2017 University of New Hampshire Combined Research and Extension Plan of Work

Status: Accepted

Date Accepted: 05/16/2016

I. Plan Overview

1. Brief Summary about Plan Of Work

New Hampshire has 1.32 million people, including 7 percent people of minority groups. (https://suburbanstats.org/ 2/24/2016). Agriculture and associated natural resources are core contributors to the economy in a state that is 84 percent forested. While most of New Hampshire is rural in character, the southern tier is home to several small cities (30,000-110,000). The attractive, open spaces maintained by predominantly pastoral small-scale agricultural operations combine with the state's abundant natural resources support a large tourism sector.

The University of New Hampshire (UNH) in Durham is the state's flagship, public, land-grant university, conducting instruction, research, and outreach to people beyond the formal classroom. The New Hampshire Agricultural Experiment Station (NHAES) resides within the UNH College of Life Sciences and Agriculture (COLSA). NHAES is responsible for the funding of Hatch and Hatch-Multistate agricultural research and McIntire-Stennis cooperative forestry research programs. The Plan of Work covers NHAES's federal and state partnership-funded Hatch and Hatch-Multistate research components
NHAES focuses on research problems that have local-to-international relevance and are closely mindful of the Hatch Act directive, which asserts that the experiment stations are best able to prioritize specific research needs for their respective states. The diverse funding portfolio of our researchers demonstrates the success of NHAES foundational support and investments, leading to strong productivity and the ability of scientists to further leverage their research findings into federal grants activity. This results in strong added value for New Hampshire taxpayers. Hatch capacity funds provide a critical baseline capability to support agricultural programs, provide opportunities for training the next generation of agricultural scientists and citizen consumers.
UNH Cooperative Extension (UNHCE) provides residents with research-based information, enhancing their ability to make informed decisions that strengthen youth, families, and communities; sustain natural resources; and improve the economy. As a major university outreach program, the network of professional extension staff resides in all 10 New Hampshire counties. County staffs work with local volunteers and campus specialists to design and conduct educational programs that meet societal, environmental, and economic needs. While many of our programs are conducted locally, we also use current communication technologies, including interactive video conferencing, distance education, and mobile technologies. As part of the national land-grant university system, we access the knowledge and expertise of other state land-grant universities.
NHAES research strongly supports the agricultural and natural resource enterprises through our suite of funded projects, and through cooperative extension trials and outreach conducted on NHAES's two horticultural/agronomy farms, two dairies, and research greenhouses. Research at the farms and dairies address both conventional and organic research, and management needs, which are disseminated to our varied stakeholders. Located in close proximity to the Gulf of Maine, UNH provides an opportunity to support coastal marine aquaculture through research and meaningful engagement with producers, harvesters, and other stakeholders.
The planned programs discussed in this Plan of Work are inclusive of the USDA-NIFA priority programs in food safety; global food security and hunger; childhood obesity; and the planned programs in climate change and sustaining natural resource have been combined for our planning and reporting purposes. In

addition state and regional priorities include supporting rural economies (Hatch, Hatch-Multistate). UNHCE education and outreach that supports programming in Youth and Families, Food Safety, Childhood Obesity, Global Food Security and Hunger, and Climate Change/Sustaining Natural Resources. However, NHAES research activities in forestry and natural resources are supported by the McIntire-Stennis Program and are not described in the Plan of Work.

In the fall of 2014, the USDA established the Northeast Regional Climate Hub in Durham, NH, under the direction of David Hollinger with the USDA Forest Service. The Northeast is experiencing impacts of climate change: increased weather variability with more intense precipitation (http://www.nrcc.cornell.edu/ 2/24/2016), warmer temperatures that extend growing seasons, and at the same time intensify weed, pest and disease outbreaks,The Hub will provide technical support to land managers, region assessments, and forecasts for hazard and adaptation planning, outreach, and education (http://www.usda.gov/oce/climate_change/hubs/NorthEastFactSheet.pdf 2_25_15). Both NHAES and UNHCE collaborate with the hub, along with 11 other New England land-grant university partners (http://colsa.unh.edu/aes/article/climatehub 2_25_15). The Hub provides a network for information sharing, that address important regional and local farming and forestry challenges. The 2015 Statement of Work for the University Network of the USDA Climate Hub emphasizes gaining understanding of stakeholder perceptions and needs in climate adaptations and plans to work with research faculty who have extension duties in the near future (Erin Lane, Forest Service, USDA Northeast Climate Hub, pers. comm).

UNH's Institute for Earth Ocean and Space is internationally known for research on climate change and its impact. NHAES has an extensive research portfolio in agriculture and forestry research related to climate change's driving factors and impacts, and the adaptations needed to limit its effects. UNHCE works with communities to plan for changing climate and its impacts.

The face of agriculture in New England and New Hampshire is evolving. Even as the overall number of farms in the United States continues to decline, the numbers of farms, farm acreage, dairy cattle, and farmers are stable or increasing in all New England states (http://www.agcensus.usda.gov/Publications/2012/Full_Report; NASS). Maintaining and growing agricultural land in New Hampshire is a significant challenge given the high value of the land relative to many parts of the country. About 3.5 percent of New Hampshire farms hold organic certification (2012 Census of Agriculture), with de-certification of organic operations exceeding new certifications in 2014 (New Hampshire Farm Bureau Federation Friday Review March 6 2015).

The mean age of New Hampshire farmers plateaued at 57.8 years in 2012, as compared to 56.2 years in 2007. Women represent more than 40 percent of farmers. However many NH farms are small or parttime ventures: approximately 70 percent of farms produce less than $10,000 in yearly sales (Weekly Market Bulletin February 25, 2015). New and beginning farmers are younger with smaller-scale operations. Immigrants from Africa (Democratic Republic of Congo, Sudan, Somalia) and Asia (Bhutan, Burma) are increasingly taking jobs in farm labor (www.dhhs.nh.gov 10/27?2014).

Many New Hampshire farms are small and diversified. Farms produce 90,000 gallons of maple syrup. Beekeepers raise bees for honey and to provide crop pollination. "You pick" berry and fruit operations are widespread. Specialty livestock, including goats, rabbits, sheep, and other animals, are grown for wool and fiber. Larger commodities include Christmas trees ($3 million), apples ($6 million), and livestock (beef, sheep, swine, poultry, and dairy) raised for home, local restaurants, and commercial sales ($90 million). The largest agricultural commodity groups include: dairy ($55 million) and ornamental horticultural ($276 million). The most recent estimate (2011) of the overall value of the state's agricultural industry is $850 million, with direct sales of agriculture and horticultural products and services valued at $479 million, plus $379 million in direct spending by agriculture-related tourism (fairs, scenic travel, etc.; www.agriculture.nh.gov). Agricultural diversity is growing to encompass the commodity mix of both Northern and Southern New England. (NASS 2014; NH Weekly Market Bulletin February 25, 2015). Cash receipts for farms grew 3.6 percent from 2012 to 2013, similar to the 4 percent increase in the region, and greater than the U.S. real domestic product (1.8 percent for 2013).

The farm-to-table movement is particularly strong in New England. New Hampshire ranks second in the nation with farms that have direct sales to consumers (31 percent). (USDA National Agricultural Statistics, 2012 Census of Agriculture). Summer and fall farmers markets (more than 52), and farm stands (more

than 70) are widespread (http://agriculture.nh.gov/publications-forms; accessed 3/7/2016). Winter farmers markets have become highly successful; there are 23 at latest count and there is increasing participation in Community Support Agriculture (CSA) farms and Community Supported Fisheries (CSF). The proximity of agricultural operations to U.S. population centers represents a unique facet of the Northeast region, and a distinctive feature relative to education, research, and extension within other regions.

The overarching goal of NHAES-planned program areas is to provide a balance that spans the range of fundamental (development) to applied (applications-oriented) research in support of important state, regional, and national agricultural and ecosystem issues. NHAES and UNHCE research, outreach, and educational programs emphasize the sustainability of the state's small-scale and diversified agricultural operations, and will contribute to the development of a highly competitive agricultural system for local and regional markets. At the same time, we continue to be strong contributors to the economic engine supporting a diversity of related New Hampshire businesses and citizens.
The UNH College of Life Science and Agriculture (COLSA) has an aging tenure-track faculty. Many older faculty are less active in research. In the last five years, new faculty have joined the college, many of whom have initiated research consistent with Hatch/McIntire-Stennis mandates. Their projects include biodiversity assessment and conservation of native pollinators, and negotiating conflicts over adaptive and integrative flood management in riverine and estuarine environments. Most recent hires included an agricultural engineer specializing in aquaponics (the combination of hydroponics and recirculating aquaculture),and an agricultural resource economist and a systems' ecologist specializing in climate and land use changes as factors driving ecological changes. Additional tenure-track job searches are in progress including faculty specializing in small Animal Nutrition, Plant Pathology/host-microbe interactions, and Critical Zone Microbial Ecology (microbes that work at the soil-groundwater-surface interface). NHAES and UNHCE plan to refill a split position in Greenhouse crop management and create additional split positions to address state and regional priorities in Agricultural Engineering, and Fruit Tree Pathology/Integrated Pest Management. Additional tenure-track faculty positions are expected to be filled in the future.

Estimated Number of Professional FTEs/SYs total in the State.

Year	Extension		Research	
	1862	1890	1862	1890
2017	84.0	null	22.0	null
2018	84.0	null	22.0	null
2019	84.0	null	22.0	null
2020	84.0	0.0	22.0	0.0
2021	0.0	0.0	22.0	0.0

II. Merit Review Process

1. The Merit Review Process that will be Employed during the 5-Year POW Cycle

- Internal University Panel
- Expert Peer Review
- Other (Peer review of proposals, manuscripts and products)

2. Brief Explanation

NHAES-sponsored research projects undergo internal peer review. Prospective project directors (tenure-track and research faculty) are first encouraged to submit a one-page description of their proposed project and meet with the NHAES director or faculty fellow to discuss the anticipated work. Faculty learn how to use Current Research Information System (CRIS) and National Information Management & Support System (NIMSS) to identify related research at other agricultural experiment stations. A proposal development and projects review manual is available online to help faculty prepare full proposals https://colsa.unh.edu/nhaes/sites/colsa.unh.edu.nhaes/files/media/nhaesmanual.pdf

Proposals submitted to the NHAES are critically reviewed for merit by a committee consisting of highly accomplished faculty members, plus the director and faculty fellow. In response to stakeholder input, the NHAES review process includes the following proposal evaluation criteria:

- Relationship to the Hatch or Hatch-Multistate programs, and to the NHAES mission and research priorities.
- Scientific and technical merit.
- Soundness of approach, procedures, and methodology.
- Likelihood of significant contributions and/or innovative advances.
- Previous and current research productivity and accomplishments (or potential, for new investigators).
- Likelihood of significant enhancement in research capability and competitiveness.

The NHAES director and faculty fellow use these recommended criteria and their own independent evaluation to make the final decision on which projects the experiment station will forward to NIFA for funding approval.
A qualitative overview of the internal NHAES merit review process comes via the scholarly peer review process, which evaluates the manuscripts originating from NHAES research projects and the ability of our scientists to leverage NHAES funding to compete for other external funding. As appropriate to the proposed research, other activities are considered, such as coordination with Cooperative Extension, outreach, training of undergraduates and graduate students, and incorporation of methodology and results into university courses.
UNH Cooperative Extension uses county advisory councils comprised of program users, decision makers, and community leaders to annually review updates to county and state plans of work. These councils meet monthly in all 10 counties with staff and extension administration. Furthermore, a state extension advisory council meets two or three times per year to discuss new programming initiatives and make recommendations to the dean and director of UNH Cooperative Extension.

III. Evaluation of Multis & Joint Activities

1. How will the planned programs address the critical issues of strategic importance, including those identified by the stakeholders?

NHAES and UNHCE fund participation in educational programs and multistate projects of

significant concern or potential impact to the state of New Hampshire, the region, and nationally, which are broadly important to agriculture and citizens. Extension programs address production and marketing issues in agriculture, building a stronger economy throughout the state and strengthening youth and families.

The NHAES Director's Office and faculty project directors maintain connections to critical issues through fostering professional contacts with varied stakeholder groups, keeping abreast of priorities expressed by funding entities, collaborating with regional and national peers, and interacting directly with stakeholders--in particular farmers and other producers--about research imperatives. NHAES Hatch multistate research projects address aspects of animal and plant agriculture that include the breeding of suitable varieties for our area, pollinator health, climate change, ecosystem services, sustainable agriculture, and supporting economies of rural communities. NHAES research activities also are influenced by available faculty expertise.

NHAES actively encourages Hatch Multistate project participation, particularly among our best and junior scientists. Such affiliation with appropriate multistate research projects supports regional or national research priorities and, concurrently, benefits junior faculty by encouraging their interactions with scientific peers.

2. How will the planned programs address the needs of under-served and under-represented populations of the State(s)?
UNH Cooperative Extension staff is committed to increased programming for under-served and under-represented audiences in New Hampshire. These individuals participate mainly through Nutrition Connections, a nutrition education program for limited-resource audiences funded by the Expanded Food and Nutrition Education Program (EFNEP) and Supplemental Nutrition Assistance Program-Education (SNAP-Ed). 4-H after-school programs and community gardens also involve a significant number of under-served families, many of whom are refugees. Staff working in these programs builds trust and rapport with under-represented audiences and help extension advisory councils understand the audiences' needs and circumstances.

Several of the planned programs for NHAES research address the needs of under-served and under-represented populations across the state. These include rural,low-income communities with emphasis on those in Northern New Hampshire. The immediate and long-term results of NHAES research impacts small farmers working traditional and organic dairies and the fledgling aquaculture industry along the Seacoast.

NHAES includes a focus on organic dairy farmers who are an under-served agricultural population. The Northeast produces approximately 25 percent of the organic milk in the country (Hoard's Dairyman , http://www.hoards.com/IB_UNH-organic, 3/2/2015), and the market has seen strong increases in demand over the last decade (agmrc.org; 3/22015). The NHAES Organic Dairy Research Farm is the only facility of its kind in the Northeast, and the experiment station is leading national research efforts to reduce the costs of inputs (e.g., bedding, forage, energy), improve grazing, and enhance the nutritional quality of organic milk products. NHAES scientists are leading a multi-investigator, integrated project supported by the Organic Research and Extension Initiative (OREI) to improve the quality, production, and marketing of milk.

3. How will the planned programs describe the expected outcomes and impacts?
UNH Cooperative Extension program development using the logic model requires the planner to closely examine the relationship between outputs and desired outcomes of a program. In

doing so, extraneous activities that do not lead to desired outcomes can be revised, eliminated, or spun off to another organization that would be more appropriate for conducting the activity. Formative evaluation plays a key role in determining whether or not a program is being implemented effectively and how it might be improved. This kind of on-going evaluation will enable staff to make modifications to their programs on a regular basis, constantly improving program effectiveness.

UNH Cooperative Extension program teams bring expertise together to work on critical issues that require multiple perspectives and innovative teaching methods. Programs that have a multidisciplinary scope are expected to be more effective and make more efficient use of staff time and resources because they will make better use of existing staff expertise to solve the problems and address challenges of the people of New Hampshire. The cooperative extension staff uses a web-based planning and reporting system developed to integrate disciplinary and interdisciplinary extension outcomes that insure a comprehensive and efficient way to meet the most critical issues identified by stakeholders and staff.

By organizing NHAES-supported individual research projects around planned programs serving national and regional priorities, the director's office has been able to refocus the research activities to target outputs and outcomes to agricultural and rural economy priorities. However, many NHAES projects, especially those discovery research, do not readily lend themselves to the logic model of program development. Furthermore, as one of the smaller state agricultural experiment stations, NHAES is limited regarding resources and programmatic scope

4. How will the planned programs result in improved program effectiveness and/or
Interaction between NHAES researchers and multistate colleagues provides synergies, opportunities for professional growth and development, and, ultimately, the potential for enhanced individual effectiveness that will carry into all activities undertaken by researchers.

In addition, to these formal multistate committee interactions, NHAES faculty participate broadly in regional, national, and international research collaborations of value to the state and region. Our new agricultural ecosystems faculty have initiated partnerships with researchers and cooperative extension faculty in Maine, Vermont, and other state agricultural experiment stations by preparing proposals to the Organic Agriculture Research and Extension Initiative (OREI) and Sustainable Agriculture Research and Education organization (SARE). The Northern New England Regional Collaborative Research Funding is another example of joint SAES activities that will impact regional priorities. These new collaborations strongly leverage NHAES support with substantial amounts of competitive funding that is directed to common themes of strategic importance.

IV. Stakeholder Input

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

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals

- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey of the general public
- Survey of selected individuals from the general public
- Other (County Advisory Councils, comments from research proposals and manuscript reviews.)

Brief explanation.

Stakeholders were encouraged to provide input to UNH Cooperative Extension in a variety of ways and across the state. Each county meets regularly with their County Advisory Council and the State Advisory Council (made up of members from each county and representatives from various partner organizations) meets two to three times each year. Further, UNHCE plans to launch a new strategic planning process during 2015, with the goal of reviewing program initiatives and directions that will guide programs and staffing. Stakeholder input will be sought as part of the strategic planning process.

NHAES encourages input from stakeholders by multiple means and from various target groups. The NHAES External Advisory Committee consisting of farmers and members of agriculture, aquaculture, ornamental horticulture , and forest industry; this Advisory group meet formally once a year to provide direct input. The director and faculty fellow interact with individual members of the External Advisory Committee throughout the year. Research presentations and meetings are targeted to both traditional and nontraditional stakeholders groups and individuals. Events range from twilight meetings at horticultural/agronomy farms (offered jointly with cooperative extension), research field days at the dairies and greenhouse facilities, various open houses and farm day events, an educational session and informational booth at NH Farm and Forest Expo and other venues, and YouTube videos of research presentations for various stakeholder groups. Public events are announced using a variety of media: direct email to stakeholders, publicity in traditional and niche mass media (newspapers and television), Facebook, Constant Contact, NH Farm Bureau's Communicator, the Department of Agriculture, Food and Marketing's NH Weekly Market Bulletin, via a Google Group (NHAGCOMM, town agricultural commissions across the state), by direct mail to farmers, and through targeted UNHCE newsletters (nhvegfruitnews.wordpress.com; dairy briefs). Nontraditional stakeholders are being increasingly engaged to inform and assist in our efforts to emphasize sustainable agricultural and food systems research.

The NHAES Director's office added an information and communications coordinator in April 2014. The NHAES Advisory Board had recommended working to improve the visibility of the experiment station, and help stakeholders to recognize the distinct roles of research (NHAES), and cooperative extension, in contrast to the educational mission of the College of Life Science and Agriculture. The NHAES communicator and information coordinator, Ms. Lori Wright has been able to stimulate input from stakeholdersThrough robust social media and directed communications. Many of her press releases are picked up by local, regional, national and international venues. In addition, NHAES research news is regularly publicized by the USDA and Ag is America via social media, and the NH Department Agriculture, Markets & Food and the NH Farm Bureau via newsletters. Better recognition of the activities and impacts of the NHAES are essential to engaging stakeholder input and participation.

Specific research projects seek input from stakeholders by surveys (telephone, in person, mail and web-based) and focus groups. Research presentations at scientific conferences, multistate project meetings, mass media, publications, and university classroom and educational programs aimed at K-12 represent addition forums to get stakeholder input.

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

1. Method to identify individuals and groups

- Use Advisory Committees
- Use External Focus Groups
- Needs Assessments
- Use Surveys

Brief explanation.

UNH Cooperative Extension's identification of stakeholders and groups is accomplished primarily through local and statewide advisory committees. Care is taken to recruit advisory committee members that represent a broad array of interests, background, and residency, including youth and under-served audiences. Membership is limited to three-year terms, and individuals may serve up to two terms consecutively, ensuring new ideas and perspectives are brought on regularly.
NHAES identifies stakeholders through interaction with UNH Cooperative Extension; NH Department of Agriculture, Markets and Food; NH Farm Bureau; New England Farm Union; and Northeast Organic Farming Association, as well as various trade organizations and community groups across the state and region. Input will be evaluated to identify the most critical issues and those for which NHAES researchers have appropriate expertise to make effective contributions. Special efforts have been made to solicit feedback from members of the state legislature's environment and agriculture committee, as well as New Hampshire's congressional delegation.

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

1. Methods for collecting Stakeholder Input

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

Brief explanation.

UNH Cooperative Extension's program plan of work addresses high-priority needs in New Hampshire identified through on-going counsel with local and statewide advisory councils. In addition, advisory council members, county and state staff, faculty, and other stakeholders take part in ongoing specific program reviews (conducted by program staff). Results of

program reviews, along with input from stakeholder groups, determine program priorities. These program reviews include focus groups, web-based stakeholder surveys and staff surveys.
For strategic planning and the development of NHAES programs and priorities, input is collected through meetings with stakeholder groups and individuals, including growers, farmers, citizens, agricultural organizations and councils, natural resources professionals and managers, state and federal agency representatives, neighboring state AES and extension administrators, research project directors, graduate and undergraduate students, and other means. While most meetings are open discussions, some are presentations followed by questions and answer sessions. Members of the NHAES administration also attend extension events and take advantage of these opportunities to participate in discussions with groups and individuals.

NHAES continues to add content to the agriculture and research sections of the college website to make agriculture much more prominent, visible, and accessible in order to encourage stakeholder interactions (http://www.colsa.unh.edu/aes/facilities). The new NHAES communicator and information coordinator has been able to stimulate input from stakeholders.

3. A statement of how the input will be considered

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

Brief explanation.

See previous (methods to collect).

Formal and informal stakeholder input to project directors, extension specialists, staff, and administrators is very helpful in gauging the changing needs, constraints, and opportunities that we might address. These influence the specific activities of supported researchers as well as NHAES and UNHCE activities and goals, in the short and long term.

Stakeholder input is used to continually review and update research priorities, relevant existing and emerging topics, and individual and programmatic performance. This information informs those activities that include faculty and staff hires as well as investments to our facilities and programs. Our strategies, activities, and priorities are dynamic and evolve with consideration of stakeholder input, institutional, and societal goals and funding, and additional factors. NHAES and UNHCE are continually working to facilitate constituent input, focus available resources on priority issues, and improve our delivery of research findings to end users.

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Childhood Obesity

2. Brief summary about Planned Program

UNHCE programs that combat childhood obesity include nutrition education programming for limited-resource audiences supported by state funding as well as the Expanded Food and Nutrition Education Program (EFNEP) and Supplemental Nutrition Assistance Program-Education (SNAP-Ed) funds. Further New Hampshire's 4-H youth development program includes healthy living curriculum for youth, ages 5 to 18.
For FY 2017, NHAES expects to have one MultiState project related to childhood obesity, NC_TEMP1193 currently being reviewed; this multistate project is a renewal of a long-standing research to use behavioral and environmental tools, to identify weight-related factors associated with health in communities of young adults, and to translate effective interventions to under-represented groups or non-represented settings, e.g. the disabled, and poor communities. Initial work will include activities to benchmark community programming efforts in change (of behavior) and sustainability related to maintaining a healthful weight.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
703	Nutrition Education and Behavior	50%		100%	
704	Nutrition and Hunger in the Population	50%		0%	
	Total	100%		100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Physical activity and nutrition play vital roles in overall health. Research has found that diet is associated with leading causes of death. Many diseases are preventable, including heart disease, diabetes, obesity, and several types of cancer. While rates of overweight and obesity continue to escalate, those with lower incomes have the highest rates of overweight and obesity. Among low-income preschool children, one in three is obese or overweight before age five. However, lifestyle choices, along with other environmental factors and genetics, have a power influence on one's health and quality of life.

It is well documented that excessive weight gain is associated with increased risk of developing life-long illnesses. College age students, 18-24 years of age, are in particular need to information on nutrition and exercise as they enter "emerging adulthood". College campuses are good test grounds to develop tools to promote healthful lifestyles; however the efficacies of various interventions in this population group have yet to be validated. Particular efforts are needed to translate tools that have been developed on campuses for promoting healthful lifestyle to under-represent groups, especially when they have limited access to affordable, healthful foods and opportunities for regular exercise. The priorities of NHAES participation in NC1193_Temp are to continue to develop evidence-based tools to impact policies, systems and environments for healthful living, and then to translate and expand these tools to diverse communities battling obesity.

2. Scope of the Program

- In-State Extension
- Multistate Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

The overriding assumption made for this program: Funding and resources will be available to continue this research and nutrition education programming and that nutrition education leads to healthy changes in behavior.

2. Ultimate goal(s) of this Program

• Effective education interventions to modify diet and physical activity in children and adults that result in improved healthy trajectories.
• Increase quality of health and nutrition choices (e.g., physical activity, menu choices) made by families, primarily within low-income and 4-H communities.
• Evaluate and improve the sustainability of interventions, previously developed on college campuses, to fight weight gain, and translate these interventions to be effective in low- income communities to battle obesity.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	11.0	0.0	0.1	0.0
2018	11.0	0.0	0.1	0.0
2019	11.0	0.0	0.1	0.0

2020	11.0	0.0	0.1	0.0
2021	0.0	0.0	0.1	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Cooperative Extension: Nutrition Connections--educational courses to income eligible NH residents--will be available through the Expanded Food and Nutrition Education Program (EFNEP) and Supplemental Nutrition Education Program (SNAP-ed).

NHAES: Researchers will use the College Health and Nutrition Assessment survey to profile weight-related factors in student populations with special foci on students with disabilities and those from low-income communities. Researchers at UNH will continue to validate newly developed tools to evaluate environment and behavior: the Healthy Campus Environmental Audit (HCEA) and the Behavior Environment Perception (BEPS) survey for college campuses. These audit and survey tools will be adapted and validated for used in low-income communities.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Education Class ● Group Discussion ● One-on-One Intervention	● Newsletters ● Web sites other than eXtension

3. Description of targeted audience

- Limited resource youth, ages 0-18
- young adults (undergraduate students)
- disabled and low-income students at Land Grant Universities and nearby community colleges.

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Number of low-income adults participating in health and nutrition programming through Nutrition
- Number of low-income youth participating in health and nutrition programming through Nutrition Connections
- Number of undergraduate students participating in Healthy Campus Environment Audit and Behavior Environment Perceptions Survey for college campus

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Number of participants who report an increase in their physical activity
2	Number of youth who learn how to choose foods according to the Pyramid and Dietary Guidelines
3	Number of participants who report eating nearer to the recommended number of cup equivalents from the Fruits and Vegetable Group

Outcome # 1

1. Outcome Target

Number of participants who report an increase in their physical activity

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 2

1. Outcome Target

Number of youth who learn how to choose foods according to the Pyramid and Dietary Guidelines

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior
- 704 - Nutrition and Hunger in the Population

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 3

1. Outcome Target

Number of participants who report eating nearer to the recommended number of cup equivalents from the Fruits and Vegetable Group

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior
- 704 - Nutrition and Hunger in the Population

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Description

Competing programmatic challenges must be considered in prioritizing resource use. Any changes in this situation including the availability of leveraging funds and resources will impact our ability to achieve expected outcomes.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

- Food recalls and surveys of Extension clientele
- Evaluate the effectiveness of a behavioral and environmental tools to benchmark community-programing for effectiveness in change and sustainability of healthful lifestyle interventions.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Food Safety

2. Brief summary about Planned Program

UNH Cooperative extension food safety programs focus on training and resources for food handlers in restaurants, schools, and other institutions as well as consumer education around food safety.
The safety of agricultural and aquaculture food products is important to all consumers within the state; specific concerns are targeted by NHAES research. Outcomes will improve the safety of food products grown, harvested or produced and consumed locally, regionally, and nationally. Current objectives of NHAES research and outreach in food safety combine basic and applied research that:

- Addresses the emergent problem of pathogenic Vibrios in shellfish in the Northeast.
- Seeks to understand and ameliorate the pathways by which beta-Methylamino-L-alanine (BMAA) and microcystin toxins produced by cyanobacterial blooms in freshwater lakes accumulate in the terrestrial food chains.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
133	Pollution Prevention and Mitigation	0%		4%	
135	Aquatic and Terrestrial Wildlife	0%		21%	
501	New and Improved Food Processing Technologies	0%		7%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	10%		10%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	45%		51%	
723	Hazards to Human Health and Safety	45%		7%	
	Total	100%		100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Cooperative extension situation and priorities

The U.S. Centers for Disease Control and Prevention (CDC) estimates that each year approximately 1 out of 6 Americans or 47.8 million people get sick from a foodborne illness. Of those people who get sick, 128,000 are hospitalized and 3,037 die from their illness. The Produce Safety Project supported by The Pew Charitable Trust and Georgetown University published a study in 2010 estimating the annual cost of foodborne illnesses is $152 billion. This study estimated the per-case cost for an individual is $1,850.

Further, this report assessed the annual health-related cost of foodborne illness by state. For New Hampshire, the estimated annual cost of foodborne illness was $681 million with a per-case cost estimate of $1,892. In 2012, New Hampshire restaurants are projected to record $2.3 billion in sales while employing 63,800 people and many of these employees have no or limited training in food safety. Although consumer awareness of food safety hazards has increased, survey results indicate that the youngest and oldest consumers and those with the highest education have the least safe food safety practices.

NHAES research situation and priorities are in two areas:

• Pathogenic Vibrio species cause shellfish-borne disease in the United States and worldwide. Previously limited to occasional outbreaks in subtropical waters, Vibrio-associated diseases have become an emergent problem in New England with resulting health concerns and negative impacts on an otherwise resurgent shellfish industry. The incidence of pathogenic strains in populations of otherwise benign bacterial species within microbial ecosystems also poses a threat for severe wound infections in people who swim, fish and work in coastal waters.
Both pathogenic and avirulent (nonpathogenic) strains of Vibrio parahaemolyticus and Vibrio vulnificus are common to the coastal estuaries. Relay treatments, moving oysters to more saline conditions for several weeks before marketing, has been shown to reduce Vibrio loads in oysters. Recent work at the NHAES has lead to the first rapid diagnostic tests which distinguish pathogenic Vibrios from benign strains (Whistler et al. Patent application 62/128764, 2015); these are referred to as 'sequence strains'. The ability to accurately identify sequence strains of Vibrios provide critical tools both to stem Vibrio disease outbreaks and also to begin to understand the ecology of pathogenic Vibrios. The ultimate goal is to forecast risk conditions for Vibrio contamination to manage shellfish harvest, especially as climate and water quality factors continue to change.

• The amino acid derivative Beta-methylamino-L-alanine (BMAA) and cyclized chains of amino acids called microcystins are produced by cyanobacterial blooms in recreational and drinking water bodies. Microcystins are classified as liver toxins. Evidence, which links BMAA to neurodegenerative diseases in animals and humans, is accumulating. At this time, microcystins are not regulated by the U.S. Environment Protection Agency, although they are on the EPA's Contaminant Candidate List. Understanding the pathways by which BMAA and microcystins spread through aerosols from lakes with algal blooms to the food chain is important in limiting exposure. Controlling environmental exposure to BMAA and microcystins is an important aspect of food safety in the region and across the country.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Extension

- Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

The overriding assumption is that funding remains adequate to address food safety research and educational needs in NH.

Other assumptions relevant to UNH Cooperative Extension include:

- People are willing to pay fees associated with ServSafe and SAFE training sessions.

Assumptions relevant to NHAES Research Activities include:

- Vibrio diseases are an emerging problem for shellfish harvesting and processing and need to be managed in order to ensure safety for consumers and economic viability of the shellfish aquaculture industry in New England and the rest of the world. Simple models can be constructed to help in the risk analysis needed to manage shellfish harvesting in the Northeast U.S. The results from this work will help to refine and inform monitoring strategies for these pathogens in colder northern temperate coastal waters in relation to emerging U.S. FDA guidelines.
- Cyanobacterial blooms that produce toxic microcystins and BMAA will continue in the state, region and globally.

2. Ultimate goal(s) of this Program

Cooperative Extension:

- New Hampshire citizens have access to safe food.
- The foodservice sector will manage food safety risks through knowledge and practice.

NHAES research goals include:

- Elucidate environmental and biological conditions that are useful for reducing or avoiding exposure to elevated levels of pathogenic Vibrio species.
- Understanding the ecologies of pathogenic and benign strains, so it will be feasible to forecast risk conditions for shellfish harvesting in the face of climate and water quality change.
- Identifying and enumerating cyanobacteria in lake aerosols and environmental conditions associated aerosolization of microcystins and BMAA.
- Measuring the transfer of these microcystins and BMAA into selected crops from irrigation water and aerosols.
- Modeling how BMAA and microcystin accumulate in terrestrial food chains.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	3.0	0.0	2.0	0.0

2018	3.0	0.0	2.0	0.0
2019	3.0	0.0	2.0	0.0
2020	3.0	0.0	2.0	0.0
2021	0.0	0.0	2.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Cooperative Extension food safety programs:

- SAFE (Safety Awareness in the Food Environment) Programs
- ServSafe®
- Workshops for consumers

Several different NHAES research projects are conducted under this program. Activities include:

- Developing, refining, and applying methods for the detection and enumeration of pathogenic and benign strains Vibrio parahaemolyticus and Vibrio vulnificus.
- Develop models of the ecology of pathogenic and benign Vibrios in a fluctuating environment.
- Evaluating, through a variety of means, how BMAA and microcystins are spread across landscapes to animal and human food sources.
- Disseminating research outcomes via scientific, extension, formal and informal venues, and to stakeholder groups and natural resource managers.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Education Class ● Workshop ● One-on-One Intervention	● Newsletters ● Web sites other than eXtension

3. Description of targeted audience

Cooperative Extension Food Safety education: Food handlers at restaurants, schools, health facilities, etc. and the general public.

The target audiences for NHAES research activities include both discrete and overlapping groups:

- For Vibrio pathogens in shellfish, the targeted audiences include the shellfish industry and shellfish regulatory agencies, graduate and undergraduate students, high school students, faculty collaborators, and other scientists.
- For microcystins from cyanobacterial bloom, the target audiences are students (college and pre-college), scientists, lake shore residents, lake association members, local and regional decision makers, source water protection and watershed managers, suppliers of surface drinking water, and public health

and environmental agencies.

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Number of people who participate in ServSafe workshops
- Number of adults participating in food safety programming through Nutrition Connections - educational courses to income-eligible New Hampshire residents
- Number of people who participate in SAFE (Safety Awareness in the Food Environment) programs
- Number of undergraduate students directly involved in the research projects
- Number of university courses in which project results have been incorporated
- Number of presentations at regional, national, or international scientific meetings
- Number of workshops, training sessions, and presentations to non-scientific and regulatory stakeholders
- Number of graduate students directly involved in the research.
- Number of reviewed, bulletin, popular and other publications
- Number of websites in which project results have been incorporated
- Number of surveys or other means of gathering information and data from participants
- Postdoc and other scientists trained in cutting edge research method

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Number of program participants who score 75% or greater on knowledge tests of high risk practices including: * Personal hygiene * Holding/time and temperature * Cooking temperatures * Prevention of contamination
2	Number of food handlers who self-report an intent to adopt recommended hand washing practices,take steps to reduce cross-contamination and/or use proper time and temperature controls after attending a SAFE program.
3	Identify key planktonic and estuarine microbiome factors that affect V. parahaemolyticus population levels and diversity in oysters
4	Number of agencies and stakeholder groups involved in research outreach related to Vibrios in shellfish.
5	Knowledge about the changes in Vibrio genomes, which cause transitions to virulence;
6	Understanding of how microcystin toxins spread from lakes to the terrestrial food chain

Outcome # 1

1. Outcome Target

Number of program participants who score 75% or greater on knowledge tests of high risk practices including:
* Personal hygiene
* Holding/time and temperature
* Cooking temperatures
* Prevention of contamination

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
- 723 - Hazards to Human Health and Safety

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 2

1. Outcome Target

Number of food handlers who self-report an intent to adopt recommended hand washing practices,take steps to reduce cross-contamination and/or use proper time and temperature controls after attending a SAFE program.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
- 723 - Hazards to Human Health and Safety

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 3

1. Outcome Target

Identify key planktonic and estuarine microbiome factors that affect V. parahaemolyticus population levels and diversity in oysters

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
- 723 - Hazards to Human Health and Safety

4. Associated Institute Type(s)

- 1862 Research

Outcome # 4

1. Outcome Target

Number of agencies and stakeholder groups involved in research outreach related to Vibrios in shellfish.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
- 723 - Hazards to Human Health and Safety

4. Associated Institute Type(s)

- 1862 Research

Outcome # 5

1. Outcome Target

Knowledge about the changes in Vibrio genomes, which cause transitions to virulence;

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
- 723 - Hazards to Human Health and Safety

4. Associated Institute Type(s)

- 1862 Research

Outcome # 6

1. Outcome Target

Understanding of how microcystin toxins spread from lakes to the terrestrial food chain

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 135 - Aquatic and Terrestrial Wildlife

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Description

Changes in funding and resource availability for the activities and in policies or regulations related to NHAES research and Cooperative Extension using animal and human subjects would compromise the feasibility of completing the objectives. The current federal and state budgetary limitations, combined with previous reductions in capacity funds, will impact the direct support of personnel or facilities and limit our abilities to complete the proposed research and extension activities.

Natural disasters or weather extremes affecting coastal areas could impact the accurate evaluation of environmental factors that influence the incidence and detection of Vibrios in oysters. Extremely heavy rains or drought conditions will impact the frequency of cyanobacterial blooms in freshwater lakes.

Competing programmatic challenges must be considered in prioritizing resource use. Any changes in

this situation including the availability of leveraging funds and resources will impact our ability to achieve expected outcomes.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

UNH **Cooperative Extension:** A post-workshop knowledge questionnaire will be administered after each SAFE program. Examination scores of the ServSafe® program's participants will be used to ascertain food safety and sanitation knowledge. Participants in both SAFE and ServSafe® programs will complete another questionnaire to assess intent to implement recommended food safety and sanitation practices.

NHAES will:

- Monitor the progress of researchers' projects, as gauged by acceptance of manuscripts in peer reviewed journals and the ability of these researchers to leverage NHAES funds for external grants.
- Quantify the adoption of new risk-management strategies by stakeholders (commercial shellfish operations, watershed associations).

UNH Cooperative Extension and NHAES will:

- Continue to gauge synergies between researchers and extension to disseminate up-to-date findings to stakeholders.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Global Food Security and Hunger

2. Brief summary about Planned Program

UNHCE's Food and Agriculture Program Team delivers information and technical assistance to New Hampshire citizens involved in agriculture for profit or to achieve their own personal goals. Extension's role is unique because our Food and Agriculture staff members provide current, research-based educational programming to farmers, horticultural businesses, and gardeners, allowing them to make informed decisions. Food and Agriculture specialists are trusted partners in the pursuit of sustainable and productive local agriculture.

Plant and animal agriculture are integral components of New Hampshire and New England landscapes. A major aspect of NHAES animal agriculture research is the dairy cattle industry. Several projects focus on improving profit margins for the dairy producers in the Northeast. Aquaculture is a growing venture in the Northeast. NHAES research is developing new ocean-based multitrophic aquaculture systems and protocols for recirculating land-based aquaculture for high-value species. The number of animal-producing small farms is increasing in NH including chickens for eggs and meat, goats, pigs, grass-fed beef and sheep. These producers need access to research-based best practices for animal husbandry appropriate to the scale of farms common to NH.
Among our horticultural crop research projects, J. Brent Loy uses conventional breeding methods to develop squash and pumpkins with improved taste, nutrition, appearance, disease resistance, and suitability for regional climate conditions. The strawberry genome project is being used in marker-assisted breeding to speed the development of improved strawberry varieties. Climate change has lengthened the growing season in Northern New England. One joint NHAES/UNHCE project will evaluate the horticultural characteristics and adaptation of new vegetable and fruit varieties for Northern England. This project will also examine low-cost management techniques that extend the growing season and improve the efficiency of vegetable and fruit cropping systems.
Native bees are estimated to be responsible for 75 percent of pollination required for fruit and vegetable production. The degree to which the health of native bee populations in Northern New England has been impacted by pathogens, pesticides, climate change, and agricultural practices is not known. "Bar-coding" and genomics will be used to investigate the biodiversity, population health, and diversity of native bee species in New Hampshire. Over 150 years of museum records will be curated to better understand historic bee species records and diversity in NH. This comprehensive survey will be the first of its kind in Northern New England.
Aquaponics, the combination of recirculating finfish aquaculture with hydroponic production of leafy greens and other high-value vegetables, could be a growth industry for the Northeast. However, relatively little research has been conducted on the aquaculture requirements of high-value fish such as brown bullhead (a type of catfish) and striped bass. Research targets include evaluating alternative (more sustainable) protein sources for fish food, determining stress/growth responses of fish to hydroponic stressors (pH, high nitrogen waste levels), and impacts of fish density on plant crop quality. Additional goals are to improve the engineering design of aquaculture and horticultural components of aquaponics with respect to water quality conditions, nutrient availability based on pH and uptake rates for the horticultural crop.
Some NHAES research will be more fundamental in nature, leading to future enhancements to agriculture. One researcher investigates reproductive hypothalamic and pituitary hormones, which control reproduction in commercially valuable aquaculture fish species. Another project examines the microbes associated with a plant parasitic nematode pest to understand how these contribute to plant disease. A

third project is targeting phosphodiesterase inhibitors as potential control agents for parasitic nematodes. Yet another project will develop genomic resources for barberries (Berberis spp.), a widespread ornamental plant, that is an alternative host for wheat stem and stripe rusts (Puccinia spp.). A long-term goal of this research is to identify the genetic mechanism(s) of resistance to wheat rusts in Berberis spp. A new research area is to examine the contribution of animal carcasses and necrophilous insects to nutrient recycling supporting soil health.
For this planned program, effective synergies with national colleagues are facilitated through affiliations of six NHAES researchers with integrated research and extension Hatch/Multi-state projects.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	20%		1%	
112	Watershed Protection and Management	0%		4%	
133	Pollution Prevention and Mitigation	0%		4%	
136	Conservation of Biological Diversity	0%		3%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		7%	
202	Plant Genetic Resources	0%		7%	
205	Plant Management Systems	20%		12%	
211	Insects, Mites, and Other Arthropods Affecting Plants	15%		0%	
212	Diseases and Nematodes Affecting Plants	15%		5%	
216	Integrated Pest Management Systems	15%		0%	
301	Reproductive Performance of Animals	0%		8%	
302	Nutrient Utilization in Animals	0%		20%	
304	Animal Genome	0%		2%	
305	Animal Physiological Processes	0%		6%	
307	Animal Management Systems	0%		17%	
315	Animal Welfare/Well-Being and Protection	15%		0%	
502	New and Improved Food Products	0%		4%	
	Total	100%		100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

This planned program comprises NHAES's largest effort and a significant proportion of cooperative extension programming. Excluding ornamental horticulture, the largest segments of NH's agriculture are dairy, vegetable, and fruit production.
Animals are produced and forage crops are raised, on a wide range of commercial farms and small scale,"homestead" operations in New Hampshire. Product value from animal operations statewide exceeds $95 million (agriculture.nh.gov). Cash receipts increased a healthy 3.6 percent from 2012-2013(NASS). The forage, pasture, and silage corn crops that support this sector cover more than 90 percent of the state's cropland.
New Hampshire agriculture is dominated by small, diversified farms. The 2007-2012 Agriculture Census

showed 5.4 percent increase in numbers of farms and a slight (0.4 percent) increase in acreage (http://www.agcensus.usda.gov/Publications/2012). Young and first-time farmers are joining the community. Although still a small fraction, nonwhite farmers in the state have nearly doubled from 33 to 65 from 2007-2012.

The NHAES supports two research and teaching dairies: a conventional Holstein operation and an organic dairy-based agroecosystem with pasture-fed Jersey cows. A cohort of Jerseys at the conventional dairy allows direct comparisons of management systems. The dairies support basic and applied research -- addressing low overall fertility of dairy cows, enhancing calf growth, improving uptake of maternal antibodies in newborn calves, and testing the efficacy of both organic and conventional food supplements for dairy cattle. Research is necessary to extend the pasturing season in New England and identify more cost effective protein sources. These supplements contribute to the production costs that have been cited as one of the most challenging aspects of sustaining organic dairying. Results of NHAES dairy research are quickly disseminated to stakeholders via ongoing collaboration with cooperative extension.

Expanding aquaculture to meet demand requires research in improved production systems (sea trout, sea urchins, oysters) and practical approaches to reducing the environmental impact of finfish aquaculture. Research is needed to develop high-value fish and seafood production systems that are appropriate for Northern New England.

A short growing season, high labor costs, and high land values make fruit and vegetable production far more costly in New England than elsewhere. An extremely variable and humid climate makes disease and insect pests a constant threat to profitability. To compete with other agricultural producers, NH vegetable and fruit growers must produce unique and high-value products. To attain sustainability, NH fruit and vegetable growers must reduce the use of chemical pesticides, minimize crop production costs, maintain high crop quality and yields, and have reliable and consistent markets for their products.

Two horticultural/agronomy farms and a greenhouse complex for vegetable and fruit breeding provide capacity for the research, teaching, and demonstration for NHAES scientists, Cooperative Extension faculty, and local staff of the National Research Conservation Service. A portion of one horticultural farm has transitioned to organic certification to enable research that addresses issues of importance to that agricultural segment.

America's abundant and inexpensive supply of food has been based in part on the exploitation of genetic diversity for developing new, higher-quality cultivars that can resist pests, diseases, and environmental stresses. Cucurbit, strawberry, and hardy kiwi are targets of NHAES crop breeding. Season extension through high-tunnels and agricultural plastics have become widespread in New England.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

The sustainability of agriculture in NH requires a holistic approach that interfaces production, human resources, economic and environmental issues, and civic policies. All must be addressed at some level.

Most national research on plant production methods are applicable to terrain and climates that are very different from those faced by NH growers. Crop varieties that are developed elsewhere may or may not be adapted to the short growing season, cold winter temperatures, specific soil types, or the prevalent pests of NH. As a result, varieties must be carefully evaluated for performance in this region. The attractiveness of local produce to consumers can be enhanced by developing new varieties with improved appearance, eating quality, and nutrition. In addition, improved disease resistance in fruit and vegetable crops reduces pesticide inputs and increases profitability.

Identifying alternative protein feeds and extending the pasturing season will improve the profitability of northern New England dairy farms. Aquaculture and aquaponics will expand as cost effective and environmentally sound production practices for New England are identified.

Support dollars for NHAES and Cooperative Extension will increase or remain the same, as will staffing levels, research space, and other resources required to complete the work.

2. Ultimate goal(s) of this Program

UNHCE and NHAES goals are complementary.

Cooperative Extension goals will ensure that:

- Agricultural businesses in New Hampshire are profitable and economically sustainable in the long-term future.
- High-quality agricultural products are available to New Hampshire citizens.
- New Hampshire citizens have improved year-round access to locally-grown agricultural products.
- Agriculture contributes to New Hampshire's high quality of life.

NHAES goals are to:

- Increase an understanding of and abilities to produce agricultural food products.
- Address state, regional, and international food security, consistent with maintaining environmental quality.
- Contribute to the abilities of New Hampshire and regional stakeholders to maintain viable agricultural businesses and careers.
- Advance scientific knowledge in related areas.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	10.0	0.0	14.0	0.0
2018	10.0	0.0	14.0	0.0
2019	10.0	0.0	14.0	0.0
2020	10.0	0.0	14.0	0.0
2021	0.0	0.0	14.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Cooperative Extension

- Workshops/conferences - including single- and multiday conferences, NH Farm and Forest events, and various producer association meetings
- Pasture walks & twilight meetings
- Farm/site visits, including kitchen table meetings and private consultations
- On-farm and university-based applied research projects
- Phone consultations
- Soil and plant tissue diagnostic services
- Publications - newsletters, news releases, fact sheets, publications, web page
- Radio and TV spots

NHAES·

- Conduct applied and discovery research
- Undertake engagement with stakeholders in multiple aspects of plant and animal agriculture, related genetics and genomics, and various types of aquaculture at a varieties/modalities: research field days, twilight meetings, seminars and education sessions at the NH Farm and Forest Expo, the Northeast Organic Farming Association NH meeting, and the NE National Farmers Union Meeting. Some of these presentations will be made available via YouTube videos.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Education Class	● Newsletters
● Workshop	● TV Media Programs
● One-on-One Intervention	● eXtension web sites
● Demonstrations	● Web sites other than eXtension

3. Description of targeted audience

Cooperative Extension and NHAES audiences include:
Farmers/producers, scientists, veterinarians, agricultural researchers, agricultural teachers, graduate and undergraduate students, and the faculty and staff of the region's land-grant universities and others who work in agriculture-related fields, and taxpayers in the state, region and nation.

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Number of farm or agricultural business site visits or private consultations
- Number of Pesticide Applicators attending recertification training
- Number of soil and plant analyses conducted by diagnostic labs
- Number of people reached through educational workshops
- Number of undergraduate students directly involved in the research projects
- Number of graduate students directly involved in research projects.
- Number of university courses in which research project results have been incorporated
- Number of research presentations at regional, national, or international scientific meetings
- Number of workshops, training sessions and presentations to non-scientific stakeholders
- Number of reviewed, bulletin, popular and other publications resulting from research projects
- Number of websites in which research project results have been incorporated
- Number of surveys or other methods used to collect data from participants conducted for research projects
- Number of postdocs and other scientists trained in cutting edge research methods

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Number of NH growers who adopt practices to improve farm productivity and/or profitability.
2	Number of NH farmers and gardeners who use soil testing recommendations to guide nutrient application.
3	Number of NH growers who monitor for pests, use cultural practices to manage pests and/or select reduced-risk (lower EIQ) materials to manage pests.
4	Number of NH growers who increase their knowledge and/or skills in crop production practices suited to the region.
5	Number of NH growers who increase their knowledge and/or skills in dairy, livestock or equine management practices.
6	Increase knowledge about plant varieties and production practices suited to the state and region.
7	New knowledge about dairy production, nutrition, animal health and dairy products important to regional producers.
8	New genomic knowledge translated into tools and strategies to facilitate varietal selection through marker-assisted breeding.
9	Knowledge related to how the neuroendocrine system influences reproduction in fin fish aquaculture and other vertebrate animals and in the control of pest species such as lamprey eels.
10	New commercialized varieties of cucurbit vegetables suited to state and region growing conditions, with improved yields, and disease and pest resistance.
11	Increased information on non-Apis bees, their conservation, pathology, susceptibility to pesticides and contribution to crop pollination including economic value.
12	Use genomic resources developed for barberries, to identify the genetic mechanisms(s) of resistance to wheat stem and stripe rusts.
13	Improve equipment and deployment methods developed for oyster aquaculture in Northern New England and disseminate to the growing number of NH oyster farmers.
14	Establish a breeding program for hardy kiwifruit (Actinidia spp.) cultivars for New England, by characterizing with genetic and molecule tools, and phenotyping hardy Actinidia germplasm obtained the USDA's National Genetic Resources Program.
15	Number of acres on an Integrated Pest Management Plan
16	Number of farmers who report adopting practices resulting in better forage crop quality and yield.
17	Establish dietary guidelines in recirculating aquaculture systems for brown bullhead (catfish) and striped bass.
18	Understanding of how small vertebrate carcasses contribute to overall soil health and the role of necrophilous insects in this process.
19	Characterize the nutrient production in the culture system and effluent streams from a recirculating aquaculture system in terms the macro- and micro-nutrients required for hydroponic plant production.

Outcome # 1

1. Outcome Target

Number of NH growers who adopt practices to improve farm productivity and/or profitability.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 205 - Plant Management Systems
- 315 - Animal Welfare/Well-Being and Protection

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 2

1. Outcome Target

Number of NH farmers and gardeners who use soil testing recommendations to guide nutrient application.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 205 - Plant Management Systems

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 3

1. Outcome Target

Number of NH growers who monitor for pests, use cultural practices to manage pests and/or select reduced-risk (lower EIQ) materials to manage pests.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 216 - Integrated Pest Management Systems

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 4

1. Outcome Target

Number of NH growers who increase their knowledge and/or skills in crop production practices suited to the region.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 205 - Plant Management Systems
- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 216 - Integrated Pest Management Systems

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 5

1. Outcome Target

Number of NH growers who increase their knowledge and/or skills in dairy, livestock or equine management practices.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 315 - Animal Welfare/Well-Being and Protection

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 6

1. Outcome Target

Increase knowledge about plant varieties and production practices suited to the state and region.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 202 - Plant Genetic Resources
- 205 - Plant Management Systems

4. Associated Institute Type(s)

- 1862 Research

Outcome # 7

1. Outcome Target

New knowledge about dairy production, nutrition, animal health and dairy products important to regional producers.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 302 - Nutrient Utilization in Animals
- 305 - Animal Physiological Processes

4. Associated Institute Type(s)

- 1862 Research

Outcome # 8

1. Outcome Target

New genomic knowledge translated into tools and strategies to facilitate varietal selection through marker-assisted breeding.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms

4. Associated Institute Type(s)

- 1862 Research

Outcome # 9

1. Outcome Target

Knowledge related to how the neuroendocrine system influences reproduction in fin fish aquaculture and other vertebrate animals and in the control of pest species such as lamprey eels.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 301 - Reproductive Performance of Animals
- 305 - Animal Physiological Processes

4. Associated Institute Type(s)

- 1862 Research

Outcome # 10

1. Outcome Target

New commercialized varieties of cucurbit vegetables suited to state and region growing conditions, with improved yields, and disease and pest resistance.

2. Outcome Type : Change in Condition Outcome Measure

3. Associated Knowledge Area(s)

- 202 - Plant Genetic Resources

4. Associated Institute Type(s)

- 1862 Research

Outcome # 11

1. Outcome Target

Increased information on non-Apis bees, their conservation, pathology, susceptibility to pesticides and contribution to crop pollination including economic value.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 136 - Conservation of Biological Diversity
- 304 - Animal Genome

4. Associated Institute Type(s)

- 1862 Research

Outcome # 12

1. Outcome Target

Use genomic resources developed for barberries, to identify the genetic mechanisms(s) of resistance to wheat stem and stripe rusts.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 202 - Plant Genetic Resources

4. Associated Institute Type(s)

- 1862 Research

Outcome # 13

1. Outcome Target

Improve equipment and deployment methods developed for oyster aquaculture in Northern New England and disseminate to the growing number of NH oyster farmers.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 305 - Animal Physiological Processes
- 307 - Animal Management Systems

4. Associated Institute Type(s)

- 1862 Research

Outcome # 14

1. Outcome Target

Establish a breeding program for hardy kiwifruit (Actinidia spp.) cultivars for New England, by characterizing with genetic and molecule tools, and phenotyping hardy Actinidia germplasm obtained the USDA's National Genetic Resources Program.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 202 - Plant Genetic Resources

4. Associated Institute Type(s)

- 1862 Research

Outcome # 15

1. Outcome Target

Number of acres on an Integrated Pest Management Plan

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 216 - Integrated Pest Management Systems

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 16

1. Outcome Target

Number of farmers who report adopting practices resulting in better forage crop quality and yield.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 205 - Plant Management Systems
- 307 - Animal Management Systems

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 17

1. Outcome Target

Establish dietary guidelines in recirculating aquaculture systems for brown bullhead (catfish) and striped bass.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 302 - Nutrient Utilization in Animals

4. Associated Institute Type(s)

- 1862 Research

Outcome # 18

1. Outcome Target

Understanding of how small vertebrate carcasses contribute to overall soil health and the role of necrophilous insects in this process.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships

4. Associated Institute Type(s)

- 1862 Research

Outcome # 19

1. Outcome Target

Characterize the nutrient production in the culture system and effluent streams from a recirculating aquaculture system in terms the macro- and micro-nutrients required for hydroponic plant production.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 205 - Plant Management Systems

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Government Regulations
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Description

Weather and climate extremes and natural disasters affect the outcomes of field research on plants and animals.
Changes in funding and resource availability for the activities and in policies or regulations related to NHAES research and Cooperative Extension using animals would compromise the feasibility of completing the objectives. The current federal and state budgetary limitations, combined with previous reductions in NHAES and UNHCE capacity funds, will continue to impact the direct support of personnel or facilities and limit our abilities to complete the proposed NHAES research and extension activities. Competing programmatic challenges must be considered in prioritizing resource use. Any changes in this situation, including the availability of leveraging funds and resources, will impact our ability to achieve expected outcomes.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

NHAES

• Monitoring the progress of projects as gauged by the acceptance of manuscripts in peer- reviewed journals and the ability of these researchers to leverage NHAES funds for external grants.
• Stakeholder surveys conducted during outreach activities, indicating the levels of interest and the impact of research outcomes on stakeholder planning activities.
• Evidence of adoption of new plant varieties, and plant and animal production methods.

Cooperative Extension

Interviews, surveys and on-farm observations

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Climate change and sustaining natural resources

2. Brief summary about Planned Program

Many aspects of climate soils, landform, and vegetation in New Hampshire and New England make this region particularly susceptible to any changes in climate. We are near a northern temperature extreme for some forms of agricultural. After several warmer years, new crops are being introduced to the region at the same time as new insects and pathogens are becoming established. In other years, winter temperatures jeopardize the cold hardiness of fruit trees and/or heavy snowfall compromise perennial grasses' ability to overwinter. All of these factors make the ability to anticipate, mitigate, and adapt to potential changes in climate a priority for agriculture and for sustaining natural resources.
NHAES research in this program area addresses climate drivers, impacts, and mitigation efforts. Northern New England already experiences more intense rainfall in the summer and higher levels of snowfall in the winter. These, combined with land use changes resulting from a growing population in southern New Hampshire, have resulted in an increased occurrence of flooding. NHAES-funded social science research will tackle stakeholders, township, and regional planning for increased flood risk, focusing on flood risk management strategies including farming practices, conservation easement, and infrastructure construction.
Researchers are seeking to improve the Community Land Model, which simulates the effect of land cover on climate change. This NHAES project will compare CO_2, water, heat, and albedo flux in agricultural, forested, and suburban landscapes, and evaluate how these respond to different management practices (fertilizing, watering harvesting).
NHAES scientists are working to better understand how microbial communities contribute to nutrient cycling. They are investigating the formation and breakdown of soil organic matter (SOM) underpin how and when N is available to support plant growth. Conventional agriculture uses inorganic N inefficiently; typically 50 percent or more of inorganic fertilizer N is lost to the environment. Developing new strategies to build SOM will improve our ability to manage N in agricultural systems to maximize productivity and minimize N losses to ground water and to the atmosphere. NHAES research is monitoring how climate change, land management, and land-use change contribute to nutrient runoff which has led to the hyper-eutrophication of coastal estuaries including NH's Great Bay Estuary.
Decreasing farmers' costs and environmental impacts associated with off-farm inputs (animal bedding) and manure disposal is another NHAES research goal. New Hampshire is 84% forested. Many dairy farms have wood lots. One research project is evaluating the sustainable production of pine shavings from farm woodlots, with aerobic composting of bedding/manure to capture heat for on-farm dairy parlor hygiene. Aerobic composting avoids production of methane, thereby reducing the production a potent greenhouse gas. These new practices have the potential to decrease the energy footprint of dairy farming in the Northeast.
Another NHAES project will increase the understanding of actinorhizal symbiosis between beneficial Frankia microbes and plants. These symbioses provide a biological source of nitrogen and avoid the high energy costs and runoff problems associated with nitrogen fertilizers. Further, these symbioses play an important role in agriculture and the restoration of lands disturbed by mining, salinization, etc. Mechanisms of communication between these plants and microbes will be evaluated through the development of tools that will allow for the genetic analysis of Frankia physiology and the interactions with its host plants.
UNHCE programs address sustainability and climate change issues by working closely with the State Department of Forest and Lands to provide forest stewardship education to landowners as well as work with communities to help them to make sound policy decisions that will address adaptations to climate

change as well as maintaining open space and providing wildlife habitat.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	0%		37%	
112	Watershed Protection and Management	20%		16%	
123	Management and Sustainability of Forest Resources	40%		0%	
124	Urban Forestry	10%		0%	
131	Alternative Uses of Land	10%		0%	
132	Weather and Climate	0%		13%	
206	Basic Plant Biology	0%		17%	
216	Integrated Pest Management Systems	10%		0%	
401	Structures, Facilities, and General Purpose Farm Supplies	0%		3%	
403	Waste Disposal, Recycling, and Reuse	0%		7%	
605	Natural Resource and Environmental Economics	10%		7%	
	Total	100%		100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Many aspects of climate, soils, landform, and vegetation in New Hampshire and New England make it particularly susceptible to any changes in climate. The health of New Hampshire's environment depends on sound land use, strong conservation organizations, and citizens engaged in natural resource management and conservation to maintain clean water, diverse natural areas and connected wildlife habitats. New Hampshire has the greatest proportion of forested land (84 percent) in the country, most of which is owned and managed by private landowners. However, the state is simultaneously experiencing suburban growth and an increase in the number of small farms. Furthermore, NH soils are thin and shallow bedrock provides less buffering compared with many other parts of the country. The majority of

plant agriculture relies on growing season rainfall rather than irrigation. Over the last 30 years the growing season in Northern New England has become warmer and wetter with more episodes of high precipitation events, causing storm water runoff, interspersed with longer episodes of drought. The high precipitation events also have led to increased flooding. With flood management largely left to townships, there is a need to engage stakeholders to work on consensual approaches to improve flood management.

Understanding the relative contributions of agriculture, forest, and suburban development to nutrient runoff that has compromised the health of Southeastern New Hampshire's Great Bay Estuary is essential as local municipalities and government agencies seek to mitigate these problems. The Piscataqua watershed is home to many small farms. Better understanding of nitrogen runoff from farms, (from animal waste and from inefficient loss of synthetic fertilizer) as well as from other nonpoint sources is another important process of restoring the health of the Great Bay Estuary.
A recent survey of Northeastern Dairy farmers identified the costs of off-farm inputs: animal bedding, and energy expenses as of most significant challenges to farmers' fiscal stability. New technologies and farming practices may be useful to decrease these costs for animal farmers while simultaneously decreasing the ecological footprint of agriculture in the Northeast.
Frankia form a symbiotic nitrogen-fixing associations with more than 200 species of plants in eight different families including many trees. The ecological range of these actinorhizal plants is very diverse as is the host range of the symbiotic bacteria. Better understanding of the interactions of Frankia and their host may enhance opportunities for employing actinorhizal plants to restore disrupted environmental sites.
All of these challenges require an interdisciplinary approach at multiple scales to improve the ecological health of New Hampshire and the region.

2. Scope of the Program

- In-State Extension
- In-State Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

The overriding assumption made for this program is that funding and resources will be available to continue these NHAES research and UNHCE activities.

Additional assumptions include:

• Predicted changes in climate will have substantial implications for New England's natural and agricultural ecosystems.
• Changes in nutrient cycling and greenhouse gas production are likely to be equally important to climate change.
• Nutrient runoff from agriculture and suburban development are among the factors exacerbating the eutrophication of NH Great Bay Estuary.
• Nitrogen fixation by actinorhizal plants is an important part of the nitrogen budget of the planet. Actinorhizal plants involved are also of economic significance with respect to land reclamation, reforestation, soil stabilization, landscaping, fuel, and as a food sourcefor ruminant animals. Actinorhizal plants provide an excellent mechanism to restore disrupted environmental sites.
• Rising energy, bedding and feed costs and the environmental footprint threaten the viability of the dairy agriculture in the Northeastern United States.
• The average age of NH landowners is aging and 40% of the land will likely change hands in the next 25 years.

2. Ultimate goal(s) of this Program

Develop and implement research-based educational outreach programs in forest stewardship, urban and community forestry, wildlife, economic viability/sustainability and natural resource conservation helping landowners make informed decisions that will influence the health and productivity of their forests, open space and related resources.

New Hampshire communities, businesses, organizations, and volunteers work together to protect, manage and steward the state's vast natural resources (including agriculture, forests and fisheries) vital to sustaining the state's character and economy, preserving recreational opportunities and maintaining a high quality of life.

NHAES research goals include: improving components of predictive models of climate change, increasing the understanding of the relative impacts of nonpoint sources of N in the eutrophication of the New Hampshire Great Bay Estuary; augment the sustainability of agroecosystems; expanding biological nitrogen fixation through Frankia and actinorhizal trees; enhancing understanding of microbial communities to soil organic matter and improving how agricultural communities deal with the trades offs of with flood risk management.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	14.0	0.0	5.0	0.0
2018	14.0	0.0	5.0	0.0
2019	14.0	0.0	5.0	0.0
2020	14.0	0.0	5.0	0.0
2021	0.0	0.0	5.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

NHAES researchers will:

- Compare new methods for assessing microbial efficiency as they impact soil C storage and greenhouse gas emissions.
- Investigate the plant and microbial contributions on Soil Organic Matter (SOM) and soil nitrogen cycling.
- Examine the processes of N mineralization in soil.
- Investigate climate impact on soil C cycling to improve the Community Land Model, a component of climate change assessments.

• Monitor the flux of N from agricultural, suburban and forested lands, and atmospheric N deposition as these impact the nutrient status of the Great Bay Estuary.
• Refine economic models of on-farm production of animal bedding, static-pile aerobic composting with heat extraction, and uses of the finished compost as soil amendments.
• Analyze existing institutional framework for flood risk management in NH along with trends in flood risk management and stakeholders awareness and interest in these

UNH **Cooperative Extension** will carry out applied research, field trials and publishing research reports including:

• Development of educational Information: newsletters (including e-newsletters), fact sheets, trade magazines, journals, posters, and displays.
• Efforts to promote local seafood awareness, marketing and consumption.
• On-line/web based information: web page updates; blogs, social media (Facebook and Twitter); electronic pest alerts; developing educational visuals/videos; podcasts.
• One-on-one education: Site visits to landowners, fishermen and natural resource professionals; phone, email, video chats and walk-in clients; one-on-one assistance to develop management or business plans.
• Public Relations/marketing/communications.
• Technical Assistance to state agencies/organizations.
• Workshops, conferences, statewide Speaker's Bureau State-wide and multistate (regional) public forums, demonstrations Invited presentations.
• Write and respond to news media.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Education Class ● Workshop ● One-on-One Intervention ● Demonstrations	● Newsletters ● TV Media Programs ● Web sites other than eXtension

3. Description of targeted audience

Audiences for **NHAES researchers** include agricultural producers, natural resource managers and consumers, land managers, scientists, undergraduate and K-12 students, public policy makers, regional planners, local communities, and decision makers concerned with the magnitude of different pollution sources that impact local water quality. Additional target audiences include stakeholders, town, county and state agencies dealing with flood risk management.

Additional target audiences for UNHCE include nonindustrial private forest owners (NIPF), municipal and other forest landowners, natural resource professionals, communities, volunteers, NH forest-based industries, and the public, landowners and recreational users of New Hampshire's lakes, estuaries, rivers, and ocean beaches.

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Number of undergraduate students directly involved in the projects.
- Number of graduate students directly involved in the projects.
- Number of university courses in which the project results have been incorporated.
- Number of presentations at regional, national, or international scientific meetings
- Number of workshops, training sessions and presentations to non-scientific stakeholders
- Number of websites in which research project results have been incorporated.
- Number of one-on-one consultations (woodlot exams, phone calls, emails, office visits, cost share programs, forester referrals, etc.)
- Number of volunteers trained and supported: Coverts, Natural Resource Stewards, Stewardship Network, Lakes Lay Monitoring and Coastal Research volunteers/citizen scientists
- Number of annual lake reports and coastal reports published on water quality assessments from volunteer monitoring/citizen science efforts
- Number of towns and conservation groups provided with direct assistance regarding land and water conservation
- People reached through media: press releases, newsletters, radio, TV, web, direct mailing
- Number of postdocs trained in cutting edge research.

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Number of acres of forest management plans meet or exceed NH forest stewardship standards
2	Number of volunteers in conservation work in NH communities as a result of training and continued work by UNHCE primarily in the Coverts, Stewardship Network and Natural Resource Stewards programs
3	Number of volunteers that provided conservation work in NH communities as a result of training and continued work by UNHCE primarily in the Coverts, Stewardship Network and Natural Resource Stewards, Lakes Lay Monitoring and Coastal Research volunteer programs
4	Number of communities making progress in community-based natural resource protection and climate resiliency programs and projects
5	Design and validate new methods for analyzing plant and microbial contributions to soil organic matter (SOM).
6	Further understanding of how global change factors impact microbial efficiency, a key determinate of soil C storage and greenhouse gas emissions.
7	Increase understanding of landscape configuration in determining the effectiveness of natural ecosystem services to attenuate N loading from agricultural versus suburban landscapes
8	Refine an integrated system for providing animal bedding using on-farm forest resources; evaluate an experimental static pile aerobic composting system for energy extraction from animal bedding and manure. Estimate costs and payback timeline for the various components of the composting system.
9	Number of Extension participants who engage with a licensed forester and/or a certified logger.
10	Number of people who report using a forest stewardship best management practice.
11	Validate the Community Land Model (CLM) for CO2 and water flux, radiation, and albedo, across agricultural, forested and suburban landscapes comparing eddy flux data to remote sensing data and modeling.
12	Understand of the mechanisms that that Frankia-actinorhizal plant symbioses aids the plants to overcome harsh environmental conditions, and clarify the role of natural products in the life style of Frankia in the soil environment and as a plant symbiont.

Outcome # 1

1. Outcome Target

Number of acres of forest management plans meet or exceed NH forest stewardship standards

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 123 - Management and Sustainability of Forest Resources
- 605 - Natural Resource and Environmental Economics

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 2

1. Outcome Target

Number of volunteers in conservation work in NH communities as a result of training and continued work by UNHCE primarily in the Coverts, Stewardship Network and Natural Resource Stewards programs

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 112 - Watershed Protection and Management
- 123 - Management and Sustainability of Forest Resources
- 124 - Urban Forestry
- 131 - Alternative Uses of Land

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 3

1. Outcome Target

Number of volunteers that provided conservation work in NH communities as a result of training and continued work by UNHCE primarily in the Coverts, Stewardship Network and Natural Resource Stewards, Lakes Lay Monitoring and Coastal Research volunteer programs

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 123 - Management and Sustainability of Forest Resources
- 131 - Alternative Uses of Land

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 4

1. Outcome Target

Number of communities making progress in community-based natural resource protection and climate resiliency programs and projects

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 123 - Management and Sustainability of Forest Resources
- 131 - Alternative Uses of Land
- 605 - Natural Resource and Environmental Economics

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 5

1. Outcome Target

Design and validate new methods for analyzing plant and microbial contributions to soil organic matter (SOM).

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships

4. Associated Institute Type(s)

- 1862 Research

Outcome # 6

1. Outcome Target

Further understanding of how global change factors impact microbial efficiency, a key determinate of soil C storage and greenhouse gas emissions.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 131 - Alternative Uses of Land

4. Associated Institute Type(s)

- 1862 Research

Outcome # 7

1. Outcome Target

Increase understanding of landscape configuration in determining the effectiveness of natural ecosystem services to attenuate N loading from agricultural versus suburban landscapes

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 112 - Watershed Protection and Management

4. Associated Institute Type(s)

- 1862 Research

Outcome # 8

1. Outcome Target

Refine an integrated system for providing animal bedding using on-farm forest resources; evaluate an experimental static pile aerobic composting system for energy extraction from animal bedding and manure. Estimate costs and payback timeline for the various components of the composting system.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 401 - Structures, Facilities, and General Purpose Farm Supplies
- 403 - Waste Disposal, Recycling, and Reuse
- 605 - Natural Resource and Environmental Economics

4. Associated Institute Type(s)

- 1862 Research

Outcome # 9

1. Outcome Target

Number of Extension participants who engage with a licensed forester and/or a certified logger.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 123 - Management and Sustainability of Forest Resources
- 131 - Alternative Uses of Land

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 10

1. Outcome Target

Number of people who report using a forest stewardship best management practice.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 112 - Watershed Protection and Management
- 123 - Management and Sustainability of Forest Resources
- 216 - Integrated Pest Management Systems
- 605 - Natural Resource and Environmental Economics

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 11

1. Outcome Target

Validate the Community Land Model (CLM) for CO2 and water flux, radiation, and albedo, across agricultural, forested and suburban landscapes comparing eddy flux data to remote sensing data and

modeling.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 132 - Weather and Climate

4. Associated Institute Type(s)

- 1862 Research

Outcome # 12

1. Outcome Target

Understand of the mechanisms that that Frankia-actinorhizal plant symbioses aids the plants to overcome harsh environmental conditions, and clarify the role of natural products in the life style of Frankia in the soil environment and as a plant symbiont.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 206 - Basic Plant Biology

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges

Description

Changes in funding and resource availability for the activities, and in policies or regulations related to NHAES and UNHCE activities, would compromise the feasibility of completing the objectives. The current federal and state budgetary limitations, combined with previous reductions in capacity funds, will impact the direct support of personnel or facilities and limit our abilities to complete the proposed NHAES and extension activities.

Competing programmatic challenges must be considered in prioritizing resource use. Any changes in this situation, including the availability.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

UNHCE evaluation and assessment methods will run the gamut from observation, written evaluations, focus groups, surveys, pre- and post-testing, follow-up communications, and public and professional forums.

NHAES Research outcomes will be evaluated:

• Through peer scientist reviews of manuscripts submitted for publication;

• Through feedback from diverse information stakeholders, and project director's success in leveraging NHAES investments with competitive grant funds.

• Through the implementation of research findings by municipal and regional planners in their efforts to mitigate eutrophication of NH's Great Bay.

• Through the adoption by regional dairy farms of on-farm animal bedding production or aerobic composting methods to reduce methane production from biological wastes.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Supporting a Rural Economy

2. Brief summary about Planned Program

New Hampshire is a strongly rural state within the similarly rural region of Northern New England. Rural communities have proximate to urban areas, through population centers in the southern part of the state (Concord, Manchester, Nashua and the Seacoast) and our Southern New England neighbors in MA. As an example, Boston is 65 miles from the University of New Hampshire.
NHAES research and UNHCE outreach activities support (ornamental) greenhouse and landscape horticulture, which represent a large economic sector in the state and are closely tied to our rural areas. NHAES offers strong support through funded projects as well as providing vital research capacity in the farms and greenhouse facilities that are used for research, extension, and teaching.
NHAES Hatch projects will include research in greenhouse management and technologies to make greenhouse production become more economically and environmentally sustainable.
NHAES also supports research through several integrated multistate research projects that are part of this planned program on rural economies, including:

• Using survey and focus groups to understand emerging opportunities and threats to the economic structure of rural communities arising from the potential shifts in local and regional food systems. Identifying and analyzing policies and strategies contributing to the viability and resiliency of communities in responding to economic and policy changes and to natural and human-made shocks. (NE1049)

• Analyzing demographic shifts in rural populations before, during and after the Great Recession (2006-2009); examining links between unemployment and population shifts; and evaluating impacts of socioeconomic changes demand on rural housing. This information is essential for local, regional, and national policy makers. (W3001)

• Identifying seed and cultivar mixtures and improving cultural practices to establish wildflower meadows for to enhance pollinator habitat. Quantify the impact of pollinator gardens on the productivity of insect-pollinated crops grown in rural areas (NC1173).

UNH Cooperative Extension's community and economic development programming provides communities with the knowledge and tools to strengthen their business base; teaches people the skills to become leaders, engage in local government, and solve community problems; and works with small business owners to grow and maintain New Hampshire' ' s farming, fishing , and forestry businesses.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	10%		0%	
205	Plant Management Systems	5%		50%	
211	Insects, Mites, and Other Arthropods Affecting Plants	5%		0%	
212	Diseases and Nematodes Affecting Plants	5%		0%	
216	Integrated Pest Management Systems	10%		0%	
403	Waste Disposal, Recycling, and Reuse	0%		10%	
601	Economics of Agricultural Production and Farm Management	20%		10%	
602	Business Management, Finance, and Taxation	10%		0%	
605	Natural Resource and Environmental Economics	15%		0%	
608	Community Resource Planning and Development	20%		5%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%		25%	
	Total	100%		100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

The New Hampshire's agricultural, forestry, and natural resources-based economies and much of our substantial tourist industry are fundamentally based on the state's rural character. It is a compelling quality of life factor for state residents and highly attractive to visitors. Maintaining this important aspect of our state requires that our rural citizens and communities are able to thrive both socially and economically. While NHAES cannot address all of the salient issues related to rural communities and economies, we do and will continue to contribute a substantial component of important knowledge that is critical to maintaining our rural character.

Rural New Hampshire communities face many challenges, including changing demographics, shifting economic structures, and societal crises, with unprecedented growth in some regions and decline in others. The aging of the U.S. population affects rural areas in unique and geographically diverse ways, with increasing rates of retirement migration affecting some areas and with aging-in-place occurring elsewhere. The changing racial and ethnic composition of rural areas produces social and economic challenges to the integration of these new racial and ethnic groups. Rapid population growth along the urban-rural periphery and in high amenity areas requires a careful examination of land use patterns. Family businesses are an integral part of the rural community, and maintain a working landscape that provides citizens with superior products as well as connections to farming in "rural" New Hampshire. Each of these program areas addresses the unique needs of farmers and assist in keeping their operations

viable. The number of NH farms is increasing, but many of the individuals who are starting these operations require basic management education. Small business startups in the natural resources and agricultural industries will require education and support from research and outreach programming in order to successfully add jobs to the state's economy. Community growth on the boundaries of suburban/rural communities places additional strain on land use, particularly with the resurgence of agriculture in New England.
Ornamental horticulture one of the two top agricultural sectors in the state (McWilliam-Jellie, Director NH Division of Agricultural Development, pers. comm.). NHAES funds research and UNHCE funds educational programs on greenhouse crops and landscaping to address the needs of rural producers and help them to become more competitive. The production component of this sector takes place in rural areas and is an important source of employment.
The priorities of producers (greenhouse) and other green industry businesses are somewhat different from those of the consumer. Producers are focused on crop production and the economic viability of their businesses. However, many nurseries and greenhouses are producing crops at less than optimal efficiencies. Labor, raw materials, and energy are becoming increasingly more expensive and/or are harder to source. Owners, operators, and employees often lack sufficient knowledge and skills to maximize productivity while maintaining level or decreased inputs.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

The overriding assumption made for this program: Funding and resources will be available to continue this NHAES and UNHCE research.

Without knowledge of regional differences, policy formation within New Hampshire may be misdirected and cause the state to be excluded from project efforts to disseminate findings that enhance the response capabilities of local government officials, regional economic development officers, extension personnel, and other stakeholders. Ongoing efforts are needed to assist municipal, county, state , and regional planners to engage stakeholders and to design policy changes to improve the welfare of the community. New knowledge about economically, environmentally, and socially sustainable production practices in greenhouses and landscape horticulture will continue to be key to employment in these large sectors of our rural economy.

2. Ultimate goal(s) of this Program

The ultimate goal of NHAES research in this planned program area is to provide new knowledge, practices, and conditions in support of a thriving rural economy and social policy structure in New Hampshire and New England.

The goals of UNHCE are :

• Farming, fishing, and forestry businesses in New Hampshire are sustained, expanded, or initiated as a result of careful planning, effective marketing, and sound financial and business management practices.
• New Hampshire communities, businesses, organizations, and volunteers work together to steward the state's vast agricultural and natural resources vital to sustaining the state's character and economy.
• New Hampshire communities remain economically vibrant as a result of greater ability to identify competitive advantages and implement effective local and regional economic development strategies.
• Residents of New Hampshire communities are engaged in local decision-making and action, resulting in greater ability to address issues/needs of social, economic, natural and cultural importance.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	11.0	0.0	1.0	0.0
2018	11.0	0.0	1.0	0.0
2019	11.0	0.0	1.0	0.0
2020	11.0	0.0	1.0	0.0
2021	0.0	0.0	1.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

NHAES scientists will:

• Collaborate with Extension to identify key issues in local agriculture by using focus groups and surveys.
• Carry out greenhouse growth trials on ornamental and alternative crops and improve cultural methods for economic and environmental sustainability.
• Evaluate perennial wildflower species and cultivars for attractiveness to key native pollinators.
• Develop regional wildflower seed mixes and compare these to commercially available wildflower seed mixes for density, diversity and ability to compete with weeds.
• Evaluate different methods for site preparation, planting, and long term wildflower meadow establishment.
• Document recent demographic trends in both rural and urban areas before, during and after the Great Recession and compare New Hampshire demographic trends to those in the region and nation. Disseminate this knowledge to local, regional, and national policymakers.
• Use focus groups and surveys to determine consumer willingness to pay, for local and/or organic foods.

- Evaluate attitudes towards new policies to reduce municipal expenditures.
- Test the effects that social capital infrastructure has on different measures of environmental quality.

Apply the results to improve communications for local policy agencies and with the public.

- Apply the results to improve communications for local policy agencies and with the public.

UNHCE will conduct:

- Workshops and seminars
- One-on-one business consultations and technical assistance
- Twilight meetings
- Development and dissemination of business resources and publications (web and print)
- Media releases (news and radio)
- Economic development technical assistance.
- Economic development planning.
- Community planning forums/charettes.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Education Class ● Workshop ● One-on-One Intervention ● Demonstrations	● Newsletters ● Web sites other than eXtension

3. Description of targeted audience

NHAES research and **UNHCE** target audiences include:

Scientists, undergraduate and graduate students, citizens, land use professionals, homeowners, landscapers, farmers, legislators, contractors, firms and rural residents, demographers, social and natural scientists as well as policy-makers and the media.

Community leaders, municipal board/committees, community volunteers, professional community development practitioners, active community members, municipalities, regional economic development corporations, regional planning commissions, and chambers of commerce.

Farmers, fishermen, food processors, forest products businesses, tourism businesses, industry sectors, potential entrepreneurs, business service providers, greenhouse and landscape professionals.

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Number of one-on-one consultations with greenhouse growers and landscape professionals
- Number of communities provided with technical assistance to enhance their decision making with regard to tourism and economic development plans, projects and activities
- Number of people reached through risk management and farm management workshops
- Number of people reached through site/farm visits related to farm and forest management
- Number of Community Profiles (community-level strategic planning program, facilitated by UNHCE professionals)
- Number of presentations at regional, national, or international scientific meetings
- Number of workshops, training sessions and presentations to non-scientific stakeholders
- Number of reviewed, bulletin, popular, news and other publications
- Number of surveys or other means of gathering information and data from participants
- Number of graduate students directly involved in research project.
- Number of websites in which research project results have been incorporated
- Number of undergraduate students directly involved in the projects
- Number of people participating in Extension's Economic Development Academy
- Number of people attending workshops/twilight meetings
- Number of community and economic development leaders and practitioners reporting increased skills or knowledge about tools and strategies for growing and sustaining local businesses and the economy.
- Number of recommended practices implemented by communities aimed at retaining and/or expanding existing businesses.
- Number of businesses (or industry sectors) that implement effective tools and strategies to grow or sustain their enterprises or industry sector.
- Number of businesses that report that they were able to sustain or grow their enterprise partly as a result of the Business Retention and Expansion Program.

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Number of community members who report new skills (e.g. leadership, group process, identifying resources, managing change, etc.)
2	Number of community leaders who develop a new understanding of the issues facing their community.
3	Number of NH growers who make informed decisions on production practices that result in business sustainability
4	Number of new businesses retained, started or expanded
5	Number of presentations to civic and government entities to increase knowledge of demographics and migration in the region and nation.
6	Disseminate results from greenhouse growth trials on ornamental and alternative crops
7	Number of NH farms that develop and implement a business plan
8	Disseminate results from 1) evaluations of attitudes towards new policies to reduce municipal expenditures and 2) testing the effects that social capital infrastructure has on different measures of environmental quality.
9	Results for regional industry focus groups will be collated and disseminated regarding growers concerns, issues regarding what is the best fresh produce grown for direct marketing (direct to consumer, such as farm stand, farmers market, CSA), what considerations go into deciding what production practices and methods to use, what information about consumers' fresh produce purchasing habits would be most useful, and obstacles to expanding operations. These analyzes will inform growers and allow producers to better tailor practices to improve economic outcomes.
10	Dollar value of volunteer hours committed by program participants to plan and implement community projects/activities.
11	Number of actions, policies, and/or plans adopted or implemented by communities or community groups
12	Number of community members who take on a new or expanded leadership role(s) in their community

Outcome # 1

1. Outcome Target

Number of community members who report new skills (e.g. leadership, group process, identifying resources, managing change, etc.)

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 602 - Business Management, Finance, and Taxation
- 608 - Community Resource Planning and Development
- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 2

1. Outcome Target

Number of community leaders who develop a new understanding of the issues facing their community.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 605 - Natural Resource and Environmental Economics
- 608 - Community Resource Planning and Development

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 3

1. Outcome Target

Number of NH growers who make informed decisions on production practices that result in business sustainability

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation

- 605 - Natural Resource and Environmental Economics

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 4

1. Outcome Target

Number of new businesses retained, started or expanded

2. Outcome Type : Change in Condition Outcome Measure

3. Associated Knowledge Area(s)

- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation
- 605 - Natural Resource and Environmental Economics
- 608 - Community Resource Planning and Development

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 5

1. Outcome Target

Number of presentations to civic and government entities to increase knowledge of demographics and migration in the region and nation.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities

4. Associated Institute Type(s)

- 1862 Research

Outcome # 6

1. Outcome Target

Disseminate results from greenhouse growth trials on ornamental and alternative crops

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 205 - Plant Management Systems

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 7

1. Outcome Target

Number of NH farms that develop and implement a business plan

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 8

1. Outcome Target

Disseminate results from 1) evaluations of attitudes towards new policies to reduce municipal expenditures and 2) testing the effects that social capital infrastructure has on different measures of environmental quality.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 403 - Waste Disposal, Recycling, and Reuse
- 601 - Economics of Agricultural Production and Farm Management
- 608 - Community Resource Planning and Development

4. Associated Institute Type(s)

- 1862 Research

Outcome # 9

1. Outcome Target

Results for regional industry focus groups will be collated and disseminated regarding growers concerns, issues regarding what is the best fresh produce grown for direct marketing (direct to consumer, such as farm stand, farmers market, CSA), what considerations go into deciding what production practices and methods to use, what information about consumers' fresh produce purchasing habits would be most useful, and obstacles to expanding operations. These analyzes will inform growers and allow producers to better tailor practices to improve economic outcomes.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 601 - Economics of Agricultural Production and Farm Management
- 608 - Community Resource Planning and Development

4. Associated Institute Type(s)

- 1862 Research

Outcome # 10

1. Outcome Target

Dollar value of volunteer hours committed by program participants to plan and implement community projects/activities.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 605 - Natural Resource and Environmental Economics
- 608 - Community Resource Planning and Development

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 11

1. Outcome Target

Number of actions, policies, and/or plans adopted or implemented by communities or community groups

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 608 - Community Resource Planning and Development
- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 12

1. Outcome Target

Number of community members who take on a new or expanded leadership role(s) in their community

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 608 - Community Resource Planning and Development

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Competing Public priorities
- Competing Programmatic Challenges

Description

Changes in funding and resource availability for the activities, and in policies or regulations related to animal and human subject use, would compromise the feasibility of completing the NHAES research

and UNHCE objectives. The current federal and state budgetary limitations, combined with previous reductions in capacity funds, will impact the direct support of personnel or facilities and limit our abilities to complete the proposed NHAES research and UNHCE activities.

Competing programmatic challenges must be considered in prioritizing resource use. Any changes in this situation including the availability of leveraging funds and resources will impact our ability to achieve expected outcomes.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

The **NHAES** will monitor the outcomes and impacts of research activities in this program area through the following ways:

- Publication of scholarly studies in peer-reviewed journals.
- Utilization of demographic analysis by local, state and regional planners, and policy makers (citations in public media, by policy makers, etc.).
- Evidence of public interest in online resources (online "hits").
- Evidence of adoption of new technologies, plant varieties and/or management systems

UNH Cooperative Extension will monitor outcomes and impacts of their activities in this planned program through the following ways:

- Baseline and post survey of business planning program participants will be used to assess change in participants' knowledge in each of the three areas (business planning, financial management, and marketing) and to track new business start-ups and employment growth and/or retention.
- Follow-up interview with community and regional economic development leaders who receive programming or technical assistance from UNHCE.
- Results of baseline and post effort surveys will determine effectiveness programming and intent to make changes in practices.

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Youth and Family

2. Brief summary about Planned Program

The backbone of a vibrant and strong New Hampshire is our youth and families. As the core of our workforce and of our communities, youth and families are the engines of our prosperity and the locus of our well-being. The staff members of the UNHCE Youth & Family Program Team are positioned to provide the research-based education and information necessary to enhance the ability of youth and families (and those who work with them), to make the kind of informed decisions and choices that will strengthen New Hampshire.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
802	Human Development and Family Well-Being	20%		0%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	20%		0%	
805	Community Institutions and Social Services	20%		0%	
806	Youth Development	40%		0%	
	Total	100%		0%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Currently, the 4-H club and 4-H camping programs reach 30% of the youth served in Cooperative Extension youth programs and has the most community support and visibility of CE youth programs. Other youth are reached through programs offered through school enrichment which include those conducted by Nutrition Connections, Marine Docents and Master Gardeners. 4-H Youth development provides a long term experience with a caring adult in out of school time settings. Youth develop leadership, sense of community and often take ownership for their own direction in learning. Specialized school programs often are more adult directed, intense learning for a shorter period of time. The **4-H Youth Development** team will help provide focused and intentional volunteer training

to help expand and retain both youth and volunteers in the 4-H club and 4-H camping programs thus increasing the % of youth reached in 4-H Youth Development.

In order to be competitive, the 21st century NH workforce needs to possess skills in the areas of science, technologically, engineering, and mathematics. Our schools often struggle to provide both the informal and hands-on place-based science learning opportunities that provide students with the tools and confidence to pursue work or further studies in science.

NH Youth Risk Behavior Surveys, Carsey Institute research, and other recent surveys all indicate that our young people face significant challenges finding outlets and environments where they feel valued and supported. While well-intended educators work with constructive outcomes in mind, they need research-based resources (provided by the **Positive Learning Environments for Youth** team), proven methods and effective collaborations in order to partner with youth effectively.

2. Scope of the Program

- In-State Extension
- Multistate Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

4-H YD is a well respected and effective youth development program in NH.

A successful 4-H YD program is dependent on an adequate number of competent volunteers.

Youth and family staff have the ability to recognize and understand the needs of individuals in communities, and to facilitate educational opportunities in respond to those needs.

Partnerships between University System of New Hampshire (USNH) and UNHCE youth and family staff can provide two-way communications for youth, families, faculty and community partners to foster lifelong learning.

2. Ultimate goal(s) of this Program

Improve number and quality of opportunities in NH that incorporate research-based "essential elements" of Positive Youth Development that are necessary to support our youth as they develop into contributing citizens.

Increase the number of youth in NH who are ready to engage confidently in science-related projects, studies and careers; and increase the ability of non-formal and volunteer science educators to engage effectively with youth in this area.

.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	20.0	0.0	0.0	0.0
2018	20.0	0.0	0.0	0.0
2019	20.0	0.0	0.0	0.0
2020	20.0	0.0	0.0	0.0
2021	0.0	0.0	0.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

- 4-H Youth Development staff and volunteer training (both in person and on-line)
- 4-H Youth Development projects, clubs, events, and camp (including NH Teen Council & Conference, National Congress & Conference, Barry Conservation Camp, healthy living and science projects)
- 4-H Youth Development staff and volunteer training (both in person and on-line)
- Afterschool Staff trainings - including N.H. Afterschool Professional Development Career System and Certification Process
- Marine Docent educational work with schools and groups
- Science Literacy statewide community of practice for agencies/organizations involved in this work
- Seacoast SeaPerch

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Education Class ● Workshop ● One-on-One Intervention ● Demonstrations	● Newsletters

3. Description of targeted audience

Youth, ages 5-18, 4-H members and volunteers, limited resource families and children, after school program staff, health practitioners

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Number of volunteers developed
- Number of youth who participated in 4-H as a 4-H club, after school or special interest group member
- Number of youth attending Barry Conservation Camp
- Number of educators and volunteers trained in youth development topics (e.g., Social Emotional Learning, STEM Education, Healthy Living, 4-H Positive youth development, etc.)

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Proportion of youth (4-H members or others) who report an increase in their universal life skills
2	Proportion of youth participants who report an increase in healthier food choices
3	Proportion of adults participants who report an increase in healthier food choices
4	Proportion of youth participants reporting or demonstrating increased engagement in STEM
5	Proportion of participants completing the Youth Mental Health First Aid course who report increased confidence in their ability to address youth mental health issues
6	Proportion of youth who report an increase in subject matter skills or practices in the animal science project areas

Outcome # 1

1. Outcome Target

Proportion of youth (4-H members or others) who report an increase in their universal life skills

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 802 - Human Development and Family Well-Being

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 2

1. Outcome Target

Proportion of youth participants who report an increase in healthier food choices

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 3

1. Outcome Target

Proportion of adults participants who report an increase in healthier food choices

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 802 - Human Development and Family Well-Being
- 805 - Community Institutions and Social Services

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 4

1. Outcome Target

Proportion of youth participants reporting or demonstrating increased engagement in STEM

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 5

1. Outcome Target

Proportion of participants completing the Youth Mental Health First Aid course who report increased confidence in their ability to address youth mental health issues

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 802 - Human Development and Family Well-Being
- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension

Outcome # 6

1. Outcome Target

Proportion of youth who report an increase in subject matter skills or practices in the animal science project areas

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 802 - Human Development and Family Well-Being
- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Economy
- Appropriations changes
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Description

Changes in funding and resource availability for the activities, and in policies or regulations related to Research and Extension using human subjects, would compromise the feasibility of completing the objectives. The current Federal and State budgetary limitations, combined with recent State reductions in capacity funds (2012), will impact the direct support of personnel or facilities and limit our abilities to complete the proposed NHAES and Extension activities.

Specific factors that impact youth and family programming in NH:

More diverse family structures. Increase in number of NH families living in poverty.

NH communities lack resources for youth opportunities, particularly in rural areas

Increasing need for out-of-school time activities promoting positive youth development for NH youth, especially teens.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Post participation survey using 4-H Common Measures Survey - Universal items and Science Literacy items for grades 4-7 or grades 8-12

- Post participation survey using Barry Camp Questionnaire
- Periodic survey utilizing CYFER common measure: Program Quality Instrument for Adult Staff & Volunteers