# FY 2020 Annual Report of Accomplishments and Results

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| Massachusetts |
| Massachusetts Agricultural Experiment Station |
| UMass Extension |

## I. Report Overview

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

| **1. Executive Summary** (Optional) |
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## II. Merit and Scientific Peer Review Processes

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

| Process | Updates ONLY |
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| **1. The Merit Review Process** | |
| **2. The Scientific Peer Review Process** | |

## III. Stakeholder Input

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

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

## IV. Critical Issues Table of Contents

| No. | Critical Issues in order of appearance in Table V. Activities and Accomplishments |
|---|---|
| 1. | Sustainable Agriculture and Food Systems |
| 2. | Climate Adaptation and Education |
| 3. | Sustainable Energy |
| 4. | Food Safety and Functionality |
| 5. | Child and Family Nutrition |
| 6. | Commercial Horticulture |
| 7. | Youth Development |
| 8. | Environmental Stewardship |
| 9. | Extension and Experiment Station Administration |

## V. Activities and Accomplishments

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

| No. | Project or Program Title | Outcome/Impact Statement | Critical Issue Name or No. |
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| **1.** | Plant Disease Diagnostics | The decline and death of plants from disease, insects and environmental stresses has many detrimental effects. These adverse effects range from economical to environmental and span from agricultural to forest settings. For example, pathogen outbreaks at commercial farms result in reduced earnings, lower vegetable yields and greater reliance on crops grown outside the region. Additionally, the introduction of invasive insects of trees can result in widespread mortality, dramatically transforming residential landscapes and having major ecological impacts on forests. Correctly identifying the causal agents responsible for decline and death of plants is critical to successful management. While some diagnoses impact only a single plant, others have broad implications for an entire | 1) Sustainable Agriculture and Food Systems<br>6) Commercial Horticulture |

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| | | species of plant. Regardless, we seek to provide unbiased and accurate information to the concerned stakeholder. Because of the financial implications of insect and disease outbreaks, the UMass Plant Diagnostic Lab serves as a critical resource for the Commonwealth and New England<br><br>In 2020, the UMass Plant Diagnostic Lab continued to fulfill its primary mission of providing reliable and accurate diagnoses of plant problems caused by diseases, insects and environmental stresses. As always, the lab provides detailed diagnostic reports outlining the biology and ecology of the pathogen/insect pest, when present, and environmentally sustainable management techniques. Sample submitters receive education on the specific plant pathogen or insect pest involved and management tactics tailored to the organisms found, age of the plant and specific site conditions. Despite the constraints of the pandemic, lab personnel participated in many educational outreach programs, which included: invited seminars for various stakeholder groups, editing and production of printed and electronic publications, editing technical manuals and updating fact sheets on many different CAFE websites. Things that could not be done this year that are typical components of any diagnostic season included twilight disease and insect walks and performing site visits for disease and insect identification. Applied research projects conducted through the Plant Diagnostic Lab focused on major pathogens of concern to tree care professionals and vegetable growers. Participants in educational outreach programs learn about the specific nature of plant problems and environmentally sustainable disease management. Numerous landscape professionals, vegetable growers, greenhouse managers and turfgrass supervisors express their gratitude for the service we provide. Many of these individuals often tell us that they could not do their job without the diagnostic and management assistance we provide. Membership in the National Plant Diagnostic Network provides staff with updates on exotic and quarantine pests, presents educational opportunities for professional development, and allows lab staff to educate growers about exotic and/or newly emerging diseases. Diagnostic support to the Vegetable, Greenhouse and Fruit programs educates extension staff and growers about the nature of specific plants problems and their management as well as environmentally sustainable techniques for disease management.<br><br>The pandemic created a serious disruption in our ability to provide service to the stakeholders that rely on the UMass Plant Diagnostic Lab. However, once the lab was | |

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| | | allowed to resume operation, after nearly three months of closure, it operated without further disruption through the rest of the year. This represents one of the greatest accomplishments of the year and highlights the importance of the lab to the state. Several submitters noted that they waited for the UMass Plant Diagnostic Lab to reopen, as opposed to sending samples to other state extension labs. The lab has assisted with or been the primary lab diagnosing a variety of important insect pests and disease-causing pathogens this past year. The rapid expansion of beech leaf disease in southern New England is one example. By coordinating with private arborists, state agencies and neighboring states, we have assisted with tracking this emerging disease that threatens a primary tree species in New England. Several other invasive and/or emerging pests and pathogens continue to be identified from plant samples submitted to the lab. Through timely diagnostics and sound management advice, we are helping to slow and stop the spread of these invasive organisms in our region. | |
| **2.** | Clean Energy Extension | The Commonwealth of Massachusetts is legally committed to reduce its economy-wide greenhouse gas emission by 80% by 2050, and a substantial clean energy transition is unfolding. The Clean Energy Extension serves an niche in this effort, providing direct support to organizations and municipalities in support of state clean energy policies and programs. The Clean Energy Extension's work is focused on market niches that are not served by the private sector - working with not for profit entities, municipalities, low income communities, and local government. Our assistance is accessible and flexible to meet the needs of the specific audience. Our work engages with the broader university community of experts as useful to address specific issues. The Clean Energy Extension employs student interns, and creates pathways for many students into the clean energy workforce.<br><br>In addition to our technical assistance role, in 2020, Clean Energy Extension has leveraged its work with successful grant applications for state and federal opportunities. We have designed, developed and launched an Offshore Wind Graduate Certificate program to prepare the professional offshore wind workforce. We received a federal grant to work with three pilot western Massachusetts rural towns to proactively plan for solar development. We were selected for a federal award to partner with agricultural extension researchers to conduct a 3 year research project on the agricultural and economic performance of dual-use solar (or agrivoltaics) across 8 site trials in Massachusetts. Clean Energy Extension established a Pollinator Friendly Solar PV | 3) Sustainable Energy |

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| | | Certification, which the state has adopted for an additional incentive adder under its solar program. We have Certified our first sites and are receiving additional applications. Clean Energy Extension has led an effort to promote and enhance the state battery energy innovation eco-system through the convening of a Steering Committee and a first Symposium.<br><br>Our most important results are providing technical support and motivation to under-resourced organizations and municipalities and we are making significant progress in helping them through the transition to cleaner energy. Clean Energy Extension has become a better known and well-regarded entity for the Commonwealth over this year. | |
| **3.** | Vegetable Extension Program | The UMass Extension Vegetable Program delivers research-based educational programming and conducts applied research to meet the needs of vegetable farmers statewide and to enhance the economic, human, and environmental health and sustainability of the vegetable industry in Massachusetts. This year was one of great upheaval for the entire farming industry and for Extension due to the COVID-19 pandemic, yet we still maintained a broad range of projects and activities and even increased our output in several key areas. Our success this year was due to our team's dedication to our mission of serving our commercial growers and the people of the Commonwealth. During a time of great uncertainty, we focused on working with government and industry partners to disseminate critical information to growers and the Commonwealth promptly and effectively.<br><br>**Education:**<br>**47 on-farm consultations** were provided to 13 farms over the 2020 growing season. This number is lower than normal due to restrictions on in-person visits because of COVID-19. However, we had a record number of phone, email, text, and video chat consultations this year, A minimum of **120 direct support consultations** were provided since January 2020. These new modes of consultation allowed us to work with many new beginning farmers and others who we had not had contact with previously.<br><br>We **organized or presented at 20 workshops** for 1057 growers and agricultural service providers. The bulk of these workshops were presented virtually due to the COVID-19 pandemic. This new medium allowed us to increase our reach and participation, with attendees from all over the state and even many from outside New England. In fact, we | 1) Sustainable Agriculture and Food Systems |

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| | | had registrants from Quebec, California, New Mexico, Kansas, Oregon, Indiana, Kentucky, Colorado and Idaho! We also were able to invite guest speakers from further afield, bringing new voices and expertise to our growers from Indiana, New York, and Michigan. We had a series of 7 virtual twilight meetings in spring on topics like early season pest scouting, organic insecticides, weed management, fertigation, marketing adaptations, COVID-19 business relief, and sanitizer use (241 live attendees and 297 subsequent views online). In the fall, we had a three-part virtual twilight meeting series on agricultural water issues pertaining to food safety regulations and climate change with 127 live attendees and 24 later views online. This new format allowed us to increase our numbers and also improve our state-wide coverage, since growers do not have to travel to attend on-farm meetings.<br><br>**Publications:**<br>The **New England Vegetable Management Guide** (NEVMG) was distributed this year to 1,300 growers and agricultural service providers across the Northeast region. The NEVMG also exists as a website which received 220,533 total and 182,830 unique page views between September 30, 2019-October 1, 2020. Our newsletter, **Vegetable Notes**, is arguably our most important output every year. It delivers timely information about weather, crop production practices, pest activity, and so much more to over 2,800 commercial growers, Extension personnel, ag service providers, and home gardeners/consumers. This year, we published an extra four issues to supply critical information during the start of the COVID-19 pandemic, and **8 new articles** were published. We **published 2 new factsheets** or other new resources for the website this year.<br>The **Vegetable Program website**, ag.umass.edu/vegetable, is another critical place for stakeholders to access a wide range of educational materials including factsheets, project outcomes, resources, and access services. According to Google Analytics, there were 335,783 page views and 282,585 unique page views originating from different machines/devices to this site between September 30, 2019-October 1, 2020.<br><br>**Research:**<br>Four research trials were conducted at the UMass Crop and Animal Research and Education Center, South Deerfield, MA or on a collaborating commercial farm on the following topics: | |

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| | | • Using Mulches to Reduce Flea Beetle Damage and Improve Crop Yield (1 trials)<br>• Evaluating Varieties for Cucurbit Downy Mildew Resistance and Yield (1 trials)<br>• Evaluating Varieties of Spinach for Winter-Production and Resistance to Downy Mildew (1 trial)<br>• Assessing efficacy of UV light to control cucurbit downy mildew (1 on-farm trial)<br><br>**Regional Collaboration:**<br>43 Extension educators from across the Northeast region participated in weekly pest alert calls, sharing updates about activity of common pests and getting support identifying new and uncommon pests or production issues. This information is used to inform our weekly Pest Alerts column in our newsletter, Vegetable Notes. The group also shares information by email, and helps to facilitate priority setting and collaborative, regional grant writing.<br><br>Our most important results are those that lead to increased knowledge, skills, and increased adoption of practices that enhance the economic, human, and environmental health and sustainability of the land, the farms, and Commonwealth. In our educational programming this year, participants reported they increased their knowledge, on average, by 78%. Similarly, on average participants in our series on agricultural water were 83% likely to adopt practices consistent with integrated crop and pest management. In our online educational workshop series on topics such as early season pest scouting, weed management, organic insecticides, and sanitizer use, evaluation respondents reported they were 68-87% (75% on average) likely to adopt practices consistent with integrated crop and pest management that were discussed in the workshops. Our educators are extremely effective in translating new information to grower audiences, resulting in changes in practice that improve crop, land, farm and food system outcomes. | |
| **4.** | Forest Conservation | Forests provide essential benefits. Massachusetts is the 8th most forested state in the country by percent of forest cover. Over 70% of the forests of Massachusetts are family forests. The average age of a FFO is almost 65 years old. We are in the midst of the largest transfer of land that we have ever seen. It is at these times of land transfer that forests stand the greatest chance of being converted to other uses (e.g., houses) or parcelized into smaller properties. The decisions these landowners make about the future of their land will shape our landscapes and the benefits they provide (or don't provide!) in the future. Informing these decisions about the future of their land is paramount to keep forests as forests. In addition, our forests face significant conservation challenges from | 8) Environmental Stewardship |

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| | | climate change, invasive insects, and excessive herbivory. Ensuring their resiliency is critical to the continuation of the public and private benefits that are derived from these forests.<br><br>There are over 50,000 family forest owners (FFOs) who own 10 or more acres of land, living in 351 communities across Massachusetts. We are charged with increasing forest conservation by informing the decisions of these FFOs who collective own 70% of our forests. We focus on research-based outreach strategies that can amplify our efforts, productive partnerships, and strategic critical issues. Specifically, work has focused on identifying and training community leaders through the Keystone Project to utilize social networks to inform FFO decisions, developed content for the website MassWoods, outreach on forest resiliency and the role of forest carbon in mitigating climate change, and a focus on conservation-based estate planning to help inform FFO decisions about their options for keeping forests as forests and not turning them over to development.<br><br>Important results for this year include:<br>• Developed and administered a statewide survey of land trusts<br>• Development of a new publication: Protecting Your Legacy Start-up Guide<br>• Reached 3,225 forest landowners through programs and direct mail who subsequently made more informed decisions about forest management and conservation<br>• Trained 680 Open Space Committee members and advocates<br>• Devised new outreach strategies to deal with the challenges of COVID – 19<br><br>**USDA Forest Service Chief's Award**<br>• The award is presented to Forest Service individuals and teams throughout the United States to honor their outstanding contributions to communities and the country. Our Family Forest Research Center received this award for its cutting-edge collaborative research with partners from government, nongovernmental organizations and universities to develop sound survey methods for collecting national data from private forest landowners. This information helps policymakers foresee future trends in private forestland management, allowing them to make better decisions while protecting the privacy of private landowners.<br>**Ernest Gould Technology Transfer Award** | |

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| | | Awarded by the New England Society of American Foresters for outstanding contribution to natural resource science and management through education and extension. | |
| **5.** | Pesticide Education | Pesticides are vital tools for controlling pests and maintaining an adequate food supply. If used improperly, pesticides can also threaten human health and the natural environment. Inexperienced applicators, accidents, inadequate protection and equipment continue to be areas of concern that increase the potential for negative personal and environmental impacts from pesticide exposure. The Pesticide Education Program works closely with the Massachusetts Department of Agricultural Resources to educate pesticide users about safe application, state regulation and proper use of pesticides in Massachusetts. This program helps agricultural and green industry businesses stay competitive and relevant through education on environmental issues that affect their industry and continued notice of updates to local and federal laws and regulations.<br><br>Approximately 2265 pesticide exam study manuals were distributed by the Program to approximately 600 individuals preparing for the state administered pesticide exams. The Pesticide Education Program conducted fifteen workshops to help individuals prepare for the Massachusetts state pesticide license exams. Seven of these workshops were held online using Zoom video conference. Approximately 12% of the individuals, who take the state pesticide applicator license exam, participate in the optional workshop. The workshop covers a variety of topics, including: pest identification, pesticide types and formulations, toxicity of pesticides, first aid for pesticide poisoning, pesticide label comprehension, personal protective equipment, environmental fate of pesticides, integrated pest management, and state and federal laws and regulations. Individuals receive a take-home practice exam to use as a pesticide exam study tool. The program used exam results provided by the Massachusetts Department of Agricultural Resources to determine the exam-passing rate for our workshop participants. Individuals who took the workshop continue to pass at a higher rate than those who did not take the workshop. Seventy-three percent of the individuals who took the workshop passed the exam compared to a passing rate 53% for nonparticipants. The program also offered six online Zoom pesticide recertification training workshops to individuals that have pesticide licenses and certifications. Topics covered in the series included: Massachusetts Pesticide Laws and Regulations, Pesticides and Impacts on Wildlife, Fungicides Modes of Action, | 1) Sustainable Agriculture and Food Systems<br>6) Commercial Horticulture<br>8) Environmental Stewardship |

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| | | Pesticide Applicator Safety, Pesticide Respirator Fit Train the Trainer and Special Topics for Pesticide Applicators. There were 571 individuals who participated in the workshops.<br><br>The Program had over 20 two-day pesticide exam prep workshops scheduled. Unfortunately, many were canceled because pf COVID 19. The state also suspended exams for a three-month period. The program was able to offer seven pesticide exam prep workshops in a new format over the course of three consecutive mornings using Zoom video conference. The program used exam results provided by the Massachusetts Department of Agricultural Resources to determine the exam-passing rate for our workshop participants. Individuals who took the workshop continue to pass at a higher rate than those who did not take the workshop. Seventy-three percent of the individuals who took the workshop passed the exam compared to a passing rate of 53% for non-participants. The Program scheduled twenty pesticide recertification training workshops that were all canceled due to COVID 19. After regrouping and revising the schedule, the Program was able to offer six recertification training workshops in May and June using Zoom video conference. | |
| **6.** | Massachusetts 4-H Youth Development Program | More than 20% of the population of Massachusetts is under age 18. These young people are the future workforce and leaders of our state and our nation. The healthy development of these youth cannot be left to chance. A statewide network of thousands of dedicated volunteers and leaders serve as mentors and role models to 4-H youth throughout the state. Volunteers and collaborators lead a variety of clubs, school enrichment activities and special interest programs that emphasize experiential learning and help youth build valuable life skills. 4-H Educators collaborate with volunteers to plan and deliver local programs, such as animal science, visual presentation programs, and community service projects that have a lasting effect on youth and a positive impact on the future success and vitality of Massachusetts.<br><br>Much of FY 2020 was a difficult year as in-person programming was suspended due to the pandemic. Several new remote programs were designed and implemented starting in March 2020, attracting youth participation from throughout the Northeast region as well as from many other states. Traditional animal science contests, such as horse bowl, hippology, judging, dairy contests, beef, sheep and goat contests, were all held via zoom and other interactive online platforms. In addition, some animal science workshops and speakers were featured throughout the year. | 7) Youth Development |

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| | | Some Massachusetts 4-H visual presentation programs, scheduled between February and early March 2020, were held in person. The visual presentation programs held after that date were conducted on Zoom. This not only presented youth members with a new learning opportunities (use of Zoom to conduct a speech, creating effective PowerPoint presentations, etc.) but also provided new training and learning opportunities for adult volunteers and 4-H staff. A highly successful program was conducted weekly with a focus on career exploration. Each weekly session featured an invited speaker who would share information about his/her position or job, how they became interested in the role, what course of study was required, and specifics about their job or position. Youth attendees were able to submit questions through the chat feature of Zoom. Each week the audience ranged from between 15-25 people per session.<br><br>As there were no in-person 4-H fairs or events during the summer of 2020, Massachusetts 4-H held a virtual fair. This event allowed youth to submit videos, photos, and written entries in order to showcase animal showing, artwork, robotic and coding entries, foods, flowers, and more. In total there were 1,264 individual entries for the fair, with a total of 203 individuals entering. | |
| **7.** | Hampden County 4-H Urban Programs | 4-H Urban Youth program provides hands-on learning opportunities for young people between the ages of 5 and 18 who live in Holyoke and Springfield. Based on the needs expressed by our community partners, we focus on Science, Technology, Engineering, Art, and Math (STEAM). We go into schools and community centers and engage with young people through hands-on activities using our outstanding 4-H curricula. We connect every activity to fields in higher education and STEAM-related careers. The program content is age and grade specific at each location, ensuring uniformity in design, training, evaluation, and desired outcomes. The program reaches over 350 youth in Springfield and Holyoke. The program enhances the Science, Technology, Engineering, Art, and Math (STEAM) skills of young people in grades K-9. Through partnerships with seven community centers and schools, Massachusetts 4-H provides programming based on its heralded national 4-H curricula. 100% of the young people we serve come from low-income families, the majority are young people of color, and they are underserved and underrepresented in their educational system compared to their white counterparts in towns and cities throughout the state. | |

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| | | We are running urban youth programs at nine sites: Sargeant West Community Center in Holyoke, Holyoke Boys & Girls Club in Holyoke, South End Community Center in Springfield, Home City Liberty Hill Townhouses Community Center in Springfield, Bay Area Neighborhood Resident Resource Center, Chestnut Accelerated Middle School Talented and Gifted in Springfield, Chestnut Academy Middle School in Springfield, Make-it-Springfield Makerspace in Springfield, and at the UMass Center at Tower Square in downtown Springfield. *Currently with Covid-19 restrictions we are working virtually with Home City Housing community centers and the South End Community Center. As a result of the program, youth are developing greater interest in science and are skilled and confident in their ability to master a variety of skills related to positive youth development. | |
| **8.** | Landscape and Nursery Extension | The UMass Extension Landscape, Nursery, and Urban Forestry Program works to educate landscape, nursery, urban forestry, and turf professionals by providing educational programming and research-based information on the best horticultural practices and technology for environmental stewardship in nursery and landscape management. The core of the Program is a group of educators and specialists in weed science, entomology, plant pathology, plant materials, alternative pest controls, and diagnostics. Working with the largest and fastest growing commercial agricultural segment in Massachusetts continually challenges the Landscape, Nursery, and Urban Forestry Program to address the industry's immediate problems and to anticipate future educational requirements. The landscape and nursery industry contributes an estimated $2 billion in sales to the Massachusetts economy, and employs over 12,000 individuals at approximately 5,000 companies. Examples of the industry's immediate problems for FY20 (the issues we addressed) include but are not limited to: challenges and opportunities for urban foresters; identification of insect, disease, and weed pests; management, identification, biology, and life cycles of invasive insects; management of invasive plants; pollinator health, pollinator preservation, and best management practices when using pesticides to reduce potential impacts to pollinators; management of woody plants and turf in ornamental landscapes; and the identification, life cycles, biology, and management of ticks found in New England, as well as information pertaining to the prevention of tick-borne disease. Our stakeholders, as well as the general public of Massachusetts, care deeply about the issues the Landscape, Nursery, and Urban Forestry Program addresses. Our goal is to promote research-based information on the best horticultural practices and technology currently available to the stakeholders we serve. For a snapshot of the | 6) Commercial Horticulture |

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| | | demand from stakeholders and the public, the Landscape, Nursery, and Urban Forestry Program website was accessed 466,514 times between 10/1/2019 – 9/30/2020 alone. (Representing a 17.51% increase from the same time period in FY19.) Of those, 410,477 represent individual (unique) page views originating from different machines/devices. Therefore, one could infer that our program's online resources alone reach at least 410,477 individuals. (Representing a 19.11% increase from the same time period in FY19.)<br><br>The Landscape, Nursery, and Urban Forestry Program conducted the following in FY20 (10/1/2019 – 9/30/2020):<br>• 5 in-person programs (prior to the pandemic)<br>• 26 live webinars/virtual events (prior to and during the pandemic)<br>• 4 short videos about insect identification<br>• Published 10 Issues of Hort Notes<br>• Published 20 Issues of the Landscape Message<br>• Published the 2020 Garden Calendar<br>These combined 31 in-person/live webinars/virtual events were attended by a total of 4,570 individuals (6,736 people registered for these programs but it is typical for online programs to have fewer attendees than those that actually register). Archived webinars/virtual events were viewed again a total of 2,763 times. The 4 short videos pertaining to insect identification (InsectXaminer) were viewed a total of 7,882 times. 10 issues of Hort Notes were published in FY20. According to Google Analytics, there were 32,309 unique pageviews and 39,017 total pageviews. On average, users spent 2 minutes and 44 seconds reading Hort Notes each time they visited.<br>20 issues of the Landscape Message were published in FY20. According to Google Analytics, there were 31,633 unique pageviews and 37,139 total pageviews. On average, users spent 2 minutes and 52 seconds reading the Landscape Message each time they visited. A total of 3,300 people purchased a total of 7,972 (2020) Garden Calendars. These numbers represent only a fraction of the Landscape, Nursery, and Urban Forestry Program's efforts to conduct and provide individual day-long programs, certificate programs and multi-day education, individual invited presentations/talks, newsletters, fact sheets, a Professional Disease Guide, a Weed Herbarium, Garden Calendar, diagnostics (in partnership with the UMass Plant Diagnostics Laboratory), one-on-one education (phone calls, e-mails, social media messages), and external media requests. | |

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| | | The most important results of the Landscape, Nursery, and Urban Forestry Program's efforts for FY20 are evidenced in the body of work reported on above. If we look at the number of unique visits to the LNUF Program's website, the number of individuals who attended our in-person, live webinars/live virtual events, the number of unique views of our archived webinars/virtual events, the number of views of our insect identification videos, and the number of people who purchased the 2020 Garden Calendar, our program has reached an estimated 433,664 individuals in FY20. We also maintain partnerships with Massachusetts professional associations, local, state, and federal government agencies, and UMass faculty to tackle the most pressing issues facing the industry. As requested, we provide articles to professional associations to highlight these issues to their members in their own publications and newsletters. Our program has also collaborated on grants and interdepartmental service agreements with the MA Department of Agricultural Resources and the MA Department of Conservation and Recreation. (For example, there is a long-standing interdepartmental service agreement with the MA DCR that again in FY20 provided funding to the Landscape, Nursery, and Urban Forestry Program.) | |
| **9.** | Urban Forestry | With over 1.2 million street trees, Massachusetts features a substantial % of urban tree canopy (UTC) cover in its three largest cities (Boston 29%, Worcester 37%, and Springfield 33%), with plans to increase urban tree populations and existing canopy cover through various greening and urban tree-planting initiatives. The value of trees planted in residential settings has been well-documented, and citizens are often passionate about maintaining urban trees and community green space. Community trees, however, are frequently presented with very challenging growing conditions and there is very little scientific data related to their survival and growth in urban environments. The Urban and Community Forestry initiative is dedicated to furthering our understanding related to the conditions that community trees are experiencing in the urban environment, and disseminating best management practices to professionals, policy-makers and citizens<br><br>Key activities for the past year focused on conducting outreach via sustained web-based programming (i.e. 'Urban Forestry Today' monthly webcasts), invited lectures (in-person and via 'zoom'), and through media outlets (i.e., newspaper & television interviews), aimed at informing large audiences of stakeholders and the general public about issues of importance. | 8) Environmental Stewardship |

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| | | A foundation for sustained collaboration has been through ongoing leadership and service to professional associations (i.e. the New England Chapter of the International Society of Arboriculture; the Massachusetts Tree Wardens and Foresters Association), agencies (i.e. USDA Forest Service, MA Dep't of Conservation & Recreation) and community-based NGO's (i.e. ReGreen Springfield). Increasingly, targeted efforts were also focused on collaborating directly with key individuals in various communities throughout Massachusetts through professional association outreach activities. Through these activities, significant progress was made towards the fundamental goals of the project, which includes working with stakeholders to disseminate and increase public knowledge regarding the importance of urban and community forests and their associated benefits. A program of applied research featuring five (5) integrated research-extension initiatives serves as the foundation for many of these activities, which is conducted in a manner that advances scholarship in the field of urban forestry, while also generating knowledge and results with immediate application by local stakeholders in support of urban tree health. Research activities for the past year focused on measuring the growth responses of trees in the urban environment (Oak spp.) and on developing pest-resistant tree species (i.e. American elm) suitable for establishment in the urban landscape.<br><br>Work with trees in populated environments is often a multi-year effort, yet our work continues to quantify and build understanding that will translate to decisions made and actions taken by key stakeholders (e.g. Tree Wardens, Arborists, urban tree committee volunteers) in their management of urban forest resources, which will inevitably effect the vitality of urban forests in communities throughout Massachusetts. | |
| **10.** | Sustainable Soil and Cropping Systems | The crops, dairy, livestock, and equine industries are important economic contributors to the Massachusetts economy, both directly, and indirectly through the services and industries they support. Together the dairy and livestock farmers in Massachusetts manage more than 130,000 acres of hay, pasture and corn, contributing to open space that is important to both non-farm residents and tourism. Massachusetts also has a sizable equine industry with a horse population of more than 40,000, with more than 10,000 horse owners. We conduct applied research and provide educational opportunities and technical assistance to dairy farmers, livestock producers, and horse owners to increase their knowledge of environmental issues and their ability to reduce | 1) Sustainable Agriculture and Food Systems<br>8) Environmental Stewardship |

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| | | the threat of pathogens and nutrient loss from barns, stables, fields and pasture. The crops, dairy, livestock, and equine team also focuses on soil health and conduct applied research and outreach activities to promote agricultural practices such as no-till system and cover cropping to improve soil health as well as sustainability and resiliency of farming in Massachusetts<br><br>In 2020, the program focused on soil health and implementation of agricultural practices to enhance soil health and more specifically supporting soil biology. “Soil health” is an important focus for many agricultural groups interested in regenerative and sustainable crop and livestock production as well as land management. While awareness of soil health is increasing, it is important to have a good understanding of what soil health entails, how it is measured, and how to manage it for optimal and sustainable delivery of the ecosystem services that soils provide. We educated our target audeicne in these areas by<br>• Posting presentation on YouTube<br>• publishing factsheets<br>• conducting webinars<br>• applied research to investigate and quantify the benefits of healthy soils on productivity and sustainability of farming systems<br><br>The major results obtained in 2020, were considerable increase in webinars attendance, higher number of farmers who are willing to implement soil health demonstrations on their farm. We were also able to secure funding to continue working with farmers on soil health on their farms. These grants include "Massachusetts Department of Agricultural Research", "Northeast Sustainable Agriculture Research and Education", and "USDA-Natural Resource Conservation Services." In addition, there was a considerable increase in the attendance for webinars. Roughly 1,000 people registered in advance for the webinar series. However, more people nationwide had access by viewing the recorded presentations. The number of volunteers participating in on-farm demonstrations related to soil health has increased dramatically. Currently 18 farms have signed up for different projects. | |
| **11.** | Integrated Pest Management for Turfgrass | Since the production, maintenance, and use of turf areas happens outdoors, the turf sector of the horticultural industry was less impacted by the COVID-19 pandemic, either positively or negatively, relative to other sectors of the industry. One key result of the | 6) Commercial Horticulture |

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| | | pandemic is that many individuals paid somewhat closer attention to turf health and performance. This greater attention and increased interest in enhancing and beautifying properties and other outdoor spaces magnified the extant perennial concerns around creating and sustaining a trained and skilled labor pool. Greater scrutiny also led to increased awareness of environmental stress problems, of which there were two remarkable, region-wide incidences caused by unique weather conditions this season: accelerated dormancy leading to widespread saprophytic fungi infection in late spring/early summer 2020, and widespread chilling injury in the fall. As ever, the work of UMass Extension's Turf Program centered on perennial educational themes including sustainability, IPM, and Best Management Practices… especially in the areas of soil health, water conservation and protection, nutrient management, and pollinator protection. These principles help to promote input reduction, natural resource protection, and management efficiency, which leads to higher quality turf for stakeholders, increased societal and ecological benefits, lower environmental and health impacts, and more successful and profitable businesses.<br><br>FY20 was a time of significant transition for UMass Extension's Turf Team. Longtime Team Leader retired in June, effectively leaving only 0.5 FTE devoted exclusively to turf-related outreach activities. Additional losses in the way of bookkeeping and project support further eroded capacity, and pandemic-related austerity measures prevented immediate steps to address these deficiencies. Priorities were the annual Fall Wrap-Up program held in-person in November of 2019, a very successful annual Winter School for Turf Managers short course held in-person in January and February prior to the pandemic, invited presentations, and diagnostics and consultations; for which there was increased demand this season and most of which were performed remotely due to travel bans and social distancing requirements. Much effort in the second half of the year was devoted our biennial Green School (the impact of which will be covered in the FY21 report): planning, facilitation, curriculum preparation, and transitioning to remote delivery.<br><br>The turf component of the 2019 Fall Wrap-Up for Landscapers communicated the latest research-based techniques and BMPs and provided a pesticide recertification opportunity for 151 practitioners. Turf Winter School 2021 hosted 36 enthusiastic turf professionals in Amherst and provided over 175 hours of education and training over six weeks during | |

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| | | the winter. Despite the circumstances, the team was able to provide 117 direct professional consultations via e-mail, phone, and other contact-free means; 33 of which were based on plant samples submitted by mail or delivery to UMass Extension's Plant Diagnostic Lab. Total web contacts exceeded 160,000; an increase of approximately 16% relative to FY19, which spoke to the reality of folks seeking to learn in virtual, non-traditional ways. Popular web destinations were the Team's Management Updates (12 in-depth updates, 11,968 views), the Professional Guide for IPM in Turf (12,558 views) and the UMass Extension's Best Management Practices for Lawn & Landscape Turf guide (2,273 views). | |
| **12.** | Sustainable Landscape Horticulture | The first area that was addressed was improving sustainability of landscapes. This is being done through research and outreach regarding plant establishment, plant selection and installation, and landscape maintenance. Ongoing research in this area is looking at the impact of rootball preparation technique on establishment (root growth and shoot growth), stress, and survival of plants. This research benefits landscape professionals, nursery and garden centers, and home owners. The second areas that was addressed was improving production practices for container grown ornamental plants. Research has specifically looked at the impact of fertilization and irrigation practices and how they can be altered to still produce good quality salable plants. Research has also looked at the use of additives to improve water holding capacity of substrates which can potentially reduce irrigation frequency and plant stress. The research benefits nursery producers.<br><br>Research projects completed include: a study looking at the impact of reduced irrigation and fertilization on flowering and growth of penstemon; a study looking at the impact of substrate type on effectiveness of substrate additives to improve water holding capacity, a study looking at the impact of container type on the effectiveness of substrates additives to improve water holding capacity; multiple studies looking at effect of substrate water holding additives on time to dry down (wilt); a study looking at the effectiveness of additives when substrates are maintained at different water holding capacities; a study looking at the salt tolerance of various Ilex species. Ongoing research is looking at the effect of rootball preparation technique on plant establishment, survival, and growth. Outreach has included presentations on research fertilization rate research, improving irrigation applications, and irrigation technology. Publications on completed research (3 articles published in 2020), a trade magazine article on irrigation technology, and multiple extension related articles/fact sheets. | 6) Commercial Horticulture |

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| | | The most important result from the production practice research was that irrigation and fertilization practices can be reduced while still producing salable plants. The extent that reduced irrigation and fertilization impact plant growth is variable between species but reductions were possible for all plants studied. It was also found that visually plants grown with the most water were generally less appealing while plants grown with reduced irrigation were most visually appealing. Results of the water holding capacity additives were mixed, indicating that they need to be assessed for different species and substrates. Preliminary data from the establishment study is showing that rootball preparation technique has not made a difference in terms of plant survival (even with drought conditions in 2020). There does seem to be a species specific effect on the impact on plant growth that may reflect difference in root systems or drought tolerance. The study will be concluded in 2021. | |
| **13.** | Sustainable Greenhouse Management | While the COVID-19 pandemic negatively affected many areas of the economy, the fact that many people spent more time at home increased interest in beautifying properties and growing food. These trends lead to one of the busiest and most successful seasons on record for greenhouse-based businesses. This boom put the spotlight on the persistent issue of a skilled labor shortage in the horticultural industries. UMass Extension's Greenhouse Crops and Floriculture Team worked to connect growers with up-to-date, research-based information to help those new to the industry, as well as experienced practitioners, to advance their skills and achieve necessary industry licensing and certifications. Front and center were perennial educational themes including sustainability, IPM, and Best Management Practices. These principles help to promote input reduction, natural resource protection, and production efficiency, which leads to higher quality plants for consumers and service providers, lower environmental impacts, and more successful and profitable businesses.<br><br>Over the past few years, the Greenhouse Crops and Floriculture Team has worked to improve and expand its web presence, as well as enhance response capabilities for emerging issues through the use of social media and other modern communications tools. This meant the Team in one regard was well-situated to continue to provide educational resources, services, and consultations in a relatively normal fashion despite travel bans and social distancing requirements. On the other hand, traditional in-person programs were significantly affected. Two key winter meetings proceeded as normal, but programs later in the year had to be transitioned to remote delivery. The annual summer meeting was adapted via two successful webinars held in August and September. The biennial Northeast Greenhouse Conference, a regional effort for which UMass Extension | 6) Commercial Horticulture |

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| | | assists in development and facilitation, pivoted into a series of well-received webinars. Key diagnostic services from UMass Extension's Plant Diagnostic lab persevered, despite a lengthy lab shutdown in the spring.<br><br>Total web and social media contacts exceeded 650,000, an increase of nearly 20% relative to FY19, which spoke to the reality of folks seeking to learn in virtual, non-traditional ways. Despite the circumstances, the team was able to provide 125 direct consultations via e-mail, phone, and other contact-free means; 43 of which were based on plant samples submitted by mail or delivery to UMass Extension's Plant Diagnostic Lab. New and veteran practitioners alike were able to receive valued greenhouse-specific training for not only important industry priorities including IPM and Best Management Practices, but also in support of critical pesticide licensing, for which the system was substantially disrupted by the pandemic. Summer webinars were partially underwritten by the Massachusetts Flower Growers Association, who with this support expressed that the industry was trusting of and grateful for our novel efforts. | |
| **14.** | UMass Extension Sustainable Fruit Production and Marketing | In Massachusetts and other areas of the Northeast, over the past few growing seasons erratic weather has made thinning (the process of removing excess flowers and fruits from trees) challenging. The most challenging time is near the traditional thinning time, when fruitlets are 7 to 14 mm in diameter. This period of time is when developing fruits are most susceptible to chemical thinners. If weather is not favorable for thinning during this time, the chance of over- thinning or under-thinning is enhanced. Fruit growers face tough choices about protecting crops from native and invasive insect pests. In recent surveys, 66% of growers were very concerned about the presence of the brown marmorated stink bug in their area, 89.7% expressed that research on this invasive pest needs to be conducted in MA and other New England states, **and** 100% of the respondents indicated that more Extension and outreach on BMSB (biology, management, biological control, effective insecticides, etc.) are needed.<br><br>In terms of diseases, 2020 was a challenging year for growers who faced the bacterial disease called fireblight. Fire blight is an aggressive and difficult to control disease that affects pears, apples, and related fruit species. It can cause significant damage in a matter of days. Plant pathologists from the UMass Extension fruit team responded to reports from Massachusetts and neighboring states, and working collaboratively, provided growers with information on the most effective ways to prevent and control fire blight outbreaks. | 1) Sustainable Agriculture and Food Systems |

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| | | Due to COVID-19, during 2020 the UMass Extension Fruit team relied heavily on online-based methods (social media, e-Fact sheets, webinars, Zoom meetings, etc.) to disseminate research-based information among stakeholders. Social media significantly widened the team's audience. The UMass Fruit Team website (UMass Fruit Advisor), when linked together with social media platforms (twitter, Facebook, Instagram), extended the team's collective impact by making it available to nearly 38,000 people. When compared to 2019, the team's efforts resulted in more than triple the number of people who accessed our educational outputs and activities.<br><br>During FY 2020 the fruit team hosted, organized, and presented research-based information at 39 (mostly online) events across New England and the Northeast. At these events, we shared vital information ranging from invasive insect pest management and time-sensitive horticultural guidance to climate mitigation strategies and integration of cutting-edge agricultural technologies.<br><br>We conducted 11 different on-farm research and demonstration projects. The fruit team's projects addressed research needs such as innovative trap-tree and 'ghost trapping' methods for controlling native and invasive fruit pests, apple and peach rootstock performance evaluations, precision thinning, optimizing cider apple production for high-value markets, dealing with outbreaks of the bacterial disease fireblight, the effect of shoot and cluster thinning on wine grape juice quality and many more.<br>Fruit team members produced and maintained 87 publications. Those publications include newsletters and production guides, fact sheets, reports, abstracts, and articles (both in refereed journals and in industry publications). An archived library of works by multiple team members continues to provide reference material to growers, service providers, gardeners, students, and educators in the field. Additionally, team members also served on numerous editorial and review boards.<br><br>Over 440 individual consultations and/or diagnostic services were performed providing fruit growers with information essential to their success in changing climate and growing conditions. The phone calls, site visits, and email correspondence permitted fruit growers to employ up-to-date protocols and preemptive strategies on their farms. | |

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| | | Research findings are published in peer-reviewed journals, and the most important findings that are relevant for growers are published in Extension magazines, journals, Fact Sheets, Newsletters, and presented at growers' conferences and meetings. As a result of the team's efforts, some growers reported reduced pesticide use on fruit crops, increased use of ecologically-based IPM strategies including biological controls and reduced-risk pesticide materials, the introduction of new crops/cultivars and production systems such as growing seedless table grapes and the introduction of high-density apple production systems. | |
| **15.** | Sustainable Cranberry Production | We addressed new and emerging pest issues (e.g., scale, brown casebearer), gathering data on occurrence in the industry and discovering details about the biology of these insects in the cranberry production systems. We continue to educate growers on resistance management in terms of fungicide, insecticide, and herbicide rotation when controlling pests. We provided diagnostic services so growers would be applying the correct management option to the correct situation. We worked to minimize nitrogen and phosphorus inputs into cranberry farms and surrounding water bodies by utilizing and interpreting tissue and soil tests to guide the proper administration of fertilizers. We also continue to refine use patterns for pesticides to maximize control and minimize environmental impacts. We use these data to obtain Special Local Needs (SLN) labels and Section 18 Emergency Exemption permits as needed. We continue to promote IPM and interregional collaborations. Working with colleagues from Clemson, Cornell, Penn State, Maryland, North Carolina and Georgia), the "My IPM" app was updated by the team. Special emphasis was placed on disease diagnoses. All of these efforts are critical to all of our stakeholders as we continue to provide effective pest management tools to the cranberry industry, which enables growers to sustain their economic viability.<br><br>We held a series of successful meetings (in-person and transitioning to virtual) that were well attended by our grower clientele. Specifically, 164 growers attended the Annual Management Update and 81 people attended 2 virtual meetings on pesticide safety. We held four virtual bogside workshops that were attended by 125 growers. We published 9 issues of the Cranberry Station newsletter, which was distributed to 195 recipients. Most subscribers are in Massachusetts, but 11 are national or international addresses; 57% receive the newsletter via email. We produced 6 videos on various aspects of cranberry cultivation that received 687 views. | 1) Sustainable Agriculture and Food Systems |

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| | | We worked directly with 20 growers or bog foremen to sample, identify, and manage scale outbreak populations in the field and handled another 41 samples for other diagnostics. Disease, insect and weed diagnostics were conducted on 62 samples using microscopic, cultural, and serological methods. Bog visits were limited (<20) due to Covid. We provided five crop insurance letters, 6 Zone II letters plus 10 consults, and wrote a letter of support regarding USDA Border Security for a fresh fruit grower. Eight consultations were made related to plant physiology (e.g., soil moisture, frost, solar panels). We conducted 24 Pesticide Certification consultations (so growers could obtain their physical license from MDAR and/or receive one-on-one training to obtain their pesticide license).<br><br>Web access continues to be an excellent resource for our constituents and people interested in sustainable cranberry production. Many of our fact sheets, presentations, and publications are available on Scholarworks, a digital repository supported by UMass Libraries. Visitors to the ScholarWorks site downloaded 8,149 documents (2800 more than in 2019) during the reporting period including 1,867 copies of various sections the UMass Cranberry Station Chart Books, 536 copies of the Cranberry Production CP-08 (Executive Summary and Full) Manuals, 444 copies of BMPs, 2,949 copies of our Extension PowerPoint presentations, and 880 fact sheets. We posted 39 new documents. UMass Cranberry Station documents were downloaded by people from 119 different countries. The top three countries being U.S., China, Canada, and Canada.<br><br>The most important results and impacts for FY 20 were:<br>• Growers managed outbreak populations of scale, brown casebearer and green spanworm.<br>• Growers had a new tool, Zeus (herbicide) to use for moss control, a weed shown to have significant negative impact on cranberry growth and yield.<br>• Growers employed alternatives to chlorothalonil for fruit rot control, including the use of the cultural practice of holding late water floods.<br><br>We adapted to the remote environment caused by Covid and provided high-quality virtual educational programs for our stakeholders. We maintained critical connectivity with our stakeholders and provided them with letters, reports, diagnoses, and management guidelines that were immediately and positively impactful on their farms. | |

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| **16.** | Integrated Pest Management for Fruit Growers | In Massachusetts, there is a high need to bring research-based information on all aspects of IPM to the state's citizens. Managing pests has been consistently identified as the number one challenge faced by a variety of small and mid-scale fruit producers in the state. Fruit growers face tough choices about protecting crops from the invasive pest brown marmorated stink bug near harvest, when pest populations are higher. Broad-spectrum insecticides are effective but also kill beneficial insects and some materials cannot be applied near harvest. Stakeholders have voiced the need to address this pest. For example, in recent surveys, : **(1)** 66% of growers were very concerned about the presence of BMSB in their area, **(2)** 89.7% expressed that research on BMSB needs to be conducted in MA and other New England states, **(3)** 96.4% indicated that the type of research proposed involving 'ghost traps (= insecticide-treated netting in association with the BMSB pheromone)' and 'trap cropping' for BMSB management is relevant and needed, **(4)** 75.9% expressed willingness to conduct on-farm research if the project receives funding (additionally, 24.1% indicated 'maybe'), and **(5)** 100% of the respondents indicated that more Extension and outreach on BMSB (biology, management, biological control, effective insecticides, etc.) are needed.<br><br>Extension delivery methods used by are varied, and reflect the varying needs of our clientele Our Extension activities emphasize the cultural and learning characteristics of our primary audience. We emphasize one-to-one interactions, workshops, presentations, extension publications, and on-farm demonstration trials. For farmers who prefer online information delivery, we provide support via e-mail, links to resources, fact sheets, and news articles. On-farm research and demonstrations are conducted. In addition, we develop educational materials to aid in the pest management decision-making process for pests associated with fruit production in the state, conduct relevant applied research and disseminate findings among growers and other audiences, and monitor and document changes in pest management practices leading to a reduction of pesticide use and associated negative environmental effects.<br><br>We developed/evaluated grower-friendly IPM strategies targeting native and invasive species. Examples include grafted trees and lures evaluation for monitoring of Tarnished plant and European sawfly, use of odor-baited trap trees for plum curculio, evaluations of the ghost trap (brown marmorated stink bug pheromone deployed in the field in combination with insecticide-treated netting), trap cropping as a potential IPM strategy | 1) Sustainable Agriculture and Food Systems |

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| | | for brown marmorated stink bug, and use of diluted Concord grape juice as an inexpensive, effective, and readily accessible material for fruit growers that need to monitor for the invasive pest spotted wing Drosophila. Research findings are published in peer-reviewed journals, and the most important findings that are relevant for growers are published in Extension magazines, journals, Fact Sheets, Newsletters, and presented at growers' conferences and meetings. | |
| **17.** | Community Health and Nutrition Extension | A majority of Springfield residents are people of color, predominantly Latino/ Hispanic (43.8%) and Black/ African American (18.9%). Health inequities are prominent among residents of Springfield, and disproportionately represented among African American/ Black and Latino families. In response, we developed an integrated research and Extension project aimed at promoting health and wellbeing among families of color, focusing on the perinatal life stage. Women of color in the U.S. have a high rate of accessing late or no prenatal care, resulting in increased risk of maternal morbidity and mortality. There is a need to reach women of color during pregnancy, a critical period to influence behavior and decision making and connect women to community services supportive of their perinatal health. Our breastfeeding coalition BCAC (I established in 2017 to address breastfeeding disparities in Springfield) developed a community-based, high quality, culturally-informed group-based prenatal education program targeting women of color in Springfield. The proposed program was submitted to UMass CAFE for funding. Although successful in receiving funding, the program had to be suspended for safety reasons due to COVID-19.<br><br>**Breastfeeding Coalition**<br>Due to the COVID-19 pandemic, our breastfeeding coalition(BCAC) adjusted in order to continue supporting the lactation support needs of communities of color. This involved BCAC partnered with the Boston Breastfeeding Coalition(BCC) to offer remote lactation support services. BCAC and BBC collaborated on numerous social justice actions and advocacy aimed at protecting families of color who are disproportionately impacted by the pandemic. These actions include input and feedback on legislative Bills addressing access to care, a statement submitted to the Federal House Ways and Means Committee for their May 27, 2020 meeting: "The Disproportionate Impact of COVID-19 on Communities of Color". | 5) Child and Family Nutrition |

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| | | **Nutrition Education**<br>Nutrition students were trained to deliver several nutrition education activities to area schools: grades K-12. Depending on the school, the education activities incorporated school garden programming or themes congruent with science curriculum. The nutrition education lessons focused on integrating knowledge with experiental activites that included food demonstrations and sampling of recipes. Context of lessons was respectful of the cultural diversity of the student audience and budget conscious, given that in many settings more than a third of students were from settings that were at risk of food insecurity. Evaluations of lessons delivered favored experiential learning and sharing of recipes of easy to prepare snacks. Anecdotally, identifying beverages with the highest sugar content was one of the most popular nutrition games! | |
| **18.** | Supplemental Nutrition Assistance Program Education (SNAP-Ed) | Through the Supplemental Nutrition Assistance Program Education (SNAP-Ed) program, we provided nutrition education to SNAP participants and those eligible for SNAP, assisting them with establishing healthy eating habits and physically active lifestyles. Our overarching goals were to:<br>• Improve dietary and physical activity practices of SNAP-Ed participants<br>• Develop and implement comprehensive, multi-level SNAP-Ed interventions that include direct, indirect, and policy, systems, and environmental (PSE) change for obesity prevention<br>Staff in five field offices (Boston, Lawrence, Raynham, Springfield, and Worcester) and one subcontractor site (Barnstable County Cape Cod Cooperative Extension) reached 35,192 adult and youth participants with direct education, making a total of 126,995 direct nutrition education contacts in FY2020. A total of 172,804 individuals were reached through indirect education methods (displays, food demonstrations at Transitional Assistance offices, leave-behind enrichment activities for school staff to use with children, and newsletters).<br><br>Major Activities in FY2020 included:<br>• We expanded the number of community-based collaborators, adding 11 new collaborators with MOUs.<br>• We were on track for implementing activities as planned during the first half of FY2020. We had reached or exceeded 50% of our direct education yearly goals, were on track to meet our yearly goals for indirect education, and 14 PSE initiatives were reaching 10,227 individuals as of the end of March. | 5) Child and Family Nutrition |

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| | | • The COVID-19 pandemic required us to restructure our program activities and collaborator partnerships in new and different ways for April through September. Major achievements during this time included:<br>• We immediately began developing a weekly newsletter called *Nutrition Bites* to stay in touch with our community partners and participants – we emailed the newsletter to all partners and participants each week, encouraging them to distribute it to their participants and to use the information for their own social media postings. Each issue contained a food safety tip, nutrition tip & recipe, physical activity tip, and food access/food security information.<br>• We quickly provided support and hardware to set staff up to effectively work from their homes, with their office desktop computer or a laptop, webcam, headset/microphone, and cell phone tripod when needed.<br>• We quickly began providing staff development focused on: technology, utilizing Zoom for program delivery and staff communication, strategies for effective remote teaching, developing and utilizing online forms such as Qualtrics and Google Forms, understanding and implementing PSE change strategies/activities, nutrition certification training, Serv Safe certification, and mindfulness during periods of stress and change.<br>• Educators reached out to community partners where programs had been interrupted, and offered them electronic and/or printed nutrition education materials and reinforcement items as appropriate. These were often provided as 'kits', with educational materials and reinforcement items provided together and delivered via USPS or curbside drop-off to agencies for distribution.<br>• Once staff were trained and had the needed hardware for providing virtual programs, educators reached out to community partners to schedule adult and youth groups as previously planned (but via Zoom – either as a group or individually) whenever possible. Many partners were closed or fully occupied navigating staffing, facilities, and safety guidelines related to the pandemic. As the summer passed, some partners were increasingly more interested and available to schedule programming. From April through September, we conducted 33 series and 10 single sessions, a total of 131 sessions, reaching 384 participants and making 1,085 contact in the second half of FY20.<br>• Once farmers' market season was in full swing, we added a second newsletter, *Produce Spotlight*, and alternated it each week with *Nutrition* | |

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| | | *Bites.* The Massachusetts WIC program publicized this newsletter on their farmers' market web page.<br>• NEP staff worked together in teams through the summer to modify and adapt *Show Me Nutrition* preschool through grade 6 youth materials for effective remote delivery. For each grade level, NEP teams developed 4 lessons using Google Slides to be used for teaching the program remotely. We encouraged staff to work in pairs, with a 'buddy' to practice teaching the lessons using Zoom in order to be ready to deliver virtual lesson series at the start of the new school year in September.<br>• We also modified our *Choices* adult curriculum for remote delivery.<br><br>Evaluation measures for FY2020 grades 3-5 and grades 6-8 youth series showed that SNAP-Ed programming resulted in statistically significant change in youth from pre to post for the following indicators:<br>• Grades 3-5 eating vegetables more often<br>• Grades 3-5 and eating fruits more often<br>• Grades 3-5 being physically active more often<br>• Grades 6-8 frequency of physical activity that makes participants' heart beat fast and causes them to breathe hard<br><br>A survey of Head Start/preschool classroom teachers of youth participating in a series of lessons showed:<br>• 84.3% of Head Start/preschool teachers of SNAP-Ed youth attending a series of nutrition education workshops responded that the students were more willing to try new foods<br>• 97.9% of Head Start/preschool teachers had reinforced the nutrition information with their students. In addition to reinforcing nutrition messages, 97.9% of preschool teachers used the materials provided by SNAP-Ed.<br>• 69.9% of classroom teachers reported that they themselves had made behavior changes such as healthier meal and/or snack choices and become more physically active since SNAP-Ed was taught in their class. | |

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| **19.** | Expanded Food and Nutrition Education Program (EFNEP) | The Expanded Food and Nutrition Education Program's mission is to assist limited-resource families to acquire the knowledge, skills, attitudes, and changed behaviors necessary for nutritionally sound diets, and to contribute to their personal development and the improvement of the total family diet, nutritional well-being, and levels of physical activity.<br><br>Six professional staff (1.17 FTE) supervised EFNEP and 13 paraprofessional staff (10.27 FTE) provided nutrition education programming to low-income adults and youth. A total of 1,000 adults and 1,401 youth were reached in FY2020 through series of nutrtion education lessons. The programming was moving along smoothly from October 2019 until early March 2020 when the pandemic began greatly affecting Massachusetts with agency, school, and program disruptions and closures. These participant numbers were lower than in past years due to extensive pandemic disruptions in the communities where we provide EFNEP services.<br><br>In response to the pandemic, UMass Extension's EFNEP program did the following in FY2020:<br>○ EFNEP staff began working remotely effective March 18<br>○ We used the initial weeks for staff development focused on: technology, utilizing Zoom for program delivery, strategies for effective remote teaching, developing and utilizing online forms such as Qualtrics, understanding and implementing PSE (Community Impacts) change strategies/activities, nutrition certification training, Serv Safe certification, and mindfulness during periods of stress and change.<br>○ We also used this time to set staff up to effectively work from their homes, with their office desktop computer or a laptop, webcam, headset/microphone, and cell phone tripod when needed. Over the summer we modified and adapted our *Show Me Nutrition* youth materials for effective remote delivery, and modified/adapted our *Choices* adult curriculum for remote delivery.<br>○ We immediately began developing a weekly newsletter called *Nutrition Bites* to stay in touch with EFNEP partners and participants, and emailed the newsletter to all partners and participants each week. Each issue contained a food safety tip, nutrition tip & recipe, physical activity tip, and food access/food security information. https://ag.umass.edu/nutrition/nutrition-bites | 5) Child and Family Nutrition |

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| | | ○ Once farmers' market season was in full swing, we added a second newsletter, *Produce Spotlight* and alternated it with *Nutrition Bites*. Massachusetts WIC publicized this newsletter on their farmers' market web page<br>○ EFENP educators reached out to participants of programs that had been interrupted, mailed them curriculum materials, and conducted the program using Zoom either in groups or one-on-one, or over the phone one-on-one so that enrolled participants could finish the program and graduate. Participants were provided with electronic and/or printed nutrition education materials and the usual reinforcement items such as measuring cups, colanders, measuring spoons, etc. These were delivered via USPS, curbside dropoff to agencies for distribution, or delivery to participants' homes.<br>○ Educators reached out to community partners to schedule adult and youth groups as previously planned (but via Zoom – either as a group or individually) whenever possible. Many partners were initially closed or fully occupied navigating staffing, facilities, and safety guidelines related to the pandemic. As the summer passed, some partners were increasingly more interested and available for EFNEP programming.<br>○ When programs could be scheduled, entry and exit data was taken using Qualtrics forms or taken via Zoom or over the phone individually with participants; the Recall was obtained when possible, but was typically problematic to obtain. Curriculum materials and reinforcement items were delivered to the partner for distribution or directly to participants' homes. Participants who did not have the technology to participate in a Zoom group were provided the *Choices* curriculum booklets followed up with Nutrition Educator individual lesson phone sessions.<br><br>Program entry and exit measures with both adults and youth measured change in the five core EFNEP areas: diet quality, food resource management, food safety, physical activity, and food security for both adult and youth participants. Improvements after participating in EFNEP included:<br>Adult Participants<br>• 94% Showed a positive change in consumption of at least one food group<br>• 81% Improved in Food Resource Management | |

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| | | • 93% Improved in Nutrition Practices<br>• 77% Improved in Food Safety<br>• 77% Improved in Physical Activity<br>• 42% Improved in Food Security<br>Youth Participants<br>• 73% Improved in Diet Quality<br>• 54% Improved in Food Safety<br>• 53% Improved in Food Resource Management<br>• 34% Improved in Physical Activity Behaviors<br>• 20% Improved in Food Security | |
| **20.** | Fish, Wildlife & Biodiversity Conservation | There is a need for greater understanding of the potential threats to water resources, biodiversity and ecosystem integrity, for land use policies that recognize both the vulnerability of natural resources and our reliance on them, and the development and implementation of best management practices that will protect terrestrial, wetland, aquatic, and coastal ecosystems. UMass Extension is among the many agencies, institutions and organizations that are addressing ecosystem health and protection. Management decisions cannot always wait for a complete understanding of potential impacts without risking the loss of species or communities of species due to inaction. The University can play a critical role in the development and deployment of new approaches and tools based on an evolving understanding of both ecological and human systems. The University of Massachusetts Amherst possesses a strong academic and research base for addressing various elements of ecosystem management and biodiversity protection. The Department of Environmental Conservation contains expertise in wildlife and fisheries conservation, forestry, conservation biology, landscape ecology, forest, wetland, aquatic and coastal ecosystems, insect and plant pests/diseases and biological control agents, climate change, and human dimensions of natural resource management. Expertise and research capacity exists in the Department of Landscape Architecture and Regional Planning in the areas of regional land use, watershed and open space planning. The Geosciences Department and Department of Civil and Environmental Engineer possess extensive capacity in the areas of hydrology, geomorphology, ecohydrology, drinking water and environmental engineering. | 8)Environmental Stewardship |

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| | | Based on information from our stakeholder input process and an assessment of the University's current research and extension capacity, these are the priorities in Ecosystem Management, Protection and Restoration that we will be addressing over the next five years:<br>1. Land Protection.<br>2. Development Impacts on Ecosystems.<br>3. Land and Resource Management.<br>4. Climate Change Adaptation<br><br>**The Conservation Assessment and Prioritization System (CAPS)**<br>Following are specific CAPS-related activities that I engaged in during the 2019-2020 year.<br>• A new, updated CAPS assessment for Massachusetts was undertaken with funding from the MA Department of Environmental Protection. Significant improvements include the incorporation of updated source data for our land cover map, including new, fine-scale data from MassGIS.<br>• A McIntire-Stennis project that investigated the degree to which CAPS, DSL and other data sources and tools are being used as part of strategic forest conservation in the Northeastern U.S. This past year we conducted a literature review, implemented a survey of tool and data users, organized a meeting of tool/data developers to review results from the survey, and convened three focus groups to gain further insight into the way that tools/data were being used, as well as barriers to their usage.<br>• The Trustees of Reservations used CAPS to identify high-quality areas of coastal wetlands and evaluate the degree to which these areas are likely to be degraded by future development in the surrounding landscape. This involved the use of CAPS to assess ecological integrity of coastal wetland under current conditions and a future scenario that includes conversions of land for development. A report was compiled titled “Coastal Conservation Prioritization Using the Conservation Assessment and Prioritization System (CAPS) and Designing Sustainable Landscapes (DSL)”<br><br>**Wetlands Assessment, Protection and Education**<br>This past year wetland related work has included: | |

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| | | • An EPA-funded project to use Unoccupied Aerial Systems (UAS) to assess wetland condition in salt marshes. This third year of data collection was significantly disrupted by COVID-19. Time and effort was invested in developing a Research and Library Operations Plan for field data collection and use of indoor lab space for equipment preparation and repair.<br>• A new collaboration on salt marsh research<br>• Providing technical assistance to MassDEP to improve the success of wetlands replacement projects including identification of potential regulatory changes and the drafting of a revised version of their mitigation guidance document.<br>• Continued work with MassDEP on a revision of the state's wetland delineation manual.<br>• One technical report related to Wetlands Assessment and Conservation was produced in the past year: Homa, E., C. Brown, K. McGarigal, B. Compton and **S. Jackson**. 2019. Development of Stream Metrics for use in the Conservation Assessment and Priorization System (CAPS). Final Report: 2010 Wetland Program Development Grant. University of Massachusetts, Amherst MA. 23 pp.<br>• Four workshops and presentations on wetlands topics reaching 746 participants for a total of 345.75 contact hours.<br><br>**River and Stream Continuity Project**<br>Work over the past year has included:<br>• Received a contract from the MA Department of Environmental Protection to help them create a guidance document on how to implement the MA River and Stream Crossing Standards during wetlands permitting. In Massachusetts, the requirement for new or replacement stream crossings is that they meet the Stream Crossing Standards "to the maximum extent practicable." The guidance document will help interpret that phrase for applicants and the local conservation commissions that are responsible for issuing permits under the MA Wetlands Protection Act.<br>• Serve as project leader for the North Atlantic Aquatic Connectivity Collaborative (NAACC) and convener of the NAACC Steering Committee. I oversee development of all new NAACC assessment modules and scoring | |

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| | | systems, and am responsible for data quality and management for NAACC data collected across the 13-state region.<br>• This year, we sent to the NAACC listserv recommended COVID-19 Field Research Safety Protocols.<br>• A beta version of a new data visualization tool, the NAACC Stream Crossings Explorer (NAACC-SCE) was created and tested.<br>• Ongoing revisions and improvements to the online Road-Stream Crossings Database to better serve cooperators throughout the 13-state region. Despite COVID-19, over the past year, 6,737 non-tidal aquatic crossing assessments from ten states were collected and entered into the NAACC database.<br>• Maintenance and technical support for an electronic crossing assessment form for laptop computers, tablets and smart phones, along with utilities to facilitate navigation to field sites and collection of photographic data that would be automatically associated with electronic field forms.<br>• Maintenance of an online training and certification program for observers and coordinators participating in the NAACC.<br>• Oversight of the NAACC Data Center (www.naacc.org) and the NAACC web site (www.streamcontinuity.org/naacc). As a result of last year's website revamp, we lost our connection with Google Analytics. Thus, I have no user data to report this year. The problem has been corrected and we will have data to report next year.<br>• Maintained the Aquatic Connectivity Scenario Analysis Tool (http://ecosheds.org/aq-connectivity-tool/#/). This is an online tool that uses road-stream crossing data from the North Atlantic Aquatic Connectivity Collaborative (NAACC) and the UMass Critical Linkages assessment to allow users to create scenarios that involve combinations of crossing replacements and/or dam removals, and evaluate them for gains in aquatic connectivity and ecological restoration potential.<br>• Nine workshops and presentations, including a conference presentation, on the topic of river and stream continuity reaching 310 participants for a total of 208.55 contact hours.<br>**Climate Change Adaptation**<br>Over the past year activities included: | |

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| | | • The third annual Mass ECAN conference was held on October 29, 2019 and was attended by over 80 people from across Massachusetts and across disciplines.<br>• From September 1, 2019 through August 31, 2020, the Mass ECAN web site received 2,200 visits from 2,100 users.<br>• Maintain and update the Massachusetts Wildlife Climate Action Tool (www.climateactiontool.org).<br>• The MA Division of Ecological Restoration referenced the Climate Action Tool in their Culvert Replacement Municipal Assistance Grant Program RFR. The following language was included in the RFR. "Culverts identified by the Massachusetts Wildlife Climate Action Tool (https://climateactiontool.org/content/maintainhabitat-connectivity-retrofit-or-replace-culverts) as priorities for replacement will be given preference."<br>• Serve as convener for the MA Climate Adaptation Partnership. This partnership includes the MA Office of Coastal Zone Management, MA Division of Ecological Restoration, MA Division of Fisheries and Wildlife, Harvard Forest, EcoAdapt, The Nature Conservancy, the DOI Northeast Climate Adaptation Science Center, and UMass Amherst. This is an action-oriented partnership to share and support best practices, conduct research, facilitate engagement, provide technical assistance, and implement projects across Massachusetts for climate change adaptation. This past year, the Partnership oversaw the work of six work groups, focusing on: cold-water streams, salt marshes, Southern New England forests, rivers and streams ("slowing the flow"), climate change communication, and main-streaming nature-based solutions.<br>• Participate as a member of the Cold-water Streams, Salt Marsh, Southern New England Forests, and Slow the Flow work groups.<br>• Assisted in the planning of a weeklong Strategic Decision Making workshop, led by the National Conservation Training Center and focused on climate related threats to cold-water streams.<br>• Leading a McIntire-Stennis project that will, in part, be investigating the degree to which people engaged in forest stewardship and conservation are using various tools and information sources to implement climate adaptation strategies and actions. | |

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| | | • Nine workshops and presentations on the topic of climate change adaptation reaching 377 participants for a total of 347.25 contact hours.<br>**Fish, Wildlife and Biodiversity Conservation**<br>Over the past year fish, wildlife and biodiversity activities included:<br>• Serve on the Steering Committee for the Staying Connected Initiative (SCI), a partnership working to restore and enhance landscape connections for the benefit of people and wildlife across the Northern Appalachian/Acadian region of the eastern U.S. and Canada.<br>• Maintaining the Massachusetts Herp Atlas web site (http://www.massherpatlas.org/).<br>• Maintaining the Massachusetts Snakes web site (http://www.masnakes.org/).<br>• Conducted eight workshops or presentations on the topic of fish, wildlife and biodiversity conservation reaching 362 participants for a total of 336 contact hours.<br><br>Additional results and impacts for FY 20 include<br><br>**Conservation Assessment and Prioritization System (CAPS)**<br>• CAPS, or elements of CAPS, have been incorporated into other landscape-based analyses, including MassWildlife's Biomap2, The Nature Conservancy's Resilient and Connected Landscapes, and Designing Sustainable Landscapes (Connect the Connecticut and Nature's Network).<br>• The Conductance Index has been incorporated into the Massachusetts Audubon Society's MAPPR tool for parcel-based prioritization and conservation.<br>• The MA Division of Ecological Restoration's Culvert Replacement Municipal Assistance Grant Program RFR directed applicants to use the results of CAPS and Critical Linkages analyses to determine their proposed culvert's priority for replacement.<br>• Our CAPS/DSL team began discussions with the Natural Heritage and Endangered Species Program about custom CAPS analyses for inclusion in Biomap3, an updated blueprint for the conservation of biodiversity in Massachusetts.<br>• I maintained the CAPS web site (www.umasscaps.org) which provides information about CAPS and its various applications. Data from CAPS | |

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| | | assessments are available for download as GIS layers or as PDF maps. This past year, the site received 2,455 visits from 2,005 users. The CAPS report for the 2011 assessment for Massachusetts was downloaded 61 times. There were 81 downloads of GIS data and 516 downloaded maps.<br>**River and Stream Continuity Project**<br>• Despite COVID-19, over the past year, 6,737 non-tidal aquatic crossing assessments from ten states were collected and entered into the NAACC database.<br>• The Nature Conservancy and New Jersey Division of Fish and Wildlife were the first to implement the new NAACC protocol for assessing road-stream crossings for use by terrestrial wildlife. This past year, these two pilot projects contributed 452 terrestrial connectivity records to the NAACC database, 150 from Massachusetts and 302 from New Jersey.<br>• A link was maintained between to NAACC database and a database for the Connecting Habitat Across New Jersey (CHANJ) project to facilitate timely exchange of data when new crossing assessments are submitted to the NAACC database.<br>• The NAACC now includes 78 active local and regional coordinators and 270 active certified lead observers.<br>• In the past year, there were 67 downloads from ScholarWorks and Bepress of my articles related to stream continuity.<br>**Climate Change Adaptation**<br>• The Mass ECAN network now has over 400 members.<br>• From September 1, 2019 through August 31, 2020, the Massachusetts Wildlife Climate Action Tool (www.climateactiontool.org) recorded 22,128 visits from 18,961 users. Of these, 7,563 visits were from 6,292 MA users. Despite the inclusion of "Massachusetts" in the name of the site/tool, 66.8% of the users and 65.8 % of visits were from people outside of Massachusetts, suggesting broad interest in this new type of climate adaptation education tool.<br>• The MA Division of Ecological Restoration referenced the Climate Action Tool in their Culvert Replacement Municipal Assistance Grant Program RFR. The following language was included in the RFR. "Culverts identified by the Massachusetts Wildlife Climate Action Tool (https://climateactiontool.org/content/maintainhabitat-connectivity- | |

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| | | retrofit-or-replace-culverts) as priorities for replacement will be given preference."<br>**Fish, Wildlife and Biodiversity Conservation**<br>• For the period September 1, 2019 through August 31, 2020, the Massachusetts Herp Atlas web site (http://www.massherpatlas.org/) recorded 4,046 visits from 3,026 users, with an average of 4.1 pages viewed per visit. Massachusetts users (the target audience for this site) recorded 2,266 visits from 1,471 users with an average of 5.38 page views per visit and an average visit time of 3:33.<br>• Between September 1, 2019 and August 31, 2020, the MA Herp Atlas web site received 113 new records (94 confirmed), 19 of which documented occurrences of state-listed species.<br>• For the period September 1, 2019 through August 31, 2020, the Massachusetts Snakes web site (http://www.masnakes.org/) recorded 69,425 visits from 58,286 users, with an average of 3.29 pages viewed per visit. A total of 40,287 Massachusetts users (the target audience for this site) recorded 48,290 visits to the web site with an average of 3.64 page views per visit. | |

| **OPTIONAL**<br>**Youth Development Expenditures (dollars)** | |
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| State and/or Institution: | FY 2020 Expenditures ($) |
| 1862 Smith-Lever | |
| 1890 Extension | |