2012 University of New Hampshire Research Plan of Work

Status: Accepted

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I. Plan Overview

1. Brief Summary about Plan Of Work

The New Hampshire Agricultural Experiment Station (NHAES) resides within the University of New Hampshire's College of Life Sciences and Agriculture. It has responsibility for Hatch and Hatch-Multistate agricultural research, and McIntire-Stennis cooperative forestry research programs. This report covers the federal and state partnership-funded Hatch and Hatch-Multistate research components. Our programs are inclusive of the USDA-NIFA national priority areas in childhood obesity, climate change, food safety, global food security & hunger, and renewable energy, while also addressing imnportant state and regional priorities in sustaining natural resources and supporting rural economies.

We focus on research problems having local to international relevance, and are closely mindful of the Hatch Act directive 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, with scientists further leveraging their research findings into federal grants activity. This results in strongly added value for NH taxpayers. The Hatch capacity funds provide critical baseline abilities to support a credible agricultural program, including field research facilities and support for training the next generation of agricultural scientists and educated citizen consumers.

Agriculture and associated natural resources are core contributors to the NH economy. Beyond the direct impacts of agricultural cash receipts and its multipliers, the attractive open spaces maintained by pastoral small-scale agricultural operations combine with our abundant natural resource base to create a compelling venue in support of our large tourism sector. The same quality of life factors provide a magnet for the growing high-technology industrial base, a biomedical industry and additional sectors of the state's economy.

In agriculture the trend in our state continues to be toward smaller farms with income balanced between crop and livestock sales. The New England dairy industry continues to suffer the impacts of low milk prices. We rank high nationally in proportion of organic farms and the value of organic as percent of total sales, consistent with our small producers seeking viable economic niches. The latter is aided through the close proximity of many New England urban and rural interfaces. We strongly support research in these areas through our suite of funded projects as well as our two horticultural farms, two dairies and research greenhouses. The farms and dairies address both conventional and organic research and management needs, and results are disseminated to our varied stakeholders. Our setting on the Gulf of Maine provides opportunity to support coastal and open water marine aquaculture through research and meaningful engagement of producers, harvesters and other stakeholders.

The overarching goal of our 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 issues. Our research, outreach and educational programs will increasing emphasize the sustainability of our relatively unique 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.

Scientists at the New Hampshire Agricultural Experiment Station are encouraged to coordinate their research activities with scientists at other stations in the northeast region and nation in partnership with the USDA National Institute of Food and Agriculture. Via this plan and the corresponding Maine plan of work update, the New Hampshire Agricultural Experiment Station and Maine Agricultural and Forest Experiment Station are declaring an intent-to-plan for a unique two-state programmatic collaboration with the goal of increasing program effectiveness and administrative efficiencies in both units through joint activities. Our tentative objectives are to (1) develop complementary and/or integrated research programs and activities at the New Hampshire and Maine stations that will more effectively meet the research needs of the two states and the northern New England region, (2) improve the distribution of research-based information from the New Hampshire and Maine stations to stakeholders in the two-state region, and (3) improve administrative efficiency and communication programs at both stations. Our intention is to submit separate, but coordinated, plan of work updates next year.

There are many potential advantages of a New Hampshire-Maine collaboration. Our units and states share a number of challenges and potential opportunities:

- The agriculture and forestry sectors in Maine and New Hampshire have parallel opportunities and needs.
- Both Maine and New Hampshire have investments in aquaculture.
- Maine and New Hampshire have similar dependencies on nature-based tourism and broadly similar needs in the environmental arena.
- The current emphasis on multi-institutional research by the USDA and other federal agencies argues for greater formal coordination at the program level.
- Coordinated, cooperative research activities, sharing of resources, and integration of certain administrative activities will more effectively serve the needs of each state as well as the region.
- Administrative demands, including outreach and communication needs, will likely increase at the same time as pressure increases to reduce administrative costs.
- With limited state funding, expertise gaps will increasingly occur at our individual stations.

During the course of the next year, we plan to involve administrators and faculty in a planning process to evaluate options and opportunities for collaboration and anticipate the outcomes influencing the 2013 (fiscal years 2013-2017) plans of work.

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

Year	Extension		Research	
	1862	1890	1862	1890
2012	0.0	0.0	11.2	0.0
2013	0.0	0.0	12.0	0.0
2014	0.0	0.0	12.0	0.0
2015	0.0	0.0	12.0	0.0
2016	0.0	0.0	12.0	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

Faculty are encouraged to submit a one page description of their proposed project and to meet with the NHAES Associate Director to discuss the anticipated work. A proposal development and projects review manual is available to help faculty prepare their full proposals. All submitted proposals are critically reviewed for merit by a committee consisting of highly accomplished faculty members plus the Associate Director. The committee develops a list of those having high, medium and low recommendation for potential approval. The NHAES Director and Associate Director use this recommendation and their own independent evaluation to make the final decision as to which projects the Experiment Station will forward to NIFA for ultimate approval of funding, based on merit and our projected support budget. We recently modified this procedure in response to stakeholder input, with the proposal evaluation criteria including: 1) Relationship to the Hatch or Hatch-Multistate programs, and to the NHAES mission and research priorities; 2) Scientific and technical merit; 3) Soundness of approach, procedures and methodology; 4) Likelihood of significant contributions and/or innovative advances; 5) Previous and current research productivity and accomplishments [or potential, for new investigators]; and 6) Likelihood of significant enhancement in research capability and competitiveness.

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?

The multistate projects to which we fund NHAES participation address topics of high concern to both NH and New England, as identified by many of our stakeholders. These include the following projects at the present time, which address aspects of animal and plant agriculture including breeding of suitable varieties for our area, and important topics of rural life that impact the state and region: NRSP3: The National Atmospheric Deposition Program; NE009: Conservation and utilization of plant genetic resources; NE1026: Weed Management Strategies for Sustainable Cropping Systems; NE1027: Ovarian influences on embryonic survival in ruminants; NE1030: Characterization and Mechanisms of Plant Responses to Ozone in the U.S.; NE1034: Genetic bases for resistance and immunity to avian diseases; NC1028: Promoting healthful eating to prevent excessive weight gain in young adults; NC1042: Management systems to improve the economic and environmental sustainability of dairy enterprises; NC1171: Interactions of individual, family, community, and policy contexts on the mental and physical health of diverse rural low-income families; and W2004: Population dynamics and change: aging, ethnicity and land use change in rural communities.

We recently initiated an effort to increase multistate project participation, particularly among our best and junior scientists. We will also urge our new faculty hires to affiliate with appropriate multistate research projects in order to support regional or national efforts and to

concurrently accrue the accompanying benefits of interactions with scientific peers. In addition to these formal multistate committee interactions, our supported faculty participate broadly in regional, national and international research collaborations of value to the state and region. These strongly leverage their NHAES support with substantial amounts of competitive funding that is directed to common themes of strategic importance. The Director's Office and faculty members maintain connection to critical issues through professional contacts, contacts with varied stakeholders and with priorities expressed by funding entities, regional and national peers, and additional means.

2. How will the planned programs address the needs of under-served and under-represented populations of the State(s)?

Several of our existing projects and programs address the needs of the state's under-served and under-represented populations. For example, we address many aspects of importance to New Hampshire's consumers and rural constituents, in addition to varied production and management challenges related agricultural research. We will work with our Extension partners to more closely evaluate the needs of the state's urban populations within these categories. Current and recent past work includes addressing the availability and intake of healthy foods, links between environmental and dietary influences and obesity, and the viability of local products and markets. Many of the multistate projects address priority needs that address these target groups. Among these are NC1028 which seeks to understand how issues important to young adults such as environment and quality of life affect their diet, activity, and life style choices. The ultimate outcome of this work will be educationally appropriate materials and interventions that meet the young adult groups' needs in their acquisition of healthful eating and prevention of weight gain. NC1171 will provide data for customizing programs and public policy to meet the needs of rural America. It also will inform the research and Extension programming in sociology, economics, family studies, nutrition and health offered to families and communities across the state. NE1039 designs effective physical activity and nutrition interventions for older adults emphasizing the need for fruits, vegetables and whole grains in the diet and based on factors relevant to them, and to design community-wide food and environmental policies to promote improved plant food intake and physical activity among older adults. If successful the information should improve health and vitality in this segment of the population.

The several NHAES projects that focus on small operations and home gardeners are additional examples of our meeting the needs of under-represented and under-served populations. If successfully these projects will provide information, technologies and services that assist these segments to weather the current economic downturn, identify niche and emerging opportunities, and thrive within our unique rural/urban interface with its growing interests in local agriculture and foods. NHAES has an underlying commitment to ensure that the organization and our activities, as well as our stakeholder venues, include and encourage participation by under-served and under-represented individuals and groups.

We will work with UNH Cooperative Extension and our partner New England State Experiment Stations to continually identify under-served and under-represented populations. As their emerging needs are evaluated, we will be proactive in partnering with these entities through new or existing multistate and integrated projects as appropriate and feasible.

3. How will the planned programs describe the expected outcomes and impacts?

We increasingly ask and train the principle investigators of all NHAES projects to focus on outcomes and impacts of their proposed and active research. As we move forward with this

initiative they will be progressively more aware of and able to identify these metrics and to report them during the annual cycle. Concurrently this year we developed a new web-based system to facilitate supported faculty in recording, evaluating and reporting their research activities, with tutorial examples to focus on outcomes and impacts. Future reports will demonstrate continuing improvements in this area.

4. How will the planned programs result in improved program effectiveness and/or

Participation in multistate and integrated research projects provides participating faculty with multiple benefits, including the ability to undertake and accomplish projects having larger and more integrated scope. Interaction with multistate colleagues provides synergies, opportunity for professional growth and development, and ultimately the potential for enhanced individual effectiveness that will carry into all activities undertaken through the NHAES.

For all our programs, whether multistate, integrated or other, strong consideration is given to potential effectiveness and efficiency in order to maximize the aggregated benefits and impacts. We target our funding to strongly support and enhance productive research, and to develop more cohesive programmatic thrusts where we can utilize our relative strengths in order to provide significant advances. Scientists who do not use taxpayer funds in a productive manner will not be supported. We are in the midst of a comprehensive evaluation of our research facilties that includes efficiency and effectiveness of staffing, feeding operations, allocations, and other aspects. Our shared goal is to provide the greatest possible outcome within the finite resources available to us.

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 selected individuals from the general public
- Other (Comments from proposal and manuscript reveiwers)

Brief explanation.

Input from our multiple stakeholders is encouraged at every opportunity and by multiple means, including presentations and meetings with traditional and non-traditional groups or individuals. Many of these are information interactions, both opportunistic and planned, and others follow more formal routes. Input from stakeholders to individual faculty and NHAES projects is encouraged by surveys (telephone, in person, and web-based), through presentations at scientific conferences, extension/educational workshops and field days, multistate project meetings, via mass media, publications, and through the university classroom and educational programs aimed at K-12. Nontraditional stakeholders are being increasingly engaged to inform and assist in our efforts to increase emphasis on sustainable agricultural and food systems research. At the same time we continue to nurture our communications with traditional agricultural stakeholders, who continue to be highly interested and supportive.

As part of our efforts to better partner with UNH Cooperative Extension following several years of modest integration between the two entities, we will work with them to develop periodic formal mechanisms to comprehensively solicit input from stakeholders throughout the state. This will augment our existing and ongoing activities, and will presumably result in enhanced interactions and participation.

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 Internal Focus Groups
- Open Listening Sessions
- Use Surveys
- Other (UNH Cooperative Extension)

Brief explanation.

The NHAES will continue to undertake strategies to identify and engage stakeholders from throughout New Hampshire and to collect and incorporate input from them. Resulting information will be evaluated to identify the most critical and feasible issues for which we may develop effective contributions. UNH Cooperative Extension, the NH Department of Agriculture, Markets and Food, and the various college and NHAES advisory committees have been helpful in identifying traditional and non-traditional stakeholders. Meetings with groups of stakeholders often result in identification of additional potential contacts. Attendance and presentations at agricultural exhibitions, such as the annual NH Farm & Forest Expo, facilitate direct conversations with a very diverse group of stakeholders and rural citizens. Listening to and speaking with participants in field days and open houses, and commodity or Extension-sponsored conferences and workshops provides insights from grower groups, professionals, government agencies, home gardeners and many others.

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 groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public

Brief explanation.

For strategic planning and 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. The NHAES administration also attends many Extension events and takes advantage of these opportunities to participate in discussion with groups and individuals.

We have redone the Agriculture and Research sections of the college website to make agriculture much more prominent, visible and accessible to encourage stakeholder interactions. NHAES research project participants obtain direct and indirect stakeholder input through varied avenues. Projects with social science components frequently use questionnaires and surveys. Stakeholder input to many basic science and some applied projects occurs in the form of reviewer inputs to proposals and manuscripts, and from questions, comments and discussions following presentations at regional, national and international conferences. Stakeholder input is also collected directly through comments and questions at workshops and training sessions for end users.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities
- Other (Strategic Initiatives Development)

Brief explanation.

Formal and informal stakeholder input to faculty, staff and administrators is very helpful in gauging changing needs, constraints and opportunities that we might address. These influence the specific activities of supported researchers, and the NHAES goals and directions 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. The information informs activities including faculty and staff hires, and investments to 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. We are continually working to facilitate constituent input, to focus our resources on priority issues and to 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

Nutrition practices and environmental conditions that impact childhood obesity are a national research priority with direct impacts on New Hampshire citizens. The NHAES currently has two projects in the area of childhood obesity. One project will evaluate the role of exposure to PBDE flame retardants as well as lifestyle choices and education in impacting obesity and human health. The second project will focus on healthful eating to prevent excessive weight gain in young adults through participation in the NC1028 multistate project.

Additional research related to nutrition but that does not focus on obesity is housed under the global food security and hunger planned program.

3. Program existence : Intermediate (One to five years)

4. Program duration : Medium Term (One to five years)

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

6. Expending other than formula funds or state-matching funds : No

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
305	Animal Physiological Processes			30%	
703	Nutrition Education and Behavior			50%	
723	Hazards to Human Health and Safety			20%	
	Total			100%	

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

1. Situation and priorities

Obesity is a global, growing epidemic recognized as a priority area by the USDA. Despite the plethora of resources devoted to understanding the roles of diet and exercise in the obesity epidemic, this epidemic continues to escalate, suggesting that other environmental factors may be involved. These factors can include the built environment and individual behavior patterns, and at the biochemical level there is a growing body of experimental evidence suggesting certain environmental chemicals could disrupt body metabolism and contribute to the obesity epidemic.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Preventing obesity in children is related not only to observed or encouraged behaviors, but also by environmental chemicals that predispose individuals to weight gain. The biological effects of endocrine-disrupting compounds may not be limited to parent compounds, but could include in vivo metabolites. Funding and resources will continue to be available at sufficient levels to support the research. Multistate collaboration will lead to productive integrative synergies.

2. Ultimate goal(s) of this Program

To expand our understanding of environmental factors that promote the development of obesity in an animal model and in young adults, and devise ways to approach the obesity problem using community-based participatory research.

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
2012	0.0	0.0	0.4	0.0
2013	0.0	0.0	0.4	0.0
2014	0.0	0.0	0.4	0.0
2015	0.0	0.0	0.4	0.0
2016	0.0	0.0	0.4	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Project activities will focus on characterizing biochemical impacts in tissues of animals exposed to environmental obesogens; determining the oxidative stress impact of environmental obesogens on key glucose-metabolizing tissues of animals; enhancing researchers' skills in participatory research techniques and building partnerships among researchers, extension and outreach educators, and populations of young adults to develop cooperative intervention programs; and developing community-based applications that can be refined and evaluated in future projects.

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

Extension

Direct Methods	Indirect Methods
• Education Class • Workshop • Demonstrations	• Newsletters • Web sites

3. Description of targeted audience

This project is intended to benefit the health of people across New Hampshire and the region, while making the conduct of scientific research more transparent to community partners, stakeholders, and the public.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2012	50	1200	20	0
2013	50	1200	20	0
2014	50	1200	20	0
2015	50	1200	20	0
2016	0	1200	0	0

2. (Standard Research Target) Number of Patent Applications Submitted

2012:0 **2013:**0 **2014:**0 **2015:**0 **2016:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2012	0	0	0
2013	1	0	1
2014	0	0	0
2015	1	0	1
2016	0	0	0

V(H). State Defined Outputs

1. Output Target

- Number of undergraduate students directly involved in the projects

2012:100 **2013:**100 **2014:**50 **2015:**50 **2016:**0

- Number of university courses in which project results have been incorporated

2012:1 **2013:**1 **2014:**1 **2015:**1 **2016:**0

- Number of presentations at regional, national, or international scientific meetings

2012:2 **2013:**2 **2014:**2 **2015:**2 **2016:**0

- Number of surveys or other means of gathering information and data from participants

2012:0 **2013:**1 **2014:**0 **2015:**0 **2016:**0

- Number of reviewed, bulletin, popular and other publications

2012:1 **2013:**0 **2014:**1 **2015:**0 **2016:**0

- Number of graduate students directly involved in the research.

2012:1 **2013:**1 **2014:**1 **2015:**0 **2016:**0

V(I). State Defined Outcome

O. No	Outcome Name
1	Number of graduate students trained and ready to enter the workforce.
2	Number of undergraduate students involved and trained in engagement research.
3	Increased knowledge about the role of PBDE flame retardant in obesity related metabolism.
4	Availability of methods for participatory research related to obesity.

Outcome # 1

1. Outcome Target

Number of graduate students trained and ready to enter the workforce.

2. Outcome Type : Change in Condition Outcome Measure

2012:1	**2013:**0	**2014:**1	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 305 - Animal Physiological Processes
- 703 - Nutrition Education and Behavior
- 723 - Hazards to Human Health and Safety

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Number of undergraduate students involved and trained in engagement research.

2. Outcome Type : Change in Condition Outcome Measure

2012:2	**2013:**2	**2014:**2	**2015:**2	**2016:**0

3. Associated Knowledge Area(s)

- 305 - Animal Physiological Processes
- 703 - Nutrition Education and Behavior
- 723 - Hazards to Human Health and Safety

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

Increased knowledge about the role of PBDE flame retardant in obesity related metabolism.

2. Outcome Type : Change in Knowledge Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 305 - Animal Physiological Processes
- 723 - Hazards to Human Health and Safety

4. Associated Institute Type(s)

- 1862 Research

Outcome # 4

1. Outcome Target

Availability of methods for participatory research related to obesity.

2. Outcome Type : Change in Condition Outcome Measure

2012:0	**2013:**0	**2014:**1	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior

4. Associated Institute Type(s)

- 1862 Research

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

Description

Changes in funding and resource availability for the activities, and in policies or regulations related to research using animal and human subjects, would compromise ability to complete the objectives. Competing programmatic challenges must be considered in prioritizing resource use.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Climate Change

2. Brief summary about Planned Program

Many aspects of climate, soils, landform and vegetation in New Hampshire and New England make it particularly susceptible to any changes in climate. We are near a northern temperature extreme for some forms of production. NH has the greatest proportion of forested land in the country. The vast majority of plant agriculture relies primarily on growing season rainfall rather than intensive irrigation. Our thin soils and shallow bedrock provide less buffer than for many parts of the country. All of these make the ability to anticipate, mitigate and adapt to potential changes in climate a priority. Further, we have the potential to serve as net carbon sink, which is important to the global environment.

This program addresses prediction, adaptation and mitigation of climate change impacts on mixed agricultural, residential and forested landscapes. While we have previously funded some projects which addressed particular aspects of this topic, we will develop a more strongly focused and integrated effort going forward. Our initial efforts comprise a team of excellent scientists having strong productivity records. Many of these individuals have not previously focused their work on agriculture, and their inclusion provides a strong addition to our efforts, including substantial extramural funding to leverage NHAES support.

3. Program existence : New (One year or less)

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 : No

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		50%	50%	
131	Alternative Uses of Land		50%	50%	
	Total		100%	100%	

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

1. Situation and priorities

New Hampshire and New England rely heavily on our natural and managed land base for economies based on production and tourism. Tourism, agriculture and forestry comprise a very large portion of the NH economy, as well as for the other nearby state. Maintaining the health of these is critical to our quality of life and economic wellbeing.

There is overwhelming evidence that warming of the Earth's climate has been induced by the global footprint of human activities. Contributing factors include the rise of CO2 in the atmosphere, increasing emissions of N2O and other greenhouse gasses, and alteration of land surface properties through ecosystem management and land cover change. Changes in climate witnessed thus far have been as apparent in the Northeastern U.S. as elsewhere. Because natural and agricultural ecosystems are vital to the region's economic and cultural well-being, understanding the long-term effects of climate change is paramount. However, ecosystems also play an important role in climate regulation. Their influence occurs both as regulators of carbon dioxide and other greenhouse gases, as well as through their effect on surface albedo and other biophysical properties. Although climate change policy initiatives often include incentives for land management activities that can offset warming, most have focused on enhanced storage of carbon. This can be achieved through, for example, no-till agricultural practices or forest management practices that maximize standing biomass. Often not considered is the fact that these practices also bear climate consequences through other mechanisms (N2O and CH4 emissions, altered albedo, etc.). Comprehensive studies of net climate impacts are rarely carried out, but are greatly needed for crafting effective land management policies that balance climate mitigation with food production, forest resources and many other services for which these ecosystems are relied upon.

2. Scope of the Program

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

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

1. Assumptions made for the Program

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. Sufficient NHAES funding and other resources will continue to be available to undertake this multi-investigator integrated project.

2. Ultimate goal(s) of this Program

The goal of this program is to address climate change impact and mitigation issues by conducting a focused study of how agriculture and other land uses in a human-dominated landscape influence climate through a combination of carbon storage, greenhouse gas emissions (N2O and CH4) and alterations to shortwave albedo and land surface heating. Results of this activity will highlight tradeoffs among multiple land management strategies in terms of their net climate effect. Information of this nature is of critical importance for preparing sound land management policies and designing strategies to cope with changes in climate.

We anticipate that outcomes from this program will provide knowledge and opportunities for NH stakeholders to anticipate and successfully adapt to changing climatic conditions.

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
2012	0.0	0.2	0.8	0.0
2013	0.0	0.2	0.8	0.0
2014	0.0	0.2	1.2	0.0
2015	0.0	0.2	1.2	0.0
2016	0.0	0.2	1.6	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Activity for the program includes measuring C pools and greenhouse gas emissions (CO2, CH4, N2O) in agricultural and suburban landscapes and comparing these data with data previously collected from forest plots in the same area; using the combined data set data to calibrate a high spectral resolution remote sensing image acquired in 2009 for the Durham, NH area from NASA's AVIRIS instrument; using the field and remote sensing data to parameterize the DNDC computer simulation model, validate and upscale model predictions; generating spatially continuous predictions of C pools, greenhouse gas emissions and shortwave surface albedo, and determine the net radiative forcing values (in W m-2) for the major components of the landscape (mowed versus grazed pasture, corn fields, forest, and suburban lawns); and making future projections of C, N and water balances for both agricultural and forested landscape units, using newly available CO2 and climate change projections through 2100.

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

Extension

Direct Methods	Indirect Methods
● Group Discussion ● Demonstrations	● Web sites

3. Description of targeted audience

Target audiences include agricultural and natural resource producers and consumers, those involved in the related food products and marketing webs, land managers, scientists, public policy makers, and those who rely on agricultural and forest products currently and in the future. Ultimately, all citizens in NH, New England and the US have a strong stake in this topic and therefore research outcomes.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2012	35	300	25	250
2013	40	300	25	250
2014	50	400	25	250
2015	50	400	25	250
2016	0	0	0	0

2. (Standard Research Target) Number of Patent Applications Submitted

2012:0 **2013:**0 **2014:**0 **2015:**0 **2016:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2012	3	0	3
2013	4	1	5
2014	4	0	4
2015	4	0	4
2016	0	0	0

V(H). State Defined Outputs

1. Output Target

- Number of undergraduate students directly involved in the projects

2012:6 **2013:**6 **2014:**6 **2015:**6 **2016:**6

- Number of graduate students directly involved in the project

2012:3 **2013:**3 **2014:**4 **2015:**4 **2016:**4

- Number of university courses in which project results have been incorporated

2012:2 **2013:**2 **2014:**3 **2015:**3 **2016:**4

- Number of presentations at regional, national, or international scientific meetings

2012:4 **2013:**4 **2014:**5 **2015:**5 **2016:**6

- Number of workshops, training sessions and presentations to non-scientific stakeholders

2012:2 **2013:**2 **2014:**3 **2015:**3 **2016:**3

- Number of websites in which project results have been incorporated

2012:2 **2013:**2 **2014:**2 **2015:**2 **2016:**2

V(I). State Defined Outcome

O. No	Outcome Name
1	Number of graduate students trained to become the future generation of scientists.
2	Information relayed to non-scientific stakeholders through integrated research and extension partnerships.
3	Unbiased knowledge about tradeoffs among multiple land management strategies in terms of their net climate effect.

Outcome # 1

1. Outcome Target

Number of graduate students trained to become the future generation of scientists.

2. Outcome Type : Change in Condition Outcome Measure

2012:2	**2013:**3	**2014:**3	**2015:**3	**2016:**2

3. Associated Knowledge Area(s)

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

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Information relayed to non-scientific stakeholders through integrated research and extension partnerships.

2. Outcome Type : Change in Condition Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

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

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

Unbiased knowledge about tradeoffs among multiple land management strategies in terms of their net climate effect.

2. Outcome Type : Change in Knowledge Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

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

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
- Competing Public priorities
- Competing Programmatic Challenges

Description

The nature of this work means that weather extremes, natural disasters and similar factors would substantially disrupt or interfere with the field aspects. Climate change is currently a public and governmental priority. Any changes in this situation, including availability of leveraging funds and resources, remote sensing products, or similar would affect the outcomes. Reduction in NHAES capacity funds that impact funding or research, personnel or facilities will negatively impact out abilities to complete the research.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Case Study
- Other (Interaction with peer scientists)

Description

The project will be evaluated through acceptance by peer scientists, feedback from all manner of information stakeholders, and success in leveraging NHAES resources with competitive grant funds.

2. Data Collection Methods

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Food Safety

2. Brief summary about Planned Program

The safety of agricultural food products is of high concern to all consumers within NH, and therefore within the umbrella of the NHAES. Supported research will target improving the safety and reliability of food products grown, harvested or produced and consumed locally, regionally and nationally.

One current thrust will combine applied and fundamental efforts to address the problem of foodborne pathogenic vibrios in shellfish, to define commonalities and differences in the mechanisms of biofilm adaptation between pathogens and commensals of agriculturally important hosts, and importantly to understand the mechanisms behind these and related processes to aid management efforts in the future. A second focus is on understanding and ameliorating the pathways through which domestic animals and humans become exposed to toxic mycrocistins produced by bacterial blooms in freshwater lakes and drinking water reservoirs.

The latter work in particular combines research, extension and teaching into an effective integrated effort.

3. Program existence : New (One year or less)

4. Program duration : Medium Term (One to five years)

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

6. Expending other than formula funds or state-matching funds : No

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
311	Animal Diseases			25%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals			25%	
501	New and Improved Food Processing Technologies			5%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins			45%	
	Total			100%	

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

1. Situation and priorities

Pathogenic Vibrio species are a significant cause of shellfish-borne disease incidence in the US and worldwide. Outbreaks of illness caused by Vibrio parahaemolyticus and Vibrio vulnificus infections have been growing concerns for consumers of shellfish, especially oysters from the Gulf of Mexico. The shellfish aquaculture industry has suffered increasingly more frequent vibrio-associated disease outbreaks linked to shellfish consumption, both on a regional and a national scale. These outbreaks and individual cases of disease have had a widespread and cumulatively devastating impact on markets. Because of this, the top priority of the east coast shellfish growers industry is to reduce food-borne illnesses associated with their products. Bofilms created by microorganisms are ubiquitous and critical to many applications in agriculture, medicine, water quality and transport, industrial applications and others. Gaining greater understanding about the mechanisms behind biofilm adaptation between pathogens and commensals is a high priority for agricultural applications. Toxic mycrocistins are produced by cyanobacterial blooms in recreational and drinking water bodies, and impact those who come in contact with these. Understanding and helping to ameliorate the pathways through which agricultural animals and products come into contact with microcystins is an important aspect of food safety in our area.

2. Scope of the Program

- In-State Research
- Integrated Research and Extension

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

1. Assumptions made for the Program

Vibrio diseases are an important problem for shellfish harvesting and processing to ensure safety for consumers and economic viability for the shellfish aquaculture industry in New England and the rest of the world. The incidence of virulent 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. The increased incidence of vibrio diseases associated with shellfish consumption in north temperate coastal areas of the US is emerging as a significant concern. Funding and resources will be available to complete the work. Simple models can be constructed to help in the risk analysis needed to manage shellfish harvesting in the Northeast US. The results from this work can help to refine and inform monitoring strategies for these pathogens in colder north temperate coastal waters in relation to emerging US FDA guidelines. Cynobacterial blooms that cause toxic microcystins will continue in the state and region. Funding and resources will continue to be available at the same or increased level to enable conduct of the research and engagement activities.

2. Ultimate goal(s) of this Program

The goal of the program is to help elucidate environmental and biological conditions and pathways that are useful for reducing or avoiding exposure to elevated levels of pathogenic vibrio species and toxic mycrocistins. Further, to increase our understanding of bacterial biofilms and how they may be managed to support agricultural goals rather than impede them.

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

Year	Extension		Research	
	1862	1890	1862	1890
2012	0.0	0.0	0.8	0.0
2013	0.0	0.0	0.8	0.0
2014	0.0	0.0	0.8	0.0
2015	0.0	0.0	0.8	0.0
2016	0.0	0.0	0.6	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Activity for the program will include developing, refining and applying methods for detection and enumeration of Vibrio parahaemolyticus and Vibrio vulnificus and their virulence genes in the Great Bay Estuary. The program will also determine environmental and biological factors associated with reduced concentrations of pathogenic vibrios in freshly harvested and post-harvest processed oysters. Presence, impacts and pathways of mictocystin expore to agricultural plants and animals will be evaluated through a variety of means. Results will be disseminated via scientific, extension and formal teaching venues. Laboratory work will address bacterial biofilm adaptationsand how these are related to agricultural processes.

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

Extension

Direct Methods	Indirect Methods
● Workshop ● Group Discussion ● Demonstrations	● Web sites

3. Description of targeted audience

The target audiences for this work include the shellfish industry and shellfish regulatory agencies, graduate and undergraduate students, high school students, faculty collaborators, those interested in ALS (Lou Gehrig's Disease), veterinarians, state and regional conservation groups; town planners, decision-makers and conservation commissions; lakes planning commissions, state and federal agencies, lake association members, lake shore residents, public water suppliers, scientists working in related areas, and cooperative extension educators.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2012	50	200	10	40
2013	75	500	20	50
2014	75	500	20	50
2015	75	500	20	50
2016	0	0	20	50

2. (Standard Research Target) Number of Patent Applications Submitted

2012:0 **2013:**0 **2014:**0 **2015:**0 **2016:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2012	1	0	1
2013	2	0	2
2014	2	0	2
2015	1	0	1
2016	1	0	1

V(H). State Defined Outputs

1. Output Target

- Number of undergraduate students directly involved in the projects

2012:4 **2013:**4 **2014:**4 **2015:**4 **2016:**0

- Number of university courses in which project results have been incorporated

2012:1 **2013:**2 **2014:**2 **2015:**2 **2016:**0

- Number of presentations at regional, national, or international scientific meetings

2012:2 **2013:**2 **2014:**2 **2015:**2 **2016:**0

- Number of workshops, training sessions and presentations to non-scientific and regulatory stakeholders

2012:3 **2013:**5 **2014:**5 **2015:**5 **2016:**0

- Number of graduate students directly involved in the research.

2012:2 **2013:**3 **2014:**3 **2015:**3 **2016:**2

V(I). State Defined Outcome

O. No	Outcome Name
1	Increased knowledge about the incidence and detection of vibrio in oysters.
2	Knowledge of environmental and biological factors associated with reduced concentrations of vibrios in harvested and processed oysters.
3	Number of citizens engaged in educational presentations and workshops related to mycrocystins.
4	Number of agencies and stakeholder groups involved in research outreach related to vibrios in shellfish.
5	Increased knowledge about mechanisms of biofilm adaptation and diversification in pathogens and symbionts.

Outcome # 1

1. Outcome Target

Increased knowledge about the incidence and detection of vibrio in oysters.

2. Outcome Type : Change in Knowledge Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 501 - New and Improved Food Processing Technologies
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Knowledge of environmental and biological factors associated with reduced concentrations of vibrios in harvested and processed oysters.

2. Outcome Type : Change in Knowledge Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 501 - New and Improved Food Processing Technologies
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

Number of citizens engaged in educational presentations and workshops related to mycrocystins.

2. Outcome Type : Change in Condition Outcome Measure

2012:50	**2013:**50	**2014:**50	**2015:**30	**2016:**20

3. Associated Knowledge Area(s)

- 314 - Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

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 Condition Outcome Measure

2012:2	**2013:**3	**2014:**3	**2015:**2	**2016:**1

3. Associated Knowledge Area(s)

- 314 - Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

4. Associated Institute Type(s)

- 1862 Research

Outcome # 5

1. Outcome Target

Increased knowledge about mechanisms of biofilm adaptation and diversification in pathogens and symbionts.

2. Outcome Type : Change in Knowledge Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

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

Description

Natural disasters affecting the coastal areas or weather extremes could impact accurate evaluation of environmental factors that impact the incidence and detection of vibrios in oysters. Changes in funding and resource availability for the activities, and in policies or regulations related to research using animal and human subjects, would compromise feasibility of completing the objectives. Competing programmatic challenges must be considered in prioritizing resource use.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

2. Data Collection Methods

- Other (Direct contacts)

Description

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Global Food Security and Hunger

2. Brief summary about Planned Program

Plant and animal agriculture are integral components of the past and future New Hampshire and New England landscapes. A primary aspect of NH animal agriculture is the dairy industry. To reduce feed costs for organic dairies, one project will investigate the use of sugarcane molasses as potential lower cost substitute for organic grains. The project will also help design forage supplementation strategies for pasture-fed organic dairy operations, enhance the quality and nutrient utilization of pasture forage, and provide farmer tools to evaluate profitability and risk. Three projects focus on pasture-fed versus total mixed ration-fed cow's milk with their different fatty acid profiles and other traits, and how these might influence health of the cows and consumers of dairy products, the presence of inflammatory markers and development of asthma-like symptoms in humans, and the physiochemical and sensory qualities of cheese. Work will investigate the potential to improve fertility of cattle artificially inseminated with conventional or sexed semen.

The second primary area of NH food production is in vegetables and small fruits. Among our horticultural crop research, a longtime plant breeder will use conventional breeding techniques to develop squash, melon, gourd, pumpkins varieties having improved taste, nutrition, appearance, disease resistance and suitability for regional climate conditions. A related effort will develop interspecies hybrids of squash having improved carotenoid content, taste and handling characteristics for processing and fresh markets. Another project will evaluate the characteristics and adaptation of vegetable and fruit varieties and evaluate and develop management techniques to extend the growing season, increase profitability, reduce environmental impact or improve efficiency of vegetable and fruit cropping systems in NH. Weeds are one of the largest problems in sustainable crop production, and one researcher will help to determine weed management strategies for sustainable cropping systems, including those under organic production. To aid in dealing with local insect pests, another project will document the NH species, plant hosts, distributions and seasonalities of plant-feeding leafhoppers that are known to transmit diseases to their plant hosts.

Another aspect of this program area involves supporting the regionally important aquaculture industry. A project involving four scientists and an extension specialist will develop integrated multi-trophic aquaculture methods for land-based and near-shore systems. Another project will focus on generating triploid green sea urchins that would provide higher consumer preference and therefore greater dollar value for local producers. Improved methods for finfish production in recirculating systems, and a morphometric measurement based validation of species identity in suspension cultured blue mussels constitute the final two applications oriented research efforts in the area of aquaculture.

Some research will be more fundamental in nature, leading to future enhancements to management strategies. One researcher will identify key reproductive hypothalamic and pituitary hormones which are important to help control reproduction in commercially important fish species used in aquaculture, among multiple other applications. Another project will lay the groundwork for genetic improvement of northwestern Atlantic Porphyra seaweed species for future use in multi-trophic aquaculture or as use for a sea vegetable crop. A molecular geneticist will generate new genomic knowledge about strawberries and translate it into tools and strategies to facilitate varietal improvement

through marker assisted breeding. A third project will increase understanding of the actinorhizal symbiosis between beneficial Frankia microbes and plants that represents an important ecological and economic role in agriculture and the environment. Mechanisms of communication between these plants and microbes will be evaluated toward future increases in agricultural production, through development of tools that will allow the genetic analysis of Frankia physiology and the interactions of Frankia with its host plants. Another will investigate epigenetic regulation in adipogenesis and its nutritional implications. The relatively simple plant Arabidopsis is extensively used to help scientists understand complex plant genes. A NHAES scientist will use Arabidopsis as a model to investigate the molecular components of pathways involved in sensing and responding to DNA damage. Two funded scientists will work to improve animal reproduction through identifying genetic, morphological and physiological attributes of the ovary that may improve fertility in ruminants. Nematodes have a major impact on agricultural production worldwide, and a NHAES project will use genomic and bioinformatics tools to reveal genetic bases for expression of the interactions of these nematodes with their hosts. Finally, the use of phosphodiesterase inhibitors as potential insecticides will be investigated.

Integrated research and extension efforts in this area are supported through partial support for three extension faculty, and effective synergies with national colleagues are facilitated through affiliation with seven multistate research projects. In the global food security and hunger program eight NHAES scientists participate in the following multistate projects: NE009 - Conservation and Utilization of Plant Genetic Resources; NE1026 - Weed Management Strategies for Sustainable Cropping Systems; NE1027 - An integrated approach to control of bovine respiratory diseases; NE1030 - Characterization and Mechanisms of Plant Responses to Ozone in the U.S.; NE1034 - Genetic Bases for Resistance and Immunity to Avian Diseases; NE1039 - Changing the Health Trajectory for Older Adults through Effective Diet and Activity Modifications; and NC 1042 - Management Systems to Improve the Economic and Environmental Sustainability of Dairy Enterprises.

3. Program existence : Intermediate (One to 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 : No

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			5%	
135	Aquatic and Terrestrial Wildlife			5%	
201	Plant Genome, Genetics, and Genetic Mechanisms			2%	
202	Plant Genetic Resources			5%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			5%	
204	Plant Product Quality and Utility (Preharvest)			9%	
205	Plant Management Systems			7%	
211	Insects, Mites, and Other Arthropods Affecting Plants			5%	
212	Pathogens and Nematodes Affecting Plants			6%	
301	Reproductive Performance of Animals			12%	
302	Nutrient Utilization in Animals			11%	
307	Animal Management Systems			17%	
311	Animal Diseases			4%	
903	Communication, Education, and Information Delivery			7%	
	Total			100%	

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

1. Situation and priorities

The largest segments of New Hampshire's agricultural sector excluding ornamental horticulture are dairy, vegetable and fruit production, and aquaculture. As a result, this planned program comprises our largest effort. The shared goals among many New Hampshire residents is to have a thriving small-scale agrarian sector along with a clean and healthy environment. Each brings important individual benefits, and combined they greatly support our critical tourism and related service industries. These industries need continuing research to help them adapt to changing economic, social, policy and environmental concerns.

The NHAES commitment to the dairy industry is evident through our supporting two operational research and teaching dairies - one a conventional Holstein operation based on total mixed ration feeding and the second an organic dairy-based agroecosystem using pasture-fed Jersey cows. We have recently added a cohort of Jerseys to the conventional dairy to allow direct comparisons of organically and conventionally managed cows and products. Similarly, for vegetable and fruit breeding, genetics and production we support two horticultural farms and a greenhouse complex. A portion of one farm will

undergo transition to organic certification beginning this year to enable us to address issues of importance to that agricultural segment.

New England in general, and New Hampshire in particular, produces only a very small portion of the food calories it consumes. The state and region, therefore, is particularly dependent on imported food, mostly from distant locations across the United States and from many other countries. The continued supply of that food is insecure, based on the highly volatile supply and price of oil, over 60% of which is imported from overseas. Globally, the demand for seafood continues to rise while many wild fish stocks are at or beyond sustainable harvest levels. To meet rising consumer demand, much of the production will depend on continued growth of the aquaculture industry. The growth of aquaculture is, however, meeting resistance in many areas due to water quality problems and the reliance on fish meal-based diets derived from wild harvested fish. One species with enormous potential for culture in northern New England is the Atlantic cod. Future expansion of the nascent cod industry in New England is dependent on our ability to reliably produce juveniles from locally-adapted stocks.

America's abundant and inexpensive supply of food and fiber is based on a productive and progressive agricultural system. The foundation for this productivity has been based on scientific knowledge and exploitation of useful genetic diversity for developing new, higher quality cultivars that can resist pests, diseases, and environmental stresses. The genes that are needed to provide a continued flow of new varieties that produce higher yields with better quality, and to better withstand pests, diseases, and abiotic stresses can only come from diverse plant germplasm. Most of the food crops important in the American diet have their origin in other parts of the world. Genetic diversity of plant species has evolved in centers of origin wherever this has occurred in the world. This source of different genes continues to be essential for plant breeders and other scientists to breed new varieties that are important to American consumers today. Locally adapted crop varieties are needed that serve consumer demands for high quality, locally grown produce and value-added horticultural products. A short growing season, high labor costs and high land values make fruit and vegetable production far more costly in New England than elsewhere. Further, an extremely variable and humid climate make disease and insect pests a constant threat to the profitability of NH farms. To compete with west coast and international agricultural producers, NH vegetable and fruit growers must produce unique and high-value products. To attain sustainability, NH fruit and vegetable growers must 1) reduce use of chemical pesticides, 2) minimize crop production costs, 3) maintain high crop quality and yields, and 4) have reliable and consistent markets for their products. There are many production challenges unique to NH and New England conditions. Regionally applicable agricultural research is needed to identify crops, crop varieties, and production practices that are best suited to these conditions.

Impaired reproductive performance is a major cause of reduced productivity for ruminants and of reduced profitability for dairy and meat animal producers. In the US, over 4 million replacement dairy heifers are raised annually. The cost of raising dairy replacements represents 15 to 25% of the total cost of managing a dairy operation. There is increasing interest in organic dairy production in response to higher milk prices and perceived consumer demand. Purchased feeds, including conserved forage and grains, account for an average of 36% of the total cash expenses of organic dairy farms located in northern New England. Northeast producers cited the high costs of production as one of the most challenging aspects of sustaining organic dairying in the region. Pasture-fed dairy cows produce milk having different fatty acid composition including specific conjugated linoleic acids and omega-3 fatty acids compared to cows fed total mixed rations. It is not known if these differences translate to animal and/or consumer health benefits.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Most national research on production methods is 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 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 vegetable crops reduces pesticide inputs and increases profitability. Supplementing high-sugars forage with molasses will optimize milk yield, and reduce feed costs and outputs of N and CH4 to the environment. We are entering an uncertain economic period and cannot continue to rely on past cheap oil supplies, both because of the depletion of remaining inexpensive oil stocks and greater competition for those stocks, and because of uncertain global economic conditions. Seasonal changes in fluid milk color and flavor, along with differences in fatty acid ratios and other health markers between grass-fed and total mixed ration-fed dairy cows will impact potential uses of fluid milk and value-added dairy products, including consumer preference. By integrating production of a commercially important plant species (seaweed) that can utilize the waste products of other cultured species (e.g. fish, sea urchins) the total economic potential of the aquaculture site is increased, while environmental impacts are minimized. Support dollars for NHAES 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

To increase our understanding of and abilities to safely produce agricultural food products to address state, regional and international food security, consistent with maintaining environmental quality. To contribute to the abilities of New Hampshire and regional stakeholders to maintain viable businesses and careers. To 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
2012	0.0	0.0	7.0	0.0
2013	0.0	0.0	7.0	0.0
2014	0.0	0.0	7.0	0.0
2015	0.0	0.0	7.0	0.0
2016	0.0	0.0	7.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Conduct applied and discovery research and undertake engagement with stakeholders in multiple aspects of plant and animal agriculture, related genetics and genomics, nutrition and health, and

integrated aquaculture involving shellfish, finfish, invertebrates and seaweed.

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

Extension

Direct Methods	Indirect Methods
● Workshop ● Demonstrations ● Other 1 (Field Days)	● Newsletters ● Web sites

3. Description of targeted audience

The target audience of this work includes consumers of animal and plant based foods and products, organic and conventional farmers, restaurants and other businesses reliant on local foods, master gardeners, home gardener associations, consumers and legislators, and those engaged in the extensive food systems network. It also includes scientists, veterinarians, agricultural researchers,Cooperative Extension specialists, agricultural teachers, graduate and undergraduate students, and the faculty and staff of the region's land grant universities.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2012	200	1200	50	200
2013	200	1200	50	200
2014	200	1200	50	200
2015	200	1200	50	200
2016	200	1200	50	200

2. (Standard Research Target) Number of Patent Applications Submitted

2012:0 **2013:**0 **2014:**0 **2015:**0 **2016:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2012	3	0	3
2013	4	0	4

Year	Research Target	Extension Target	Total
2014	4	0	4
2015	4	0	4
2016	4	0	4

V(H). State Defined Outputs

1. Output Target

- Number of undergraduate students directly involved in the projects

2012:5 **2013:**5 **2014:**5 **2015:**5 **2016:**0

- Number of graduate students directly involved in the research

2012:4 **2013:**4 **2014:**5 **2015:**5 **2016:**5

- Number of university courses in which project results have been incorporated

2012:4 **2013:**4 **2014:**4 **2015:**4 **2016:**0

- Number of presentations at regional, national, or international scientific meetings

2012:5 **2013:**5 **2014:**5 **2015:**5 **2016:**0

- Number of workshops, training sessions and presentations to non-scientific stakeholders

2012:6 **2013:**8 **2014:**8 **2015:**8 **2016:**0

- Number of reviewed, bulletin, popular and other publications

2012:2 **2013:**2 **2014:**2 **2015:**2 **2016:**0

- Number of websites in which project results have been incorporated

2012:2 **2013:**2 **2014:**2 **2015:**2 **2016:**0

- Number of surveys or other means of gathering information and data from participants

2012:2 **2013:**1 **2014:**1 **2015:**2 **2016:**0

V(I). State Defined Outcome

O. No	Outcome Name
1	Increased knowledge about plant production practices suited to the state and region.
2	New knowledge about dairy production, nutrition, animal health and dairy products important to regional producers.
3	Advances in squash varieties having enhanced nutritional benefits including carotenoid concentrations.
4	Increased knowledge about integrated multispecies aquaculture systems.
5	Improved juvenile growth in cod aquaculture.
6	Knowledge about fatty acid composition in pasture fed and total mixed ration fed Jersey cows, and in their milk.
7	New genomic knowledge translated into tools and strategies to facilitate varietal selection through marker assisted breeding.
8	New commercialized varieties of cucurbit vegetables suited to state and region growing conditions.
9	Improved range of weed management options available for sustainable and organic growers.
10	New NH leafhopper data available through a web-accessible database
11	A working technology to produce triploid green sea urchins for use in natural harvest and land based aquaculture.

Outcome # 1

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 307 - Animal Management Systems
- 311 - Animal Diseases

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

Advances in squash varieties having enhanced nutritional benefits including carotenoid concentrations.

2. Outcome Type : Change in Condition Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems

4. Associated Institute Type(s)

- 1862 Research

Outcome # 4

1. Outcome Target

Increased knowledge about integrated multispecies aquaculture systems.

2. Outcome Type : Change in Knowledge Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 204 - Plant Product Quality and Utility (Preharvest)
- 302 - Nutrient Utilization in Animals
- 307 - Animal Management Systems

4. Associated Institute Type(s)

- 1862 Research

Outcome # 5

1. Outcome Target

Improved juvenile growth in cod aquaculture.

2. Outcome Type : Change in Condition Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 307 - Animal Management Systems

4. Associated Institute Type(s)

- 1862 Research

Outcome # 6

1. Outcome Target

Knowledge about fatty acid composition in pasture fed and total mixed ration fed Jersey cows, and in their milk.

2. Outcome Type : Change in Knowledge Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 307 - Animal Management Systems

4. Associated Institute Type(s)

- 1862 Research

Outcome # 7

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

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 204 - Plant Product Quality and Utility (Preharvest)

4. Associated Institute Type(s)

- 1862 Research

Outcome # 8

1. Outcome Target

New commercialized varieties of cucurbit vegetables suited to state and region growing conditions.

2. Outcome Type : Change in Condition Outcome Measure

2012:2	**2013:**3	**2014:**3	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 204 - Plant Product Quality and Utility (Preharvest)

4. Associated Institute Type(s)

- 1862 Research

Outcome # 9

1. Outcome Target

Improved range of weed management options available for sustainable and organic growers.

2. Outcome Type : Change in Knowledge Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 205 - Plant Management Systems

4. Associated Institute Type(s)

- 1862 Research

Outcome # 10

1. Outcome Target

New NH leafhopper data available through a web-accessible database

2. Outcome Type : Change in Condition Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 211 - Insects, Mites, and Other Arthropods Affecting Plants

4. Associated Institute Type(s)

- 1862 Research

Outcome # 11

1. Outcome Target

A working technology to produce triploid green sea urchins for use in natural harvest and land based aquaculture.

2. Outcome Type : Change in Condition Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 307 - Animal 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

Description

Weather and climate extremes and natural disasters affect the outcomes of field research on plants and animals. Economic factors and government regulations may impact the available resources and abilities of relevance of undertaking specific research methods. Appropriations changes that reduce Hatch funds would compromise ability to undertake and complete the work. Competing programmatic challenges must be weighed to ensure effective use of limited NHAES resources.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Sustainable Energy

2. Brief summary about Planned Program

The cost of energy is a major input to NH agricultural operations, and rising energy costs challenge the viability of our producers, many of whom operate on a thin margin. Renewable and sustainable energy are thereby important areas of concern and potential development for the state and region. The typically small size of our farms means that renewable and sustainable energy schemes which are appropriate for this operational scale are of greatest interest.

The primary biological resource for potential conversion to energy in New England is trees. New Hampshire has the greatest proportion of forested land area of any state. Our marginal climate and poor soils make growth of other major crop biofuels less feasible. The northern latitude also reduces photosynthetic opportunity for algae production, though each of these may hold promise at smaller scales. Research and engagement under this program area address renewable and sustainable energy sources and approaches, particularly but not exclusively those well suited to the unique geographic, environmental, biophysical and social conditions in New England.

Initially we have a single project under this program area. At about the same time as the project was initiated, the investigator was named to a central UNH administrative position, with a very large administrative workload. Progress on the very novel research will therefore be more limited than would otherwise be the case.

3. Program existence : Intermediate (One to five years)

4. Program duration : Medium Term (One to five years)

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

6. Expending other than formula funds or state-matching funds : No

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources			30%	
403	Waste Disposal, Recycling, and Reuse			70%	
	Total			100%	

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

1. Situation and priorities

The dairy industry in NH is second to ornamental horticulture in economic impact. The dairies throughout NH and New England are critical aspects of the renowned pastoral environment that attracts tourists and residents alike. Many dairies in the region are going out of business under the current economic situation. The higher prices available for organic dairy products is incentive to some producers who are able to absorb the higher production requirements (costs, management, compliance).
The biggest challenges facing organic dairy producers in the northeast is the cost of inputs including grain and other feedstocks, energy, bedding and other materials from off-farm. These same demands are important in the economics of the NHAES Organic Dairy Research Farm, where this research will occur. At the same time, there are important under-utilized material and energy resources produced on many New England farms; the two major resources are woodlot trees and manure. The development of knowledge and technologies for helping to close the energy and material budgets of operations through integrated, multi-stage usage of wood and manure resources would be highly relevant and beneficial to many regional dairy producers who have similarly diversified operations. This program area will work to develop and test technologies for farm-scale compost based energy production.

2. Scope of the Program

- In-State Research

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

1. Assumptions made for the Program

Bedding, energy and soil amendments will continue to require economical solutions to maintain viability of the northeastern dairy agriculture sector. NHAES will obtain sufficient funding to maintain the Organic Dairy Research Farm and support the research. Federal and state regulations will continue to be consistent with dairy compost and compost-based energy capture operations.

2. Ultimate goal(s) of this Program

The research is intended to develop, test and improve an integrated system for using wood from Farm woodlots as a renewable resource for bedding for the barns, and then using the combined bedding plus manure resource to produce energy for on-farm use through aerobic composting with integrated heat exchange system. Description of an engineered system meeting small to moderate-sized farm requirements for bedding, manure handling, and energy is a final goal.

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
2012	0.0	0.0	0.2	0.0
2013	0.0	0.0	0.2	0.0
2014	0.0	0.0	0.2	0.0
2015	0.0	0.0	0.2	0.0
2016	0.0	0.0	0.2	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Temperature, trace gas (CO2, CH4, H2S, NH4) and oxygen concentrations will be measured in experimental then operational bedding/manure piles with and without different degrees of aeration. Development of best practices around optimizing the production of energy while minimizing the generation of greenhouse gases for farm-scale aerobic composting operations will follow.

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

Extension

Direct Methods	Indirect Methods
● Workshop ● Group Discussion ● Demonstrations	● Web sites

3. Description of targeted audience

Dairy farmers in the Northeastern US, and those interested in sustainable energy solutions that are feasible for small diversified operations.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2012	30	80	20	0

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2013	30	100	20	0
2014	30	100	20	0
2015	30	100	20	0
2016	30	80	20	0

2. (Standard Research Target) Number of Patent Applications Submitted

2012:0 **2013:**0 **2014:**0 **2015:**0 **2016:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2012	1	0	1
2013	1	0	0
2014	0	0	1
2015	1	0	0
2016	0	0	0

V(H). State Defined Outputs

1. Output Target

- Number of undergraduate students directly involved in the projects

2012:2 **2013:**2 **2014:**2 **2015:**2 **2016:**0

- Number of university courses in which project results have been incorporated

2012:2 **2013:**2 **2014:**3 **2015:**3 **2016:**0

- Number of workshops, training sessions and presentations to non-scientific stakeholders

2012:2 **2013:**2 **2014:**2 **2015:**2 **2016:**0

- Number of websites in which project results have been incorporated

2012:1 **2013:**1 **2014:**1 **2015:**1 **2016:**0

- Number of graduate students directly involved in the research.

2012:1 **2013:**1 **2014:**0 **2015:**0 **2016:**0

V(I). State Defined Outcome

O. No	Outcome Name
1	New and improved knowledge about compost-based renewable energy systems for small animal operations available to peers and stakeholders.

Outcome # 1

1. Outcome Target

New and improved knowledge about compost-based renewable energy systems for small animal operations available to peers and stakeholders.

2. Outcome Type : Change in Knowledge Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources
- 403 - Waste Disposal, Recycling, and Reuse

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
- Government Regulations
- Competing Programmatic Challenges
- Other (Competing time demands)

Description

The work will be conducted at our Organic Dairy Research Farm facility, so natural disasters and weather extremes would affect progress toward meeting objectives. Allocation of limited resources to competing programs must be considered, particularly if funds decrease or costs increase. Government regulations controlling compost and energy development must be supportive for the work to continue. Competing demands for time and attention of the principal investigator may affect the ability to progress in a timely manner.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

2. Data Collection Methods

- Other ()

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Sustaining Natural Resources

2. Brief summary about Planned Program

Research conducted in this program area will address myriad aspects of sustaining our natural resource base. Additional work is supported through other areas in this report and through our McIntire-Stennis forestry management program.

Understanding of the relative magnitudes of chemical sources and sinks is critical to address the role of current and future land uses in potential policies to mitigate impairment of public waters. Two projects will investigate how agricultural and suburban land management impacts water quality entering rivers, and their impact on local coastal and estuarine systems. One will combine in grab samples and situ sensor networks with river network modeling for the Great Bay watershed to quantify C, N and P fluxes. It will provide recommendations about where current N mitigation efforts should be focused and where future land change or land management activities might be concentrated to minimize impacts. The second project will investigate the contributions of farm-derived and other sources of N to the build-up of excess N in the Great Bay estuary, and feasibility to use eelgrass wrack on farms as a way to bio-remediate the N loading in the Bay and recycle organic material within the system back to the farm soils, as was historically done along the east coast.

A perception that decisions impacting agriculture and natural resources are arrived at through appropriate stakeholder participation is important to public acceptance. Another project will design, apply and evaluate approaches to facilitate two-way communication between managers, policy makers and stakeholders and evaluate the utility and value of a web-based instrument in this process.

The final project will address local and regional airborne deposition of nutrients through direct measurements and modeling of regional impacts on water bodies and land resources. Work in this area includes participation in the national research support program NRSP3 - The national atmospheric deposition program.

3. Program existence : New (One year or less)

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 : No

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%	
112	Watershed Protection and Management			40%	
133	Pollution Prevention and Mitigation			15%	
903	Communication, Education, and Information Delivery			25%	
	Total			100%	

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

1. Situation and priorities

New Hampshire's abundant natural resources are central to our economy and quality of life. Many aspects of forested land and associated wildlife resources are covered under our McIntire-Stennis program and are not a part of this report. Because of New Hampshire's climate, geography and other factors the quality of our water bodies and river networks is a very high concern. Suburban, agricultural and other land uses impact the concentrations of nitrogen, carbon, phosphorous, salts and other constituents in water, to the point that some water bodies are becoming impaired. Regional and national air flow and weather patterns bring chemicals and excess hydrogen ions (acidity) to New England through the process of airborne deposition. The Great Bay estuary in the NH seacoast region is a unique resource of great importance to commercial, recreational and conservation goals and activities, and is being impaired by excess nitrogen imports. These factors taken together create a high priority research area for New Hampshre and the NHAES.

Discussion and evaluation of agricultural and natural resources issues and the subsequent decisions that impact these are often highly charged, and are nearly always of substantial interest and concern to New Hampshire's population. Enhanced approaches to facilitate communication between managers, policy makers and stakeholders as a part of these decisions will help gain the best potential solutions and buy in by those directly and indirectly affected.

2. Scope of the Program

- In-State Research
- Multistate Research

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

1. Assumptions made for the Program

Funding in support of planned activities will stay the same or increase. Access to public lands and waters will continue. Local and national airborne deposition resources will be maintained. Effective communication among interested stakeholders will continue to be a priority.

2. Ultimate goal(s) of this Program

The ultimate goal of this program area is to increase our understanding of natural resources in New Hampshire and surrounding areas, including the status and trajectories of processes that may impact these, to aid in the effective sustainable management of these public and private resources.

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
2012	0.0	0.0	0.8	0.0
2013	0.0	0.0	0.8	0.0
2014	0.0	0.0	1.0	0.0
2015	0.0	0.0	1.0	0.0
2016	0.0	0.0	1.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Research concerning the sources and sinks of major constituents impacting water quality in the state will be measured and modeled. Potential land use priorities or modifications that could affect the water quality of rivers. the Great Bay Estuary and coastal margins will be considered. Potential strategies to remove excess nitrogen from the Great Bay will be evaluated. Methods to enhance two-way communication among stakeholders interested in potentil agricultural and natural resources decisions will be developed and tested. Airborne deposition of chemicals and acidity will be measured, and real and potential impacts characterized.

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

Extension

Direct Methods	Indirect Methods
● Workshop ● Group Discussion ● Demonstrations	● Web sites

3. Description of targeted audience

Residents of New Hampshire and New England; private, public and municipal users of water; agricultural and suburban land use planners and managers, individuals and organizations interested in conservation of water and estuarine resources, town managers and relevant committee members, other scientists, undergraduate and graduate students, state and federal agencies, and natural resources professonals.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2012	15	30	10	5
2013	15	30	10	5
2014	20	30	10	5
2015	20	20	10	5
2016	20	20	10	5

2. (Standard Research Target) Number of Patent Applications Submitted

2012:0 **2013:**0 **2014:**0 **2015:**0 **2016:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2012	1	0	1
2013	2	0	2
2014	2	0	2
2015	1	0	1
2016	1	0	1

V(H). State Defined Outputs

1. Output Target

- Number of graduate students trained and directly involved in the research.

2012:2	**2013:**2	**2014:**1	**2015:**1	**2016:**1

- Number of undergraduate students trained and directly involved in the research.

2012:2	**2013:**3	**2014:**3	**2015:**2	**2016:**2

- Number of stakeholder venues where results have been presented.

2012:1	**2013:**2	**2014:**2	**2015:**1	**2016:**1

V(I). State Defined Outcome

O. No	Outcome Name
1	A spatially distributed river network model for the Great Bay watershed that relative land use sources and sinks for N, P and C.
2	Knowledge of the relative contributions of different agricultural land management practices and suburban land uses toward N, P and C exports from the watersheds to the coastal estuary.
3	Number of stakeholders involved in presentations about magnitude and potential impacts of regional airborne nutrient deposition.

Outcome # 1

1. Outcome Target

A spatially distributed river network model for the Great Bay watershed that relative land use sources and sinks for N, P and C.

2. Outcome Type : Change in Condition Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 112 - Watershed Protection and Management
- 133 - Pollution Prevention and Mitigation

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Knowledge of the relative contributions of different agricultural land management practices and suburban land uses toward N, P and C exports from the watersheds to the coastal estuary.

2. Outcome Type : Change in Knowledge Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 112 - Watershed Protection and Management
- 133 - Pollution Prevention and Mitigation

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

Number of stakeholders involved in presentations about magnitude and potential impacts of regional airborne nutrient deposition.

2. Outcome Type : Change in Condition Outcome Measure

2012:40	**2013:**50	**2014:**50	**2015:**50	**2016:**0

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 112 - Watershed Protection and Management
- 133 - Pollution Prevention and Mitigation

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

Description

Weather and climate extremes and natural disasters affect the outcomes of field research. Economic factors and government regulations may impact the available resources and abilities of relevance of undertaking specific research methods. Government regulations affecting access to and sampling of important variables may interfere with completion. Appropriations changes that reduce Hatch and extramural funds would compromise ability to undertake and complete the work. Competing programmatic challenges must be weighed to ensure effective use of limited NHAES resources.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Supporting Rural Economies

2. Brief summary about Planned Program

New Hampshire is a strongly rural state within the similarly rural region of Northern New England. We enjoy a rather unique circumstance of having close proximity of rural and urban areas, through our Southern New England neighbors in MA and beyond. As example, Boston is only about 60 miles from UNH.

The NHAES research programs in this area address this situation by focusing on the welfare of low income individuals and families, the economics of municipal waste disposal, the population dynamics into and out of the state and region and how it impacts land use and need for public spending, and our largest single agricultural sector which permeates the rural character and economy of NH.

Ornamental and landscape horticulture represents the single largest agricultural economic sector in NH, and is closely tied to the economies of our rural areas. We offer strong support through funded projects as well as providing the farm and greenhouse facilities that are used for research, extension and teaching. Research in this program area includes developing sustainable plant nutrition management strategies for bedding and potted flowering plants, and linking root zone temperature profiles and plant performance in northern nursery production systems.

The NHAES efforts in the supporting rural economies area involve integrated research and extension efforts of two faculty having split appointments, as well as two other faculty participating in multistate research projects NC1171 - Interactions of individual, family, community, and policy contexts on the mental and physical health of diverse rural low-income families, and W2004 - Population dynamics and change: Aging, ethnicity and land use change in rural communities.

3. Program existence : New (One year or less)

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 : No

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			7%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			30%	
204	Plant Product Quality and Utility (Preharvest)			15%	
205	Plant Management Systems			7%	
403	Waste Disposal, Recycling, and Reuse			10%	
605	Natural Resource and Environmental Economics			4%	
801	Individual and Family Resource Management			10%	
802	Human Development and Family Well-Being			10%	
805	Community Institutions, Health, and Social Services			7%	
	Total			100%	

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

1. Situation and priorities

The New Hampshire 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 to 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 the 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 rural citizens, local and state organizations, and federal agencies with relevant oversight. Our role in providing unbiased and objective information is particularly critical in helping to resolve sometimes emotionally and politically charged topics.

Waste management and disposal costs have more than tripled in the past two decades. State and local governments need economic analysis of various management options in order to make appropriate decisions. Rural residents are often underemployed or unemployed due to personal choice reasons or reasons beyond their control. The role that physical and mental health plays in the lives of rural New Hampshire families and in the complex interaction among the family context, community, and policies is a critical aspect of our rural environment. 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 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.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Waste management continues to be a problem for local municipalities, especially with budget problems exacerbated by the current recession. These local governments need new information to implement policies to manage service delivery in a cost effective fashion. Rural mothers face numerous barriers when attempting to maintain a strong attachment to the labor force. Being employed at any job is inadequate for many rural families to become financially self-sufficient when wages were low and hours were unpredictable. Barriers such as lack of child care, transportation problems, and health (both mothers own health and health of other family members) are constant challenges to rural low-income mothers. The Earned Income Tax Credit (EITC) is an important source of income for a number of rural families, although their knowledge of the EITC is limited. Without knowledge of regional differences, policy formation within New Hampshire may be misdirected and the state would be excluded from project efforts to disseminate findings which enhance the response capabilities of local government officials, regional economic development officers, extension personnel, and other stakeholders. New knowledge about economically, environmentally and socially sustainable production practices in floriculture 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

T The ultimate goal of this 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.

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
2012	0.0	0.0	1.1	0.0
2013	0.0	0.0	1.0	0.0
2014	0.0	0.0	1.0	0.0
2015	0.0	0.0	1.0	0.0
2016	0.0	0.0	1.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Conduct research related to solid waste management and provide useful economic information to guide effective management decisions. Identify and analyze ongoing and potential changes in rural labor markets and the impacts of migration, commuting, and workforce development policies on rural labor markets. Investigate the potential for rural development policies based on entrepreneurship, industrial clustering, value-added and nontraditional agricultural businesses and analyze the spatial implications of industrial restructuring on employment and earnings. Investigate the changing organizational structure, tax policy and fiscal standing of local governments and the impact of tax and/or expenditure limitations on local government fiscal stress and economic growth in rural areas. Develop a better understanding of the role of amenities in rural development and the impact of economic and social changes on the quality of life in rural communities. Examine individual and family level characteristics and policies which impact physical and mental health in diverse rural low-income families. Examine the aging of the rural population within the context of overall U.S. population aging, and describe how in-migration, aging-in-place, and other demographic forces shape the spatial distribution and composition of rural populations. Develop improved over-wintering techniques for large container grown trees and shrubs will save labor and enhance profitability for northeastern producers, assuming continuation of high energy costs and interest in local production of agricultural products once economic recovery results in renewed demand for landscape plant material. Undertake greenhouse trials to determine effective and resource-efficient management techniques for use of controlled-release fertilizers in producing bedding and potted flower plants of importance to the state and region.

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

Extension

Direct Methods	Indirect Methods
● Education Class ● Workshop ● Group Discussion ● Demonstrations	● Newsletters ● Web sites

3. Description of targeted audience

State, local, and regional waste management professionals, scientists, undergraduate and graduate students, citizens, land use professionals, homeowners, sustainable energy associations, legislators, contractors, firms and rural residents, demographers, social and natural scientists as well as policy-makers and the media. Rural, low-income families, and private and governmental social services personnel and entities especially in terms of employment and health care. State policy makers, planners and concerned citizens that will facilitate actions to enhance the social and economic development of the state, aid in developing comprehensive plans to guide future landscape development, and protect the state's abundant natural resources. Owners and operators of greenhouses that produce floriculture crops. Nursery producers and landscape contractors in NH and throughout the northeast. Extension educators who work in horticulture. State citizens interested in efficient and sustainable use of the state's economic and environmental resources in support of a thriving social structure.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2012	200	300	25	50
2013	200	250	25	50
2014	200	250	25	50
2015	200	250	25	50
2016	200	250	25	50

2. (Standard Research Target) Number of Patent Applications Submitted

2012:0 **2013:**0 **2014:**0 **2015:**0 **2016:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2012	2	0	2
2013	2	0	2
2014	2	0	2
2015	2	0	2
2016	2	0	2

V(H). State Defined Outputs

1. Output Target

- Number of undergraduate students directly involved in the projects

2012:3 **2013:**3 **2014:**3 **2015:**3 **2016:**0

- Number of presentations at regional, national, or international scientific meetings

2012:3 **2013:**2 **2014:**2 **2015:**2 **2016:**0

- Number of workshops, training sessions and presentations to non-scientific stakeholders

2012:15 **2013:**15 **2014:**15 **2015:**15 **2016:**0

- Number of reviewed, bulletin, popular, news and other publications

2012:20 **2013:**10 **2014:**10 **2015:**10 **2016:**0

- Number of surveys or other means of gathering information and data from participants

2012:1 **2013:**1 **2014:**1 **2015:**1 **2016:**0

- Number of graduate students directly involved in the research activities.

2012:3 **2013:**3 **2014:**3 **2015:**3 **2016:**3

V(I). State Defined Outcome

O. No	Outcome Name
1	Increased knowledge about economics and policy related to waste management.
2	Increased knowledge among rural individuals and families related to employment and health care.
3	Number of presentations to civic and government entities to increase knowledge of demographics and migration in the region and nation.
4	Availability of modified production systems for woody nursery crops in northern nurseries.
5	Availability of new management guidelines for use of controlled-release fertilizers in greenhouse floriculture.

Outcome # 1

1. Outcome Target

Increased knowledge about economics and policy related to waste management.

2. Outcome Type : Change in Knowledge Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 403 - Waste Disposal, Recycling, and Reuse
- 605 - Natural Resource and Environmental Economics

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Increased knowledge among rural individuals and families related to employment and health care.

2. Outcome Type : Change in Knowledge Outcome Measure

2012:0	**2013:**0	**2014:**0	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

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

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

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

2012:2	**2013:**2	**2014:**2	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 805 - Community Institutions, Health, and Social Services

4. Associated Institute Type(s)

- 1862 Research

Outcome # 4

1. Outcome Target

Availability of modified production systems for woody nursery crops in northern nurseries.

2. Outcome Type : Change in Condition Outcome Measure

2012:0	**2013:**0	**2014:**1	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

4. Associated Institute Type(s)

- 1862 Research

Outcome # 5

1. Outcome Target

Availability of new management guidelines for use of controlled-release fertilizers in greenhouse floriculture.

2. Outcome Type : Change in Knowledge Outcome Measure

2012:0	**2013:**0	**2014:**1	**2015:**0	**2016:**0

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 204 - Plant Product Quality and Utility (Preharvest)
- 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
- Public Policy changes
- Government Regulations
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Description

Economic and public policy changes affect rural economies and choices related to lifestyle and social services. Natural disasters are another factor that can have unanticipated and often localized influences on rural populations. Population changes through migration, immigration, cultural groupings and other factors are the target of one research project. Reduction in NHAES resources available to support this work will compromise its effectiveness and completion. Research emphases must always be evaluated relative to competing programmatic challenges and opportunities in order to provide greatest value to society.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description