2019 Annual Report of Accomplishments and Results

Virginia
Virginia State University and Virginia Polytechnic Institute & State University

I. Report Overview

The NIFA reviewer will refer to the executive summary submitted in your Plan of Work. Use this space to provide updates to your state or institutions as needed.

1. Executive Summary (Optional)

Virginia Cooperative Extension (VCE), a partnership between Virginia Polytechnic Institute and State University (VT) and Virginia State University (VSU), and the Virginia Agricultural Experiment Station (VAES) and the Virginia State University Agricultural Research Station (VSUARS), enables people to improve their lives through research and education using scientific knowledge focused on the issues and needs of the citizens of Virginia. Audiences are involved in designing, implementing, and evaluating needs-driven programs. VCE is a dynamic organization that stimulates positive personal and societal change leading to more productive lives, families, farms, and forests, as well as a better environment in urban and rural communities. The overall educational goal is to bring about change in people's knowledge, understanding, abilities, or behavior related to an issue and/or broader changes in economic, environmental, or social conditions. Progress towards these goals is recorded by planned program at the individual and team levels. The primary, overall research goal for Virginia is to develop relevant basic and applied research data to help solve the problems of the agricultural sector and to support the economic, environmental and social health of the Commonwealth of Virginia.

VAES, VSUARS, and VCE PROGRAMMATIC GOALS:

VCE's goals are to: 1) develop and transfer new knowledge in applied and basic life sciences, 2) perform relevant, objective, and timely research, 3) improve the quality of life for communities and citizens in the Commonwealth, 4) use a systems approach to programming, with task-oriented work teams that respond to the needs of individuals, groups, and organizations, 5) work with at-risk, underserved, and underrepresented audiences who need specialized attention, 6) fully integrate a culturally diverse paid and volunteer staff in planning, implementing, and

evaluating programs, and 7) recruit and collaborate with public and private partners to better utilize resources, heighten impact, and reach a more diverse audience.

In particular, VSU's Extension program goals are to: 1) improve local and state economies by helping small and limited resource farmers and citizens garner resources to own, operate, and sustain small businesses, 2) educate and empower socially disadvantaged farmers to produce, distribute, and market organic, locally grown, and ethnic foods to feed Virginia's citizens, 3) ensure safe food supplies by teaching small-scale growers and farm families effective food safety practices, 4) address health issues and nutrition practices that confront limited-resource urban and rural citizens, 5) help youth, families, and seniors manage money to survive during challenging economic times, and 6) enable parents and families to leave their children in high quality and safe child-care environments.

VAES is committed to developing and implementing research that addresses society's needs and expectations. The College is focused on improving human and animal health and nutrition, enhancing the quality of the environment, reducing the effects of major infectious diseases, developing value-added products, building viable communities, and preventing chronic diseases such as obesity, heart disease, and diabetes. Research programs are conducted on the main campus as well as at the 11 Agricultural Research and Extension Centers (ARECs) located across the Commonwealth. The research focus of VSU's Agricultural Research Station includes the following: developing production systems that conserve natural resources; crop diversity and alternative crops; economically competitive and sustainable small-scale agricultural systems; bio-based energy production; improving food safety and quality; and value-added plant and animal products.

PLANNING:

VAES, VSUARS, and VCE address a broad range of problems and issues facing citizens of Virginia through focused research and educational programming. The foundation for Research and Extension programs are built on the identification and prioritization of strategic issues through situation analyses, which are accomplished through the examination of trends and emerging issues identified by local advisory groups in Unit offices (Extension Leadership Councils), AREC Advisory groups, and individual Extension specialists. In 2018 every Unit office completed a local situation analysis. Unit profiles were created based on data gathered from a variety of sources such as US and Agriculture census data. This data was supplemented with community input collected via issue forums, focus groups, key informant interviews, and community surveys. Unit situation analyses will become the background and rationale for deciding which problems and issues will be addressed and reported on by VAES, VSUARS, and VCE.

VCE is in the fifth year of a new program planning process that is based on the objectives identified in the latest VCE Strategic Plan. State level Program Teams that are aligned with Strategic Plan objectives are comprised of agents, specialists, and others. These teams meet on a regular basis to coordinate state level programming, including situation analysis, program planning, program development, evaluation, and reporting for the Strategic Plan objectives and evolving community needs. State Program Leaders guide and assist Program Teams, and also serve as liaisons between Program Teams and the Associate Directors. District Program Leadership Teams made up of experienced agents representing all program areas provide training and mentoring to new agents on development, delivery and evaluation of programs. These efforts are enhancing the capacity of Virginia Cooperative Extension to deliver quality programs and document the impacts of those programs.

REPORTING:

Beginning in 2016, all Virginia Tech College of Agriculture and Life Sciences and Virginia State University Extension and research faculty report through a new University-based activity reporting system. This system includes annual program reports focused on faculty goals, outputs, outcomes, and other data for each planned program for teaching, research, and Extension at an individual, unit, college, and organizational level. All research faculty are required to propose peer-reviewed Experiment Station projects submitted to USDA/NIFA, and entered into REEport. Researchers prepare annual progress and termination reports reviewed by the VAES associate director before being submitted to REEport. Extension impacts are shared with partners and stakeholders through efforts at multiple levels. In 2018 VCE began producing professional quality Unit office level brochures detailing Extension impacts and return on investment information. This information is shared with local and state officials and updated on an annual basis.

II. Merit and Scientific Peer Review Processes

The NIFA reviewer will refer to your 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
1. The Merit Review Process	
2. The Scientific Peer Review Process	

III. Stakeholder Input

The NIFA reviewer will refer to your 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
1. Actions taken to seek stakeholder input that encouraged their participation with a brief explanation	In 2018, a system-wide situation analysis update was conducted in VCE Units. The first step in the process is to involve appropriate stakeholder groups, including Extension Leadership Councils, to create a plan to examine the community through as much diversity related to the Extension program areas as possible.
2. Methods to identify individuals and groups and brief explanation.	VCE's most valuable connections to local communities are in the form of representative groups known as Extension Leadership Councils (ELCs). Although each local ELC may take unique approach to form and overall structure, all local ELCs have a common mission: to advance and promote Virginia Cooperative Extension's programs and presence in the local community. The ELCs do not have any supervisory authority or responsibility; instead, their primary areas of work include relationship building, Extension advocacy, and program advisement and support. ELC involvement in these activities ensures Extension's efforts remain relevant to the community. When the local ELC is representative of the overall community, each ELC member serves as a key connection with a sub-group of that community. Accordingly, it is important that ELCs maintain a diverse membership (geographic, demographic, socio-economic, etc.). Without such connections, the involvement and support for local Extension programs will be limited to the communication networks of the local agents, which makes local ELCs particularly important for agents who are new to the community. The local ELC can play a key role in the "on-boarding" process by introducing agents to community leaders and key stakeholders.
3. Methods for collecting stakeholder input and brief explanation.	Two forms of data were collected and examined: the unit profile, and community and resident perspectives. The unit profile is a descriptive document based on quantitative data gathered from a variety of sources including the Census Bureau, state governmental departments and agencies, Planning District Commissions, city and county agencies, and various service agencies. It provides program planners and unit residents a snapshot indicating current unit baseline data to gauge the effectiveness of Extension educational programs. Basic unit profiles are provided to all Units. After analyzing the unit profile, the planning group focuses on understanding the nature of challenges and opportunities facing the unit from a community and resident perspective. The purpose of this situation analysis activity is to assess peoples' knowledge, attitudes, and other perspectives on what

	issues and problems they think impact their lives both positively and negatively. In addition, it also allows the planning group to get in touch with other groups, agencies, and organizations from which collaborations might be formed to further address issues and problems.
4. A Statement of how the input will be considered and brief explanation of what you learned from your stakeholders.	Once the planning group has completed the development of a unit profile and assessed needs from a community and resident perspective, the final step in situation analysis is to interpret the data and decide on the direction for Extension educational programs. In this step, decisions and actions should be taken to address the following questions: 1) What are the issues identified in the situation analysis?, 2) What is VCE presently doing?, 3) What issues are of priority interest?, and 4) What renewed direction should VCE programs take? Completed situation analysis reports were submitted by March 1, 2019. Five-hundred one issues were identified in the reports and were entered into a situation analysis issues search program. Users can search by Unit, District, Planning District, and Program Team. In addition, there are issues in the system that have been identified in three previous system-wide situation analysis updates (2004, 2008, 2013). Each situation analysis report was posted to the local Unit website for viewing by the general public. In addition, a rubric was developed to assess the quality of the 2013 and 2018 situation analysis reports. For 2018, 102 situation analysis reports were analyzed. Of those 23% were rated as Excellent, 72% were rated as Good, and 4% were rated as Fair. An effort is also currently underway to validate the assessment instrument. The top three issue priority areas that were identified were: youth (life skills, decision making, leadership, well-being); food, nutrition, and health (safety, preservation, access, chronic disease prevention, healthy lifestyles); and agriculture production, profitability, and sustainability.

IV. Planned Program Table of Contents

V. Planned Program Activities and Accomplishments

Please provide information for activities that represent the best work of your institution(s). See Section V of the Guidance for information on what to include in the qualitative outcomes or impact statements. Add additional rows to convey additional accomplishments. You may expand each row as needed.

1. Agricultural Viability, Profitability, and Sustainability

Corresponding VCE Program Teams:

- Animal Production
- Agronomic Crops and Horticulture
- Agribusiness Management and Economics
- Emerging Pest and Pesticide Management

No.	Title or Activity Description	Outcome/Impact Statement	Planned Program Name/No.
1.	**Finding Common Ground through Soil Health, Cover Cropping, and Farm-to-Table Connections**	RELEVANCE: Finding common ground can often be difficult particularly when people come from diverse backgrounds, have specific philosophic perspectives, or just see things differently. Virginia Cooperative Extension continues to work with all of agriculture to help farms of all sizes and types of operations be viable and succeed in an ever-increasing competitive marketplace. Virginia is fortunate to have 44,800 farms and more than 8.1 million acres of farmland. These farms are not one-size-fits-all but uniquely different based on place, history, and values. Virginia Cooperative Extension works to leverage agricultural and community partnerships in education and research to develop the place and values-based food systems across Virginia to serve farms of all sizes. Within this context, farmers are finding common ground around topics and their mutual interest in soil health, cover cropping, and better farm-to-table connections. Farmers mutually want people to know what they are doing	1

		to protect the environment and at the same time have a better appreciation of agriculture, how food is produced, and where it comes from. Why soil and cover cropping? Soil is a critical resource to farming, conservation, and health in the 21st century. Cover cropping is a key component for building and maintaining soil health because cover crops keep the soil covered and armored; protect soil habitat; diversify food and carbon sources for soil microorganisms; enhance plant and animal communities, and encourage the growth of living roots throughout the year. Why farm-to-table connections? Virginians and tourists to Virginia purchase close to $30 Billion dollars of food each year. Hence, there are more opportunities to connect Virginia farmers to these markets so Virginia farmers and food businesses capture more of these food dollars. Additionally, 70% of the U.S. consumer population and regional markets are located within a day's drive of Virginia. RESPONSE: Virginia Cooperative Extension worked collaboratively with agricultural and community partners to deliver educational and researched based programs to serve farms of all sizes and valued place and values-based food and farming systems across Virginia. To build on the growing interest in soil health, cover cropping systems, and farm-to-table connections, a multi-pronged educational program that was farmer-oriented and community-focused; highlighted and reinforced foundational principles; and demonstrated innovative practices was used to appeal to beginning farmers, experienced farmers, crop advisors, and agency personnel. At the same time, the approach would allow farmers and food businesses to tell their stories better for customers and people better informed. To encourage the finding of common ground around soil health and farm-to-table connections, Virginia Cooperative Extension	

		collaborated with the following organizations: Virginia Sustainable Agriculture Research and Education (SARE), USDA- Natural Resources Conservation Service, Virginia Beginning Farmer and Rancher Coalition, Virginia State University's Small Farm Outreach Program, Virginia Department of Agricultural and Consumer Services, Virginia Association for Biological Farming, Soil and Water Conservation Districts such as Shenandoah Valley and Thomas Marshall, Shenandoah Valley Produce Auction, Southern SARE, Virginia Farm Bureau Federation, Virginia Foundation for Agricultural Innovation Rural Sustainability, Farm Credit of the Virginias, Fauquier Education Farm, Virginia Forage and Grassland Council, Producer Associations, Non-Profit Organizations, and others. As part of this collaboration, Virginia Cooperative Extension and collaborators helped to present content, develop programs with mutually reinforcing themes, farmer testimonials, hands-on demonstrations and research, videos, technical materials, and stories related to soil health, cover cropping, and farm-to-table connections that would appeal to a cross-section of Virginia agronomic, horticultural, and livestock producers. RESULTS: In 2017 Virginia farmers harvested more than 2.6 million acres of cropland. Of this acreage, approximately 180,000 acres were devoted to cover crops for improving soil function and health, which indicates more education and outreach is needed to increase the acres of cover cropping and increase soil building practices. Specific programmatic soil health, cover cropping, and farm to table collaboration included the 2016 and 2017 Virginia Association for Biological Farming Conference, Shenandoah Valley and Northern Piedmont Vegetable and Fruit Schools, a USDA-NRCS/Extension Soil-Health Team Building Workshop, The Community, Local, and Regional Food Systems Forum, the Southern Region Cover Crop	

		Conference, a Rainfall Simulator Demonstration at the Shenandoah Valley Produce Auction Annual Member Meeting, A Conservation Innovation Grant Showcase, Eastern Shore Cover Crop In-Service, the 2016 - 2017 Virginia Farm to Table Conference, and the Common Ground Series of Soil Health Profiles from Virginia Farms. These collaborative programs directly reached an estimated 942 farm owners (~17, 500 acres); provided 230 Extension and USDA Professionals and mentor-leader farmers with multi-county and multi-jurisdictional responsibilities with 2,760 hours of professional development. Eleven soil health videos and technical clips were developed and published to expand the scope and outreach of training materials. This outreach method resulted in 26,834 online views of the educational videos from December 2015 to December 2017. The videos are accessible from Virginia USDA-NRCS's YouTube Channel and Virginia Cooperative Extension's Soil Health and Cover Crops topic page at https://ext.vt.edu/agriculture/soil-health.html. An emerging outcome of the Southern Region Cover Crop Conference is that Virginia is exploring forming a Cover Crop Council and Learning Network to improve communication and coordination.	
2.	**Research and Outreach Hop Yard, Urban Horticulture Center at Virginia Tech; Hops VCE Program**	Relevance: The craft brewing industry continues to grow in Virginia, and with it, interest in growing locally-sourced ingredients such as barley and hops. Hops are a challenging crop to grow in the mid-Atlantic; disease pressures and shorter daylength (latitude) results in reduced yield compared to the Pacific Northwest (dominant hops growing region). Little information exists on what cultivars are the best-suited to mid-Atlantic conditions, or the production practices that reduce incidence of disease and optimize yields.	1

		Response: In 2015 we constructed a 0.70 acre hop yard at the Urban Horticulture Center to commercial specifications and finished planting cultivar trials in spring 2016. We also installed a two-cultivar study assessing influence of nitrogen rate on plant establishment and yield. This work was funded by the Virginia Agricultural Council and VDACS. Cultivars planted in November 2015 include Alpharoma, Cashmere, Centennial, Crystal, Mt. Hood, Mt. Rainier, Nugget, Sorachi Ace, Southern Cross, Tahoma, and Ultra. Cascade – the most widely grown cultivar in Virginia - was included in the trials as a benchmark/control. Cultivars planted include (replicated trials) Southern Brewer, Yakima Gold, Comet, and Spalt Select. Additional cultivars, planted in mini-trials of five plants each, include NeoMexican, Glacier, Yeoman, and Vanguard. We created a Facebook page to communicate progress and also promote education and outreach pubs and events associated with hops at Virginia Tech. Research continues through 2020. Research Results: Hops were harvested in August/September and dried/packaged in the Food Science & Technology Pilot Plant. Data taken included main stem and laterals length at harvest, days to flower, cone (flower) production (wet weight and dry weight) 100-cone weight, pest and pathogen susceptibility, plus acid analysis and other flavor compound profiles through the Virginia Tech Hops Analysis lab (Ken Hurley). Cultivars Cascade and Crystal had the greatest biomass and highest cone yield for year one harvest; Cascade, Comet, and Chinook had the greatest biomass and yield in seasons two, three, and four. Extension and Outreach Results: The hops team hosted a full field day on June 14, 2019 with hands-on diagnostics, harvester demo, and other	

		educational sessions (28 attendees). Research results were also presented at the 4th annual South Atlantic Hops Conference (3/16-17/2019) in Asheville, NC (220 attendees).	
3.	**Graze 300**	Relevance: Producing and feeding conserved forages has some of the greatest negative economic and environmental impacts for livestock production systems. The 2011 Virginia Cooperative Extension Farm Enterprise budget for a spring calving herd shows that over 50% of the variable cost are for hay. Research conducted in Virginia shows that a 40-head cow/calf operation in the state can potentially save $166 per head per year in expenses if the farm shifts from continuous grazing to practices that include rotational grazing, stockpiling fescue, and purchasing hay. University of Kentucky research suggests that producers feeding hay at a purchase price of $80/ton will operate most profitably at zero to 60 days of hay feeding. Survey data indicates that Northern Shenandoah Valley livestock producers typically graze 228 days per year. Only a small handful of producers in Virginia's Piedmont and Shenandoah Valley regions regularly approach or achieve a 300-day grazing season. The long-term profitability of cow/calf production throughout Virginia and the South will require many farmers to extend the number of days they graze their cattle above the typical 228-day timeframe. To improve long-term profitability and environmental outcomes, most producers need greater knowledge of the management skills and infrastructure required to extend the grazing season. Response: Since its creation in 2016, Graze 300 is continuing to work towards the goal of increasing the number of livestock producers that extend their grazing season. Grazing 300 days per year will not be realistic for all but will be achievable and more profitable for many. Of the agents	1

		who filled out the program team survey, agents have conducted eight pasture walks/twilight tours, organized four field days (warm season grasses, forage analysis, fescue dilution), conducted one field trial on using granulated biosolids to fertilize stockpiled fescue, seven demonstration/research plots were maintained, hosted three workshop series that were three nights long, supported monthly discussion groups that met over 15 times, gave three introduction to Graze 300 talks, and have consulted on numerous farm visits. In 2018, educational videos on Graze 300 appropriate topics were developed and have been very valuable tools through 2019 for agents and those visiting the Graze 300 website. Our team has been able to document multiple case studies that show economic benefit of improving grazing management. Results: In 2019, 31 agents and specialists bought-in to the Graze 300 Program team and action plans. To date, 1,300+ producers have attended an Extension forage program related to Graze 300 which is more than double since 2017. We as a team recognize that it may not be realistic for all producers in the state to achieve 300 days of grazing but we do firmly believe that all producers can take small steps to at least begin to extend their grazing seasons. According to agent and producer testimonies for 2019, two producers have implemented rotational grazing, two producers have installed new or additional cross fencing, and two farmers have developed stockpiling strategies that will help them further extend their grazing season. Additional management changes include one producer seeding annual ryegrass to further his grazing after a dry summer, one producer increased their use of summer annuals, and one producer reduced his stocking rate to decrease grazing pressure. Some producers made simple changes like focusing more on fertilizer requirements while	

		one producer did a complete renovation to novel fescue (which has inspired a couple other producers in his area to do the same). One agent is focusing on her dairy producers that are making the switch to incorporating grazing into their herds. These dairy producers are realizing a benefit to animal health as well as a decrease in high feed costs. We anticipate significant financial and water quality benefits from this educational effort. Virginia's beef cow herd numbers just over 725,000 head according to the Census of Agriculture, 2017. If producers raising only 20% of the Virginia cattle herd (representing about 145,000 cows) extended their grazing season and subsequently reduced their operating costs by $100 per head per year, the economic benefit would be $14,500,000 per year. Producers who graze in winter indicate their animal performance is equal to those cattle under hay feeding management. There will also be horse, sheep and goat farmers who will see financial benefit from extending their grazing seasons. Extending the grazing season will also benefit water quality, which is particularly important in the Chesapeake Bay watershed. Managed grazing systems (which include rotational grazing) have increased vegetative cover on pastures, improved manure distribution, improved water infiltration and resulted in greater soil quality. The Chesapeake Bay TMDL gives nutrient and sediment credit for every acre of pasture converted into a grazing management system and every foot of stream where livestock are excluded.	
4.	**Consumer Horticulture Program (Sub) Team Supports VCE Agents**	RELEVANCE: The VCE Consumer Horticulture Program (Sub) Team was developed to provide support to Extension specialists, agents, technicians, and program coordinators with consumer horticulture responsibilities. RESPONSE: For 2019, the team's goals were to initiate dialogue, create connections, develop resources, provide training, and facilitate reporting.	1

		RESULTS: This was accomplished through the following actions: expanded the Plan of Action and a new reporting template that can be used for both VCE and local stakeholder reporting, quarterly Zoom sessions were held on topics deemed important through the statewide survey conducted in 2018, connections were made across the state and provided examples of successful youth horticulture programs so agents & Master Gardeners reduce time reinventing the wheel, a partnership guidance document for agents is in progress, holes in consumer horticulture resources were assessed and a strategy for filling them developed, the role of Master Gardener Volunteers in urban nutrient management education was assessed and a strategy to expand their role is in progress, one of 2 submitted training session was selected for Winter Conference 2020.	
5.	**Agritourism**	Relevance: Tourism generated $20.4 billion in revenue in 2011, supported over 207,000 jobs, and provided $1.32 billion in state/local taxes. Agritourism venues (wineries and farms) are an integral part of the tourism sector and viewed as having a beneficial impact on local economies. Agritourism is a value-added activity that can generate additional net farm revenue and allows for diversification of the farm business making it a low-risk alternative for farmers to cope with the rising cost of agricultural inputs and production problems. Agritourism is expanding in Virginia and educational programing is needed to help farmers evaluate this as an alternative enterprise as well as to work with county zoning and planning boards to understand the uniqueness of an agritourism operation. Response: Conducted regional agritourism programs. Delivered resources through an annual state-level agritourism conference. Hosted and	1

		communicated resources through the statewide agritourism listserv. Delivered agent-focused trainings on the tools of agritourism. Planned regional agritourism workshops. Publicized programs and resources to county farms. Gathered data from local farms. Results: Team members spoke at several regional agritourism meetings across the state and we partnered with tourism or economic development departments. Team members didn't do an evaluation since we were co-leading with other organizations. Team members maintained the VCE agritourism website and list-serv. Team members spoke to 40-50 people throughout the year on agritourism recommendations, questions, and walkthroughs. Team members also spoke at the Agritourism Caucus 101 in Washington DC for VA and NC representatives which was a huge impact for VCE.	
6.	**Beginning Farmer and Rancher Coalition**	Relevance: Emerging trends in U.S. agriculture suggest that in order to enhance our agricultural resource base we need to establish, sustain, and preserve our farms, farmers, and farmland. A growing number of nongovernmental groups, Cooperative Extension Services, and USDA agencies are working to improve the viability of new farms, and the economic, social, and environmental fabric in which they are entrenched. These new initiatives are responding to an overwhelming concern of a steady decline in the number of individuals entering into agriculture coupled by an increase in the number of exiting farmers and ranchers. Virginia Cooperative Extension is providing the platform to beginning farmer program development to thrive in Virginia through the Virginia Beginning Farmer and Rancher Coalition Program (VBFRCP). Using a community-based participatory approach to program development, the Virginia Beginning Farmer and Rancher Coalition Program aims to improve opportunities for beginning farmers and ranchers to establish and sustain viable agricultural operations in Virginia through the development and	1

		enhancement of whole farm planning programs, online resources, and farmer mentoring networks. Response: 1. Conducted regional whole farm planning programs with VBFRCP whole farm planning curriculum. 2. Delivered resources through bi-annual state-level VBFRCP meetings. 3. Hosted and communicated resources through the statewide VBFRCP website, listserv, YouTube Channel, blog, and Facebook sites. 4. Continued critical and targeted start-up issue team work to support resource development and trainings for Virginia's new and beginning farmer communities. 5. Conducted one-day in-service training events for agents and coalition partners. 6. Conducted regional farmer-mentor networks. 7. Gathered data from farmer trainings. 8. Offered whole farm planning workshops through mini-grant initiative. Results: VSU Small Farm Outreach Program (SFOP): Participant evaluations were distributed, collected and tabulated for beginning, limited resource, minority and veteran farmer (target audience) trainings in 2019. Many are focused on whole farm planning and the VSU SFOP beginning farmer/veteran curriculum was developed with the foundation from VBFRCP resources. • The VSU SFOP 2019 data follows: o During 2019, VSU Small Farm Outreach Program agents and staff (VSU specialists and program associates) have conducted 239 Workshops, 574 Farm Visits, 8 Farm Tours, 704 Emails, 1-on-1 contacts and Phone calls. o In relation to whole farm planning topics and outreach: ▪ Over 3,000 SDVFR received information on USDA programs through local news outlets and outreach activities	

		▪ 384 indicated an increase in knowledge in USDA programs and service networks ▪ 38 successfully applied and benefited from various USDA programs and services. ▪ 177 SDFVR indicated that they have increased their knowledge in whole farm planning ▪ 145 gained knowledge on land transition and retention ▪ 33 indicated that they will take proactive action to avoid foreclosures ▪ 132 indicated that they have improved their knowledge in farm financial planning, and record keeping. ▪ 12 have developed and written whole farm business plans ▪ 216 have indicated an increased knowledge have increased in production of high value crops/livestock ▪ 66 have diversified their operations ▪ 83 plan to adopt a new and cost efficient production practices ▪ 43 of those surveyed indicated an increase in farm incomes of 10% or more VT Beginning Farmer and Rancher Coalition: • 350 farms were able to make integrated whole farm plans and decisions and had increased access to knowledge networks for successful new-farm startup	
7.	**Farm Transition**	Relevance: Transitioning a farm business is a lifelong process regardless of the age or experience of the farmer. New or established farmers need to address the transition out of active management into the next generation that will take over responsibility for the business and its assets. The questions these individuals need to address are multi-faceted: what are our goals; do we have a viable farm business; how can the business support retirement of one generation and family living of the next generation; what legal and financial tools are needed to achieve our mutual goals; how do we evaluate tools, methods and professionals employed to help us achieve our goals?	1

		Response: Organized and conducted two two-day workshops, one one-day workshop, and mini-workshops on farm and forest-owner transition Results: • 124 farms/farm families increased their awareness and understanding of farm transition • 92 farms/farm families initiated transition plan development • 20 farms/farm families implemented transition plans focused on creating a mindset within families and/or businesses to address intergenerational transition	
8.	**Training Virginia small, limited–resource, and socially disadvantaged producers**	RELEVANCE: Small farmers in Virginia have been faced by several barriers that limit their ability to successfully operate a profitable farm business. Such barriers are, but not limited to: 1) Lack of knowledge of USDA programs and services, 2) limited access to credit and capital, 3) lack of skills in farm business and financial planning, 4) lack of knowledge of improved production practices and 5) limited access to existing and viable markets. RESPONSE: Through federal and state funding, the Virginia State University – Small Farm Outreach Program (VSU-SFOP) conducts primary outreach efforts to ably equip small farmers with the tools and skills needed for them to make informed decisions in operating successful profitable farm businesses through outreach, training and technical assistance, in a holistic manner, thereby enhancing their economic opportunities and quality of life. During 2019, VSU Small Farm Outreach Program (SFOP) agents and staff have conducted the following educational activities: • Educational outreach to 3,000 Socially Disadvantaged Veterans, Farmers, and Ranchers • 239-Educational workshops on the following subjects: USDA programs and services; Farm business planning and financial management; Improved	1

		production systems for high value and profitable crops and livestock; Hands-on demonstrations with appropriate small farm tools and equipment; Marketing strategies to enhance their farm profits • 574-Technical service field visits • 704-Indirect technical service contacts (Email and Phone) • Eight (8) farm tours conducted RESULTS: As a result of 2019 evaluation of VSU-SFOP educational and technical service outreach, 384 underserved and/or socially disadvantaged, limited resource beginning, veteran small farmers and ranchers indicated an increase in their knowledge in USDA programs. Due to an increased confidence and knowledge of USDA programs, 38 VSU-SFOP clientele successfully applied for and benefited from USDA programs and services. In 2019, 145 VSU-SFOP gained practical knowledge and skills on how to transition their land to future generations or to retain their land when faced with foreclosure actions. As a result, 33 VSU-SFOP decided to take pro-active actions to avoid foreclosures on their farmland. In 2019, 132 VSU-SFOP clientele learned skills in farm financial planning and record keeping as well as the importance of developing a business plan. As a result, 12 VSU-SFOP clientele have developed and written business plans for their beginning farm businesses.	
9.	**VSU Blueberry U-Pick offers nature-based intervention for reducing workplace stress and improving employee perception of well-being**	RELEVANCE: Over 55 percent of Americans feel stressed most of the day (Gallup, 2019). Feeling stressed negatively influences an individual's sense of well-being. Within the workplace, employee stress reduction may lead to improved organizational performance through improved employee performance, perception of well-being, organizational civility, reduced sick leave and absenteeism. Medical researchers have determined exposure to nature and outdoor activities may improve mental health and assist in chronic pain management. Due to the high cost of health care interventions, there is a need for identifying and applying innovative workplace strategies to address employee well-being through stress reduction. Nature-based interventions may be a low cost, easy to	1

		implement employee stress reduction solution for organizations to implement. RESPONSE: From June to August 2019, the VSU Small Fruits and Vegetable Program organized and implemented Blueberry U-Pick events for VSU employees as a nature-based intervention to improve employee well-being, a total of 10 U-pick blueberry events was conducted. RESULTS: In 2019, 120 VSU employees participated in the Blueberry U-Pick events picking 380 pints of fruit. Harvested fruit saved participants a total of $1,140 ($3.00 per pint local pricing). A survey was conducted, and 24 participants responded. Participants used berries fresh, frozen, in recipes, and shared with friends and family. Sixty-two percent of participants believed participating in this activity increased their personal well-being from 51% to 100%. Ninety-five percent of participants felt better about their health because of spending time outdoors, meeting other VSU employees, and exercising. Additionally, 100% of participants stated that they and their family have benefited from eating the fresh berries they picked. One interesting finding was that 79% of participants felt that their appreciation for working at VSU increased from 51% to 100% after attending the Blueberry U-Pick events.	
10.	**VSU trains aquaculture farmers to successfully stock juvenile shrimp for higher profitability**	RELEVANCE: Virginia consumers are paying top dollar for locally grown freshwater prawns (shrimp) raised without the use of hormones or antibiotics in a chemical-free environment. Small, limited resource aquaculture farmers are cashing in by selling their shrimp harvests from $10 to $12 per pound at local farmers' markets and online. Over the last five years, Southside Virginia tobacco farmers have been "fishing" to find profitable enterprises to diversify their operations. One of the most promising enterprise for interested tobacco farmers has been growing tropical freshwater shrimp in a temperate climate to meet consumer demand for local shrimp. A well-stocked one-acre pond typically yields 1,000 pounds/acre or 10,000 whole shrimp annually. Healthy juvenile stocking methods ensure a harvest of ten (10) large whole shrimp per	1

		pound yielding an estimated sales potential of $10,000 to $12,000 per year! In order to produce a high quality shrimp yield, farmers must pay close attention to the critical input of stocking juvenile shrimp into production ponds. Ponds must be stocked with healthy, unstressed juvenile shrimp. Unfortunately, the transfer from indoor cultivation to a natural pond environment is quite stressful to juvenile shrimp and leads to increased mortality rates. Juvenile stress from improper stocking methods leads to increased mortality throughout the entire production cycle resulting in reduced profits for shrimp farmers. Education is vital for success. RESPONSE: Farmers are provided with overall freshwater shrimp management skills by the aquaculture extension office. Educational sessions are established with VSU's aquaculture specialist, preferably at the pond site, to evaluate pond accessibility, water quality, transportation needs, and best management stocking procedures. However, communication is essential to good stocking. Farmers with ponds to be stocked with shrimp need to confirm with the nursery operator the means of payment, the size of the pond, number of shrimp to stock and when the shrimp will be transported. VSU aquaculture specialist is present at the nursery on the day of the juvenile harvest for distribution to educated farmers. Handling techniques are observed and recommendations for timely stocking suggested. Tank specific dissolved oxygen and water temperature management are provided to the farmer. RESULTS: As a result of VSU's educational efforts, 20 small, limited resource aquaculture farmers in Virginia acquired the knowledge, ability and skills to successfully transport and stock juvenile shrimp. The reduction in mortality rates and the increase in healthy mature shrimp harvest rates has made an economic contribution of an estimated total of $100,000 per year (20 farmers x $5,000 sales/per year).	

11.	**Show me the money! Managing market risk through beginning farmer brand development technical assistance and training**	RELEVANCE: In order to become an established farm operation, beginning farmers must stay in business for ten years. According to the U.S. Small Business Administration (2018) only one in three start-up businesses actually make it to their tenth-year anniversary. With odds like this, beginning a small farm enterprise is a "risky" business. One important way to manage risk in a competitive marketplace is for new businesses to create a memorable brand that customers find value in economically supporting. In order to reduce marketing risk, small, beginning farm businesses may benefit from educational training on how to develop their farm brand. RESPONSE: In order to address the identified need for additional educational training on how to develop their farm brand, the VSU Marketing and Agribusiness extension program in conjunction with the VSU Small Farm Outreach program agents, Vernon Heath, Derrick Cladd and Tracy Porter, as well as the Virginia Farmers Market Association have conducted direct technical assistance and training in logo design, web design and/or product display techniques. RESULTS: 1n 2019, as a result of conducting direct technical assistance and training, 71 beginning small farmers learned how to develop their brand by creating a business logo, a webpage or product display. Of the 71 participants, 87% stated the skills learned in the risk management marketing classes would increase their income a minimum of $100 to a maximum of $5,000 as a result of implementing branding practices amounting to a total additional gross on-farm income range of $6,100 ($100 X 61 participants) to $305,000 ($5,000 X 61 participants). A tangible result of implementing the marketing techniques learned in training and direct technical assistance, nine farmers created their farm logo, 12 participants created a farm webpage and fifty participants learned how to create a product display.	1

12.	**Food insecure Carroll County Virginia elementary school children learn to grow food indoors**	RELEVANCE: In the United States, over 800 million people live each day uncertain where their next meal will come from. In Virginia, over 893,000 people do not have reliable access to affordable and nutritious food in sufficient quantity for healthy mind and body system development and maintenance. This condition of uncertainty in food accessibility is termed as "food insecurity" and is related to income and geographic location. In the rural mountain area of Carroll County, Virginia, nearly 60% of the total student population of Carroll County schools is eligible for free and reduced lunch demonstrating a potential need for educational opportunities to train school-age youth how to grow their own food, so that they can help improve their family's access to fresh, affordable foods. RESPONSE: Carroll County has seven elementary schools. Four of the elementary schools have an outdoor school garden. The three remaining elementary schools do not have a dedicated outdoor space or volunteers to manage an outdoor garden. These three schools that do not have an existing outdoor garden expressed interest in exploring growing indoors using hydroponic methods in their classroom. In 2019, the VSU-CE Greenhouse Program utilizing a $500 Ag in the Classroom grant award was able to establish three elementary school programs to teach students and teachers how to grow indoors using hydroponics, aquaponics, and aeroponics methods. Student activity books were provided that included a weekly plant growth journal for students to use to track their plant's growth. In addition to the classroom hydroponics setup, teachers were also provided with seeds and starter trays to get their plants germinating. Students maintained the fertilizer concentration in the grow tank and monitored the pH level of the water to maximize the health of the plants. Students also created a trellis structure in the classroom to support the vines on their bean plants. RESULTS: As a result of this educational outreach effort in Carroll County, 90 elementary students acquired the knowledge, skills and abilities to grow produce indoors. During the 2019 school year, participating students	1

		grew the following vegetables indoors: Radishes, basil, thyme, sugar snap peas, and kohlrabi greens. Prior to this project, 95% of students did not know plants could be grown without soil, and 100% of students did not know that hydroponics was an ancient process utilized by ancient civilizations all over the world. When asked if they found hydroponics and aquaponics more attractive than traditional farming methods, 90% of students replied yes. When asked if aquaculture was a viable way to address food insecurity and help resolve food desert areas, 100% of students replied yes. Two of the three schools have already decided to continue doing Classroom Hydroponics during the 2020 school year. Seven teachers who led the classroom experiments noted the attentiveness of students whilst making weekly observations regarding plant growth. Additionally, students transferred knowledge to classroom visitors by explaining how their indoor hydroponic system worked and how it was a potential solution for food insecurity in for locations with extremely cold climates during the majority of the year.	
13.	**VSU Sustainable Urban Agriculture Certification Program (SUACP) trains urban garden trainers**	RELEVANCE: Nearly 75 percent of the U.S. population resides within 200 miles of a city representing potential customers for produce and livestock products grown on urban farms. A USDA survey of 315 U.S. urban farm producers cited their greatest training need was achieving and maintaining business profitability. The survey determined there was a lack of available educational training to assist urban farm producers in being profitable. Virginia Cooperative Extension educators and Master Gardener program volunteers may be inadequately prepared to confidently teach growing urban farm audiences how to start and manage a successful urban farm business. RESPONSE: The VSU Sustainable and Urban Agriculture Certificate Program (SUACP) has conducted three-12 week programs to 84 individuals who expressed interest in learning how to start or manage an urban farm. Industry and Cooperative Extension educators developed an urban agriculture curriculum rich in experiential learning to train participants in the following subjects: Sustainable soil management, plant propagation,	1

		nursery management, permaculture, plant disease, pest management, greenhouse production, animal husbandry (chickens and rabbits), urban farming business planning and management. RESULTS: In 2019, VSU SUACP participants which included urban farmers, gardeners, extension educators, school teachers, and other community members were surveyed with the following results: Six out of ten participants believed the 12-week educational program fulfilled their expectations. Sixty-three percent of participants benefitted from hands-on learning experiences during the 12-week course. As a result of the success of the face to face program, an online module was introduced for distance learners.	
14.	**Making bank with value added farm products! Limited resource socially disadvantaged farmers and food artisans learn to transform raw produce into high dollar food products for consumer direct markets**	RELEVANCE: In Virginia, 10,862 Virginia farmers earned less than $1,000 from their farm operation (USDA, 2017). Conversely, USDA (2018) reported that Virginia producers sold nearly $1.3M in value added products which were sold directly to customers through farm stands, farmers markets, Community Supported Agriculture, and online sales. With market demand skyrocketing for ready to eat specialty food products, educational outreach on cost effective methods of producing and marketing value added farm products to Virginia small and minority farmers may provide significant economic benefits. Additional education and technical assistance are needed to assist small, minority, limited income farmers to adopt value added production and marketing practices. RESPONSE: From 2010 to 2019, in collaboration with the Virginia Food Works (VFW) Processing Facility (Prince Edward, VA), the Southern Virginia Food Hub (South Hill, VA) and the VSU Small Farm Outreach Program (SFOP) over 15 educational hands on workshops and processing facility tours have been conducted with over 500 limited resource socially disadvantaged farmers and food artisans throughout Virginia. Additionally, direct technical service from the VSU CE Marketing and Agribusiness program and cooperating VCE Extension Agents and VSU SFOP is provided to participants needing additional assistance in	1

		understanding regulations, label creation, consumer promotional materials and cost-effective packaging options. In 2019, the VSU CE Marketing and Agribusiness program created an outreach brochure for VFW to distribute to potential clientele to explain the value-added opportunities available from VFW. RESULTS: As a result of collaborative value added farm tours and workshops and the VFW brochure educational outreach efforts on behalf of the Virginia Food Works Processing Facility (Prince Edward, VA) and Southern Virginia Food Hub (South Hill, VA), 100 unique value added farm products from strawberry jam to spicy tomato salsa have been created with Virginia grown farm products and are being sold directly to the public through farm stands, farmers markets, Community Supported Agriculture, food hubs and online sales with an estimated retail value range of $5 to $15 per specialty product netting 100 limited resource socially disadvantaged farmers and food artisans a minimum annual gross income range of $125,000 ($5 each x 250 production volume per process event X 100 producers) to $375,000 ($15 each x 250 production volume per process event X 100 producers).	
15.	**Training Virginia sheep farmers how to lower lamb loss, reduce feed and labor costs with spring lambing on pasture techniques**	RELEVANCE: Hair sheep have been a growing segment of the U.S. small ruminant industry. They are well suited for sustainable, pasture-based production and are a good fit for novice producers. One of the most stressful times for a shepherd is lambing. Many producers do not realize that pasture lambing is an option, especially when necessary to take a lamb and force it onto a foster mother (mothering up). The difficulty with this process is convincing the foster mother to accept the lamb, and then allowing her to feed the foster lamb. In order to reduce lamb losses and cut down on labor and feed demands associated with indoor lambing systems, spring lambing on pasture may be a viable solution. It has been estimated that $25 per ewe is needed to manage a lambing ewe in a barn to pay for feed, bedding, labor and other expenses. Additionally, research has showed that barn or shed lambing results in higher lamb loss (15%) compared to lambing on pasture (8%). To address this issue and potential	1

		solution, the VSU Small Ruminant Program has conducted research and outreach to limited resource, small-scale, and socially disadvantaged lamb producers to inform on the benefits and techniques involved with spring lambing on pasture. RESPONSE: Two workshops were developed and implemented to explore pasture lambing as an option for Virginia hair sheep producers. In these workshops, the biology of gestation and parturition, preparation for lambing, supplies needed, demonstration of lambing positions, dealing with complications and the unexpected and the processing of newborn lambs were taught and demonstrated (hands-on experience). Workshops were kept to small number to provide direct interactions and experiential learning with participants. RESULTS: As a result of attending workshops, 24 small scale sheep producers increased their knowledge of low-input pasture lambing by nearly 60%. Economic savings were thus realized by participating sheep producers. Seventeen participants (averaging 20 breeding ewes per farm) prior to training would have spent an additional $500 ($25/ewe X 20 ewes) if they were to conduct lambing indoors as opposed to lambing on pasture. With an average lamb crop of 180% (36 lambs/farm each lambing), it is estimated that lamb loss would be approximately 2.9 lambs each pasture lambing compared to 5.4 in barn lambing. This potentially results in 42.5 live lambs ((2.5 x additional locally produced pasture-raised lambs available to market in Virginia (5.4-2.9 = 2.5 X 17 producers)) that can be sold in local food channel systems (direct to consumers) for premium prices ($7 to $18 per pound). If just half of existing hair sheep producers adopted pasture lambing and direct marketing to consumers in Virginia, a reduced lamb loss could result in profits of approximately $320/lamb. Therefore, with 70% of participants adopting pasture lambing practices, the total potential savings as a result of trainings for Virginia sheep farmers is estimated to be $8,500 ($500 x 17 farmers) as well as potential profits of $6,400 ($320/lamb X 2.5 lambs X 8 farms).	

16.	**Detecting, monitoring and forecasting spread of plant pathogens through air and water systems using autonomous vehicles**	Relevance: Diseases of wheat and barley frequently result in yield losses from 10 to 20 percent in susceptible varieties, requiring one or more fungicide applications at a price of 29.6 dollars per ha, which would cost producers in Virginia alone $2.4 million per year. Results from these studies provide researchers worldwide with the knowledge and tools to accelerate development of barley and wheat varieties having more effective and durable disease resistance. Development of varieties having durable resistance to prevalent and newly emerging diseases and/or new races such as fusarium head blight, stripe rust and stem rust provide growers, end users and consumers with a sustainable, economical and safe food supply. Knowledge of the movement of plant pathogens in the planetary boundary layer of the atmosphere threatens domestic and global agriculture. Knowledge of the movement of fungal plant pathogens in the atmosphere provided strategies to anticipate, prevent, and respond to agricultural threats of high-risk plant pathogens. Innovative use of autonomous vehicles, coupled with big data analyses, can contribute to more efficient and effective decisions for protecting crop and environmental health. Response: Virginia Tech researchers in the School of Plant and Environmental Sciences, Eastern Virginia Agricultural Research and Extension Center (AREC), and Tidewater AREC focused on the identification, genetic characterization, mapping of chromosome location, and development of DNA markers for genes governing resistance to diseases including fusarium head blight in barley, and leaf and stripe rusts, and fusarium head blight in wheat. As part of the Virginia Tech SmartFarm Innovation Network, they are developing optical and aerial methods for increasing effectiveness and efficiency of detection of fusarium head blight and other diseases. Results: Wheat cultivar Hilliard, released in 2015, and Dyna-Gro 9811, released in 2017, are broadly adapted and express moderate to high levels of resistance to powdery mildew, leaf and stripe rusts, Fusarium head	1

		blight, leaf and glume blotch, Barley Yellow Dwarf Virus, Wheat Soil Borne Mosaic Virus, and Hessian fly. Wheat varieties USG 3118 and #Berkeley, released in 2017, and SR8483, released in 2018, also provide producers with varieties having resistance to the prevalent strains of stripe, leaf and stem rusts and Hessian fly. Wheat varieties released by Virginia Tech have been grown in more than 12 states in the eastern U.S., and on the basis of seed sales, more than 1.78 million units of certified seed of these varieties have been sown on over 890,000 acres (360,178 ha). Evidence of transport barriers in changes in structure in Fusarium head blight and regional movement of invasive plant pathogens. Thousands of colonies of Fusarium have been collected, sub-cultured and stored. Fusarium head blight on a susceptible cultivar of spring wheat was associated with 11 single-spored isolates of Fusarium graminearum collected with UAVs during fall, winter, spring, and summer months.	
17.	**Pesticide Safety Education** (Multistate)	Relevance: U.S. Department of Agriculture (USDA) and the US Environmental Protection Agency (EPA) mandate the safe use of pesticides by commercial, private, and public applicators. USDA and EPA ask Cooperative Extension nationwide to address this mandate. The Virginia Tech College of Agriculture and Life Sciences has a key initiative in agricultural and environmental sustainability and Virginia Cooperative Extension (VCE) has a planned program in pest management. Response: The Virginia Pesticide Safety Education Program provides workshops, certification courses, training manuals, electronic media, and web-based education for pesticide applicators. In addition, the program provides train-the trainer workshops for Virginia Cooperative Extension agents who serve as pesticide applicator trainers. Results: VCE Pesticide Safety Education enabled commercial and private pesticide applicators to be trained and certified according to state and federal requirements. We enable over 24,000 agricultural producers and pest managers to maintain certification in 27 pesticide applicator categories by using our manuals and educational programs. We enable	1

		pest managers to legally use pesticides on farms, pest management businesses, and public IPM programs throughout Virginia. Cooperative Extension Agent trainers are key to this effort. They hosted the majority of the 119 trainings to recertify over 2,000 private applicators in 2019. The 27th annual Virginia Pesticide Safety Educators Workshop (PSEW) gave them the latest information and resources to hold their trainings. About 61 VCE agents participated in the 2019 PSEW. VTPP hosted 16 online courses to prepare applicators for certification (61 companies, 25 government entities (including public schools) (217 individuals) enrolled). We shared pesticide safety education information with 13,912 page views through VTPP.ORG. Most were from Virginia. Top metro areas included: Washington DC (Hagerstown, MD), Roanoke/Lynchburg/Blacksburg, Richmond/Petersburg, Norfolk-Portsmouth-Newport News, Charlottesville, Tri-Cities TN/VA, Harrisonburg, and Philadelphia. Tablet and phone users increased; most used desktop computers. Because of the program, risks to public health and the environment were minimized while maintaining crop protection and effective pest control. Multistate Extension Collaborators: The program works with nearby states, federal agencies, and the American Association of Pesticide Safety Educators to solve critical issues relating to pesticide safety education and compliance assistance. Multistate Extension Involvement/Integrated Research and Extension Involvement: The activities address critical needs of stakeholders by helping them fulfill the regulatory compliance requirements for certification and training under federal and state pesticide control laws. The activity serves all who seek certification under the law.	
18.	**Beef Quality Assurance**	Relevance: Consumers are increasingly interested in the safety and quality of the U.S. beef supply. There is also growing interest in the production practices used to raise beef cattle. Scientific research has investigated and determined best management practices (BMPs) that can be used to produce safe, wholesome beef. National and state level programs are needed to disseminate knowledge about new and existing BMPs to beef producers.	

		Response: The national Beef Quality Assurance (BQA) program was developed over 30 years ago, with support of the National Beef Checkoff, to research new BMPs and assess the quality of the U.S. beef supply. Virginia started its own BQA program approximately 20 years ago. The national BQA program has developed training materials that can be used for state level BQA trainings for beef producers and youth. The Virginia BQA program serves to certify extension agents and agriculture instructors to hold producer trainings, maintain training records, and disseminate training materials to trainers and trainees. Results: The current number of active BQA certifications in Virginia is 2488. During 2019, 579 producers or youth were either certified or re-certified. These producers reside in nearly every county of the Commonwealth, and several surrounding states. We estimate that the certified producers represent over half of the cattle produced in Virginia. Added value of cattle produced on BQA certified farms is estimated to be $1.5-2.0 million annually.	
19.	**2019 Youth for the Quality Care of Animals Trainings Teach Production Skills, Networking, and Show Ring Ethics while Growing Strong Animal Agriculture Advocates**	Relevance: With the ever-growing population numbers, the responsibility of farmers and producers to meet the world's food needs becomes increasingly critical. However, as the demand for high quality and increased quantity of food grows, the knowledge of the average citizen regarding food production and what that entails wanes. Social media and non-research supported views of animal agriculture continue to create a growing population that does not understand where food comes from, how it is produced, or the extent of the healthy animal-derived food supply available in the United States. 4-H and FFA youth enrolled in livestock projects are involved in the day-to-day care of animals that will become part of the world's food supply. It is crucial that youth receive proper training and education on the importance of quality care and husbandry techniques applied to these project animals. Food animal production and those involved on a daily basis continue to fall under increasing scrutiny concerning the care and well-being of these livestock.	

		Our youth livestock producers are not exempt, and often face greater analysis due to the public nature of youth livestock shows and events. While YQCA training satisfies a requirement to exhibit animals at the State Fair of VA, it fundamentally provides youth with knowledge and information to be conscientious, successful producers and positive, valuable advocates for the meat animal industry. Response: Certified Instructors trained by the national YQCA organization provided hands-on, experiential learning opportunities for youth, involving in-depth information on the production of food animal projects and the proper animal husbandry techniques required to produce healthy animals and quality products for the consumer. Instructors share an age-appropriate slide deck that focuses on Food Safety, Animal Well Being, and Life Skills. In addition to the nationally required slide deck, Virginia's YQCA program requires hands-on activities, large group trainings that provide networking, and group learning opportunities. Trainings are organized and delivered at various locations across the state and open to all 4-H and FFA youth interested in or requiring YQCA certification. In an effort to educate our youth and provide them with the knowledge and resources needed to advocate for animal agriculture, an annual YQCA Certification is required for all youth livestock exhibitors who participate at the State Fair of Virginia Youth Livestock Shows. Additionally, there are seven Units in VA that require this training for all youth livestock exhibitors at their county fairs or local livestock shows. Results: Virginia's YQCA District Training Teams were comprised of 54 certified instructors trained by the National YQCA organization and the Virginia YQCA State Leadership Committee. 919 youth, representing 47 Virginia Units, were certified at 24 statewide trainings between January 5th and August 14th, 2019. Of those certified, 348 youth were required to complete the training in order to exhibit livestock at the 2019 State Fair of Virginia Youth Livestock Shows. The remaining youth certified to meet local show requirements or to simply learn more about their	

		responsibilities as food animal producers. Evaluation data was collected from 505 youth participants during the 2019 certifications. Junior participants between the ages of 9 and 13 represented 52% of those evaluated, while senior youth, ages 14 – 19 years, comprised the remaining 48%. Nearly 71% of these youth recorded having shown livestock for less than 5 years with less than 30% representing those who had shown for five or more year. Eighty-eight percent of the junior participants indicated learning something new, as did 78% of the senior trainees, and nearly 80% of both age groups shared they were more comfortable explaining animal agriculture practices to consumers and the public, as a result of what they learned during the training. When questioned, youth conveyed an increased understanding of proper animal husbandry practices, and an appreciation for the opportunity to learn via hands-on learning activities. These trainings involved a cumulative 300+ hours of specialist, VCE faculty, and volunteer time to prepare and deliver.	
20.	**2019 Tri State Beef Conference Enhances Producer Income** (Multistate)	Relevance: Beef enterprise income is greatly impacted by price risk. Virginia's beef farms are small with 90% having less than 100 animals. These producers have too few cattle to use many of the available options to manage price risk. Response: In collaboration with extension colleagues from Tennessee and North Carolina, we initiated the Tri-State Beef Conference to address key regional issues impacting producers related to marketing, production, and price risk management. The educational program was funded through grants and industry partnerships. Extension specialists and agents, along with scientists from peer institutions and industry professionals have served as educators. The 11th annual conference was hosted in 2019. Results: To date, 11 conferences have attracted 2,294 participants. Pre- and post-conference assessments of beef producer attendees have estimated the economic benefit resulting from changes to their enterprises as a result of attending the conference to be $2.1 million.	

2. Biotechnology, Biomaterials, and Bioenergy

Corresponding VCE Program Team:

- Natural Resources Management

No.	Title or Activity Description	Outcome/Impact Statement	Planned Program Name/No.
21.	**Chemical-enzymatic fractionation to unlock the potential of biomass-derived carbon materials for sodium ion batteries**	Relevance: Agricultural and food wastes are renewable organic materials generated as the byproduct of agricultural and food production. As the largest renewable carbon source, an estimated 30 billion tonnes is globally produced each year and is projected to increase due to the accumulation of agricultural activities. Agricultural and food wastes can generally be categorized into crop residues (e.g., corn stover, wheat straw), woody residues (e.g., wood sawmill residues), and food processing wastes (e.g., brewer's spent grain, orange peels, grape pomace). The volumes of these agricultural and food wastes are vast and display a pattern of excess found in many countries. For example, the amount of corn stover that can be sustainably collected is 80-100 million dry tonnes per year in the US and more than 200 million dry tonnes worldwide, and only a small portion of it is currently used as animal feed or bedding materials. In terms of food processing wastes, citrus peels, pulp and seeds generated post-processing are as high as 15.6 million tonnes each year, and most of these citrus wastes are used as low-value animal feed or landfilled. Agricultural and food wastes rotting in landfills contributes significantly to methane emission, a greenhouse gas that is at least three times more powerful than carbon dioxide. In developing countries, meanwhile, agricultural residues, e.g., corn stover and rice straw, are incinerated to reduce waste volume; however, this incineration is increasingly restricted due to the potential air	2

		pollutions. With the worldwide economic development and population growth, the associated agricultural and food waste economic and environmental problems are becoming more challenging. Therefore, appropriate management and valorization of agriculture waste are urgently needed. The efficient utilization of agricultural and food wastes not only enhances the value chain of agriculture but also reduces the potential environmental pollutions caused by waste disposal. Response: Virginia Tech researchers in the Department of Food Science and Technology and Department of Chemistry, in cooperation with researchers from The George Washington University and universities in China, designed a process by which non-lignocellulosic components, hemicellulose and cellulose biomass residues were removed as fractions, and remaining residues were fractionated to create a variety of precursors for carbonization. The biomass source was brewer's spent grain, which is an agricultural waste material. The role of each of the biomass components in sodium ion battery performance was evaluated. Results: The electrochemical properties of the hard carbons from cellulosic and lignin-based biomass derived from brewer's spent grain were most effective. Other biomass resources, grape pomace and walnut shells, also delivered sufficient electrochemical energy. From this research, the potential of biomass-derived carbon materials for sodium ion batteries is revealed. New sources of carbon energy from agricultural waste materials may be discovered.	

3. Community Viability

Corresponding VCE Program Teams:

- Community, Local, and Regional Food Systems
- Family and Community Economics
- Leadership, Volunteerism, and Civic Engagement

No.	Title or Activity Description	Outcome/Impact Statement	Planned Program Name/No.
22.	**Financial Literacy - Capacity Building for Adults**	Relevance: While the median household income in Virginia which was $68,766 for 2018 is higher than the median U.S. household income of $57,652 (Census.gov, Dec 2018). Virginians also take on more debt than the typical U.S. household. For example, Virginia is among the top ten states with the highest level of household debt (Federal Reserve Bank of New York, 2018). At the national level, the 2018 Consumer Financial Literacy Survey prepared by Harris Poll found that 79% of adults would benefit from advice and answers to everyday financial questions and 73% are currently worried about their personal finances. The same survey revealed that 24% reported finding it difficult to reduce debt due to unexpected financial emergencies. Eight percent of all adults have debts in collection with Millennials (ages 18-34) having a greater percentage in collection – thirteen percent. The well-being of Virginians depends on individual and family financial capacity. Financial capacity will enable individuals to make informed choices, sound decisions, and avoid financial pitfalls, as well as obtain knowledge of strategies to implement during times of financial crisis. The process of developing financial capacities will provide individuals the appropriate tools to understand and apply financial products, services, and concepts in an effort to improve their financial situation. The process of developing financial capacities will provide individuals the appropriate tools to understand and apply financial	3

		products, services, and concepts in an effort to improve their financial situation. Response: FCS Agents collaborated with Master Financial Education Volunteers, Extension Leadership Council members and community volunteers to deliver financial literacy workshops, and one-on-one counseling sessions to Virginia residents. FCS Agents collaborated with the Department of Social Services, Department of Housing, community colleges, Volunteer Income Tax Assistance Sites, earned income tax sites, community organizations, correction facilities, as well as churches and businesses across the state. Results: 3943 adults attended one of 492 sessions led by 15 VCE Extension agents in 2019. There was a dramatic increase in planned behavior based on surveys taken prior to the adult financial literacy programs and after them: we observed that 86.3% of participants plan on writing short term financial goals after attending our training. We also see 87.6% of attendees plan on writing a spending and savings plan. The majority, 76.9% of attendees plan on paying themselves first for savings. After our training, we also report that 75.6% plan on saving towards their emergency fund, 83.8% plan on paying down debt, and 82.5% plan on checking their credit reports annually.	
23.	**Poverty Simulation Brings Realistic Experience to Help Community Members Understand Limited Resource Audience**	Relevance: Poverty impacted 1 in every 10 Virginia residents (9.8%) in 2018 (census.gov). The federal guidelines for determining the poverty threshold is dependent on income as well as the number of people living in the household. For example, in 2018, a family of one is considered under the poverty level if his or her income is less than $12,140 while a family of	3

		four is under the poverty level if household income is less than $25,100 (Federal Register, 2019). Besides the negative financial aspects of being impoverished, it is also linked to poor nutrition and health, emotional distress, teen pregnancy, and academic failure (vaperforms.virginia.gov). There are drastic differences in poverty rates across the state of Virginia, with the northern region having the lowest rates (6.6%) while the south (20.2%) and southwest (18.6%) regions having the highest (2015 numbers). Response: Virginia Cooperative Extension's Family and Consumer Sciences (FCS) and 4H Agents hosted Poverty Simulations to help individuals understand the real-life situations that families living in or near poverty must experience daily. The simulation gave participants a first-hand knowledge of the decisions these families have to make, and their fears and frustrations. In the simulation, 44 to 82 participants assume the roles of up to 26 different a low-income families living on a limited budget. Some families were newly unemployed, some were recently deserted by the primary wage earner, some were homeless, and others were recipients of TANF (temporary assistance for needy families), either with or without additional earned income. Still others were senior citizens receiving disability or retirement checks or grandparents raising their grandchildren. The task of the "families" was to provide for basic necessities and shelter during the course of four 15-minute "weeks." The major strategy of the simulation is to allow participants the opportunity to interact with resources that would be found in low-income communities such as; a bank, childcare center, grocery store, payday/car title lender, employer, utility company, pawn broker, social service agency, faith-based agency, mortgage company, school, and community health care facility. In the	

		summer of 2018, the FCE program team elected to spend $800 to update materials in our Poverty Simulation kits Results: 24 VCE agents and specialists conducted 21 poverty simulations reaching 1384 participants in 2019. 645 volunteers contributed 1971 hours in volunteer time equaling $54,202.50 ($27.50/hr). Of those surveyed: 97% stated that the simulation changed their views and increased empathy toward those facing poverty, 97% changed their view regarding financial pressure of those facing poverty, 96% changed their views regarding the impact of social services and other resources available for those facing poverty, and 97% changed their views regarding the emotional stress of those facing poverty.	
24.	**Master Financial Education Volunteer Program**	Relevance: While the median household income in Virginia which was $68,766 for 2018 is higher than the median U.S. household income of $57,652 (Census.gov, Dec 2018). Virginians also take on more debt than the typical U.S. household. For example, Virginia is among the top ten states with the highest level of household debt (Federal Reserve Bank of New York, 2018). At the national level, the 2018 Consumer Financial Literacy Survey prepared by Harris Poll found that 79% of adults would benefit from advice and answers to everyday financial questions and 73% are currently worried about their personal finances. The same survey revealed that 24% reported finding it difficult to reduce debt due to unexpected financial emergencies. Eight percent of all adults have debts in collection with Millennials (ages 18-34) having a greater percentage in collection – thirteen percent. The well-being of Virginians depends on individual and family financial capacity. Financial capacity will enable individuals to make informed choices, sound decisions, and avoid financial pitfalls, as well as obtain knowledge of strategies to implement during	3

		times of financial crisis. The process of developing financial capacities will provide individuals the appropriate tools to understand and apply financial products, services, and concepts in an effort to improve their financial situation. The well-being of Virginians depends on individual and family financial capacity. Financial capacity will enable individuals to make informed choices, sound decisions, and avoid financial pitfalls, as well as obtain knowledge of strategies to implement during times of financial crisis. The process of developing financial capacities will provide individuals the appropriate tools to understand and apply financial products, services, and concepts in an effort to improve their financial situation. These numbers reveal the urgent need for Virginians to receive education to improve their financial literacy to improve their money management skills and make wise financial decisions. VCE agents are skilled at providing financial education to youth and adults; however, there are too few agents to meet the needs of financial education in the state of Virginia. Trained volunteers allow us to reach more participants. Response: The Master Financial Education Volunteer Program curriculum covers multiple personal finance topics and provides a standardized training program across the state. Volunteers receive a minimum of 20 hours of classroom training, led by a Virginia Cooperative Extension agent. In return, these volunteers give back a minimum of 40 hours in volunteer time. To aid in training, Dr. Mountain disbursed $2,400 out of the Celia Ray Hayhoe endowment to be used to be used by VCE agents to support their training. Additionally Dr. Mountain provided one AFC scholarship out of personal program funds totaling $1250 to help support VCE agent training.	

		Results: The pool of Master Financial Education Volunteers (MFEV) has steadily grown over the past few years. In 2019 11 VCE agents were involved in training 91 volunteers (79 of whom have graduated from the program) in 9 different cohorts. The 79 graduates compared to 130 in 2018, 115 graduates in 2017, 188 graduates in 2016, and 100 graduates in 2015. In 2019, 211 Master Financial Education volunteers contributed 5035.8 hours (up from 205 MFEV and 4311 hours in 2016 but down from 353 MFEV and 9912 hours in 2017 and 324 MFEV and 8191 hours in 2018) equating to $138,484.50 ($27.50/hour). These volunteers assisted with a variety of programs such as: one-on-one financial counseling, Reality Store, Kids Marketplace, poverty simulations, youth money management workshops, Money Smarts Pay, Money Talk, just to name a few.	
25.	**Youth Financial Management**	Relevance: The 2018 Junior Achievement/The Allstate Foundation reported that 72% of teens look to their parents for money management information. The report also shows that 50% of youth have a goal of creating a savings plan while 43% are concerned that they do not have the skills to manage their money. Meanwhile, America Saves (2015) state that while youth are aware that it is important to save, they don't know how to save. Seemingly, youth are eager for financial education, but lack the resources to achieve financial literacy. For many, attending college will be one of the earliest major financial decisions one makes. This year, Junior Achievement/ The Allstate Foundation released a report stating only 50% of adults between the age of 18 and 29 were "very confident" in their ability to pay off their student loan. It is quite possible that this lack of confidence stems from an underlying misunderstanding of personal finance topics. While Virginia was one of 37 states requiring implementation of personal finance state standards and one of 17 states requiring students to take a personal finance course, it is NOT one of the 7	3

		states that require personal finance student testing (councilforeconed.org) as of 2018. The Program for International Student Assessment (PISA) reported that of 15 year old students from 13 countries, the United States scored less than average. All of this is evidence that there is a need for more youth financial education. A 2016 Bank of America/USA TODAY Better Money Habits Report found that young Americans 18 – 26 years of defined adulthood as "financial independence. This population indicated they wished they had learned more about personal finance in school. Only 31% reported their high school did a good job teaching financial skills and only 41% of those attending college reported that their college did a good job. Response: Virginia Cooperative Extension uses several approaches and programs to educate youth and increase the financial capacity of Virginia's youth. The program's goal is to educate students about sound money management skills and the financial planning process and to help them begin to develop positive behaviors that are necessary to attain financial maturity and achieve a secure future. VCE offered Reality Store simulations, Kids Marketplace simulations, Real Money Real World simulations, and Reading Makes Cents. Each of these programs offers hands-on learning in an environment that correlates to Standards of Learning and educational mandates. Results: 24 agents conducted a total of 66 Kids Marketplace simulations in 2019 with an audience of 2530 children. Of those surveyed, 79% of these youth learned more about using money, 81% learned that different jobs pay different amounts of money, 81% reported that the program gave them new ideas on how to handle money in the future, and only 10% of	

		youth did not plan on talking with their parents about money and the program. 71 agents conducted a total of 227 Reality Store programs in 2019 with an audience of 11,623 children. Of those surveyed, 93% stated the program increased awareness of making smart financial decisions and 92% reported that having insurance and a savings account would help plan for emergencies, and 75% reported there is a clear relationship between my performance in school, my participation in community activities, and my future occupation. 11 Agents conducted 45 Real Money, Real World programs in 2019 with an audience of 2053 children. Of those surveyed, 80% indicated they will think through how spending impacts other opportunities and choices and 66% stated this program helped them decide they will seek out more training or education after high school. Combined, 15,419 Virginia youth were reached by Extension Financial education in 2019, an increase from 14,955 in 2018, 13,497 in 2017, 10,573 in 2015, 9046 in 2014, and 7681 in 2013 but a decrease from 15,787 youth in 2016. We relied on many volunteers to help us accomplish these goals. In total, 2,135 volunteers contributed 10,884.15 hours equating to $299,310 ($27.50/hour) in 2019. This compares to 1,904 volunteers and 9,964.5 hours in 2018, 1,734 volunteers and 7,519 hours in 2017, 2,381 volunteers and 11,346 hours in 2016, and 1015 volunteers and 5500 hours in 2015.	
26.	**Leadership, Volunteerism, and Civic Engagement Program Team Impact**	RELEVANCE: “People have the inherent capacity to solve their own problems and that social transformation is within the reach of all communities" (Kellogg Foundation, 2009). However, there is a need to prepare volunteers, civic leaders, and elected and appointed officials to be the force for positive change within their communities. Research supports this notion that community leaders need to be involved in the decision-making process and problem solving to help organize and develop their	3

		communities. Yet, there is often a lack of formal leadership training that equips community leaders with the skills necessary to effectively meet community needs (Tackey, Findlay, Baharanyi, & Pierce, 2004). Educational programs focused on leadership, volunteerism, and civic engagement can build the capacity of youth and adults to effectively participate in community planning and decision-making. However, Virginia Cooperative Extension's Unit Situation Analysis and Issues Reports reveal three key related needs: (1) need for prepared leaders, (2) need for more representative civic engagement, and (3) limited capacity to foster volunteerism. RESPONSE: The Leadership, Volunteerism, and Civic Engagement (LVCE) Program Team offers VCE professionals an opportunity to "buy-in" to the associated action plans. For calendar year 2019, a total of 80 agents and 21 specialists bought-in for 20.7 Full-Time Equivalency. The LVCE Program Team supports those agents in their work through professional learning and regular formative evaluation, including quarterly impact evaluation surveys. Areas of work are organized into the following sub-groups: - Civic Engagement: Enhance the capacity of youth and adults to engage in civic activities locally, regionally, statewide, and globally through providing science-based educational tools, resources, programs, events, and hands-on learning experiences. - Community Leadership: Enhance leadership by improving communication and development of an effective decision-making process among individuals, both youth and adults. - Emergency Preparedness: Enhance the readiness of individuals and communities for impending disasters and also recovery after disasters through education of the public and through collaboration with other agencies serving the emergency response community. - Volunteer Management: Foster	

		volunteerism by developing tools and resources to support the best volunteer management practices related to volunteer recruitment, training, and management. RESULT: Community leadership, volunteerism, and civic engagement continue to be large and critical areas for Virginia Cooperative Extension programming. In calendar year 2019, educational contacts reported under the Leadership, Volunteerism, and Civic Engagement (LVCE) Program Team action plans spanned six planned program areas (Agriculture Profitability and Sustainability; Community Viability, Food, Nutrition, and Health; Natural Resources, Environment, and Climate Change; Strengthening Virginia Families; and Youth Development) and totaled 78,080 direct contacts and 66,333 indirect contacts across our sub-teams. In aggregate, the LVCE Program Team work reflects more than one-half million contacts supporting the mission of VCE, helping people put scientific knowledge to work through learning experiences that improve economic, environmental, and social well-being.	
27.	**Virginia Cooperative Extension Volunteers Make Positive Impacts Across the Commonwealth**	Relevance: Volunteering is important in Virginia. More than 2.2 million Virginians volunteer each year, representing more than a third of residents (Corporation for National and Community Service 2018). Research shows that volunteers are more engaged in their communities than non-volunteers and also that there are health benefits to volunteering, especially for older adults (Corporation for National and Community Service 2007). Virginia Cooperative Extension and its many partner organizations need an active base of trained volunteers to meet the growing demand for programming to address community issues. Thus, our	3

		volunteer programs aim to benefit the individual volunteers, our organization, and communities across Virginia. Response: In 2019, Virginia Cooperative Extension continued to coordinate several Master Volunteer programs, including Extension Master Gardener, Virginia Master Naturalist, Master Food Volunteer, Master Financial Education, and Energy Masters programs. These programs provide in-depth training of 20-40 hours to onboard new volunteers and a diversity of service opportunities to engage the trained volunteers in assisting with Extension and other local programming to address community needs. Together, the Master Volunteer programs had more than 7,100 active volunteers in 2019 who provided more than 600,000 hours of service. In 2019, 16,931 adult and youth volunteers supported 4-H members to increase confidence, competence, connection, character, and caring among Virginia youth in rural and urban communities across the programmatic areas of Agriculture; Civic Engagement; Healthy Living; and Science, Technology, Engineering, and Mathematics. Overall for 2019, 29,376 Virginia Cooperative Extension volunteers across all program areas reported 1,164,9340 hours of service. Results: Without volunteers, programming by VCE and its many partner organizations would be greatly reduced. Due to volunteers, VCE is able to answer more horticultural questions from consumers, provide more opportunities for individuals to spend time in nature, help more families reduce their electricity bills through energy conservation, help more youth learn leadership and life skills, and much more. Some highlights of volunteer contributions and impacts in 2019 included:	

		• Extension Master Gardener volunteers worked with Extension Agents on the Healthy Virginia Lawns initiative, aimed at decreasing nutrient runoff from urban turf. Together they engaged 889 clients and wrote 1,093 nutrient management plans that covered more than 261 acres of residential turf. • Virginia Master Naturalist volunteers improved natural resource conditions on more than 580 sites through invasive plant management in parks, maintenance of habitats for pollinators and other wildlife, trail maintenance of hundreds of miles of trails, and litter cleanup events. They also created 60 new habitat sites through planting projects. • Master Food volunteers conducted 200 education programs for adults and youth, reaching more than 900 individuals statewide. In addition, participation in the Master Food Volunteer program increased the volunteers' knowledge of nutrition and led to healthy changes in their own behaviors, such as increasing the number of fruits and vegetables they ate daily. • 4-H volunteers helped provide overnight camping experiences across Virginia at the six 4-H educational centers. This enabled 29,405 youth to engage in 4-H camping - a "sustained experience that provides a creative, recreations, and educational opportunity in group living in the outdoors. It utilized training leadership and the resources of natural surrounding to contribute to each camper's mental, physical, social, and spiritual growth (ACA, 2014)."	
28.	**Community Leadership**	Relevance: Community leaders continue to express the need for increased understanding of the best options for community engagement, facilitation, conflict resolution, meeting management, and strategic or project planning and	3

		implementation. These skill sets are essential for community leaders to support community progress. This need has been validated by the increased number of requests received for assistance in decision-making conversations and strategic planning and Virginia Cooperative Extension is appropriately situated to address solutions to meet this need through program development and content delivery. Response: In response to addressing community leadership needs, Virginia Cooperative Extension equipped its agents and specialists with tools for planning and delivering facilitation services using the Strengthening Your Facilitation Skills (SYFS) curriculum. In addition, specialists are prepared to design a process for planning and decision-making and deliver facilitation support to agencies, organizations, and community groups in Virginia cities and counties. A team of ten agents and two specialists developed, coordinated, and delivered four, 15-hour, interactive Strengthening Your Facilitation Skills (SYFS) Training workshops during 2019. Holding classes in four locations across the state, VCE equipped 60 individuals with various skills and strategies of facilitation for a variety of community-based work. In its second year as an offered short-course in the VCE facilitation series, the 6-hour Strategic and Project Planning training session was taught in three regions of the state to 53 participants. Additionally, VCE responded to a request for a separate in-house SYFS training session with 13 Prince William County Government officials. Virginia Cooperative Extension faculty engage regularly with stakeholders around decision-making and planning topics. In 2019, these stakeholder interactions included: agricultural entrepreneurs, county planners and policy officials, Virginia Association of Soil and Water Conservation Districts, Thomas Jefferson SWCD, Blue Ridge SWCD, Virginia Cattle Industry Board, Virginia Association of Professional Soil Scientists, Virginia Food System Council, Chesapeake Bay Foundation Mountains-to-Bay Grazing Alliance, Virginia Farm Bureau, Virginia Department of Health, National FFA Organization, National 4-H Organization, Extension Committee on Organization and Policy, North Carolina A&T, Federal Aviation Administration, Youth Alcohol & Drug Abuse Prevention Project through Virginia ABC, CALS	

		Global, Leadership Southside, Leadership Amherst, Leadership Fauquier, and the VT Cyberbiosecurity Initiative. Results: Strengthening Your Facilitation Skills training delivered throughout the Commonwealth resulted in positive outcomes for participants. Specifically, 95 percent of the participating individuals reported that they had increased ability to facilitate group discussions after the training. Of those completing the training, 100 percent indicated that their understanding of facilitation values and principles increased, and 100 percent reported the training was either helpful or very helpful for the individuals' particular needs. Of evaluation survey respondents that attended the Strategic and Project Planning training, 92 percent found the session helpful, with 92 percent reporting that they plan to adopt planning skills and practices learned during the training. Also, 94 percent felt it was valuable enough to recommend it to others. Beyond the training and because of the recommendations of Extension agents and Extension's respected reputation, more than 13 organizations/agencies were led through the development and/or implementation of a facilitated decision-making process in 2019 resulting in a strategic plan or a clearly defined organizational focus and/or a plan of work. One SYFS participant wrote, "each facilitator was knowledgeable and gave great suggestions during the assignments." An attendee at one of the SPP courses stated, "Informal nature sets the participants at ease. Engaging trainer willing to utilize a real-world case study rather than the one provided." Of external stakeholder groups contracting VCE support of strategic planning work, one shared that "we now have clarity around mission and outlined goals and objectives that we are putting into action."	
29.	**Virginia 4-H Day at the Capital – promoting youth leadership development and civic participation**	Relevance: Research shows that practices of youth development engage youth in active roles by viewing them as community resources rather than as passive recipients of services. Building leadership development and civic engagement not only empowers youth but improves their motivation for positive changes such as academic performances and career	3

		exploration. The commitments to helping people and involvement in community groups have been associated with gains on achievement testing, school participation, and increased future career goals. Virginia 4-H Civic Engagement programs are a proven catalyst advancing youth academic success and career development. Response: 4-H Day at the Capitol is designed to enhance youth knowledge of governmental procedures and emphasize the importance of citizen involvement in the governmental process. It provides the opportunity to strengthen communication, leadership and other citizenship skills; understand the importance of civic and social responsibilities as they relate to the development of better citizens and leaders; exchange ideas, practice respect and form friendships with other youth of diverse backgrounds as well as experience hands-on learning. In response, participants will observe the legislative process in action, learn more about how a bill becomes a law by participating in a hands-on program, and experience educational tours and meetings of the Richmond historical areas and their local legislators. Results: 279 youth participated in 4-H Day at the Capitol and How a Bill Becomes a Law program with 53% (143) completing the pre/post evaluation. Results indicated that 32% of participants are more interested in getting more involved in the legislative process after participating in How a Bill Becomes a Law; 27.5% of participants can tell others about the process of how a bill becomes a law; and 17% know the purpose of committees in legislation than before participating in the program. One 4-H Volunteer complimented the hands-on How a Bill Becomes a Law	

		program and stated that it was a good way to teach about the process for ideas to become laws.	

4. Food, Nutrition, and Health

Corresponding VCE Program Team:

- Food, Nutrition, and Health

No.	Title or Activity Description	Outcome/Impact Statement	Planned Program Name/No.
30.	**VCE Programming Enhances a Stronger Food Safety Culture in Virginia**	RELEVANCE: Despite efforts nationwide to reduce foodborne outbreaks, illnesses related to consumption of contaminated food continues to occur. In 2018 alone, there were significant outbreaks associated with consumption of lettuce, ground beef, eggs and breakfast cereal. Between 2013 and 2016, the state of Virginia averaged over 2900 cases of foodborne illness per year. For each confirmed case, there are an estimated 20-38 unconfirmed cases; therefore 59K - 112K Virginians are affected annually. The estimated economic loss in Virginia is between 95 and 183 M per year. Regardless of market outlet requirements and size of farm, access to food safety education is crucial. Training and resources must be up-to-date, relevant to stakeholder audiences, and research-based. Ultimately, stakeholder access to the needed trainings and resources will lead to the adoption and implementation of best practices that reduce microbial risks and strengthen a prevention-based food safety culture in Virginia. RESPONSE: Virginia Cooperative Extension (VCE) offers a wide range of national, regional and state specific educational opportunities across the Commonwealth. Each training is tailored specifically to meet specific audience (grower, producer, retailer, consumer etc.) needs. In 2019, the following trainings/ programs were delivered by VCE:	4

		New and expanding food businesses: • Over **400** individuals or small companies were mentored resulting in 124 individual small companies having **412** food products (13% increase from 2018) analyzed by the *VCE process authority*. Farmers market/direct market food producers: • **100** produce growers and farmers market managers were trained in how to increase the safety of produce sold in the local, direct marketplace. • **561** additional Virginians learned how to navigate food safety requirements for opening new markets. This included market sector training and handling requirements based on specific buyer policies (including farm to school). Food service industry: • **664** individuals representing various food service operations (full service, quick service, daycare, assisted living facilities, school food service, volunteer organizations, professional chefs, and regulators who inspect food service operations) were trained in *Food Allergy Awareness for the Food Service Industry*. • **899** food service managers representing **737** different establishments (restaurants, daycares, schools) completed the *ServSafe* for managers 16 hr certification training. • **442** food service employees from 40 different establishments completed the *ServSafe* for employees training. • **176** individuals representing **24** different organizations (churches, civic groups, etc.) completed the Cooking for Crowds training. Fresh Produce Growers: • 91 growers were mentored on-the-farm in identifying risks, with 36 growers developing food safety plans and passing a third party Good Agricultural Practices audit (100% success rate).	

		• Over 700 growers, 20 extension agents, and 45 state/county/city officials attended VCE-led information sessions about the new *FSMA Produce Safety Rule (PSR)*. • 6 Produce Safety Alliance (PSA) Grower Trainings were hosted across VA, resulting in total of 97 growers trained. Completion of the PSA training is a requirement for growers to comply with FSMA PSR. 3 VCE specialists are recognized lead trainers for the PSA and 23 agents are recognized trainers • 12 specialists/agents provided support for 17 *On Farm Readiness Reviews (OFRR)*. OFRRs are a joint program between extension and state government to assist produce growers to meet regulations (program is <2 h and includes a farm walk-thru and conversation on food safety practices). • 11 agents conducted pilot water testing education and cost share for 47 growers, ultimately analyzing 561 samples. Water testing is a costly requirement under the FSMA PSR, and this grant reduced the cost to growers conducting this testing by 50%. <u>Food Manufacturers:</u> • 4 VCE specialists are recognized as lead trainers for the *Food Safety Preventive Controls Alliance (FSPCA)*. The FSPCA oversees the standardized curriculum that is recognized by FDA and required for food producers to comply with FSMA. • 50 food manufacturers completed FSPCA training, and 42 completed a FSPCA refresher course requested by VDACS. • 273 clients from over 100 companies were trained in HACCP, *Good Manufacturing Practices (GMP),* Food Processing Sanitation, and Food Recall management. • 1 of these GMP trainings was delivered to 8o participants in Spanish. • One-on-one assistance with HACCP plans (2), SOP writing (2) and sampling (1200) for seafood industry in Hampton.	

		The following additional outputs were: • **10,507** page views for Virginia Produce Food Safety website from the US and dozens of other countries. • **46** new or revised Extension publications The infrastructure and capacity of VCE trainers (specialists/agents) across the Commonwealth is: • **15** Servsafe instructors • **1** PSA trainer of trainers, (only approximately 15-20 TOTs in the US!). • **3** PSA lead trainers • **23** PSA trainers • 5 HACCP trainers • 4 FSPCA trainers • Many of these efforts have been supported by grant funding. • Board/ committee members for the following food safety professional organizations: Conference for Food Protection, International Association for Food Protection, Seafood HACCP Alliance, International HACCP Alliance, Association of Food and Drug Officials, RESULTS: The outcomes from the previously mentioned trainings have been significant, resulting in 1,803 clients receiving certificates from national programs. These were required for them to comply with state and national regulations. Briefly, 1,341 retailers, 288 produce growers, and 323 food manufacturers were able to maintain their businesses or open new markets as a result of VCE programs. Additional impacts include: • 114 (28%) products evaluated for safety through the Food Innovation Program required reformulation changes to ensure their safety prior to entering into commerce. • Fresh produce growers intended to do the following to reduce contamination risks: (i) Provide more food safety training for workers; (ii) Testing quality of water used for irrigation; (iii) Improve handwashing and toilet facilities for	

		workers; (iv) Improve cleaning and sanitizing methods; (v) control/monitor animals on the farm/packing/storage areas; (vi) Use safer methods (temperature control, sanitation etc.) for storage and transport of product to marketplace; and (vii) Document food safety practices. • 100% of grower training participants increased their knowledge with an average of 5 point increase in test scores. • Growers participating in the water testing pilot program saved a total of $5,610 in water analysis costs, as well as an estimated $4,500 in travel and/or mailing costs provided through agent coordination of sample collection and handling to the four laboratories • 39% of growers that were mentored in conducting on-farm risk assessments, implementing best practices, and developing food safety plans, passed third party food safety audits, thereby opening new markets for their products. • 100% individuals completing food allergen training increased their knowledge and confidence in their ability to serve people with food allergies safely. Additionally, this program was the Southwest District Winner for the 2018 VCE Program Excellence Award for New Initiatives. Efforts described herein have been critical for building capacity for VCE to deliver extension food safety programming to help meet a wide range of producer needs and challenges, although longer-term economic or public health impacts of this work are yet to be fully measured. If we estimate that one foodborne illness for every person certified in a food safety program was preventive, VCE programs may have saved VA over 2.9M dollars in healthcare costs. Additionally, the capability to provide trainings in Spanish-language ensure proper understanding and application of food safety systems by the high portion of Hispanic owners and employees	

		working in the food service and food processing industries in Virginia. This multi-leveled approach is cultivating a stronger food safety culture across the Commonwealth, thereby resulting in safer food, starting new businesses, opening access to new markets, and complying with regulatory guidelines.	
31.	**VCE Home Food Preservation Expertise Prevents Illness, Reduces Public Cost across Virginia**	Relevance: The number of consumers preserving foods at home continues to increase as more consumers emphasize greater control over what they eat and where their food comes from. Failure to adequately preserve foods in the home can result in foodborne illness. Foodborne botulism is a severe form of food poisoning. Most of these cases are associated with improperly processed home-canned food. Just one case of botulism can cost $1,680,903 related to medical services, deaths, lost work, and disability. In order to prevent illness, it is essential that consumers follow validated recipes when preserving foods at home. Extension educators are recognized as a credible resource for home food preservers. Response: To help ensure safe home food preservation methods Virginia Cooperative Extension agent(s) in 23 County (ies) provided food preservation trainings and support in 2019. 214 individuals attended general classes on home food preservation. Some received more in-depth training including: • 135 individuals attended hands on boiling water bath canning classes for canning high acid foods (jams, jellies, pickles, fruits, etc...). • 66 individuals attended hands on pressure canning classes for canning low acid foods (vegetables, meats, fish, etc.…). • 10 individuals attended hands on fermentation classes	4

		• 33 individuals attended freezing and/or dehydrating classes • Additionally, VCE provided pressure canner dial gauge inspection for 60 residents and provided one-on-one individualized home preserver support via phone/e-mail to over 164 residents in across Virginia. Results: Home food preservers completing education through VCE programs were evaluated to determine their knowledge gain in safe home food preservation techniques and how the training impacted their future behaviors. One-hundred percent of Virginia residents working with VCE increased their knowledge on how to preserve foods safely at home. Follow up discussions with several participants revealed that even long-time home canners were using unsafe canning methods. Canning low acid foods using the water bath method carries a botulism risk, at least two participants confessed to using this method and that they were going to change this behavior. One specific comment was: "I have canned for years, but I learned so much last night about safely canning and available resources, I feel even more confident moving forward". Use of an inaccurate gauge can lead to under processed foods which could create a botulism risk. Of those tested, 18 (30%) were inaccurate and recommended to be replaced. It is assumed that if one case of botulism can be prevented through replacement of an inaccurate dial gauge, the potential annual savings to the State of Virginia can be approximately 30 million dollars.	
32.	**Low income, minority families saved over $54,000 in annual food bills through VSU Expanded Food and Nutrition**	RELEVANCE: The monthly cost of food for a family of four is not cheap. The range in food costs for a family of four spans from $654 (thrifty) to $1,300 (liberal spending) per month. According to USDA (2020), families of four bringing home up to $2,655 per month, only receive $640 in food	4

	Education Program (EFNEP) Trainings	stamps which is $14 short of the "thrifty" food budget! Many families, especially ones that struggle financially may benefit from learning how to stretch their tight food budget. Stretching a limited food budget includes learning how to use low cost foods in balanced healthy meals for the entire family. Nationally, more than 80% of families enrolled in Expanded Food and Nutrition Education Program (EFNEP) classes survive at or below the 100% poverty level, with the majority (70%) of participants being minorities. Research studies demonstrate that poor health and chronic diseases such as diabetes, disproportionately plague low-income and minority populations and incorporating a healthy diet reduces chronic disease outcomes. Covering the food costs involved in making healthy meals is a recurring challenge for low income families. Additional education is needed to assist low income families to successfully navigate healthy balanced eating within their limited budget constraints. RESPONSE: In 2019, the VSU Expanded Food and Nutrition Education Program taught and graduated 66 low income and minority participants. Each individual was required to attend eight different class events. The participants learned how to improve their diet with nutrition knowledge and skills. Participants learned the following skills: 1) How to spend less on food bills and 2) How to increase their physical activity levels by moving more each day and incorporating simple exercise routines in daily activities. RESULTS: As a result of graduating from the 2019 VSU Expanded Food and Nutrition Education Program, participants saved an average of $68.64 on their monthly food bills totaling $823.68 annual savings. Combined annual food savings for all participants was $54,362.88. Sixty graduates stated	

		that their diet quality improved after participation. Additionally, 51 participants increased their exercise activity from 0 minutes per day to 30 minutes or more per day improving their positive health outcomes such as reduced risk of chronic disease development over their lifetime.	
33.	**Protecting Milk Flavor and Nutrients During Retail Storage Planned Program**	Relevance: Milk quality is often diminished in retail dairy display cases because of lighting and if protective packaging is not used. Fluorescent and LED lighting causes flavor degradation and loss of nutrients. Consumers do not like the resulting flavor, which influences milk sales. Dairy processors and retail supermarkets can benefit from guidance for fluid milk packaging and retail lighting to protect milk quality before consumer purchase. Response: Researchers in the Virginia Tech Department of Food Science and Technology evaluated the light protective efficiency of milk packaging with different light-blocking pigments (white, yellow, none) in a retail dairy case. LED lighting conditions in the dairy case modeled different color temperatures: 'warm white' looks yellowish white; 'daylight' is described as neutral white and is the commonly used lighting conditions; and 'cool white' is viewed as bluish white. Analytical measurements to assess indicators of oxidation, a reaction that causes the degradation of flavor and nutrients, were completed. Results: Warm white lighting (higher color temperature) caused more oxidation, with greater loss of Vitamin A and Vitamin B2 (riboflavin) when milk was packaged in traditional translucent milk packaging. Milk packaging with yellow pigmenting or a greater concentration of white pigmenting provided much greater protection of milk quality. Low LED color temperature (cool white; bluish appearance) lighting caused less damage than the other retail lighting conditions but consideration of	4

		consumer perception of visual display is also important. Key points from this and related research include: • Guidance on fluid milk packaging criteria for protecting fresh milk flavor and nutrients is available • Guidance on dairy case lighting criteria for protecting fresh milk flavor and nutrients is available • Results contributed to development of a methodology for predicting milk packaging success in protecting fresh milk flavor and nutrients A major retail case manufacturer is using this information for providing lighting guidance to retail supermarkets and other vendors. A major manufacturer of food grade pigments for food packaging is using this information for providing milk packaging guidance to dairy processors. The information is also being distributed through peer-reviewed publications and other resources.	
34.	**Sweet gardens of hope: Fresh fruit for inner-city food desert communities**	RELEVANCE: Gilpin Court is the largest public housing community in Richmond, Virginia. Eight hundred families, mostly single mothers raising children with an average annual income of $8,786, live within the impervious concrete walls of 77-year-old structures overlooking a tree barren landscape. The Gilpin Court is geographically isolated despite being "in the heart" of culturally vibrant Richmond city. Bordered on the south by a highway and on the north by a ravine, low income residents of Gilpin Court have restricted access to healthy foods, such as fruits and vegetables. With a lack of easily accessible grocery stores, underserved residents rely heavily on prepared, highly processed convenience store foods for daily meal consumption. Without inclusion of often expensive fruits and vegetables into a daily diet, Gilpin Court residents are at a high risk for obesity.	4

		RESPONSE: In 2019, Urban Forestry Extension Specialist Joel Koci of the VCE at VSU worked with Lewis Ginter Community Garden and City of Richmond Parks and Recreation Department to install fruit tree gardens within select inner-city locations. Koci trained community volunteers on 1) How to select fruit trees appropriate for the specific site conditions; 2) How to properly install fruit trees and 3) How to maintain planted fruit trees using sustainable growing methods (low or no pesticides). Inner-city fruit orchard gardens were established in four low income areas in Richmond: Gilpin Court Public Housing complex, Lumpkin's Slave Jail site, Fulton Bottom and Forest Hill. RESULTS: In 2019, 80 community volunteers (which included 10 youth and 40 senior citizens) planted 90 donated fruit trees (purchased by the Lewis Ginter Community Garden program). At each of the four sites, nine apple trees and four pear trees were planted with a conservative yield estimate of 125 apples per tree per year and 100 pears per tree per year, under low maintenance, sustainable growing practices. In 2021, each site will result in a conservative, minimal yield estimate of 1,125 local and sustainably grown apples and 400 local and sustainably grown pears valued at $2.75 per pound at local Richmond Farmers' Markets. There are two apples in one pound or two pears in one pound. Estimated annual food bill savings for residents at Gilpin Court in fresh fruit expenditures total $2,098 ((563 pounds of apples + 200 pounds of pears) x $2.75). The typical life span of an apple or pear tree in the wild is 50 years. Therefore, over the span of 48 years, the Gilpin Court residents will enjoy over $100,716 worth of free, fresh fruit (763 pounds of fruit per year x $2.75 per pound x 48 years). Additionally, all four areas over the next 48 years will provide underserved,	

		inner-city residents with a minimum total of $402,864 worth of free, fresh fruit.	
35.	**Expanding the Impact of Virginia Cooperative Extension on Diabetes Through Balanced Living with Diabetes, and the National Diabetes Prevention Program**	RELEVANCE: Diabetes is a growing health problem in the United States. Over 30 million Americans are living with diabetes, and 84 million have prediabetes. Prediabetes, if not treated, leads to type 2 diabetes within five years in up to 30% of people. Poorly controlled diabetes is the seventh leading cause of death in the US, and the leading cause of kidney failure, lower-limb amputations, and adult-onset blindness. The CDC has raised the alarm of the future impact of growing diabetes rates on our healthcare system: "More than a third of U.S. adults have prediabetes, and the majority don't know it. Now, more than ever, we must step up our efforts to reduce the burden of this serious disease (CDC Director Brenda Fitzgerald, M.D.). The National Diabetes Prevention Program was formed by the CDC to expand availability of intensive lifestyle change interventions to people with prediabetes to reduce their risk for developing diabetes. RESPONSE: The Food, Nutrition and Health program team is promoting the expansion of evidence-based diabetes prevention and lifestyle management programming by Virginia Cooperative Extension. VCE has joined the National Diabetes Prevention Program to turn the tide of rising diabetes rates in Virginia and is expanding capacity to conduct the 12-month CDC recognized diabetes prevention program (DPP), and the Balanced Living with Diabetes (BLD) lifestyle management program throughout the Commonwealth. RESULTS: VCE faculty conducted seven BLD programs in 6 Central and Southwest Virginia counties, providing valuable information on diabetes	4

		lifestyle management skills to 80 residents in underserved communities. Seven Extension agents were trained in 2019 as Lifestyle Coaches to conduct the DPP, increasing the number of trained coaches to 18, and the VCE capacity to provide the DPP to 25 Virginia counties. Six DPP programs reaching 49 people with prediabetes in 2019. Forty-six percent of those who completed the 12-month DPP program lost weight, with an average loss of 3% of body weight. Seventeen percent of attendees lost 5% or more of body weight, 55% indicated increased compliance with physical activity guidelines, 76% increased their ability to balance eating and physical activity for weight loss, 75% improved their ability to make healthy food selections, and 72% increased their ability to manage stress in healthful ways. Importantly, 93% of those completing the DPP program indicated that they felt healthier after completing the program, and 100% planned to continue a healthier lifestyle in the future. We reached a diverse audience of men and women that ranged in age from 38 to 74 years and had a racial composition of 60% black, 38% white, and 2% Native American. Some dramatic outcomes have also been experienced, as evidenced by one participant, "Hi; I just got back from my doctor's appt! I have very good improvement in my labs. My A1C is 5.6!!! They were over 6. I am no longer in prediabetes. All my other labs are better. YAY. She was so excited about my weight loss too. This is what I really was working towards- a healthier me. Thanks for teaching me how to be healthy."	
36.	**Physical Activity Program Outcomes**	4H Mindfulness Tools: On June 24, 2019, 43 high school students attended a Mindfulness Tools workshop in Blacksburg, VA. No outcomes were assessed aside from reach.	4

		FitEx. In the spring of 2019, 41 participants from Culpeper County collectively trekked 12,217.05 miles in 8 weeks. Participants reported consuming 1.5 cups of fruit and 2.8 cups of vegetables—matching the Dietary Guidelines for Americans. When asked, "In general, compared to others your age, how would you rate your health," 60% reported that they were somewhat healthy, reported very to extremely healthy (30%), and one participant reported not healthy (10%). This indicates that FitEx can be appropriate for a diverse group of individuals seeking health promotion habits! LIFT: In 2019, LIFT was offered through two approaches in Virginia. This year, 83 participants across seven counties of Virginia—Charlotte, Lunenburg, Madison, Portsmouth, Spotsylvania, Rappahannock, and Roanoke. Agents reported positive perceptions of program delivery, including that their participants were still meeting after the program and even "asking for weights for Christmas." A number of participants had limited mobility including collar bone issues, two knee replacements, torn rotator cuff, use of a walker, stroke, or other illness. This led to higher-than-expected drop out rates. However, agents retained 54% of participants for data collection, which is 3% higher than a typical behavior change intervention! Twenty-six participants (54%) completed post program functional fitness assessments and 23 participants (48%) completed the post program survey. Data are reported, in aggregate, and only for those present at follow-up (e.g., no intent-to-treat analysis). Highlights of reported program impacts include increased fruit consumption, increased number of days participating in moderate intensity aerobic activity, increased confidence in meeting physical activity recommendations, and increased social connections with relatives in	

		person and group events. Objective measures include improvements in lower and upper body strength, cardiovascular health (through 2-minute step test), and improved agility. However, the measures did not show improvements in flexibility or balance. LIFT only: The 48 participants were predominantly female (85%) and 44% represented races other than Caucasian (representing a 38% increase in racial diversity when compared to 2018!). The average Body Mass Index (BMI) of participants was 28.5(+8.15) kg/m2, with participants representing normal weight (31%), overweight (24%), or obese (25%) BMI categories. Notably, 20% of the participants did not report their height/weight to calculate BMI. Ninety-one percent of the participants had not previously participated in LIFT, and 67% of participants had not previously participated in any Cooperative Extension programming before.	
37.	Addressing Food Access with Intergenerational, Community-Based Strategies in Lynchburg, VA and Columbus, OH (Multistate)	Relevance: More than 1.7 million Virginians, including 480,000 children live in low-income areas with limited supermarket access. Research indicates that people living in communities with low food access suffer from disproportionately high rates of obesity, diabetes and other diet-related diseases. The national nonprofit organization, The Food Trust, along with the American Heart Association, found that many lower-income communities in Virginia have both poor supermarket access and a high incidence of diet-related deaths. Lynchburg is one community that has been identified as a food desert. Lynchburg's low food access rate is 26.4%, compared to 7.3% nationally. In the Near East Side of Columbus, Ohio, similar concerns have been raised. Moreover, the age groups most affected by food insecurity tend to be older adults and young children.	4

		Response: Recognizing the need to work with communities on this complex issue, a team from Virginia Cooperative Extension and the Ohio State University submitted and received a $1.2 million USDA-CYFAR grant to implement a community-based intergenerational project, namely Food for a Long Life (FFLL), in Virginia and Ohio. The goal of the Food for a Long Life (FFLL) research project is to improve food security of young children and their families by increasing healthy food access, consumption, and nutrition education. A community-based participatory action research (CBPAR) approach is being used in combination with intergenerational (IG) strategies to meet project goals in the Near East Side of Columbus, OH and Lynchburg, VA. After an initial period of community-based participatory action research activities and 14 listening sessions, programming began in both states with preschool children and older adults in four sites. Virginia also hosted two Community Council meetings attended by an average of 10 community partners, as well as two staff focus groups at the child care and adult day care sites to discuss FFLL implementation. And to support sustainability, build capacity, and extend program reach, intergenerational training was provided to 17 staff representing two sites in Virginia. Results: During the past year, Food for a Long Life (FFLL) has illustrated the Community Based Participatory Action Research (CBPAR) approach by continuing to have Discovery/Community Council meetings in each community as an iterative process that allows community stakeholders to inform future goals and direction of the project related to increasing healthy food access, education, and consumption. Discovery Councils discussed program ideas followed by mapping them to outcome measures and implementation strategies. From this information and to address sustainability of the project, the research team collaborated with	

		Extension nutrition specialists to gain access to SNAP-Ed resources in each state. The research team collected consent and baseline data from four childcare sites on specific dates from August-September 2018. Follow-up data from participants at the four sites were collected in November 2018 and April-May 2019. The research team also specifically conducted staff focus groups interviews across sites in May and June 2019 to inform programming for Year 4 of Food for a Long Life, consistent with a CBPAR approach. Working with a SNAP-Educator in Virginia, a market day was offered at one early childhood education site where the majority of children qualified for SNAP benefits. Children were able to practice good nutrition and numeracy skills by selecting from available produce to carry home and share with their families. Also the SNAP-Educator and a local church contributed to prepare snack bags immediately prior to the winter and spring breaks, providing children with additional food when they would not be in school for an extended period of time. FFLL coordinated the event and provided some food and carrier bags for the effort. In Virginia, FFLL delivered or supported 11 single generation nutrition education programs at one childcare site (White Rock Head Start) for approximately 120 children. At this site, two classrooms (36 children) also participated in seven intergenerational nutritional activities at the older adults' site (Program for All-inclusive Care of the Elderly: PACE) where approximately 32 older adults joined in as active participants or observers of programming. Two focus groups were held with staff at both sites. Data from the staff focus groups indicated their observation of positive results from participation. Specifically, one staff member at the childcare site stated “parents are commenting that kids will point out veggies at store and say “I had that”, commenting that kids are more likely to try new things – the courtesy bite.” Another staff member reported “At the start,	

		about 30% of the [120] children would try the new foods, and now close to 100%." Staff at the preschool center also noted that "The kids were more likely to try things with the elder there," indicating a positive influence in trying new fruits and vegetables during intergenerational program beyond the child-only (single-generation) lessons. The staff at PACE, the older adult day site, also observed positive impacts from the programming with their participants. The dietician at PACE specifically articulated: "One of the aspects that I see….We serve a population that has a high level of mental disorders, a lot of depression because of circumstances and history and everything. We deal with a lot of pain management…. Bringing in children and stuff takes away the pain. It really does. With the depression, too, the biggest thing you want is that social engagement. Having social engagement with children is a perspective they often don't get, because it's older people…." Another staff member reported "Being able to spend time with the children that we bring in, sometimes that just makes their day, just everything to them." Earlier data from listening sessions and observations revealed that some of the staff at the child care/Head Start center were personally challenged with accessing healthy food and/or struggled to make healthy food choices. One action that changed, as reported in the focus groups, is that staff at the child care site were motivated to choose healthier options. "I started Biggest Loser [weight loss competition among staff]. There are more fruit trays and veggie trays at our staff events." Focus group responses also led to a request for additional intergenerational programming options, as both the adult and child sites continue to see positive changes physically and socially. Expanding upon the work, FFLL also delivered single generation nutrition education programming at Rivermont Early Learning Center, reaching approximately 40 children. And five family events were hosted by FFLL	

		(with an average of 10 families of children and staff as well as 6 stakeholders attending each session). In addition, access to food was provided to approximately 178 families (children and staff) at one childcare site (White Rock Head Start) and approximately 98 older adult participants (PACE) through food distribution (strawberries and snap peas). To further address the noted concerns with food access and food security, FFLL was able to leverage partnerships to secure donated food from the Blue Ridge Food Bank and purchase additional food at very low-cost to send food backpacks home with 150 preschool children during the extended winter break. As reported at listening sessions, focus groups, and in staff conversations, the children are typically provided breakfast and lunch during the school-day. Extended breaks leave a number of the families struggling to provide the meals and snacks. In preparation for the upcoming spring break, FFLL staff have already connected with partners and stakeholders, including Lynchburg Community Action Network to ensure food backpacks will be sent home with the preschoolers.	
38.	**The Virginia Family Nutrition Program Combats Hunger through Comprehensive Programming**	Relevance: In 2017, 11.8% percent of Americans or 15 million people were living in food-insecure households. The figure was higher for households with children at 15.7%. Virginia averages a lower food insecure rate than the national average, 9.8% (based on 2013-2015 data), however it still poses large concerns. Food insecure households are uncertain of having, or unable to acquire, enough food to meet the needs of all of their household members due to limited money or resources. They are more likely to make food budget adjustments, reduce food intake, and change the types of food served, resulting in lower fruit, vegetable, and dairy consumption and higher consumption of fat. In spite of local, state, and federal nutrition assistance resources, food assistance is still not enough to prevent all people from being hungry. About 55% of households living at 130% of the	

		federal poverty level who receive SNAP benefits for 12 months are still food insecure by the end of each month, highlighting the importance of pairing assistance with education to improve household food security. Response: The overall mission of the Virginia Family Nutrition Program, consisting of the Expanded Food and Nutrition Education Program (EFNEP) and the Supplemental Nutrition Assistance Education Program (SNAP-Ed), is to provide quality nutrition education and address food- and nutrition-related concerns and food budget constraints faced by food insecure individuals and households. To this end, the Virginia Family Nutrition Program aims to improve dietary habits, physical activity, and access and availability to affordable and nutritious foods and beverages and opportunities for physical activity through: individual or group-based nutrition education, health promotion, and intervention strategies; comprehensive, multi-level interventions at multiple complementary organizational and institutional levels; and community and public health approaches to improve nutrition. These approaches span the four cornerstone initiatives of the Virginia Family Nutrition Program: Peer-led Nutrition Programs; Volunteer-Led Nutrition Programs and policy, systems, and environment-focused initiatives (led by Family and Consumer Science SNAP-Ed Extension Agents); the Food Access and Availability Initiative; and the Nutrition and Physical Activity Social Media and Support Initiative. Assessment and evaluation and partnerships and collaborations lay the foundation for the entire program. The Peer-Led and Volunteer-Led Nutrition Programs utilize evidence-based educational programs that include menu planning, preparing meals at home, food buying, food safety and storage to address food insecurity and combat hunger. Key messages include buying locally grown foods and encouraging gardening and	

		appropriate food preservation as well as raising awareness of community resources as strategies to access affordable and nutritious foods to meet food security needs. The Food Access and Availability Initiative strives to ensure that individuals and households at risk of food insecurity or hunger can conveniently purchase low-cost, nutritious items. The Nutrition and Physical Activity Social Media and Support Initiative supports key food and nutrition messaging through social media, including Facebook, Pinterest, Instagram and Twitter, to help shape social and cultural norms and values. Results: Youth and adult participants improved their behavior as a result of participating in Peer-Led nutrition programs. Efforts have been taken to provide additional curricula and training to Peer Educators to help with engagement of young families. Family and Consumer Science (FCS) SNAP-Ed Extension Agents have been provided with additional training opportunities to help expand SNAP-Ed efforts to elicit policy, systems, and environmental changes within their communities as "Agents of Change". FCS SNAP-Ed Agents also continued recruiting and training volunteers to deliver nutrition and physical activity focused education throughout the state. A total of 683 volunteers were trained by SNAP-Ed FCS Agents. This effort was leveraged into 6,299 total volunteer hours and service to 3,764 adults and 52,482 youth clients. In addition, volunteer efforts resulted in 580,728 indirect contacts, including media. The Food Access and Availability Initiative has continued to evolve to better partner with new statewide groups working on increasing SNAP sales at farmers markets. The partnership between the Family Nutrition Program and the Virginia Farmers Market Association has continued to grow. Additionally, nine additional partnerships were added to the Shop Smart, Eat Smart FNP signature program The Social Media and Support Initiative has shifted to	

		better support nutrition education in the field. The county-level Facebook pages have been consolidated into one statewide page. The website was designed with a strong emphasis on food and recipes to appeal to young families while also tying in content related to shopping on a budget, physical activity, cooking skills, and work with SNAP at farmers markets and food retail partnerships. The Virginia Family Nutrition Program intends to continue to grow, reaching more individuals with comprehensive, multi-level interventions in the future with the strong foundation established this year and previous years.	
39.	**Reaching Virginia Adults ages 45+ using the Healthy Eating and Staying Active as We Age Curriculum**	Relevance: Nationally, almost 39.6% of adults are obese. Virginia ranks 28th in the U.S. with an adult obesity rate of 30.4%. Obesity can result in numerous health and economic concerns. Health consequences include higher risk of heart disease, stroke, type 2 diabetes, and certain types of cancer. Older adults are at an even greater risk for malnutrition and chronic diseases than younger adults. Improvements in nutrient intake and physical activity levels can help alleviate, manage, and prevent many of these risks. By 2034, older adults are projected to outnumber children for the first time in United States history. Due to this shift in demographics, nutrition education and health-related resources specific to older adults has become increasingly critical. Response: The need for an evidence-based nutrition education program that targets these specific needs of the aging population was identified by Virginia's Family Nutrition Program. The Family Nutrition Program developed the Healthy Eating and Staying Active as We Age (HESA) Curriculum in FY 2018 and piloted in the program in FY 2019. The HESA curriculum is comprised of nine, 60 minute lessons consisting of nutrition education, food tasting experiences, physical activity engagement, and hands-on activities relevant to the lessons. Lessons were implemented by	

		SNAP-Ed Program Assistants for adults ages 45 years and older in community settings across Virginia. Results: A pre/post questionnaire with responses rated on a Likert type scale was used to evaluate changes in participants' food resource management, nutrition and physical activity, and food safety behaviors as following participation in the program. Perceptions of food accessibility and affordability were also evaluated. The five point Likert scale ranged from No or Never (1), to Almost Always (5). A sample of HESA participants (n=278) reported statistically significant improvements in frequency of shopping with a grocery list (2.71±1.43 pre to 3.44±1.42 post)and planning their grocery shopping to avoid food waste (3.39±1.29 pre to 3.79±1.17 post); consumption of fruits (2.73±1.15 pre to 3.40 to 1.18 post), vegetables (2.76±1.22 pre to 3.39±1.13 post), dairy (2.64±1.18 pre to 3.14±1.20 post), lean protein (3.15±1.10 pre to 3.61±1.03 post), and sugar sweetened beverages (SSBs, 2.36±1.26 pre to 2.00±1.06 post); performing physical activities (2.95±1.22 pre to 3.27±1.16 post) and decreasing sedentary behaviors (3.13±1.16 pre to 3.45±1.09). There was also a statistically significant increase in perceived affordability of healthy food (3.18±1.30 pre to 3.49±1.17 post), perceived accessibility of fruits and vegetables (3.25±1.22 pre to 3.57±1.06 post), and perceived increased opportunities to be physically active (3.43±1.20 pre to 3.72±1.12 post) following participation in comprehensive SNAP-Ed classes. Behavior changes from HESA participants were compared to behavior changes from Eating Smart, Being Active (an existing evidence-based curriculum for SNAP-eligible, adult audiences, participants). There were no significant differences in behaviors or perceptions of interest accept in perceived opportunities for physical activity. The increase in perceived opportunities for physical activity was significantly greater among HESA participants than	

		ESBA participants at 0.33±1.12 and 0.12±1.16, respectively. SNAP-Ed implementing agencies, such as Virginia's FNP are required to use evidence-based nutrition education curricula. The pilot implementation and evaluation of HESA was the initial step in the process of creating an evidence-based curriculum deemed necessary based on the shift in demographics and current research onto address the needs of older adults.	

5. Natural Resources, Environment, and Climate Change

Corresponding VCE Program Teams:

- Natural Resources Management
- Natural Resources, Environmental, and Agricultural Literacy

No.	Title or Activity Description	Outcome/Impact Statement	Planned Program Name/No.
40.	**Natural Resources, Environmental, and Agricultural Literacy Education Creates Behavior Change in Youth and Adult Participants**	Relevance: According to VDACS, Virginia has approximately 70,000 producers, while the state has 8.5 million residents (US Census, 2018), meaning less than 1% of Virginia's population is farming. Today's youth and adults have limited opportunities for meaningful exposure to agricultural experiences. Meanwhile, the public receives unsubstantiated information from multiple sources, which creates misunderstandings about common practices in agriculture, natural resources, and environmental management. The public needs access to research-based information enabling them to make informed consumer decisions. Response: VCE personnel devoted time to educating the public on the realities of modern agricultural practices and the science of food and fiber production. Agents and specialists facilitated structured, consumer-	5

		focused agricultural literacy events for youth and adults. The team also made training, support, and online curriculum resources available year-round to agents. Response: 25 agents responding to an end-of-year state-wide survey of agriculture, environment, and natural resources programming activities reported planning or assisting with the conduction of 11 "field" programs, 34 in-school programs, 13 camps, 62 presentations, and 41 workshops and 11 clubs. These programs varied in nature. For example, agents interacted with the public through educational booths, presentations, and displays. Agents provided Ag in the Classroom curriculum at schools; others provided basic horticulture, food, meats, and garden exposure and training to the public. Agents engaged in large-scale, high-quality farm field day experiences for local schools or families. A number of these interactive programs integrated SOLs into agricultural science activities in an interactive "station rotation" format at a farm site. Agents engaged 4-H youth in a number of these activities. Agents partnered with Master Gardeners, Master Naturalists, Soil and Water Conservation Districts, Farm Bureau, local schools, Virginia Department of Forestry, Farm Service Agency, Natural Resource Conservation Service, Virginia Department of Environmental Quality, Virginia Department of Game and Inland Fisheries, local beekeeper associations, state park officials, local parks and recreation departments, local businesses, and others. Results: Through delivery modes, such as camps, school programs, clubs, field days, workshops, and presentations, agents reported the following results in 2019: Of the 1,058 camp participants, 45% reported learning a new skill, 42% reported gaining knowledge, and 14% reported a change in	

		behavior. Of the 4,786 school program participants, 14% reported learning a new skill, 72% reported learning new knowledge, and 3% reported a change in behavior. Of the 3,881 presentation participants, 40% reported learning a new skill, 89% reported learning new knowledge, and 42% reported a change in behavior. In total, 26% of all participants reported learning a new skill, 70% reported learning new knowledge, and 19% reported a change in behavior (n=15,146). The reported set of consumer-focused agricultural literacy and education programs provided meaningful to exposure to agriculture for an estimated 15,146 people including 2,916 adults, an increase in participants of 180%; the NREALE program team reasonably expects that other unreported programs facilitated by agents in Virginia could raise these totals.	
41.	**Preserving and Passing Virginia's Forestland to Generation NEXT**	RELEVANCE: Forestland owners 65 years and older own 41% of Virginia's 10 million acres of private forestland. High land values and taxes force many heirs to sell land to meet financial obligations; a major force behind the loss of nearly 300,000 forested acres since 1977, and the increasing parcelization and fragmentation of family woodlands. Virginia, is on the cusp of the largest intergenerational transfer of family forests ever and landowners need to know how to protect their land. A common barrier to estate planning is using planning tools and having confidence in knowing where to start. CUMULATIVE RESPONSE: To generate awareness of this issue, previous landowner programs have included brief conservation planning sessions and mass media informed the general public. Focusing on Land Transfer to Generation "NEXT", a 12-hour in-depth short course, was piloted in Charlottesville in 2009 and since then in Warrenton, Palmyra, Staunton, Farmville, Rockbridge, South Boston/Orange, Chatham/New Kent/Radford,	5

		Lynchburg, Farmville in '10, '11, '12, '14, '15, '16, '17, '18 & '19 respectively. Half-day workshops have been delivered in Brunswick, Halifax, Prince Edward, Surry Counties and Lebanon/New Kent in '18, '19 respectively. A one-day program was delivered in Harrisonburg in 2019. Program design draws from national curricula and utilized local experts to develop new material and initiate participant planning. Five-hundred and seventeen individuals representing 349 family units have completed a workshop which utilizes the expertise of private legal and financial professionals, conservation specialists and extension agents. CUMULATIVE RESULTS: Following short-course participation, landowners can better articulate their land transfer goals and have begun planning. Participants indicated the program would increase the likelihood of their property staying intact (83%), in the family (79%) and in woodland (81%). Follow-up surveys reveal that in the 6 months following the short-course, 80% have begun estate planning. Participants estimate an average family savings of $300,000 as a result of this program. As these landowners continue executing their plans, over 132,000 acres of land is expected to remain open and family owned. The program has been recognized as one of the most successful land-transition programs in Virginia by the Department of Agriculture and Consumer Services and fellow educators have adopted this model beyond Virginia as the program receives national attention.	
42.	**Ensuring Top Dollar for African American Landowners through Forest Management Education**	RELEVANCE: According to Schelhas et al. (2018) African American landowners have endured a history of discrimination and distrust of the forestry profession and have fallen prey to timber harvesting predatory schemes due to a lack of knowledge, skills and abilities to understand the	5

		economic value of their forestland. Many of African American and other underserved landowners are selling their precious timber resources without the assistance of a consulting forester. Without the proper knowledge to inform their timber cutting decision, many underserved landowners receive only a fraction of their timber's true value. For this reason, it is vital to seek out and provide trusted counsel from 1890 institutional forest management professionals who have their best interests at heart. RESPONSE: In collaboration with the VSU Small Farm Outreach Program, the VSU-CE Forestry Management Program conducted four workshops to train participating landowners how to select a consulting forester and how to sell their timber for maximum value. RESULTS: As a result of conducting four workshops, 69 landowners were trained on how to select a consulting forester and how to sell their timber for maximum value. 24 African American landowners attended these trainings. Fifty-nine participants completed the evaluation and 100% of participating landowners reported that they would use the information learned to market their timber. Seventy-six percent of the landowners responded that their understanding of marketing their timber was good to excellent after attending the training. After the success of these four workshops, additional workshops are planned for 2020 which will include timber contract development and negotiation skill building, as well as introducing the online tool: My Land Plan (https://mylandplan.org) from the American Forest Foundation.	

43.	**Understanding phosphorus dynamics in manure and fertilizer impacted Delmarva soils to improve crop productivity and reduce environmental impacts**	Relevance: The USDA estimates that there are 5,153 family-run poultry farms in Delaware, Maryland, Pennsylvania, Virginia, and West Virginia, with the majority located within the Chesapeake Bay watershed. The nature of phosphorus in the Delaware-Maryland-Virginia (Delmarva) region is affected by the long-term applications of fertilizers and manures, often sourced from poultry producers. The appropriate application of novel technologies could dramatically expand the range of opportunities to more efficiently transfer phosphorus beyond the nutrient-loaded watersheds of the Chesapeake Bay region. Best management practices to reduce the legacy phosphorus in Delmarva soils is essential. Response: Since 2011, Virginia Tech researchers in Blacksburg and the Eastern Shore Agricultural Research and Extension Center (AREC), in partnership with researchers at University of Maryland, University of Delaware, and Virginia State University, unraveled the nature of phosphorus in manure- and fertilizer-impacted 'legacy' phosphorus soils from the Delmarva region. Legacy phosphorus soils were analyzed using X-Ray absorption near edge structure (XANES) spectra at the Advanced Photon Source, Department of Energy's Argonne National Laboratory in Lemont, IL. Results: Even though Delmarva soils are identified with excessive phosphorus, farmers still indicate phosphorus deficiencies still occur. The XANES method, in combination with other analytical methods, has identified various phosphorus forms present in the soils, varying by the Delmarva region. Long-term applications of poultry litter do affect phosphorus dynamics. This research program has contributed to submission of two patent applications, presentation of information at	5

		numerous regional, national, and international meetings, and sharing of knowledge with stakeholders through field days and Extension programs.	
44.	**Microbial community diversity and nitrogen-fixing function of soybean root nodules influences soybean traits and environmental resilience**	Relevance: The soybean industry has an estimated annual value of $40B per year. However, prices and profits for soybean farmers has declined. Soybeans are the most planted crop by area and is the leading cash crop in the US. This crop is a primary source of protein for livestock and poultry. Protein is rich in nitrogen, which in soybeans, is facilitated by a type of bacteria, diazotrophs, that facilitate the transfer of soil nitrogen to support plant growth. The soybean microbiome has great potential for increasing soybean yields and contribute, in part, to guiding breeding strategies for improved soybean varieties. The microbial community within soybean root nodules, where diazotrophic bacteria reside, is more diverse. Diazatropic bacteria assist soybeans in taking up nitrogen from the soy, thus reducing the addition of fertilizers. The microbiome of soybean root nodules interacting with soil, water, and other environmental influences can help develop soybeans with greater resilience to water shortages and other acute and chronic climate-defined influences. Response: Researchers in the Virginia Tech School of Plant and Environmental Sciences sought to characterize the bacterial community of soybeans to better understand the influence on soybean traits and water responsivity. The microbiome of soybean root nodules from 9 different soybean cultivars was studied. The influence of water status was assessed on the microbiome. Results: Researchers found that soybean nodule bacteriome was dominated by rhizobia as well as many types of non-rhizobia taxa, which do not fix nitrogen, in high abundance, with high variability based on	5

		soybean cultivar and water status. Amino acid profiles within nodules described functional changes attributed to both soybean cultivar and water status. The function of the non-nitrogen fixing bacteria within the nodules may have functions in plant-growth promotion. The nitrogen-fixing function of bacteria in soybean nodules is sensitive to soil water status, as observed under field conditions. Understanding the relationship between plant and root nodule bacteria in the soybean assists in deciphering symbiotic mechanisms that advance soybean breeding, both in traditional and molecular breeding programs, for improved traits. These discoveries will change the way soybean crops are managed as the soybean microbiome can be influenced to improve crop yield and resilience.	
45.	**Beginning Woodland Owner Retreats**	Relevance: Forestry is the third largest industry in Virginia. It contributes over $21 billion a year to the economy. Our woodlands also provide clean water and air, plant and wildlife habitat, scenery and recreational opportunities, and soil protection and enhancement. The annual value of these environmental benefits is estimated to be $16 billion. Research into landowner decision making highlights the importance of planning, professional assistance, and peer influence to increase stewardship and sustainability while meeting society's demands for goods and services from the woods. Most Virginia woodlands (68%) are owned by private families. An aging owner population and rapid turn-over of land results in constantly changing ownership. While most owners claim a conservation ethic, few have knowledge & experience to recognize & implement sustainable woodland management practices, such as planning and seeking professional assistance.	5

		Response: To reach these new landowners, the VFLEP and the Virginia Department of Forestry developed the Forest Landowner Weekend Retreat Program. This day-and-a-half program combines classroom, field, and hands-on learning experiences to introduce landowners to basic forest management concepts, skills, and natural resource professionals. Over 457 landowners have attended one of our 18 Retreats. In 2019, 75 woodland owners, who owned a total of 3,845 acres, attended a Retreat. The average ownership size of attendees was 180 acres. As a result of attending a Retreat, exit surveys indicate that 57% intended on creating a list of ownership goals (43% already had), 66% intended on contacting a natural resource professional (30% already had), 60% intended on obtaining a management plan (33% of the attendees already had one), and 76% intended on implementing at least one sustainable management practice in the next year. Attitudes also changed as a result of the Retreats. At the end of the program, 100% of participants agreed or strongly agreed that working with a natural resource professional would help them achieve their ownership goals (versus 71% prior to the Retreat). In addition, after the Retreat's completion, 98% of participants agreed or strongly agreed that active management practices are beneficial to woodlands and wildlife (versus 23% before). After the Retreats, we've heard back from our speakers that they have been contacted by participants, wanting to donate easements, join Tree Farm, obtain a management plan, sell timber, etc. To formally capture this anecdotal data and assess the programs mid-term outcomes, we developed and distributed a follow-up survey in the spring of 2015. This	

		survey was sent out to landowners who attended a Retreat between 2008 and 2012. The survey was administered electronically via a Qualtrics link to all participants for whom we have a valid e-mail address; other participants received a paper survey. The survey response rate was 30%. Of the respondents, all were Virginia landowners who owned a total of 1767 wooded acres. In 2020, we will survey folks who have attended a Retreat between 2013-2016. Results: Over 80% of the respondents had created a list of woodland ownership goals since attending a Retreat (versus 14% of the general landowner population). The most common ownership goals included: • To protect or improve wildlife habitat (100%) • To protect nature or biological diversity (92%) • To enjoy beauty or scenery (85%) • To protect water resources (85%) • For timber products such as logs or pulpwood (85%) • To pass land onto children or other heirs (69%) • For recreation other than hunting (69%) Additionally, since attending a Retreat, 81% have met with a natural resource professional (versus 19% of the general landowner population). The most commonly contacted natural resource professionals were Virginia Department of Forestry foresters (69%) and private consulting foresters (54%). Fifty percent of Retreat participants obtained a written forest management plan. Since only 3% of landowners nationally have a written management plan, this is good news indeed.	

		Finally, participants implemented a number of sustainable forest management practices on their lands as a result of attending landowner weekend Retreats. These included: • Improving wildlife habitat (63%) • Cutting and removing trees for sale (50%) • Eliminating or reducing invasive species (50%) • Cutting and removing trees for own use (44%) • Road construction or maintenance (50%) Thirty-seven percent attended an additional landowner education program. Based on these results, the Landowner Weekend Retreats are far exceeding our anticipated mid-term outcomes, and appear to be providing Virginia's woodland owners with the tools they need to start implementing sustainable management practices on their land.	
46.	**Virginia Household Water Quality Program (VAHWQP)**	Relevance: Nearly one quarter (21%) of Virginia's population (1.6 million people) rely on private water supply systems, such as wells, springs and cisterns, for their household water. In the US, municipal water supplies are regulated under the Safe Drinking Water Act by the Environmental Protection Agency, which mandates regular testing and water treatment. Homeowners who use private water supplies are completely responsible for routine testing, system maintenance and addressing any water quality problems, should they exist. Lack of knowledge about private water supply management and water quality issues may lead to system neglect and a lack of regular water testing, which can have serious implications for water	5

		quality, longevity of the water supply system, and, ultimately, the health and safety of the families who rely on these systems. Response: The Virginia Household Water Quality Program (VAHWQP) provides confidential water testing and educates private water supply users through county-based drinking water clinics. With Virginia Cooperative Extension agents, trained through the Virginia Well Owner Network (VWON), faculty in Biological Systems Engineering (BSE) coordinate clinics in at least 60 counties per year. At a clinic kickoff meeting, participants receive water sampling kits and instructions. A day later, participants bring their water samples to a central location in the county. The samples are transported to Virginia Tech for analysis. Samples are analyzed for 12 chemical constituents and for the presence of total coliform and *E. coli* bacteria. Three weeks later, test results, an explanation of individual results, and possible solutions to water problems, including water treatment options, are discussed with clinic participants at an interpretation meeting. This interpretation meeting is a critical value-added component unique to VAHWQP drinking water clinics. Results: Sixty-four (64) drinking water clinics were held serving participants from 88 counties in 2019. This year, 2294 samples from private water supplies were tested. The sampled systems provide water for 5917 Virginians. Statewide, in 2019, about 42% of all samples did not meet the EPA standard for public systems for total coliform bacteria, 7% were positive for *E. coli*, and 8% of samples exceeded the recommended level for lead in water that had been stagnant in the plumbing system for at least six hours. Based on online clinic evaluations (total RR=14%), 61% of respondents reported attending the VAHWQP clinic interpretation	

		meeting; 97% stated they believed they understood their test results. The most commonly reported recommended action taken after clinic participation was shock chlorination (17.2%), followed by installing or improving the function of water a treatment device (19.2%), performing maintenance on well or moving a source of potential contamination (14.4%), and pursuing additional testing (10%). One-fifth of survey respondents shared more detailed actions they took. Nearly 71% of clinic participants report having never tested their water previously (41%) or testing it only once before (30%). Participation in a VAHWQP clinic is designed to encourage subsequent, annual testing using a commercial lab. If delivered commercially, the value attributed to the VAHWQP drinking water clinics offered in 2019 would be $734,080. The cost to the 2019 participants was $123,670 a cost savings of approximately 84%. Furthermore, grant funding was used to subsidize water testing for 737 participants. In 2019, about 8,000 unique visitors, 84% of which were new to the site, used VAHWQP's website, www.wellwater.bse.vt.edu.	
47.	**What's in your water, kids? Connecting young people with their drinking water through the Virginia Household Water Quality Program**	Relevance: Nearly 1.6 million Virginians rely on private water supply systems, such as wells, springs and cisterns, for their household water. In the US, municipal water supplies are regulated under the Safe Drinking Water Act by the Environmental Protection Agency, which mandates regular testing and water treatment. Homeowners who use private water supplies are completely responsible for routine testing, system maintenance and addressing any water quality problems, should they exist. The Virginia Household Water Quality Program (VAHWQP) provides confidential water testing and educates private water supply users through county-based drinking water clinics. With Virginia Cooperative Extension agents, trained through the Virginia Well Owner Network	5

		(VWON), faculty in Biological Systems Engineering (BSE) coordinate clinics in about 60 counties per year. Based on survey and demographic information collected, we know that VAHWQP is effective in reaching older homeowners (average people per household = 2.5), but appears to be missing families with young children. Children are especially susceptible to health problems associated with certain contaminants, such as *E. coli* and lead. Children learn about the water cycle, water contamination and conservation at various stages in their education. These topics tie in well with the VAHWQP message, which uses conversations about family drinking water to build understanding of, and responsibility for, our shared water resources. Response: A variety of efforts were conducted in 2019 to extend VAHWQP programming about groundwater protection, well and spring construction and maintenance, water testing, drinking water safety and water treatment, to youth audiences. Using table-top groundwater models, well component exhibits, and program resource materials developed specifically for youth, the VAHWQP state coordinator (Erin Ling) developed and delivered programming to about 560 students in 2019. Programming included 1 to 2-hour long interactive demonstrations to students attending VT's College of Engineering Center for the Enhancement of Engineering Diversity (CEED) Camps. CEED camps seek to reach middle school 7th and 8th graders (Imagination) and Pathways (9th and 10th graders; focus on first generation potential college students). Programing was also developed and delivered to students attending the Governor's School for Agriculture who selected BSE as their major. Interactive displays and conversations were used at Montgomery County Stormwater Education Days in the spring and fall to engage over 170 sixth graders about these topics. In addition, guest lectures were developed and delivered to two sections of	

		Blacksburg High School 9th grade Earth Science class and 100 3rd graders at Margaret Beeks Elementary in Blacksburg. Camp and school outreach efforts were supported by the following graduate and undergraduate students: Daniel Smith, Tyneshia Griffin, Isabelle Largen, and Marquelle Benn. These efforts are part of a larger effort to develop and deliver formal youth programming as part of VAHWQP. Program development focuses on delivering a STEM-compatible curriculum in science-oriented classes and through 4-H clubs and/or camps. Results: As a part of the VAHWQP youth programming development process, a STEM-oriented, high school-based VAHWQP drinking water clinic program, developed in 2015, was expanded in 2019 when a Virginia Tech Integrative Science and Solutions for Freshwater Systems interdisciplinary seed grant was received with collaborators Leigh Anne Krometis (BSE), Madeline Schreiber (GEOSCI), Luke Juran (GEOG) and Erika Bonnett (4-H State Program Staff). This grant allowed us to add new schools, and incorporate VT undergraduates in designing and implementing hands-on learning modules, which will be converted into 4-H curricula. Working with STEM/Agriculture, Biotechnology and Earth Science teachers from Carroll County, Grayson County, Galax, Wythe (Rural Retreat) and Holston (Washington County) High Schools, these programs engaged students by offering free private water supply sample analysis to their families and tying subject matter to the standards of learning for each grade. Grant funding from the VT Freshwater Systems seed grant, Rural Community Assistance Project and a donation from Virginia Lakes and Watersheds Association completely funded the analysis of 102 samples, a value of $6120. This program includes a field trip to the VT campus where students gain hands-on experience in the BSE Water	

		Quality Lab analyzing their own water samples, hear lectures about groundwater, well construction and food safety, and starting in the fall, included activities led by VT undergraduate student collaborators Isabelle Largen, Wynnie Avent and Alivia Colon. This year, these student-developed activities focused on the impact of geology on water quality, issues of water-taking and ethics, and impacts of natural disasters on wells. Participating high school students learned about how to interpret their water sample analysis results and were responsible for helping to explain their analysis results to their families and teachers at a local VAHWQP interpretation meeting. Information covered during the program directly addresses 2 Earth Science, 3 Biology and 1 Chemistry Standards of Learning. Teachers reported that students learned how to apply science concepts to real life scenarios in meaningful ways and also learned about possible science and research career opportunities.	
48.	**Improving Environmental Literacy of the Next Generation** (Multistate)	Relevance: A wide body of research indicates that America's youth are increasingly out of touch with the natural world and lack even the most basic level of environmental literacy. Our nation is faced with a generation of children (and adults) with a growing disconnect with nature and natural systems. More and more children and adults do not know where their food and fiber comes from. Lack of contact with the outdoors and nature leads to our children suffering from what Richard Louv calls "nature-deficit disorder." (Last Child in the Woods: Saving Our Children From nature-Deficit Disorder, Alogonquin Books of Chapel Hill, 2005). Nature-deficit disorder does not describe an existing medical problem but it does describe the human costs of alienation from nature, among them: diminished use of the senses,	

		attention difficulties, and higher rates of physical and emotional illness. The author suggests new studies show that exposure to nature may reduce the symptoms of ADHD and "improve all children's cognitive abilities and resistance to negative stresses and depression." Response: It is widely agreed that efforts to reach youth with curricula and learning opportunities to connect with the natural world are essential. In an effort to make youth more aware of forests, the National 4-H Forestry Invitational is conducted every year and every state has the opportunity to send a team to participate. A committee of Extension agents, specialists, faculty, and industry experts from Alabama, Florida, Georgia, Kentucky, Maryland, Ohio, Virginia, and West Virginia plan and conduct the National 4-H Forestry Invitational. Alabama, Arkansas, Florida, Georgia, Indiana, Kentucky, Louisiana, Mississippi, South Carolina, Tennessee, Utah, Virginia, and West Virginia competed in the 2019 Invitational. Fifty-one 4-H youth and 58 adults participated in the 40th annual national 4-H forestry invitational. While at the Invitational 4-H members competed for overall team and individual awards in several categories. Events included tree identification, tree measurement, compass and pacing, insect and disease identification, topographic map use, forest evaluation, the forestry bowl and a written forestry exam. Results: Today's youth are tomorrow's landowners, voters, policy makers, and inheritors of the natural resources we depend upon and must pass along to future generations. During these educational events and	

		presentations youth were exposed to the native hardwood forest of the region, how trees regenerate and grow, and the environmental benefits of trees and the forest. Youth learned tree identification, insect and disease pests, how to read and use topographic maps, how to use a compass and pace distances, and how to determine volume board feet of trees. They learned sustainable forest management practices and made recommendations on how to manage a forest. As a result of these programs, youth are more aware of their local forests, the environmental benefits of forests, the products that are manufactured from the forest, and the importance of the forest to the local economy.	

6. Strengthening Virginia Families

Corresponding VCE Program Team:

- Human Development

No.	Title or Activity Description	Outcome/Impact Statement	Planned Program Name/No.
49.	**Addressing Opioid and other Substance Misuse and Behavioral Health Challenges in Virginia**	Relevance: Virginia families and communities are grappling with the impact of opioid and other substance misuse on newborns, children, adults, seniors, schools, health and social service systems, the workforce, and communities as a whole. On November 21, 2016, the Virginia State Health Commissioner declared the opioid addiction crisis a public health emergency. This issue is impacting rural, urban and suburban communities across the Commonwealth. Youth themselves are not immune to the	6

		epidemic, as 13% of high school students in Virginia report having misused a prescription medication. The overall mortality rate for prescription opioid overdose in Virginia in 2017 was 7.2 per 100,000 in rural counties and 5.3 per 100,000 in urban counties; mortality rate for fentanyl and/or heroin overdose was 4.3 per 100,000 in rural counties and 10.4 per 100,000 in urban counties. Neonatal abstinence rates (newborn withdrawal from drug exposure in the womb) were 14.1 per 1,000 in rural counties and 5.8 per 1,000 in urban areas. This issue is impacting rural, urban and suburban communities across the Commonwealth. Solutions, including prevention, are needed at all levels. There are numerous prevention programs available that aim to reduce risky youth behavior, including substance misuse, or strengthen families. However, surveys show that most programs lack scientific evidence that they'll be effective. Some programs fail because of ineffective program design, poor implementation, lack of sustainability or shifts in focus. In the end, youth, their families and our entire society pay a great price for programs that do not work, and for ineffective delivery of programs that do work. Response: Recognizing the need for a cross-program, public-private response, VCE convened a team to develop an initial plan, which received federal grant funding. This project used a two-pronged approach, targeting youth through a program demonstrated to prevent substance misuse (PROSPER) while also targeting education to those who are prescribed opioids (HPEP). PROSPER is an evidence-based delivery system with demonstrated success in prevention of drug abuse in youth through family- and school-based programming. The evidence-based programming includes developing local community PROSPER teams, implementing the SFP 10-14 (Strengthening Families) Program and embedding the Botvin	

		LifeSkills Training program for all 7th graders in public schools. The Hospital Patient Education Program (HPEP) provides education for patients and their families receiving opioid prescriptions through their health care providers to prevent addiction and alert them to the need for proper control of these medications, resources for any concerns, and disposal bags to discard unused medications. The initially-funded project (USDA) led quickly to a funding opportunity (SAMSHA) to build upon and expand the work, and led to a statewide consortium of higher education institutions working collaboratively to provide responsive, timely, data-driven support to enhance the effectiveness of local community health and social programs. Subsequently, federal funding from USDA-CYFAR and USDA Rural Health and Safety Education were also secured to extend and broaden the work. Results: Process and outcome evaluations were administered. Outcome evaluations assessed program success at all levels. Short term outcomes related to awareness and knowledge were assessed in youth and families through observation and survey data. Pre and post tests were administered to 7th grade LifeSkills Training participants to assess changes in anti-drug knowledge, anti-drug attitudes, drug-refusal skills, and other critical life-skills such as assertiveness, relaxation, self-control. Retrospective pre-post surveys were given to parents and youth in the SFP 10-14 program. Programming to address opioid issues has been provided to 20 localities, and local PROSPER community teams have been formed in five counties. • The team planned and hosted a statewide "*Higher Education Conversation on Opioid Misuse and Addiction*" with 71 participants from 23 colleges and universities across Virginia and community	

		stakeholders from health departments, community services boards and law enforcement. As a result, Virginia Department of Behavioral Health and Developmental Services and 5 universities developed a MOA to create the *Virginia Higher Education Consortium (VHEOC)*. The VHEOC works together to support local Community Services Boards to prevent and treat opioid and other substance use disorders with cutting edge academic resources. State funding has been committed. • LifeSkills Training: 16 rural school divisions had 72 teachers, counselors, school division staff or community services board staff trained implement in middle schools during the school day, as part of the regular health/PE curriculum. This solid partnership extends the reach to all students in that grade, as the regular school teachers implement it, and do not rely on existing or hired grant personnel to deliver. This allows greater likelihood of sustainability. • Results from 385 pre-tests and 275 post-tests included significant increases in anti-drug knowledge, and life skills knowledge. There was a slight but not significant increase in drug refusal and self-control skills as indicated by intent on the pre-post tests and a significant increase in assertiveness skills. Some anecdotal evidence include quotes from teachers and staff, including: • "I just wanted to tell you that we started the Botvin Health Curriculum today and it seems like it is going to be a success. We discussed self-image {sic} today and the students were very open and honest in class discussion as well as through their workbook answers. There were even a few students who expressed some concerns that I felt needed to be looked at further and I recommended those students to [Guidance Counselor]. As long as	

		the students continue to participate and be honest I feel that they will get a lot out of this curriculum and hopefully we will also be able to help many of them deal with issues that they may be experiencing" -Educator in Rappahannock County. • During a fidelity check, the Extension Project Coordinator witnessed a student relaying their fears about going home after school due to their older sibling and siblings' friends smoking pot on a daily basis. Student lives in a single parent home, in which the parent works long hours/odd shifts. Other students in the class and the teacher negotiated strategies for the student so that the student would now have a safe place to be while they are waiting for their parent to return home from work. • HPEP training was provided to 10 medical staff across 3 rural hospitals to offer program for patients and families. • VCE personnel and partners graduated families in three distinct 7-week sessions of family-based SFP 10-14 program for 6th graders and their parents. Retrospective survey results for youth participants indicated significant changes in the following areas, all of which are factors that decrease risky behaviors related to substance misuse: • I do things to help me feel better when I am under stress. • I appreciate the things my parents/caregivers do for me. • We have family meetings to discuss plans, schedules, and rules. • I know how to tell when I am under stress. • I know there are consequences when I don't follow a given rule. • My parents/caregivers and I can sit down together to work on a problem without yelling or getting mad. • I know the qualities that are important in a true friend.	

		• I know what my parents/caregivers think I should do about drugs and alcohol. • I feel truly loved and respected by my parents/caregivers. • Parents indicated that they are more likely to: • Wait to deal with problems with my child until I have cooled down. • Remember that it is normal for children to be harder to get along with at this age. • Help my youth understand what the family and house rules are. • Let my youth know what the consequences are for breaking rules. • Find ways to keep my child involved in family work activities, like chores. • Talk with my child about his or her future goals without criticizing. • Often tell my child how I feel when he or she misbehaves. • Spend special one-on-one time with my youth. • Let my youth know the reason for the rules we have. • Listen to my youth when he or she is upset. • Talk with my child about ways to resist peer pressure. • Give compliments and rewards when my child does chores at home or learns to follow rules • Explaining to my child the consequences of not following my rules concerning alcohol use	

7. Youth Development

Corresponding VCE Program Teams:

- 4-H Positive Youth Development

No.	Title or Activity Description	Outcome/Impact Statement	Planned Program Name/No.
50.	**Introducing a new 4-H STEM curriculum: Grass, Goats, and…Uninvited Guests!**	RELEVANCE: The gap between unfilled jobs and skilled talent to fill jobs is widening in the United States. Between 2018 and 2028, an estimated 2.4 million STEM jobs will be unfilled resulting in the loss of an estimated 2.5 trillion dollars (Deloitte, 2018). Unfortunately, one-third of US adults believe teachers do not have the resources needed to provide STEM education to their students (Emerson, 2018). Nearly half of US parents claim their daughter is not being encouraged to pursue a STEM career path. Racial diversity is low in STEM fields (Pew Research Center, 2018). According to Margot and Ketler (2019), educators (K-12) may feel uncomfortable teaching STEM subjects and need additional support in the form of guidance and integrated curriculum. To address this educational need, the VSU-CE 4-H STEM program developed and introduced a new interdisciplinary STEM curriculum "Grass, Goats, and…Uninvited Guests! (GGUG)" in 2019. RESPONSE: Throughout 2019, 11 training sessions were conducted resulting in 42 VCE agents, 324 adults, and 545 youth being trained in Grass, Goats, and…Uninvited Guests! This integrated STEM curriculum, includes agriculture (A) by focusing on small ruminant internal parasites, diagnostics, and treatment. This innovative, hands-on program uses goat or sheep stuffed animal models, group learning, and edible treats to teach complex scientific ideas in an easy to understand manner. The FAMACHA© system and hematocrit determination to diagnose anemia, dag scoring,	7

		body condition scoring, fecal worm egg counts, and treatment for worms are covered. The use of live farm animals is not required to conduct a program nor is it costly to perform, making it ideal for teachers serving urban, low income, underserved students. Especially exciting is the addition of an optional research project component allowing youth to conduct research and create models to teach others about a disease or parasite occurring in their favorite animal or pet! The program was piloted successfully in several Virginia communities and is available as a peer-reviewed 4-H curriculum. RESULTS: In 2019, the innovative STEM curriculum: GGUG was enthusiastically taught and received across Virginia reaching 42 VCE agents, 324 adults, and 545 youth in urban, rural and underserved communities. After receiving training in GGUG to 92% participants agreed they felt more comfortable teaching STEM topics as a result of the workshop. Most importantly, over 80% of participating youth said the workshop increased their interest in pursuing a STEM career path!	
51.	**Encouraging Healthy Lifestyles Among Youth**	Relevance: The latest data from the Centers for Disease Control and Prevention show that the national obesity rate among youth 2 to 19 years of age is 18.5%, translating into one in every six young people being obese. Although Virginia's Childhood obesity rate is lower than the national average at 13.2%, there is still reason to be concerned as childhood obesity has immediate and long-term effects on physical, social, and emotional health. Response: Through 4-H's Healthy Lifestyles and Food and Nutrition curriculum, Virginia Cooperative Extension addresses the state's childhood obesity problem. Specifically, through the combined efforts of 4-H and FCS	7

		agents and FNP Program Assistants, 18,323 youth were reached and engaged in food, nutrition, and health programming for a minimum of six hours. Of those youth, 8,430 were reached through programming that was delivered through the financial support ($71,000) of the 4-H Nutrition Healthy Habits grant sponsored by National 4-H Council and the Walmart Foundation. Furthermore, 176 teens across the Commonwealth served as teen teachers assisting in the delivery of nutrition educational content. Results: Positive impacts were reported across all measured behaviors from the 1,316 youth who completed the 4-H Healthy Living Common Measures evaluation. Over half (53.9%) paid attention to how much fruit they consume each day, 50.4% vegetable consumption, and 77.2% water consumption. In terms of eating behaviors, 66.0% ate breakfast frequently, 67.7% ate meals with their family, and 36.6% gave their family ideas for healthy meals or snacks. 70.4% reported they learned about healthy food choices through 4-H programming and 81.5% indicated they learned why it is important for me to eat a healthy diet. Teen Cuisine, a Virginia curriculum focused on teaching teens proper cooking techniques, food resource management, nutrition, physical activity, as well as food safety also yielded positive results. Specifically of the 721 Teen Cuisine youth completing the evaluation, 79.0% indicated that they ate more fruits and vegetables, 59.4% whole grains, 53.9% ate less junk food, 62.7% drank less soda/soft drinks, 85.6% drank more water, and 60.9% ate less saturated fat. For cooking skills, 73.6% reported better measuring skills, 86.9% now knew how to safely use a knife, 66.5% cooked more, 93.3% washed hands before cooking, and 91.3% washed hands before eating. Additionally, three-quarters (77.6%) were more physically active. Several successes were noted from participants. Following are quotes from teen	

		participants: "Thank you very much for the fun labs. It was my very first time cooking. My favorite dishes were, well, all of them." "I just want to start off saying thank you for letting us take part in your program. The food was absolutely amazing I learned so many new and cool ways to cook. The most fun part was the omelets. I finally learned how to cook one thanks to you guys." "I really enjoyed making things some ways I hadn't tried before. I learned about food labels in this program. Thank you for being an amazing program!" "I learned a lot from making the food such as teamwork, and how to make things." "One thing I enjoyed learning was the different kitchen tools." "Thanks for pushing me to try new things like garlic." "Teen Cuisine is an awesome program to help kids to learn how to cook. My favorite recipe was the breaded chicken nuggets they were so amazing and good. Thank you so much." "Thank you for letting us try to complete the Teen Cuisine program. I especially loved the chicken nuggets and the smoothies, they were delicious. Thanks to the Teen Cuisine Program I know how to tell if a food is good for me or not."	
52.	**Virginia 4-H Pork Challenge – Developing Life Skills and Nutrition Knowledge**	Relevance: Based on research reported by eXtension, 87% of surveyed tweens and teens reported cooking and making some of their own meals and/or snacks. However, youth who lack healthy cooking knowledge may rely on pre-packaged foods or prepared foods containing questionable nutritional value. Research by Slow Food USA indicates that participation in cooking programs increases the following behaviors in youth: fruit and vegetable consumption, willingness to try new foods, food safety behavior, pride in cooking abilities, and cooking self-efficacy. To help address these behavioral changes, Virginia 4-H offers an opportunity for youth to participate in Food Challenge. Most recently, Virginia 4-H received a grant from the Virginia Pork Council to implement the Virginia 4-H Pork Food Challenge Contest.	7

		Response: The Virginia 4-H Pork Food Challenge was developed in 2018 as way to combine culinary skills, food safety, nutrition education, presentation skills, and pork knowledge into one contest area. A partnership was established with Smithfield Foods and we were able to hold the contest in their demonstration kitchen. In addition, the participants were invited to a tour of the facility and were able to see firsthand how pork is processed and packaged for distribution. This year's contest was held on August 24, 2019 and 11 teams participated, up 8 teams from last year. Results: Our participation number significantly increased this year. We had 39 youth (11 teams) compete this year compared to the 11 participants we had last year. Evaluation results revealed that this contest was impactful and beneficial to the youth. Youth indicated that as a result of participation in this contest, 92% increased their level of understanding of MyPlate, food nutrients and their functions, food and kitchen safety, as well as how to plan, prepare, and alter a recipe. In regards to behavioral change, 91% have planned or prepared a recipe at home based on that they learned. 94% have made healthier food choices based on knowledge gained through this contest. 89% have changed the way they handle and prepare foods, and are more willing to listen to others, and are better at following through on obligations because of participation in this contest. Furthermore, 77% are more comfortable speaking in front of others, 89% are more comfortable working in a team and being a leader because of participation.	
53.	**2019 Computer Science 4-H Teens as Teachers impact the**	RELEVANCE: Virginia Cooperative Extension youth programs that include design thinking allow youth the opportunity to reinforce existing and	

	community while building interest in STEM	develop new STEM knowledge while simultaneously encouraging them to think "outside of the box" and be creative. They are able to set and work towards the goal of creating a design to accomplish something that has relevance to their lives and interests, contributing to the development of essential life skills such as confidence and problem solving. Technology based skills are one of the sought after skills for most jobs and careers. The need of computer skills in the fields from agriculture to medicine to engineering, make it important and a focus in Virginia to focus on teaching youth STEM and Computer Science skills. RESPONSE: The 4-H CS teens as teachers program is the main focus of the 4-H Google CS Pathways grant in which Virginia participates. As part of this program, a focus of training teens to teach and deliver CS programming throughout the state has given an opportunity to reach new audiences and connect youth to 4-H that might not have thought there was a place for them. Three trainings were held in 2019 to grow CS through Teens as Teachers. From across Virginia there are 57 trained teens who deliver programs in computer science, computational thinking, technology, and coding. RESULTS: Through this program, teens and their adult partners have garnered a sense of inclusion, confidence, and self assurance as they have gained skills in teamwork, communication, empathy, and organization. The teens as teachers CS program, along with the adult CS volunteer program, were integral in the success of expanding CS across the commonwealth of Virginia, and forging new opportunities with school districts, military bases, and other partners in the communities that we serve. Over 8000 youth have been reached through the teens as teachers program this year.	

		Research has shown that teen teachers programs increase the interest in STEM careers, create connections with the youth they work with, and make growth in STEM learning for both the teen and youth they work with. These results also replicate the impact that teen teacher programs have shown in Virginia this year. Youth who have participated in 2019, reported that they have an increase in confidence, interest in STEM, and has impacted their 4-H experience for the positive.	
54.	**2019 Teen Summit: Empowering Youth Voice**	Relevance: Teens are the next generation, and in order to ensure we have a commitment to diversity and inclusion in the future, it is important that we engage them in a movement towards an inclusive, civil society for all individuals. Teens have often mentioned that they don't have a safe place to discuss issues that are weighing heavy on their minds, such as, racial and gender inequality, environmental justice, and the opioid and vaping epidemics. Response: To address this concern and need, Virginia 4-H held its first inaugural Teen Summit to provide teens with an avenue to discuss issues important to them and inspire them to take charge by empowering them with the skills they need to turn ideas into action. Results: Through this overnight Summit, 63 teens learned how their voice can be meaningful tools for change in relation to social justice topics. Topics identified by the teens were women in male dominated professions, substance abuse, shooting sports, domestic violence, environmental justice, working with youth with disabilities, programming for at-risk youth, and LGBTQ rights, just to name a few. This event empowered them to ask thoughtful questions to a panel of experts so that they to better understand advocacy so that they may implement their own	

		ideas upon returning home. They also learned how to identify a need or challenge within their passion area and how they can work with their adult mentor and peers to identify a solution to that problem and the measurable and attainable steps they will need to take to bring their desired solutions to fruition, as well as apply for mini-grants to be able to help carry the work forward. Through results from a post survey of the summit, 84% of teens who responded that because of the summit they planned to advocate in their local communities using the information that they learned at the summit. More than 75% of teens also said that they would recommend their friends to attend in the future. Of the skill development at the conference, teamwork, public speaking, and ability to advocate rated the highest in skill teens felt that gained through attending the conference.	
55.	**4-H Teens Learn Leadership Skills Through Camp**	Relevance: 4-H youth development emphasizes the importance of meeting four basic human needs through Head (Independence), Heart (Belonging), Hands (Generosity) and Health (Mastery). Virginia 4-H provides opportunities for youth to develop life skills that help them become healthy, contributing citizens. In particular, youth need opportunities to learn and practice leadership skills. Research shows that youth who serve as leaders learn and practice decision making, conflict management, responsibility, and other life skills. 4-H teens serve as leaders for other youth at unit, district, and state 4-H events. However, many of these teens lack the leadership skills necessary to lead others and may not provide a positive environment for youth development. Response: Leadership skills are enhanced through 4-H Teen Leadership and Counselor-in-Training (CIT) programs. Teens, ages 13-18, develop leadership skills through year-long trainings focused on developing and demonstrating competencies. They learn about ages and stages of development, how to teach younger children, and appropriate supervision requirements. Teens then practice those leadership skills as counselors-in-	

		training (CITs) and teen leaders at 4-H camp, day camps, after-school programs, and other settings where they lead activities and assist in supervising youth. Results: Over 1,200 teens from across the state of Virginia participated in leadership training as part of the camping program. In written surveys of 1000 teens attending 4-H Camp responded and indicated that being a teen leader had significantly contributed to improved skills in the following: • stepping forward to assume leadership positions (112% increase) • thinking before acting (112% increase), • time management (63% increase) • responsibility (16% increase), • being more active in the community (16% increase) When teens were asked what skills they feel will assist them in future endeavors, the top answers were problem solving, teamwork, and learning to communicate effectively. When asked how they will use what they have learned as a teen counselor in the future, teens most indicated they would use acquired skills for future employment, community involvement and in daily life. Quotes from some of the teens included: "I will (hopefully) be able to handle different types of situations with more precision. I will also (hopefully) be able to use the skills that I learn here in regular life." "I will use it to step up to future opportunities and to do the best in everything I do." "I would say 4H camp has contributed to about 90% of my qualities as a leader, a friend, and an individual." "I will use the confidence and leadership skills I've gained in jobs, relationships, and anything else" "I am always working with others, so being a camp counselor has taught me to use what I know, but also to be ready to learn more. I will use this during work, school, community outreach etc" "My experiences as a teen leader will help me excel in college, the workforce and life in general."	

56.	**EquiSmartz Develops Life Skills**	Relevance: Virginia ranks as the 12th largest equine state in the nation and Equine ranks as Virginia's 8th largest agricultural commodity. There are approximately 3000 youth currently enrolled in Virginia's 4-H Horse program. With the changing demographics of Virginia from a more rural situation to that of a more urban existence, the need to foster youth involvement with equine and the utilization of the interest in equine to teach necessary life skills is imperative. Additionally with the cost of equine ownership on the rise, a focus on events that do not require equine ownership is critical. Response: The EquiSmartz educational contest weekend offers the opportunity for both team and individual competition and learning at the Junior and Senior levels. The three-day contest incorporates Horse Bowl, Hippology, Team and Individual Presentations, Public Speaking and Horse Judging. Youth prepare on the county and district levels through training sessions and competition in order to qualify for this state level competition. Results: Through the process of preparing and competing, these youth learn and hone the life skills of responsibility, planning, organization, decision making, team work, public speaking and humility, to name a few. Over 69 volunteers and 11 Extension agents worked to make the weekend events run smoothly to ensure a positive experience for all. Many former 4-H alumni return to help run the event and serve as mentors for the youth. 4-Hers commented that the event was a fun and rewarding learning experience. In conclusion, volunteer hours totaled 887.5 (not including the 4-H Horse Program Extension staff hours). Total contestants resulted in	

		317 youth participating in one or more events making up 536 total entries (up by 27% from 2015 - the highest total ever).	
57.	**4-H Military Partnership: Making a Difference for Youth on Virginia Military Installations**	Relevance: Virginia is in the top three states with the highest number of military installations. Therefore, maintaining each link in the structure of the Virginia 4-H military program is critical. In Virginia, 4-H clubs have been established on Army, Navy, and Air Force installations, which represents 11 military installations with 14 sites. Training provided by Virginia Cooperative Extensions state, local staff, and volunteers, helps military staff deliver a variety of programs and projects focused on experiential learning and the development of life skills to military youth. Response: A 4-H Military Club Director was responsible for gathering, compiling, and submitting reports for the 4-H Military Partnership Grant provided by the Department of Defense. Local support of each installation site was provided by Extension Agents located in the county or city near each respective installation. Four part-time 4-H Installation Club Coordinators provided support to 4-H staff responsible for chartering clubs, enrolling members, training club leaders, and involving 4-H military club members in local, regional, and state programs. Branch focus area greatly influenced the identification of outcomes which gave staff direction as they planned programming to develop life skills in the youth. 4-H project focus areas were Citizenship, Healthy Living, and Science, Technology, Engineering, and Math (STEM). Citizenship: Projects included 4-H Day at the Capitol, club officer training, presentations, theater arts, service learning, character education, bully prevention. Healthy Living: Projects included 4-H Cooking, Dashboard Dining, Teen Cuisine, First Aid, and Steps to a healthy teen. STEM: Projects included National 4-H Youth	

		Science Day Experiment –Motion Commotion, Junk Drawer Robotics, Environmental education, and Gardening. Results: Youth Participation by military branch was: Army: 3 installations with 6 chartered 4-H clubs and enrolling 715 youth. Navy: 7 installations with 13 chartered 4-H clubs and enrolling 661 youth. Air Force: 1 installation with 3 chartered 4-H clubs and enrolling 411 youth. Participants were invited to complete the 4-H Common Measures evaluation. One hundred twenty-nine (129) youth completed the evaluation. Responses showed the following results in the three project focus areas. Citizenship: As a result of participation in this 4-H program, 88% of respondents agreed or strongly agreed that they don't let their friends talk them into doing something that they don't want to do. 90% of respondents agreed or strongly agreed that they can apply knowledge in ways that solve "real-life" problems through community service. Healthy Living: As a result of participation in this 4-H program, 93% agreed or strongly agreed that they learned how to make healthy food choices. 85% agreed or strongly agreed that they now eat more fruits and vegetables.	