FY 2020 Annual Report of Accomplishments and Results

New Jersey
Rutgers, the State University of New Jersey
Rutgers Cooperative Extension and the New Jersey Agricultural Experiment Station

I. Report Overview

The NIFA reviewer will refer to the executive summary submitted in your FY 2020 Plan of Work located in the Institutional Profile. Use this space to provide updates if needed.

1. Executive Summary (Optional)
Refer to the FY2020 Plan of Work

II. Merit and Scientific Peer Review Processes

The NIFA reviewer will refer to your 2020 Plan of Work. Use this space to provide updates as needed or activities that you would like to bring to NIFA's attention.

Process	Updates ONLY
1. The Merit Review Process	Refer to the FY2020 Plan of Work
2. The Scientific Peer Review Process	Refer to the FY2020 Plan of Work

III. Stakeholder Input

The NIFA reviewer will refer to your 2020 Plan of Work. Use this space to provide updates as needed or activities that you would like to bring to NIFA's attention.

Stakeholder Input Aspects	Updates ONLY
1. Actions taken to seek stakeholder input that encouraged their participation with a brief explanation	Refer to the FY2020 Plan of Work
2. Methods to identify individuals and groups and brief explanation.	Refer to the FY2020 Plan of Work
3. Methods for collecting stakeholder input and brief explanation.	Refer to the FY2020 Plan of Work
4. A Statement of how the input will be considered and brief explanation of what you learned from your stakeholders.	Refer to the FY2020 Plan of Work

IV. Critical Issues Table of Contents

No.	Critical Issues in order of appearance in Table V. Activities and Accomplishments
1.	Maintain viable agriculture and aquaculture
2.	Protect and sustain our resources
3.	Ensure healthy outcomes: food, nutrition, health
4.	Ensure positive outcomes for our youth
5.	Build sustainable and resilient communities

V. Activities and Accomplishments

Please provide information for activities that represent the best work of your institution(s). In your outcome or impact statement, please include the following elements (in any order): 1) the issue and its significance (e.g. who cares and why); 2) a brief description of key activities undertaken to achieve the goals and objectives; 3) changes in knowledge, behavior, or condition resulting from the project or program's activities; 4) who benefited and how. Please weave supporting data into the narrative.

No.	Project or Program Title	Outcome/Impact Statement	Critical Issue Name or No.
1.	**Cranberry Research Program**	Cranberries are cultivated on 15,000 acres across ~250 farms in the Northeast with a $59 million production value in 2019. Carolina redroot and broomsedge bluestem (BBS) are increasingly troublesome perennial weeds for NJ cranberry growers, accounting for significant economic loss ($800/acre) and threatening the regional effort of cranberry bog renovation. Additionally, pieces of redroot seed capsules can be collected with cranberry fruit during harvest operations and become problematic in the processing of cranberry products, further exacerbating the economic impact caused by this weed. These impacts, combined with the high cost of renovation	Maintain viable agriculture and aquaculture

		(~$45,000 per acre), have led the NJ Cranberry Research Council to rank both weed species as high priorities for research. A research program specifically addressing Carolina redroot ecology and control has been conducted by NJAES researchers and extension faculty. The program focuses on creating a framework of biological and ecological knowledge for Carolina redroot, so that NJ cranberry growers can use this information for improving existing bogs and developing new tactics based on cultural practices (bog flooding, bog sanding, planting density, use of herbicides). Field and greenhouse experiments have been conducted to evaluate the efficacy of these tactics, refine existing approaches and develop new strategies founded on sequential applications of efficient herbicides that will prevent or suppress Carolina redroot emergence and prevent the development of blooming stalks. The research has led to publications and educational material presented at professional and scientific meetings. Additional materials are under development for 2021, such as fact sheets and research publications. New control strategies developed through this project will be implemented in 2021 on 66% of the total New Jersey cranberry acreage (3,000 acres), allowing an increase in cranberry production for an estimated commercial value of $1.1 million. Funding of this project helps cranberry growers remain competitive in an increasingly competitive economic environment and preserves the future of a crop traditionally associated with New Jersey.	
2.	**Sustainable Wine Grape Production**	Beginners Grape Growers Program: The Wine Grape industry has been one of the fastest growing agricultural sectors in New Jersey over the past decade. Given the popularity of wine, agro-tourism, and	Maintain viable agriculture and aquaculture

		supporting local agriculture, it is not surprising that many vineyard owners are first generation growers transitioning to agriculture with limited experience. These novice growers require unique educational support to assist them in avoiding costly mistakes with this perennial crop. This educational training resulted in the participants' increased awareness of financial risks, capital investments, and time involvement required in wine grape production. Furthermore, two of the participants made the decision to plant a vineyard. RCE faculty provided consultations (on-site, one-on-one, and follow-up visits) to these growers, saving an estimated $4,000 (at the commercial rate of $200/hr) in private consulting charges. This resulted in the establishment of 12 acres of wine grapes with an estimated annual revenue of $24,000 - $36,000 per acre from selling grapes or $32,000 - $64,000 per acre in wine sales as these vineyards come into full production. Furthermore, one vineyard had the conditional agreement where a decision was made after the site suitability was confirmed using Rutgers Arc-GIS site assessment tool. This program is instilling confidence in Rutgers' institutional support to these first-time growers. <u>Best Management Practices</u>: New Jersey is uniquely suited to produce high-quality wine grapes. Its varied climates create an opportunity for producing a rich and varied suite of wines. However, major biotic and abiotic stresses such as (1) harsh winters leading to cold injuries and subsequent scourge of crown gall disease; (2) high humidity causing high disease pressure and excess precipitation causing excess canopy,	

		and (3) viral diseases, caused by infected planting material sourced from the non-certified nurseries, affects the long-term sustainability of the wine industry. These threats resulted in developing and implementing a Best Management Practices (BMP) program. This program resulted in a rapid increase in the awareness and planting of cutting-edge certified material, indicating that New Jersey growers are moving towards minimizing the risk of virus introduction from otherwise high-risk non-certified nurseries. Average savings were in the range of $4,200-$4,800 per acre, which is the cost of replanting an acre of virus infected block. Beginners avoided planting cold tender varieties. Considering the cost of replanting a vineyard after cold damage, many growers saved $4,200-$4,800 in replanting and $43,000 - $72,000 in bottled wines sales. Growers learned the importance of e clone numbers and FPS #s and how they affect grape growing and wine making. An outcome of the program was increased planting of cool-climate clones of cold tender varieties. <u>Continuing Education on Wine Grape Pest Management</u>: Through two Wine Grape Twilight sessions, a Wine Grape camp, and a Grape Symposium, 158 growers received timely information on production issues from Rutgers wine grape Specialists and Agents. These series are the major source of information for scouting-based pest management and the early warning of pests. Growers who implemented this information realized cost savings through increased labor efficiencies and reduced pesticide use. It also provided more than 700 pesticide recertification credits for growers to maintain their commercial applicator license.	

		Wine Quality Improvement Program: Pricing for wine is greatly determined by its quality which, apart from fruit quality, is determined by the process of wine making itself. Quality Wine Analysis (QWA) of New Jersey wines strongly indicated that there is a need for improvement in the operation of wineries across the state. RCE faculty provided continuing education to commercial wineries by regularly organizing meetings and workshops and inviting wine experts from other institutions and reputed consultants to share their knowledge and expertise. Outcomes for winemakers included enhanced winemaking skills utilizing specific wine varieties and resolution of wine-making related problems. Improving the quality of wines could potentially earn thousands of dollars a year for many years to come. High quality wine will also allow New Jersey to attain recognition amongst NJ citizens and beyond.	
3.	**Hazelnuts: Establishing a Sustainable Commercial Nut Crop for New Jersey Farmers**	Historically, there has been no significant nut crop production in New Jersey, though hazelnuts have shown to be a promising direct market, value added and/or wholesale nut crop for this region. As this is a new crop, there is significant education that must be provided to growers prior to establishing plantings. Notably, hazelnuts have historically been highly susceptible to a deadly endemic fungal pathogen Anisogramma anomala, which causes eastern filbert blight (EFB). Collaboration between a faculty member at Oregon State University and an NJAES faculty member has created plant cultivars with resistance to this pathogen. The study of the EFB pathogen showed that it has a wide genetic diversity in NJ and can overcome the resistance of Oregon hazelnut cultivars. The faculty are developing a curriculum to educate both extension personnel and New Jersey growers on how to establish, maintain and	Maintain viable agriculture and aquaculture

		harvest a hazelnut orchard with Rutgers NJAES hazelnut cultivars. A focus of this program is to develop best management practices for EFB and other similarly genetically diverse pathogens to ensure that New Jersey hazelnut production will be a successful and sustainable farming venture. A replicated trial of four Rutgers NJAES hazelnut selections and seedling pollenizers is being conducted at the Rutgers Snyder Research Farm. Horticultural information including bloom time, pollination, tree vigor, disease susceptibility, and yield will be collected from this trial and it will also serve as a hazelnut production demonstration site. In addition, several talks have been presented on how to establish and maintain a hazelnut orchard at grower meetings and this information has been outreached in several grower articles and professional peer-reviewed journals. The early impact of the hazelnut extension program was assessed through a survey of growers that have expressed interest in establishing hazelnut orchards on their farms and/or are currently growing hazelnuts. The farmers (n=8) represented three states (WV, NJ and PA), and a total of 24 acres. Since none of the growers surveyed had prior experience growing tree fruit/nut crops, the factsheet 'Think Twice, Plant Once: Does a Tree Fruit Orchard Make Sense for Your Farm?' was distributed to growers and they were surveyed on how useful it was: 88% of respondents found the factsheet to be helpful and they noted that they learned new information such as best management practices, and irrigation methods. As a result of reading this factsheet the growers also noted that they would begin to implement the following practices: Soil preparation; Irrigation practices; and deer fencing of their field. Respondents rated their knowledge on orchard management and had an average of 5.7 (Scale of 1 (no knowledge) to 10 (complete	

		understanding) prior to reading the factsheet and 7.5 after reading the factsheet. RCE faculty continue to advise growers on how to prepare fields for hazelnut production, educate them on planting pollenizers and describe the importance for scouting for EFB on those pollenizers.	
4.	**Breeding and germplasm enhancement for New Jersey cranberry and blueberry industries**	Farming of native berry crops such as cranberries and blueberries provides a significant contribution to NJ and US economies. Thus, it is critical to provide these growers with varieties that will enable the economic sustainability of these crops. NJAES research is focused on developing these improved varieties. In the past year, progress has been made in numerous areas, including: • Blueberry breeding -Several recently identified selections with improved machine-harvestability traits continued to show promising performance. In addition, over a thousand new progeny were grown out for field planting in 2021. Machine harvest of blueberries is increasingly important due to labor shortages and high cost of hand labor. A large interspecific population of blueberry was evaluated for numerous traits of economic importance, with a goal of identifying genetic markers to facilitate future breeding efforts. • Cranberry breeding - Advanced selections with enhanced resistance to fruit rot disease have been established in three diverse growing areas, NJ, WI and BC. The performance of these selections under minimal fungicide inputs will allow us to evaluate them for potential release. Genetic resistance to fruit rot will allow for reduced and/or alternative fungicide applications, reducing grower costs, environmental impacts, and human health concerns. The latest breeding crosses should result in varieties with further enhancement in disease resistance, fruit quality, and stress tolerance.	Maintain viable agriculture and aquaculture

		• A better understanding of genetic and environmental factors influencing phytochemicals, associated with human health, has provided guidance to our breeding program. Varieties with enhanced phytochemical levels will improve plant performance, and lead to berry products with improved nutritional aspects	
5.	**Disease Management of Fresh-Market and Processing Vegetable and Herb Crops Grown In New Jersey**	The vegetable crops grown in New Jersey help feed over 60 million Americans who live in the mid-Atlantic and northeastern regions of the United States. Vegetable crops must be grown economically and efficiently in order for New Jersey vegetable growers to compete in the larger US and international marketplace. Growers rely on integrated pest or best management practices which incorporate different production and cultural practices to help control insects, weeds and plant disease. Sweet basil is a globally important herb crop grown for its unique aroma and flavor. Field-grown basil is sensitive to cold stress during early spring and fall in temperate regions. Cold temperatures lead to leaf death and brown discoloration, resulting in significant crop loss due to leaf damage. Cold stress also impacts the essential oil composition which affects taste, flavor and marketability. Researchers have proposed that plant nutrition could be improved by adding silicon fertilizer since studies have shown that silicon can be beneficial to some crops and can strengthen the plant's defense system. One study conducted in NJAES greenhouses found that the silicone amendments that had been applied to the basil plants increased low temperature tolerance during the early stages of growth and overall survival rates compared with the non-treated basil. The outcomes of this study will provide greenhouse producers of hydroponic basil with knowledge of silicone amendments to reduce heating costs during the winter season. In addition, more research is needed to determine how these results may be useful during field	Maintain viable agriculture and aquaculture

		production, transportation and postharvest handling of sweet basil. Sweet basil could potentially have extended growing seasons in locations where colder temperatures can be expected.	
6.	**Introductory Fisheries Science for Stakeholders (IFISSH)**	New Jersey's marine fishing industries provide significant socio-economic benefits to the state, including the production of local, high-quality seafood, support for the tourism industry, employment opportunities, and contributing to the social fabric of coastal communities. In 2016, New Jersey's commercial fishing and seafood industries had an estimated $2.28 billion total economic impact and provided over 37,000 jobs. Concurrently, New Jersey's recreational fishing industry had an estimated additional $1.17 billion total economic impact in 2016 and involved over 15,000 jobs and approximately 1 million anglers. Given the value of New Jersey's commercial and recreational marine fishing industries, it is critical that appropriate fishery management regulations are in place to ensure the long-term sustainability of both our marine fishery resources and the industries that rely on these resources. Fisheries management has become increasingly complex in terms of the content of management plans and the fisheries science considered in the development of these plans, and this science is not easily understood by most stakeholders. Extension programming is needed to help meet the needs of stakeholders of New Jersey's marine fisheries as they relate to fisheries science, stock assessment, and fisheries management so that they are prepared to get involved with and make progress on related issues, including the responsible stewardship of marine fishery resources. The 2020 curriculum was implemented again to serve a diverse clientele, including recreational and commercial fishermen, interested	Protect and sustain our resources

		members of the public, and paraprofessionals interested in fisheries science with an objective to educate stakeholders of New Jersey's marine fisheries on the science, management, and responsible stewardship of fishery resources so they are better prepared to make progress on and get involved with issues impacting their industries. In 2020, the first half of the IFISSH curriculum was delivered as a HyFlex (i.e., hybrid and flexible) course where students could participate live in-class or remotely via webinar. However, in response to the COVID-19 pandemic, the final classes were offered via webinar participation only. There was a total of ten 2.5-hour evening classes from late January through March 31. Experiential learning field trips were originally planned to visit a commercial fishing dock and a recreational fishing trip, but they were cancelled due to circumstances surrounding the pandemic. Nineteen different lecturers delivered presentations on their respective areas of expertise, which ranged from fisheries biology, oceanography, stock assessment, and fisheries management and fabric of coastal communities. Based on course evaluation responses (n=40 individuals), the average rating of the overall course quality was 4.8 and 4.9 was the average rating for overall course organization (based on a scale of 1-Poor to 5-Excellent). When asked if they Strongly Disagree (score = 1) or Strongly Agree (score = 5) with the statement that “I am pleased that I participated in the program", the average response was 4.8. The average response was 4.8 when asked how strongly they agree that “The information presented was valuable”. The IFISSH course produced a significant increase in knowledge in topics related to fisheries science and management based on the average response when students (n=40 evaluation respondents) were asked about their level of knowledge before taking the course (5.3) and after taking the course (7.7) (scale of 1-Low to 10-High). The	

		average response was 4.5 out of 5.0 when students were asked if they plan to use or share with others what they learned.	
7.	**Earth Day Every Day Webinar Series**	In April 2020 as people across the state were adapting to living with COVID-19, Rutgers Cooperative Extension (RCE) faculty and staff were creating online content to provide learning experiences while people were in lockdown at home. April 22, 2020, marked the 50th anniversary of Earth Day, so RCE launched its "Earth Day, Every Day" weekly webinar series so that the event did not go by uncelebrated. The series focused on steps that everyone could take at home to protect the environment. The 1-hour webinars and question/ answer sessions covered simple actions that make our homes more sustainable, from environmentally friendly lawn care, to reducing plastic waste and energy, and even a special Halloween wildlife edition. The target audience was residents and the content was simplified so no special skills were needed to implement changes at home. The spring and fall series spanned 18 weeks with a different topic each session. All the recordings are available online at https://envirostewards.rutgers.edu/Earth-Day.html. The series reached more than 2,900 people representing all 21 counties in the state, as well as 30 other states and several from outside the US. The value of the program was expressed by many as such: • This is a fantastic series. I suspect that the statistics in this presentation would be really shocking to most consumers...so glad this presentation will be available for me to share with others! • This is really helpful - I'll appreciate all the more detailed tips we can get afterwards, on things like better food storage and composting. • The info provided was eye opening. I never knew any of this was	Protect and sustain our resources

		happening. I am changing my ways • I've been composting for just under 2 years and now understand many of my mistakes and how to correct them. I've learned a lot! Results from the spring series indicated that 76% of the survey respondents indicated they plan on implementing some of the actions they learned during the webinars. These include eradicating invasive plants from their home landscapes, installing beneficial habitat for wildlife, adapting to coastal flooding, soil testing to prepare for lawn renovations, initiating an energy audit for their home, and reducing food waste to name a few. A 6-month follow up survey is being conducted to determine actual actions implemented.	
8.	**Rutgers Environmental Stewards Program**	Since 2005 the Rutgers Environmental Steward program has trained volunteers on how they can take action to help solve environmental problems in their communities. The program has trained close to 700 volunteers in areas concerning climate change, soil health, alternative energy, water resource protection, invasive species, habitat conservation, pollinator health, environmental policy, and more. Stewards learn about the techniques and tools used to monitor and assess the health of the environment. They gain an understanding of the research and regulatory agencies operating in New Jersey that focus on environmental issues. Stewards are introduced to a network of expert individuals and organizations who can be of service to them in the future as they wrestle with solving local environmental problems. Rutgers Environmental Stewards work on a diverse array of projects from protecting Pine Snakes in the Pine Barrens, to reducing plastic waste, to protecting our local rivers and streams with rain gardens. Stewards are typically excited about science and the natural world around them, want to engage with their local policy makers,	Protect and sustain our resources

		want to do their part to make a difference, and are self-starters. Many Stewards go on to become members of their local environmental commissions, green teams, and planning boards. In 2020, the program transitioned to virtual learning due to COVID. Classes ran for 20 weeks and were offered in counties throughout the state. The content included topics such as, water quality monitoring, invasive species identification and eradication, impervious cover reduction, reviewing developer site plans to assess environmental impact, rain garden design, and many other topics. Once students complete 60 hours of classroom instruction and 60 hours of a volunteer internship they are certified as Rutgers Environmental Stewards. The internship is one that the Steward develops with guidance from the RCE program coordinator. In 2020, 74% of survey respondents (n=58) rated the program as excellent; 26% rated it as good. 89% rated the online program as "easy to use/learn". 98% said they would recommend the program to a friend. 75% said their environmental knowledge has improved to a considerable or great extent. 71% said this course has helped them understand how they can improve the environment in their community. 84% said their enthusiasm about environmental volunteerism increased as a result of their program participation. A few other testimonials include: - “These programs were a great pleasure and very enlightening. I've considered myself to be an environmentalist since I was a teenager (now 50 yrs. old) but these seminars revealed to me just how much more I had to learn; “I spent my career in advocacy. I was a state legislator, lobbyist, fundraiser, campaign manager, staffer, donor, volunteer in elections and campaigns. I hope to use my new-found knowledge to change poor (mostly just old-school) thinking and policies to make NJ more green	

		both literally and figuratively. Thank you! Thank you! Thank you!"; - "I loved lectures on WebEx and that I was able to attend so many other county's stewardship classes from my home!!! It made attending and childcare etc. so much easier!! I love that the classes have been recorded and I can see again or see others I have missed. All the classes have been terrific and all of the lecturers great."; - "I really loved this course. It opened a whole series of resources for me that I have always been interested in but never knew how or where to find. Plus, it introduced me to all sorts of folks who are involved in Environmental stewardship."; "Coming from a corporate technology career, I had passion but no clue where to put it. The Rutgers Environmental Stewards program empowered me to take my first steps in service of the environment. The program gave me the broad, sound, scientific base to better understand the challenges we face and where I can make a difference. The classes are incredibly informative with a mix of science, policy experts and resources, and local examples of success. I met many experienced professionals in front of the classroom and joined a motivated community of Stewards that continue to be a source of knowledge and inspiration. The field trips provided invaluable opportunities to see stewardship in action. Thanks to my RES certification, I am now a member of the Montclair Environmental Commission, assisting my community to create and maintain a cleaner, more sustainable future." This year's Stewards and their recruits completed 4,807 volunteer hours the value of which equals $141,758. More details about projects are here: https://envirostewards.rutgers.edu/certified-stewards/CertifiedRutgersEnvironmentalStewards2020.html	
9.	**Characterizing the physical environment of the coastal ocean and its**	The oceanography of the coastal ocean around the United States undergoes remarkable variability across time scales from days and weeks to seasons, years, and decades. This variability must therefore be considered in the management of and policies related to the many	Protect and sustain our resources

	relationship to ecosystem indicators	ocean related human uses, including sustainable fisheries management, maintaining healthy water quality, and the responsible deployment of offshore wind facilities. Through this project, NJAES researchers are developing products and services that deliver relevant ocean observations, predictions and expertise to the responsible management of our oceans. During this reporting period, researchers deployed two underwater glider missions along the New Jersey coast. Each mission was completed with input from partners at the New Jersey Department of Environmental Protection (NJDEP) to monitor conditions along the New Jersey coast. In total the two missions sampled over 35 days on the ocean waters off the coast of New Jersey as several fall storms passed overhead. These data were reported to NJDEP in real-time throughout each deployment. One of the critical parameters reported to the NJDEP was dissolved oxygen (DO). DO is a measure of the amount of oxygen in the water. This is used by NJDEP as an indicator of water quality. Very low oxygen conditions can starve species like fish of oxygen resulting in large die-offs. The glider is being used to monitor conditions so that NJDEP can get a better background on how effective DO is as a metric of water quality and also track the occurrence of dangerous low oxygen events. This past year, researchers also began a new series of glider deployments focused on the environmental and ecological monitoring of future offshore wind sites. This glider is equipped with a range of sensors that simultaneously measure the ocean conditions (temperature, salinity), phytoplankton concentration, and higher trophic levels including fish and marine mammals. This well-equipped glider flew three missions in 2020, centered in the offshore wind energy lease areas along the southern coast of New Jersey. The first deployment spent the month of August 2020 mapping ocean	

		conditions throughout the study region while simultaneously tracking nearby marine mammal activity. The goal of this series of missions is to demonstrate the efficacy of ocean gliders as a platform to monitor and inform mitigation of potential impacts of offshore wind development on marine mammals, particularly the endangered North Atlantic Right Whale. Additionally, the group is developing ecological models that link observed ocean conditions to marine mammal occurrence to better understand their habitat selectivity. These models could potentially serve the offshore wind industry as a tool that will inform their activity to again, minimize impact on endangered species that share the same ocean. Through the fall of 2020 the group conducted two more missions in which the fall migration of these animals was well characterized. It is critical that the unique dynamics of the offshore ocean and relevant fisheries and marine mammals is considered in the planning process. NJAES researchers continue to work with stakeholders throughout the region to ensure these critical issues unique to the Mid-Atlantic Bight are considered in the planning and deployment of offshore wind.	
10.	**Onsite Wastewater Treatment Systems: Assessing the Impact of Climate Variability and Climate Change**	Pharmaceuticals and personal care products are chemicals that are commonly used in many American households and contribute to the municipal waste stream. Some of these chemicals may be metabolized by the human body, but a large fraction is released directly into the waste stream. Pharmaceuticals and personal care products may have pharmacological activity, whereas others may interfere with hormonal systems by mimicking estrogen. This has an ecological impact on any animals that may be living in water that receives treated effluent, and could contaminate drinking water. This research group's work examines the removal of micropollutants to improve water quality and produce tools for monitoring water	Protect and sustain our resources

		quality. If these chemicals are not fully degraded by the microorganisms in wastewater treatment systems, they may be released into the environment. To examine this problem, researchers established cultures using anaerobic digester sludge as a source of microorganisms and supplied the cultures with pharmaceuticals and personal care products that have similar chemical structures. Their studies have shown that these pharmaceutical and personal care products are transformed by the microorganisms into products that are slow to degrade. Their results provide evidence of metabolites that could be used as targets when screening water samples and biosolids, which are key modes of micropollutant entry into the environment. Ultimately, this leads to a better understanding of micropollutant removal for future improvements to wastewater treatment systems and improved monitoring of water quality. An Organization for Economic Cooperation and Development report projects that sales of chemicals worldwide will increase by 3% annually between now and 2050, thus providing a steady stream of diverse chemical structures that may be entering wastewater treatment and the environment. Given that pharmaceuticals are used daily throughout the world, their release into the environment is both a public and an environmental health concern.	
11.	**Sitting...The Silent Killer**	Since March 2020, many New Jersey residents have been working from home and decreasing the amount of time spent outside the house due to Coronavirus and state mandates. This has led to an increase in sedentary lifestyles, on top of the already abundant sedentary occupations and leisure time pursuits prior to the pandemic. As part of the Department of Family and Community Health Sciences (FCHS) Wellness Wednesdays webinar series, this topic was chosen to	Ensure healthy outcomes: food, nutrition and health

		help people understand the long-term impacts of prolonged sitting on their health. Over 20 studies focusing on the effects of prolonged sitting on various health outcomes were combined to give a full picture of this very serious issue. Most of these studies contained information on what factors decreased or reversed these effects. The program has been delivered via live webinar (also recorded) with supplemental resources. Information about the webinar series and the webinar archive is available here. Of those who participated in the live webinar, 92% indicated "Good" to "Excellent" program content, 97% learned something they had not learned before, and 95% indicated that they planned to change their behavior based on something they learned from the program. A short follow-up survey was sent a week later. Of those who responded, 17% said "I am planning on making a change this week." while an overwhelming 83% indicated "I have made a change since watching the webinar. "Some participants report purchasing devices that allow them to stand while working and others indicate moving more during commercial breaks and getting up after 45 minutes of sitting to move around.	
12.	**Home Food Preservation**	Interest in home food preservation – canning, freezing, dehydrating, and fermenting – has increased in recent years as more people plant home gardens, participate in CSA's, or buy produce from local farm markets. In particular, the Covid-19 pandemic in 2020 further increased consumer interest in home gardening, with many planting vegetable gardens for the first time. Consumers were also cooking more at home, and interest consequently rose in learning to preserve extra produce for future consumption. Many people had never preserved food at home and others may have used outdated or unsafe recipes and procedures, proliferated by the availability on the internet or in social media groups. Although rare, home-canned	Ensure healthy outcomes: food, nutrition and health

		vegetables are the most common cause of botulism outbreaks in the United States. According to the Centers for Disease Control and Prevention, from 1996 to 2014, there were 210 outbreaks of foodborne botulism reported to CDC. Of the 145 outbreaks that were caused by home-prepared foods, 43 outbreaks, or 30%, were from home-canned vegetables. These outbreaks often occurred because home canners did not follow proper canning instructions, did not use pressure canners when indicated, ignored signs of food spoilage, or did not know they could get botulism from improperly preserving vegetables. The Department of Family and Community Health Sciences (FCHS) recognized the need for additional outreach in food safety and home food preservation. In 2016, a pilot program for FCHS Master Food Preserver (FMFP) Volunteers was initiated by several FCHS Educators. A cohort of 21 participants from 11 NJ counties (and one PA county) completed the three-day training and many went on to assist FCHS Educators with demonstrations, classes, and other events related to home food preservation outreach. Due to demand, FCHS Educators continue to provide leadership to this initiative. In March of 2020, a second class of 15 prospective FMFP volunteers enrolled in a new "hybrid" training version of the FMFP training program, to include 8 weekly/biweekly webinars and 3 hands-on practice sessions. Due to restrictions on in-person programming forced by the Covid-19 situation, the planned hands-on sessions were put on hold and will resume when restrictions are lifted. During 2020, FCHS outreach in Home Food Preservation and Food Safety transitioned to a 100% virtual delivery model, including statewide programming such as: R U Ready to Garden Series, hosted by Rutgers Cooperative Extension of Middlesex County, Dept. of Agriculture and Resource Management, Canning in Glass Jars, The Rutgers Cooperative Extension Great	

		Tomato Tasting at Home, etc., as well as Facebook Live demonstrations. In 2020, more than 582 consumers participated in a total of 9 webinars on home food preservation. Webinars were recorded for subsequent viewing by interested consumers. There were an additional 1,130 engagements via social media, including Facebook. Social media proved to be an excellent marketing tool for food preservation programs. One example was the herbs webinar that went viral with over 545 people registering! The hybrid model was successful in training future FCHS Master Food Preservers (FMFP). FCHS also offered ten sessions as professional in-service to FCHS department members. Discussions with the FMFP class indicated they found the training very valuable in gaining new knowledge and correcting inaccurate information or practices.	
13.	**School and Early Care Nutrition and Health**	Many children eat unhealthy foods and drink too many sugared beverages which leads to difficulty with weight management and increases risk for chronic disease. Providing programming directly to youth that focuses on healthy food choices and the importance of physical activity, information and tools to help shape their behavior patterns during their most formative years, is critical and will hopefully lead to a lifetime of healthy decision making. In addition, youth need to understand the food system and how food is grown and produced. In this program, youth learn where the food comes from, the growing process, nutritional value and the role that food plays in a healthful diet; how to prepare and/or taste a healthy snack made with the food; and grow herbs or vegetables from seed or seedlings. The participating schools start or revitalize their school gardens to	Ensure healthy outcomes: food, nutrition and health

		promote nutrition education, healthy eating and physical activity behaviors and science knowledge in students. *Methods from Our Farm*s workshops focused on seasonal fruits, vegetables or dairy foods. Featured foods were apples, corn, and pumpkins. The 20-minute to one-hour workshops were conducted at childcare centers, preschools, elementary schools, and libraries for children ages three through ten. The first half of the program included an introduction to the food through pictures documenting its growing process, a children's story or other activities. The second half of the class involved making and/or tasting a healthy snack with the food. *School Enrichment Healthy Living Programs* for kindergarten to 5th grade are part of a joint initiative of Family & Community Health Sciences and 4-H Youth Development in Somerset County. *Make Your Plate Great* teaches children how to build healthy eating habits using MyPlate. Hands-on activities go over each food group and how to make a great plate. Children find out what different foods do for the body. After the conclusion of this program, participants can identify healthy food choices and make basic connections between poor food choices and poor health. *Make Your Plate Great* is conducted in individual classrooms with groups of 20-25 students. *Get Moving - Get Healthy NJ* teaches the importance of eating healthy food and the benefits of daily physical activity through experiential learning activities such as learning stations or instructor-led fitness activities such as matching games, label reading, or measuring sugar in beverages, to teach healthy eating. Instructors led fitness activities using dance, yoga, fitness dice or other methods to promote physical activity. *Germbusters* teaches children about how germs spread and the importance of and proper technique for handwashing. These classes	

		were a popular request even before COVID-19 especially at the start of the school year. *Garden-enhanced nutrition education* - As a partner on Healthier Somerset Coalition and its Community Health Improvement Plan, FCHS and has made significant strides in achieving the goals of launching school gardens and providing nutrition education in Somerset County schools. FCHS is a member of a team that secured a Healthier Communities Grant for Healthier Somerset to create a school garden and provide education for two special needs classrooms at Alexander Batcho Intermediary School (ABIS) in Manville. The work of school gardens and physical activity education typically takes place in person and is very hands on, which presented a challenge when schools locked down due to COVID19. FCHS pivoted and provided virtual lessons via Zoom that included hands-on garden and nutrition activities for the students. Funding from Healthier Communities Grant Network and Healthier Somerset made it possible so that each student at ABIS would have an indoor hydroponic garden that would be easy to transport home when the schools locked down. In total, hydroponic gardens were provided to the eighteen students from both classrooms and one for each of the classroom teachers. Providing this kind of virtual education and at-home gardens was crucial as the students with special needs were more engaged in learning when the material was interactive. FCHS faculty also facilitated a separate project with a classroom at Bernardsville High School. Work with Bernardsville High School began in January 2020 in conjunction with a volunteer Rutgers Master Gardener. In that time, students were able to start and sprout seeds, go on a grocery store tour, prepare 3 recipes, and participate in nutrition lessons on My Plate, Whole Grains and Eating Colorful Fruits and Vegetables before school became remote in March. The original plan was to do more hands-on gardening in the summer months during which the students	

		would still have class. However, a shift was made from teaching from gardening to skills-based knowledge on nutrition, food safety, and meal planning. In the fall, Bernardsville HS started a tower garden that students would assist in using when in school. Total youth reached through 84 classes/classrooms was 1,405. Gardens created using a garden box, tower garden and/or individual aero gardens. Children retained content from program to program and had the opportunity to experience new foods. They had fun tasting the featured food and often asked for seconds. *Make Your Plate Great* and other programs - After the program, children recalled important facts and ways they can make healthier choices on their plate. Hands-on activities gave children the opportunity to put knowledge into practice. Response from both students and teachers were overwhelmingly positive and participation in try at home activities demonstrated an interest in gardening and nutrition outside of class time. School garden-enhanced nutrition education projects (2 schools). Response from both students and teachers was overwhelmingly positive and participation in trying at home activities demonstrated an interest in gardening and nutrition outside of class time. Plans are in motion to start work with another school in 2021.	
14.	**Edible Luminescent Probes of Food Quality**	Ensuring and improving the overall quality, including stability and safety, of processed foods is a perennial concern of the food industry. Consequently, instrumental techniques have long been used to monitor specific physical and chemical properties of foods and food materials that are thought to relate to the generation and maintenance of quality during processing, distribution, storage, and sale. The development of instrumental methods to monitor physical and chemical properties relevant to food quality has been an important area of research within food science and technology supported by both the NJ Agricultural Experiment Station and NIFA.	Ensure healthy outcomes: food, nutrition and health

		The water activity of a food is an essential variable influencing shelf-life and stability as well as microbiological safety. Current methods for measuring water activity, albeit accurate and even straightforward, nonetheless have limitations: they require physical sampling of the food, always require hands on manipulation, can only monitor the average water activity throughout the food, and take some time. NJAES researchers have identified a class of potentially edible molecules found naturally in many fruits and vegetables that may act as optical spectroscopic probes of water activity. This identification of a spectroscopic protocol using fluorescence as a sensitive assay of water activity will enable a rapid (seconds), non-contact measurement of water activity that can also be used to measure how water activity may vary with composition and/or location in a complex food. This work should thus not only introduce novel ways of investigating important food properties in the lab but also in real foods during storage or packaged for sale.	
15.	**Identification and mechanism of anti-obesity phytochemicals in foods**	Obesity is a serious public health issue. Since 1975, obesity in the population has tripled, increasing the risks of type 2 diabetes, cardiovascular diseases, and some cancers. Considering the negative health impact and huge economic burden on individuals, effective dietary interventions and strategies are urgently needed for obesity prevention. In the food research area, identification of natural bioactive compounds with anti-obesity activity has received increasing attention due to their excellent bio-efficacy and long-term safety. Aged citrus peels (*chenpi*) have been used as a dietary supplement for gastrointestinal health maintenance in China for hundreds of years. *Chenpi* is created by sun-drying mandarin orange peels and is aged by storing them dry. The taste is first slightly sweet, but the aftertaste is pungent and bitter. The relationship between the modulation effect of *chenpi* on gut microbiota and obesity prevention	Ensure healthy outcomes: food, nutrition and health

		is not clearly understood. In this research group's recent study, mice were fed with high-fat diet with *chenpi* extract, and a normal diet for 11 weeks. Results showed that *chenpi* extract reduced body weight gain and food efficiency. Additionally, it was found that *chenpi* had a strong prebiotic effect on gut bacteria and enhanced digestion.	
16.	**Minecraft 4-H Fair**	There was a great deal of disappointment when it was announced in early April 2020 that in-person New Jersey 4-H programs were cancelled due to Covid-19 social distancing restrictions. Morris County 4-H members agreed they would all miss the sense of community that the county fairs brought, and they wanted to find a way to recreate that. 4-H teens proposed the idea to recreate the Morris County 4-H Fair using Minecraft. Anyone could visit the familiar Fair through game play, YouTube videos, and in-game live tours. For those unfamiliar with Minecraft (including many volunteers and 4-H staff supporting this project), this open-world online game promotes creativity, collaboration, and problem-solving. Minecraft is wildly popular with kids, so it was a natural fit. Over 40 youth members representing 12 4-H clubs and 10 adult volunteers formed a new short-term club focused on showcasing a finished product for public view on a specific day in July (the original opening day of the Morris County 4-H Fair). Server space was donated by MC Pro Hosting. In 1.5 months, this team poured over 800 hours into building a scale replica Fair and surrounding town. They included creative details only possible in a virtual world, created hidden mazes for players to explore, and filmed walk-through tours for YouTube. The success of this project relied on the kids' building skills and the adults' ability to adapt their tech skills. Build sessions took place in Minecraft. For those without Minecraft	Ensure positive outcomes for our youth

		accounts, Discord (a group chatting platform originally intended for gamers) was used to share video screens of Minecraft players and keep everyone connected to voice/text conversations. At least two adult volunteers supervised each build session via Minecraft and/or Discord. When the project went live, visitors toured the Fair using their personal Minecraft account or joined a Zoom meeting utilizing screen share of another 4-H volunteer in Minecraft. Visitors also explored the Fair through the YouTube videos. The result was an in-depth Fair experience where visitors enjoyed familiar Fair favorites (i.e., food, animals, rides) and explored something new designed by youth. It exceeded expectations and was a real 4-H Fair in its own right. It showcased the hard work of 4-H members, invited the public's participation, and connected people in a meaningful way while physically separated. The build team included 25 4-H youth in grades kindergarten through one year out of high school and 10 adult volunteers. This team gave over 800 hours of their time to build the Minecraft 4-H Fair, prep the games/activities for each day of the Fair, and delivery of the live events. In addition, 8 youth members and 2 adult volunteers from the Somerset County 4-H Minecraft club participated in build sessions to recreate their beloved Somerset County 4-H Fair next door to the Morris County 4-H Fair. In total, 41 youth and 81 adults participated in the four-day Minecraft 4-H Fair experience. The YouTube videos received 806 views and the club's YouTube channel received 54 subscribers. Following the success of this event, county 4-H programs across NJ, Texas, and Rhode Island requested information in order to create their own virtual 4-H experience in Minecraft. Five families joined the Morris County 4-H program immediately following the event. The project's build team established the Minecraft 4-H Club as an official 4-H club in Morris County. Quotes from participants include: "I got to build with 4-Hers	

		of all different ages and from different clubs. We had fun building together and now I feel like I have a whole new group of friends." (Morris County 4-H Minecraft Club) "This was the most relaxing Fair experience! I loved seeing the kids' creative take on a well-loved Fair." (Morris County 4-H leader)	
17.	**NJ 4-H from Home**	In March of 2020, due to the impact of the COVID-19 pandemic throughout the state of New Jersey, the NJ 4-H program was no longer able to host in person club meetings, educational programs, events, and activities. As a result of this, RCE 4-H faculty and staff were determined to find ways to continue to engage NJ 4-H youth and program participants. A team of RCE 4-H professionals began to find ways to move 4-H programming onto a virtual format. One strategy of this program was to create engaging virtual webinars for 4-H youth and their families. Having a place to share information about these webinars and offer links to other family resources. Keeping with the 4-H philosophy of education and learn by doing, the NJ 4-H from Home website and its virtual interactive webinars was developed. Even though program participants were not able to meet and be in the same room, 4-H from Home has maintained the 4-H Essential Elements of education in this new virtual environment. 4-H from Home interactive webinars give youth the opportunity to interact with caring adults and peers, showcase their work, offers a place for youth to feel connected and a sense of belonging, and is a safe and inclusive virtual environment for youth interactions. NJ 4-H has been able to continue to provide interactive, engaging, educational programs throughout the state and continues to grow and offer more virtual programs and 4-H opportunities. It is anticipated that 4-H from Home will continue as a new model of Extension based programming for many years to come.	Ensure positive outcomes for our youth

		The 4-H from Home was created along with a website (http://nj4h.rutgers.edu/4h-from-home/) and a series of one-hour interactive workshops. The website was designed to promote the interactive workshops and house hands-on resources youth and families could access and participate in from the safety of their own home. The 4-H from Home website was created to support current 4-H families and those families new to 4-H, as families would not have access to extracurricular and out-of-school time educational activities during this time. As the COVID-19 pandemic continued 4-H from Home continued to evolve and grow as needs changed. 4-H from Home received feedback from 4-H and Extension professionals, 4-H families, and program participants. 4-H from Home was able to incorporate feedback to create new interactive webinars, add new resources to the website, and expand the range of virtual youth programs being offered. 4-H from Home has evolved to offer two different types of virtual interactive programming including one-hour interactive workshops and six (or more) hour STEP clubs (short-term interactive clubs). The website provides a platform to disseminate information about these programs and a place to share other virtual opportunities offered by the Department of 4-H Youth Development and relevant opportunities from other Extension programs. In addition to the website, a thorough marketing plan was followed, engaging university based social media and marketing platforms to help reach a broader audience outside the general 4-H families. The NJ 4-H from Home website quickly grew and has evolved to include a page focused on service, with ideas/activities youth and families can do from home. Workshops covered a wide variety of topics including science, creative arts, agriculture, health and wellness, citizenship, service, and many more. Workshops were being hosted every Tuesday	

		and Thursdays of each week beginning March 2020 – August 2020. Workshops were offered at no cost to families and were originally designed for youth in grades 4th – 8th. Additional interactive workshops were created for youth in grades K-3 as well as requests coming from NJ families. 4-H faculty/staff, volunteers, other extension professionals, and even out-of-state 4-H professionals were able to offer workshops in their area of expertise. At the same time newly created short-term virtual (STEP) 4-H clubs were being tested out through 4-H from Home. These STEP clubs focused on various topics including teen leadership, agriculture, STEM, creative arts, animal science, healthy living, cooking, and many more. STEP clubs were opened to all youth regardless of 4-H enrollment status and physical location. STEP clubs met for at least six hours or more. Length of time, topics covered, scheduled meeting dates, club objectives, and youth recognition were created by the STEP club program lead. The NJ 4-H from Home website continues to be updated and evolves regularly with the change in needs throughout the state. Most recently a page on this website has been developed for NJ 4-H club leaders, helping to support their virtual club programs. The website continues to add new resources and programs to support club members, volunteers, and families around the state of NJ. Since its inception in March 2020, the 4-H from Home initiative has offered 44, 1-hr interactive workshops welcoming 524 unique participants from all 21 counties in New Jersey and some out of state. Interactive workshops were taught by Rutgers Cooperative Extension faculty/staff from all of the extension departments (4-H Youth Development, Agriculture and Natural Resources, Family and Community Health Sciences). Volunteers and interns also taught via interactive workshops, as well as guest professionals from outside of	

		NJ. A total of 25 STEP clubs with 375 youth participants were hosted by 4-H from Home. STEP clubs run for a minimum of six hours and integrate the 4-H essential elements including opportunities for presentation, showcase, and recognition. In addition to supporting 4-H families, the 4-H from Home team focused on outreach to non-4-Hers throughout the state. A marketing plan was developed including a website, social media campaigns and press releases. Eighty families not already associated with 4-H have been recruited to participate in sessions. 4-H From Home Interactive Workshops, Virtual 4-H From Home interactive workshops offer youth the opportunity to participate in hands-on activities.	
18.	**Homebound Generosity in Community**	4-H club activity was comprehensively disrupted due to Covid precautions and compliance with the university policy for virtual programs only. The impact on youth was evident in their 4-H survey responses indicating personal worry, anxiety, fear, and frustration. How to mitigate the negative consequences of staying at home away from friends and from classrooms became the continuing challenge. The 4-H thriving model provides a framework based on research to create steps to positive youth development despite this challenge. Self-confidence while experiencing lack of control over daily living can be encouraged through the practice of generosity. Doing good for others allows for a personal sense of purpose no matter what an individual's age. Identifying what is needed in the community and assessing capacity to meet the need is a skill that can be learned and will grow over time. 47 youth in grades K thru 12th participated in 9 organized service projects for community members. RCE staff and parents collaborated to help youth identify community organizations with special needs during the COVID pandemic. Several 4-H clubs used funding from their club bank accounts which they had saved in previous year for	Ensure positive outcomes for our youth

		expected in-person projects such as horse shows, Fair exhibits, educational trips. Funding was used to purchase supplies that made it possible. 1) More than 300 requested holiday gifts purchased for residents of county nursing home through the Amazon registry. Amazon delivered to the home. 2) Through collaboration with JBMDL Air Force staff, holiday care packages were provided for shipment to 16 deployed Airmen. 3) Coffee gift cards were sent to 45 police officers in Mt. Holly Township. 4) Birthday party supply boxes were provided to the Generations Family Success Center to be distributed to children and teens served at the Center. 5) In support of Seeds of Hope serving bagged lunches to homeless individuals, 4-H members decorated lunch bags and provided them to the organization for packing lunches. 6) The Horse Project Advisory Council organized youth from 5 clubs to write cards and create drawings which were sent to health care workers in 4 local hospitals. 7) Five families separately took turns visiting a clean-up site and took photos of the bags of garbage collected and then shared photos on social media. 8) More than 100 greeting cards created by club members were distributed to military families and to those in the 4-H community experiencing illness. 9) Carloads of pet foods and toys were provided to two local animal shelters. All collected evidence of impact is anecdotal. Feedback indicated most of the youth learned about organizations in the community and about the variety of needs that they were unaware before now. While the main intent was promoting youth confidence and sense of purpose, an unanticipated result was the satisfaction expressed by parents and youth who experienced new levels of family togetherness and shared goals. Many youth also felt the connection to their fellow club members even though they could only meet, organize, and share results on zoom. One parent stated, "Doing something for a perfect stranger opened up a broader world view to see real people with	

		needs greater than our own." Several youth members continue to organize more community service projects in 2021.	
19.	**Understanding Recruitment and Retention in the 4H Club Program**	This Hatch-Multistate research activity is focused on understanding why youth and families join, drop out, or stay in 4-H. By learning about these factors, we can improve youth recruitment and retention in 4-H. As a result of the research activities across multiple states, the findings will be more generalizable and thereby the faculty and programmatic staff will be able to develop steps to implement strategies across multiple states to both engage and retain more youth in 4-H programming. As a result, more youth will receive the short- and long-term benefits of 4-H, including the tools (knowledge, attitudes and skills) they need to become competent, caring, and contributing citizens of the world, as well as thriving and successful adults. This research study directly benefits 4-H youth and families, and potential youth and families, by improving the program. Further, the finding that a majority of states and territories (54%) experienced a decline in 4-H enrollments from 1996-2003 shows the problem is not limited to one environment and suggests that there are robust factors that cut across states. There is a need to ascertain why 26 states and territories have retained or increased their 4-H club enrollments while 31 have declined. Although academics have investigated 4-H youth retention, most studies are within state or county boundaries with results presented as applicable to programming and youth within those geographic boundaries. A multistate 4-H youth retention study would increase the heterogeneity of the youth population and thus the generalizability of the findings would be greater than single-state studies. A team of Cooperative Extension faculty and staff from states including California, Idaho, Wyoming, Washington, Florida, Louisiana,	Ensure positive outcomes for our youth

		and New Jersey have formed a research team to study the experiences of first year 4-H members and their families and examine member retention in these states. Online Qualtrics Surveys were distributed to first-year 4-H families in the 2018-2019 4-H project year. The youth (member) and adult (parent) data collected is in the process of being analyzed. The research team has determined the need for the qualitative data codes to be reviewed and revised to more clearly examine the data. These issues with the method of analysis being previously conducted is being reassessed with the Rutgers Office of Research Analytics to gain the most accurate results using their extensive expertise in data analysis. Over the past year, research study information has been disseminated to Extension professionals through two research sessions and a poster session at virtual professional development conferences.	
20.	**Increasing Community Resiliency through the Ecological Restoration of Floodplains**	Dense urbanization has significantly modified New Jersey's natural landscape, reducing the ecological and economic benefits it provides. Low-lying developed areas near surface waters are particularly affected. During storms, these locations receive elevated stormwater inputs from upland areas and storm surge from overflowing riverbanks and marsh fringes. The resulting flooding severely jeopardizes health and human safety, compromises the integrity of development and infrastructure, and furthers environmental degradation through sediment and chemical pollutant deposition into adjacent ecosystems. Improving resiliency in urbanized coastal areas requires an integrated approach of shoreline retreat, ecological restoration, and green infrastructure construction, coupled with community education and acceptance of resilience strategies through tangible socioeconomic outcomes.	Build sustainable and resilient communities

		Rutgers Cooperative Extension has partnered with multiple towns to better understand opportunities for maximizing community resilience in these areas through ecologically centered land stewardship. Five open space and floodplain restoration plans have been completed, which included recommendations for ecological restoration, stormwater management and flood storage, landscape buffer establishment, and increased public access. Through a series of demonstration projects, the partners (which also includes the United States Fish and Wildlife Service – New Jersey Field Office) have initiated a phased implementation strategy for one of the Townships. The work has resulted thus far in the removal of ~1.5 ac of paved road, installation of ~3 ac of native warm season meadow, 1 acre of wetland, management of invasive vegetation across ~20 acres, and the planting of ~1250 native trees and shrubs. Additional wetland restoration plans are in the stages of development of engineering plans to integrate ecological restoration and green infrastructure to increase landscape resilience to flooding in these areas. In one municipality, a concept plan has been generated for a greenway throughout a significant portion of the township, and construction plans are in the first phase of a trail system. In addition, interpretive signage has been created to encourage public use of these new areas. On an annual basis, these green infrastructure practices will capture over 240 million gallons of stormwater. The floodplain restoration activities are expected to increase storage volume within the floodplain by ~525,000 gallons. Together, the green infrastructure and floodplain restoration interventions will help reduce localized flooding and improve water quality. Green infrastructure practices are very effective at reducing sediment and nutrient loads. These practices are estimated to reduce the annual pollutant loads to the relevant surface waters by 36,000	

		pounds of sediment, 1,320 pounds of nitrogen, and 250 pounds of phosphorus. These systems are also very effective at reducing pathogen loads to the waterway, as well as other pollutants such as heavy metals. In addition to the green infrastructure practices, the floodplain restoration will help filter pollutants from the rising river and the overland flow from adjacent lands.	
21.	**2020 Green Infrastructure Champions Program**	In urban communities, stormwater runoff causes localized flooding and creates water quality problems. When many of these older communities were built, stormwater management was not required, which resulted in stormwater runoff from most streets, parking lots, roads, and rooftops to be quickly conveyed to local waterways without any treatment. If localized flooding and improved health of local waterways is a goal to a better quality of life, these communities must be retrofitted with green stormwater infrastructure. To achieve this goal, local leadership is needed. *Green Infrastructure Champions* is an Extension program that was created to empower local stakeholders to play a dominant role in encouraging municipalities and other property owners to implement green stormwater infrastructure practices. They are provided with a series of training opportunities to increase their knowledge about stormwater issues and green stormwater infrastructure solutions. After participating in five workshops, these individuals are certified as Green Infrastructure Champions and become key players in implementing green infrastructure as a stormwater management approach in their community. Once certified, the Green Infrastructure Champion has access to technical support from the Rutgers Cooperative Extension (RCE) Water Resources Program staff. An educational program was created to train and certify Green Infrastructure Champions. Green Infrastructure Champions will be key players in implementing green infrastructure as a stormwater	Build sustainable and resilient communities

		management approach town by town. Green Infrastructure Champions are able to: 1) enhance their knowledge through green infrastructure workshops, seminars, and personal research, 2) engage community leaders to adopt green infrastructure as a stormwater management solution by updating ordinances and municipal master plans, 3) encourage local non-governmental organizations (NGOs) and schools to incorporate green infrastructure in their existing landscaping, 4) secure funding for green infrastructure, and 5) publicize implementation of green infrastructure through social media channels. By the end of this year, it is anticipated that the Green Infrastructure Champions will coordinate the installation of at least 12 rain gardens, which will manage over 800,000 gallons of stormwater per year. The 2020 Green Infrastructure Champions Program was a success even with switching the remaining six sessions to all virtual due to COVID 19. This change allowed for more people to participate who would ordinarily not have the opportunity to join in person. Reach was expanded to people from New York, Iowa, South Dakota, and Vermont. The virtual option has also provided an opportunity for an increase in the number of people in the private sector as well as NGO's.	
22.	**Reducing Pest Infestations and Pesticide Use in the Urban Environment**	The urban environment is surrounded by multiple pests that are both economically and medically important. Among them, German cockroach, bed bugs, house mouse, termites, and ants are the most common and important urban pests. To reduce the economic damage, nuisance, or health risks caused by these pests, effective methods and materials need to be developed and used. The public also needs to be aware of the importance of urban pests and methods to prevent and control them. The long-term goal of this integrated	Build sustainable and resilient communities

		Hatch project is to develop practical and effective solutions for managing urban pests. During this reporting period, NJAES researchers studied the results of their research involving the implementation of a building-wide integrated pest management program in a low-income community in Paterson, New Jersey. After 12 months, cockroach infestation rates reduced considerably from 48% to 12% and cockroach allergen levels reduced by over 90%, as insecticide residue levels from floor dust samples decreased by 74%. They concluded that cockroach infestations can be successfully reduced to extremely low levels in a building if an effective cockroach management program is adopted. Also, although rarely studied, it is expected that effective cockroach control will also lead to significant health benefits for the building occupants. Results of a bed bug study were analyzed involving two apartment complexes - one privately owned in Trenton, NJ and another managed by a public housing authority in Linden, NJ. Both housing communities had bed bug infestations for 7 years, prior to this study. Researchers evaluated two methods to control bed bugs: non-chemical methods only versus non-chemical methods plus silica gel dust. They found that mean bed bug count was reduced by 99% and 89% in non-chemical plus silica gel dust and non-chemical treatment, respectively. Non-chemical plus silica gel dust treatment caused significantly higher bedbug count reduction than the non-chemical treatment at 6 months. The results of this study have important implications in the implementation of bed bug management programs in multifamily housing communities. Applying these findings in development of future bed bug management programs will help eliminate bed bugs more safely and efficiently.	

23.	**An Examination of the Demand for Domestically Produced and Processed Ethnic Food in the United States**	There is a growing demand for international food in the United States. Both traditional supermarkets and specialty food stores are increasingly providing various international food selections. The aim with this research is to examine American consumers' purchasing behavior of ready-to-eat (RTE) pre-cooked international food at grocery stores by identifying the most commonly purchased foods. In addition, another aim is to find out what price and non-price factors as well as consumers' demographic characteristics, influenced consumers' decision to purchase RTE international food. Using an online survey, consumer data was collected from 262 individuals who were primary food shoppers for their households in New Jersey, a state well-known for its ethnic diversity in the northeast United States. Based on responses, researchers identified several major food types by their popularity. The most commonly bought pre-cooked international food was Mexican and similar type of food (includes South American) followed by Chinese food, then East Asian food (Japanese, Korean, Thai, etc.), then European food (Greek, Spanish, French, etc.), then Middle Eastern food, then Indian food, and lastly Caribbean food. It was found that the most important non-price factors for consumers were the taste of such food, followed by such food being safe, then the quality, and then flavor of such food. Food processors and retailers, thus, should give priority to these four non-price factors in their respective value propositions to attract and retain customers. The model used to explain consumers' decision to purchase one of the top two RTE international food choices (either Mexican or Chinese) shows that authenticity of such significantly impacted consumers' purchasing behavior. Therefore, producers of such food need to adhere to the authentic nature of such food to satisfy consumer demand. The study also found that those consumers who	Build sustainable and resilient communities

		are older or who have higher levels of education or who are female tend to purchase such food less. Considering young Americans (20-35 yrs.) are known for their willingness to try out international food more than their parental generations, food marketers may want to target these young Americans, particularly the young males.	
24.	**Specialty Crops and Food Systems: Exploring Markets, Supply Chains and Policy Dimensions**	The trend toward buying organic food is increasing worldwide. For the first time, the U.S. organic market in 2018 broke through the $50 billion mark, with sales hitting a record $52.5 billion, up 6.3 percent from the previous year. Organic food sales reached $47.9 billion, which is an increase of 5.9 percent compared to 2017. Similarly, sales of organic non-food products jumped by 10.6 percent to $4.6 billion (U.S. Organic Industry Survey 2019). The demand for organic fruits and vegetables continues to grow at a rate far higher than the rest of the agricultural industry. This study attempts to identify the characteristics of consumers in the Mid-Atlantic region of the United States who are willing to buy certified organic produce. These characteristics may include social, economic, demographic attributes, buying behavior, and attitudes towards organic fruits and vegetables. An analysis of such traits can provide policymakers, farmers, and marketers important feedback to target efforts and investment in the development of markets for organic fruits and vegetables. A logit model was developed to predict who is more likely to buy certified organic produce using 1,100 respondents in the Mid-Atlantic region. About 87% of the consumers were willing to buy certified organic produce, and the remaining 13% were not. While 6% of respondents stated that they would not pay slightly more for organic produce, nearly 43% of the respondents stated that they would pay more than 10 cents premium for a dollar's worth of organic produce. Among the opinion variables, those who feel freshness is	Build sustainable and resilient communities

		more important to purchase organic products, those who think organic food tastes better than non-organic foods, and those who think synthetic chemicals in agriculture harm the environment are more likely to purchase certified organic produce. Those who feel ripeness is more important to purchase organic products and those who think there is no difference between organic food and conventional food in terms of food safety are less likely to purchase certified organic produce. The themes identified in this study suggest that stakeholders in the production and marketing of organic fruits and vegetables have much to do if the industry is to serve varied consumer interests. It is incumbent on marketers, retailers, and producers to better convey relevant information to consumers. Given the complexity of consumer decision making, appropriate educational materials that could broaden the organic food consumer base need to be developed. At the same time, marketers need to include information on the authenticity of the 'organic' label, freshness and taste of organic fruits and vegetables, environmental benefits, etc. The themes also revealed that some educated young people are the main potential consumers of organic fruits and vegetables. Some consumers with higher shopping frequency tend to buy organic fruits and vegetables, hence, these shoppers should be targeted with more information about the availability of local Mid-Atlantic organic produce.	