term - Individuals incorporate skills/change behaviors related to: Increased adoption of healthy food practices. Increased consumption of fruits, vegetables, whole grains and low-fat dairy. Increased participation in family meals. Increased participation in physical activity. Increased participation in family-related physical activity. Increased use of new 'campaign' website. Improved understanding of the relationship between early nutrition and later risk for chronic disease. Understanding the process by which perilipins at the surface of lipid droplets control how much energy is released from the adipocyte at times of need. Understanding how the intestines and body uptake and process dairy fat. Identify genes, their protein product and how the proteins influence the way the body processes fat.
9	Lowering Sodium in Your Diet - Medium Term - Individuals incorporate skills/change behaviors related to: Increased adoption of healthy food practices. Increased consumption of fruits, vegetables, whole grains and low-fat dairy. Increased participation in family meals. Increased participation in physical activity. Increased participation in family-related physical activity. Increased use of new 'campaign' website. Improved understanding of the relationship between early nutrition and later risk for chronic disease. Understanding the process by which perilipins at the surface of lipid droplets control how much energy is released from the adipocyte at times of need. Understanding how the intestines and body uptake and process dairy fat. Identify genes, their protein product and how the proteins influence the way the body processes fat.
10	Best Practices in Early Care Education - Medium Term - Individuals incorporate skills/change behaviors related to: Increased adoption of healthy food practices. Increased consumption of fruits, vegetables, whole grains and low-fat dairy. Increased participation in family meals. Increased participation in physical activity. Increased participation in family-related physical activity. Increased use of new 'campaign' website. Improved understanding of the relationship between early nutrition and later risk for chronic disease. Understanding the process by which perilipins at the surface of lipid droplets control how much energy is released from the adipocyte at times of need. Understanding how the intestines and body uptake and process dairy fat. Identify genes, their protein product and how the proteins influence the way the body processes fat.
11	Brigantine Homes Community Garden - Medium Term - Individuals incorporate skills/change behaviors related to: Increased adoption of healthy food practices. Increased consumption of fruits, vegetables, whole grains and low-fat dairy. Increased participation in family meals. Increased participation in physical activity. Increased participation in family-related physical

	activity. Increased use of new 'campaign' website. Improved understanding of the relationship between early nutrition and later risk for chronic disease. Understanding the process by which perilipins at the surface of lipid droplets control how much energy is released from the adipocyte at times of need. Understanding how the intestines and body uptake and process dairy fat. Identify genes, their protein product and how the proteins influence the way the body processes fat.
12	Smarter Lunchroom Report for Metuchen School District - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.
13	Delivery of Fresh Fruit and Vegetables to Home-bound Seniors - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.
14	4-H Summer Cooking Camp - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.
15	Healthy Living in Garfield - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.
16	Building Collaborations and Distributing Fresh Produce to Seniors and Urban Residents at the Farmer?s Market - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.
17	Family and Community Health Sciences & 4-H - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.
18	Eat Healthy Using My Plate - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.
19	Mechanisms of Dietary Lipid Assimilation in the Intestine - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical

	activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.
20	Grow Healthy FCHS School Wellness Initiative - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.
21	Structure/Function Studies of Perilipin A - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.
22	Community Gardens in Union County - Fresh Produce for Local Food Pantries - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.

Outcome #1

1. **Outcome Measures**

Short Term - Individuals gain awareness, knowledge, skills related to: Attitudes about healthy eating for adults/youth. Healthy food choices for adults/youth. Selection of healthy foods for adults/youth. Benefits of physical activity (reduced overweight and obesity, reduced risk of diabetes, heart disease and cancer.) Physical activity recommendations for health for adults/youth. Identify factors that promote excessive weight gain and protect against childhood obesity. Understand the molecular mechanisms of lipid transport in the intestinal cell. Demonstrate the affects on calcium absorbtion and bone mass by weight loss

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Medium Term - Individuals incorporate skills/change behaviors related to: Increased adoption of healthy food practices. Increased consumption of fruits, vegetables, whole grains and low-fat dairy. Increased participation in family meals. Increased participation in physical activity. Increased participation in family-related physical activity. Increased use of new 'campaign' website. Improved understanding of the relationship between early nutrition and later risk for chronic disease. Understanding the process by which perilipins at the surface of lipid droplets control how much energy is released from the adipocyte at times of need. Understanding how the intestines and body uptake and process dairy fat. Identify genes, their protein product and how the proteins influence the way the body processes fat.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
N-3 Polyunsaturated Fatty Acids and Human Health and Disease

Research regarding omega-3 fatty acids and health is abounding, with corresponding increases in the number of foods touted for their omega-3 content. There is an increasing need: for reliable and timely information about omega-3s; and, clarity regarding misconceptions held by the public (and propagated in the news) with regard to their potential role in human health.

What has been done
An eXtension website has been developed as a means of providing this needed information, but questions remain regarding: the viability of some of the website's components, e.g., a podcast created to help shoppers identify and purchase omega-3 rich foods; whether or not the intended users (Extension professionals and the public) find the website appealing and easy to use; how the website can best be marketed to its intended users; and, whether or not pregnant women, who are one of the website's primary target audiences, will use the website to the extent that it improves their intake of omega-3 rich foods. An NJAES Extension Specialist evaluated the effect of an eXtension site on meeting the public's informational needs regarding omega-3 fatty acids. A more specific focus was on some of the website components, particularly a grocery store podcast.

Results
Research findings suggests that eXtension website grocery shopping podcasts provide useable information regarding the health benefits of omega-3 consumption, and that they are likely a practical means for encouraging people to consume more ample amounts of omega-3s. This determination was made using data collected from 340 shoppers who listened to the podcasts as they shopped. Two- hundred fifty-one of the shoppers agreed to share their shopper loyalty cards with the research team which, in cooperation with A&P, enabled the researchers to review their store shopping receipts for six month prior to and six months after their exposure to the podcast. Most of the shoppers who participated in this study were white, women, and/or had at least a high school education. Statistical analyses revealed that more than half of the shoppers (59%) increased their purchases of n-3 rich foods. Further, the mean number of omega-3 rich food items they purchased increased significantly from 0.2 ±0.7 pre-intervention to 3.6 ±5.1 post-intervention ($t[172] = -6.9$, $P<0.001$). These findings suggest that grocery store podcasts appear to be an

effective means of nutrition education that nutritionists can use to assist their clients in making healthier purchases, but longer term studies should be done to assess if lasting change results from these types of interventions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #3

1. Outcome Measures

Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Assessing and Addressing Individual and Environmental Factors That Influence Eating Behavior of Young Adults

Young adults are at a uniquely increased risk for weight gain because of rapidly changing social situations that influence eating and exercise behaviors. Despite extensive efforts to promote weight management, these efforts only reach a small proportion of the population at risk and even effective programs promoting individual behavior change may have limited effectiveness in environments that promote weight gain. Research is needed to elucidate the combination of

individual and environmental factors associated with unhealthy weight gain among college students.

What has been done

An NJAES Extension Specialist recognized that a myriad of environmental and individualized factors can influence eating behavior and lifestyle choices, tailored intervention strategies that have both an environmental and individual focus can begin to be developed. Additionally, identification of the individual factors and the necessary environmental factors to support the individual change is the first step in the development of indexes for comparisons and benchmarking to support policies and programs for behavior change on college campuses and communities. This project, a collaboration among multiple institutions, uses established research techniques (the PRECEDE-PROCEED model for community-based participatory research) with communities of young adults to: 1) Develop instrument(s) and strategies to assess and evaluate individualized factors associated with eating behavior and health outcomes; 2) Refine and validate environmental assessment instruments for evaluating environmental factors that influence eating behavior and health outcomes; 3) Explore mechanisms of interaction between the identified individualized factors and environmental factors in influencing eating behavior; and 4) Use the findings to develop a Healthy Campus Index that can be used by higher education institutions around the nation to determine the how supportive their campuses are of promoting healthy weight among their students as well as identify areas of strength and areas needing improvement so that campuses can make meaningful changes that better support young adult health.

Results

In collaboration with colleagues from other universities, an NJAES Extension Specialist gathered and analyzed data from the newly completed Young Adult Eating and Activity for Health (YEAH) program, an 18 month on-line intervention program implemented and tested at Rutgers and 14 other universities. Participants in the USDA-funded YEAH intervention significantly increased fruit and vegetable intake, decreased percent of calories from fat, and improved self-instruction and self-regulation for mealtime behavior. An analysis of YEAH data to assess the effect of cognitive load on student health outcomes determined that young adults with high cognitive loads were significantly more likely to have greater routine restraint, compensatory restraint, sensitivity/susceptibility to external cues, and emotional eating compared to low cognitive load participants. Finding indicates that stress management may help ameliorate behaviors associated with excessive weight gain. The study team also created novel scoring methods to measure physical activity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #4

1. Outcome Measures

Taste Genetics, Obesity and Weight Loss - Medium Term - Individuals incorporate skills/change behaviors related to: Increased adoption of healthy food practices. Increased consumption of fruits, vegetables, whole grains and low-fat dairy. Increased participation in family meals. Increased participation in physical activity. Increased participation in family-related physical activity. Increased use of new 'campaign' website. Improved understanding of the relationship between early nutrition and later risk for chronic disease. Understanding the process by which perilipins at the surface of lipid droplets control how much energy is released from the adipocyte at times of need. Understanding how the intestines and body uptake and process dairy fat. Identify genes, their protein product and how the proteins influence the way the body processes fat.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Taste Genetics, Obesity and Weight Loss

In the last 30 years there has been a growing epidemic of obesity in the population but current interventions have not been successful in stemming this tide. Taste sensitivity to the bitter compound 6-n-propylthiouracil (PROP) is a common genetic trait that is a marker for food preferences and eating habits. Studies have shown that women who are genetically taste blind to PROP (i.e., non-tasters) habitually consume diets that are higher in added fats and sweets and higher in energy content than PROP tasters or super- tasters. These dietary differences could explain why non-taster women, are heavier than super-taster women. These data suggest that in the context of obesity, non-taster women would be more successful following a low-carbohydrate diet that does not restrict calories and fat content. Super-taster women would be more successful following a low-fat diet because they are less sensitive to reductions in dietary fat content and they typically consume fruits and vegetables that are emphasized in this diet.

What has been done
An NJAES researcher investigated individual differences in genetic sensitivity to bitter taste (PROP tasting) as a biological marker for dietary intake and obesity. Obese women who meet the study criteria are divided into ?super? PROP tasters and non-tasters. Each ?taster? group is

randomized into two groups for a six-month intervention designed to test the effectiveness of specific diet regimens (a low-fat-diet and a low carbohydrate diet). Each group attended weekly sessions during months 1-3 of the program, and then met every other week for months 4-6. Dietary targets for the LF group are 1,200-1,500 kcal/day and < 28% fat. The target for the LC group is < 50 g carbohydrate/day; there is no calorie target for the LC group. The physical activity goal gradually increases to 40 min/day at least 5/days per week. Four-day diet records were collected at baseline, 3-months and 6-months and were analyzed for energy intake, and macronutrient intake (% protein, fat and carbohydrate intake). Body weight was also measured at the same intervals. Compliance assessments included attendance at meetings, keeping a weekly food log and meeting the weekly physical activity goal. Eating attitudes measures (i.e., dietary restraint, disinhibition and hunger) were also collected at baseline, 3 and 6 months.

Results

Results reported here are preliminary results based on the 41 women who completed the 6-month intervention. Mean weight loss for the current cohort was 8.0 + 1.1 kg, which is within the targeted range of 0.25-0.5 kg /wk. The overall dropout rate was 16.3%. Interim results revealed that at 3-mo, all participants in the LC group lost more weight than those in the LF group ($p<0.03$), but this difference dissipated at 6-mo. Examination of the sub-groups using paired-comparison tests revealed that non-tasters in the LC group lost marginally more weight at 6-mo than non-tasters in the LF group ($p<0.08$). Weight loss was high to date in this trial (8.5% loss of baseline body weight) and attrition was low (16%). The pattern of weight loss we observed (more early weight loss in the LC group relative to the LF group that disappeared at the end of the trial) is consistent with findings from the literature. Current data are consistent with the hypothesis that non-taster women following the LC diet will lose more weight than non-taster women following the LF diet. The researchers expected that non-taster women following the low-carbohydrate diet would show greater dietary and behavioral adherence; higher dietary restraint; and lower disinhibition and hunger than non-taster women following the low-fat diet. These outcomes would identify key behaviors and eating attitudes that optimize weight loss when participants are matched with a diet corresponding to their genetically-determined food preferences. Contrary to expectations, measures of behavioral compliance were high in all subgroups including attendance at sessions (79-97% across groups) and keeping a daily food log (71-93%). Compliance with weekly physical activity goals was lower than for the other compliance measures, but was similar across groups (48-64%). Dietary restraint scores rose, and disinhibition and hunger scores fell in all participants at 3-months, and remained steady through the end of the trial (all p- values = 0.01-0.001 for baseline vs. 3-mo and 6-mo scores for all three measures. Thus, measures of behavioral compliance were high, consistent with positive treatment outcomes. Increasing dietary restraint and decreasing disinhibition were associated with successful weight loss.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #5

1. Outcome Measures

Evaluation and Characterization of Novel Botanical Extracts for the Prevention and Treatment of Metabolic Syndrome and Diabetes - Medium Term - Individuals incorporate skills/change behaviors related to: Increased adoption of healthy food practices. Increased consumption of fruits, vegetables, whole grains and low-fat dairy. Increased participation in family meals. Increased participation in physical activity. Increased participation in family-related physical activity. Increased use of new 'campaign' website. Improved understanding of the relationship between early nutrition and later risk for chronic disease. Understanding the process by which perilipins at the surface of lipid droplets control how much energy is released from the adipocyte at times of need. Understanding how the intestines and body uptake and process dairy fat. Identify genes, their protein product and how the proteins influence the way the body processes fat.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Evaluation and Characterization of Novel Botanical Extracts for the Prevention and Treatment of Metabolic Syndrome and Diabetes

The occurrence of type 2 diabetes continues to soar to epidemic proportions reaching almost 8% (23.6 million) of the population in the U.S. alone. Another 57 million Americans have prediabetes, defined by an impaired fasting glucose values as a result of insulin resistance. Insulin resistance is a key pathophysiologic feature of the "metabolic syndrome" and is strongly associated with co-existing cardiovascular risk factors and accelerated atherosclerosis. Due to the clinical consequences associated with insulin resistance in subjects with metabolic syndrome and type 2 diabetes, clinical regimens directed at increasing insulin sensitivity in vivo remain one of the most desirable goals of treatment. Although it is well established that lifestyle modification can improve insulin resistance and effectively improve many of the risk factors associated with metabolic syndrome, the success of maintaining lifestyle changes in humans over a chronic period is poor. Therefore, strategies to improve insulin resistance by pharmacological means have represented the traditional approach for clinical medicine. However, because of the widespread use of dietary supplements by the general public, nutritional supplementation with the use of botanicals that effectively increase insulin sensitivity represent a very attractive and novel approach for future

studies designed to intervene in the development of metabolic syndrome.

What has been done

NJAES researchers, in collaboration with researchers at three other institutions, are conducting a comprehensive analysis of the hypothesis that extracts from Artemisia sp. and Rubus improve insulin sensitivity, as well as isolating and characterizing the active components of these extracts based on the in vitro activities in muscle cells and adipocytes. Finally, TNO Intestinal Model (TIM) apparatus that simulates human gastro intestinal tract will be used to assess the bioavailability of active components in these extracts.

Results

Recent work on the characterization of Artemisia botanicals for improving insulin sensitivity examined how the active compounds from an extract of Artemisia dracunculus L. called PMI-5011 can be formulated with a food matrix such as soy protein to significantly improve the parameters related to the overall effectiveness of the botanical in future clinical work. A large commercial batch of Artemisia dracunculus (280 kg) was grown in greenhouse conditions and shipped to LSU (frozen) for processing into clinical materials. The polyphenols from Artemisia dracunculus were formulated with soy protein isolate (5011 Nutrasorb) and administered as a food for clinical testing (confirmed by experts at the FDA). Using the TIM model of the upper gastrointestinal tract of humans, the bioaccessibility of the active compounds of Artemisia, specifically the chalcone, 2′,4′-dihydroxy-4-methoxydihydrochalcone (DMC-2), from the soy formulation were determined to be similar to the bioaccessibility of the extract formulated with a commercial excipient and better than the extract alone. The 5011 Nutrasorb had higher relative bioavailability than the extract alone. This formulation was provided to Project 1 investigators and is currently in clinical testing. Artemisias dracunculus, santolinifolia and scoparia were continuously cultivated at Rutgers. The plants were processed into extracts and incorporated into diets for animal studies to determine their effect of insulin signaling pathways. Each of the plants produced a comparable chemical fingerprint. Artemisia santolinifolia and scoparia were fractionated using FCPC and subfractionated using HPLC in the same manner as was performed for A. dracunculus and individual compounds from the active fractions were preliminarily identified using LC-MS as described in previous project reports. A validation study was also initiated for the PMI-5011 project to quantify the DMC-2 in samples of PMI-5011, the quantification of DMC-2 in the plasma of mice treated with PMI-5011 and the synthesis of DMC-2 for use as a chemical standard. Ten grams of DMC-2 were synthesized to greater than 99% purity and the validation analyses of extracts and plasma are ongoing.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #6

1. Outcome Measures

Changing the Health Trajectory for Older Adults through Effective Diet and Activity Modifications - Medium Term - Individuals incorporate skills/change behaviors related to: Increased adoption of healthy food practices. Increased consumption of fruits, vegetables, whole grains and low-fat dairy. Increased participation in family meals. Increased participation in physical activity. Increased participation in family-related physical activity. Increased use of new 'campaign' website. Improved understanding of the relationship between early nutrition and later risk for chronic disease. Understanding the process by which perilipins at the surface of lipid droplets control how much energy is released from the adipocyte at times of need. Understanding how the intestines and body uptake and process dairy fat. Identify genes, their protein product and how the proteins influence the way the body processes fat.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Changing the Health Trajectory for Older Adults through Effective Diet and Activity Modifications

There is a strong connection between the diet, metabolism, aging, the biological clock (circadian rhythm) and genome stability. A healthy diet consisting of whole grains, fruits and vegetables provides a healthy supply of antioxidants that promote healthy metabolism, proper functioning clock and genome integrity. These combined factors help reduce many adverse health conditions such as cardiovascular disease and cancer, and may reduce age-related diseases like macular degeneration.

What has been done
An NJAES researcher is working to identify effective biomarkers and other indicators that reflect improvement in diet (fruit, vegetables, and whole grains) and physical activity and chronic disease risk in older adults. This researcher is trying to identify two effective biomarkers that reflect improvement in diet and disease prevention. The first is rate-of-change in telomere length and the second is a BMAL1 chromatin immunoprecipitation (ChIP).

Results

The researchers have optimized the different assays and generated the necessary materials. Using zebrafish as a model system (zebrafish and human telomeres are nearly identical) we have developed a quantitative PCR assay to measure telomere length. The goal is to eventually be able to use this in combination with DNA isolated from a cheek swab to measure the relative genome age and determine how diets rich in antioxidants (fruits, vegetables and whole grains) protect telomeres. The next step is to develop an easy assay that can measure BMAL1 binding to the telomeres to see if a healthy diet can improve the protective measure bestowed by the circadian clock. Thus far, the research has generated an anti-BMAL1 antibody and performed some preliminary tests of the ChIP. Repeated testing shows BMAL1 binding to the telomeres.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #7

1. Outcome Measures

Creation of Meals on Wheels Emergency Plan - Medium Term - Individuals incorporate skills/change behaviors related to: Increased adoption of healthy food practices. Increased consumption of fruits, vegetables, whole grains and low-fat dairy. Increased participation in family meals. Increased participation in physical activity. Increased participation in family-related physical activity. Increased use of new 'campaign' website. Improved understanding of the relationship between early nutrition and later risk for chronic disease. Understanding the process by which perilipins at the surface of lipid droplets control how much energy is released from the adipocyte at times of need. Understanding how the intestines and body uptake and process dairy fat. Identify genes, their protein product and how the proteins influence the way the body processes fat.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Creation of Meals on Wheels Emergency Plan

Meals on Wheels in Greater New Brunswick (MOWGNB), like most service providers in central New Jersey, was greatly affected by Sandy. After encountering many problems during this storm, they determined that an emergency plan was important for them to be able to best serve their clients.

What has been done
In consultation with Board members, program staff of MOWGNB and Elijah's Promise, the New Brunswick Fire Department, the Middlesex County Office on Aging and Disabled Services, and Meals on Wheels Association of America, an Emergency Preparedness Plan was prepared. The plan was officially voted on and approved by the MOWGNB Board, and is currently being enacted.

Results
The MOWGNB Board adopted the plan and is working to enact it. The New Brunswick and Highland Park Fire Departments now keep up-to-date lists of the most vulnerable clients, and they have agreed to serve meals to those clients in unforeseeable emergencies, when MOWGNB is not able to operate.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #8

1. Outcome Measures

Kids in the Kitchen 4-H Summer Enrichment Program - Medium Term - Individuals incorporate skills/change behaviors related to: Increased adoption of healthy food practices. Increased consumption of fruits, vegetables, whole grains and low-fat dairy. Increased participation in family meals. Increased participation in physical activity. Increased participation in family-related physical activity. Increased use of new 'campaign' website. Improved understanding of the relationship between early nutrition and later risk for chronic disease. Understanding the process by which perilipins at the surface of lipid droplets control how much energy is released from the adipocyte at times of need. Understanding how the intestines and body uptake and process dairy fat. Identify genes, their protein product and how the proteins influence the way the body processes fat.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Kids in the Kitchen 4-H Summer Enrichment Program

According to health rankings released by the Robert Wood Johnson Foundation and the Population Health Institute from the University of Wisconsin, Cumberland County is the poorest county in the state and the least healthy county in New Jersey. Second only to neighboring Salem County in adult obesity rankings, Cumberland County is composed of many wide open spaces, little public transportation, high rates of unemployment and a high undocumented population. Children can serve as catalysts for family change, encouraging healthy behaviors through sharing their learning with loved ones.

What has been done
A three day summer enrichment program was designed to engage youth and their families in developing awareness needed to make better food choices. The camp focused on nutrition, food preparation, food safety and manners, the program engaged learners who have completed grades 3 ? 7 in planning, preparing and serving a luncheon on Friday for the participant?s parents and caregivers.

Results
A pre-posttest survey were utilized as evaluation tools in the program. In addition a process evaluation was conducted to gain insight into youth's opinions on the logistics of the program. Evaluation revealed the following: 95% of youth surveyed demonstrated an increase in knowledge and skills in each of the three program domains: manners, food preparation skills and kitchen chemistry. 84% indicated they had learned ?some? or "lots" about the effect of yeast on food. 89% stated they had learned ?some? or ?a lot? about setting the table properly 95% learned ?some? or "lots" about measuring ingredients Participants stated "The only thing I did not like was that it was only 3 days" "I loved everything. I would like to be a cook someday" "I learned about cooking, cutting properly, safety and proper place setting." "It was so much fun!" Ways in which youth stated they can use this information in the future included teaching others, preparing a meal for family, volunteering at a soup kitchen or senior center and in chosen career paths.

4. Associated Knowledge Areas

KA Code	Knowledge Area

701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #9

1. Outcome Measures

Lowering Sodium in Your Diet - Medium Term - Individuals incorporate skills/change behaviors related to: Increased adoption of healthy food practices. Increased consumption of fruits, vegetables, whole grains and low-fat dairy. Increased participation in family meals. Increased participation in physical activity. Increased participation in family-related physical activity. Increased use of new 'campaign' website. Improved understanding of the relationship between early nutrition and later risk for chronic disease. Understanding the process by which perilipins at the surface of lipid droplets control how much energy is released from the adipocyte at times of need. Understanding how the intestines and body uptake and process dairy fat. Identify genes, their protein product and how the proteins influence the way the body processes fat.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Lowering Sodium in Your Diet

High blood pressure and heart disease are linked to obesity. Lowering blood pressure is important for many adults to improve their risk factors linked to heart disease, stroke.

What has been done
Power point presentations were developed on High Blood Pressure: What Can I Do? and the DASH Eating Plan to help consumers cook with less salt and control their risk for hypertension. Programs range from 1-2 hrs. in length with presentation and Q & A were presented to Adults, Seniors, Health Care Professionals and Plainfield School Nurses.

Results
Comparing learning of ?before and after class?, 80% of participants said they would almost always read food labels before purchasing food, they would purchase foods with lower sodium levels, learn to eat foods with less sodium and most would not cook with salt and 48% said they would substitute herbs, spices or other flavorings for salt when cooking.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #10

1. Outcome Measures

Best Practices in Early Care Education - Medium Term - Individuals incorporate skills/change behaviors related to: Increased adoption of healthy food practices. Increased consumption of fruits, vegetables, whole grains and low-fat dairy. Increased participation in family meals. Increased participation in physical activity. Increased participation in family-related physical activity. Increased use of new 'campaign' website. Improved understanding of the relationship between early nutrition and later risk for chronic disease. Understanding the process by which perilipins at the surface of lipid droplets control how much energy is released from the adipocyte at times of need. Understanding how the intestines and body uptake and process dairy fat. Identify genes, their protein product and how the proteins influence the way the body processes fat.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Best Practices in Early Care Education

New Jersey ranks very high in rates of childhood obesity, particularly in preschool obesity in underserved communities. Additionally, in some communities access to fresh fruits and vegetables is limited resulting in nutritionally unbalanced diets. Childhood obesity prevention and reduction efforts must involve the environments in which the children live, play, and go to school. The earlier children learn about the importance of healthy eating and physical activity the more likely these habits will be incorporated into a healthy lifestyle.

What has been done

The Department of Family & Community Health Sciences, in partnership with the NJ Department of Agriculture, successfully obtained a USDA Team Nutrition Training Grant that provided training for NJ foodservice professionals of the National School Lunch Program (NSLP) and Child and Adult Care Feeding Program (CACFP) on implementing the 2010 Dietary Guidelines for Americans, applying for the HealthierUS School Challenge, maximizing the use of USDA Foods, and meeting the requirements for the new meal patterns for school meals mandated by the Healthy Hunger Free Kids Act of 2010, with emphasis on local foods and Farm to School Initiatives.

Results

FCHS Educators created 4 data collection and evaluation tools for the child care sites: webinar evaluations; a Let?s Move Child Care Checklist (LMCC) Quiz summary; food tasting records; and a final participant survey. Highlights of these evaluation tools follow. Webinars: Nearly 100% of viewers responded that the webinar format and length were effective and appropriate. Wellness Policies webinar 98% of viewers who completed the evaluation responded that they will participate in their center?s wellness policy development. After viewing the ?Win with Tastings in Early Care Centers? webinar, 92% of viewers who completed the evaluation agree or strongly agree that they feel confident in their ability to plan and conduct food tastings. Of the 34% who did not plan to conduct a food tasting in the 2 months following the webinar, 57% cited food allergy concerns and 43% cited time as a barrier. After viewing the Role-Modeling webinar 98% of viewers who completed the evaluation agree or strongly agree that they feel confident in their abilities to role model behaviors encouraging children to participate in physical activity; drink more water; and eat healthy foods, especially more vegetables and fruits. After viewing the Choosing Recipes for Healthy Kids webinar, 96% of viewers who completed the evaluation agree or strongly agree that they feel confident in their ability to follow food safety and food allergen principles when providing meals or snacks to children. 98% felt able to identify and select whole grain items when providing meals or snacks to children. 73% plan to utilize local farmers when possible for local ingredients. Upon completion of a Final Participant Survey, child care staff was asked to indicate in which way(s) the Grow Healthy TN project has impacted their center. The most frequently cited responses were: Implemented more nutrition activities; implemented more garden activities; Increased parent involvement in center wellness; increased staff involvement in center wellness; implemented more physical activity; and improved the healthfulness of the center?s menu. The Final Participant Survey also yielded these key findings: 90% of respondents reported that the LMCC Checklist process increased their awareness about center wellness; identified priority areas for wellness improvements; helped develop a wellness action plan and increase compliance with CACFP guidelines. 80% now offer water freely indoors and outdoors; 70% have added more fruit to the menu; 60% have added more vegetables other than fried potatoes. 90% of respondents reported that the curricula selected helped them incorporate nutrition, physical activity and gardening into their program. 100% reported that the garden helped them promote nutrition education in the classroom and 80% indicated that the garden helped them conduct vegetable and fruit tastings as well as increase parent involvement.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #11

1. Outcome Measures

Brigantine Homes Community Garden - Medium Term - Individuals incorporate skills/change behaviors related to: Increased adoption of healthy food practices. Increased consumption of fruits, vegetables, whole grains and low-fat dairy. Increased participation in family meals. Increased participation in physical activity. Increased participation in family-related physical activity. Increased use of new 'campaign' website. Improved understanding of the relationship between early nutrition and later risk for chronic disease. Understanding the process by which perilipins at the surface of lipid droplets control how much energy is released from the adipocyte at times of need. Understanding how the intestines and body uptake and process dairy fat. Identify genes, their protein product and how the proteins influence the way the body processes fat.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Brigantine Homes Community Garden

Brigantine homes is a low income housing community. This part of Atlantic City is a food desert. It is also is a high crime area where a lot of youth programs do not stay. We are serving a high Hispanic and black population with limited youth programming and troubles with food security.We had 23 youth participate in this program along with 2 adult mentors. 18 Hispanics and 5 African Americans youth.

What has been done

A permanent garden structure was built by a -kind donation from Atlantic county. We used this garden to teach the youth about Gardening and healthy living. Also adults and youth volunteered to tended to the garden and keep it safe. We even had the Mayor of Atlantic City come down to do the grand opening. We used the Master Gardeners curriculum to teach the youth and the grown vegetables were given to the residents.

Results
87% of the youth changed the attitude towards gardening. 82% of the youth have a better understanding of food security. Also what was not measured in the evaluation was the pride and ownership the community including the youth and adults had when they were able to harvest the garden.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #12

1. Outcome Measures

Smarter Lunchroom Report for Metuchen School District - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Smarter Lunchroom Report for Metuchen School District

The Metuchen School District cafeterias provide healthy foods, but students were not always making healthy choices.

What has been done
At the request of the Metuchen Wellness Committee, the three District cafeterias were observed during multiple lunch periods. Using the Smarter lunchroom approach (Hanks, Just & Wansink (2012), specific recommendations about availability and placement of healthier and less healthy foods and beverages were provided for each cafeteria. Hanks, Andrew S., Just, D. & Wansink, B. (2012). Smarter Lunchrooms Can Address New School Lunchroom Guidelines and Childhood Obesity. The Journal of Pediatrics, Volume 162, Issue 4, 867 ? 869.

Results
All three cafeteria environments were changed as a result of the report, cafeteria advertising was changed, as were the placements of food and beverages. Most, but not all, of the recommendations were adopted resulting in students more frequently making healthy food choices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #13

1. Outcome Measures

Delivery of Fresh Fruit and Vegetables to Home-bound Seniors - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Delivery of Fresh Fruit and Vegetables to Home-bound Seniors

For aging adults, eating adequate amounts of fruits and vegetables can help prevent or manage chronic disease and promote quality of life. Homebound seniors, and particularly low-income homebound seniors, may have difficulty accessing and affording fruits and vegetables, even in urban settings where community-based efforts to improve access and affordability are present. This project sought to address these issues by providing registration in a county run program to increase the affordability of fresh produce, and by delivering fresh produce to homebound seniors who receive home-delivered meals (HDMs).

What has been done
To address the issue of limited access and affordability among these at-risk seniors, two joint interventions were launched between May and August 2014. The first intervention involved registering 13 low-income, home-delivered meal (HDM) participants for the Senior Farmers? Market Nutrition Program (SFMNP). SFMNP is a federal nutrition assistance program that aims to increase fresh, local produce affordability and to support local famers? markets, roadside stands, and community supported agriculture programs. Of approximately 60 HDM recipients approached, 13 who were interested in the program and eligible based on income were successfully enrolled. The second intervention established produce home-delivery for approximately 60 HDM participants, including those who were registered for SFMNP. The New Brunswick Community Farmers? Market supplied all of the produce, most of which was locally grown. During the intervention, four produce home-deliveries were made, with 214 produce bags delivered.

Results
Overall, most participants interviewed reported that they ate the fruits and vegetables delivered to them, and that their fruit and vegetable consumption increased as a result of the program. In addition, our intervention raised awareness of the Senior Farmers Nutrition Program (SFMNP), and13 individuals were successfully enrolled in the SFMNP. Over 95% of the SFMNP vouchers were redeemed.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #14

1. Outcome Measures

4-H Summer Cooking Camp - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
4-H Summer Cooking Camp

Urban youth experience unique challenges when it comes to health living. By educating youth on nutrition and how to prepare healthy options we may reverse the trend of poor health and childhood obesity.

What has been done
Sixty inner city youth participated in the program. We began with "What's in a Kitchen" (because reading levels varied we had items with numbers by them and the students had to match the item to the number), them onto common weights and measures (whole and halves were easy the challenge was fractions), finally we introduced proper hand washing (two sinks one for food preparation and the other for hand washing).The students were placed in groups of five each day their jobs changed , table setter, recipe reader, ingredient gather, food preparation and table clearer. Table manners were incorporated (sitting down-no talking with food in your mouth- using a napkin). Each day the youth made a different non-carbonated fruit drinks from fresh fruits. Many youth really enjoyed the "naturally" sweeten beverages. The "Get Moving Get Healthy" activity stations and lessons were also incorporated in the sessions. To reinforce what was learned nutrition bingo, name that nutrient and other food related games were played. Each participant received a cookbook of all of the recipes that were made, so they could make them at home.

Results
The program was designed for youth in grades 4th-8th and who were attending select summer day camp programs throughout the city. We required the participants participate for the entire week. The youth often wanted the program to be extended and some have joined existing Mercer County 4-H clubs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #15

1. Outcome Measures

Healthy Living in Garfield - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Healthy Living in Garfield

Currently, the number of overweight and obese youth in New Jersey is higher than the national average. By educating young people on nutrition, fitness and positive lifestyles, we can help them

to create healthy habits and reverse the trend of poor health. In urban areas, youth experience unique obstacles when it comes to healthy living. Fast food and corner stores/bodegas offer inexpensive snacks and meals that are unhealthy and easily accessible. Neighborhoods are often not safe for outdoor activities and sports. Cultural differences in meals will cause imbalance in food group distribution (too much grains or meats, not enough vegetables). The youth in the city of Garfield experience some or all of these obstacles.

What has been done

The instructor used the Get Moving-Get Healthy with New Jersey 4-H curriculum in addition to the Cornell University Choose Health curriculum. Youth attended a one hour session once per week for six weeks. The healthy living lessons were hands-on, and were followed by team building activities or games, designed to get the participants out of their seats and moving around. The goals of the program were for youth: To understand the importance of proper nutrition and physical activity. To learn ways to make healthy eating and physical activity a part of their daily lives. To change eating habits by making healthier food choices. To include physical activity in their daily lives. To share what they learned with their parents/caregivers and siblings so they could make healthy choices/changes together. To ultimately live longer and healthier lives. The program had three primary areas of focus. 1. Learning the "Choose My Plate? model, including the food groups and their individual calorie levels. 2. Learning about portion sizes and how to identify them. 3. The importance of daily physical activity, and ways to make it fun and easy.

Results

64 evaluations were collected and the results show the program was successful and had a positive impact on the youth participants. As a result of participating in this 4-H healthy living program: 95% of participants strongly agree or agree that they learned the foods they should eat every day. 92% of participants strongly agree or agree that they learned what makes up a balanced diet. 91% of participants strongly agree or agree that they learned why it is important to eat a healthy diet. 94% of participants strongly agree or agree that they learned how to make healthy food choices. As a result of participating in this 4-H healthy living program, youth now take the following actions: 72% strongly agree or agree that they eat more fruits and vegetables. 64% strongly agree or agree that they eat more whole grains. 61% strongly agree or agree that they eat less junk food. 81% strongly agree or agree that they drink more water. 81% agree that being active is fun. 94% agree that being active is good for them. 94% agree that physical activity will help them stay fit.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #16

1. Outcome Measures

Building Collaborations and Distributing Fresh Produce to Seniors and Urban Residents at the Farmer?s Market - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Building Collaborations and Distributing Fresh Produce to Seniors and Urban Residents at the Farmer?s Market

Urban seniors may have difficulty accessing and affording fresh fruits and vegetables. Affordability is also a major obstacle.

What has been done
Union County Freeholders, NJ Dept. of Agriculture and the Senior Meals Coordinator along with Rutgers Cooperative Extension FCHS Educator, SNAP-Ed Supervisor and Staff, Ag agent, Master Gardeners along with Elizabeth, Plainfield, Roselle, Rahway, WIC in Elizabeth and Plainfield supported bringing Fresh Produce to Farmers Markets at various sites in Union county fostering a collaborative effort of Rutgers Cooperative Extension, county and city agencies with NJ farmers. To provide nutrition education along with distribution of vouchers for free produce at the participating markets. Vouchers ($ 20) for free produce for seniors were distributed in Union County. Three farmers visited 9 towns to deliver produce to Union County senior residents. Nutrition education was provided by SNAP-Ed at the sites and SNAP-Ed assists with distributing vouchers with Union County Division on Aging Staff.

Results
Outcomes/Impacts: In FY 2014?Eighteen thousand $5.00 vouchers worth $90,000 were given to eligible seniors in Union County to purchase Jersey Fresh fruits and vegetables as part of the

WIC Senior Farmers Market program. Seniors get a maximum of 4 vouchers at $5.00 each or a total of $ 20 per senior. Transportation to the farmer?s markets is provided by county paratransit system. Besides providing urban seniors with fresh fruits and vegetables, farmers joined a new customer base.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #17

1. Outcome Measures

Family and Community Health Sciences & 4-H - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Family and Community Health Sciences & 4-H

At a time when childhood obesity and chronic disease rates are exceedingly high, the need for programming emphasizing healthy living is great. Providing programming that focuses on healthy food choices and the importance of physical activity to youth, gives them important information that can shape their behavior patterns during their most formative years, hopefully leading to a

lifetime of healthy decision making.

What has been done

School Enrichment Healthy Living Programs These are part of the Get Moving ? Get Healthy NJ initiative of 4-H and Family & Community Health Sciences. The Make Your Plate Great program teaches participants how to build healthy eating habits using the new ChooseMyPlate food icon. Participants find out what different foods do for the body and make a healthy snack. Get Moving - Get Healthy NJ teaches the importance of eating healthy food and the benefits of daily physical activity. Activities include cardio, strength building, flexibility training, basic yoga poses and movement activities that help participants strengthen their muscles and increase flexibility. Group poses encourage cooperation and meditation helps participants become aware of the mind-body connection. All 4-H Clubs are encouraged to elect a Health Officer who serves as an advocate for health at all club meetings by sharing healthy facts or leading activities that promote healthy living.

Results

At the conclusion of the Make Your Plate Great program, participants expressed their desire to share information learned with their family members. Teachers of participants also reported that they observed an increase in healthy snacks being brought to school. Nine new Health Officers were trained in Somerset County. Clubs with Health Officers integrated health tips and topics into their general club meetings, encouraging their peers, leaders, and family members to make better choices in their daily lives. Some Health Officers shared information that related to their project areas, such as horse health and safety when working with electronics/circuits.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #18

1. Outcome Measures

Eat Healthy Using My Plate - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Eat Healthy Using My Plate

Providing programming that focuses on healthy food choices and physical activity is essential to address the major health crises of childhood obesity.

What has been done
ChooseMyPlate programs were developed with power point presentations, evaluations and handouts. These included: ?My Plate for Educators 2014? for training teachers; ?ChooseMyPlate for seniors?, ?My Plate Makeovers? ?Healthy Food for Kids? and ?10 Tips for Eating Healthy? for adult and parent groups. All workshops, trainings and presentations include post/pre evaluations and handouts.

Results
Posttest shows planned change in foods consumed and change in attitudes toward healthier options. Post-Pre for MyPlate N= 435 adults Pre Post Set goals for changing my health behavior 51% 78% Buy more healthy than unhealthy food 48% 75% Know a balanced lifestyle includes good nutrition and physical activity 65% 74% Exercise 30 minutes MOST days 62% 75% Make sure my kids exercise at least 60 minutes per day 60% 74% Know and follow MyPlate when planning meals and snacks 62% 76% Eat salads and sufficient fruit/veg daily 41% 58% Drink 6-8 cups fluids daily 52% 81% Watch my portion sizes 56% 82% Eat a healthy breakfast EVERY day 31% 52% Pack a healthy lunch daily 30% 49% Drink at least 3 cups of 1% or non-fat milk daily (or substitute food/beverages) 31% 46%

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #19

1. Outcome Measures

Mechanisms of Dietary Lipid Assimilation in the Intestine - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Mechanisms of Dietary Lipid Assimilation in the Intestine

Free fatty acids (FA) and monoacylglycerol (MG) are the hydrolysis products of dietary triacylglycerol (TG). They constitute not only a major source of calories, but are also precursors of many biologically active molecules and are incorporated as structural components of cellular membranes. The mechanisms which regulate the uptake and intracellular movement of FA and MG in intestinal cells remain largely unresolved.

What has been done
The ultimate goal of this work is to understand and thereby be able to regulate the influx, efflux, and intracellular targeting of FA and MG. This research will define the mechanisms by which dietary fat is taken up and processed by intestinal cells, and will provide an understanding of how the uptake of lipid can be regulated-either to decrease uptake, as in the case of caloric reduction, or to increase uptake, in the case of nutrient malabsorption. Such an understanding will not only enhance our knowledge of the basic mechanisms of utilization of a major nutrient, triacylglycerol, but will enable more effective regulation of net intestinal lipid uptake. This will have important implications for the treatment of obesity and malabsorptive disorders, and will assist in the development of effective enteral drug delivery systems.

Results

We studied the roles of the enterocyte fatty acidbinding proteins (FABPs), and showed for the first time that they have clearly distinct functions in the intestine. For example, mucosal lipid metabolism was differentially modified, with significant decreases in FA incorporation into triacylglycerol (TG) relative to phospholipid (PL) in IFABP-/- mice, while LFABP-/- mice had reduced monoacylglycerol (MG) incorporation in TG relative to PL, and reduced radiolabeled monoacylglycerol (MG) incorporation in TG relative to PL, as well as reduced FA oxidation. Interestingly, striking differences were found in whole body energy homeostasis: LFABP-/- mice fed high-fat diets became obese relative to WT, while IFABP-/- mice displayed an opposite, lean, phenotype. Fuel utilization followed adiposity, with LFABP-/- mice preferentially utilizing lipids, and IFABP-/- mice preferentially metabolizing carbohydrate for energy production. Changes in body weight and fat may arise, in part, from altered food intake; mucosal levels of the endocannabinoids 2-arachidonoylglycerol (2-AG) and arachidonoylethanolamine (AEA) were elevated in LFABP-/-, perhaps contributing to increased energy intake. This direct comparison provides evidence that LFABP and IFABP have distinct roles in intestinal lipid metabolism; differential intracellular functions in intestine and in liver, for LFABP-/- mice, result in divergent downstream effects at the systemic level. We also discovered and helped elucidate the function of small intestinal monoacylglycerol lipase (MGL) by generating transgenic mice that over-express MGL specifically in small intestine (iMGL mice). After only 3 weeks of high fat feeding, iMGL mice showed an obese phenotype; body weight gain and body fat mass were markedly higher in iMGL mice, along with increased hepatic and plasma TG levels compared to wild type littermates. The iMGL mice were hyperphagic and displayed reduced energy expenditure despite unchanged lean body mass, suggesting that the increased adiposity was due to both increased caloric intake and systemic effects resulting in a hypometabolic rate. The presence of the transgene resulted in lower levels of most MG species in intestinal mucosa, including the endocannabinoid 2-arachidonoyl glycerol (2-AG). The results therefore suggest a role for intestinal MGL, and intestinal 2-AG and perhaps other MG species, in whole body energy balance via regulation of food intake as well as metabolic rate.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #20

1. Outcome Measures

Grow Healthy FCHS School Wellness Initiative - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Grow Healthy FCHS School Wellness Initiative

Childhood obesity continues to be a concern in America, with roughly more than one third of children and adolescents overweight or obese. Health experts continue to emphasize the importance of making changes to policy and the environment affecting children and families to promote healthy lifestyles. Providing a healthy school environment is a key strategy, one which emphasizes provision of healthy foods served/sold on campus, adequate physical activity, role modeling of healthy behaviors by school adults, and parent involvement in school health. The Healthy, Hunger Free Kids Act of 2010 reinforced nutrition guidelines for school meals and competitive foods, as well as bolstered school wellness policies and practices, through school wellness councils, and employment of evidenced-based practices to assess their school wellness environments. This allows unbiased action planning and sustainable and systematic change.

What has been done
A comprehensive and ongoing school wellness partnership has developed over the past several years between FCHS and School Districts (serving Pre-K through 8th Grade students) throughout the state. Students participate in food, nutrition and edible garden programming, including vegetable taste testing?s to identify new vegetable options to achieve USDA vegetable subgroup requirements in school cafeterias. ?School Staff: teachers, nurses and administrators participated in professional development workshops to complete the CDC School Health Index (SHI) assessment tool to develop school wellness plans, and identify strategies to enhance nutrition and physical activity in their schools & curricular integration strategies for school food and garden activities. ?Training ? FCHS Wellness Champions: volunteers were trained to teach supplementary food/nutrition lessons in schools, serve on school wellness councils, and provide support to school wellness activities throughout the school year. ?Students participated in Youth Advisory Councils to conduct a wellness assessment via the Students Taking Charge assessment and develop plans to address identified needs in areas of nutrition & physical activity.

Results
Changes in Knowledge ? Surveys indicate improved understanding and awareness of key school nutrition and wellness issues and strategies to enhance school wellness and nutrition in each target audience. Changes in Condition ? Follow-up surveys and outreach indicate a number of changes have resulted: Built 3 new school gardens and enhanced/expanded 4 existing school gardens, making them integral components of the school environment. New vegetables have

been added to school lunch menus, based on results of student taste-testing?s, enabling school nutrition professionals to increase the variety of vegetables served and better meet USDA vegetable subgroup requirements. Schools developed SHI assessments and developed wellness implementation plans and strategies. YACs developed youth-led projects to increase physical activity during indoor recess. YACs developed youth-led projects to increase healthy offers in the cafeteria o FCHS Wellness Champions are teaching nutrition lessons in elementary school classrooms, leading after-school food & garden clubs and supporting school garden and wellness council projects.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #21

1. Outcome Measures

Structure/Function Studies of Perilipin A - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Structure/Function Studies of Perilipin A

Obesity is a growing problem in the U.S. and most other countries of the world. To develop effective treatments for obesity, it is critical to understand the biology of fat storage in adipose tissue.

What has been done

A NJAES researcher investigates the functions of a protein, perilipin, which is found in fat storing cells in adipose tissue. Perilipin is the major protein surrounding the fat storing structures called lipid droplets. Perilipin functions to control the amount of fat stored during feeding are released when energy is needed by the body. Working with collaborating scientists in Austria, we have demonstrated that phosphorylation of serine 239 of (mouse) CGI-58 is important for release of CGI-58 from the perilipin scaffold during the stimulation of lipolysis. This phosphorylation neither increases nor impairs the interaction of CGI-58 with ATGL, or co-activation of lipolysis. Additionally, we have continued to characterize a mutation of CGI-58 (His82Arg) that is responsible for a neutral lipid storage disorder in humans. We have found that the mutation blocks the co-activation of ATGL in vitro, but does not impair the physical interaction of mutated CGI-58 with ATGL, or the recruitment of these proteins to lipid droplets.

Results

NJAES researcher has gain of knowledge that will help the research community to better understand how adipose tissue controls fat storage and release. We have gained better understanding of how perilipin works to control fat metabolism in adipose tissue by controlling the interaction of various perilipin-binding proteins with lipid droplets, the major fat storing structures in adipocytes (fat cells). Changes in knowledge for 2014 include new discoveries that the protein kinase A-mediated phosphorylation of serine 239 of mouse CGI-58 is important for efficient release from a binding site on perilipin 1. This adds to prior knowledge that phosphorylation of serine residues at positions 492 and 517 of mouse perilipin 1 facilitate the release of CGI-58 from lipid droplets into the cytoplasm. This release of CGI-58 enables interaction of CGI-58 with ATGL and the activation of lipolysis. The ultimate outcome of increasing adipose lipolysis is to release fatty acids into circulation for uptake by peripheral tissues for metabolism to drive ATP synthesis. These findings increase the knowledge of basic scientists regarding the biology and function of adipocytes, and the control of whole body energy homeostasis in animals. Maintaining balance in energy metabolism is critical to avoid pathological complications of obesity and insulin resistance.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #22

1. Outcome Measures

Community Gardens in Union County - Fresh Produce for Local Food Pantries - Long Term - Individuals experience: Decreased overweight and obesity for youth/adults. Decreased risk factors for nutrition-related health problems and chronic diseases that are affected by diet and physical activity for youth/adults. A clear and comprehensive understanding of the genetic and physiological mechanisms of obesity and related chronic diseases. Pharmacological and/or medical treatments to alleviate the effects of obesity and related diseases.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Community Gardens in Union County - Fresh Produce for Local Food Pantries

US Census data for Union County NJ, indicates that 10.8 % of the population is living below the national poverty level (2009-2013). According to the NJ Anti-Hunger coalition, www.njahc.org, a USDA study of NJ food stamps recipients jumped from 414,500 in 2007-09 to 622,022 in 2010. The number of NJ households experiencing food insecurity increased from 7.7% of the population in 2004-06 to 11.5% in 2007 - 09. The Anti-Hunger coalition lists 27 food pantries in Union County as resources for families and individuals in need of food. Donations of fresh vegetables to food pantries give families access to healthy food and allows pantries to use financial resources to purchase other perishable items such as milk and meat.

What has been done
RCE of Union County has been addressing the food security issue on two fronts: starting community gardens and providing local food pantries with produce for distribution. Schools and community organizations look to NJAES Cooperative Extension for guidance on starting and managing school and community gardens. The Master Gardeners of Union County have been providing local food pantries with fresh produce since 2002. They grow fruits and vegetables in their "Sharing" demonstration garden located at Trailside in the Watchung Reservation. Two of the volunteers coordinate with local food pantries for delivery of the produce. The County Agricultural Agent, Madeline Flahive DiNardo, has been working with the community organization "Come Grow with Us" affiliated with the United

Way of Union County, Groundworks Elizabeth and NJ Assemblywoman Annette Quijano's office to establish community vegetable gardens. The goal of the project is to provide organizations with raised beds and vegetable transplants to get community gardens started, give guidance on growing and harvesting vegetables, and teach plant and nutrition workshops.

Results

The Master Gardeners '?Sharing Garden? project yielded 2,460 pounds of produce in 2014. The retail value of the small fruits, herbs and vegetables donated to fifteen local agencies that provide food to their clientele is $4,220.06. Since 2002, volunteer Master Gardeners have cultivated and donated 23,820.5 lbs. of hardy vegetables, fruit and herbs to help feed the hungry in Union County. The ?Come Grow with Us? gardens provide fresh produce to the community garden workers and their families. The community gardens provide 4,300 pounds of produce to their community.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

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

No items to report.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

NJAES research and extension outcomes related to this planned program were evaluated utilizing a variety of evaluation methods appropriate for each initiative to determine effectiveness on both a qualitative and quantitative level. For KASA and practice change we included the measurement of knowledge gained as measured by pre/post Likert-scale assessments. Surveys were used to measure increase in skills acquired, behavior change and practice adoption. For process evaluation we focused on program delivery,

participation, relevance and timeliness. Data was collected at appropriate times for each initiative that supports this planned program. IRB approved evaluation instruments were used to collect research and extension data. Data analyses and comparisons relevant to basic and applied research and demonstration were collected and analyzed and reported utilizing a variety of data collection methods appropriate to each research question. The major goal of evaluating is the demonstration of social, economic, behavior and environmental changes in conditions that contribute to improved quality of life as a result of participation in programs and benefits of research solutions. See state defined outcomes for detailed results of each initiative.

Key Items of Evaluation

None to report.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

4-H Youth Development

☑ 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
806	Youth Development	100%		0%	
	Total	100%		0%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	30.0	0.0	1.0	0.0
Actual Paid	32.0	0.0	0.0	0.0
Actual Volunteer	4120.0	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**
440889	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1992745	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
613550	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Positive Youth Development:

• Employ Essential Elements (belonging, independence, mastery and generosity) as the basis for life skill development and related workforce development skills.

- Utilize Experiential Education Model (Experience, Share, Process, Generalize, Apply).

Provide opportunities for youth to:
- Feel and believe that they are cared about by others (Attachment, Belonging, Connection)
- Feel and believe they are capable and successful (Achievement, Mastery, Competence)
- Know they are able to influence people and events (Autonomy, Power, Confidence)
- Practice helping others through youth's own generosity (Altruism, Purpose, Contribution)

Subject matter:
(USDA/NIFA Mission Mandates)
Science, Engineering, Technology (includes:science literacy, animal science, plant science, environmental science, life sciences, etc) Citizenship (includes youth engagement, community youth development, community service, character development, civic engagement, etc) Healthy Lifestyles (includes chemical health, mental and emotional health, foods & nutrition, physical health and safety, etc).

2. Brief description of the target audience

- School Age Youth (K - 13, one year out of high school) and their Parents
- 4-H Volunteers (adult and youth)
- Teachers/Educators/other Youth Development Educators
- School Age Child Care Providers
- College Students (interns, collegiate 4-H)
- Other Extension Professionals and University Partners
- Communities: Stakeholders and Non-Profit, Social Service, Government Agencies
- Under-served and Under-represented Audiences

Delivery modes:

- 4-H Clubs and Related Activities
- 4-H Afterschool (clubs and short-term programs)
- 4-H School Enrichment
- 4-H Special Interest
- 4-H Camping (day camps and overnight camping)
- 4-H Mentoring and Individual Study

3. How was eXtension used?

Faculty participated in the development of collaborative educational products.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	30658	0	56217	200290

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	6	0	6

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- A variety of strategies will be implemented to reach target audiences. This will include and not be limited to workshops, field visits, classes, newsletters, media releases, electronic communications,and publications.In addition a trained volunteer teaching base will be developed. Quantitative reports of participation will be collected.

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Short Term - Youth increase awareness, knowledge, attitudes, and skills related to essential elements, workforce development, life skill development, and relevant subject matter. Volunteers increase knowledge and awareness of practices fostering positive youth development, including youth/adult partnerships. Youth development professionals and stakeholders increase awareness and knowledge of problems and solutions supporting positive youth development, including: policies that need to be addressed,community resources and support.
2	Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.
3	Long Term - Youth demonstrate mastery and competencies needed to become engaged by assuming leadership positions in communities; developing and implementing action plans to address community needs, and becoming productive members of the workforce. 4-H youth are engaged partners in decision making regarding RCE programming including but not limited to 4-H youth development programming. 4-H alumni and volunteers become engaged citizens by assuming leadership positions in communities. Youth development professionals and stakeholders influence decision makers in policy development related to youth development needs and issues.
4	4-H Science, Technology, Engineering and Math - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.
5	6th Annual Rutgers Summer Science Program - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.
6	Middlesex County 4-H Project GIFT - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.
7	Lindley G Cook 4-H Youth Center for Outdoor Education: Science, Engineering and Technology Camp 2014 - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with

	adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.
8	SET Programs in Somerset County - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.
9	2014 Be a GEEK - Great Engineering Experiences for Kids - Camp - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.
10	North Jersey 4-H Teen Conference (NJTC) - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.
11	Ethics/True Colors - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.
12	"Discover the Leader in You!" 4-H Conference - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.
13	County Special Interest Camps: Cooking and Science Camp - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.
14	Essex County 4-H Farm Camp - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.
15	State 4-H Small Animal Educational Symposium - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in

	partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.
16	4-H Public Speaking Program - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.
17	New Brunswick 4-H Youth and Community Development - Long Term - Youth demonstrate mastery and competencies needed to become engaged by assuming leadership positions in communities; developing and implementing action plans to address community needs, and becoming productive members of the workforce. 4-H youth are engaged partners in decision making regarding RCE programming including but not limited to 4-H youth development programming. 4-H alumni and volunteers become engaged citizens by assuming leadership positions in communities. Youth development professionals and stakeholders influence decision makers in policy development related to youth development needs and issues.
18	Elizabethport 4-H Program - Long Term - Youth demonstrate mastery and competencies needed to become engaged by assuming leadership positions in communities; developing and implementing action plans to address community needs, and becoming productive members of the workforce. 4-H youth are engaged partners in decision making regarding RCE programming including but not limited to 4-H youth development programming. 4-H alumni and volunteers become engaged citizens by assuming leadership positions in communities. Youth development professionals and stakeholders influence decision makers in policy development related to youth development needs and issues.
19	New Jersey 4-H Youth Development - Long Term - Youth demonstrate mastery and competencies needed to become engaged by assuming leadership positions in communities; developing and implementing action plans to address community needs, and becoming productive members of the workforce. 4-H youth are engaged partners in decision making regarding RCE programming including but not limited to 4-H youth development programming. 4-H alumni and volunteers become engaged citizens by assuming leadership positions in communities. Youth development professionals and stakeholders influence decision makers in policy development related to youth development needs and issues.
20	Passaic County 4-H SET (Science, Engineering and Technology) Ambassadors Program - Long Term - Youth demonstrate mastery and competencies needed to become engaged by assuming leadership positions in communities; developing and implementing action plans to address community needs, and becoming productive members of the workforce. 4-H youth are engaged partners in decision making regarding RCE programming including but not limited to 4-H youth development programming. 4-H alumni and volunteers become engaged citizens by assuming leadership positions in communities. Youth development professionals and stakeholders influence decision makers in policy development related to youth development needs and issues.

Outcome #1

1. Outcome Measures

Short Term - Youth increase awareness, knowledge, attitudes, and skills related to essential elements, workforce development, life skill development, and relevant subject matter. Volunteers increase knowledge and awareness of practices fostering positive youth development, including youth/adult partnerships. Youth development professionals and stakeholders increase awareness and knowledge of problems and solutions supporting positive youth development, including: policies that need to be addressed,community resources and support.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Horticulture Therapy with Incarcerated Youth

The Union County Juvenile Detention Center houses youth awaiting judicial proceeding and or more permanent placement in the state corrections system. The majority of the youth have lead impoverished lives. Regardless of their background this time of incarceration is a stressful period for these adolescents. Alleviating their anxiety and helping them develop skills for their release is of critical importance.

What has been done

4-H has created a horticulture therapy program for the youth. The objectives of the program are to introduce them to the therapeutic elements of horticulture and to instill in them the life skills of persistence and perseverance. On a regular basis the Rutgers Cooperative Extension Program of Union County meets with the youth to plan, plant and maintain a horticulture therapy area. In the area ornamentals are grown and then given as gifts to their visitors. Additionally, produce is grown in the garden and used as the focal point of nutrition lessons.

Results
The program is well supported by the administration of the Union County Human Services Department. They have viewed the program and were very pleased with its accomplishments. Approximately 35 youth have participated in the program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #3

1. Outcome Measures

Long Term - Youth demonstrate mastery and competencies needed to become engaged by assuming leadership positions in communities; developing and implementing action plans to address community needs, and becoming productive members of the workforce. 4-H youth are engaged partners in decision making regarding RCE programming including but not limited to 4-H youth development programming. 4-H alumni and volunteers become engaged citizens by assuming leadership positions in communities. Youth development professionals and stakeholders influence decision makers in policy development related to youth development needs and issues.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Atlantic County Community and Partnership Development

Community and partnership development is critical to empowering people, building healthy and sustainable communities, and renewing neighborhood pride through education, resource development, and advocacy. Partnerships are absolutely critical in this economy to maximizing

success and development impact. Partnering with a variety of community based organizations, non-profits, educational systems, and businesses is critical in addressing the broad range of factors affecting economically distressed youth, families, and communities within Atlantic City, as well as others throughout Atlantic County. Four of Atlantic City?s casinos have shut down, 8,000 workers have lost their jobs, and revenue has continued its 8-year decline. Although state officials are considering numerous tax and financial aid packages for the city?s municipal finances, none have been enacted yet. Despite the city?s 30% poverty rate, the district is not declared an Abbott district due to casino tax revenues. One of the negative results of the casino closings and loss of taxes is the budget cut of $40 million from the city?s school district.

What has been done
The Atlantic County 4-H Youth Development Program has been integral in the establishment and workings of The Community Engagement Committee, which provides awareness to the Atlantic County community on minority overrepresentation in the juvenile justice system. As a member of the Youth Services Commission 4-H is a part of quarterly community meetings to address issues, identify current programs, and working on programs needed, the 4-H Youth Development Program has partnered with numerous organizations to share resources and implement programs, as well as participate in numerous community fairs/expos.

Results
4-H is in partnership with Atlantic Cape Community College?s GEAR UP mentor program. 4-H provides monthly mentor training workshops on asset building activities and reflection strategies. 4-H is now on the schedule of afterschool programs at 6 partner schools in Atlantic City and Pleasantville to provide SET (science, engineering, and technology) and workplace readiness skills programs. 4-H Youth Development is a designated program that police stations may require a youth to participate in as opposed to being charged for minor offensives as allowed under the policy. 4-H implements Taking Charge: A Framework for Personal Development, a program initially funded through a State Community Partnership Block Grant for first time, low-level offenders.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #4

1. Outcome Measures

4-H Science, Technology, Engineering and Math - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
4-H Science, Technology, Engineering and Math

There is an overall decline in student achievement in STEM. 4-H as one of its mission mandate areas has dedicated resources and expertise to expand and improve STEM programming in NJ.

What has been done
Our 4-H Rutgerscience Saturday program engages young people grades 5-9 in cutting edge science at Rutgers University. Students work with university faculty to explore current areas of research. The Climate Change Teen Summit is for high school age youth. The Climate and Environmental Change Summit is a multi-day on campus event
for middle and high school students designed to increase knowledge and understanding of climate change science through interaction with Rutgers University scientists. Ocean days for K-12 students (3-5, 6-8 9-12) bring students to campus to study current ocean science themes and conduct a ?science fair? on campus in collaboration with Rutgers oceanographers and environmental scientists. The Science of Soil program engages middle school youth in learning about New Jersey soil. The program culminates in a citizen science project that invites students to collect soil data and share it using a specially developed iPad app. Finally, the 4-H Summer Science program brings 9-12 grade students from NJ urban centers to campus for a week long residential program. This program is designed to encourage underrepresented youth in STEM careers.

Results
For the Climate Change Teen Summit, after the program, students? perception of climate change was measured to determine how they felt about climate change and what they thought they could do about it in the context of their communities. Overall, the 2014 participants felt empowered to be leaders within their communities and that environmental issues (such as climate change) were worthy of their time and attention. Over the four years we have
been offering the 4-H Climate and Environmental Change Teen Summit, 100% of the students noted in their post survey they could make a positive impact by reducing their carbon footprint and encouraging others (family, school, and friends) to do the same. The focus of the 2014 Summit is coastal resiliency and adaptation, with funding from Kresge Foundation. Students participating in the Ocean Days program all reported positive opinions of the ocean and their role in environmental issues. The majority of students reported an increase in understanding of ocean and environmental science content knowledge as well as an increase of their understanding of the nature and process of science. In the 4-H Summer Science program we see positive shifts in

young peoples? perception of their own participation in science. Pre and Post test results (n=60) show youth are more interested in working with scientists to solve problems and learning about new science discoveries. The camp also increased participants? perception of science as exciting (not boring) and that they as students of science are good at it and can learn science.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #5

1. Outcome Measures

6th Annual Rutgers Summer Science Program - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
6th Annual Rutgers Summer Science Program

There is an overall decline in student achievement in STEM. 4-H, as one of its mission mandate areas, has dedicated resources and expertise to expand and improve STEM programming.

What has been done
The Rutgers Summer Science Program was established in 2009 as an opportunity for traditionally underserved youth to: learn more about science, explore research occurring on campus, and gain a better understanding of opportunities available in science, engineering, and technology; explore opportunities available at Rutgers University, experience campus-life, and learn about post-secondary education; prepare to serve as a 4-H Science Ambassador in their home community. In its sixth year, sixty-three (63) high school youth from six urban counties throughout New Jersey participated in the campus-based portion of the program, at the Rutgers School of Environmental

and Biological Sciences (SEBS). During their weeklong residential experience, they explored science through hands-on activities in animal science, biomedical science, biotechnology, engineering, exercise science, food science, geospatial technology, landscape architecture, marine science, microbiology, and nutritional science. Youth participated in discussions, workshops, and lab tours by faculty, staff, and graduate students. During the week, they also learned about campus life and the opportunities available at Rutgers from an undergraduate student panel and a representative from SEBS. The experience also helped prepared them to become 4-H Science Ambassadors. As 4-H Science Ambassadors, they returned home and worked with their local 4-H program to promote 4-H and science to other youth.

Results

Student participants reported that, ?Subjects I thought I loathed were subjects that I want to look into. This would not have been possible without the scientists I worked with. The scientists were very helpful and clear on what they taught us, and they were fun and helped relieve some worries about college. The physics lecture was especially entertaining and enlightening. I loved their passion for what they were teaching. The love for the subject made me very interested in that specific science. My experiences with the scientists were very interesting and beneficial. Being introduced to many fields of science was a good experience, and opened up my mind to many possibilities. I learned to be more open with people and ask more questions. All the scientists were very helpful and caring and open. They wanted to do anything in their power to help us learn. I wasn't afraid to ask them questions and they honestly enjoyed having us ask them questions. It was very interesting to learn more about their jobs and learn how they got to where they are now. It was very interesting to have a talk with several scientists and ask them questions about their field that they specialize in. Moreover, it seems I was able to connect and discover mutual emotions through their story.?

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #6

1. Outcome Measures

Middlesex County 4-H Project GIFT - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Middlesex County 4-H Project GIFT

To compete in this global economy, youth must be able to identify and solve real problems, use appropriate tools, reason effectively and apply critical thinking skills. Development of these life skills can enhance personal behavior and professional conduct in life and careers. Opportunities for service learning are critical to the overall development of youth.

What has been done
The goal of the 4-H Project GIFT event is to provide underprivileged families with the opportunity to ?shop for free? for gifts for their children, thus making the holidays more affordable through a service learning project developed by 4-H members. To increase an awareness of community issues and issues and needs for ?youth and families at risk? in 4-H teens and adults, to increase teamwork, communication, problem solving, and organizational skills within the 4-H Teen Council group, to provide youth and adults an opportunity to work together as partners in developing a project to address a critical community need, to provide a sense of accomplishment, positive self-concept and empowerment in youth and adults involved in implementing the program. The program is run as a youth-adult partnership with teens and adult volunteers having equal roles in the planning and running of the program.

Results
End of program evaluations for 4-H teens demonstrated that teens learned and practiced the following skills as a result of their participation in the Project GIFT program. In the past 5 years the number of teens participating in the planning and implementation of the program has increased from 55 to 80. Through end of program evaluations, 4-H teens indicate that they have increased their skills in the areas of teamwork, organizational skills, responsibility, youth-adult partnerships, and empathy and concern for other?s needs. Of the 4-H teen participants surveyed, 90% rank Project GIFT as the most valuable project they do in 4-H. 4-H teens have reported that when applying for colleges they used their experiences in Project GIFT in their essay for college applications Over 350 children from 140 families were reached in 2014.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #7

1. Outcome Measures

Lindley G Cook 4-H Youth Center for Outdoor Education: Science, Engineering and Technology Camp 2014 - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Lindley G Cook 4-H Youth Center for Outdoor Education: Science, Engineering and Technology Camp 2014

America faces a future of intense global competition with a startling shortage of scientists. Only 18 percent of U.S. high school seniors are proficient in science (NAEP 2005) and a mere 5 percent of current U.S. college graduates earn science, engineering, or technology degrees.

What has been done
To address increased demand for science and technology professionals, 4-H set out to reach young people in science programs. 4-H Science programs engage youth with hands-on learning to ensure global competitiveness and prepare the next generation of science, engineering, and technology leaders. The residential SET camp provides non-formal education with hands-on inquiry-based learning in a youth development context. Classes were developed using a number of resources, including the ?Design It! Engineering in Afterschool Programs? curriculum, which is the foundation of the Super Coasters class. The Sea Perch kits were highly successful in the Ocean Robotics course. Resources from NASA and ESTES were used in the rocketry program.

Results
Campers were surveyed online after their experience at SET camp. At camp, the children said they learned: to work as part of a team 87.5%, to try new things 87.5%, that learning can be fun 62.5%, to feel good about myself 62.5%, grown-ups can be fun too 87.5%, to respect and get

along with all different kinds of people 75.0%.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #8

1. Outcome Measures

SET Programs in Somerset County - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
SET Programs in Somerset County

The 4-H Science Initiative is one of the National 4-H Mission Mandates. It is the 4-H program's contribution to improving science technology, engineering and applied math (STEM) education in New Jersey. 4-H is responding to our nation's concern for improving human capacity and workforce abilities in STEM areas by combining non-formal education with hands-on inquiry-based learning in a youth development context.

What has been done
The Somerset County 4-H Science-sational Day is an opportunity for youth grades 1-6, to get excited about science and science concepts, learn how to apply them in ?real world? settings, and see how adults use these skills in their career or hobbies (thus helping to answer the age old question, ?why do I have to learn this??). Volunteers from the community, local corporations, and 4-H leaders and members teach the workshops. Morris County 4-H also conducted a Science-sational Day.

Results
Somerset County 4-H Science-sational Day In 2014, 200 youth participated. Evaluations show that: ? 94% learned something new about science due to Science-sational Day ? 96 % think the day is good or great. ? 76% learned more about 4-H. 2014 surveys completed by parents show that: ? 91 % of parents felt that the program was a very valuable educational experience for their child ? 95 % would sign their child up again ? 100 % felt the program encouraged their child's interest in science. Through the program, Somerset County 4-H has built strong relationships with local corporate partners. Not only do the scientists present workshops at Science-sational Day, they now help with judging at the fair, donate money to other programs, and recognize Somerset County 4-H as one of the best positive youth development programs in the county. On average, 100 educators/year attend Educator Workshops and Webinars. 6,000 youth participated in a school enrichment programs, additional youth were reached through the Morris County event with similar evaluation results.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #9

1. Outcome Measures

2014 Be a GEEK - Great Engineering Experiences for Kids - Camp - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
2014 Be a GEEK - Great Engineering Experiences for Kids ? Camp

There is a growing disconnect between the skills that employers need in an increasingly technological world and the lack of these skills in today?s youth and young adults. Considering that a 2-year degree in a STEM field is worth more than a 4-year liberal arts diploma, providing STEM education in non-formal settings can be a vital link between education and workplace readiness.

What has been done
Building on the success of the first Be a GEEK (Great Engineering Experiences for Kids) Camp in 2013, the Atlantic County 4-H Youth Development Program continued its commitment to increase youth interest, excellence, and participation in national 4-H SET ? Science, Engineering, and Technology ? mission mandate educational programs. Following the basic principles of the Design It and Explore It curriculum series, the program allows for the development of basic engineering principles, exemplifies the design process, and promotes problem solving. Incorporating the experiential learning philosophy of 4-H and making learning relevant, the 2014 program involved food engineering and mechanical engineering focusing on saltwater taffy. Youth explored food engineering, combining science, microbiology, and engineering, and the engineering of simple machines in making a taffy puller. The county 4-H agent developed all relevant instructional materials and working prototype. The agent and two county 4-H program associates conducted the activities. Three 4-H Ambassadors also provided time and assistance during the 2-days.

Results
A total of 30 youth participated in the 2014 2-day program with 33% returning participants from 2013. Participants completing a retrospective pre/post program evaluation (n=26) indicated the following impacts: ? 47% change in what they know about how gears turn objects ? 46% change in knowledge of simple machines ? 44% change in understanding that pulleys make work easier ? 32% change in using the engineering process to make improvements ?30% change in knowledge of force and mechanical advantage principles Participants also indicated: ? 62% rated the overall program as EXCELLENT (31% as VERY GOOD) ? 54% rated the presenters as EXCELLENT (38% as VERY GOOD)

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #10

1. Outcome Measures

North Jersey 4-H Teen Conference (NJTC) - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
North Jersey 4-H Teen Conference (NJTC)

Inspiring and training youth to become leaders is important. Defining what a leader is or does can be tricky, 4-H provides youth with the knowledge and awareness to develop the capacity to lead.

What has been done
The North Jersey 4-H Teen Conference (NJTC) is a 3-day educational program for 4-H members in grades 8 through 13 (the first year of college) from 10 counties in northern New Jersey. The development of this conference was based on demonstrated interest of 4-H teens in coordinating a conference for teens in the northern New Jersey 4-H counties. Started in 2008, the conference focuses on leadership development, team building, service learning and building youth-adult partnerships. A planning committee of 4-H teens and adults representing their respective county 4-H programs meet monthly to plan, implement, deliver, and evaluate the conference. The planning committee has more teens than adults (by more than a 2:1 ratio) and is truly an example of a successful youth ? adult partnership.

Results
The team consists of staff/volunteers/and youth from nine North Jersey Counties. This program was the 2013 National Winner for the Beyond Youth Leadership Award from the National Association of 4-H Extension Agents. Adult Volunteers and County 4-H Staff In 2014 end-of-program surveys were conducted with adult volunteers and 4-H staff involved in the NJTC conference. As a result of this experience, adults reported that (n=14): ? 93% believe NJTC was a success (7% did not answer the question) ? Comments included: ? ?Youth left feeling positive about the experience indicating an interest in returning and recruiting new participants.? ? ?Teens had a great weekend full of educational and fun learning activities, learning skills and knowledge, and learning life skills.? In 2014, planning committee members indicated the following skills learned or gained as a result of their participation in the conference (n=28): ?82% gained the ability to work effectively in partnership with adults ?89% gained leadership skills ?89% gained communication skills ?75% gained better teamwork skills ?82% gained responsibility ?75% gained planning and organizing skills ?75% gained self-confidence ?57% gained self-esteem ?61% gained self-motivation ? 61% gained increased ability to speak in public 2014 Teen planning committee members commented that as a result of NJTC they will: ? Be part of planning committees in college ? Use the skills learned to better plan for events for the club ? Take more responsibly in my county ? Tell people about what I learned and experienced ? Plan more things to share with other teens ? Use the skills I gained or improved to become a more active member

in the activities I do.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #11

1. Outcome Measures

Ethics/True Colors - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Ethics/True Colors

Traits like honesty, responsibility, compassion, and respectfulness may seem like expensive luxuries, but they're priceless assets when it comes to building enduring and rewarding relationships with teachers, co-workers, friends, and families. Human beings are social creatures and thrive in relationships with others.

What has been done
The Ethics/True Colors program is provided to all new 4-H members and volunteers in Atlantic County schools and outreach programs/organizations. Ethics/True Colors is geared at having participants find their "True Color" from a personality ID assessment, and then discovering what makes them that specific color/category. Through group activities and interaction, the youth learned how to understand other people and then how to "make it work" when there is conflict between color groups (people). Additionally, information on the six pillars of character and ethical decision making was provided. Participants learned how to enhance their relationships with other

people, the characteristics that everyone should live up to, and things to consider when making decisions.

Results
Surveys show that as a result of the Ethics/True Colors program, participants felt they understand themselves better and therefore can understand and work with others better, learned about character building and the six pillars of character, and learned ways to improve their decision making processes. The surveys indicated the following: ? 99% of participants feel they understand themselves better ? 95% of participants feel they can identify individual attributes of others and can work with them better ? 91% of participants understand the characteristics everyone should live up to ?90% of participants know ways to improve their decision making processes to make ethical/healthy decisions Participants noted the following at the conclusion of the program: ? "This self-discovery process is a powerful tool to help optimize my life!" ? "Identifying my personality and the personalities of others provided me with helpful insights into different motivations, actions, and communication approaches." ? "A beneficial and enjoyable program. I enjoyed the piece on building and improving character, as well as the part about understanding and nurturing ourselves and our relationships."

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #12

1. Outcome Measures

"Discover the Leader in You!" 4-H Conference - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

"Discover the Leader in You!" 4-H Conference

Leadership is an essential life skill to develop in both youth and adults. Leadership development enables individuals to initiate qualities, which can make them a leader and guide others to be more productive. Leadership includes personal qualities such as communication skills, problem-solving capabilities, ability to work with and manage others and oversee tasks, etc. In today?s world, human productivity and success are a result of leadership skills and abilities. The unpredictable challenges of the future emphasize the need for effective leaders.

What has been done
The ?Discover the Leader in You? 4-H Conference was planned and implemented in Spring 2014. The conference included large and small group interactive and hands-on activities focusing on leadership and personal development. The purpose/objectives of the program were to provide an opportunity for program participants to: ? Develop an understanding of leadership and who is a leader. ? Identify qualities and characteristics of effective leaders. ? Develop an understanding of leadership skills and characteristics. ? Increase their awareness about the seven leadership life skills (understanding self, communicating, getting along with others, learning to learn, making decisions, managing, and working with groups).

Results
The evaluation methods for this program included an End-of-Program Evaluation. Evaluation results are as follows: ?95% of the program participants indicated that as a result of participating in the conference they learned ?a lot? about leadership. ? 84% learned ?a lot? about leadership skills and characteristics. ? 98% indicated that they plan to use what they learned. ? 96% plan to take on more leadership roles in their 4-H club and/or county 4-H program. ? 100% of the participants rated the program as ?Great? or ?Good?. ? 76% of the participants indicated that they ?Strongly Agree? or ?Agree? that as a result of their participation in the conference they have a greater interest in leadership. ? 75% of the participants indicated that they ?Strongly Agree? or ?Agree? that as a result of their participation in the conference they feel comfortable taking on a leadership role. ? As a result of participating in the ?Discover the Leader in You!? 4-H Conference, five youth applied and were selected to attend Leadership Washington Focus at the National 4-H Center in July 2014.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #13

1. Outcome Measures

County Special Interest Camps: Cooking and Science Camp - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
County Special Interest Camps: Cooking and Science Camp

Historically, Ocean County had no extensive program or camp that would allow students to engage in food science or the science of food. However, there existed a strong interest in increasing the number of science based programs offered to 4-H youth.

What has been done
Ocean County 4-H has been operating a summer program/camp for 4-H members, which provided an opportunity for youth to learn about both science and food. During three morning sessions, youth prepare food that is served for lunch and afternoon snack. The program focuses on safe food handling and food preparation skills. In the afternoon youth conduct experiments or face engineering challenges as they engage in science activities. This part of the program focuses on engineering process and experimental design. Field trips focus on the intersection of food and science. Program Objectives: Youth will increase their: ?knowledge, ability, skill, and attitude related to science, engineering, and cooking. ?interest in science and cooking. ?confidence and ability to cook meals. ?confidence and ability to be an engineer.

Results
The results show increases in their confidence and attitudes. In addition, participants indicated an increased relationship between cooking/food and science. (1=none, 4=a lot). How much do you know about? ?solving challenges like a scientist does? - 48% increase ?building your own designs? - 40% increase ? testing what you built like a scientist does? - 51% increase ?making observations like a scientist does? - 49% increase ?redesigning your original design to solve a challenge - 57% increase ?farming and farm life? - 45% increase ?maintaining a safe environment while cooking? - 34% increase ?using kitchen tools correctly? - 27% increase how confident are you as an engineer? - 60% increase how confident are you that you can cook meals? - 47% increase how much do you like science? - 13% increase how much do you like cooking? - 17% increase how much do you think cooking and food are related to science?

4. Associated Knowledge Areas

KA Code	Knowledge Area

806 Youth Development

Outcome #14

1. Outcome Measures

Essex County 4-H Farm Camp - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Essex County 4-H Farm Camp

In Essex County, youth do not typically have a chance to experience first-hand where there food comes from.

What has been done
The 4-H farm camp supports youth development by promoting a positive interest in nature and encouraging awareness and interest in farming and agriculture. Our mission is to provide the best camp experience for your children, while also providing a beneficial learning experience about food, our earth and nutrition. All campers learn about farming and gardening in small groups, taught by a team of 4-H staff, Master Gardener volunteer, guest presenters, 4-H teen interns, and college interns. Campers have the chance to get out into the field each day and work in the garden, getting their hands dirty by pitching in with the farm chores and learning a new theme centered around the garden. 4-H Farm Camps helps reconnect youth to nature and offers youth in Essex County a space to directly experience agriculture through our chickens, bees and community gardens. 90 % of the children shared their experience from camp with their family and friends.

Results
When asked if they learned about where food comes from; 93% of the children indicated that they learned "A LOT" about food when asked if they learned about anything new or different; 100%

indicated that they learned "A LOT of new and different things When asked if they would like to learn more; 86% of the children indicated that they would
When asked how to rate the program as poor, okay or excellent; -100% rated the program excellent In addition to the above survey results from program participants farm camp provided an opportunity for teens in the community to gain job skills through interning to help run youth groups at farm camp. 90% of families rated camp safety as excellent 85% of adults rated farm camp excellent 100% of youth rated the camp excellent Based on the above figures there was an overall satisfaction with Farm Camp. In addition to survey results from parents/guardians and youth, other key stakeholders including Montclair Community Farms collation partners, were impressed by the camp activities and community interest, asking for us to come back for the 2015 year.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #15

1. Outcome Measures

State 4-H Small Animal Educational Symposium - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
State 4-H Small Animal Educational Symposium

There were limited opportunities for youth, volunteers and parents to learn about small animals, rabbits, cavies, poultry and herpetology.

What has been done

The State 4-H Small Animal Educational Symposium hosted by the State 4-H Small Animal Project Advisory Council provided an opportunity for 4-H members, leaders and parents to participate in a variety of educational events all in one day. Activities and events included: rabbit hopping contest, art show, avian bowl, animalology contest, judges writing workshop, reptile workshop, show etiquette workshop and poultry, rabbit & cavy showmanship workshops. Thirty (30) youth and 18 adults plus the 11 youth and adults who assisted with workshops and events from 9 counties (Atlantic, Burlington, Cumberland, Gloucester, Mercer, Middlesex, Monmouth, Ocean and Salem) attended the event. The purpose/objectives of the program were to provide an opportunity for program participants to: ?To develop an understanding of rabbit, cavy & poultry showmanship procedures and techniques and the skills necessary to properly show an animal. ?To learn the procedures and knowledge needed for the 4-H Avian Bowl. ?To learn the procedures and techniques for 4-H rabbit hopping. ?To provide a fun and educational venue for 4-H rabbit, cavy, small animal, poultry and herpetology project members to interact.

Results

The evaluation methods for this program included an End-of-Program Evaluation. Evaluation results are as follows: ?79% rated the poultry showmanship workshop as ?excellent? and 21% rated it as ?good?. ?92% rated the rabbit showmanship workshop as ?excellent? and 8% rated it as ?good?. Several participants indicated that the workshop was very informative and they learned a lot. ?89% rated the writing for show judges workshop as ?excellent? and 11% rated it as ?good?. ?83% rated the art show and rabbit hopping event as ?excellent? and 17% rated it as ?good?. ?100% rated the animalogy quiz bowl and show etiquette as ?excellent?. ?Program participants indicated that they developed skills as a result of participation in the program (63% developed self-confidence; 60% developed communication/public speaking skills; and 77% developed skills related to working in groups). ?51% of the participants indicated that the event was ?very valuable? and 37% stated that it was ?valuable?. ?71% of the participants rated the symposium as ?excellent? and 29% rated it as ?very good?. Some of the comments from the participants regarding what they liked best about the symposium included: ?everything?, ?educational aspect?, ?knowledge the presenters had to share?, friendly & helpful staff?, fun and very informative?, ?poultry showmanship and the fact the children got to bring their own chickens?, ?getting to experience an avian bowl?, ?I learned how to train my rabbits to hop over poles?.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #16

1. Outcome Measures

4-H Public Speaking Program - Medium Term - Youth apply knowledge, attitudes, skills, and behaviors needed to become competent, caring and contributing citizens by: taking on leadership roles in their youth organizations and schools, and working in partnership with adults in a variety of settings. Youth and adults demonstrate effective partnerships through increased youth participation on advisory committees and other governing bodies. Volunteers and youth development professionals apply practices fostering positive youth development.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
4-H Public Speaking Program

Public Speaking remains American's #1 fear. However, effective public speaking is a skill that youth will use throughout life, in the workforce and within their communities. Public speaking teaches youth to organize their thoughts and encourages the development of poise and self-confidence. With public schools increasingly stretched to teach toward test outcomes, formal opportunities to hone public speaking and presentation skills is not often included in county classrooms. Learning communication skills helps young people in their education and prepares them for workforce, civic, and family roles they will assume as adults. Public speaking skills are highly ranked as an important skill set for professionals. Public speaking has been a key component of the 4-H program throughout its 100+ year history.

What has been done
4-H youth select a topic, organize their information, prepare visuals such as posters and power point presentations, and practice their performances prior to the contest. This preparatory work takes place individually and at the club level, with guidance from parents and club leaders.

Results
Youth participants? 4-H Public Presentations nights indicated on end-of-program evaluations that they learned or gained the following skills as a result of their participation in the event. They plan to deliver future presentations, speak clearly, improved listening skills, how to tell story to generate interest, improved eye contact, better able to receive constructive feedback, how to research topics, and confidence in speaking ability.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #17

1. Outcome Measures

New Brunswick 4-H Youth and Community Development - Long Term - Youth demonstrate mastery and competencies needed to become engaged by assuming leadership positions in communities; developing and implementing action plans to address community needs, and becoming productive members of the workforce. 4-H youth are engaged partners in decision making regarding RCE programming including but not limited to 4-H youth development programming. 4-H alumni and volunteers become engaged citizens by assuming leadership positions in communities. Youth development professionals and stakeholders influence decision makers in policy development related to youth development needs and issues.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
New Brunswick 4-H Youth and Community Development

A significant portion of New Jersey?s Spanish speaking youth are at a substantial risk for negative life outcomes including poor health, substance abuse, school failure and violence, due to poverty ? many are new immigrants and live in communities facing generational poverty and the concurrent challenges of such poverty. At the same time, Latino communities are further isolated due to language and cultural barriers. Research demonstrates that culturally responsive education provides the means and opportunity to develop the basic skills youth need to become responsible family members, participants in the work force, and contributing residents.

What has been done
Previous programs for the Latino community have been short term educational programs in schools during after school, but have not resulted in a sustained youth development program in the community. The New Brunswick 4-H program was developed to meet these needs, utilizing the structure and philosophy of 4-H, while working in collaboration with community organizations and Rutgers University students. For the past 5 years the New Brunswick 4-H program has been successful in meeting these needs. New Brunswick 4-H continues to provide opportunities for youth grades K-13 to participate in clubs and special interest programs with a focus on developing skills in communication, leadership, citizenship, decisional making and development of a positive self-concept. This has been accomplished through 4-H club and special interest

programs with project areas including robotics, leadership, citizenship, general science, arts, dance, sports and fitness, food and nutrition, environmental science, culture and citizenship. Special interest programs in after-school settings with a focus on robotics, food and nutrition, arts and crafts and gardening continue each year due to requests from schools and community organizations. AmeriCorp VISTA volunteers serve as 4-H club leaders and, work with management and marketing of the program, and assist with fund development. Rutgers University students serve as 4-H club leaders and other Rutgers University students do internships working within the 4-H program. New Brunswick High School students take part in internships in 4-H and assist with the implementation of after-school educational programs. Program Objectives include: ?Provide a positive youth development experience for underserved Latino Youth. ?Develop leadership skills in youth and adults. ?Enable adults in the Latino community to assist with the running of club and projects. ?Provide positive leadership development opportunities for youth and adults. ?Provide an opportunity for youth to develop and maintain community and cultural connections. ?Build family strengths in the Latino community. The visibility and credibility of 4-H in New Brunswick has increased and there has been a 50% increase in requested for collaborative efforts and youth educational programming from community organizations over the past two year. The increase in requests for collaborative efforts has demonstrated that the 4-H program is sustainable in New Brunswick due to demonstrated interest in the program and an increasing sense of trust and respect.

Results

New Brunswick 4-H teens have not only become fully integrated into the 4-H program but are taking initiative and leadership in the development of these programs. ? An observational assessment was completed by 4-H adult volunteers with 4-H clubs and special interest programs. These assessments indicated a continued increase in demonstrated communication and cooperation skills; and indicated that youth can work together to set goals and solve problems, show an increase in public speaking and communication skills, and a strong increase in leadership skills. ? Retrospective pre-post surveys were conducted with 4-H youth. Survey results indicated an increase in goal setting skills, communication skills, decision making skills, and an increase in the interest in participating in community service projects. ? Ongoing collaborations have continued with different community and university organizations. In 2014, there was another 50% increase in requests for collaborative programming and New Brunswick 4-H has assisted with a Catholic Charities summer camp, after-school programming at the New Brunswick Charter School, a community ?Trunk or Treat? program, New Brunswick library educational programs, the Raritan River Festival, NB HUB Teen Center events, Internship programs for High School students, Citizen?s Campaign workshops and Environmental Commission programs. Collaborators that traditionally provide programs for adults in the community indicate that 4-H is a respected organization to partner with for youth programming. Currently, New Brunswick 4-H is working with partners to secure additional grant funding to support youth programming. ? New Brunswick 4-H became a site working with the Bristol-Myers Squibb Science Saturdays program in 2014. ? An increase in internship opportunities for Rutgers University students have been developed and the number of Rutgers University students working with the 4-H program has doubled since 2013. New partnerships with Rutgers University departments formed in 2014. ? Grant funding from an ongoing collaboration with the Unity Square partnership was secured and is currently providing funding to support new 4-H clubs and special interest programs. Due to continued increase in partnerships and collaborations with local agencies and Rutgers University departments, the New Brunswick 4-H program has increased its visibility and credibility. There is a sustainable process in place for recruitment and retention of 4-H programs.

4. Associated Knowledge Areas

KA Code	Knowledge Area

806 Youth Development

Outcome #18

1. Outcome Measures

Elizabethport 4-H Program - Long Term - Youth demonstrate mastery and competencies needed to become engaged by assuming leadership positions in communities; developing and implementing action plans to address community needs, and becoming productive members of the workforce. 4-H youth are engaged partners in decision making regarding RCE programming including but not limited to 4-H youth development programming. 4-H alumni and volunteers become engaged citizens by assuming leadership positions in communities. Youth development professionals and stakeholders influence decision makers in policy development related to youth development needs and issues.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Elizabethport 4-H Program

The Elizabethport section of Elizabeth, N.J. is one of the poorest neighborhoods in Union County.

What has been done
The Union County 4-H program offers enrichment activities in cooking, nutrition, gardening, along with field trips ? all woven into the values and standards of a 4-H Club to youth living in Elizabethport.

Results
On average, 40 children participate in the program each year. Thanks to 4-H programming many of the youth, (4-H has run this program since 1993), have gone to college, trade schools, and military service. 4-H has helped these children stay on the pathway to success.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #19

1. Outcome Measures

New Jersey 4-H Youth Development - Long Term - Youth demonstrate mastery and competencies needed to become engaged by assuming leadership positions in communities; developing and implementing action plans to address community needs, and becoming productive members of the workforce. 4-H youth are engaged partners in decision making regarding RCE programming including but not limited to 4-H youth development programming. 4-H alumni and volunteers become engaged citizens by assuming leadership positions in communities. Youth development professionals and stakeholders influence decision makers in policy development related to youth development needs and issues.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
New Jersey 4-H Youth Development

A commitment to high-quality, positive youth development is at the core of 4-H?s work with young people in New Jersey. The 4-H Youth Development Program prepares young people to make a positive impact in their communities and the world.

What has been done
The Rutgers Cooperative Extension, 4-H Youth Development Program uses a learnby-doing approach to enable youth to develop the knowledge, attitudes and skills they need to become competent, caring and contributing citizens of the world. This mission is accomplished by using the knowledge and resources of the land grant university system, along with the involvement of caring adults. The 4-H Youth Development Program is part of Rutgers Cooperative Extension. 4-H educational programs are offered to all youth, grades K-13 (one year out of high school), on an age-appropriate basis, without regard to race, religion, color, national origin, ancestry, age, sex, sexual orientation, gender identity and expression,
disability, atypical hereditary cellular or blood trait, marital status, civil union status, domestic partnership status, military service, veteran status, and any other category protected by law. In 2014, 59,972 youth (*duplicates included) participated in the following ways: 12,582 youth were members of organized 4-H clubs (community, in-school, after school and military), 7,162 youth were members of 4-H special interest/short-term programs, 955 youth participated in camping

programs, 38,177 youth were involved in 4-H school enrichment programs, 436 youth participated in 4-H individual study programs, 660 youth participated in after-school education programs. NJ 4-H Project Enrollment: Science, Engineering & Technology 34,254 Healthy Lifestyles 19,911, and Citizenship 13,956.

Results
The 4-H Youth Development Program is preparing young people to make a positive impact in their communities and the World. An in-depth study by Tufts University has discovered that, when compared to other youth, young people involved in 4-H: ?Have higher educational achievement and motivation for future education. ?Are more civically active and make more civic contributions to their communities. Volunteers are essential to the successful delivery of 4-H programs to youth. This year 3,748 adult volunteers donated, on average, 220 hours per year preparing for club meetings and teaching youth. According to the Independent Sector, the value of volunteer time for New Jersey in 2013 was $25.33/hour. This equates to more than $22.8 million in time donated to New Jersey 4-H. There were also 372 4-H teen volunteers who shared their skills with younger 4-H members and with other youth in their communities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #20

1. Outcome Measures

Passaic County 4-H SET (Science, Engineering and Technology) Ambassadors Program - Long Term - Youth demonstrate mastery and competencies needed to become engaged by assuming leadership positions in communities; developing and implementing action plans to address community needs, and becoming productive members of the workforce. 4-H youth are engaged partners in decision making regarding RCE programming including but not limited to 4-H youth development programming. 4-H alumni and volunteers become engaged citizens by assuming leadership positions in communities. Youth development professionals and stakeholders influence decision makers in policy development related to youth development needs and issues.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Passaic County 4-H SET (Science, Engineering and Technology) Ambassadors Program

Urban communities like Paterson, Passaic and Clifton in Passaic County tend to have lower graduation rates and higher rates of poverty and unemployment ? all contributing to educational deficits. According to the National Science Foundation?s Strategic Plan for 2011-2016 ?the nation must maintain a robust science, technology, engineering, and mathematics workforce.?

What has been done
Rutgers 4-H Samsung Summer Science Program and became Passaic County 4-H SET Ambassadors for the 2014-2015 year. Each teen was trained to teach activities based on topics they had explored throughout their week long Rutgers science experience. Teens are exposed to the activities and then must practice teaching the project to other teens in order to receive feedback and improve their teaching skills. After completion of their week long Rutgers 4-H Samsung Summer Science Program participating teens depart camp with all of the necessary activity supplies to support them as Passaic County SET Ambassadors with the goal of sharing the knowledge they gained with other youth (K-12) in their home communities. Upon returning back home many Passaic County 4-H SET Ambassadors meet as part of the Passaic County Teen Crusaders club, receive additional training and plan science programs and events in their home towns.

Results
The Passaic County teens that participate in the Rutgers 4-H Samsung Summer Science program and become Passaic County SET Ambassadors are able to learn about the different areas of science that many have never before explored. Passaic County 4-H SET Ambassadors feel they have gained by being a SET Ambassador: ?gained experience in teaching other students, an opportunity to learn [herself], and involvement in a great organization.? ?An understanding of what science is, and how to share the enjoyment of science with others.? 4-H SET Ambassadors feel has been the best part of giving back to their community: Is feeling like a vital part of it. It is one of the only times that [she feels she is] part of a greater whole and can actually have an influence on someone?s life. Seeing other students apply the knowledge, ?favorite part about teaching is learning from the ideas that kids come up with. Rather than sticking to the box, they go completely outside of it. The next generation of coming into the adolescents will definitely be one to look out for.? Many of the past Passaic County 4-H SET Ambassadors who participated in Rutgers 4-H Summer Science between the years of 2009 and 2011 are currently enrolled in a variety of colleges including: Fairleigh Dickinson University, Columbia University, Montclair State University, Voorhees College, William Paterson University, the New Jersey Institute of Technology, Berkley College, Carnegie Mellon University, Pennsylvania State University, Seton Hall University, Passaic County Community College and Rutgers University. At these universities these former SET Ambassadors are majoring in a variety of science fields including: computer science, mechanical and computer engineering, art, nursing, criminology, and diplomacy and international relations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

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.)
- Other (Youth risk factors)

Brief Explanation

None to report.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

NJAES research and extension outcomes related to this planned program were evaluated utilizing a variety of evaluation methods appropriate for each initiative to determine effectiveness on both a qualitative and quantitative level. For KASA and practice change we included the measurement of knowledge gained as measured by pre/post Likert-scale assessments. Surveys were used to measure increase in skills acquired, behavior change and practice adoption. For process evaluation we focused on program delivery, participation, relevance and timeliness. Data was collected at appropriate times for each initiative that supports this planned program. IRB approved evaluation instruments were used to collect research and extension data. Data analyses comparisons relevant to basic and applied research and demonstration were collected and analyzed and reported utilizing a variety of data collection methods appropriate to each research question. The major goal of evaluating is the demonstration of social, economic, behavior and environmental changes in conditions that contribute to improved quality of life as a result of participation in programs and benefits of research solutions. See state defined outcomes for detailed results of each initiative.

Key Items of Evaluation

None to report.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Global Food Security and Hunger - Agricultural Viability

☑ 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
205	Plant Management Systems	20%		20%	
211	Insects, Mites, and Other Arthropods Affecting Plants	20%		20%	
215	Biological Control of Pests Affecting Plants	20%		20%	
601	Economics of Agricultural Production and Farm Management	20%		20%	
604	Marketing and Distribution Practices	20%		20%	
	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	65.0	0.0	36.0	0.0
Actual Paid	40.0	0.0	16.0	0.0
Actual Volunteer	2584.0	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**
840115	0	1232397	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
3932462	0	5008696	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
476087	0	2328981	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Identify critical programmatic foci/needs based on Extension and stakeholder assessment. These can be broadly defined under three areas:

- Production BMPs (nutrient, pest, waste/by-products management, water quality and quantity, energy)
- Financial BMPs (marketing, labor, risk management, policy e.g. farmland preservation)
- Ag Systems (sustainable ag, organic ag, new crops and use/alternative)

Develop an inventory of local (county based), regional and statewide programs designed to meet these needs; identify team members and their roles.

Create a multi-task effort to generate and share research-based information with clientele through demonstrations, educational meetings and workshops, certification programs, trainings, development of recommendation and decision making guides, etc.

2. Brief description of the target audience

Stakeholders (broadly defined to include producers, processors, marketers, end-users, policymakers, legislators).

Commercial agriculture producers and end-users (such as marketers, processors, consumers, etc.).

Municipalities and other governmental and non-governmental agencies, etc.

3. How was eXtension used?

Faculty participated in answering "ask the expert" questions, learn professional sessions and the development of collaborative educational products.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	125383	0	16073	0

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

Patent Applications Submitted

Year:	2014
Actual:	38

Patents listed
8642769
8721767
8753642
4599872
201200019
201100393
201100381
201100252
201200020
200900136
201000094
201100364
201100365
201100363
201200486
200900347
200900343
201200487
201200123
201300356
201300368
201400071
201400137
201400191
201400206
201400224
201400236
201400070
201400404
201400405
201400510
201400511
201400133
201400138
201400346
201400298
201400002
13999932

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	85	91	176

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- A variety of strategies will be implemented to reach target audiences. This will include and not be limited to workshops, field visits, classes, newsletters, media releases, electronic communications,and publications.In addition a trained volunteer teaching base will be developed. Quantitative reports of participation will be collected.

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Short Term - Increases in knowledge and skills of agricultural and horticultural industry professionals will occur relating to: Nutrient management Pest management Waste/by-products management and utilization Improving water quality and conserving water Conserving energy Marketing skills Labor management Risk management Policy e.g. farmland preservation Sustainable ag and organic ag production methods New crops and use/alternative crops
2	Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.
3	Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
4	Evolution and Epidemiology of Emerging Single-Stranded DNA Viruses that Threaten New Jersey Agriculture - Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.
5	Mid Atlantic Secure Milk Supply Project - Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.
6	National Youth Agri-Science Summit - Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of

	improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.
7	Ensuring the Sustainability of the New Jersey Horse-racing Industry - Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.
8	Epidemiology and Management of Stone Fruit Diseases - Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.
9	2014 Sclerotinia Sclerotiorum (White Mold) Resistance Trial in Soybeans - Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.
10	Statewide Pomology and Viticulture Extension - Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.
11	4-H Animal Science Programs - Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or

	the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.
12	Annies Project New Jersey and Beyond - Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.
13	Crop insurance Education of NJ Farmers - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
14	Pepper Evaluations for Phenotypic Traits, Physiological Disorders, Diseases and Cultural Practices - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
15	Rutgers NJAES Strawberry Variety Release Project - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
16	Weed Control in Vegetables and Fruit - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
17	Resistance Management for Fresh-Market and Processing Vegetable Crops in New Jersey - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
18	Improving Economic and Environmental Sustainability in Tree Fruit Production through Changes in Rootstock Use - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
19	Extend and Maximize the Post-Harvest Quality of High Value and Perishable Crops - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
20	Metabonomic Detection of Abnormalities in Horses: A search for Early Diagnoses and Dietary Intervention and Potential Models for Human Disorders - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
21	Genetic Improvement of Woody Plants (Trees and Shrubs) for Ornamental Uses - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space,

	quality of life) and will support the agricultural industry socially, politically and economically.
22	Fungicides and Vegetables - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
23	Antioxidant Supplements, Oxidative Stress and Muscle Oxidation in the Young Racehorse - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
24	Weed Control in Cranberries - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
25	Molecular Mechanisms Regulating Skeletal Muscle Growth and Differentiation - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
26	Conservation and Utilization of Plant Genetic Resources - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
27	Turfgrass Breeding - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
28	Improving Sustainability, Efficiency, and Efficacy of Peach Disease Management Strategies: Biofungicides, Conventional Fungicides, and Abiotic Environmental Factors - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.
29	Nuances of Marketing Ethnic Specialty Vegetables and Herbs - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

Outcome #1

1. **Outcome Measures**

Short Term - Increases in knowledge and skills of agricultural and horticultural industry professionals will occur relating to: Nutrient management Pest management Waste/by-products management and utilization Improving water quality and conserving water Conserving energy Marketing skills Labor management Risk management Policy e.g. farmland preservation Sustainable ag and organic ag production methods New crops and use/alternative crops

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Development of an Efficient Clonal Propagation Method for Asparagus Propagation and Use It to Generate Heat, Salt and Drought Tolerant Asparagus Parental Lines

Asparagus has become an increasingly popular vegetable among consumers worldwide. Consumption in the United States alone has almost doubled since 1990. Once regarded as upscale and expensive, asparagus consumption has grown in part because it is rich in important nutrients and minerals, including folic acid, protein, betacarotene, niacin, Vitamin a, Vitamin C, Vitamin E., Vitamin K and dietary fiber, among others. Within the United States, asparagus production is largely concentrated in four states: California, Michigan, New Jersey, and Washington. Domestic production is insufficient to meet domestic demand, and the United States is the world?s largest importer of asparagus.

What has been done
NJAES researcher is exploring the use of somatic embryogenesis for large-scale clonal propagation of asparagus.

Results

NJAES researchers have developed an effective and efficient somatic embryogenesis protocol that can produce clones ready to be transferred to greenhouse established an efficient protocol for generation of asparagus somatic embryos. This procedure has the potential to facilitate production of a large number of parent plants in much shorter time. This will decrease costs of production for U.S. asparagus producers, allowing them to expand production to better meet domestic demand for this increasingly popular vegetable. Since somatic embryogenesis can be an efficient tool to recover plants from mutant cells that exhibit desirable traits such as better tolerance to heat and drought, this method can also be used in asparagus breeding programs to develop new and improved varieties of asparagus that are better adapted to changing growing conditions as a result of climate change and other factors.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #3

1. Outcome Measures

Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Milk Quality

The number of New Jersey dairies now totals 65 farms statewide. With the high fluid milk

demand in the state, it is important that these remaining farms remain in the state and provide as much milk as possible to support the economy within the state. Even beyond the sale of milk, New Jersey dairymen support many other industries in the state in order to remain profitable.

What has been done

By using cow side tests for parameters such as somatic cell count and bacterial levels, producers were able to identify and address issues before they became major problems. All New Jersey dairy producers had access to two in state analytical labs (New Jersey Department of Agriculture Lab in Trenton-official and Rutgers Cooperative Extension of Salem County lab-unofficial) to identify microorganisms responsible for issues found on farm.
Beyond the milk itself, the washing cycle of the milking system was monitored using a specialized piece of equipment called a LactoCorder. Cow comfort and housing conditions were also monitored using Hobo devices which logged temperature, humidity and light intensity so that housing conditions could be amended to accommodate the cows.

Results

In 2014, over 50% of New Jersey dairies participated in the milk quality program performed by Rutgers Cooperative Extension of Salem County. All participating farms were able to maintain somatic cell count under 400,000 in order to receive milk premium bonuses. Milk samples were taken from 36 farms (55% of New Jersey dairies) across the state for analysis including somatic cell counts and culturing for microorganisms. With the control and elimination of contagious mastitis microorganisms, overall herd health improved within herds that had tested positive. Bulk tank monitoring took place in 2014 where 27 farms statewide participated. The testing was done to identify microorganisms present in the milk and the overall quality of the product. When an issue was identified, further steps were taken to remediate any problems found. During 2014, Rutgers Cooperative Extension of Salem County assisted 14 dairymen statewide who had PIC issues. In all cases, careful inspections took place to pinpoint the cause of the inflated PIC counts and sampling also took place. In all cases, potential solutions were suggested and enacted and the PIC counts fell back to acceptable levels.
With the improvement of cow housing conditions, milk production improves, leading to more milk in the bulk tank and a bigger milk check.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #4

1. Outcome Measures

Evolution and Epidemiology of Emerging Single-Stranded DNA Viruses that Threaten New Jersey Agriculture - Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of

water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Evolution and Epidemiology of Emerging Single-Stranded DNA Viruses that Threaten New Jersey Agriculture

Many of the emergent diseases of crops and livestock are caused by a group of viruses that we know little about: the single-stranded DNA (ssDNA) viruses. Whitefly-transmitted geminiviruses are the largest pathogen threat to crops worldwide, and have become particularly prevalent in the United States due to the recent introduction of a two polyphagous, Mediterranean biotypes (B and Q) of the whitefly Bemisia tabaci. Critically, despite these well-established threats, our biggest agricultural liabilities may lie in unknown ssDNA viruses; it is becoming clear that we have not characterized a large fraction of the diversity of geminiviruses, especially in North and South America. There is a need to identify which geminiviruses are already present in the United States, and to understand how single-stranded DNA viruses spread and adapt quickly to novel hosts. This is especially important as the invasive Q biotype whitefly has already been found in northeastern states like NJ, and will likely become more prevalent as climate change makes this region a more hospitable habitat for these disease vectors.

What has been done
Current NJAES research project attacks several aspects of this emerging problem in US agriculture, using leaf tissue collections, laboratory analysis, statistical models and epidemiological methods to document the who, where, and how of begomovirus emergence in the United States.

Results
Over the past few year, an NJAES researcher has made significant advances in elucidating the mutational mechanisms that allow ssDNA viruses to evolve as quickly as RNA viruses, quantifying how important mutation is to begomovirus evolution, surveying the worldwide diversity

of begomoviruses, and studying the movement of begomoviruses among countries and continents. As a result of this research, we now have proof of concept data that suggests ssDNA viruses can be controlled through increasing their mutation rate, an antiviral strategy that has proved effective against RNA viruses.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #5

1. Outcome Measures

Mid Atlantic Secure Milk Supply Project - Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Mid Atlantic Secure Milk Supply Project

Foot-and-mouth disease (FMD), sometimes referred to as "hoof and mouth", is a highly

contagious viral disease of cattle and other cloven-hooved animals such as pigs, sheep, and goats. FMD is not a public health concern and does not affect food safety however hoof and mouth outbreaks can cause mass panic among milk consumers which could lead to severe decreases in milk consumption which could be devastating for the dairy industry.

What has been done

Rutgers Cooperative Extension Agricultural Agent and staff researched New Jersey dairy farmers with information about the secure milk supply plan. Educational programs were conducted to prepare any interested diary producer for a hoof and mouth outbreak by ensuring that they were in compliance with the secure milk supply plan permit procedures so that they could receive a permit to continue to move milk in times of an outbreak as long as their farm wasn?t infected. Furthermore milk haulers, milk processers and other dairy industry business professionals were made aware of the rules of the secure milk supply plan and also to ensure that any interested milk hauler or milk processor parties were in compliance with the secure milk supply permitting procedures so that they too could move and receive milk in times of a hoof and mouth outbreak. Outreach included bi-monthly newsletters, speaking to farmers one on one about the SMS plan, writing and placing publications in the dairy newsletter, on regional and state conference calls discussing progress of the SMS plan, visiting demo and interested dairy farms, collaborating with an interested milk processing plant to work towards implementing a plan, and specifics of a SMS plan, and researching equipment needed in order to carry out the SMS plan on the appointed demonstration farm. A farm demonstration was attended by Ag professionals, dairy producers, dairy hauler company personnel, milk processing plant personnel and representative from the NJ Department of Agriculture. This demonstration showed start to finish what steps needed to be followed in order to move milk and be permitted according to the secure milk supply plan on a dairy farm and as a milk hauler.

Results

Throughout the implementation of the Mid Atlantic Secure Milk Supply, Rutgers was able to have over 30 one on one consultations with New Jerseys Dairy producers. This yielded eight interested producers who are motivated to move forward and learn more about what is needed to create a secure milk supply plan for their farms. Demonstration attendees witnessed the standard operating procedures that need to be implemented on a dairy farm in order to continue to ship milk off farm during a hoof and mouth outbreak. RCE will continue to educate New Jerseys producers about the Mid Atlantic Secure Milk Supply Plan and to work with interested farmers as well as the interested dairy processing plant in order to ensure that all SOP?s are followed for them to become permitted to ship and receive milk during a hoof and mouth outbreak.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #6

1. Outcome Measures

National Youth Agri-Science Summit - Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
National Youth Agri-Science Summit

Today, many young people are generationally and geographically removed from farming and agriculture. Yet, it is vital that these young leaders and future decision makers understand the critical role of agricultural science innovation in addressing the world?s most pressing problems. Through 2015, it is estimated that there will be 54,400 annual job openings for those with agricultural college degrees. While the percentage of these opportunities in production agriculture (farming) has declined, 27% of these jobs will be in science and engineering and 47% will be in management and business. A shortfall of graduates for these science and business positions is projected, especially for the anticipated demand in animal and plant biotechnology.

What has been done
National Youth Agri-Science Summit. High school youth and their adult partners interested in becoming Champions for Agriculture in their communities attended the five-day summit held at the National 4-H Youth Conference Center in Chevy Chase, Maryland. At the conclusion of the summit teams returned to their home communities prepared to help increase the agricultural literacy of the general public as well as key local stakeholder groups. The teams learned about issues related to production of food, feed, fuel, and fiber with an emphasis on the rapidly

emerging areas of animal and plant sciences and technologies. Participants were introduced to various challenges facing agriculture, including global food security and sustainability, and teens learned how they could begin to address those challenges today and in the future.

Results
Results of Pre/Post Survey of Youth Participants (n=43 matched pairs) Item Pre Post Interest, Relevance, Careers aware of a variety of areas of study I can pursue in agricultural science at colleges and universities. 3.80 4.72 I know about some of the careers available in agricultural science. 4.16 4.74 I can see myself pursuing a career in agriculture. 4.33 4.56 Agriculture science is a topic that interests me. 4.47 4.67 Agriculture science will be important in my future. 4.56 4.77 Agriculture research is useful for solving everyday problems. 4.16 4.53 Agricultural Science Knowledge and Skills I understand and can explain the role of agricultural science in our society. 3.80 4.63 I am aware of key agricultural issues facing producers. 3.74 4.70 I am aware of key agricultural issues facing consumers. 3.71 4.70 I understand the primary roles of the United States Department of Agriculture. 3.52 4.51 Community Engagement and Service I know where I can go to find people in my community who can help me plan and carry out an agricultural literacy project. 3.88 4.51 I plan to facilitate agricultural literacy activities in my community. 3.24 4.58 I am excited about the idea of sharing my knowledge of agricultural science with younger youth in my community. 4.12 4.74 Teens as Teachers I am confident I can teach others about agriculture. 3.71 4.72 I know agricultural curricula I could use to teach others about the production of food, fuel, and fiber. 3.37 4.58 I feel prepared to teach agricultural literacy concepts to others. 3.16 4.56

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #7

1. Outcome Measures

Ensuring the Sustainability of the New Jersey Horse-racing Industry - Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Ensuring the Sustainability of the New Jersey Horse-racing Industry

The Equine Science Center found in 2007 that the New Jersey equine industry was valued at $4 billion, generated $1.1 billion annually in positive impact on the New Jersey economy, was responsible for 13,000 jobs (7,000 jobs generated by racetracks and horse racing breeding and training operations), and paid an estimated $160 million annually in federal, state, and local taxes ($85 million generated by equine operations and owners and $75 million generated by New Jersey racetracks). Regarding acres, 176,000 total acres supported equine facilities, with 46,000 additional acres producing hay for horses on non-equine-related operations. This total of 222,000 acres represents more than one quarter of the state's 790,000 acres remaining in agriculture in the most densely populated state in the nation. Racing was not the only equine discipline in jeopardy if New Jersey racing was not sustained. Sport competition and recreational horse users also stood to suffer, as would traditional agricultural interests such as grain, hay, and straw farmers who continue to remain in business and maintain agriculturally productive open space due to the fact that their major customers are horse owners.

What has been done
People involved in the racing sector of the New Jersey horse industry approached the Rutgers Equine Science Center about researching the state of the industry since the Center's last white paper in 2009. Research was conducted by Center faculty, students, staff and industry constituents; the paper was published and spread widely through the Center's website and media contacts. Now the publication is being used by industry leaders to lobby for support for the industry.

Results
Industry is using this document to influence the legislature to put on the 2015 state ballot the question as to whether New Jersey voters want to expand casino gaming beyond Atlantic City.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants

215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #8

1. Outcome Measures

Epidemiology and Management of Stone Fruit Diseases - Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Epidemiology and Management of Stone Fruit Diseases

Reduce loss from plant diseases on tree fruit crops; improve grower profitability; decrease pesticide usage ? results in less impact on environment & residue on foods; promotes sustainability.

What has been done
An Extension Specialist conducted studies on use of biorational materials for management of peach brown rot and on the importance of cover sprays for preharvest brown rot control; examined efficacy of improved reduced risk conventional fungicides against all peach diseases; developed and presented novel bioassay for examining fungicide residues on fruit; examined novel copper formulations for peach bacterial spot control; published research on the relative susceptibility of peach cultivars to rusty spot. Continued with year 2 of a study at a commercial

Aronia (chokeberry) site with a cooperating grower. The project?s objective was to determine the time of berry and foliar infection caused by a rust fungus. In addition, control with a fungicide was examined. Aronia is a potential new, high-value crop for New Jersey growers. All spray guides (peach, plum, cherry, apple, and pear) in the 2014 New Jersey Commercial Tree Fruit Production Guide (E002) were updated to include new information on fungicides and bactericides to control tree fruit diseases; included information on relative efficacies and application rates for each individual disease. In vitro studies were published on the quantitative ability of three organic / biorational fungicides to control the growth of Monilinia fructicola, causal agent of brown rot on stone fruit. This disease can cause 100% fruit loss if not properly managed.

Results

Brown rot ? Growers began adopting newer fungicide formulations and utilizing them in proposed mixture and alternating programs to fend off development of resistance by the brown rot pathogen. Outbreaks of resistant pathogens have been reported in many other peach growing regions. 2014 was a moderately favorable year for brown rot development; grower awareness of the resistance threat allowed them to take action in their disease control programs; no commercial economic losses were observed. Bacterial spot ? two year copper bactericide study demonstrated importance of using higher copper rates to significantly improved disease control and reduce yield loss. However, growers will need to be careful as increased phytotoxicity was also observed. Peach rusty spot ? growers can use announced findings to select new cultivars for planting that have a higher degree of disease resistance (therefore reducing amount of fungicide spraying in future years). Production guide ? a few new products were added to the latest guide; online publication has broadened its use considerably.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #9

1. Outcome Measures

2014 Sclerotinia Sclerotiorum (White Mold) Resistance Trial in Soybeans - Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
2014 Sclerotinia Sclerotiorum (White Mold) Resistance Trial in Soybeans

White mold is a soil pathogen. Wet shady conditions can lead to an abundance of white mold in the soil that can infect and devastate over 400 types of field crops consequently lowering their production yields. This mold can stay in the soil for many years consistently re-infesting the planted crop if perfect conditions exist. Decreased yields can be very financially detrimental to NJ farmers especially as they pertain to soybeans, one of the most widely produced crops around the state.

What has been done
A trial was conducted at the Snyder Research Farm in Pittstown NJ. 36 varieties of full season soybeans were planted. Data was collected on plant growth, disease severity, disease presence, purple seed stain presence per pound of seed, and bean yield with the objective of identifying varieties of soybean seeds most resistant to white mold disease. Twilight meetings and farm tours were held for bean growers in order to communicate our findings.

Results
As a direct result of the meetings farmers are now more informed when planting their own soybeans as to how to manage and plant them in order to minimize white mold infestation and spread. Minimizing white mold saves farmers money because it lessens the chance that they will suffer yield losses due to white mold infestation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #10

1. Outcome Measures

Statewide Pomology and Viticulture Extension - Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Statewide Pomology and Viticulture Extension

The wine industry is experiencing rapid growth and many entrants into the industry need technical education and information for developing their production enterprises. New grape growers are coming from divergent backgrounds and need a wide range of help from basic agricultural information to highly technical information specific to wine grapes in New Jersey. Grape production in New Jersey is costly and risky, for it to be sustainable many decisions need to be made correctly and many efficiencies need to be exploited.

What has been done
A series of educational programs has been conducted or planned and several educational resources are being delivered via a website. A symposium was held where experienced national speakers as well as local experts educated growers and winemakers about new grape cultivars and global cultivars of interest to New Jersey. Two environmental events (a Winter freeze and a Summer hailstorm) eliminated field trial data from this year, so research projects are continuing with a one-year gap.

Results

This project has changed the understanding and awareness of the target audience with regard to the suitability of some previously untested wine grape cultivars for New Jersey. Furthermore, the sensitivity of wine grapes to some phytotoxic agents has been revealed during the course of the project. An enhanced understanding of winter freeze injury to a range of cultivars has been achieved.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #11

1. Outcome Measures

4-H Animal Science Programs - Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
4-H Animal Science Programs

New Jersey is a state with a rich history of agricultural roots, however, New Jersey is becoming an ever more urbanized state. Youth interested in learning agricultural practices, especially related to large animals, have increased difficulty finding that information. 4-H animal projects is one of those options.

What has been done
Numerous educational events and competitions at the county, state level and national level designed to provide experimental activities with live animals, hands-on workshops, computer simulations, skill-a-thon stations, quiz bowls, and symposiums were held. Members, parents and volunteers focused on youth increasing their awareness and understanding of current issues in the animal industry and the breath of career opportunities in the animal industry. Youth practice oral and written skills, apply ethics and good sportsmanship, personal responsibility and self-discipline.

Results
Participants responding to an evaluation of a state equine event when asked to list 1 thing they learn; 32% indicated they will use the equine knowledge that have gained from this experience in their career (several indicated they wish to be a veterinarian in the future) 28% indicated they learned to work as a team 21% indicated they learned a great deal about the anatomy of the horse 21% indicated they will use this information in college 13% indicated they gained valuable communication skills. As a result of their participation in the 4-H goat project, during the year, members agreed or strongly agreed that they: ? 92% improved teamwork skills. ?89% improved leadership skills. ?85% gained the skills necessary to safely care for their goat(s). ?85% improved record keeping skills. ?84% gained knowledge of goat care and management practices. ?82% improved communication skills. ?79% have more empathy and concern for others. ?74% became more responsible and disciplined. ?72% improved goal-setting skills. ?66% became more aware of career opportunities available in the animal industry. ?50% increased understanding of current issues in the animal industry. Similar results were also reported by participants in the dairy programs and the Junior Breeder Livestock Symposium.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #12

1. Outcome Measures

Annies Project New Jersey and Beyond - Medium Term - Productive agricultural land is stabilized to meet the needs of the agricultural industry and the needs of people of NJ. Agriculture remains a relevant and viable economic sector as profits increase (through reduced costs and/or increased or new sales or revenue streams). Measurable reductions in environmental impact (clear and adequate sources of water, reduced waste, reduced soil losses, reductions in non-point source pollution, etc.) will occur through the adoption of improved and sound management practices. Overall state environmental quality will be enhanced by agriculture, such as through the utilization

and recycling of biowastes generated by the non-ag sector or the enhancement of air quality. The products of NJ agriculture will add to the nutritional quality of New Jerseyans food supply.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Annies Project New Jersey and Beyond

There are over 1500 women in New Jersey who identify themselves as ?primary operators? of their farms. It is imperative in order for them to succeed that they are well informed on risk management and farm business management.

What has been done
RCE Specialists and Agricultural staff have completed 4 years of Annie?s Project. Annie?s Project New Jersey which is tailored to New Jersey farmers and differs from Annie?s Project in other states in five key areas: 1) the focus on creating a farm business plan throughout the training, 2) the use of social media education and adoption for marketing and business development, 3) the use of social media tools to assist the participants in networking that is sustainable and interactive, long after the course is completed, 4) using a unique combination of in-person education and distance learning opportunities to expand the audience within the program, and 5) recording the distance learning sessions for asynchronous education of participants and additional women farmers following the completion of the ?live? course. We also took this concept abroad per Rutgers' mission, Jersey Roots, Global Reach. Last year was the 3rd year of Suzanne's Project in Turkey and the first year of Suzanne's Project in Guyana. We added an International Service Learning component called Empowering Turkish Women Farmers and took 5 students to live on farms in Boztepe Turkey to develop case studies for future Suzanne's Project classes. In addition RCE provided educational forums on the availability of crop insurance products and risk management tools, we have ensured that our clientele are well informed and able to reduce their farm risk. By providing networking opportunities, we ensured that our clientele know where to go for help and are able to develop business contacts as well as friendships and support networks. Educational resources can be found at the following websites: https://learn.extension.org/events/1689, https://learn.extension.org/events/1861, http://www.extension.iastate.edu/annie/mtt.html, http://aesop.rutgers.edu/~farmmgmt/anniesproject.html, http://aesop.rutgers.edu/~farmmgmt/apfwconference2013.html,

Results
Annie?s Project New Jersey has resulted in scholarly deliverables as well as positive changes in the lives of program participants. Classes resulted in a number of participants writing a formal business plan for their farm including a mission statement, marketing analysis, and financial statements.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #13

1. Outcome Measures

Crop insurance Education of NJ Farmers - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Crop insurance Education of NJ Farmers

New Jersey fondly known as the garden state, is home to about 9,100 farms of which produce approximately 32,000 cattle and calves, 8,000 hogs and pigs, and 7,000 cows which produce annually 31 million pounds of milk. Furthermore 90,000 acres are in corn production and 89,000 acres of soybeans are grown annually. Recent weather events such as climate change and

hurricanes have increased instances of damaging weather for crops, because of the unreliable weather conditions it is in the growers best interest to cover their risk using crop insurance which would allow them to return to production even after suffering a crop loss, or a crop loss that lead to increase livestock production expenses.

What has been done
RCE Agricultural Agent and Staff delivered training to over 5,677 producers through a wide variety of educational venues including meetings, one-on-one sessions, workshops, conferences/sessions, newsletters, postcards, bulletins, blogs, and radio public service announcements that reached 287,198 producers and individuals in a timely manner. We placed special emphasis on providing services to small farms, socially disadvantaged producers, we also targeted beginning farmers, immigrant farmers, and farmers seeking production changes, and exhibited at a two day Native American PowWow.

Results
In 2014, 1,539 crop insurance policies were sold in the state. These policies covered 172,950 acres of New Jersey?s farmland with $81,808,275 worth of liability. With the recent unpredictable weather, it is imperative to not only maintain but continue to increase the crop insurance policies sold in NJ through the use of crop insurance education and risk management outreach.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #14

1. Outcome Measures

Pepper Evaluations for Phenotypic Traits, Physiological Disorders, Diseases and Cultural Practices - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Pepper Evaluations for Phenotypic Traits, Physiological Disorders, Diseases and Cultural Practices

New Jersey grows 3,200 acres of bell peppers for a value of $27,649,000 a year and is ranked third in the nation (NASS, 2014). The principal disease problems with peppers are Phytophthora blight (phytophthora capsici), anthracnose (Colletotrichum sp.) and bacterial leaf spot (Xanthomonas campestris) (BLS). The number one disease problem in New Jersey is phytophthora blight which is endemic in southern New Jersey.

What has been done
Yearly the pepper advisory committee evaluates the pepper research and extension efforts. They review the results from the past year and make recommendations for the following year. Goals and objectives ?Select cultivars that have tolerance or resistance to phytophthora, blight Bacterial Leaf Spot and Anthracnose with good horticultural characteristics. ?Evaluate cultivars for the presence of skin separation (silvering) ?Determine the races of bacterial leaf spot found in New Jersey bell pepper cultivar evaluation initially commenced to select cultivars with good horticultural characteristics (fruit size, shape, color, etc.), but with the identification of phytophthora blight in southern New Jersey disease tolerance was added. In 2014, 18 cultivars and advanced breeding lines were evaluated for tolerance to Phytophthora and silvering. Advanced breeding lines and commercially available cultivars are screened in a naturally infested field. Materials are evaluated for at least two years than those with a high tolerance to phytophthora are screened for horticultural characteristics and yield. Materials which have both tolerance to disease and good horticultural characteristics are recommended to growers for trial planting on their farms. Six cultivars and breeding lines with resistance to various bacterial leaf spot races were planted in a commercial field to assess which races may be present in South Jersey. These trial results demonstrated that races 1, 2, 3, 4 and 6 can be found on New Jersey farms. The next step is evaluating breeding lines that have tolerance to bacterial leaf spot.

Results
Growers have saved around $22,000,000 over the last fifteen years from using cultivars tolerant or resistant to phytophthora blight. All the recommended cultivars and the main ones grown in New Jersey were evaluated through our screening system. Since new cultivars are being release each year, growers and seed companies ask for this research to continue.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management

604 Marketing and Distribution Practices

Outcome #15

1. Outcome Measures

Rutgers NJAES Strawberry Variety Release Project - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Rutgers NJAES Strawberry Variety Release Project

Strawberries are a high value crop and can be very profitable for eastern United States farmers. Unfortunately the climate and pest problems of strawberries in the region create challenges for local production. Farmers seek strawberry varieties which are better adapted to the region, are pest resistant, and produce high quality fruit with excellent flavor for local markets.

What has been done
Utilizing traditional plant breeding the Rutgers NJAES has developed strawberry selections which have the potential to help farmers enhance local production and marketing. With this potential in mind, a project was initiated to evaluate and expedite the release of new strawberry varieties for eastern U.S. farmers. The new strawberry selections were tested in field research trials at five Universities and on thirteen local farms using both organic and conventional production systems. Rutgers NJAES developed partnerships with two commercial strawberry nurseries to test the plant material for potential release to the industry. Consumer input on the flavor of the new strawberries was obtained through blinded taste panels. Farmers and industry professionals were educated on this research and local strawberry production techniques through twenty six presentations and tours at on-farm meetings and winter meetings and conferences. Consumers learned about the project through field days and the taste panels.

Results

The results of the University field research and on-farms trials resulted in plant patents applications for three of the Rutgers NJAES strawberry selections. One of the selections was released for commercial production and named ?Rutgers Scarlet?TM. Two nurseries have requested licensing agreements to begin commercial production of ?Rutgers Scarlet?TM? and have expressed interest in agreements for other selections. One commercial nursery got orders for over 30,000 of the ?Rutgers Scarlet?TM strawberry plants.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #16

1. Outcome Measures

Weed Control in Vegetables and Fruit - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Weed Control in Vegetables and Fruit

Weeds reduce yield quality and earliness, increasing the cost of food.

What has been done
The target audience are county agricultural agents, farmers and agricultural business persons.

The goal is to improve their knowledge on weed control subjects.

Results
Yield and quality of vegetables and fruit has increased.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #17

1. Outcome Measures

Resistance Management for Fresh-Market and Processing Vegetable Crops in New Jersey - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Resistance Management for Fresh-Market and Processing Vegetable Crops in New Jersey

In the mid-Atlantic region of the United States over 200,000 A of fresh-market and processing vegetable crops are grown on an annual basis. The development of fungicide resistance to important fungicide chemistries used in vegetable production has been documented in New Jersey and the mid-Atlantic region in recent years. A number of these commonly-used chemistries have a high-risk for resistance development if they are overused or used improperly.

Vegetable growers in NJ, as well as, the rest of the mid-Atlantic region need more information on fungicide chemistries (i.e. modes-of-action, FRAC codes) in order to manage fungicide resistance development properly.

What has been done
Since 2007, 25,000+ fungicide resistance management guidelines have been distributed in the mid-Atlantic and surrounding region representing over 100,000 A of vegetable production. Approximately 1,800 of the guides were distributed to commercial vegetable growers, crop consultants, industry representatives, crop advisors, Extension agents and Extension specialists in New Jersey and other states. The resistance management guides have become widely adopted and used by many vegetable growers to help develop effective season-long fungicide spray programs while helping to reduce the chances for fungicide resistance development in the region. Recommendations guides are updated annually and available on-line through the Vegetable Crops On-line Resource Center hosted by the New Jersey Agricultural Experiment Station (http://plant-pest-dvisory.rutgers.edu/) and other state experiment station websites.

Results
Demand for the FRAC guide remains high and each year the fungicide resistance management guide is distributed to more vegetable growers in the mid-Atlantic and surrounding region.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #18

1. Outcome Measures

Improving Economic and Environmental Sustainability in Tree Fruit Production through Changes in Rootstock Use - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Improving Economic and Environmental Sustainability in Tree Fruit Production through Changes in Rootstock Use

With the competitive international market, the demand for high quality fruit by consumers, the strong pressure to reduce chemical use, and a need to enhance the economic efficiency of production, tree-fruit growers must look to alternative, economically and environmentally sustainable management schemes of production. Growers who want to stay profitable must establish high-density plantings with much smaller trees using new cultivars. These high-density plantings may cost 10 to 20 times more to establish than low-density plantings, thus greatly enhancing the economic risk.

What has been done
Over 10 research trials have been conducted in NJ, 8 at Rutgers Snyder Farm, one at RAREC and one at Rutgers Cream Ride Station. An RCE County Agricultural Agent has conducted extensive multi-state nursery research at the Adams County Nursery (ACN) Delaware location from 2012-2014. At ACN extensive plant growth regulator applied research has been conducted to enhance the apple tree quality for current high density tall spindle systems. In NJ, the main goal has been to evaluate the influence of rootstocks on temperate-zone fruit tree characteristics grown under varying environments using sustainable management systems.

Results
Research has resulted in recommendations and educational programs which guided planting of 170,000 acres of fruit trees over the past 5 years in the U.S. Recommendations have increased yields by 20% per acre in mature orchards, improved fruit size by10%, increased the percentage of fruit meeting the highest grade category by 20%, shortened the time to pay back an orchard from more than 10 years to less than 8 years, and the financial benefit to U.S. fruit growers was $200,000,000 over the last 5 years. Pesticide use in high density orchards was reduced nearly 40% with associated environmental benefit plus $100,000,000 saved over the past 5 years in pesticide cost and application.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #19

1. Outcome Measures

Extend and Maximize the Post-Harvest Quality of High Value and Perishable Crops - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Extend and Maximize the Post-Harvest Quality of High Value and Perishable Crops

Small fruit and cut flowers are important horticultural commodities in the US. The annual retail trade in floricultural products is a $32 billion industry. Cut flowers are a highly perishable commodity and methods to reduce losses due to fungal disease and senescence during shipping is vital. The small fruit industry is likewise a significant horticultural industry in the US. For example, strawberries are a $2.3 billion industry.

What has been done
An NJAES researcher is developing an organic system to control postharvest fungal diseases of fresh fruit and flowers during shipping and storage, using the controlled release of natural antifungal volatile compounds in a modified atmosphere package. This research will make it possible to reduce production losses of high value, perishable, organic and conventionally grown horticultural commodities. These losses are estimated to be as high as 25% in the US and even greater worldwide. Export markets for US blueberries and strawberries could expand as post-harvest life is extended and microbial contamination reduced. Cut-flower losses will be reduced, increasing profitability of the legal global trade in cut-flowers.

Results
This research has resulted in a patent application for a cost effective solution to the problem of microbe-mediated degradation of packaged agricultural products. This solution harnesses the anti-microbial properties of volatile essential oils of herbs (such as thyme) and controls the release of such anti-microbial oils in a manner that inhibits, prevents, or delays microbe-mediated

degradation or decomposition of produce (such as cuts fruits and vegetables) and cut flowers. This technology will benefit growers, processors and shippers of fresh produce and flowers by reducing losses due to disease. The technology will also extend the shelf-life of these commodities and benefit consumers as well. This method will potentially expand the trade in fresh fruit and flowers, increasing incomes to farmers and workers worldwide in a way that reduces microbial contamination of these products.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #20

1. Outcome Measures

Metabonomic Detection of Abnormalities in Horses: A search for Early Diagnoses and Dietary Intervention and Potential Models for Human Disorders - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Metabonomic Detection of Abnormalities in Horses: A search for Early Diagnoses and Dietary Intervention and Potential Models for Human Disorders

Equine animals (Equus caballus) are the #1 agricultural animal industry in New Jersey and generates over $1.1billion in revenue annually. In addition to sport and recreational activities,

horses are used in mounted police activity, search and rescue, therapeutic riding and ?youth at risk? programs. It has been well documented that there are genetic predispositions to common diseases such as osteochondrosis dissecans (OCD), recurrent rhabdomyolysis, and laminitis that can severely limit a horse's usefulness.

What has been done
NJAES researchers have conducted a series to experiments, gathering and analyzing data to identify the metabolic defect and associated nutrient needs associated with a genetic predisposition to osteochondrosis (OCD) that will allow early detection of horses predisposed to the development of lesions and to develop nutritional intervention to reduce or eliminate development of lesions in predisposed horses.

Results
In 2014, these researchers reported that the metabolic profile associated with OCD in Standardbreds was refined to the point that the potential metabolic defects associated with the increased risk of development of lesions were identified. Genomic data supported the metabolic profile. Based on that profile, a nutritional formula was developed that theoretically would reduce the incidence of lesions in predisposed animals, for which a patent is now pending. A spectral analysis of the Thoroughbred data revealed similar but distinct metabolic differences between OCD and non-OCD yearlings. Negotiations are in progress to scientifically test the formula in predisposed horses.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #21

1. Outcome Measures

Genetic Improvement of Woody Plants (Trees and Shrubs) for Ornamental Uses - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Genetic Improvement of Woody Plants (Trees and Shrubs) for Ornamental Uses

The nursery industry is in need of new plants for ornamental and potential cropping purposes that are adapted to the specific climatic and edaphic conditions of the US.

What has been done
NJAES researchers are breeding improved, disease- and pest-resistant woody ornamental plant cultivars of dogwood, hazelnut, holly, and other species that are both attractive and hardy. Hazelnut, in particular, has potential agricultural applications within the eastern United States if varieties that are resistant to eastern filbert blight disease can be developed.

Results
NJAES researchers report that a project to fingerprint the NJAES collection of Cornus (dogwood) germplasm with SSR markers is nearing completion, which will help determine genetic relationships between these plants and those available in the trade, and for added intellectual property rights protection. Progress is also reported on optimizing the use of tissue culture techniques as a means to efficiently and effectively propagate new hybrid dogwoods. A patent application was filed in 2014 for a new dogwood variety.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #22

1. Outcome Measures

Fungicides and Vegetables - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fungicides and Vegetables

Vegetable crops must be grown economically and efficiently in order for small-scale vegetable growers to compete in the larger US and international marketplace. Growers rely on integrated pest or best management practices which incorporate different production and cultural practices to help control insects, weeds and plant disease. Without proper disease management strategies, annual losses to vegetable disease would exceed millions of dollars annually. One of the most destructive soil-borne diseases of solanaceous and cucurbit crops is Phytophthora capsici. In the US, losses to phytophthora blight exceed millions of dollars annually.

What has been done
NJAES Extension Specialist evaluates how resistant various vegetable cultivars are to phytophthora blight and other fungal diseases, monitors fungicide resistance development among vegetable cultivars, and develops fungicide resistance management strategies. Fungicide resistance management guidelines have been developed for all 30 crop groups listed in the commercial vegetable production recommendations guide for the five Mid-Atlantic States (NJ, PA, VA, MD, and DE) and WV to help vegetable growers manage fungicide resistance development on their farms.

Results
Fungicide resistance management guidelines have been delivered to thousands of vegetable growers, crop consultants, crop advisors, extension specialists and county agents at local, state, and regional meetings in our region for the past 8 years. This guide has brought the awareness and importance of understanding FRAC codes/fungicide resistance management to thousands of vegetable farmers in and outside the mid-Atlantic region. The guide has allowed for important decisions to be made in controlling important vegetable diseases and reducing the chances for fungicide resistance development. The use of this guide will help prolong the efficacy of important fungicides/fungicide classes with known risks for resistance development in our region. This is extremely important in pathogens where there are only a few effective, high-risk fungicides labeled for control.

4. Associated Knowledge Areas

KA Code	Knowledge Area

205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #23

1. Outcome Measures

Antioxidant Supplements, Oxidative Stress and Muscle Oxidation in the Young Racehorse - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Antioxidant Supplements, Oxidative Stress and Muscle Oxidation in the Young Racehorse

Losses of top equine athletes at Olympic Games, World Equestrian Games and Thoroughbred Triple Crown Races, have provoked public interest in the performance and welfare of competitive horses.

What has been done
NJAES researchers specifically examined the effect of acute exercise and intensive exercise training on the oxidative stress, antioxidant status, and muscle metabolism of yearlings and mature mares.

Results
Research findings indicate that training did significantly improve antioxidant status and reduce oxidative stress in the mature trained mares, while the trained yearlings did not exhibit significant changes in either regard. When challenged to acute exercise before training, it was found that the mares had significantly higher levels of oxidative stress and stress hormone (cortisol), as well as

lower antioxidant status, compared the yearlings. After exercise training, when undergoing acute exercise, the trained mature mares had lower levels of oxidative stress compared to prior training and, when challenged with acute exercise, had lower oxidative stress and cortisol. With the yearlings, there were fewer significant changes in oxidative stress after training and in response to acute exercise. In conclusion, young, maturing horses had lower levels of oxidative stress and cortisol, and higher levels of antioxidants, compared to mature mares. Training can help reduce levels of oxidative stress in mature mares while, in young horses, training is not as influential in reducing oxidative stress, suggesting that their young age is the most important defense against exercise-induced oxidative stress. An important aspect of this study was that no antioxidant supplementation was used. Antioxidants have become wildly popular as supplements, for both human and equine athletes.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #24

1. Outcome Measures

Weed Control in Cranberries - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Weed Control in Cranberries

Weeds, particularly perennials, are difficult to control in cranberry bogs. Cranberry growers in New Jersey, Massachusetts, Wisconsin and elsewhere need effective herbicide treatments for weed control.

What has been done
Field studies were conducted to evaluate efficacy and potential phytotoxicity of new herbicides for use on newly planted and established bearing cranberries. Herbicides, including indaziflam and two formulations of diclobenil, were evaluated for crop safety and efficacy for the control of redroot in cranberries. Indaziflam injured cranberries in past studies when applied during active growth, but the herbicide did not injure cranberries when applied in early spring soon after the winter flood was removed. Research conducted in prior years confirmed that indaziflam could be applied to cranberries safely in early spring. Weed research at Rutgers Blueberry and Cranberry Research Center, Chatsworth, New Jersey, evaluated a new experimental herbicide, BCS-AA10717, from Bayer. The new Bayer herbicide did not injure cranberries when applied in early spring before any new growth was evident, but slight injury was observed when cranberries were treated after buds began to swell in May. Previous work indicated that cranberries were injured when treatment was delayed until after the growing season had begun. This herbicide has provided excellent weed control in tree fruit studies, and is similar to Casoron in chemical structure.

Results
New herbicides, including mesotrione (Callisto 4SC) and quinclorac (Quinstar 4L) were registered for use in cranberries, and extension agents and commercial growers were instructed on the safe and effective use of these products. One grower reported that cranberry yields rose from 50 to 80 barrels per acre to over 150 barrels per acre as a result of improved weed control. Special effort was made to improve the control of weeds in newly planted cranberry bogs, where weeds slowed the establishment of the crop. A large grower reported that the time between planting a new bog and the first commercial harvest was reduced from 4 to 5 years to less than 2 years due to improved weed control. This improvement in the time line for bringing new bogs into production has been due to growers adopting the use of mesotrione and quinclorac in new non-bearing cranberry bogs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #25

1. Outcome Measures

Molecular Mechanisms Regulating Skeletal Muscle Growth and Differentiation - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Molecular Mechanisms Regulating Skeletal Muscle Growth and Differentiation

The identification of an optimal protein intake level (not the minimal requirement) for health and wellness has yet to be established for animals and humans. Much controversy exists concerning optimal protein nutrition for metabolic health and longevity. Results can be used to refine current diet formulations to maximize muscle mass in domestic animals and thus benefit the meat industry.

What has been done
Rodent models (control wild type or genetically modified) were fed diets containing different levels of essential amino acids in combination with different levels of dietary fat and/or physical activity. Body composition and fuel usage was monitored in live animals and signaling pathways regulating protein synthesis were assessed at the levels of mRNA and protein expression, using standard biochemical and molecular biology approaches in collected tissues.

Results
During 2014, NJAES researchers conducted more analysis to confirm preliminary results reported in 2013 regarding mTORC1 signaling pathway?a protein complex that controls protein synthesis and is a dominant growth mechanism in muscle. We can now say conclusively that the mTORC1 signaling pathway is not activated by the plant steroid 20 hydroxyecdysterone (20HE). 20HE is found in high abundance in quinoa and spinach and is present in other plant products and has been associated with metabolic or anabolic benefits. However, results indicate that the 20HE plant steroid is unlikely to be a potent anabolic agent in animal feed, as oral consumption of this

plant steroid does not acutely activate signaling pathways that promote skeletal muscle protein synthesis. These results contradict previously published claims of muscle growth by 20HE; however, these prior reports utilized cell culture models or infusions in mice. Our results make an important contribution to understanding if and how plant steroid compounds like 20HE can be used in animal feed to promote leanness, indicating that the use of these compounds in animal feed are not expected to augment any anabolic effects of protein intake.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #26

1. Outcome Measures

Conservation and Utilization of Plant Genetic Resources - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Conservation and Utilization of Plant Genetic Resources

The consistent development of a steady stream of new and improved tree fruit varieties is critically important to our long-term agricultural competitiveness. The identification of new sources of genetic diversity to develop peach, apricot, and apple cultivars which are better adapted to ever-changing northeastern growing conditions is essential to the survival of the tree-

fruit industry.

What has been done
NJAES researchers are using classical plant breeding methods to develop novel tree-fruit germplasm that integrates diverse useful genes from various resources to breed, release, maintain, and evaluate improved germplasm and cultivars. They have continued to acquire and characterize Prunus and Malus plant genetic resources for its potential use in plant breeding programs in the Northeast and elsewhere in the US, and other similar temperate environments in Europe, North Africa, South America, Australia and New Zealand.
NJAES researchers propagated trees to be used in crosses in the greenhouse and harvested open pollinated seeds to select segregants that are better adapted to our local environment with superior cultivars and advanced selections. The major objective of the apricot (Prunus armeniaca L.) breeding program is to develop apricots with improved eating quality and broader range of adaption. The focus of our peach and nectarine [Prunus persica (L.) Batsch] crosses this year was to develop mid-late ripening cultivars with large, firm fruit that soften slowly, and are tolerant to bacterial spot (Xanthomonas campestris pv. pruni).

Results
A patent application was filed for one apricot selection that is being propagated for release to fruit growers. This variety produces an attractive fruit with 30% red blush over a dark orange ground color. The fruit are sweet and juicy, have a nice aromatic flavor, and ripen early.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #27

1. Outcome Measures

Turfgrass Breeding - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Turfgrass Breeding

Turfgrass touches millions of Americans' lives daily in physical and social ways that make it an important and positive element in a myriad of environments. Disease and pest-resistant grasses will reduce the use of fungicides and insecticides needed to maintain fine turf areas. Improved cultivars with better wear tolerance can provide better, safer sports turf. There is a great need for cultivars with better shade and drought tolerance and a reduced growth rate to also reduce maintenance costs. The development of improved breeding and evaluation techniques will benefit other breeding programs designed to improve turf, forage, and biomass grasses.

What has been done
Researchers from the NJAES Center for Turfgrass Studies gather and analyze turfgrass samples from around the United States, as well as from Europe, Africa, and Asia, to identify and evaluate grass germplasm with desirable traits that can be incorporated into our turfgrass breeding program. Over the past few years, new emphasis was placed on the genetic control of different growth habits in tall fescue and breeding for drought tolerance in tall fescue. Continued emphasis on breeding for disease resistance for rust in Kentucky bluegrass, dollar spot and red thread in fine fescue and red thread dollar spot, gray leaf spot and summer leaf spot in perennial ryegrass. A new emphasis placed on developing turfgrass for low maintenance conditions with limited fertilizer, pesticides and water inputs. Center for Turfgrass Studies staff also maintain and monitor cultivars developed at the New Jersey Agriculture Experiment Station to continue the assurance of quality seed.

Results
Some of the newly released perennial ryegrasses with grayleaf spot resistance released in 2014 were Reenvair, Vision and Manhattan 6 perennial ryegrasses. New promising Kentucky bluegrasses hybrids that were released in 2014 were Waterworks, Zinger and Dautless. Continued developments of turf-type tall fescue were being released in 2014 with improved brown patch resistance. Six new ones were Rambler II, Slate, Leonardo, Rockwell, Michelangelo and Reflection tall fescue. In 2014 the new creeping bentgrass released was Cobra II. Over 40 new cultivar and germplasm agreements were executed in 2014 with turfgrass seed organizations. Eighteen new varieties were increased and named in 2014. During 2014, there were 16 U.S. Plant Variety Protection (PVP) Applications made and 17 U.S. PVP certificates were issued. This will directly benefit golf course superintendents, sod farmers, and turfgrass seed companies. The environment and public at large will also benefit from a reduction in chemicals used to maintain quality turf.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #28

1. Outcome Measures

Improving Sustainability, Efficiency, and Efficacy of Peach Disease Management Strategies: Biofungicides, Conventional Fungicides, and Abiotic Environmental Factors - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Improving Sustainability, Efficiency, and Efficacy of Peach Disease Management Strategies: Biofungicides, Conventional Fungicides, and Abiotic Environmental Factors

Major diseases on peach and nectarine include brown rot blossom blight and fruit rot, scab, and bacterial spot. Each of these diseases, if not effectively controlled, alone can cause 100% crop loss when pathogen inoculum levels and environmental conditions are favorable for disease development. Other diseases, such as rusty spot and constriction canker can also contribute to significant yield loss if not managed properly.

What has been done
An NJAES Extension Specialist examined the new biorational material BLAD, a polypeptide of beta-conglutin derived from sweet lupine seeds, and a combination of copper octanoate (a fatty acid copper material approved for organic use) plus the biological control agent Bacillus amyloliquefaciens. These biorational products, currently produced by commercial companies, were tested alone and in alternation with current conventional fungicides.

Results

Findings related to use of biofungicides and improvements in application timing with the bioassay will allow current commercial peach growers to improve the efficiency and efficacy of their disease management programs. This outcome in turn will reduce costs and improve profitability. Furthermore, by substituting and incorporating biorational materials into their programs, conventional pesticide residues in the environment and on harvested fruit will be reduced, thereby benefiting the consuming public. Usage of biorational materials in the field will also reduce applicator exposure to conventional pesticides. Finally, proper deployment of conventional fungicide chemistries, as with the bioassay, will aid in limiting development of fungicide resistant strains of the various peach pathogens.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #29

1. Outcome Measures

Nuances of Marketing Ethnic Specialty Vegetables and Herbs - Long Term - New Jersey's agriculture will remain a viable and important industry. New Jersey residents will recognize the importance of agriculture's contributions to societal well being (open space, quality of life) and will support the agricultural industry socially, politically and economically.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nuances of Marketing Ethnic Specialty Vegetables and Herbs

Growing ethnic populations of first- and second-generation immigrants in the Mid-Atlantic Region

and along the East Coast offer farmers marketing opportunities to provide fresh produce native to these groups? homelands. Asian, Hispanic and African populations are growing at rapid rates in the region, and specialty groceries and restaurants are increasing to serve ethnic foods to both the ethnic populations and the general public. Providing the fresh produce common in these cuisines is an additional niche for fresh produce growers.

What has been done

Objectives: ? To characterize the size, growth patterns, and produce preferences of major ethnic populations of the East Coast. ? To determine production characteristics and economic potential of selected ethnic vegetables. ? To facilitate coordinated production of selected ethnic vegetables by growers in several East Coast states to create a year-round supply of consistent quality and quantity. ? To identify and evaluate production systems for specific ethnic crops that have potential marketability in the Mid-Atlantic region. Program Design & Content ? Grant funded studies of Ethnic communities and consumers, purchasing habits and food selections ? Identification of potential crops that can be grown successfully and profitably in Mid-Atlantic and East Coast regions ? Evaluation of specific crops and production systems suitable for local farms Program Delivery & Educational Materials ? Field demonstration-research trials ? NJAES and Journal publications ? Ethnic Crop summaries presented at farmer twilight meetings and regional conferences (NJ, PA, NY) ? Updated and increased resources available on www.worldcrops.org website.

Results

Three new farms have been established in Atlantic County producing ethnic crops. Three existing Asian farmers have expanded their operations and markets based on opportunities presented through this program. Likewise, several existing vegetable growers in and around Atlantic County have adopted new ethnic crops and expanded their markets.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

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

Weather presented a major challenge to researchers this year.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

NJAES research and extension outcomes related to this planned program were evaluated utilizing a variety of evaluation methods appropriate for each initiative to determine effectiveness on both a qualitative and quantitative level. For KASA and practice change we included the measurement of knowledge gained as measured by pre/post Likert-scale assessments. Surveys were used to measure increase in skills acquired, behavior change and practice adoption. For process evaluation we focused on program delivery, participation, relevance and timeliness. Data was collected at appropriate times for each initiative that supports this planned program. IRB approved evaluation instruments were used to collect research and extension data. Data analyses and comparisons relevant to basic and applied research and demonstration were collected and analyzed and reported utilizing a variety of data collection methods appropriate to each research question. The major goal of evaluating is the demonstration of social, economic, behavior and environmental changes in conditions that contribute to improved quality of life as a result of participation in programs and benefits of research solutions. See state defined outcomes for detailed results of each initiative.

Key Items of Evaluation

None to report.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Climate Change - Home, Garden 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
102	Soil, Plant, Water, Nutrient Relationships	20%		20%	
111	Conservation and Efficient Use of Water	20%		20%	
131	Alternative Uses of Land	20%		20%	
205	Plant Management Systems	20%		20%	
721	Insects and Other Pests Affecting Humans	20%		20%	
	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	3.0	0.0	3.2	0.0
Actual Paid	22.0	0.0	0.0	0.0
Actual Volunteer	2640.0	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**
405605	0	296360	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1877494	0	1296351	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
361707	0	1020377	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Identify critical programmatic foci/needs based on Extension and stakeholder assessment broadly defined under two areas:

- Environmentally sound gardening/lawn care
- Home horticulture-lawn, garden and grounds management
- Commercial horticulture - professional management and maintenance
- Environmentally sound household, structural pest control
- Home pest control-termites, carpenter ants,, etc.
- Human-heath related pest control-bed bugs, mosquitoes, ticks, etc.
- A school IPM program will be developed to train end-users sound management techniques,

Develop an inventory of local (county based) and regional and statewide programs designed to meet these needs. Identify team members and their roles. Create a multi-task effort to generate and share research-based information with clientele, including research, demonstrations, educational meetings and workshops, certification programs, trainings, etc. Research on plant cultivars that exhibit increased disease ans insect resistance , as well as reduced need for fertilizer and irrigation water, will lead to reduced dependence on chemical control of pests and disease, lessening the impact on the environment.

2. Brief description of the target audience

Stakeholders:

- Homeowners and residential clientele
- Commercial horticulture professionals (management and maintenance)
- Commercial pest control operators
- Public health officials
- Local environmental commissions or others that have interest in these areas
- Municipalities and other governmental and non-governmental agencies, including Parks Commission, Public Health, Mosquito Commission, schools, etc.
- Volunteers (trained via Master Gardener Program, Environmental Stewards Program), youth and others who can support and benefit from these efforts
- Underserved and underrepresented audiences

3. How was eXtension used?

Faculty participated the development of collaborative educational products and answering "ask the expert" questions.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	33497	28276	0	0

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	9	29	38

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- A variety of strategies will be implemented to reach target audiences. This will include and not be limited to workshops, field visits, classes, newsletters, media releases, electronic communications,publications. In addition a trained volunteer teaching base will be developed.Quantitative reports of participation data will be collected.

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Short Term - Increased knowledge and improved decision making skills of professionals and volunteers (Master Gardeners and Environmental Stewards) working in commercial horticulture professions (management and maintenance), commercial pest control operators, public health officials, municipalities and other governmental and non-governmental agencies. Increased number of trained youth and adult volunteers, and measurable impact of their assistance on clientele. Increased number of certified pest control operators. Increased number of youth and adult clientele utilizing Extension information and service to improve their own and others knowledge and decision making skills.
2	Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.
3	Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.
4	Outdoor Recreation, Parks and Other Green Environments: Understanding Human and Community Benefits and Mechanisms - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.
5	Improved Prediction of Atmospheric Fine Particle Concentrations and Human Exposures in the Eastern US - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.
6	Evaluating the Physical and Biological Availability of Pesticides and Contaminants in Agricultural Ecosystems - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.

7	Surveillance of Adult Mosquitoes and Mosquito-Borne Arboviruses - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.
8	Recycling Issues - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.
9	4-H Master Trees Steward Program - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.
10	Rutgers Veterans Environmental and Technology Solutions (RVETS) - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.
11	Safe Practices for Urban Gardening - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.
12	Organic Land Care - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.
13	Green Knight Newsletter Educates New Jersey Residents about Environmental Issues - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil

	amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.
14	Horticulture for Seniors - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.
15	Teaching Garden at Presby Iris Gardens - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.
16	Protecting Atlantic County?s National Resources and Environment - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.
17	Nursery Crop Integrated Pest Management - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.
18	Involving Youth in the Improvement of Their School Grounds - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.
19	Mainelis Chemical and Physical Nature of Particulate Matter - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.
20	Ecology & Management of Emerging Disease Vectors - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.
21	Biology, Ecology & Management of Emerging Disease Vectors - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.
22	Management of Annual Bluegrass on Golf Courses: Improved Practices for Maintenance, Pest Control, and Viable Techniques for Transition to More Desirable Grasses - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.
23	Center for Urban Environmental Sustainability - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.
24	Community-based Green Infrastructure Initiative for Urban New Jersey: Green Infrastructure Municipal Outreach and Technical Assistance Program - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.
25	Stormwater Management in Your Backyard: "Build a Rain Barrel" workshops - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.

26	Forest Stewardship - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.
27	Green Infrastructure: Incorporating Green Infrastructure Resiliency in the Raritan River Basin - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.
28	Rutgers Environmental Stewards - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.
29	Salem Watershed Project Grant 319h - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.
30	Management of Emerging Disease Vectors - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.
31	New Jersey Climate Extremes - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.

Outcome #1

1. **Outcome Measures**

Short Term - Increased knowledge and improved decision making skills of professionals and volunteers (Master Gardeners and Environmental Stewards) working in commercial horticulture professions (management and maintenance), commercial pest control operators, public health officials, municipalities and other governmental and non-governmental agencies. Increased number of trained youth and adult volunteers, and measurable impact of their assistance on clientele. Increased number of certified pest control operators. Increased number of youth and adult clientele utilizing Extension information and service to improve their own and others knowledge and decision making skills.

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.

2. **Associated Institution Types**

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Lag Times and Boom-bust Dynamics in Populations of Exotic Species

Under human influence, species are being transferred between regions faster and farther than at any other time in Earth's history and, in some cases, have caused enormous changes to recipient ecosystems. Despite considerable advances in our understanding of how exotic (invasive) species spread and establish self-sustaining populations, our ability to forecast when and where they will exert strong ecological impacts remains weak. Once an exotic invasive species appears, there is an immediate need to allocate resources to manage this species invasion, and effective management requires accurate forecasts of the potential damage of the invasion. However, predicting which exotic species will produce impacts and under what circumstances has proven difficult.

What has been done
Our NJAES researcher is taking a different tack, focusing on ecological impact, which is defined as a measurable change to the properties of an ecosystem by an exotic species. Using exotic birds as a model system, an NJAES researcher is exploring the prevalence of complex population dynamics in exotic species and the mechanisms behind some of these dynamics and, in the process, developing new statistical tools for identifying these dynamics. Based on criteria used by the International Union for the Conservation of Nature to classify species as threatened with extinction, population collages is defined as a ≥90% reduction in abundance within 10 years or three generations, whichever metric is greater. NJAES researcher developed a flexible, rigorous method to account for uncertainty in the two components of this definition (percent decline and duration of decline) and provide an estimate for the probability of a collapse having occurred. A Bayesian statistical approach is used to account for uncertainty in observed maximum abundance, which is a necessary step when defining collapses as a percentage drop from this value. This uncertainty is then translated into confidence limits around the magnitude of decline that should be considered a collapse. The same method is used to assess the uncertainty about the period of potential collapses.

Results
Some basic tools and methods to describe and measure the population dynamics for exotic/invasive species are now in place as a result of this research, and have already been applied. There are 54 exotic bird species on Hawaii, 33 of which have exhibited noticeable declines at some point in their time series. NJAES research findings indicate that 17 of 54

established exotic bird species on Hawaii experienced probable collapses, many leading to near extirpation. Declines from maximum abundances (ranging from 135.47 to 0.11 individuals) into a zone of possible collapse took on average 7 years. Collapse may be more common among exotic species than previously expected. Applying these methods to other taxa and locations is crucial for improving our understanding of exotic species population dynamics and management of invasive species, and future research will employ the methods developed here to investigate population lags and collapses within other exotic species groups (e.g., freshwater fish) or exotic birds in other regions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #3

1. Outcome Measures

Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Rotary and Rutgers: Growing Lives One Seed at a Time Enabling Garden Initiative

Dr. Benjamin Rush, University of Pennsylvania professor of the Institute of Medicine and Clinical Practice, published findings in 1812 that patients who worked in gardens had better recovery rates from mania compared to those who had not had the same gardening experience. In 1879, the Friends Hospital in Philadelphia, PA was the first American hospital to build a greenhouse to

be used for patient rehabilitation. When injured WWII veterans were admitted to Veterans Administration hospitals, physicians used on-site gardens, donated and planted by garden clubs and horticultural businesses, specifically for rehabilitation therapies. Today, gardening is used in hospitals, recovery and rehabilitation centers, senior centers, public and private schools, rehabilitative programs, and correctional facilities, all with the goal of providing people living with physical, mental or social limitations full and unobstructed access to therapeutic gardening activities. The professional field of Horticultural Therapy (HT) began in 1973.

What has been done
Rotary International District 7510 and Rutgers University joined forces and resources to launch an enabling garden initiative in Hunterdon, Mercer, Middlesex, Somerset, and Union counties. The "Rotary-Rutgers: Growing Lives One Seed at a Time" project is a Central New Jersey initiative in which pilot sites across the counties are identified to host and implement enabling garden spaces. Pilot site locations include: Hunterdon County Rutgers NJAES Cooperative Extension Office, Flemington Mercer County Mercer County Community College, West Windsor Middlesex County Rutgers University Cook Campus Floriculture Greenhouses; Arista Care at Cedar Oaks, South Plainfield Somerset
County Kirkside Senior Housing, North Branch Reformed Church, Branchburg; East Mountain School, Carrier Clinic, Belle Mead; Richard Hall Community Mental Health Center, Branchburg; Raritan Valley Community College, Branchburg Union County Community Access Unlimited Group Home, Roselle.

Results
In 2014, a pergola was funded and erected at the Branchburg location of the Richard Hall Community Mental Health Center, with approx. $3,500 of Rotary International District 7510 funds. This pergola will create a useable courtyard space for horticultural therapy sessions for all those clients and employees to participate in and enjoy. In addition, the RVCC site has been secured for a large 'enabling' or therapeutic garden space along their main parking area and entrance to the main campus buildings. Horticultural Therapy sessions have been expanded to include audiences through the partner audiences and locations listed above.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #4

1. Outcome Measures

Outdoor Recreation, Parks and Other Green Environments: Understanding Human and Community Benefits and Mechanisms - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health

related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Outdoor Recreation, Parks and Other Green Environments: Understanding Human and Community Benefits and Mechanisms

Citizen science programs pose excellent opportunities for the public to engage in authentic science learning. These programs fall under the umbrella of public participation in scientific research and have been shown to result in science content learning gains and development of scientific reasoning skills. In addition to these traditional STEM learning gains, citizen science projects promote positive community engagement, self-efficacy among volunteers with respect to environmental action, and increased motivation to engage in environmental learning. A number of claims have suggested, however, that simple engagement in outdoor activities and environmental recreation might equally contribute to these individual and community level literacy gains.

What has been done
NJAES researcher served environmental learning among individuals who are and who are not engaged in a citizen science projects. Targeting a land management citizen science project as well as individuals who engage in recreation on restored landscapes. In response to the following goals of the multistate project: "(1) Identify mechanisms by which parks and other green environments support human, health, environmental literacy and community vibrancy, which outcomes they enhance, and the relative contributions of the various mechanisms. b. Substantiate and extend the evidence for the role of park and outdoor recreation services in promoting environmental literacy among youth, and document the long-term influences of early lifespan connections with nature. c. Substantiate and extend the evidence for the role of park and outdoor recreation services in promoting community vibrancy and resilience." NJAES researcher carried out surveys to judge attitudes about the environment and gauge the knowledge and literacy toward the environment, with a focus on park and green space use. Individuals living in six townships near Rutgers University were mailed paper surveys with pre-stamped return envelopes. Those individuals were chosen by random sampling from the online white pages listings for the six focal townships.

Results

75 surveys were sent to each township, totaling to 450 surveys sent. There were 74 completed returns fairly evenly distributed across the townships. All surveys were kept anonymous and no identifying information was asked of participants. These data have allowed us to broadly characterize different types of park and greenspace users. Not surprisingly, we found a strong correlation between education and financial status. Our data suggest that Environmental Literacy is correlated with amount of education, visitation to regional or national parks, trust in local groups and print media. Environmentally-literate individuals were less likely to trust large scale institutions and, most of all, large corporations. Environmental literacy did not scale with science knowledge or personality features such as optimism. Environmentally-literate individuals were likely to own pets and prefer less urban/suburban environments. These individuals tended not to use local parks. Additionally, if an individual preferred an urban environment, they were more likely to trust government. By and large, respondents listed issues of health and society as being more important that environmental quality. Most of the respondents did not seem aware of phrases such as ecosystem services or security. Pet ownership correlated with local park use and with sense that they are living in a community. Individuals who owned pets were more likely to prefer less urban environments. If an individual felt that they were living in a community-driven town, they were more likely to be aware of local issues. Certain townships had more respondents relating to community than others. Education level tended to correlate positively with annual income and these individuals tended to live further from local parks, yet were more likely to rate local parks highly, though they may not regularly visit these. Individuals living near local parks tended to view less quality in these parks and linked these characteristics with distinct preferences for certain park features and motivations for use. Local parks tended to correlate more with community engagement and pet ownership. Individuals in this context tended to prefer safety and cleanliness. People living further from parks, tended to seek park activity, such as hiking or, in some cases, engaging with water features. This means that different people from similar locations would be more or less likely to engage in projects, depending on the type of project, and may be engaged different ways. Our data provide insight into how groups and stakeholders may engage in environmental education or citizen science, such as working with community on a local level and perhaps engagement with data and larger park improvement projects. Furthermore, spatial analysis indicates park exposure and distance are important variables in determining the types of activities in which people may engage. Our characterizations have implications for how to engage the public in place-based education projects involving climate change or public health issues such as obesity, and through what means to engage citizens. Persons living the same distance from the same park may have different conceptions green space based on a number of these factors and can therefore play an important role community engagement.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #5

1. Outcome Measures

Improved Prediction of Atmospheric Fine Particle Concentrations and Human Exposures in the Eastern US - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Improved Prediction of Atmospheric Fine Particle Concentrations and Human Exposures in the Eastern US

Atmospheric fine particulate matter (PM) is largely responsible for visibility degradation, adversely affects human health, and alters precipitation patterns and climate. Fine PM concentrations in most states currently exceed US EPA's health-based standards, and exposure to fine PM has a considerable impact on the heath of residents in these states. The formation of organic PM, a major fine PM constituent, is particularly poorly understood. PM2.5 has a considerable impact on the heath of residents in these states. The poor understanding of the atmospheric formation of organic particulate matter, also called secondary organic aerosol (SOA) is a major source of uncertainty in predictions of PM2.5 concentrations and PM2.5 properties.

What has been done
Our previous research has led to the recognition 1) that SOA forms through reactions in atmospheric waters (i.e., clouds, fogs and wet aerosols) and 2) that the variable efficiency with which atmospheric particles are transported from outdoors to indoors is a significant source of uncertainty in exposure and risk assessments. Research facilitated the improved treatment of these processes in predictive models that are used for air quality management and public health protection. Designed to enhance the "vitality, health, sustainability and overall quality of life in New Jersey," in accordance with the mission of the New Jersey Agricultural Experiment Station.

Research answered the following questions: 1) Is SOA formation observable in real atmospheric waters under controlled conditions 2) How much of the SOA produced can be explained by known mechanisms 3) What additional SOA precursors are potentially important 4) To what extent can we predict SOA formation 5) What happens to the concentrations of outdoor-generated particulate organic matter as this material is transported into the indoor environment, and 6) Can we model exposure to atmospheric PM2.5 considering not only atmospheric chemistry and transport, but also the penetration and persistence of particulate species into indoor environments.

Results
Researchers completed controlled OH radical oxidation experiments with the ambient mixtures of water soluble gases. These experiments demonstrate the formation of organic aerosol, suggesting that gaseous organic emissions are converted to particulate matter through chemistry in ambient clouds, fogs and aerosols. In a collaboration with Colorado State University, analysis of field measurements also provides evidence for organic aerosol formation through atmospheric aqueous chemistry. Objectives 2 and 3: We identified the major precursors for organic aerosol formation through aqueous chemistry in the ambient mixtures from two field locations. Our hypothesized precursors (glyoxal and methylglyoxal) were of only modest importance. Instead, we found that the major precursors were hydroxycarbonyls, polyols and amines. We have now begun to sample water-soluble gases indoors and to study the effects of dampness (aqueous films on exposures indoors.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #6

1. Outcome Measures

Evaluating the Physical and Biological Availability of Pesticides and Contaminants in Agricultural Ecosystems - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Evaluating the Physical and Biological Availability of Pesticides and Contaminants in Agricultural Ecosystems

Adult black fly females are a nuisance by their presence around one's nostrils, ears, arms, hands, and other exposed skin areas. These flies can discourage people from remaining in or visiting certain recreational areas for fishing, camping, hiking, golf, etc. when the black fly season occurs. Children are especially susceptible and may be severely bitten while adults in the same area are scarcely aware of the flies. It is suspected that the expansion of black fly populations is associated with improvement in stream and river water quality in recent years. As with many aquatic insects, black flies are very sensitive to water pollution.

What has been done
NJAES research assessed the effects of parasites on black fly populations as well as setup database of EPA established pollution tolerance values for aquatic invertebrates and stream rankings. Use existing data for black fly occurrence where applicable, and made new simuliid collections from unique EPA ranked streams that currently have no simuliid occurrence data, as well as made collections of species in complexes where previous morphological identifications may be incorrect. Used chromosomal analysis to identify species within complexes. Correlated the stream rankings with the simuliid species found therein to establish simiid pollution tolerances. Then correlated individual pollution tolerance values with co-occurring simuliid species. As the project has matured, we are expanding our scope of research to include fish species as an additional indicator of environmental quality. Fish species caught in waters adjacent to pesticide areas and non-pesticide areas, and analyzed for their usefulness as biomarkers for water quality and contaminant burden.

Results
We have completed the black fly work. Pollution tolerance values are reported for the 39 species of black flies known in New Jersey. Morphologically similar species were identified chromosomally to ensure accurate identification. Species of the same genus varied markedly in tolerance values, questioning the accuracy of generic-level tolerance values for the Simuliidae. An index for predicting the colonization and spread of the Simulium jenningsi group, which includes the major pest species of black flies in the eastern United States, is proposed, with implications for control programs worldwide. We are now using fish species as indicators, and after approvals, have caught and are analyzing fish samples for metals and other contaminants.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #7

1. Outcome Measures

Surveillance of Adult Mosquitoes and Mosquito-Borne Arboviruses - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Surveillance of Adult Mosquitoes and Mosquito-Borne Arboviruses

New Jersey mosquitoes have been of great public nuisance and economic importance since the earliest historical record. Migrating flood water mosquitoes and domestic species have affected not only the economic development of rural and resort areas but also the great urban and industrial centers. The problems from nuisance species continues to impact the state, but are nevertheless diminished by the sudden appearance of new mosquito-borne arboviral diseases. West Nile Virus (WNV) has become firmly established in the northeast since its unexpected appearance in New York City during the fall of 1999. Similarly, Eastern Equine Encephalitis (EEE)

poses an annual public health threat to residents, tourists and the equine industry in southern New Jersey and appears in mosquito populations every year.

What has been done
NJAES Researchers: 1) Conduct surveillance for mosquitoes. 2) Conduct surveillance for endemic mosquitoborne arboviruses (EEE & WNV). 3) Conduct surveillance for exotic mosquito-borne arboviruses in New Jersey. 4) Fulfill the mandates of Title 26 of the New Jersey Health Statues. This research affects all New Jersey residents by monitoring and assessing the threat posed by mosquito-borne diseases.

Results
This research affected all New Jersey residents by monitoring and assessing the threat posed by mosquito-borne diseases. The project further provides for and encourages environmentally sound, scientifically based, and professional control by county mosquito control districts, and meets state mandates for mosquito control. Again in the 2014 FY year surveillance data was collected throughout the calendar year from the 21 countries in New Jersey and posted weekly on the web. Identification support for rare and unusual species, as well as new mosquito species, was provided. Regular training for county professional staff was provided at meetings and workshops. http://vectorbio.rutgers.edu/ the website has been improved and "hits" to the site have increased.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #8

1. Outcome Measures

Recycling Issues - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Recycling Issues

Legislators, municipalities, the recycling industry and the residents of New Jersey need assistance in addressing various special recycling issues. It was necessary to develop recommendations on how to manage these stockpiles to reduce the pollutant load in the runoff. Assistance in handling runoff from stockpiles of other recycling materials was also needed. For example, it was found in one case in New Jersey that stormwater runoff from a wood recycling facility caused the death of fish in a lake. Guidance was needed how to handle the run-off from wood mulch stockpiles.

What has been done
A permanent facility was constructed at the Rutgers EcoComplex that allows testing stockpiles of various materials and developing Best Management Practices (BMPs) for handling leachate from stockpiles. At this facility and at existing wood recycling facilities it was determined that leachate from wood chip stockpiles can be a point-source of water pollution. In addition to the assessment of pollutant loads, the three-dimensional flow of water through the stockpiles was evaluated.

Results
The outcomes are knowledge gain, the expansion of markets of recycled materials and the prevention of stormwater pollution from stockpiles of recycled materials.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #9

1. Outcome Measures

4-H Master Trees Steward Program - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
4-H Master Trees Steward Program

Union County's community forest lacks an adequate number of trees. This deficit contributes to higher rates of skin cancer as well as asthma. Educating Union County's youth about shade trees and their benefits disposes youth to protect our current community trees and to plant more of them in the future.

What has been done
The 4-H Master Tree Steward Program was created to train volunteers. They learn about tree identification, biology and care. Once trained, these volunteers implement a curriculum to teach school aged children about trees.

Results
A sampling of 226 students showed that as a result of the Rutgers/4-H Class on Tree Appreciation: 71% said they were less likely to damage trees. 90% said they were more likely to take better care of trees around their homes. 86% said they were more likely to take better care of trees around their schools. 70% said they will observe trees more closely. 69% said they are more likely to plant a tree. 98% said they learned that there are many different kinds of trees. 84% said they were more likely to stop others from damaging trees. 78% said they want to learn more about tree care and planting. 83% said they will tell someone about what they learned.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #10

1. Outcome Measures

Rutgers Veterans Environmental and Technology Solutions (RVETS) - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Rutgers Veterans Environmental and Technology Solutions (RVETS)

Those that fish the Passaic River and consume their catches are being exposed to a number of contaminants associated with historical contamination of the river. Fish consumption bans are largely ignored, so a fish exchange (clean fish for contaminated fish) may be the best option for the protection of human health. Veterans in NJ are at greater risk of being unemployed than the non-veteran population. Veteran unemployment in NJ is among the highest rates nationally.

What has been done

15 veterans entered this green job skills training program and had received 1,000 hours of training through the end of 2014. (The program ends in February 2015). There have been more than 30 unique guest lecturers, 20 educational field trips, and 8 projects benefitting Essex County and the local community. The program is 40 hours a week from May through February. The trainees have also learned about starting their own businesses and how to become successful small business owners.

Results
The fish exchange is in its infancy and 11 trips to the river yielded 10 angler intercepts. All 8 of the consuming anglers encountered were willing to participate in a fish exchange. All 10 fishermen were aware of some pollution in the river and had heard about the dangers of eating fish from the Passaic. Once the proper permits are in place, the greenhouse will be used to grow clean fish to be used in the fish exchange program. This is expected to happen in the 2015 iteration of the program. A greenhouse and community garden provided fresh produce for the veterans and the local community. As part of their training, the vets installed an irrigation system at Presby Iris Garden, planted new trees at Brookdale Park, pruned and maintained the trees at Branch Brook Park, assisted in the preparation of a new Little League baseball field, maintained the landscaping at the RCE Passaic office, worked at the Montclair Community Farm, and hosted a successful Community Day at the Newark community garden that was attended by more than 100 local residents.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #11

1. Outcome Measures

Safe Practices for Urban Gardening - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Safe Practices for Urban Gardening

Soil testing on New Brunswick residential lots have shown high lead levels which requires increased testing and risk management strategies in order to ensure that lead is not transmitted to plants grown for consumption. Although the health problems associated with lead exposure are well known and lead levels in New Brunswick children have decreased, many immigrants continue to garden directly in the soil and have little knowledge of the testing and soil abatement measures necessary to create safe gardening conditions. The availability of clean soil or methods for composting and creating safe soil is limited and more effort is necessary to provide culturally appropriate education to the largely Mexican community on these topics.

What has been done
The goal of the program is to provide bilingual training for urban gardeners to educate them about best practices for protecting themselves from contaminated garden soil. A number of different methods are used to implement the program. - Garden Guardian/ Protector de Jardin classes are conducted in April and May in conjunction with local community organizations including Unity Square Partnership and Elijah?s Promise. The classes utilizes a train the trainer approach to recruit bilingual residents to teach their friends and neighbors about soil safety when gardening. Residents attend 2 classes where they learn about source of lead in soil, soil testing, interpreting results, remediation techniques, and composting.

Results
83% (n= 6) of Latino residents that participated in the 2014 Garden Guardian training indicated after the training that they: ? felt more comfortable teaching their friends and neighbors about safe soil practices (verses 45% before the training) ? understood how to take a soil sample (verses 27% before the training) ? new the levels of lead in the soil that are safe to garden in (verses 18% before the training) ? knew the sources of lead in soil (verses 18% before the training) ? understood the methods to stay protected from lead while gardening or playing in the soil (verses 18% before the training) 52% of those that responded to the follow up survey from the school garden conference (n= 21) indicated they had already incorporated or planned to incorporate safe soil education into their teaching or outreach.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water

131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #12

1. Outcome Measures

Organic Land Care - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Organic Land Care

An assessment was conducted to determine the needs of professional landscapers and homeowners with regards to organic landscaping. A survey was administered to attendees at the 2012 Central Jersey Turf and Ornamental Institute event (n = 173). 40% of those surveyed responded that their clientele had already inquired about organic or ?all natural? landscaping practices. 57% of overall respondents answered "yes" or "maybe" when asked if they wanted to become certified organic landscapers. 73% of landscaping company owners responded that they would like to become certified organic landscapers compared to 58% of crew managers and 43% of crew staff. 33% believed that being certified in organic land care would help their businesses, and 33% of respondents believed their customers might be willing to pay more for organic landscaping. More and more customers are asking their professional landscapers for organic land care services.

What has been done

Organic Land Care Certificate Course for professional landscapers A 5-day education program with over 20 speakers lecturing on a variety of topics: the history of the organic movement, basics of soil, alternatives to turf, site analysis/design, organic turf management, organic weed and pest management, water resources issues, planting and plant care, and wildlife management, among others. 24 participants representing many NJ counties attended this year?s class. Organic Land Care Working Group: This program has been evolving with the assistance of an organic land care working group with members consisting of professional landscapers, Rutgers personnel, New Jersey Department of Environmental Protection employees, Environmental Protection Agency representatives. The working group is currently finishing up an Organic Land Care Best Management Practices practical field manual for professional landscapers. The 5-day course and its materials, a homeowner "how to get started" fact sheet, and the best management practices manual are all works in progress through 2014. Team members have also given several "Introduction to Organic Land Care" presentations this year to introduce the topic to landscapers and others.

Results

The professional landscapers that attended the two introductory classes came into the workshops with some prior knowledge (52% correct on pre-workshop survey, n = 26). After the workshop, 74% of the knowledge test answers were correct. This knowledge increase was statistically significant at the 0.001 level (paired t-test). The success of the introductory program has led to the creation of an Organic Land Care Certificate Course for professional landscapers. The professional landscapers in the Organic Land Care working group have taken it upon themselves to create a new trade association: New Jersey Organic Landcare Association and the website is www.njola.org. This may be a significant impact to the landscaping industry. We will be documenting the environmental impact of this training in 2015.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #13

1. Outcome Measures

Green Knight Newsletter Educates New Jersey Residents about Environmental Issues - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Green Knight Newsletter Educates New Jersey Residents about Environmental Issues

We created this newsletter to provide education and outreach about environmental and resource management topics to a diverse audience of clientele. The goal is to educate readers about environmental issues in New Jersey and make them aware of educational opportunities and hands-on environmental activities that they can engage in, within and beyond their own watershed.

What has been done
The full newsletter is distributed quarterly by email and other electronic means. This is supplemented with monthly emails listing upcoming events and other brief news pieces. Approximate distribution is 575, in addition to readers who subscribe to the newsletter through Twitter (98 people) and through the RSS feed (57 people). Article subjects include descriptions of successful mitigation and demonstration projects, educational articles about specific topics, announcements of educational resources, and upcoming educational events.

Results
A survey of readers in 2014 showed that readers valued the newsletter for the quality of its content, its informative nature, and its providing information that changed readers? behavior. Readers rated the newsletter 4.5 out of 5 for content quality, 4.3 out of 5 for newsletter quality, and 4.7 out of 5 for being informative. In addition, 100% of respondents said that they gained knowledge reading the newsletter, 83% said they shared what they had learned with others, and 48% said they changed a behavior based on reading the newsletter.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #14

1. Outcome Measures

Horticulture for Seniors - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Horticulture for Seniors

Senior citizens in public housing are often isolated from their families and communities which complicates any existing physical and mental health issues they are facing. Isolation is unhealthy for seniors.

What has been done
Senior centers have been contacted and invited to send their residents to a monthly horticultural activity run by Rutgers Master Gardeners. The MGs include lessons about health, diet, exercise, etc. in a social, hands-on learning environment. 40 to 50 seniors participate in the monthly activities. The MG Senior Hort committee has targeted poorer, underserved seniors from Essex County (i.e. Newark, East Orange, Irvington).

Results
Through conversations with the participating seniors the Master Gardeners have learned that program participants have formed new friendships with people from other communities and senior centers. The monthly event is eagerly anticipated by the seniors and staff. MG volunteers have used simple (3-5 question) surveys to measure participant satisfaction with specific horticultural activities, surveys have also provided new programming ideas to the volunteers. Lessons and activities have been adjusted to meet the needs and expectations of the senior participants.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #15

1. Outcome Measures

Teaching Garden at Presby Iris Gardens - Medium Term - Educated youth and adult clientele, both professional and residential, utilize their newly gained knowledge and skills to implement and make changes such as: Efficient and effective pest control techniques. Proper utilization of fertilizers and other soil amendments as needed based on soil testing. Proper selection of plant materials to reduce need for chemical inputs. Reduction in the damage caused by structural pests. Reduction in health related incidents and costs association with human health vectors (ticks, mosquitoes). Protect health and safety of school children. Enhance or maintain environmental quality.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Teaching Garden at Presby Iris Gardens

There is a broad public interest in learning how to vegetable garden, an interest that has increase in response to economic hardship. Along with the economic savings provided by gardening, there is also an increased interest in local, fresh vegetable consumption.

What has been done
The Rutgers Master Gardener Teaching Garden has been created at Presby Iris Gardens in Montclair (a part of the Essex County Parks Department.) Because of its proximity to public transit (light rail and buses), Presby Iris Gardens is accessible to all residents of Essex County. The

garden has multiple beds which demonstrate various cultivation techniques for home gardening (i.e. square foot gardening, lasagna gardening, etc.) The garden is also a demonstration of integrated pest management and organic pest control; providing the public examples of how to reduce pesticide use. Evening and weekend gardening workshops are offered throughout the year, making the educational programs accessible to the working public.

Results
People left the workshops tangible examples of backyard gardening that they can implement either at home or in a community garden. Teachers have a new local resource/field trip destination to supplement their classroom teaching.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #16

1. Outcome Measures

Protecting Atlantic County?s National Resources and Environment - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Protecting Atlantic County?s National Resources and Environment

?Consumer Horticultural Education ?Enhance Public Awareness and Access to RCE Coordinate

development of community gardens to provide low availability areas with fresh produce ?Offer Pesticide applicators re-certification credit classes ?Multi-department program coordination ?Promote Integrated Pest Management Education to Public

What has been done

Goals and Objectives: To influence personal gardening practices and educate the general public on proper horticultural practices to minimize water usage and fertilizer waste. Participants will become leaders in the community and educate a greater audience in appropriate gardening practices. The 60 hours of training that they received covered a wide range of topics including soils, fertilizers, pesticide safety, lawn care, plant pathology, diagnostic technique, vegetable and small fruit cultures, insect identification, and indoor plant care.

Results

Continued to have an ongoing relationship with the Atlantic City Housing Authority and Atlanticare in the development of community gardens for residents of each ward in Atlantic City. In continuing our work with the Atlantic City Housing Authority, Atlanticare, and the residents of Atlantic City, we have been combining an education of growing your own food and the nutritional benefits of eating fresh produce. Atlantic City is an area with minimal opportunity to acquire fresh produce. We have also continued to be involved with several school gardens that have partnered with the local community residents in maintaining a vegetable garden. We continue our work with the Atlantic City Ocean Aquarium and Gardner's Basin in demonstarting the types of plants for a seashore environment. We have been instrumental in helping the area become revitalized and as such has now been added to the historic registry which has made available substantial funds to continue the revitalization. The participants of the Master Gardener class increased their knowledge of the topics covered in the classes. They have gained confidence in their ability to answer other residents regarding questions on the topics. They have adopted the recommended gardening practices in their own gardens and many have begun to teach these practices to other home gardeners. A certain percentage of the Master Gardeners, have become leaders and decision makers in their communities regarding environmental issues through local board positions and environmental commissions. In 2014, approximately 1000 inquiries were resolved by the volunteers on the helpline and various events. The total volunteer hours for 2014 were 5,815.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #17

1. Outcome Measures

Nursery Crop Integrated Pest Management - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nursery Crop Integrated Pest Management

According to the USDA 2012 Agricultural Census 125 nurseries were surveyed in Cumberland & Salem Counties. Cumberland County totaled the fifth largest acreage in production for the United States and had the third largest square footage of any United States county for nursery production under protection. Cumberland County had 6,790 acres of stock in the open and more than an additional 280 acres listed as being under protection. Sales of nursery stock ranked ninth of counties in the United States. The NJDA inspected 244 nursery locations and a total of 6,839 acres within Cumberland County's alone, which were the largest number of nursery locations inspected in any county of New Jersey. Salem County added an additional 70 locations. Local nurserymen produce around 400 species of plants that include well over 2000 varieties. Because of the diversity of plant material and various systems of production, growers constantly search for innovative methods of optimizing their production systems in a way that maximizes output while minimizing environmental impact. Pesticide development has evolved from products that control a wide range of pests to ones that are very focused on certain pests or pest classes. This has resulted in more specificity along with higher pesticide costs. The combination of many plant varieties, the various pests, and the issue of increasingly pest-specific pesticides creates a serious challenge to growers in their efforts to control pests. In addition, growers need to rotate between classes of pesticides to help reduce the possibility of pest resistance. The final issue is grower concern of phytotoxicity. Presently, growers are forced to continually search for pest control agents and techniques that control the pest, do not harm plants, and are cost effective. Offered a choice between the range of pesticides that offer effective control, nurserymen choose pesticides that have the lowest toxicity and minimum environmental impact however the need for rotation of products sometimes forces one to make alternate choices.

What has been done
Integrated pest management relies on scouting plant material to determine pest presence and pressure. Using scouting information, Cooperative Extension personnel offer control strategies. Growers use information provided in their choice of control products. 2014 was the eleventh year Cooperative Extension has been involved in scouting for pests in nurseries. Following each scouting event, growers are notified of pest problems, population dynamics and populations of

beneficial insects in an effort to help them make educated decisions on management practices to be implemented. A total of 583 acres of nursery plant material were scouted during the 2014 growing season. The primary pests problems continue to be spider mites and aphids.

Results
A goal of the IPM program and a measure of success is to have nurseries train their personnel and start their own integrated pest management programs. Three nurseries took advantage of personnel training during 2014. There are presently five nurseries that have taken on their own scouting programs following their involvement in and training provided by the nursery IPM program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #18

1. Outcome Measures

Involving Youth in the Improvement of Their School Grounds - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Involving Youth in the Improvement of Their School Grounds

School grounds in Union County lack sufficient numbers of trees to make adequate shade

(protects against skin cancer), to help fight asthma (filter particulate matter out of the air), and to add beauty to the lives of county residents.

What has been done
In 2014, 4-H trained 70 students from 35 different schools on how to plant and care for trees. These 70 students then proceeded to plant $2,000 worth of shade trees on their school property. In the process of planting and caring for the trees, they involved an additional 1,000 students.

Results
$2,000 worth of trees were planted. Publicity for the importance of planting trees was generated in several Union County communities. Youth increased their awareness of how to improve the environment. Youth gained valuable leadership and stewardship skills.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #19

1. Outcome Measures

Mainelis Chemical and Physical Nature of Particulate Matter - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Mainelis Chemical and Physical Nature of Particulate Matter

Questions concerning the environmental fate of nanoparticles arising from agricultural operations and from the manufacture, use or disposal of consumer products has arisen and little is known about the toxicology and environmental behavior of these particles.
Of particular concern are nanoparticles, or particles between 1 and 100 nanometers in size. The number of nanotechnology-based consumer products continues to grow despite the concerns regarding the exposure and potential health risks. The inhalation exposure is expected to be the highest from cosmetic powders and consumer sprays, which are usually applied close to the personal breathing zone. However, there are currently very few quantitative data describing such exposures.

What has been done
An NJAES researcher is investigating the physical, chemical, and biological nature of particulate matter, including nanoparticles, derived from agricultural practices, processes, and operations and from the production, use, and disposal of consumer products, as they impact air, water, and soil quality and associated health, economic, and environmental impacts. This researcher realistically simulated the use of consumer sprays that contain silver and zinc compounds, and the released particles were analyzed using a Scanning Mobility Particle Sizer and an Aerodynamic Particle Sizer. A compact electrostatic collector built in-house was used to capture airborne particles to examine their shape and agglomeration using Transmission Electron Microscopy (TEM), while an ICP-MS method was used to investigate the presence of metals in the selected consumer products. Overall, 13 nanotechnology-enabled consumer products were investigated for their potential to release particles.

Results
Nanosized particles were released during the use of almost all investigated products. Number concentration of released nanoparticles varied substantially, depending on a particular product and product category. Some of the highest released nanoparticle concentrations were observed for spray products, reaching concentrations as high as 10^6/cm. During the use of nanotechnology-enabled products, a release of submicron and supermicron particles was also observed, indicative of the release of nanoparticle agglomerates and nanoparticles attached to larger particles stemming from product matrices. Presence of individual nano-sized particles and micron-sized agglomerates among the released particles was confirmed when analyzing captured airborne particles using TEM. As per ICP-MS analysis, the concentration of Ag (silver) in the spray products ranged from 1 to 16 mg/L, while the concentration of Zn (zinc) ranged from 10 to 100,000 mg/L; presence of other metals, such as lead, was also detected in some products.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #20

1. Outcome Measures

Ecology & Management of Emerging Disease Vectors - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Ecology & Management of Emerging Disease Vectors

The mosquito is a very dangerous creature. Each year there are 300 - 500 million cases of malaria reported worldwide, resulting in up to 2.7 million deaths, mostly children. In addition, introduced mosquitoes (i.e. mosquitoes transported accidentally from one country to another, usually associated with cargo of goods or people) are usually critical disease vectors and have led to disease outbreaks such as yellow fever and in the recent past, West Nile virus. Although mosquito control for disease control has a long history, it has often been reactive, which means that intensive mosquito control only occurs following a disease outbreak and is often performed under an emergency mentality. As a result it has often relied on massive application of insecticides or habitat destruction without careful attention to either the population dynamics of the target species or the potential development of insecticide resistance. In contrast, the development of strategies for control of Ae. sollicitans, the salt marsh mosquito and a tremendous biting nuisance that delayed the settling of coastal NJ, utilized a careful study of the life-history of the species. Researchers learned that its eggs hatch only during Spring tides, and this knowledge facilitated proactive and effective control.

What has been done
NJAES researchers are utilizing mathematical and statistical tools and laboratory-based analysis such as genomic sequencing to understand the factors underlying both the egg hatch, larval development and growth phases of important disease-bearing mosquito species, as well as the existence and development of insecticide resistance, both pre-existing and potentially as a result of mosquito control activities. The ultimate objective of this research is the development of pro-active control strategies that focus primarily on source-reduction.

Results

NJAES researchers have successfully used NextGen sequencing and bioinformatics to examine the genomes and transcriptomes of feral and domestic forms of Culex pipiens (the common house mosquito). They have identified genes involved in digestion, innate immunity, hemostasis, olfaction and chitin binding. By examining molecular divergence between closely-related yet phenotypically-divergent forms of the same species, these results provide insights into the identity of rapidly-evolving genes between incipient species that can be targeted to develop better methods of control. These NJAES researchers have collaborated with researchers at USMRIID (DOD) and two groups in Germany to use genetic analysis to make predictions regarding vectorial capacity and disease risk. Their findings underscore differences in vector competence between different genetic forms in the Cx. pipiens complex, but indicate that if Rift Valley Fever virus (a class II bioterrorism agent) were to arrive in the US, competent vectors abound in the highly urbanized northeast. NJAES researchers have developed new methodology to identify important disease vectors and the role of native vs. exotic species in local arboviral transmission in the US. Their findings support the preeminence of Culex. Restuans (another mosquito species) as an enzootic vector of WNV and strongly suggest this species has become a "native invasive" that exploits human modified habitats, reaching very high abundance there. Importantly, high infection rates in disturbed wetland sites with high populations of Cx. restuans suggest this species may enable the introduction of WNV to urbanized environments where both Culex contribute to transmission potentiating disease risk.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #21

1. Outcome Measures

Biology, Ecology & Management of Emerging Disease Vectors - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Biology, Ecology & Management of Emerging Disease Vectors

The Asian tiger mosquito, Aedes albopictus, is an aggressive and day-biting mosquito that transmits important human viral diseases (e.g. dengue and chikingunya fevers) and displaces native insect species. This peridomestic mosquito deposits eggs in natural and artificial containers including trash, pots, bird baths, etc. These container larval habitats tend to be cryptic and, therefore, difficult to reach by conventional insecticide treatments.

What has been done
We have developed an auto dissemination station that transfers the insect growth regulator, pyriproxyfen, from the station to the mosquito?s egg-laying organs.

Results
Field efficacy experiments have demonstrated pupal mortality of 87% for this newly-developed auto dissemination station, making it a highly effective technology for controlling Asian tiger mosquito populations. This work resulted in NIH-SBIR funding of $1.65M to support research needed to commercialize this equipment and this new technology to market. A company has signed an Option to License this technology, and applications for EPA registration of the station have been initiated. Standard Operating Procedures were generated for adult and egg surveillance, rapid blood meal identification, truck-mounted larvicide and adulticide applications, and larval bioassays. A degree-day model permits accurate treatment timing. NJAES researcher has developed an application to calculate the operational cost of implementing various recommended strategies, treatments or protocols for controlling Asia tiger mosquito (Aedes albopictus) populations. This 'costing tool' permits planning of control strategies, deciding the number of treatments needed, and prioritizing the intervention areas. The project demonstrated that traditional passive means of public education to reduce larval habitats were ineffective, whereas active community engagement (e.g., volunteers coupled with tire pick-up days, trash can-drilling days, a cell phone app, public service announcements, etc.) reduced backyard containers. When a cost-benefit analysis for Ae. albopictus suppression was conducted, results indicated that each dollar spent on control generated $9.60 of value to residents. Of even greater significance, 'willingness to pay' analysis showed residents would accept a tripling of the existing budget for effective mosquito control. The project's surveillance and control strategies are already being used by local, state, federal and international groups to manage Ae. albopictus. The project realized national recognition in November with receipt of the Team Award from the Entomological Society of America.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water

131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #22

1. Outcome Measures

Management of Annual Bluegrass on Golf Courses: Improved Practices for Maintenance, Pest Control, and Viable Techniques for Transition to More Desirable Grasses - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Management of Annual Bluegrass on Golf Courses: Improved Practices for Maintenance, Pest Control, and Viable Techniques for Transition to More Desirable Grasses

Annual bluegrass (ABG) is a highly invasive weed on golf courses where it frequently becomes the dominant species despite attempts to suppress it. As a result, superintendents usually resort to managing it rather than working to eliminate it in favor of more pest-tolerant bentgrasses. The annual bluegrass weevil (ABW) and anthracnose basal rot (ABR) disease, caused by the fungus Colletotrichum cereale, have become the most severe pests of ABG. Their control often depends heavily on pesticides. There is an urgent need to gain a better understanding of the biology, and pathogenesis of ABR, develop improved integrated pest management (IPM) tools for more effective pest management, learn how stresses affect ABG and its sensitivity to ABR, and how to either mitigate these stresses or find ways to transition to more desirable/sustainable grasses.

What has been done
NJAES Extension Specialists are developing new molecular tools to study C. cereale and the infection process and assessing the impact of nitrogen, cultivation and other cultural practices on ABR. The tolerance/resistance of ABG and bentgrass varieties to ABR are evaluated in the greenhouse and field. Cultural techniques (e.g., use of over seeding species; cultivation; soil fertility), alone or in combination with novel biocontrols and herbicides to reduce/eliminate ABG in

favor of more desirable turfgrass species are studied. Tolerance/resistance of ABG and bentgrass species varieties to ABR are evaluated in the lab and field.

Results

During 2014, extension specialists conducted a series of field-based investigations to determine how N fertility impacts the gene expression of C. cereale and surrounding microorganisms. The complete transcriptome is being sequenced in this study to determine if C. cereale pathogenicity levels increase under low N fertility, and whether these pathogenicity levels correspond with disease severity. Two experiments on best management practices (BMP) affecting anthracnose disease on annual bluegrass determined that increasing nitrogen fertilization was the most influential and beneficial BMP. Further data analysis is needed to interpret interactions of sand topdressing with nitrogen fertility and mowing height.

A study assessing the impact of nitrogen fertilization and mowing height on fungicide inputs clearly indicates that fungicide inputs can be reduced if nitrogen fertility is increased and/or mowing height is increased. A study of potassium fertilization clearly indicates that low soil levels of potassium intensified anthracnose disease on annual bluegrass. Leaf tissue concentrations of > 2.0% potassium resulted in reduced anthracnose disease. A study of soil pH indicated that anthracnose disease is less severe when soil pH increases in the range of 5.2 to 6.8.

Turfgrass researchers at NJAES collected data from a trial to study the genetic ability of bentgrass to compete against annual bluegrass. Initial results indicate some cultivars of bentgrass can outcompete annual bluegrass. Best Management Practice recommendations have been distributed the golf course industry through research reports published by the United States Golf Association and TriState Turf Research Foundation. The most recent BMP recommendations are also posted on the Rutgers Center for Turfgrass Science website. We also present this information at national and local conferences. Adoption of this information by practitioners will result in reduced pesticide inputs, cost savings, and improved plant health.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #23

1. Outcome Measures

Center for Urban Environmental Sustainability - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Center for Urban Environmental Sustainability

New Jersey is the most densely populated state in the U.S. and has sustained environmental alterations and impacts for more than three centuries. This positions the state as a microcosm of current and potential environmental issues facing the U.S.

What has been done
CUES is a unique transdisciplinary center housed in the departments of Landscape Architecture (LA) and Environmental Sciences (DES). CUES provides the platform to combine the best science/environmental engineering (DES), and environmental planning/design (LA) expertise in addressing (sub-)urban environmental issues. Through collaborations with faculty and students, CUES provides educational opportunities for Rutgers students interested in the intersection of environmental planning and resiliency with sustainable innovative design. By integrating scientific/engineering research into tangible design decision making, CUES brings the knowledge available through Rutgers out into New Jersey?s (sub-)urban communities. IN 2014 the main activity was to support the effort to obtain funding from the State of New Jersey to begin construction. Review engineer interpretation of conceptual designs. Advice on phasing of implementation of conceptual design. Perth Amboy 2nd Street Park: Develop concept design to convert a contaminated site into a community park that meets the needs and interests of the surrounding neighborhood residents.

Results
Sustainable Jersey: Reduction of Brownfield Inventory in New Jersey, Three action Items were improved for inclusion in the SJ program. 22 municipalities submitted materials related to the Brownfield Action Items. 8 Municipalities earned SJ points in 2014. Stantec: Research and Development Project not completed, yet. Voorhees Environmental Park:
Funding was obtained, construction will start spring 2015 Perth Amboy 2nd Street Park: proposed park design was well appreciated by local residents and formally approved by the city council. The design development informed the deliberations regarding the appropriate approach towards remediation. The intended use as a public park and the very positive support by the local community throughout the outreach and design proposes that the City?s leadership lean towards a complete cleanup of the site. The original intent was to just cap the site; however, the evident limitations of capping for future possible uses led to the decision to further explore options of removing contamination and importing clean fill.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #24

1. Outcome Measures

Community-based Green Infrastructure Initiative for Urban New Jersey: Green Infrastructure Municipal Outreach and Technical Assistance Program - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Community-based Green Infrastructure Initiative for Urban New Jersey: Green Infrastructure Municipal Outreach and Technical Assistance Program

As stormwater runoff flows over the land or impervious surfaces (paved streets, parking lots, and building rooftops), it accumulates debris, chemicals, sediment or other pollutants that can adversely affect water quality if the runoff is untreated.

What has been done
Passaic Valley Sewerage Commission (PVSC) is committed to helping struggling communities better manage their existing water infrastructure. Through its partnership with RCE Water Resources Program, PVSC will: ?Provide outreach and education about green infrastructure strategies to municipalities in its service area ?Install demonstration green infrastructure projects to reduce stormwater runoff volumes ?Provide cost-share funding to assist municipalities in

evaluating needs and green infrastructure opportunities to increase soil infiltration and groundwater recharge and protect waterways from nonpoint source pollution.

Results
A complete municipal wide green infrastructure assessment was completed for Bayonne, Little Falls, Montclair, Newark, Paterson, Saddle Brook and West Orange. Through cost-sharing agreements between PVSC and the municipalities, Green Infrastructure Feasibility Plans have been provided to these municipalities to begin implementing green infrastructure projects throughout the community. PVSC and the RCE Water Resources Program will be working together to install three demonstration projects in the spring of 2015 to serve as examples for the public to understand the benefits of green infrastructure.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #25

1. Outcome Measures

Stormwater Management in Your Backyard: "Build a Rain Barrel" workshops - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Stormwater Management in Your Backyard: "Build a Rain Barrel" workshops

As stormwater runoff flows over the land or impervious surfaces (paved streets, parking lots, and building rooftops), it accumulates debris, chemicals, sediment or other pollutants that can adversely affect water quality if the runoff is untreated.

What has been done
Best management practices (BMPs), such as rain gardens and rain barrels, are used to control stormwater runoff. The Stormwater Management in Your Backyard program provides information on the science and engineering behind stormwater BMPs and empowers volunteers to educate their own communities. BMPs such as rain gardens and rain barrels are used to control stormwater runoff. "Build a Rain Barrel" workshops, offered as part of the Stormwater Management in Your Backyard program, provide information on rain barrel construction and maintenance and include a hands-on training where attendees build a rain barrel for installation at their home or business. Between January 2014 and August 2014, twelve (12) "Build a Rain Barrel" workshops were held with 239 people in attendance.

Results
239 rain barrels were built and hopefully installed, capturing approximately 836,500 gallons of stormwater annually.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #26

1. Outcome Measures

Forest Stewardship - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Forest Stewardship

Almost one hundred and twenty thousand landowners own approximately 1.3 million acres of forestland in New Jersey, yet less than ten percent of those owners actively manage their forestlands. Because of increasing developmental pressures, the increasing value of the state?s forests for open space, water, wildlife, quality of life and traditional forest products, and the increasing threat of invasive species, it is more important than ever that these private lands are actively and sustainably managed.

What has been done
Six presentations, evening programs, and field days were conducted or presented on forest stewardship primarily for private, nonindustrial forest landowners. Assistance was provided for planning and conducting the annual Tree Farm Day. Growing Christmas trees is a land management option for landowners. One twilight meeting was planned for Christmas tree growers. An invited talk on controlling cryptomeria scale on true firs was presented at the NJ Christmas Tree Growers Annual Winter Meeting. Four on-line newsletters were published for woodland stewards and one newsletter for Forest Stewardship woodland owners was published.

Results
Approximately 235 landowners attended the programs conducted on forest stewardship. Topics addressed included southern pine beetle, emerald ash borer, sirex wood wasp, thousand canker disease, viburnum leaf beetle, timber stand improvement, tree identification, lumber production, forest stewardship programs and farmland assessment. Presenting pertinent, readily adapted/applied management information and alternatives can help provide incentives for landowners to sustainably maintain their open space and woodlands through active forest management. With the average size of forestland ownership in New Jersey of 15 to 20 acres, some 3,525 to 4,700 acres have benefited from more knowledgeable landowners, subsequent better management, and a higher likelihood of remaining forested.
Approximately 95 Christmas tree growers attended the twilight meeting and the annual winter meeting. With the average farm size in NJ of eight acres, and if one-quarter of the attending growers adopted the shearing and scale control techniques presented at the meetings, 160 acres benefited both economically and environmentally.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #27

1. Outcome Measures

Green Infrastructure: Incorporating Green Infrastructure Resiliency in the Raritan River Basin - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment- in their homes, gardens, schools, parks and workplaces.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Green Infrastructure: Incorporating Green Infrastructure Resiliency in the Raritan River Basin

Green infrastructure in portions of the Raritan River Basin are particularly vulnerable to climate change threats based upon impervious cover reduction action plans.

What has been done
The goals of this project are: 1) to enhance the climate resilience of the municipalities within the Raritan River Basin study area by providing each municipality with an action plan to reduce stormwater with climate resilient green infrastructure practices 2) to provide funding to implement some of the actions contained within the plans 3) to provide a guidance document for municipalites and stakeholders to implement green infrastructure practices 4) to provide recommendations for policy changes that will continue to promote these actions beyond this two-year project during the first five months of this project, the project team began to develop impervious cover assessments for approximately
25 of the 54 municipalities in the Raritan River Basin. The assessments include GIS analyses using the NJDEP Land Use/Land Cover data to determine acres of impervious surfaces on a municipal basis and HUC14 basis. The assessments also include stormwater runoff volume calculations to determine stormwater runoff volumes associated with identified impervious cover for the New Jersey water quality design storm, 2-year design storm, 10-year design storm and the 100-year design storm. Finally, the assessments include the identification of three opportunities for each municipality to eliminate, reduce, or disconnect directly connected impervious surfaces using green infrastructure practices. Examples of concept plans and detailed green infrastructure information sheets are provided in each assessment. Detailed green infrastructure information sheets describe existing conditions and issues, proposed solutions, anticipated benefits, possible

funding sources, potential partners and stakeholders, and estimated costs are provided. Finally, these detailed green infrastructure information sheets provide an estimate of gallons of stormwater captured and treated per year by each proposed green infrastructure practice. Concept plans are also included and provide an aerial photograph of the site and details of the proposed green infrastructure practices.

Results
The project team has developed impervious cover assessments for approximately 25 of the 54 municipalities in the Raritan River Basin in the first five months of the project. This project also installed "climate resilient" green infrastructure practices in the Raritan Basin to reduce the water quality and flooding impact of impervious surfaces, helping to move these 25 municipalities towards climate resiliency. This project implemented climate resilient green infrastructure practices that will treat 5 to 10 acres of impervious surfaces, capturing 68 to 136 million gallons of stormwater annually. More importantly, the project will provide 25 municipalities with plans that contain projects that could treat an additional 50 acres of impervious surfaces in the Raritan Basin. This project empowered communities to change policy and take action. Finally, this project trained 10 to 15 undergraduates, 1 to 2 graduate students, and youth groups throughout the Raritan Basin.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #28

1. Outcome Measures

Rutgers Environmental Stewards - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Rutgers Environmental Stewards

Environmental issues are among the most serious problems faced statewide and nationally. A six year NJDEP study concluded in March 2003 on comparative risk from environmental stressors concluded that the top four environmental issues in New Jersey were 1.land use change, 2.indoor pollution, 3.invasive species and 4.outdoor air pollution. NJAES has more faculty working in environmental related fields than in agriculture. But, in sharp contrast to agriculture, there is no environmentally oriented extension program integrating research and extension with public input though a hierarchically connected set of advisory groups. Environmental research at the NJAES is currently not particularly integrated, nor overly focused on priority issues in NJ. Based on over 95 years of experience in agricultural extension, it is clear that a well formed and thought out extension program is the missing link that could improve efficiency and relevance of environmental research carried out at NJAES and speed improved policy and technology adoption and access to environmental expertise by New Jersey residents. These facts establish a need for an environmental outreach program.

What has been done
Rutgers Cooperative Extension formed a partnership with Duke Farms Foundation to create a statewide Environmental Stewardship certification program. Cooperators include the NJDEP, NJ Audubon, the Association of NJ Environmental Commissions, and a rapidly expanding list of environmentally related organizations from government, academia and the non-profit sector. An advisory council was formed to guide the Rutgers Environmental Stewards program which consisted of internal and external stakeholders.
Regional instruction locations were established. As of 2013 regional classes have been conducted for nine years providing 1,260 hours of training to 352 students. To support promotion and management of the program a web site was created, http://envirostewards.rutgers.edu. The site functions as both a promotional tool to attract students and serve them as an educational resource.

Results
The Rutgers Environmental Stewards is a long term program that entered its 10th year in 2014. Summary data presented included: Completed Training 402 of 439 91.57% Engaged in Intern Project 202 52.20% Completed Intern Project 130 33.59% On Environmental Commission 28 7.24% Impact summaries of work conducted by the 138 Rutgers Environmental Stewards who have attained certification in the program are available on-line at http://envirostewards.rutgers.edu/CertifiedRutgersEnvironmentalStewardsImpactsandProjects.html, 89% reported increased enthusiasm and confidence. The quality and measurable impact of the internship portion of the program is on track to equal or exceed these measures of training

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #29

1. Outcome Measures

Salem Watershed Project Grant 319h - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Salem Watershed Project Grant 319h

Salem County covers 338 square miles with nearly half of this land actively farmed. Salem County is home to six rivers, 34,000 acres of meadow, marshland, tidal and fresh water wetlands, and 40 lakes and ponds. Many important headwaters congregate in Salem County. Salem county watershed is an integral part of Salem County?s natural environment. Watersheds are areas of land that drain into bodies of water such as rivers, lakes, streams or bays. Watersheds? collect service waters and filter out impurities and harmful chemicals so when the water is then absorbed it is in a cleaner state. Dissolved oxygen, pH, nitrate, and phosphate levels are indications of the watersheds water quality and health. Agricultural practices can sometimes directly affect watershed health and therefore agricultural conservation practices must be instituted in order to keep the watersheds water quality in check. Nitrogen and phosphate run off from farming practices can cause low oxygen in the water or algae blooms which lead to fish kill and harm the quality of water in the watershed.

What has been done
A majority of cropland in the target watershed is managed by six farmers. A variety of tillage practices are used on this land, included reduced till or no till in some areas and conventional tillage in others. Much of the land receives applications of manure, as the majority of these fields are connected to dairy operations. Farmers currently engage in comprehensive good management practices for soil, nutrients, and manure. These farmers were provided the ability to expand their reduced-tillage activities through the use of new no till farming equipment. By using this new equipment as part of their daily planting and tilling practices, these farmers are effectively reducing the potential for soil erosion and the runoff of soil, manure, nutrients, and fecal bacteria

during storm events in to bodies of water within the watershed. The goal of this project was to expand reduced-tillage activities in the watershed by providing farmers with necessary equipment; equipment such as vertical tillage equipment and vertical-cut manure spreaders. By increasing each farms no-till activity, farmers are minimizing the amount of nutrients such as manure, fecal bacteria, nitrogen, and phosphate that can leach into the soil and consequently drain into water bodies in the watershed. This idea was proposed to the selected group of farmers and was well received. Every farmer was interested in obtaining new equipment which would improve their planting and spreading but also would minimize their environmental impact. Steps were taken at Memorial Lake East to establish a permanent buffer with would filter incoming water and plans are underway to develop a basin for catching sediment at Avis Mill Pond.

Results
Six farmers participated in the project. Five of these farmers with the help of the grant purchased vertical tillage equipment which will improve their planting and minimize environmental impact. One of these five farmers also purchased a no till planter and additional farmer also purchased a no till planter. This equipment allows farmers to more efficiently plant their crops and also minimizes nutrient loss into the soil and through leaching thus preventing runoff into the waterways and maintaining watershed health. Each farmer is thankful to have been able to be a part of a project that not only helps their production but keeps the environment in their home town healthy and thriving. The two projects at Avis Mill Pond and Memorial Lake east are still ongoing but plans are underway to create a basin and a permanent buffer at the assigned target areas.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #30

1. Outcome Measures

Management of Emerging Disease Vectors - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Management of Emerging Disease Vectors

Mathematical models are useful tools in characterizing and predicting health risks. Ecological models of disease vector populations and epidemiological models of patterns of introduction and subsequent transmission of infection are critical tools in determination of best public health initiatives to prevent and control vector-borne outbreaks.

What has been done
NJAES research investigates the integration of novel vector populations into native and already established, previously introduced populations, incorporating elements of climate and human land use, and habitat quality for vector ecology, to determine the potential efficacy of surveillance and control measures to accurately assess and prevent human, agricultural, and wildlife health risks. Our work strengthened basic and applied research on the pathogen, hosts, and environmental factors that influence mosquito-borne disease emergence. Used knowledge of mosquito, pathogen, vertebrate reservoir, and environment interactions to enhance ability to predict and prevent conditions leading to disease. Developed strategies to control mosquito vectors. We have completed the analysis of mathematical models studying the impact of vector feeding behavior on disease transmission dynamics and are preparing the results for publication.

Results
We found evidence of rapid (within 10 years) evolutionary shifts in vector populations in response to temperature gradients. This has far reaching implications for the timescale of effect we could see during climate-change driven alterations in vector habitat, altering some currently common assumptions about die-off/expansion patterns as local habitat characteristics change.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

Outcome #31

1. Outcome Measures

New Jersey Climate Extremes - Long Term - New Jersey's residents will reside, work and play in a healthy, safe, and sound environment-in their homes, gardens, schools, parks and workplaces.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
New Jersey Climate Extremes

The Office of the NJ State Climatologist (ONJSC) works with them to evaluate ongoing and potential future impacts of extreme weather and climate events on the various sectors they represent. This assists them in making important decisions that have direct impacts associated with the health, safety and prosperity of all who reside, work or vacation in the Garden State.

What has been done
The State Climatologist delivers data and information on weather and climate extremes to NJ stakeholders. The ONJSC has been involved in the following: 1. Monthly narratives of conditions across NJ that often address extremes and the impacts of such events. 2. Posting of station observations of snowfall events. The ONJSC gathers and quality controls upwards of 200 observations following any snowfall event in NJ, with particular attention (e.g. map generation) for major ones. 3. Operating the New Jersey Weather and Climate Network (NJWxNet). This unique network of over 150 weather stations serves as a one-stop Internet resource for New Jersey weather and climate data. Five-minute monitoring of extreme events puts important information in the hands of emergency management officials, while lengthier monitoring of precipitation deficits provides valuable local information in times of drought. 4. Operating the New Jersey portion of the national Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) (http://cocorahs.org). There are presently over 250 active observers reporting daily accumulations of precipitation across NJ. These daily observations (with the ability to submit special reports during extreme events) complement the NJWxNet observations. Currently, a potential calendar year NJ station maximum rainfall record recorded by a CoCoRaHS observer in 2011 is being evaluated by a national extremes panel. 5. The State Climatologist sits on the NJ Department of Environmental Protection's (NJDEP) drought advisory committee, and the NJ Office of

Management's Hazard Mitigation committee. He also recently sat on a national committee that assessed extreme weather and climate issues, and is a member of the National Academies of Science Board on Atmospheric Science and Climate. The state climatologist has also advised state agencies regarding extreme events that have led to flooding in river basins throughout NJ, and that are associated with heat waves. 6. The ONJSC cooperates with the NJDEP to maintain a webpage that depicts extremes of statewide monthly temperature and precipitation from 1895 to present: http://climate.rutgers.edu/stateclim/NJ_monthly_extremes.pdf. The ONJSC posts a vast array of climate observations for the state as a whole, regional divisions and individual stations on our website: http://njclimate.org. These are accessed by many having an interest in extremes.

Results
Information provided through this program is used to protect the health and safety of everyone in NJ.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
721	Insects and Other Pests Affecting Humans

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

None to report.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

NJAES research and extension outcomes related to this planned program were evaluated utilizing a variety of evaluation methods appropriate for each initiative to determine effectiveness on both a qualitative and quantitative level. For KASA and practice change we included the measurement of knowledge gained as measured by pre/post Likert-scale assessments. Surveys were used to measure increase in skills acquired, behavior change

and practice adoption. For process evaluation we focused on program delivery, participation, relevance and timeliness. Data was collected at appropriate times for each initiative that supports this planned program. IRB approved evaluation instruments were used to collect research and extension data. Data analyses and comparisons relevant to basic and applied research and demonstration were collected and analyzed and reported utilizing a variety of data collection methods appropriate to each research question. The major goal of evaluating is the demonstration of social, economic, behavior and environmental changes in conditions that contribute to improved quality of life as a result of participation in programs and benefits of research solutions. See state defined outcomes for detailed results of each initiative.

Key Items of Evaluation

None to report.

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Global Food Security and Hunger - Integrated Pest 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
216	Integrated Pest Management Systems	100%		100%	
	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	25.0	0.0	13.0	0.0
Actual Paid	20.0	0.0	4.0	0.0
Actual Volunteer	61.0	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**
192047	0	695941	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1626460	0	1240036	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
136553	0	1977799	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research
- Develop new and novel techniques for pest management and pest detection

Delivery

- Provide IPM information to a wide variety of stakeholders
- Employ new methods for delivery IPM information

Education

- Conduct IPM educational programs for stakeholders
- Conduct IPM educational training for university students
- Conduct IPM educational training for Vo-Ag and FFA students
- Conduct IPM public awareness campaign

Extension

- Work with communities, schools, businesses to help them meet their regulatory responsibilities on pesticide application
- Help growers develop scouting programs to identify pest populations before significant plant damage occurs.
- Develop pest management options to be used in an integrated or rotational program.
- Identify indicators to help growers anticipate pest problems.
- Develop monitoring techniques and population damage thresholds for selected pests.
- Provide scientifically sound advice to state regulatory bodies on pest management and pesticide issues
- Create a multidisciplinary program comprising of faculty, staff, volunteers, industry partners and government officials
- Investigate IPM methods to help growers produce top quality crops, limiting or reducing production costs.
- Evaluate all pest and crop management practices into a set of commercially used methods. These include the use of: pesticides, economic/aesthetic threshold levels, resistant cultivars, optimum horticultural practices, environmental monitoring, pest scouting, and fertility monitoring and recommendations.

2. Brief description of the target audience

- Municipalities
- Pesticide applicators and their employers
- Commercial pesticide applicators
- State Dept. of Environmental Protection
- Staff and students who gain valuable scientific experience
- Industry partners in agriculture and related commodities
- Consumers
- NJAES Faculty and Staff involved in pest management research/outreach
- Farmers
- Commodity groups
- New Jersey residents
- School faculty, staff and children
- NJAES researchers
- Secondary and university students
- Governmental agencies
- Environmental organizations
- Agricultural, landscape, fine turf and other related industries

3. How was eXtension used?

Faculty participated in answering "ask the expert" questions, developing collaborative educational products and the development of professional development sessions.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1325	21501	0	0

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	8	25	33

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- A variety of strategies will be implemented to reach target audiences. This will include and not be limited to workshops, field visits, classes, newsletters, media releases, electronic communications,publications. In addition a trained volunteer teaching base will be developed. Quantitative reports of participation will be collected

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Short Term - Develop improved IPM delivery methods. Develop detection, monitoring and sampling methods that reliably predict pest levels. Develop novel management methods for a wide variety of pests. Develop IPM training for secondary and university students. Improve public awareness about IPM Determine the effectiveness of pheromones for mating disruption of pests. Greater understanding of entomopathogenic nematode species'effects on pests. Evaluation of the effectiveness of natural pesticides and crop management to reduce pests. Determine which types of plants attract pests to be used as a pest control method.
2	Medium Term - Research and educational programs, and public awareness campaign results in increased adoption of IPM in traditional and non-traditional systems. Research findings used to develop new projects. IPM training of students creates new IPM interns, professionals and researchers. Knowledge of various natural insecticides and their effectiveness on pests. Determining the best time and application method for IPM products. Greater understanding of pest biology and ecology. Greater understanding of entomopathogenic species biology and ecology.
3	Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.
4	Improving Microbial Control of Arthropods - Medium Term - Research and educational programs, and public awareness campaign results in increased adoption of IPM in traditional and non-traditional systems. Research findings used to develop new projects. IPM training of students creates new IPM interns, professionals and researchers. Knowledge of various natural insecticides and their effectiveness on pests. Determining the best time and application method for IPM products. Greater understanding of pest biology and ecology. Greater understanding of entomopathogenic species biology and ecology.
5	Enabling Pesticide Registrations for Specialty Crops - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.
6	Protecting Human Health and Urban Environment through Integrated Pest Management Programs - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.
7	Improving Sustainability, Efficiency, and Efficacy of Peach Disease Management Strategies: Biofungicides, Conventional Fungicides, and Abiotic Environmental Factors - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

8	Investigations into a New Invasive Species, Halyomorpha halys (Stal) (Hemiptera: Pentatomidae), A Potential Threat to New Jersey Agriculture - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.
9	North Jersey Ornamental Horticulture Conference Turf Day Program - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.
10	IPM for Landscape Contractors - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.
11	Management of Annual Bluegrass on Golf Courses: Improved Practices for Maintenance, Pest Control, and Viable Techniques for Transition to More Desirable Grasses - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.
12	Integrated Pest Management/Pesticide Safety Education - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.
13	Analyzing Bat Guano for Brown Marmorated Stink Bugs and Other Agricultural Pests - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.
14	Blueberry and Cranberry Insect Pest Management - Towards the Development and Implementation of Reduced-Risk - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.
15	Insect Biochemical Defenses Against Toxic Compounds - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.
16	Internet Technologies for Distance Education: Online Pesticide Training and Recertification for Licensed Professionals - Long Term - Protect commodities, homes and communities from

	pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.
17	Field Crop Observational IPM Training for Master Gardener Volunteers - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.
18	Blueberry Integrated Pest Management Delivery - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.
19	Upland Fruit (Tree Fruit and Grape) Integrated Pest Management (IPM) Delivery - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

Outcome #1

1. **Outcome Measures**

Short Term - Develop improved IPM delivery methods. Develop detection, monitoring and sampling methods that reliably predict pest levels. Develop novel management methods for a wide variety of pests. Develop IPM training for secondary and university students. Improve public awareness about IPM Determine the effectiveness of pheromones for mating disruption of pests. Greater understanding of entomopathogenic nematode species'effects on pests. Evaluation of the effectiveness of natural pesticides and crop management to reduce pests. Determine which types of plants attract pests to be used as a pest control method.

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Medium Term - Research and educational programs, and public awareness campaign results in increased adoption of IPM in traditional and non-traditional systems. Research findings used to develop new projects. IPM training of students creates new IPM interns, professionals and researchers. Knowledge of various natural insecticides and their effectiveness on pests. Determining the best time and application method for IPM products. Greater understanding of pest biology and ecology. Greater understanding of entomopathogenic species biology and ecology.

2. **Associated Institution Types**

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Management of the Brown Marmorated Stink Bug

The brown marmorated stink bug (BMSB) is a major invasive pest of many economically important crops throughout the Mid-Atlantic States. Control tactics are difficult and generally include repeated chemical sprays. However, with the potential risks pesticides pose to the environment and non-target organisms, more research is needed on BMSB behavior, seasonal biology, economic impact, and alternative control methods.

What has been done
NJAES researchers are using laboratory studies and field surveys and trials to assess the extent and nature of injury caused by BMSB on various agricultural crops, to determine the potential for biological control of this pest, to determine host plant characteristics that attract BMSB for use in trap crop control, and to develop best management practices for BSMB control.

Results
Feeding injury diagnostics by plant phenology were conducted this year and it was determined that early season feeding on plants by brown marmorated stink bugs was highly injurious, whereas feeding just prior to harvest did not cause significant injury. Research on phenological stage dependent injury by BMSB to wine grapes validated data from the prior year showing that white varietals are more susceptible to BMSB feeding and that injury beginning at veraison can lead to reduced yield. Natural enemy surveys using sentinel BMSB egg masses identified that predation, while low, remains the key mortality agent. Katydids were a primary predator. However, egg mortality due to predation was found at about 6% under organic management, which is significantly less disruptive to natural enemies than conventional programs. This work will be expanded to include gut content analysis and to include additional life stages of BMSB. A second year examining the diurnal activity of BMSB adults/nymphs was completed and showed that adult activity remains constant throughout the day. However, nymphs are most active 7 to 10 hours after sunrise. Research on the dispersal behavior of BMSB adults/nymphs showed that the dispersal of both adults and nymphs within orchards is related to surrounding land use and varietal ripening dates. Results from another study of dispersal behavior of BMSB in peach using protein markers (a mark-recapture technique) suggest that there is a strong edge effect, with 85% of insects stopping at the orchard edge before moving to the interior. Surprisingly some individuals stayed at the edge for one week. This supports the use of border sprays to manage BMSB, a control technique that minimizes the use of expensive and toxic pesticides. All of these

findings will inform the development of more effective management practices for controlling the spread of the brown marmorated stink bug and reducing the associated crop damage and losses.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #3

1. Outcome Measures

Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Development and Implementation of New Reduced-Risk Insect Management Strategies for Blueberries and Cranberries

Blueberry maggot, cranberry weevil, cranberry fruit worm, Sparganothis fruit worm, blueberry aphids, oriental beetle, and plum curculio are among the most important insect pests of highbush blueberries and cranberries in New Jersey. In addition, the Brown Marmorated Stink Bug (BMSB) and Spotted Wing Drosophila (SWD), two new invasive species, pose a major threat to the blueberry and cranberry industries in New Jersey. The implementation of Food Quality Protection Act (FQPA) is expected to reduce the availability of insecticides that are currently used to manage these insect pests. There is a need for new, low-risk management strategies to management strategies for these pests that are not affected by FQPA.

What has been done
An NJAES Extension Specialist is using laboratory-based research studies and field research to

develop new low-risk management strategies against these major pests. These strategies include: monitoring strategies for new invasive pests, mating disruption for oriental beetle, use of host-plant volatiles for pest monitoring and control, use of pheromones for insect monitoring and management, evaluation and implementation of new chemical strategies, and assessment of efficiency of biological control agents.

Results

Different baits were tested for monitoring spotted wing drosophila (SWD), a new invasive pest of small fruit crops including blueberries. Six attractants (Kombucha, Cowles, and Suzukii, Apple cider vinegar (ACV), Trecé, and Kerr) were evaluated. Results showed that the attractants Suzukii and Trecé were the most attractive to the SWD throughout the 2014 season. Color and pheromone-baited traps were evaluated for cranberry weevil. These studies showed that cranberry weevil adults are more attracted to yellow and white than green, blue, red, brown, and black. Glandlure II (E) reduced cranberry weevil captures while geranic acid had no effect. In 2013-2014, an NJAES Extension Specialist conducted a study to assess the efficacy of an odor-baited "trap-bush" approach against Plum curculio (PC), comparing PC injury to fruit (i.e., number of oviposition-scarred fruit), in "trap-bush" plots versus "control" plots. Trap-bush plots had bushes baited with an attractant (grandisoic acid + benzaldehyde) along the perimeter, whereas the control plots had unbaited bushes. The amount of injury was significantly greater on and near trap bushes compared with those on and near unbaited bushes. No difference in fruit injury was found between interior plots. These results indicate that odor-baited trap bushes can be used to manipulate PC behavior, i.e., aggregate adults, in blueberries such that insecticides are targeted only to a few perimeter-row bushes within fields rather to entire fields.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #4

1. Outcome Measures

Improving Microbial Control of Arthropods - Medium Term - Research and educational programs, and public awareness campaign results in increased adoption of IPM in traditional and non-traditional systems. Research findings used to develop new projects. IPM training of students creates new IPM interns, professionals and researchers. Knowledge of various natural insecticides and their effectiveness on pests. Determining the best time and application method for IPM products. Greater understanding of pest biology and ecology. Greater understanding of entomopathogenic species biology and ecology.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Improving Microbial Control of Arthropods

Broad-spectrum chemical insecticides are still the mainstay for insect pest control in most agricultural systems and urban/suburban landscapes. While chemical pesticides can rapidly kill various pests, heavy reliance on their use generates problems that include human health hazards, secondary pest outbreaks, environmental contamination, decreases in biodiversity, and insecticide resistance. There is an urgent need to accelerate the development and implementation of cost-effective, environmentally safe alternatives for insect control. A viable alternative to chemical insecticides are biological control agents as they are generally not harmful to humans or environment, and have negligible potential to cause resistance or harm non-target organisms.

What has been done
NJAES extension specialists are using laboratory and field tests to develop and advance the use of entomopathogens for pest suppression. Research conducted prior to 2014 indicated that entomopathogens can provide control (average 65%) of moderately high larval populations of the annual bluegrass weevil (ABW), Listronotus maculicollis, on golf course fairways. However, control rates were about 20% lower than for standard insecticides and tended to further fall behind the insecticides at higher, but not uncommon, ABW densities. In 2013 we observed that combined application of nematodes and imidacloprid tended to improve nematode efficacy against ABW. To examine the effect of split application on efficacy of nematodes and nematode-imidacloprid combination we conducted a field study in 2014 on the efficacy of combining the nematode Steinernema carpocapsae and the pesticide imidacloprid applied alone or in combination to control ABW.

Results
Test results indicated that nematode imidacloprid combinations (77-78% control) but not nematodes alone (50-58% control) were significantly better than imidacloprid alone. Split application of nematodes, whether for nematodes alone (88%) or in the combinations (both 95%) showed the greatest potential. Where imidacloprid is already used for white grub control, its combination with split nematode application could be a highly effective option for ABW larval control.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #5

1. Outcome Measures

Enabling Pesticide Registrations for Specialty Crops - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Enabling Pesticide Registrations for Specialty Crops

Specialty Crops are high value / low acreage crops and make up about 46% of U.S. agricultural production and $43 billion in sales. Twenty-six states derive more than 50% of agricultural crop sales from specialty crops and thirty-three states derive more than 40% of their agricultural crop sales from specialty crops. US Specialty Crop Growers produce most of the vegetables, fruits, nuts, herbs, spices, floral, nursery, landscape, turf, and Christmas trees for the American consumer. If these growers do not have safe and effective pest management tools, their crops and businesses will not survive and the American consumer will suffer. Even though these are high value crops, they are low acreage. Therefore agrichemical companies have little incentive to register their products for these crops. IR-4 fills the void for these growers and, since 1963, the IR-4 Project has cooperated with researchers, producers, the agrichemical industry and federal and state agencies to secure regulatory clearances that allow agrichemical companies to achieve registrations for pest management products on specialty crops.

What has been done
IR-4 research conducts and funds research that provides data needed to support registration of safe and effective crop protection products on specialty crops, which ensures a safe and secure food supply, allows US growers to compete in a global economy and prevents potential economic losses to individual states in the millions of dollars.

Results

Data from studies involving 30 chemical pesticides were integrated into a pesticide tolerance petitions and formally submitted to US Environmental Protection Agency. These packages will be reviewed and when deemed appropriate, EPA established a pesticide tolerance through a publication of this action in the Federal Register. In 2014, 142 pesticide tolerances were established. Utilizing established crop grouping and other allowable extrapolations, these pesticide tolerances translate to 683 registrations that can be uses to protect the domestic food supply from destructive pests while keeping healthy fruits, nuts, vegetables and other specialty crops available year round at a reasonable price. During the period of performance, IR-4 supported 7 registrations (A16901B 45WG, DPX-HGW86, Mainspring 200SC, Marengo G, Mika WG, Regalia MAXX, and Xxpire) for a total of 3,984 new ornamental crop uses. The economic impact of Ornamental Horticulture Program deliverables has been quantified. Miller and Leschewski in their "Economic Impact of the IR-4 Project and IR-4 Project Programs" report noted that the Food Crops Program generates economic activity sufficient to support 14,501 full and part time jobs with wages of $582 million. The IR-4 Ornamental Horticulture Program and associated research is estimated to add nearly $1.0 billion to annual GDP. IR-4 submitted amended registration packages for Hops Beta acid, and a new registration for the viral coat protein of papaya ringspot virus to EPA. From efficacy research funded through the biopesticide grant program, there were 7 additions of crops to biopesticide labels. In addition, a 24C labels have been developed for 9, 10 Anthraquinone including Avipel Liquid for Corn (10 states), Avipel Dry formulation for Corn (13 states). In addition, Section 18s were supported for, AV-1011 for rice in Louisiana and Arkansas and the Avipel Liquid in Sunflower in South Dakota. The need for IR-4's services in all four program areas will increase over the next several years. New and emerging factors driving the increased need for IR-4 include the unintentional introduction of new pests/invasive species, pests becoming increasing resistant to available pesticides, increased need for product performance data, increased complexity of regulatory data requirements, internationalization of data requirements, and emerging regulatory issues (e.g. pollinator protection). Other areas identified as forces to drive the increased need for IR-4 include consumer demand for locally grown, pick your own or organically grown specialty crops. There is also anticipation that there will be emerging pest management technology (e.g. RNAi) that will require IR-4's assistance for registration on specialty crops/specialty uses.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #6

1. Outcome Measures

Protecting Human Health and Urban Environment through Integrated Pest Management Programs - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Protecting Human Health and Urban Environment through Integrated Pest Management Programs

In recent years, bedbugs have re-emerged as a major household pest. The recent resurgence of bed bugs in North America, Europe, Australia, and some Asian countries have signaled strongly the crucial need to develop effective methods to control urban pests to protect public and environmental health. Climate change, urban sprawl and growing populations make the spread of pests and pest-borne diseases increasing likely. The increased frequency and speed of travel enables pests to spread freely and quickly from area to area. Current pest control methods and tools often fail to provide adequate pest suppression, result in environment contamination, risks of human-insecticide exposure, or insecticide resistance development. For example, spraying insecticides on beds and sofas is a common practice for controlling bed bugs. Most bed bug populations in the U.S. contain at least one of the gene mutations related to insecticide resistance. As a result, insecticide spray alone is not effective in eliminating bed bugs. Some effective non-chemical control methods and tools became available; however, how to combine them into an effective and sustainable program requires understanding of the bed bug biology and ecology and characteristics of the infested communities. Adopting more effective pest control techniques will reduce pesticide use, human/pesticide exposure, and leads to more sustainable control.

What has been done
An NJAES Extension Specialist conducts both laboratory and field experiments to determine how bed bugs locate their hosts, spatial distribution patterns, and dispersal behavior. Experimental arenas and naturally infested residences are be used in these studies.

Results
A new and more effective bed bug lure was developed by NJAES and was transferred in 2014 to industry for commercial development. This lure can be used in conjunction with bedbug traps to attract, trap, and eliminate bedbugs resulting in a bed bug lure is now become commercially available for helping detecting bed bugs resulting in 85% bed bug elimination rate after 7 months after implementing various bed bug treatment programs in a community in Irvington, New Jersey, Hackensack Housing Authority (New Jersey) adopted a more effective bed bug monitoring and treatment program, bed bug infestation rate reduced by > 50% after 9 months and 90-100% reduction of German cockroach reduction after 3 months of treatment in a field comparison study.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #7

1. Outcome Measures

Improving Sustainability, Efficiency, and Efficacy of Peach Disease Management Strategies: Biofungicides, Conventional Fungicides, and Abiotic Environmental Factors - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Improving Sustainability, Efficiency, and Efficacy of Peach Disease Management Strategies: Biofungicides, Conventional Fungicides, and Abiotic Environmental Factors

Major diseases on peach and nectarine include brown rot blossom blight and fruit rot, scab, and bacterial spot. Each of these diseases, if not effectively controlled, alone can cause 100% crop loss when pathogen inoculum levels and environmental conditions are favorable for disease development. Other diseases, such as rusty spot and constriction canker can also contribute to significant yield loss if not managed properly. Unfortunately, disease-resistant cultivars are not commercially available for most peach and nectarine diseases. Even when resistant cultivars exist, such as for bacterial spot, rusty spot, and constriction canker, they are not available for all harvest periods, provide only partial resistance, do not have favorable horticultural characteristics, or are less marketable. Similarly, cultural disease control tactics are at best partially effective. Given the above, commercial peach growers are heavily dependent on the application of fungicides and bactericides for effective disease management. The cost of implementing such programs can be quite high. Furthermore, since most applications are timed according to tree

phenology or on a calendar basis, many unnecessary sprays may be applied.

What has been done

NJAES researcher and Extension Specialist evaluated the efficacy of biofungicides for management of peach diseases and their integration into current disease control programs, with particular emphasis on brown rot and rusty spot. Determined the ability of new fungicides to control pathogen growth during different phases of the disease cycle to allow more effective deployment in peach disease control programs. Examined the influence of environmental factors on various components of the disease cycle for peach pathogens, with particular emphasis on peach scab. Successful novel disease control strategies discovered at the research level are presented to growers during local and regional meetings as well as during field days at the research center. These strategies are tested in large block studies in cooperation with commercial growers, thereby acting as demonstration sites for teaching all growers. Finally, new control approaches are relayed to growers via articles in newsletter(s) and/or grower journals.

Results

Sub-zero temperatures in January and February 2014 and a major hail storm in May 2014 caused considerable fruit loss in many of the experimental peach orchards. This limited the amount of field studies conducted and made statistical comparisons difficult to interpret. Nevertheless, promising results were obtained from several experiments in blocks that had below-normal but acceptable numbers of fruit. Unfortunately, low rainfall in August resulted in very low levels of the fruit rot phase of the disease for all treatments. Under these conditions, no differences were observed among treatments, including the non-treated control. With respect to research on conventional fungicides, a novel bioassay was developed for estimating fungicide residues on peach fruit. The intent of the bioassay was not to determine existence of residues on fruit ready for consumption (this can be done best with chemical tests), but rather to determine if sufficient residue exists to provide acceptable disease control. Once a fungicide is applied, many environmental factors such as sunlight and rainfall cause a gradual decline in the residue. The bioassay can be used to quantitatively determine how these and other factors degrade the residue. Once these relationships are understood, growers need only apply fungicides when residues have diminished below an acceptable control threshold, rather than on a strict calendar basis. Using this "informed approach", fungicides are only applied when they are needed for protection against disease development, rather than routinely. In summary, all of these findings related to use of biofungicides and improvements in application timing with the bioassay will allow current commercial peach growers to improve the efficiency and efficacy of their disease management programs. This outcome in turn will reduce costs and improve profitability. Furthermore, by substituting and incorporating biorational materials into their programs, conventional pesticide residues in the environment and on harvested fruit will be reduced, thereby benefiting the consuming public. Usage of biorational materials in the field will also reduce applicator exposure to conventional pesticides. Finally, proper deployment of conventional fungicide chemistries, as with the bioassay, will aid in limiting development of fungicide resistant strains of the various peach pathogens.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #8

1. Outcome Measures

Investigations into a New Invasive Species, Halyomorpha halys (Stal) (Hemiptera: Pentatomidae), A Potential Threat to New Jersey Agriculture - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Investigations into a New Invasive Species, Halyomorpha halys (Stal) (Hemiptera: Pentatomidae), A Potential Threat to New Jersey Agriculture

Halyomorpha halys (St?l) (Hemiptera: Pentatomidae), an introduced species from Asia, has the potential to become a major pest in ornamentals and is a pest in tree fruit in the Mid-Atlantic in the United States. Halyomorpha halys has a wide host range including tree fruit, vegetables, and ornamental plants. In its native habitat, H. halys causes crop loss due to stippling, catfacing and bruising of plants and transmits a plant pathogen responsible for Paulownia Witches Broom. Overwintering adults emerge in early spring and is believed to complete one generation per year in the Northeastern United States. The extent of its spread and host range in the United States is known; however its range continues to expand. At the current time it is present in California, Delaware, Florida, Maryland, Mississippi, New Jersey, New York, Ohio, Oregon, Pennsylvania, Tennessee, Virginia and West Virginia.

What has been done
NJAES Extension Specialists conducted a nationwide survey for the presence of H. halys (BMS); evaluated the origin and distribution of H. halys in the United States using an analysis of Halyomorpha halys DNA; determined the most appropriate monitoring system for evaluating H. halys populations in agricultural and landscape systems; determined the importance of H. halys to mid-Atlantic tree fruit and soybean growers; and developed strategies to manage H. halys in agricultural and landscape systems.

Results
The results have revealed that BMSB has been detected in over 42 states, and in Canada and Europe. In the US, BMSB continues to cause severe agricultural damage in Mid-Atlantic States and is an increasing threat in an additional 5 eastern states and three western states. The project evaluated the use of pheromone traps baited with the recently USDA identified BMSB's aggregation pheromone. These data show that it is attractive to BMSB adults and nymphs throughout the season. It is expected that it will be available for use from commercial sources this spring.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #9

1. Outcome Measures

North Jersey Ornamental Horticulture Conference Turf Day Program - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
North Jersey Ornamental Horticulture Conference Turf Day Program

The landscape of NJ is comprised of 890,425 acres of turf, according to a 2001 Rutgers University study of the turf industry. Turf makes up 19% of the state's total acreage. Golf Courses, commercial properties and residential neighborhoods create a demand for professional turf management services. Professional turf managers care for 39% of the turf acreage. The 2,442 service providers who maintain commercial and residential properties contribute $400 million

dollars in payroll and benefits to the state?s economy. They also contribute $691 million in cash expenditures. This competitive industry needs to be apprised of university research on best turf management practices to distinguish themselves from competitors and minimize the use of pesticides and fertilizers thus protecting our natural resources. The industry professionals who apply pesticides to turf, trees and ornamental plants are required to be licensed by the NJ Department of Environmental Protection (DEP). Professionals must participate in DEP approved recertification programs to keep their licenses. The recertification programs keep the professionals aware of current and proposed regulations, plant pest and disease issues and the safe and appropriate uses of pesticide products. Industry professional who apply fertilizers to turf must become certified fertilizer applicators to be in compliance with newly adopted state fertilizer regulations.

What has been done

Rutgers Cooperative Extension provides the industry with training and manages the professional certification program. The North Jersey Ornamental Horticulture Conference (NJOHC) has been serving the turf industry for 53 years. The main objective of the NJOHC is to promote the adoption of integrated pest management (IPM) practices by industry professionals. Adoption of IPM practices will reduce the amount of fertilizers and pesticides used on residential, commercial and public properties. The NJOHC is organized by a team of RCE faculty and program coordinators. The three day conference consists of Turf Day, Tree Day and Landscape Day. Each day features five lectures by Extension, industry and regulatory professionals. Speakers prepare and distribute handouts. Each year program evaluations are conducted. Topics are selected based on current events affecting the industry such as new regulations or climate changes and previous years program evaluations. To help professionals comply with the new fertilizer applicator laws, Rutgers NJAES Turf Specialist, gave a lecture on the fertilizer regulations that qualified certified fertilizer applicators with require continuing education credits.

Results

On the program evaluation (N=78), Ninety-five percent (95%) of the professionals will make more informed pest management decisions as a result of attending the conference. Important concepts learned were identified by participants as: NJ Turf Fertilization Application Requirements 87% (63) Calibrating Pesticide Equipment 74 % (58) Identifying White Grubs 72% (56) Managing Green Kyllinga Weed 70% (55) Selecting proper herbicide products 62% (49) Seventy-three (73) participants indicated that they have attended the North Jersey Ornamental Horticulture Conference in the past, and 76% changed pest management practices as a result of the training. Some examples of changed practices were: Making sure my employees are certified; Definitely more IPM and scouting work; Keeping fertilizer off sidewalks and driveways; Better awareness and careful handling procedures; Think twice before products are utilized; and Being more aware when making decisions about applying pesticides. Seventy four percent of the participants (74%) who had attended the conference in previous years indicated that their use of pesticide has been reduced as a result of attending the conference. ? 1-10% reduction: 15 professionals ? 11-20% reduction: 11 professionals ? 21-30% reduction: 6 professionals ? > 30% reduction: 12 professionals When asked if their businesses have saved any money as a result of the training program, 31 indicated yes, 9 no and 26 said the question was not applicable to them. When asked an opened ended question about how much is saved annually, responses ranged from $200 to $5,000 with a mode of $3,000 and percentages ranged from five to ten percent (5-10%). Fourteen participants answered the question. Professionals who attended the program in previous years (N= 71) were asked how the information presented at prior programs affected their business or career. Respondents indicated: 69 have been able to maintain their NJ Department of Environmental Protection Pesticide Applicator License. 62 practice IPM. 50 see improved communication with their customers. 49 use the information to train employees. 28 experienced an increase in sales. 11 indicated their attendance helped them get a promotion.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #10

1. Outcome Measures

IPM for Landscape Contractors - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
IPM for Landscape Contractors

In the northeastern counties there is a great density of people and thriving landscape and turf industries. There has been too much reliance on traditional chemical use for pest management, and high nitrogen and phosphorous fertilizers used unnecessarily. Often the chemicals are applied at the wrong time and without good reason. This poses risks to water quality in streams and lakes, and many environmental indicators show the chemicals can pose health threats to humans and wildlife and ecosystems as a whole. It is clear that alternatives need to be used instead of traditional practices, and science needs to be applied. IPM tactics need to be taught and widely communicated. Our challenge is to educate all the landscape contractors, each of whom represents 25-75 residential and commercial properties, which accounts for hundreds of acres of landscapes.

What has been done
An RCE Agricultural Agent works with a small team of Agricultural Resources and Management Agents and program associates to design and deliver yearly training at the North Jersey Ornamental Horticulture Conference (NJOHC). The 3-day training is specialized to meet the

needs of landscape and turf professional in the northeastern counties (Passaic, Essex, Bergen, Union, and Morris). This training program marks its 53rd year in 2014; and it remains popular and much appreciated by target clientele--meeting the changing needs of these large and growing industries. Over 600 professionals attended over the 3 days in 2014. The focus is on updating the attendees on new and emerging technologies and best management practices.

Results
Yearly evaluations provide important feedback, demonstrating changes in behaviors and adoption of new practices by clients. NJOHC evaluations in 2014 indicate that of 129 respondents: 108 believed they learned something new they can apply to their management practices and 104 believe they will make more informed pest management decisions as a result of the training. Of the 96 repeat attendees: 57 had reduced the amounts of chemical pesticides applied. They also reported greater use of IPM tactics on a regular basis. Additional Outcomes: 79 report maintaining their NJDEP pesticide applicator license; 83 report the training helped them to train employees; 82 report they had improved communication with their clientele; 82 report practicing IPM tactics on properties they manage.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #11

1. Outcome Measures

Management of Annual Bluegrass on Golf Courses: Improved Practices for Maintenance, Pest Control, and Viable Techniques for Transition to More Desirable Grasses - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Management of Annual Bluegrass on Golf Courses: Improved Practices for Maintenance, Pest Control, and Viable Techniques for Transition to More Desirable Grasses

Annual bluegrass (ABG) is a highly invasive weed on golf courses where it frequently becomes the dominant species despite attempts to suppress it. As a result, superintendents usually resort to managing it rather than working to eliminate it in favor of more pest-tolerant bentgrasses. The annual bluegrass weevil (ABW) and anthracnose basal rot (ABR) disease, caused by the fungus Colletotrichum cereale, have become the most severe pests of ABG. Their control often depends heavily on pesticides. There is an urgent need to gain a better understanding of the biology, and pathogenesis of ABR, develop improved integrated pest management (IPM) tools for more effective pest management, learn how stresses affect ABG and its sensitivity to ABR, and how to either mitigate these stresses or find ways to transition to more desirable/sustainable grasses.

What has been done

NJAES Extension Specialists are developing new molecular tools to study C. cereale and the infection process and assessing the impact of nitrogen, cultivation and other cultural practices on ABR. The tolerance/resistance of ABG and bentgrass varieties to ABR are evaluated in the greenhouse and field. Cultural techniques (e.g., use of over seeding species; cultivation; soil fertility), alone or in combination with novel biocontrols and herbicides to reduce/eliminate ABG in favor of more desirable turfgrass species are studied. Tolerance/resistance of ABG and bentgrass species varieties to ABR are evaluated in the lab and field.

Results

During 2014, Extension Specialists conducted a series of field-based investigations to determine how N fertility impacts the gene expression of C. cereale and surrounding microorganisms. The complete transcriptome is being sequenced in this study to determine if C. cereale pathogenicity levels increase under low N fertility, and whether these pathogenicity levels correspond with disease severity. Two experiments on best management practices (BMP) affecting anthracnose disease on annual bluegrass determined that increasing nitrogen fertilization was the most influential and beneficial BMP. Further data analysis is needed to interpret interactions of sand topdressing with nitrogen fertiliy and mowing height.

A study assessing the impact of nitrogen fertilization and mowing height on fungicide inputs clearly indicates that fungicide inputs can be reduced if nitrogen fertility is increased and/or mowing height is increased. A study of potassium fertilization clearly indicates that low soil levels of potassium intensified anthracnose disease on annual bluegrass. Leaf tissue concentrations of > 2.0% potassium resulted in reduced anthracnose disease. A study of soil pH indicated that anthracnose disease is less severe when soil pH increases in the range of 5.2 to 6.8.

Turfgrass researchers at NJAES collected data from a trial to study the genetic ability of bentgrass to compete against annual bluegrass. Initial results indicate some cultivars of bentgrass can outcompete annual bluegrass. Results (Best Management Practice recommendations) have been distributed the golf course industry through research reports published by the United States Golf Association and TriState Turf Research Foundation. The most recent BMP recommendations are also posted on the Rutgers Center for Turfgrass Science website. We also present this information at national and local conferences. Adoption of this information by practitioners will result in reduced pesticide inputs, cost savings, and improved plant health.

4. Associated Knowledge Areas

KA Code	Knowledge Area

216 Integrated Pest Management Systems

Outcome #12

1. Outcome Measures

Integrated Pest Management/Pesticide Safety Education - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Integrated Pest Management/Pesticide Safety Education

Currently in New Jersey there are 15,000+ certified applicators registered with the New Jersey Department of Environmental Protection (NJDEP) - Pesticide Control Program. Of these, approximately 3,000 are private applicators. To remain certified New Jersey law requires that private and commercial applicators accumulate at least 12 hours of recertification training divided between CORE (4) and CATEGORY (8) classifications during a five-year period.

What has been done
Work was done to develop management strategies for use against the brown marmorated stink bug (BMSB) in vegetables and tree fruit. In addition, the vegetable IPM program was able to impact more acreage through the use of their website that tracks weekly European corn borer, corn earworm and BMSB population changes in the state. The vegetable and fruit IPM programs? faculty and staff also conducted research evaluating the impacts of the brown marmorated stink bug (BMSB) in their programs and participated the BMSB working group.

Results
The application of pesticide in the state is a safer operation that is being done in a manner that does not create a hazard to applicators, workers or the general public. As a result of this program, benefits were seen in the areas of fruit, greenhouse, nursery and vegetable production

systems. The various programs were able to document the following benefits: Pesticide use in tree fruit was reduced up to 80% for Oriental fruit moth control. Growers in the vegetable IPM program received more timely information that resulted in less pesticide use, Nursery growers were better able to predict pest outbreaks and more effectively manage these outbreaks, Greenhouse growers were better able to manage pests and reduce insecticide and fungicide use because of the scouting program provided by the greenhouse IPM program. Growers were able to effectively manage BMSB in tree fruit and vegetables. Overall, IPM adoption in the state was seen on ~7,000 acres of blueberries, 500 acres of nursery stock, 10 greenhouse acres, 8,600 acres of peaches, 2,500 acres of apples, 100 acres of peaches and 27,500 acres in vegetables (carrots, cole crops, high-tunnel tomato production, pumpkins, peppers, snap beans, staked tomatoes, sweet corn, and sweet potatoes).

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #13

1. Outcome Measures

Analyzing Bat Guano for Brown Marmorated Stink Bugs and Other Agricultural Pests - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Analyzing Bat Guano for Brown Marmorated Stink Bugs and Other Agricultural Pests

Fruit production is one of the leading agricultural industries in the state of New Jersey, with the value of utilized production of the four major crops (apples, peaches, blueberries, and

cranberries) estimated at approximately $150 million per year. Pest control is a major challenge for fruit growers in New Jersey, especially those considered to be sustainable (and non-chemical), is seen as a high priority. The brown marmorated stink bug (Halyomorpha halys) (BMSB), which is resistant to many insecticides and interrupts IPM strategies for other pests.

What has been done
Our specific objectives for the project are to: 1) to document the presence of agricultural insect pests in bat guano; 2) compare their populations at farms with and without resident bat colonies; and 3) link peaks in insect pest abundance with peaks in bat foraging activity. Our primary target is the BMSB, and our secondary targets are codling moths, Oriental fruit moths, and tufted apple bud moths.

Results
We have successfully identified brown marmorated stink bug in the fecal matter of bats, and we can infer that they consistently consume BMSB throughout the season, even when trap counts indicate low activity. We are now running statistical analyses to extrapolate from our dataset the expected number of BMSB a colony of bats will consume across the growing season. Impacts from this project include: 1. potential reduction in pesticide application 2. Improvement of environmental quality 3. Maintenance of IPM strategies for other insect pests 4. Promotion of bat conservation 5. Our molecular assay can be used as a surveillance tool for BMSB in at-risk areas.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #14

1. Outcome Measures

Blueberry and Cranberry Insect Pest Management - Towards the Development and Implementation of Reduced-Risk - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Blueberry and Cranberry Insect Pest Management - Towards the Development and Implementation of Reduced-Risk

The blueberry and cranberry industry in New Jersey suffers major yield losses due to insect pests. Growers rely heavily on insecticides to manage pest problems.

What has been done
The Blueberry/Cranberry Entomology Program at Rutgers University focused on the development and implementation of cost-effective reduced-risk insect pest management practices in blueberries and cranberries and the dissemination of this information to blueberry and cranberry growers. Several methods of information transfer including annual grower meetings, field days, twilight meetings, newsletters, and electronic media are used to serve the blueberry and cranberry industry in New Jersey. Newsletter articles (30) were published throughout the growing season to provide information on pest management and to update findings on new pesticides. Educational sessions (4) were regularly offered in Atlantic and Burlington Counties. These sessions provided an overview of research progress and future work. More informal twilight meetings (3) were held during the growing season to provide seasonally-relevant pest management information. Summer sessions (2) directed to the community (local schools and senior institutions) were also conducted regularly during the growing season. The research program also delivered presentations at meetings to the scientific community.

Results
Developed and implemented new tools for monitoring insect pest populations in blueberries and cranberries, ?Worked with IR-4 on the registration of new insecticides in blueberries and cranberries, ?Evaluated, implemented, and promoted adoption of new reduced-risk strategies for insect control in blueberries and cranberries, ?Delivered presentations to more than 100 New Jersey blueberry and cranberry growers on the use of new insect pest management practices. These strategies are reduced-risk and have had a positive impact on the environment and the well-being of humans and their communities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #15

1. Outcome Measures

Insect Biochemical Defenses Against Toxic Compounds - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Insect Biochemical Defenses Against Toxic Compounds

Chemical control has so far successfully controlled mosquitoes in NJ. However, continued use of any insecticide increases the risk of resistance evolution in stressed populations. It is, thus, very important to monitor populations for potential resistance development. Epidemic outbreaks of mosquito-transmitted diseases occur with some frequency worldwide because vector control fails due to insecticide resistance. Although it is still possible to control salt marsh mosquitoes in New Jersey with the available insecticides, these mosquitoes possess a high potential for evolving resistance when the selection pressure increases because of a continually diminishing choice of compounds that can effectively be used in insecticide rotations.

What has been done
This research deals with Eastern Salt Marsh Mosquisito, Aedes sollicitans and a lepidopteran, the Southern Armyworm, Spodoptera eridania. Aedes sollicitans is a major bridge vector of the eastern equine encephalitis virus between birds and mammals. Large swarms of blood-seeking Ae. sollicitans can kill young livestock by exsanguination. Despite being extremely urbanized, vigorous agricultural activities are found in NJ. Lepidopterous larvae can severely damage fruits and vegetables, the commonest types of agricultural practices in NJ. S. eridania is not a problem in NJ but serves as a model system for developing strategies and techniques; it has a life history similar to the Fall Armyworm (Spodoptera frugiperda), which is a pest in NJ, especially in sweet corn. Insecticides, being a valuable resource, must be used effectively, in small doses, causing no resistance evolution, and not impeding non-target species. One major aspect of resistance to synthetic insecticides, addressed by this project, is the metabolic defenses of target insects, especially cytochrome P450s and esterases. (The other major constituent of insecticide resistance that this project does not address is insensitivity in the molecular target sites.) The project focuses on problem-solving research and outreach by being a component of the instructional programs of the Department of Entomology as well as interfacing with NJ salt marsh mosquito control activities as performed by the NJ State Mosquito Control Commission and mosquito control agencies in each NJ county. This research contributes valuable information to relevant stakeholders in NJ and abroad.

Results
The toxicity of spinosad and pyriproxifen is governed in the mosquito larvae by their ability to detoxify the compounds with their cytochrome P450 enzymes. The methoprene toxicity is

counteracted about equally by the cytochrome P450 and esterase activities in the mosquitoes. This was confirmed by in vitro assays with cell free preparations from the mosquito larvae with model substrates, the insecticidal compounds, commercial synergists and standard inducers. Data such as these and more of the same kind suggest that insect control with synthetic insecticides can be very much improved from current practices. Applications of much lower concentrations than are currently used will be possible and should be implemented as soon as possible to reduce the environmental damage done by massive, area-wide insecticide applications. Researchers also studied purified enzyme proteins of the cytochrome P450 oxido-reductase, an auxiliary enzyme essential for cytochrome P450 action, in larval mosquito tissues and reconstituted in an E.coli system. The eventual results of this work can lead to the development of more effective insecticide blends and to more effective insecticide synergists, perhaps even to the introduction of local population with R-genes (resistance genes) or Interference-RNA.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #16

1. Outcome Measures

Internet Technologies for Distance Education: Online Pesticide Training and Recertification for Licensed Professionals - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Internet Technologies for Distance Education: Online Pesticide Training and Recertification for Licensed Professionals

Modern life has constrained available time audiences can afford to attend traditional seminars, workshops, and other outreach programs. At the same time, licensed professional pesticide applicators require new, efficient and timely delivery systems to provide easy access to educational information and regulatory updates leading to a more successful licensing and re-certification procedure.

What has been done
Rutgers NJAES enhanced teaching, research and outreach efforts with the use of new technologies in digital media and the Internet to provide quality research-based information to help resolve critical issues facing agriculture, urban and rural communities, and the environment. Distance education efforts utilizing enhanced communication linkages reach existing and under-served clientele groups by facilitating distribution of research-based findings, educational opportunities, and regulatory updates. This project team developed a web site, www.recert.rutgers.edu, dedicated to training and providing licensure recertification credits on the proper use and storage of pesticides and the selection, use and storage of personal protective equipment. In so doing, this site provides 2 (two) CORE license recertification credits for commercial growers and applicators in NJ. Two separate modules are currently available for viewing and provide CORE (general pesticide safety) recertification credits for NJDEP licensed applicators and additionally for licensed applicators in NY, PA, and MD.

Results
2014 activity for online CORE recertification credits through www.recert.rutgers.edu totaled 45 commercial applicators attaining 90 CORE credits, for a program total of 590 online commercial applicators since the site launched in 2002. Pre- and post-evaluative questionnaires and online survey results reveal: ?85 % indicate a high level of satisfaction with the website design and content. ?90 % strongly agreed the convenience of taking an online course was important to them. ?80 % stated that the website provides a necessary learning experience in addition to the recertification credit. ?Users were most knowledgeable in utilizing materials to neutralize spills (97% correct) and locking storage facilities (94% correct) before completing the web site. ?Users most improved their knowledge in pesticide storage and inventory regulations (a 30% increase in evaluative survey scores) and signage regulations regarding language (a 22% increase in evaluative survey scores) after viewing the website.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #17

1. Outcome Measures

Field Crop Observational IPM Training for Master Gardener Volunteers - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Field Crop Observational IPM Training for Master Gardener Volunteers

Currently there is no official NJAES Field and Forage Crop IPM program. Field and forage crop producers are in need of current and relevant IPM information during the growing season. IPM scouting reports are one method that farmers learn of pest management issues within the region. Unfortunately, for some farmers the cost and time associated with obtaining IPM information is prohibitive.

What has been done
A master gardener crop scout training was established to teach master gardeners how to scout commercial field crops for pests. The trained volunteers primarily use observational ipm scouting. The training focused primarily on field crop production, pest management, and diagnosing insitu field problems. The on goin program was again continued in 2014 with 14 volunteers (5 new participants and 9 returning volunteers). The group of master gardeners was provided 3 hours of weekly hands on IPM field training over a 26 week period. Participants were initially provided with 3 hours of classroom training about the basics of IPM. IPM insect monitoring traps were placed across a farm. A small lab was established with a microscope, insect collecting equipment and reference books. The training was primarily focused on observing various agronomic groups from planting till harvest. During this time, participants where taught how to scout and identify pests within the various crops. Crop production and management practices were observed and explained to participants to provide a greater understanding of how agricultural commodities are produced. The objective of the project was to train Master Gardener volunteers as field and forage crop IPM scouts. An additional objective is to increase the insect and disease identification skills of the master gardener participants. The overall goal of the program is the collection of useful and relevant IPM data that could be shared with the agricultural community. The information collected from the scouts has been shared with the field and forage crop community via the NJAES Field and Forage Crop Blog. Additionally a master gardener IPM scout blog has been developed to share information gathered and learned through the program with other master gardeners. In 2014, a field day was also initiated to educate the public and community gardeners about IPM techniques.

Results
Survey data was collected from the master gardener program participants. Master Gardener participants in the program all reported that they have significantly increased their knowledge of insect and disease pests. All participants reported a greater understanding and appreciation of agricultural production. Data has begun to be collected on the use of the newly established Master Gardener blog. Since its inception over 6,300 visits have been recorded at the IPM blog site. Over the last three growing seasons Master Gardener participants have provided over 1,800 volunteer hours, valued at over $46,000 to the newly established program. Communications with agricultural stakeholders have indicated the information provided by the program has been useful. Attendance at the programs first field day was recorded at 45 participants.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #18

1. Outcome Measures

Blueberry Integrated Pest Management Delivery - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Blueberry Integrated Pest Management Delivery

Blueberries are a unique agricultural commodity, since they are one of only several native foods in commercial production in the US. In New Jersey most blueberries are grown in the ecologically sensitive ?New Jersey Pinelands?, which is characterized by porous soils with high water tables,

which are subject to vertical movement of a number of agricultural chemicals. This area is a source for much of the surface and shallow ground water found in the southern and central part of the State, and encompasses the Cape May, Rancocas, Great Egg Harbor, Mullica, and the Barnegat Bay watersheds, home to over 2.6 million people. The pest complex on blueberries is extensive, with pests attacking virtually all parts of the plant (e.g., fruit, buds, leaves, roots, stems, and flowers) and pest management requiring up to 12 pesticide sprays per year.

What has been done

An integrated pest management (IPM) program was delivered to commercial blueberry growers. The program employed seasonal field scouts who collected weekly pest management data. The program reached all blueberry growers in New Jersey, but collected farm specific data on those farms participating in the scouting program. Results of scouting data were summarized in 2 statewide newsletters (The Blueberry Bulletin and The Plant & Pest Advisory-Fruit Edition ?Now on a Web Blog format). Results were also transferred to growers with farm visits, seasonal update meetings, and a broadcast fax system. The program collected data on insect and disease pests as well as fertility levels through soil and plant tissue sampling. Based on the scouting results, pesticide recommendations were made to all growers, within the objectives listed above. A research/demonstration component demonstrated and refined the use of alternative pest management practices such as the use of trapping methods for determining treatment timings for blueberry maggot, and mating disruption for Oriental beetle. Growers participated in an IPM program, and maintained high fruit quality while minimizing pesticide use. In 2014, this included 43 growers who grew 5,000acres of blueberries or about 66% of the state acreage, and about 75% of the state production. Growers were taught about monitoring and management of spotted wing drosophila. An investigation was carried out to determine optimum trap types. Fruit was surveyed to assess fruit quality and SWD infestation rates. An industry wide survey was continued on the impacts by SWD on the NJ blueberry industry.

Results

Growers cooperated with the program in the use of new detection, monitoring and sampling methods that reliably predict pest levels. Growers were educated about novel management methods for a variety of pests in blueberries. Through demonstrations, articles, county reports and other outreach, public awareness on IPM was improved. Articles appeared in 2 newsletters with 44 editions (printed and web versions), with over 2,250 subscribers (including mail and web blog subscriptions). Newsletters on the Web recorded over 7,000 views or downloads. Growers minimized on farm pest management costs. Some growers spent as much as $250/A for pesticides while the average IPM participant spent $140/A. The average grower using IPM practices saved about $100/A. New pest management practices such as mating disruption and whole farm GIS based monitoring were used. Small plot research/demonstration trials for Oriental beetle mating disruption continued to show that Oriental beetle could be managed with mating disruption in place of soil applied insecticide. Based on our research and demonstration work, a registration package is now finished, and commercial use started in 2013. IPM training of students and farm employees created new IPM interns, professionals and researchers. The program trained 4 students and seasonal workers, and 1 farm employee as IPM scouts, enabling the 66% of NJ blueberry acreage to be under IPM practices, and an additional 16% of NJ acreage to be self-scouted. Fertility monitoring leads to recommendations of lower fertilizer use. During 2014, 286 samples were taken for combined monitoring of plant fertility and nematode levels. Soil and plant fertility tests demonstrated that about 75% of fields sampled had sufficient to high levels of soil phosphorous. In 2012, the spotted wing drosophila developed as a serious invasive pest in blueberries nationwide. While this is a serious threat to IPM programming, we made adjustments in 2014 to help protect the blueberry industry while minimizing conventional OP and carbamate insecticide use. While non-managed fields showed over 175 maggots per qt of berries, no fruit rejections were reported by IPM participants. While insecticide applications averaged just over 11

applications per field, OP and carbamate use was minimized to 55% of total applications.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #19

1. Outcome Measures

Upland Fruit (Tree Fruit and Grape) Integrated Pest Management (IPM) Delivery - Long Term - Protect commodities, homes and communities from pests. Increased abundance of high quality food and fiber products. Increased acreage in New Jersey grown under IPM practices. Reduced environmental problems associated with current pest management practices. A comprehensive understanding of best management practices for IPM that are economically viable and environmentally safe.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Upland Fruit (Tree Fruit and Grape) Integrated Pest Management (IPM) Delivery

New Jersey tree fruit production is located in both southern and northern counties. According to the latest agricultural statistics, NJ peach production is valued at $39.6 million and apples at $28.5 million. The industry in southern counties is heavily oriented towards wholesale markets and peach production, while the industry in northern counties is heavily dependent on direct markets and apple production. Retail market fruit production in northern counties is valued at approx. $12-15 million. New Jersey fruit growers produce commodities that are susceptible to more than two dozen arthropod and disease pests. Management of this pest complex can cost producers up to $500 or more per acre. Some large NJ growers may spend up to $350,000 for pesticides alone.

What has been done

An integrated crop management (ICM) program was delivered to commercial fruit growers who produced apples, peaches, nectarines, and grapes. The program reached both primary and secondary participants. Secondary participants attend extension update meetings, and receive other IPM/ICM information through personal visits, fax broadcasts, articles, newsletters and the Internet. Primary participants are those growers who access all the above information and participate in a field scouting program. While some primary participants do self-scouting, the majority contribute funding through acreage participation fees which fund seasonal field scouts, travel, supplies, and laboratory costs. Weekly field scouting forms the program core and data source for newsletter articles, and from which pest management recommendations were made, with nutrition and nematode management included at specific times of the season. A broadcast fax service was used in Hunterdon and Gloucester Counties to advise of timely pest events and supplement the Plant and Pest Advisory Fruit Edition Newsletter. Organized grower meeting contact reached a total of 784 audience members, while on-farm consultations totaled 1,238 visits. The Plant and Pest Advisory Newsletter was changed to a blog format on the Web. A total of 31 weekly articles were written in that format, with a total circulation of 2067 subscribers in NJ and other states. Acreage impacted by primary participants totaled 80% of all state tree fruit acreage. Over 95% of total state tree fruit acreage was impacted by the program. IPM information reached over 90% of NJ grape growers.

Results

The program demonstrated reduced risk methods that included the use of mating disruption and ground cover management as tools to replace insecticide use for Oriental fruit moth, tarnished plant bug and stink bugs and two species of peach tree borers. Degree-day pest phenology models were updated, and proper use was advised to growers. Pesticide use records were collected at the end of the season to measure the program impact on pesticide use. Demonstrations were conducted on commercial farms to encourage use of alternative practices. Alternative practices include use of mating disruption and reduced risk pesticides. In southern counties, where the bulk of commercial peaches are produced, 75% of growers used alternative, ?reduced risk? insecticides, and 80% of growers used reduced risk fungicides. In total, program participants reduced pesticide use by 26-80% compared to standard spray schedules, depending on the practices used. Other IPM practices included grower use of degree day based pest models, reducing insecticide use by 40% compared to standard calendar spray methods. Laboratory tests where completed in 2014 as part of the fertility component. Over 75% of areas sampled were shown have sufficient to excessive phosphorous levels, which led to decreased phosphorous use on those sites. The invasive insect, brown marmorated stink bug (BMSB) has set pest management programs back 30-40 years. A trial project conducted in 2012-14 demonstrated that growers could treat field edges while using mating disruption and ground cover management to reduce insecticide use by up to 75% compared to most commercial practices now being used for BMSB.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

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

None to report.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

NJAES research and extension outcomes related to this planned program were evaluated utilizing a variety of evaluation methods appropriate for each initiative to determine effectiveness on both a qualitative and quantitative level. For KASA and practice change we included the measurement of knowledge gained as measured by pre/post Likert-scale assessments. Surveys were used to measure increase in skills acquired, behavior change and practice adoption. For process evaluation we focused on program delivery, participation, relevance and timeliness. Data was collected at appropriate times for each initiative that supports this planned program. IRB approved evaluation instruments were used to collect research and extension data. Data analyses and comparisons relevant to basic and applied research and demonstration were collected and analyzed and reported utilizing a variety of data collection methods appropriate to each research question. The major goal of evaluating is the demonstration of social, economic, behavior and environmental changes in conditions that contribute to improved quality of life as a result of participation in programs and benefits of research solutions. See state defined outcomes for detailed results of each initiative.

Key Items of Evaluation

None to report.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Global Food Security and Hunger - Aquaculture

☑ 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
135	Aquatic and Terrestrial Wildlife	100%		100%	
	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	3.0	0.0	4.8	0.0
Actual Paid	4.0	0.0	3.0	0.0
Actual Volunteer	10.0	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**
29153	0	174238	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
467874	0	788911	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
82821	0	709504	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

• Investigate the genetic mechanisms for disease resistance and improved quality in economically important shellfish

• Create a dynamic and cooperative partnership with faculty, staff, businesses, regulatory/advisory

councils and the government to research best management practices and discover effective solutions and management practices to address threats to NJ aquaculture as well as investigate opportunities to increase the quality and quantity of the aquaculture harvest.

- Collect and analyze data on how communities and businesses are affected by the aquaculture industry management practices.
- Examine the presence of unhealthy levels of contaminants in aquaculture products.
- Determine best techniques for shellfish hatcheries on and off shore.

2. Brief description of the target audience

- Aquaculture related businesses and employees
- State Department of Environmental Protection
- State Department of Agriculture
- Industry partners who learn ways to improve or protect their harvests
- Communities who depend on aquaculture-related revenue
- NJAES faculty and staff involved in water research/outreach
- Consumers of aquaculture products, including recreational fishing

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	204	0	0	0

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	6	16	22

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- A variety of strategies will be implemented to reach target audiences. This will include and not be limited to workshops, field visits, classes, newsletters, media releases, electronic communications,publications. In addition a trained volunteer teaching base will be developed. Quantitative reports of participation will be collected.

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Short Term - Knowledge of seasonal variations for shellfish diseases. Create census data on communities involved in aquaculture. Determine the level of pollutants in economically important fish species. Develop markers and maps of important genetic traits. Knowledge of shellfish hatchery techniques that decrease time for growth to market size.
2	Medium Term - Identify spatial and temporal relationships between patterns of shellfish diseases in NJ and environmental correlates. To develop disease-resistant strains of shellfish. Develop superior disease-resistant and larger genetic lines of shellfish.Measure the impact of communities on the aquaculture industry. Knowledge of the feasibility of off-shore shellfish farming.
3	Long Term - Clear and comprehensive understanding of community, environmental, genetic and physical regulators of aquaculture quality and quantity. A safe and secure aquaculture industry that can meet consumer demands for high-quality products and also be environment friendly and economically viable. Creation of superior aquaculture products that will be of high demand outside NJ.
4	Aquatic Robotics: Summer Enrichment Program at Club 21 Summer Camp in Millville - Medium Term - Identify spatial and temporal relationships between patterns of shellfish diseases in NJ and environmental correlates. To develop disease-resistant strains of shellfish. Develop superior disease-resistant and larger genetic lines of shellfish.Measure the impact of communities on the aquaculture industry. Knowledge of the feasibility of off-shore shellfish farming.
5	Sustainable Fisheries Research- Medium Term - Identify spatial and temporal relationships between patterns of shellfish diseases in NJ and environmental correlates. To develop disease-resistant strains of shellfish. Develop superior disease-resistant and larger genetic lines of shellfish.Measure the impact of communities on the aquaculture industry. Knowledge of the feasibility of off-shore shellfish farming.
6	Understanding Ecological Aspects of Shellfish Pathogens to Improve Management - Long Term - Clear and comprehensive understanding of community, environmental, genetic and physical regulators of aquaculture quality and quantity. A safe and secure aquaculture industry that can meet consumer demands for high-quality products and also be environment friendly and economically viable. Creation of superior aquaculture products that will be of high demand outside NJ.
7	Characterizing the Physical Environment of the Coastal Ocean and its Relationship to Ecosystem Indicators - Long Term - Clear and comprehensive understanding of community, environmental, genetic and physical regulators of aquaculture quality and quantity. A safe and secure aquaculture industry that can meet consumer demands for high-quality products and also be environment friendly and economically viable. Creation of superior aquaculture products that will be of high demand outside NJ.
8	Shellfish Genetics and Breeding for Aquaculture - Long Term - Clear and comprehensive understanding of community, environmental, genetic and physical regulators of aquaculture quality and quantity. A safe and secure aquaculture industry that can meet consumer demands for high-quality products and also be environment friendly and economically viable. Creation of superior aquaculture products that will be of high demand outside NJ.
9	Fish, Fishing, and Risk to Eco-receptors and Humans in Coastal New Jersey - Long Term - Clear and comprehensive understanding of community, environmental, genetic and physical regulators of aquaculture quality and quantity. A safe and secure aquaculture industry that can meet consumer demands for high-quality products and also be environment friendly and economically viable. Creation of superior aquaculture products that will be of high demand

	outside NJ.
10	Marine Natural Product Discovery in Extreme Environments - Long Term - Clear and comprehensive understanding of community, environmental, genetic and physical regulators of aquaculture quality and quantity. A safe and secure aquaculture industry that can meet consumer demands for high-quality products and also be environment friendly and economically viable. Creation of superior aquaculture products that will be of high demand outside NJ.

Outcome #1

1. Outcome Measures

Short Term - Knowledge of seasonal variations for shellfish diseases. Create census data on communities involved in aquaculture. Determine the level of pollutants in economically important fish species. Develop markers and maps of important genetic traits. Knowledge of shellfish hatchery techniques that decrease time for growth to market size.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Medium Term - Identify spatial and temporal relationships between patterns of shellfish diseases in NJ and environmental correlates. To develop disease-resistant strains of shellfish. Develop superior disease-resistant and larger genetic lines of shellfish.Measure the impact of communities on the aquaculture industry. Knowledge of the feasibility of off-shore shellfish farming.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
SEA-SI Sea Science Investigations

Cumberland County, the poorest county in New Jersey, was declared a disaster area following

Superstorm Sandy. Then a nor'easter followed. Yet, Cumberland County, absent boardwalks and funnel cake on the western Jersey shore, was not named one of the nine counties eligible to receive the bulk of $1.8 billion in federal hurricane/ disaster aid.

What has been done

SEA-SI: Sea Science Investigations is a hands-on summer enrichment program offered by 4-H at Beaver Dam Boat rentals. Participants become active stewards of the Oranokin Creek, and learn about water quality, marine life, boating, crabbing; take part in hands-on science activities; specimen collection and identification and explore topics such as aquaculture, marine robotics and environmental stewardship practices of local businesses. Curriculum utilized included Project PORTS, Waterbotics, NOAA's How Do We Explore and Private Eye. Offered for three days in August, the program is three hours each day. SEA-SI is designed to include no more than 12 students. Demonstrations and activities relating to underwater ROVs, aquaculture systems, geocaching, water quality and habitat assessment were offered. Critical thinking and creative writing exercises were also included.

Results

A pre-posttest survey and end of session focus group discussion were utilized as evaluation tools in the program. Evaluation revealed the following: 67% rated presenter as excellent 33% rated presenter as very good When asked about prior knowledge of hand lining: 56% indicated no prior knowledge 33% indicated "some? knowledge 11% indicated "lots" of knowledge There was a 123% calculated change, with 67% indicating they now knew "lots" following the program 33% indicating they had learned "some" following the program Respondents indicated an 88% change in their knowledge regarding how oysters clean water Likewise 88% indicated change in their knowledge of aquaculture practices. 22% indicated they knew "a lot", 33 % "a little" and 44% indicated they knew "nothing" about operating an underwater ROV prior to the program. At the close of the program there was a 50% change in knowledge, with 44% responding they had learned "a lot", 34 % indicating they had learned some and 22% indicating they had learned "a little" Focus groups provided further qualitative responses on the learning. Participants remarked "I cannot wait until I come next year!" "The BEST thing I did was the underwater robot." "I will volunteer to help with the oyster shell bags again". "I loved the ROVS".

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife

Outcome #3

1. Outcome Measures

Long Term - Clear and comprehensive understanding of community, environmental, genetic and physical regulators of aquaculture quality and quantity. A safe and secure aquaculture industry that can meet consumer demands for high-quality products and also be environment friendly and economically viable. Creation of superior aquaculture products that will be of high demand outside NJ.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Sustainable Fisheries: From Case-Studies to Global Meta-analysis

Commercial and recreational fisheries play a critical economic and social role in the United States. Nationally, commercial landings are worth over $4 billion per year (dockside value) and the economic impact of recreational fishing is more than $38 billion. Despite the clear importance of fisheries, our ability to manage fisheries is falling behind. In 2007, of the 528 fish and invertebrate stocks recognized by the National Marine Fisheries Service (NMFS), only 179 or slightly over one third were fully assessed. Globally, the availability of stock assessments and the status of fisheries generally presents even more cause for concern. It is estimated that approximately two-thirds of fish stocks are currently below the biomass that would support maximum sustainable yield. Biomass of exploited marine fishes declined 38% between 1970 and 2007, although it appears to have leveled-off in recent years. Fishery status in fresh waters is less well known, but in many cases appears to be worse than in marine waters.

What has been done
NJAES researchers are building upon case studies from individual fisheries in the U.S. and other countries to examine the impacts of fishing and other changes on aquatic environments. In addition, the comparative approach helps identify those management strategies that are working and lead to their broader adoption in other locations. These comparisons involve (1) development of a new global database with information about many fish populations around the world based on information that has already been collected by U.S. and foreign fishery management agencies and (2) novel research on fish populations in the U.S., Mexico, and Mongolia which differ in their natural environments and fisheries, but share many of the same challenges, such as vulnerability to climate change and overfishing.

Results
NJAES research improved our understanding of how the 2010 Macondo oil spill in the Gulf of Mexico impacted marsh fish communities. There is surprisingly little detectable long-term impact on marsh fishes in Louisiana compared to other severe oil spills such as the Exxon Valdez. A meta-analysis of a global database of fish stock assessments demonstrated that depensation (negative population growth rate at low abundance) appears to be quite rare or only occurs at extremely low abundance. However, fish populations are naturally quite variable in their reproductive output, which leads to frequent stochastic depletion even for lightly harvested populations. Thus, we should expect to see even sustainably managed populations occasionally

dip below target population sizes.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife

Outcome #4

1. Outcome Measures

Aquatic Robotics: Summer Enrichment Program at Club 21 Summer Camp in Millville - Medium Term - Identify spatial and temporal relationships between patterns of shellfish diseases in NJ and environmental correlates. To develop disease-resistant strains of shellfish. Develop superior disease-resistant and larger genetic lines of shellfish.Measure the impact of communities on the aquaculture industry. Knowledge of the feasibility of off-shore shellfish farming.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Aquatic Robotics: Summer Enrichment Program at Club 21 Summer Camp in Millville

Cumberland County ranks at the poorest county in the Garden State and has minority enrollment of 65% (majority Hispanic) which exceeds the New Jersey state average of 49%. New Jersey ASK School test results reveal that students from the Cumberland County Elementary schools are not unilaterally proficient in the areas of science and mathematics. Students in 4th - 6th grades must prepare to meet the challenge of Next Generation Science Standards which include collaborative learning and brainstorming benchmarks implemented through the Engineering Design Process.

What has been done
A total of 39 youth in 4th - 6th grades participated in week long Aquatic Robotics Summer Enrichment programs offered by 4-H faculty at Lakeside Middle School in Millville. The program focused on LEGO robotics in a marine environment, adapting the Waterbotics curriculum to the abilities and interests of slightly younger youth. Imbedded within the program were science and

engineering topics including Iterative Design, Simple Machines, Buoyancy, Stability, Action and Reaction, Momentum, Gears/Torque. Cooperative learning and public speaking were incorporated into the program, as were team building and leadership development exercises.

Results

A pre-posttest survey and end of session focus group discussion were utilized as evaluation tools in the program. In addition the Waterbotics curriculum survey was implemented. In the initial session, 16 males and 2 females participated in the program, with all students completing the pre-post survey. In the second session, 16 males and 5 females participated with 19 completing the pre and post evaluation. Evaluation revealed the following: 100% of them knew nothing of the engineering design process or different types of buoyancy (positive, negative and neutral) prior to the program. After the program, 89% indicated they learned some or lots about the engineering design process 11 % learned "a little" about iterative design and the engineering design process. Prior to the program 100 % indicated they knew nothing about buoyancy. Following the session 63% indicated they learned a lot about the principle of buoyancy 26% indicated they had learned some about the principle of buoyancy 11%indicated they had learned a little about the principle of buoyancy - Many youth reported a prior knowledge base in elements of an effective team, while 26% reported they knew nothing, 26% reported knowing "a little", 16% knew "some" and 32 % reported that they knew "a lot", however, 100% of respondents indicated significant gains in knowledge and skills in this domain, with 100% responding they had learned some or a lot about elements of effective teams. The Waterbotics Curriculum survey revealed that 83% of participants stated that the project had changed their minds about how interesting science and technology are. Likewise, 83% stated ?This project made me want to take more classes in science if they are available." - 42 % responded that "This project made me want to do more after school science or engineering projects if they are available." And "This project made me consider engineering as a career path." Focus groups provided further qualitative responses on the learning. Participants offered that "Science is creative, like art". "Leadership is not the same as a title". While some students remarked that brainstorming collectively was challenging, others offered "Brainstorming is easy! We could have MORE people in our group and everyone's ideas would be included". All students could define the engineering design process, identify career prospects related to STEM and reported gains in learning both in science and engineering.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife

Outcome #5

1. Outcome Measures

Sustainable Fisheries Research- Medium Term - Identify spatial and temporal relationships between patterns of shellfish diseases in NJ and environmental correlates. To develop disease-resistant strains of shellfish. Develop superior disease-resistant and larger genetic lines of shellfish.Measure the impact of communities on the aquaculture industry. Knowledge of the feasibility of off-shore shellfish farming.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Sustainable Fisheries Research

Commercial and recreational fishermen in NJ struggle with the need to balance fishing activities and conservation. Natural resource managers at the state and federal level provide a management framework designed to keep these needs in balance, but they also struggle to understand the implications of climate change and changes to fish habitat for sustainable fishery management.

What has been done
An Extension Specialist research on NJ fisheries involves fishermen and natural resource managers in a collaborative research process where they work alongside scientists to solve problems of mutual interest. Two examples of such collaborative research are: 1) Ecosystem modeling of fishery management decisions in Barnegat Bay. In a study funded by the NJDEP, we developed an Ecopath with Ecosim model of the Barnegat Bay estuary. This model was based on historical data of fish and invertebrate biomass in the Bay, their diets and key life history characteristics, and estimates of primary productivity. Data collection involved interviews with scientists and stakeholders (residents and fishermen) familiar with Barnegat Bay and its ecological components and processes. This model was used to evaluate the likely direct and indirect impacts of changes to management of important Bay fisheries, including those targeting hard clam and blue crab. 2) Electronic tagging study to understand passage of American shad and river herring through a fish ladder on the Raritan River. In a study funded by the NJ DEP, we have been working with volunteers including students from Rutgers and residents of Middlesex and Monmouth Counties to capture and tag fish as they migrate up the Raritan River on their annual spawning migration. Captured fish are tagged with electronic tags which are used to record their passage through a fish ladder on the Island Farm Weir (IFW) in Bound Brook, NJ. This research has determined that, despite the presence of the fish ladder, the IFW remains a significant barrier for upstream migration of fish. More than 25 volunteers assisted with this research and learned about the ecology of the Raritan River.

Results
From conversations with volunteer fishermen and Barnegat Bay stakeholders, it is clear that for nearly all of them, their understanding of fish biology and ecosystem processes has increased. For most volunteers working on the Raritan River study, their understanding of barriers to fish migration and the challenges of restoring rivers has increased.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife

Outcome #6

1. Outcome Measures

Understanding Ecological Aspects of Shellfish Pathogens to Improve Management - Long Term - Clear and comprehensive understanding of community, environmental, genetic and physical regulators of aquaculture quality and quantity. A safe and secure aquaculture industry that can meet consumer demands for high-quality products and also be environment friendly and economically viable. Creation of superior aquaculture products that will be of high demand outside NJ.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Understanding Ecological Aspects of Shellfish Pathogens to Improve Management

Oyster and hard clam fisheries are severely depressed from historical levels with a major factor being losses from diseases that kill shellfish. Aquaculture is developing rapidly, but routinely confronts the same problems of disease and mortality. These diseases are often operating in open systems where aquaculture and fisheries occur. As such, they are significantly influenced by many ecology factors. Because aquaculture is one of the fastest growing sectors of agriculture, understanding disease dynamics and how it can be controlled to minimize losses is critical and have major impacts on the industry. The ability to detect pathogens, predict their presence, and control their impact is of paramount importance to the management of shellfish populations (wild or farmed) in New Jersey and elsewhere. It follows that by enhancing our understanding of host-pathogen-environment interactions we can identify potential control points and develop new or improve existing strategies to lessen the negative impacts of these pathogens. Successful strategies will lead to increases in aquaculture and fisheries production as well as improvements in the protection of human health.

What has been done
NJAES researchers at our Haskins Shellfish Laboratory conduct laboratory and field studies study shellfish parasite life history and ecology, including spatial and temporal relationships between shellfish pathogens and environmental correlates, examine the ecological processes involved in maintaining self-sustaining oyster populations with minimal impacts from disease, develop disease-resistant shellfish populations, develop detection assays for shellfish pathogens, and assist the shellfish industry and regulatory agencies.

Results
NJAES researchers continued to collect spatial and temporal data for shellfish pathogens in Delaware Bay and related these data to several environmental correlates. This work was presented at several meetings and workshops and is published in the technical reports. The primary use for this information was to help manage the Delaware Bay Oyster Fishery. Models were developed to explore transmission dynamics of Perkinsus marinus (the pathogen that causes Dermo in shellfish), using data results from experiments conducted during the past two years. Experiments were completed to investigate survival of Perkinsus marinus in seawater, a parameter that is poorly understood and critical to modeling disease transmission. These studies indicated initial high survival for about three days, then a rapid decay that began to plateau within a week. The annual stock assessment of the Delaware Bay Oyster Population was completed, including disease analyses, and presented to both the industry and regulatory agency to help develop harvest quotas. Funding was obtained to hold workshops to identify and resolve regulatory issues among East Coast states regarding movements of shellfish for aquaculture, restoration and other activities so that risks of spreading disease are minimized.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife

Outcome #7

1. Outcome Measures

Characterizing the Physical Environment of the Coastal Ocean and its Relationship to Ecosystem Indicators - Long Term - Clear and comprehensive understanding of community, environmental, genetic and physical regulators of aquaculture quality and quantity. A safe and secure aquaculture industry that can meet consumer demands for high-quality products and also be environment friendly and economically viable. Creation of superior aquaculture products that will be of high demand outside NJ.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Characterizing the Physical Environment of the Coastal Ocean and its Relationship to Ecosystem Indicators

Coastal ecosystems span watersheds to the deep sea and are extremely complex. This complexity hinders planning for ocean resource management, sustainable development, energy policy, homeland security and emergency response. This lack of understanding is fueling governments around the world to build regional integrated coastal ocean observing networks. The networks are enabled by rapid advances in technology, from satellites in space to robots below the ocean surface. These systems are built to support both basic research and the practical needs of society, from offshore resource management to the economy. The coastal ocean is a highly variable system with processes that have significant implications on the hydrographic and oxygen characteristics of the water column. The spatial and temporal variability of these fields can cause dramatic changes to water quality and in turn the health of the ecosystem. One important water quality measure is the amount of oxygen in the water. Very low oxygen conditions can starve species like fish of oxygen, resulting in large die-offs. While low Dissolved Oxygen (DO) concentrations are not uncommon in the coastal ocean, what is less understood is how the location and size of these low DO regions vary and what impact that variability has on ecosystem health. Therefore, alternative sampling strategies are needed to continuously map these low DO areas in a way that quantifies this variability.

What has been done
NJAES researchers are using continuous ocean observations enabled by rapid advances in technology (Autonomous Underwater Vehicles or AUVs) to describe the physical environment. Of particular interest is defining the physical variables at the necessary temporal and spatial scales to describe the critical interactions with the ecosystem, from phytoplankton and bacteria to fishes. This can be accomplished by coordinating an extensive array of existing observational, data management, and modeling assets to generate and disseminate real-time data, nowcasts and forecasts of the ocean extending from Cape Cod to Cape Hatteras. Interactions with the Mid-Atlantic Regional Association Coastal Ocean Observation System (MARACOOS) will ensure that data is collected at the appropriate time and space scales. An important component of the research will be the outreach to stakeholders throughout the state with vested interests in the coastal ocean.

Results
During this reporting period we deployed three glider (AUV) missions along the New Jersey coast to map the subsurface DO concentration in near real-time within the near coastal ocean. The first deployment began on July 17, 2014. The three missions together collected important water quality measurements along 1,417 km within the coastal waters off New Jersey. These data were reported to NJDEP in real-time throughout each deployment. Sensor calibration was conducted under the guidance of an existing Environmental Protection Agency Quality Assurance Project Plan. One of the critical parameters reported to the NJ Department of Environmental Protections (NJDEP) was dissolved oxygen (DO). DO is a measure of the amount of oxygen in the water.

This is used by NJDEP as an indicator of water quality. Very low oxygen conditions can starve species like fish of oxygen resulting in large die-offs. The glider is being used to monitor conditions so that NJDEP can get a better background on how effective DO is as a metric of water quality and also track the occurrence of dangerous low events. Over the past few year, a model of Butterfish thermal niche was developed and coupled to a hindcast of daily bottom water temperature derived from a de-biased regional numerical ocean model (ROMS) in order to project thermal habitat suitability in the Northwest Atlantic on a daily basis over the last 40 years. This model of habitat suitability was used to estimate the proportion of thermal habitat suitability available on the Northeast US continental shelf that was sampled on fishery-independent surveys conducted during the spring and fall. The method explicitly accounted for the relative motions of thermal habitat in the context of sampling on the survey. The habitat based estimate of availability developed using the approach was integrated into the catchability estimate used to scale population size in the butterfish stock assessment model accepted at the 59th NEFSC stock assessment review. The contribution of the availability estimate (along with an estimate of detectability) allowed for the development of fishery reference points, a change in stock status from unknown to known, and the establishment of a directed fishery with an allocation of 20,000 metric tons of quota.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife

Outcome #8

1. Outcome Measures

Shellfish Genetics and Breeding for Aquaculture - Long Term - Clear and comprehensive understanding of community, environmental, genetic and physical regulators of aquaculture quality and quantity. A safe and secure aquaculture industry that can meet consumer demands for high-quality products and also be environment friendly and economically viable. Creation of superior aquaculture products that will be of high demand outside NJ.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Shellfish Genetics and Breeding for Aquaculture

Shellfish are important marine resources. They support major aquaculture and fishery industries in the US and around the world. The sustainable development of the shellfish aquaculture is increasingly dependent on technological advances. Currently there are a number of problems and challenges facing the shellfish aquaculture industry, where genetic research and development can contribute greatly.

What has been done
NJAES researchers are engaged in an integrated research program in shellfish genetics and breeding using both traditional and modern approaches to serve the shellfish aquaculture industry. The overall objective of the research is to produce superior shellfish varieties that are disease resistant, fast growing, of high meat quality, and sterile, by using a combination of traditional and modern approaches. The program covers three areas of research: 1) selective breeding for faster growing and disease-resistant oysters; 2) developing sterile and faster growing varieties by ploidy manipulation; and 3) genetic studies toward the mapping of genes affecting commercially important traits and marker-assisted selection (MAS). Specifically, we propose to: 1) continuously improve shellfish strains; 2) to develop and improve new tetraploid lines; and 3) to map oyster genes affecting disease-resistance.

Results
Rutgers University has maintained an oyster breeding program since 1960. Strains developed at Rutgers had shown strong resistance to MSX, but they did not grow well and did not show much resistance to Dermo. We continued our oyster selection program with added attention to improved Dermo resistance and fast growth. We carried the selection program forward for four more generations from 2004 and 2013. As a result, Rutgers strains have shown significant improvement in both disease resistance and growth. In a recent comparison, Rutgers strains outperformed all other strains in NJ and some other culture sites in New England area. Second, we developed and improved superior triploid eastern oysters from Rutgers disease-resistant strains, and released them for aquaculture production. Triploid oysters are ideal for aquaculture because of their sterility, superior growth and improved summer meat quality. Triploid oysters have become an important part of the oyster aquaculture industry. Triploid oysters are produced by mating normal diploids and tetraploids that have four sets of chromosomes. We produced and selectively bred tetraploid eastern oysters for seven generations. Triploid oysters produced from Rutgers tetraploids combine the superior growth of triploids and disease resistance that was developed over 50+ years of selective breeding. They grew faster, survived better and yielded 82 - 192% more meat than normal diploids. Diploids and triploids from Rutgers strains have become popular stocks for aquaculture in NJ and the New England area. We are one of the leading groups of the international oyster genome project that sequenced the genome of the Pacific oyster for the first time. Research on oyster genomics has provided not only new tools for oyster breeding, but also novel insights to basic biology of molluscs, as exemplified by the publication of the oyster genome in Nature. In addition to research on oysters, we also conducted basic and applied research on other economically important shellfish species such as clams, scallops, pearl oysters and abalone in collaboration with international partners. These studies broadened our knowledge on a wide range of shellfish species and may have broad impact on shellfish aquaculture.

4. Associated Knowledge Areas

KA Code	Knowledge Area

135 Aquatic and Terrestrial Wildlife

Outcome #9

1. Outcome Measures

Fish, Fishing, and Risk to Eco-receptors and Humans in Coastal New Jersey - Long Term - Clear and comprehensive understanding of community, environmental, genetic and physical regulators of aquaculture quality and quantity. A safe and secure aquaculture industry that can meet consumer demands for high-quality products and also be environment friendly and economically viable. Creation of superior aquaculture products that will be of high demand outside NJ.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fish, Fishing, and Risk to Eco-receptors and Humans in Coastal New Jersey

Most states are facing an environmental situation in which contaminants are increasing, human populations are increasing, habitat for wildlife is decreasing, and human and ecological health risk is increasing.

What has been done
NJAES researchers examined toxic chemicals in fish, and the fate and effects of these chemicals in eco-receptors and humans. To understand the potential risk to consumers of fish and shellfish, it is essential to understand fishing rates, consumption rates, the reasons why people fish, and contaminant levels in those fish or other resources. Few scientists examine the whole process from how and why people fish, through understanding of the marine ecosystem, to contaminants in fish and other marine resources (e.g. shellfish, birds), to risk assessment and risk management. Collaborations with the public, with the Jersey Coast Angler's Association, with the Jersey Shore Shark Association, and with NJ DEP (through fish collections on their trawls) resulted in research that is both scientifically sound and directly responsive to the needs of the public to understand the risks from fish consumption. Outputs included publications to the scientific community, meetings and communication tools for the general public, brochures for the general public and meetings and information for regulators and state agencies. Another area of research has involved examining the effects of Superstorm Sandy on the perceptions of coastal

residents about ecological resources. This has resulted in several publications and talks, as well as additional funding from the US Centers for Disease Control.

Results

Our research findings for the period can be summarized as the following:
We examined selenium mercury molar ratios in internal tissues of bluefish (because they are an important game fish for NJ), as well as these ratios in a range of New Jersey fish. The ratios are important because excess selenium might partly ameliorate the adverse effects of mercury. The ratios were fairly high for most fish, meaning that selenium levels would be protective. The ratios were low for some fish, which suggests that the effects of mercury would be felt. We examined fish consumption rates of NJ anglers in light of mercury levels, and determined that some fishermen are eating enough fish to be above the safe advisory levels. We computed these for a number of the most frequently eaten selfcaught fish. Sushi is an important food item to NJ residents, and we found that the mercury in tuna sushi can be sufficiently high to provide a risk to high end consumers. We examined overall fish consumption and the relative risk from different species of fish, and showed that the NJ consumer can select fish that are high in nutrients and fatty acids, while being low in mercury. Using feathers as a bioindicator, we found that mercury levels did not change dramatically over a 25 year period, but that cadmium and lead decreased. The decreases were partly due to regulation (no more lead in gasoline, removal of cadmium from batteries), and the lack of a change in mercury may be due to increases from power plant emissions in the US and China.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife

Outcome #10

1. Outcome Measures

Marine Natural Product Discovery in Extreme Environments - Long Term - Clear and comprehensive understanding of community, environmental, genetic and physical regulators of aquaculture quality and quantity. A safe and secure aquaculture industry that can meet consumer demands for high-quality products and also be environment friendly and economically viable. Creation of superior aquaculture products that will be of high demand outside NJ.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Marine Natural Product Discovery in Extreme Environments

With the lack of effective agents to control a spectrum of deadly cancers and viruses (e.g., HIV) and with drug-resistant microbes reaching epidemic proportions, pharmaceutical firms are actively searching for novel biodiversity to screen for bioactive natural products and are in the active process of attempting to synthesize many of the promising bioactive compounds. Despite our relatively rudimentary knowledge of biodiversity in marine ecosystems, recent discoveries have identified a number of natural products with commercially-significant activities such as: anti-tumor, anti-microbial, anti-viral, antifungal, anti-parasitic, and anti-inflammatory agents; cardiovascular modulators; and cytotoxins.

What has been done
NJAES research focused on commercial product development, and innovative educational initiatives associated with organisms inhabiting deep-sea hydrothermal vents and cold-water seeps. Specific objectives are outlined as follows: (1) to screen a wide spectrum of invertebrates and microorganisms isolated from deep-sea extreme environments for bioactive compounds of significant use to a wide range of industrial companies with distinct product emphasis (e.g., pharmaceuticals, bioremediation, food, detergents). To this end, we propose to continue screening new extracts, fractions and compounds from our extensive collection of marine organisms, and to create a library of apoptosis inducing compounds that have a potential to be developed as anti-cancer drugs. (2) to continue sampling and basic research efforts at deep-sea hydrothermal vents and cold-water seeps at various sites in the oceans throughout the world: and (3) to undertake a diversity of educational initiatives, centered around the showing of a large-screen IMAX film entitled Volcanoes of the Deep Sea that we co-produced in conjunction with the Stephen Low Company and which is presently being shown at museums and science centers throughout the world. These efforts are an integral part of a concerted effort to educate an extremely large segment of the public to the wonders of the highly unique deep-sea ecosystems in which we are conducting our ongoing research efforts.

Results
Recent discoveries have identified a number of natural products with commercially-significant activities such as: anti-tumor, anti-microbial, anti-viral, anti-fungal, anti-parasitic, and anti-inflammatory agents; cardiovascular modulators; and cytotoxins. Bioactive marine natural products are often structurally unique with no counterparts in terrestrial organisms. We have available to us highly unique and vast collections of different marine organisms from extreme and unexplored environments and we are using a new and effective method to screen compounds for potential anti-cancer (i.e., apoptosis induction) activity. In May 2014, researchers associated with NJAES Project NJ32107 were honored at a Patent Award Reception hosted by Rutgers' Senior Vice President of Research (Christopher Molloy) for their receipt of a Patent (Patent No: US 8,183,395 B2) for "Compositions and Methods For Treating Cancer"; screening extracts of cultured novel species bacteria from deep-sea hydrothermal vents, as well as screening extracts of invertebrate mussels from hydrothermal vent habitats for bioactive compounds; developed a new assay using a combination of two or three cell-based assays for induction of apoptosis (ApopScreen), necrosis (ApopScreen and LDH) and autophagy (ApopScree and Cytotoxic) to detect novel classes of bioactive compounds from deep-sea hydrothermal vent organisms; isolated and cultured numerous micro-organisms from a variety of extreme deep-sea hydrothermal vent environments; identified the structure of bioactive compounds and specifically those with newly active compounds as necrosis inducers using advanced and sensitive NMR

methods capable of measuring a high quality carbon spectrum on 1000+ molecular weight samples as small as 0.1 mg; synthesized new and unusual molecular structures with potential anti-cancer activity for drug development and pharmaceuticals in conjunction with the Department of Chemistry at Rutgers University; developed a synthetic method for hydroxyethylamine chromene and chromane in order to increase their bioactivities; verified the mechanism of action of bioactive compounds, specifically those with necrosis inducer activity using LDH and MTT assays; and developed a new method of screening for the detection of apoptosis, necrosis and autophagy inducer. Various outcomes and impacts of this project are featured on the following Rutgers/NJAES website: http://deepseacenter.rutgers.edu/. The development of new ceramide compounds and derivatives as new inhibitors of cancer cell growth has been brought to the attention of several pharmaceutical science groups in NJ (e.g., Reaction Biology) and is expected to lead to a number of productive collaborations over the coming years.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife

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

None to report.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

NJAES research and extension outcomes related to this planned program were evaluated utilizing a variety of evaluation methods appropriate for each initiative to determine effectiveness on both a qualitative and quantitative level. For KASA and practice change we included the measurement of knowledge gained as measured by pre/post Likert-scale assessments. Surveys were used to measure increase in skills acquired, behavior change and practice adoption. For process evaluation we focused on program delivery, participation, relevance and timeliness. Data was collected at appropriate times for each initiative that supports this planned program. IRB approved evaluation instruments were used to collect research and extension data. Data analyses and comparisons relevant to basic and applied research and demonstration were collected and analyzed and reported utilizing a variety of data collection methods appropriate to each research question. The major goal of evaluating is the demonstration of social, economic, behavior and

environmental changes in conditions that contribute to improved quality of life as a result of participation in programs and benefits of research solutions. See state defined outcomes for detailed results of each initiative.

Key Items of Evaluation

None to report.

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Food Safety

☑ 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
102	Soil, Plant, Water, Nutrient Relationships	5%		5%	
104	Protect Soil from Harmful Effects of Natural Elements	5%		5%	
501	New and Improved Food Processing Technologies	15%		15%	
502	New and Improved Food Products	10%		10%	
503	Quality Maintenance in Storing and Marketing Food Products	10%		10%	
504	Home and Commercial Food Service	20%		20%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	10%		10%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	10%		10%	
723	Hazards to Human Health and Safety	15%		15%	
	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	3.0	0.0	4.0	0.0
Actual Paid	6.0	0.0	4.0	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**
115186	0	327876	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
549448	0	810883	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
132432	0	153818	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

• Conduct training and certificate programs for growers, producers, food workers, consumers and vendors to increase knowledge of food safety practicies.
• Design strategies, tools and processes to detect and eliminate pathogens, chemical and physical contaminants during production, transportation, processing and preparation of food.
• Invesitgate the ecology of threats to the food supply from microbial and chemical sources
• Develop technologies for the detection of food supply contaminants

2. Brief description of the target audience

• Producers
• Processors
• Retail - restaurants/vendors/supermarkets
• Department of Health
• Consumers, families, youth communites
• NJAES - faculty - staff - students
• Food manufacturers
• Schools - child care providers - food service workers

3. How was eXtension used?

Faculty have participated in answering "ask the expert" questions, development of collaborative educational products, and learn professional development products.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	71	0	0	0

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	22	27

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- -New methods in technologies -Educational workshops -Newsletters -Scientific publications -Patents -Website development -Extension publications -Volunteers trained -Agricultural and Industry Certifications -Train the trainer programs -Audits conducted

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Short Term - Increase knowledge of viable technologies, detection prevention, intervention and control technologies and practices to ensure food safety. Increase understanding of the ecology of threats to food safety from microbial and chemical sources.
2	Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.
3	Long Term - A safe food supply resulting from reduced incidence of food-borne illnesses.
4	Engineering for Food Safety and Quality - Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.
5	Chlorine Dioxide Releasing Packaging Systems to Improve Microbial Safety of Fresh-Cut Produce - Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.
6	Home Food Preservation - Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.
7	Intelligent Control of Biofilms through Targeted Antimicrobials - Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.
8	Transformations and Bioavailability of Mercury in Aquatic Ecosystems - Long Term - A safe food supply resulting from reduced incidence of food-borne illnesses.
9	On-farm Microbial Food Safety for the Fruit and Vegetable Industry - Long Term - A safe food supply resulting from reduced incidence of food-borne illnesses.

Outcome #1

1. Outcome Measures

Short Term - Increase knowledge of viable technologies, detection prevention, intervention and control technologies and practices to ensure food safety. Increase understanding of the ecology of threats to food safety from microbial and chemical sources.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Enhancing Microbial Food Safety by Risk Analysis

The Centers for Disease Control and Prevention has recently reported that an estimated 48 million cases of foodborne illness, 128,000 hospitalizations, and 3,000 deaths occur each year from foodborne microorganisms. In addition to human suffering, foodborne illnesses also have a substantial economic impact in the United States. The annual cost of foodborne illness in the U.S. is estimated at $89 billion for loss of productivity, other economic losses and medical expenses.

What has been done
Predictive microbiology and quantitative microbial risk assessment (QMRA) are rapidly developing scientific disciplines that use mathematical equations, numerical data, and expert opinion to estimate the presence, survival, growth, and death of microbes in foods. These models allow for the prediction of the safety of a product, based on the entire sequence of events up to consumption. They provide a framework for identifying critical data gaps and evaluating the effectiveness of risk-reduction strategies. An NJAES Extension Specialist develops and validates

predictive risk assessment models for appropriate commodity/pathogen pairings. These developed models are validated using real-life scenarios, whenever possible. The models generated for one commodity are used to guide a series of experiments to validate the model for different, closely related commodities. This information is used to development interventions to prevent/mitigate food safety threats. Communication effects include united presentation in the US and international, a series of audio podcasts available on the internet which address the interface between risk assessment and risk management.

Results

The experimental design this work probes fundamental factors important in cross-contamination that have previously not been explored. We have found that contact time does have a significant influence on microbial transfer, and longer contact times promote greater transfer. However, surface type (both contact surface and food) often has a more significant effect than contact time. One curious finding is the transfer to white bread appears to be much greater than transfer to gummy squares, for reasons that are not immediately apparent. Additional research is planned to investigate this phenomenon.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products
504	Home and Commercial Food Service
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #3

1. Outcome Measures

Long Term - A safe food supply resulting from reduced incidence of food-borne illnesses.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A Genome-wide Screen to Identify Novel Genes for Resistance to Fusarium Head Blight

Fusarium head blight (FHB) caused by Fusarium graminearum is one of the most important cereal diseases worldwide. Trichothecene mycotoxins, which are virulence factors of Fusarium, accumulate in the grain, presenting a food safety risk and health hazard to humans and animals.

What has been done
An NJAES researcher is using activity tagging to identify genes that confer resistance to Fusarium in Arabidopsis thaliana (small flowering plant). Activation tagging uses a modified T- DNA vector which contains multiple copies of the cauliflower mosaic virus (CaMV) 35S gene enhancer arranged in tandem. In addition to knocking out genes, the modified T-DNA vector can also function as an enhancer when inserted either upstream or downstream of a gene to produce gain-of-function phenotypes.

Results
We screened an activation tagged Arabidopsis thaliana population against trichothecin (Tcin), a type B trichothecene in the same class as deoxynivalenol (DON). We identified trichothecene resistant root 1 (trr1), which contained a T-DNA insertion upstream of two nonspecific lipid transfer protein (nsLTP) genes, AtLTP4.4 and AtLTP4.5. Expression of both nsLTP genes was induced in trr1 over 10-fold relative to wild type. Overexpression of AtLTP4.4 provided greater resistance to Tcin than AtLTP4.5 in Arabidopsis thaliana and in Saccharomyces cerevisiae relative to wild type or vector transformed lines. Tcin treatment increased reactive oxygen species (ROS) production in Arabidopsis and ROS stain was associated with the chloroplast, the cell wall and the apoplast. Overexpression of AtLTP4.4 attenuated ROS levels, highlighting the importance of AtLTP4.4 in maintaining the redox state. Exogenous addition of glutathione (GSH) and other antioxidants enhanced resistance of Arabidopsis to Tcin while the addition of buthionine sulfoximine (BSO), an inhibitor of GSH synthesis, increased sensitivity, suggesting that resistance was mediated by GSH. Total GSH content was significantly higher in Arabidopsis and in yeast overexpressing AtLTP4.4 relative to the controls. These results demonstrate that trichothecenes cause ROS accumulation and overexpression of AtLTP4.4 protects against trichothecene-induced oxidative stress by increasing the GSH-based antioxidant defense.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products

504	Home and Commercial Food Service
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #4

1. Outcome Measures

Engineering for Food Safety and Quality - Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Engineering for Food Safety and Quality

With an increasing demand by consumers for fresh-like, healthy, nutritious and safe food, the US food processing industry is continually challenged to meet this demand while guarding their products against emerging pathogenic microorganisms that are tolerant to conventional treatment methods. Improved and novel food processes are needed to assure quality and wholesomeness in processed foods.

What has been done
NJAES researcher evaluated the role of surface roughness in microbial inactivation due to Cold Atmospheric Pressure Plasma (CAPP) treatment. CAPP is an ionized gas consisting of charged and neutral particles, and radiation of varying wavelengths. Due to its relatively low temperature, CAPP is considered a potentially useful non-thermal food processing technique able to inactivate microorganisms on food surfaces. However, past research has shown different microbial inactivation on surfaces possessing different roughness values. NJAES researcher evaluated and quantified the effect of surface roughness. Sandpaper sheets of various roughness values (i.e. various grits) that correspond to the typical roughness (Pa) values of various fruits were selected. The surface roughness was quantified using Confocal Laser Scanning Microscopy (CLSM). A

fixed area of sandpaper was inoculated with the nonpathogenic surrogate Enterobacter aerogenes and left to dry for two hours. The sandpaper was subjected to plasma treatment for five minutes. Surface temperature of the sandpaper samples never exceeded 50 °C. Scanning Electron Microscopy (SEM) was used in conjunction with CLSM to view the stacking of grains on sandpaper surfaces and verify the presence of E. aerogenes between the grains. Experiments were conducted to confirm that there were no contributions of temperature in the inactivation of E. aerogenes. The log reduction in microbial population was determined.

Results

Experimental findings show 1-2 log reductions in E. aerogenes following plasma treatment with the log reduction increasing with sandpaper grit number, i.e., decreasing roughness. Thus, surface roughness does play a role in microbial inactivation due to CAPP treatment which would serve as a good reference for researchers/industry in using CAPP treatment for decontamination of foods. As NJAES research has developed the necessary proof of concept that as the surface roughness increases, microbial inactivation decreases, and future research will look to validate these findings with actual fruit surfaces.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products
504	Home and Commercial Food Service
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #5

1. Outcome Measures

Chlorine Dioxide Releasing Packaging Systems to Improve Microbial Safety of Fresh-Cut Produce - Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Chlorine Dioxide Releasing Packaging Systems to Improve Microbial Safety of Fresh-Cut Produce

Chlorine dioxide (ClO2) is traditionally applied in the washing of fresh produce in order to remove dirt and inactivate microorganisms on the surface. This washing process has been found to be effective for lettuce, cabbage, green bell pepper, baby carrot, apple, tomato, mungbean sprout, and blueberry. However, the washing process has two disadvantages: (1) due to high surface tension of water, ClO2 in the aqueous phase cannot access the hard-to-reach areas such as pores and crevices on fresh produce where microbes are usually attached, and (2) once the washing process is completed, ClO2 is no longer available to combat the surviving microbes. Recently, these limitations have motivated scientists to explore the use of ClO2 gas treatment to complement the washing process. ClO2 gas can penetrate the areas inaccessible by washing. In fact, the use of ClO2 gas treatment has shown to be effective in microbial inactivation for a number of fresh produce products including lettuce, cabbage, green bell pepper, baby carrot, apple, tomato, blueberry, and so on. A possible but not preferable approach to apply the gas treatment is to gas flush the package with ClO2. Due to the unstable and explosive nature of ClO2, transportation and storage of this gas should be avoided. Hence this approach requires that ClO2 be generated onsite upon demand in the food manufacturing plant. Installing a ClO2 generator is either not feasible or too expensive for many fresh produce companies. A better approach is to develop an innovative ClO2 releasing packaging system to release ClO2 in a slow and controlled manner.

What has been done
An NJAES researcher is developing a packaging system that can generate and release chlorine dioxide in a controlled manner to improve the quality and microbial safety of fresh-cut produce. These package systems may be used alone, or in combination with other technologies such as modified atmosphere packaging and controlled release packaging, to provide the most cost effective solution for the particular application.

Results
In collaboration with the USDA Eastern Regional Research Center, an NJAES research demonstrated the feasibility of incorporating a salt into a packaging film in such a manner that, when fresh tomatoes were packaged inside the film, the carbon dioxide and moisture generated by the tomatoes could trigger the release of chloride dioxide to inhibit microbial growth in the tomatoes without adversely affecting the sensory quality. Work will continue to optimize the process variables to better control the release kinetics of chloride, and also evaluate the effectiveness of the system for other fruits and vegetables.

4. Associated Knowledge Areas

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

104	Protect Soil from Harmful Effects of Natural Elements
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products
504	Home and Commercial Food Service
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #6

1. Outcome Measures

Home Food Preservation - Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Home Food Preservation

Interest in home food preservation ? canning, freezing & dehydrating ?has increased as more people plant home gardens, participate in CSA's or buy from local farm markets. They want to preserve the extra produce for later in the year. Many people have never preserved food at home and others are using outdated or unsafe recipes and procedures.

What has been done
Family and Community Health Sciences Education conducted canning and freezing food preservation workshops including demonstrations, hands-on practice, videos, PowerPOint lectures and equipment discussion and display. USDA National Food Preservation Center and the Ball Company curricula was used. Consumers were reached at the Great Tomato Tasting, an annual Rutgers Cooperative Extension event at a research farm; the Rutgers University Home

Gardeners School and at various County locations throughout the state.

Results
Participants reported gaining knowledge both in understanding the importance of proper food preservation to ensure safety and the techniques required for a safe and high quality product. Those who said they did not follow proper procedures indicated they would change as a result of learning about potential health risks from improperly canned food. Participants planned to preserve food in the coming year. Sample comments from evaluations:
-Really very glad I took this class because it eliminated my fears and increased my knowledge. - Only canned tomatoes in past, but may expand to other items in future -What was the most important thing learned? -Many variations of: Only stick to tested recipes; only use tested recipes when canning - that I don?t have to sterilize jars - follow directions exactly in canning - importance of blanching.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products
504	Home and Commercial Food Service
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #7

1. Outcome Measures

Intelligent Control of Biofilms through Targeted Antimicrobials - Medium Term - Adoption of safe food handling practices at the individual, family, community, production and supply system levels.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year **Actual**

2014 0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Intelligent Control of Biofilms through Targeted Antimicrobials

Biofilms are complex populations of microorganisms. They are responsible for the biofouling of dairy and meat products and the contamination of processing equipment. The presence of biofilms within food processing facilities results in post-production contamination, tainted food reaching the consumer, and a significantly shorter product shelf life. Typically, biofilms have an increased resistance to disinfectants and antibiotics, making their eradication from these environments challenging. The development of degradable polymers with antimicrobial agents (AM) built into the polymer allows for delivery of the AM as it is continuously degraded. This time-controlled, slow release of an antimicrobial has the potential to target production of biofilms as they form. The steady release of AM could deliver a sufficient amount of stress to allow for efficient control of non-desired microorganisms.

What has been done
Several natural and nature-derived antimicrobials were tested for their activity against foodborne pathogen Listeria monocytogenes. Building on our previous study of these substances' activity against planctonic cells of L. monocytogenes, we pursued elucidation of these substances' activity against biofilms as biofilms are usually more tolerant to various stresses than planktonic cells, and foodborne pathogens are often establishing their presence in the food products in a form of biofilms.

Results
NJAES researchers found that the bacteriocin subtilosin is not very effective against biofilms of L. monocytogenes, although it is good in controlling the pathogen's free cells. At the same time, e-poly-L-lysine (PL) (FDA GRAS approved antimicrobial) and lauramide arginine ethyl ester (LAE) were particularly effective in controlling biofiolm formation and in killing of biofilmassociated L. monocytogenes. Based on this finding and considering our previous study showing nisin's (FDA GRAS approved preservative) activity L. monocytogenes in combination with various natural antimicrobials, PL, LAE and nisin are selected for the last phase of this project's study, specifically loading into biodegradable polymers for the targeted-release based control of L. monocytogenes.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products
504	Home and Commercial Food Service
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

723 Hazards to Human Health and Safety

Outcome #8

1. Outcome Measures

Transformations and Bioavailability of Mercury in Aquatic Ecosystems - Long Term - A safe food supply resulting from reduced incidence of food-borne illnesses.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Transformations and Bioavailability of Mercury in Aquatic Ecosystems

Mercury is a potentially serious public health concern due to its accumulation in aquatic and terrestrial food chains. The consumption of marine and freshwater fish containing elevated concentrations of mercury by women of child-bearing age has been linked to adverse health outcomes for their children (Oken et al., 2005; Grandjean and Perez, 2008).

What has been done
NJAES researchers examined the biological and abiotic mechanisms that lead to the mobilization, transformation, and bioaccumulation of mercury in subsurface, estuarine, and marine environments. Understanding the fate of mercury in some of the most densely populated states in the U.S. will link process studies focused on biological cycling, speciation, and bioaccumulation to environmental management of the nation's aquatic natural resources. This work addresses the research priority area of Food Safety in that it will improve the knowledge base needed to "reduce the incidence of food-borne illness and provide a safer food supply." Ongoing research examined the photochemical reduction of mercury inside marine phytoplankton cells, the mercury isotopic composition of methylmercury in estuarine sediments, mercury isotopic fractionation during microbiologically-catalyzed mercury methylation, mercury concentrations in Antarctic krill, and the physiology and biochemistry of inorganic carbon acquisition in marine diatoms.

Results
Results include the following findings:
Photochemical reduction of intracellular mercury in marine phytoplankton is an important pathway

of mercury reduction in coastal waters. A method for the separation of methylmercury from estuarine sediments for mercury isotope analysis was developed and tested. The mercury isotope signature of methylmercury from estuarine sediments indicated that there is spatial and temporal variation in the extents of methylmercury recycling through demethylation. The mercury isotope fractionation factor associated with mercury methylation by the ubiquitous iron-reducing anaerobe Geobacter sulfurreducens was determined. Dissolved elemental mercury concentrations in surface waters along the West Antarctic Peninsula increased with proximity to the shore. Along the West Antarctic Peninsula, concentrations of methylmercury were higher in juvenile krill, which undergo development near shore and feed on sea-ice algae during overwintering, compared to concentrations found in adult krill. Pyruvate carboxylase (PYC) from the marine diatom T. pseudonana was shown to be able to catalyze the decarboxylation of oxaloacetate in vitro. In addition, activities of PYC in T. pseudonana were suppressed in cultures acclimated to high CO2. This chloroplastic enzyme may therefore help diatoms fix inorganic carbon in the ocean as part of a biochemical carbon concentrating mechanism.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products
504	Home and Commercial Food Service
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #9

1. Outcome Measures

On-farm Microbial Food Safety for the Fruit and Vegetable Industry - Long Term - A safe food supply resulting from reduced incidence of food-borne illnesses.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
On-farm Microbial Food Safety for the Fruit and Vegetable Industry

The fruit and vegetable industry is under increased pressure to improve their food safety practices and to obtain a third party audit confirming they are improving their practices. This is even more important with the enactment of the Food Safety Modernization Act which will be implemented over the next several years.

What has been done
The project was initiated at the request of the produce industry in 1999. Growers received letters from supermarkets requesting they have food safety plans and third party audits in place for the 1999 growing season. Growers did not have an understanding as to what was required. Fundamentals for training needs were solicited from individual growers and buyers to help design the project. The goals and objectives: ? Train the produce industry (wholesale/retail growers and distributors) in basic food safety ? Train wholesale/retail growers on how to carry out a risk assessment on their operations; write a food safety plan and prepare for a third party audit ? Train first level buyers on food safety and how to prepare for third party audits ? Have growers and buyers who participate in food safety training pass their third party audits. ?Train grower in the requirements of the Food Safety Modernization Act and how to prepare for it. ?Determine research needs in the food safety area ? Design and carry out research that directly benefits the fruit and vegetable industry.

Results
Growers have changed their practices as it relates to food safety. Even if they do not need a third party audit, growers are considering food safety as part of doing business. This awareness has expanded as retail buyers are questioning food safety at the farm level. Approximately 100 operations have passed their third party audit in 2014. This is a 33% increase over 2013.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products
504	Home and Commercial Food Service
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

723 Hazards to Human Health and Safety

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

None to report.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

NJAES research and extension outcomes related to this planned program were evaluated utilizing a variety of evaluation methods appropriate for each initiative to determine effectiveness on both a qualitative and quantitative level. For KASA and practice change we included the measurement of knowledge gained as measured by pre/post Likert-scale assessments. Surveys were used to measure increase in skills acquired, behavior change and practice adoption. For process evaluation we focused on program delivery, participation, relevance and timeliness. Data was collected at appropriate times for each initiative that supports this planned program. IRB approved evaluation instruments were used to collect research and extension data. Data analyses and comparisons relevant to basic and applied research and demonstration were collected and analyzed and reported utilizing a variety of data collection methods appropriate to each research question. The major goal of evaluating is the demonstration of social, economic, behavior and environmental changes in conditions that contribute to improved quality of life as a result of participation in programs and benefits of research solutions. See state defined outcomes for detailed results of each initiative.

Key Items of Evaluation

None to report.

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Sustainable Energy

☑ 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
605	Natural Resource and Environmental Economics	100%		100%	
	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	4.0	0.0	2.0	0.0
Actual Paid	4.0	0.0	1.0	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**
29153	0	59554	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
510861	0	302463	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
8830	0	20121	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Perform experiments to investigate renewable energy production.

- Develop methodologies and scientifically sound alternatives to fossil fuels
- Educate homeowners, business owners, farmers and agri-related businesses, youth and families about conservation and efficiency practices related to energy use.
- Provide education and training to enhance bio energy related job development and careers.

2. Brief description of the target audience

- University faculty, staff and students
- School aged youth
- Families
- Homeowners
- Farmers
- Agri-businesses
- State agencies and organizations
- Industry partners
- Small businesses
- Entrepernuers
- Policy and decision makers

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	129	0	0	0

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	1	3	4

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- -Scientific publications and patents produced -Participants reach through direct and indeirect education -New methodologies and technologies developed

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Short Term - Increase knowledge, energy efficiency technologies and conservation practices related to energy use. Explore research strategies to replace fossil fuel consumption.
2	Medium Term - Participants in direct and indirect educational methods will adopt practices to conserve energy use and reliance on fossil fuels. Business owners will create and maintain green jobs/careers as a result of bioenergy development. Newly developed plants and technologies will be adopted to enhance energy independence.
3	Long Term - Fossil fuel consumption will be replaced with biofuels. Economic development will be enhanced through an increase of jobs and careers as a result of bioenergy development. Environment quality enhanced as a result of sustainable biofuel production and utilization.
4	Integration of Molecular and Classical Perennial Grass Breeding for Turfgrass Improvement and Biofuel Production - Medium Term - Participants in direct and indirect educational methods will adopt practices to conserve energy use and reliance on fossil fuels. Business owners will create and maintain green jobs/careers as a result of bioenergy development. Newly developed plants and technologies will be adopted to enhance energy independence.
5	Improving Estimates from National-scale Above-ground Tree Biomass Equations - Medium Term - Participants in direct and indirect educational methods will adopt practices to conserve energy use and reliance on fossil fuels. Business owners will create and maintain green jobs/careers as a result of bioenergy development. Newly developed plants and technologies will be adopted to enhance energy independence.

Outcome #1

1. Outcome Measures

Short Term - Increase knowledge, energy efficiency technologies and conservation practices related to energy use. Explore research strategies to replace fossil fuel consumption.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Medium Term - Participants in direct and indirect educational methods will adopt practices to conserve energy use and reliance on fossil fuels. Business owners will create and maintain green jobs/careers as a result of bioenergy development. Newly developed plants and technologies will be adopted to enhance energy independence.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Sustainable Energy Production Using Duckweed Biomass through Optimized Waste-to-Fuel Technologies

The quest for renewable energy alternatives to fossil fuels that have low carbon footprints has become a global priority. In response to the urgent call for significant decreases in Greenhouse Gas (GHG) emission, the Renewable Fuel Standard provision of the Federal Energy Independence and Security Act of 2007 requires 36 billion gallons of biofuels to be used in our nation's transportation fuel supply by the year 2022. Of these, 21 billion gallons are expected to derive from cellulosic and other "second generation (i.e. non-corn starch-based)" biofuels. Two major alternative biofuel strategies are being pursued worldwide. In the so-called second generation biofuels, technologies are being optimized for conversion of cellulosic feedstock materials into sugars for subsequent fermentation. However, cellulose is heavily fortified in plant-based feedstocks and requires significant energy input and enzyme pretreatments to aid its transformation into fermentable sugars with current technologies. With current estimated

production cost of cellulosic ethanol at about 3 times that of corn-starch ethanol, it is unclear if and when cellulosic bioethanol will become economically viable. The situation with algal biodiesel, also called third generation biofuel, is perhaps even a bit worse since the scale-up of this approach has been particularly problematic. One of the major issues, for example, is the economical separation of algal biomass from the aqueous medium in which it has been growing. A recent life cycle analyses of these different biofuel feedstocks have raised significant concerns over their true environmental impact, especially for algal biofuels. Alternative sources of renewable biomass are needed. NJAES researchers are exploring the potential for using the Lemnaceae family of aquatic plants, commonly called duckweeds, as a commercially viable feedstock as a micro-crop for fuel production. Duckweeds are flowering aquatic plants which float on or just beneath the surface of still or slow-moving bodies of fresh water and wetlands. The chief characteristics that make duckweeds ideal for waste-to-energy conversion are their rapid growth rate, easy harvesting potential, and ability to grow directly on existing wastewater sites.

What has been done

NJAES researchers seek to develop new aquatic agronomic methods for deploying selected duckweed strains as a waste-to-fuel platforms. Identifying optimal strains for biomass production from municipal wastewater and creating a sustainable wastewater-to-fuel pipeline for this process are the first steps in this research. To facilitate the creation of a new aquatic cropping system with duckweed, these researchers have also focused on developing the biotechnology that will pave the way toward breeding elite duckweed strains with desirable traits, such as high growth rate duckweed strains that also can accumulate high concentrations of target components such as starch (for bioethanol production) or protein (for animal feed).

Results

NJAES researchers have identified a number of duckweed strains that can grow well in municipal wastewater and those that can produce high starch or protein, and have partnered with a start-up company in Argentina to implement this process. These researchers have now completed the first database for two molecular barcodes with data from all 37 known species of duckweed. This resource can now be deployed to identify 30 out of the 37 species within 3 days via a generic PCR-based protocol. This work should help duckweed researchers and application specialists in more accurate typing of duckweed isolates worldwide. To help advance genomic approaches in duckweed, a highly accurate genome sequence map is essential. Toward this end, NJAES researchers are finalizing work in de novo genome sequencing and assembly for a strain of Greater Duckweed, S. polyrhiza (9509). Using a novel integration approach with genome draft sequence of another strain of S. polyrhiza (7498), they have produced a high fidelity reference genome for this species of duckweed and have validated its genome assembly as well as the predicted transcript models. This work should help set the stage for genomics-guide breeding of duckweeds in the near future. This research can potentially play a major role in getting this new crop system adapted and perhaps spark a new source of renewable fuel in the near future. The success of this project will have local impact in New Jersey and elsewhere in the U.S., as well as internationally, by creating a new industry for the agronomic deployment of duckweed micro-crops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics

Outcome #3

1. Outcome Measures

Long Term - Fossil fuel consumption will be replaced with biofuels. Economic development will be enhanced through an increase of jobs and careers as a result of bioenergy development. Environment quality enhanced as a result of sustainable biofuel production and utilization.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Horticultural Engineering

Controlled environment plant production systems (greenhouses and growth chambers) are used worldwide to produce high quality plant material (produce, floriculture, and nursery crops). Rising energy prices have made a significant impact on the profitability of many greenhouse operations. Engineering information and solutions can help growers reduce energy use and operating costs. Alternative energy sources and novel technologies need to be investigated for potential applicability and economic return. Some of the technologies involved require relatively high initial investment costs. Therefore, research is needed to determine the best possible applications before growers are able to make informed investment decisions. Education outreach efforts are necessary to reach target audiences.

What has been done
Two projects are ongoing that are related to greenhouse energy efficiency. Both projects are collaborations with several other educational institutions from across the country. One of the projects investigates the use of light emitting diode (LED) lighting systems for photoperiodic and supplemental lighting of vegetable and flowering crops. The other project aims to develop an online (undergraduate) course consisting of individual lectures (modules) focused on engineering and crop production issues that can be integrated into a variety of courses related to controlled environment plant production.

Results
Greenhouse energy use research has resulted in new information that has been communicated with the industry through presentations and webinars. Growers who implemented the information

resulting from research and presentations have been able to realize energy savings between 5 and 30%. Several course modules on horticultural engineering topics were developed and made available as webinars as part of our multi-institutional education project. A project stakeholder meeting organized at Rutgers provided valuable information for our research project on the use of LED lighting systems for horticultural applications.

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics

Outcome #4

1. Outcome Measures

Integration of Molecular and Classical Perennial Grass Breeding for Turfgrass Improvement and Biofuel Production - Medium Term - Participants in direct and indirect educational methods will adopt practices to conserve energy use and reliance on fossil fuels. Business owners will create and maintain green jobs/careers as a result of bioenergy development. Newly developed plants and technologies will be adopted to enhance energy independence.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Integration of Molecular and Classical Perennial Grass Breeding for Turfgrass Improvement and Biofuel Production

Although perennial grasses such as switchgrasses are expected to be used as a biofuel crop on marginal land, there has been little to no extensive research to evaluate their performance on marginal land. Therefore, it is unknown how perennial grasses will perform on marginal land and how different soil types influence yield characteristics such as cellulose and lignin content, plant height, disease, drought etc. This knowledge is critical to the successful development of biofuels so that enough biomass can be generated domestically to offset foreign oil dependency. Marginal cropland typically has poor quality soils with low amounts of N (nitrogen) which can reduce biomass yield. Like turfgrasses, switchgrass is not a food crop and until recently has not been

widely studied at the genomic level. In order for switchgrass and other perennial grasses to be successful and economical for biofuel production on marginal land we need to understand the mechanisms of stress tolerance, i.e. response to Nitrogen, Phosphorous, drought, and how environmental conditions like marginal land influence cellulose and lignin content in plant tissue.

What has been done
NJAES researchers are using laboratory methods and field trials: to identify proper selection procedures to optimize selection of germplasm for biomass production on marginal land with limited nitrogen; to identify, clones and cultivars that respond positively to added nitrogen and which produce high biomass yields in marginal land with low amounts of N; to identify superior clones and/or families to use in population improvement programs to develop new cultivars with better performance on marginal land; and to identify optimum breeding and selection techniques. Genomic approaches are used to identify the best performing switchgrass plants on marginal land (with low N) in Northeastern US and identify germplasm with improved performance on marginal land to use in a breeding program.

Results
Several studies were planted in previous years on prime and marginal sites to identify the best selection procedures for the identification of germplasm with improved performance on marginal land. With USDA-NIFA funding, this research has identified 22 clones of switchgrass with both high yields on reclaimed mine land and high yield in prime soil. The next steps here are to recombine these selections and use population improvement to concentrate genes important for high biomass yield in marginal environments. This line of research is unique in that it specifically provides strategies for integrating feedstock production onto marginal land, which will be critical to the enhancement of our economy and critical to the increased use of biomass fuel sources. This research will improve the current state of knowledge of biomass yield of perennial grasses on marginal land and will provide a crucial step in the implementation of perennial grass biomass production in stressful environments.

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics

Outcome #5

1. Outcome Measures

Improving Estimates from National-scale Above-ground Tree Biomass Equations - Medium Term - Participants in direct and indirect educational methods will adopt practices to conserve energy use and reliance on fossil fuels. Business owners will create and maintain green jobs/careers as a result of bioenergy development. Newly developed plants and technologies will be adopted to enhance energy independence.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Improving Estimates from National-scale Above-ground Tree Biomass Equations

Concern over global climate change has led to intense interest in carbon accounting. Forests play a major role in the carbon cycle by sequestering carbon in cellulose (e.g., Malmsheimer et al. 2008). Determining the amount of carbon stored in a forest is a daunting task yet is essential for reliable carbon accounting.

What has been done
NJAES research concentrate on improving estimation of
above-ground biomass (and consequently, improved estimates of carbon storage) in forest trees. The USDA Forest Service has produced a comprehensive, national-scale set of biomass equations for all tree species in the United States (Jenkins et al. 2003). These equations were developed from meta-analysis of "pseudodata" generated from a comprehensive list of published volume equations. As a result, the equations are almost certainly biased for specific species, and it is not possible to generate valid confidence intervals for predictions from the equations.

Results
This work led to more accurate estimation of carbon biomass stored in forests. Perhaps more importantly, it will permit computation of valid uncertainty estimates for estimates which use the Jenkins et al. equations. As stated in chapter 6 of IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories (http://www.ipccnggip.iges.or.jp/public/gp/english/), it is essential to be able to quantify the level of uncertainty in estimates of carbon storage. Better estimates of carbon storage is needed to design national forest management schemes aimed at enhancing the role of forests as carbon sinks and ameliorating the effects of global climate change, and also for determining the value of forests in carbon markets such as the Chicago Climate Exchange. In order to assess the total error in biomass prediction, data needed to fit an individual tree biomass model, and another data set consisting of a large mapped stand in which inventories could be simulated and simulation results compared against the actual, known biomass of the stand (possible only with a fully mapped stand). Due to data scarcity issues, green weight was used instead of biomass. It showed that the common practice of ignoring model parameter uncertainty in weight prediction results in confidence intervals which are far too liberal, underestimating uncertainty by 10-40%. I also showed that the common practice of ignoring log transformation bias introduced large and non-ignorable bias in weight prediction.

4. Associated Knowledge Areas

KA Code	Knowledge Area

605 Natural Resource and Environmental Economics

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Other (Consumption Practices)

Brief Explanation

None to report.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

NJAES research and extension outcomes related to this planned program were evaluated utilizing a variety of evaluation methods appropriate for each initiative to determine effectiveness on both a qualitative and quantitative level. For KASA and practice change we included the measurement of knowledge gained as measured by pre/post Likert-scale assessments. Surveys were used to measure increase in skills acquired, behavior change and practice adoption. For process evaluation we focused on program delivery, participation, relevance and timeliness. Data was collected at appropriate times for each initiative that supports this planned program. IRB approved evaluation instruments were used to collect research and extension data. Data analyses and comparisons relevant to basic and applied research and demonstration were collected and analyzed and reported utilizing a variety of data collection methods appropriate to each research question. The major goal of evaluating is the demonstration of social, economic, behavior and environmental changes in conditions that contribute to improved quality of life as a result of participation in programs and benefits of research solutions. See state defined outcomes for detailed results of each initiative.

Key Items of Evaluation

None to report.

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
	Number of new crop varieties, animal breeds, and genotypes whit climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
	Number of participants adopting best practices and technologies resulting in increased yield, reduced inputs, increased efficiency, increased economic return, and/or conservation of resources.
Global Food Security and Hunger (Outcome 2, Indicator 1)	
	Number of new or improved innovations developed for food enterprises.
Food Safety (Outcome 1, Indicator 1)	
	Number of viable technologies developed or modified for the detection and
Sustainable Energy (Outcome 3, Indicator 2)	
	Number of farmers who adopted a dedicated bioenergy crop
Sustainable Energy (Outcome 3, Indicator 4)	
	Tons of feedstocks delivered.