

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-health 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 and 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 <u>their own and others knowledge and decision making skills.</u>
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 <u>environmental quality.</u>
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 collapses 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 than 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 health of residents in these states. The formation of organic PM, a major fine PM constituent, is particularly poorly understood. PM_{2.5} has a considerable impact on

the health 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 PM_{2.5} concentrations and PM_{2.5} 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 PM_{2.5} 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 simuliid 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 mosquito-borne 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 Statutes. 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 counties 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 associated 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 demonstrating 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 $10^6/\text{cm}^3$. 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 proactive 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 chikungunya 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
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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 through 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 watershed's 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 watershed's 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, including 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 into 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 farm's 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 which 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 an 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 Emergency 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
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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.