2007 University of New Hampshire Research Plan of Work

Brief Summary about Plan of Work

The New Hampshire Agricultural Experiment Station (NH-AES) resides within the University of New Hampshire College of Life Sciences and Agriculture. It has the responsibility for the Hatch, McIntire Stennis, Animal Health, and Multi State Research Programs. This Plan of Work does not include New Hampshire Cooperative Extension, which is a separate administrative unit in New Hampshire. However, there is effective coordination of appropriate programs between the two units. Through the NH-AES Advisory Committee representing key stakeholder groups, we are working to facilitate constituent input and to improve our delivery of research findings to end users. The goal of our planned programs is to provide both basic and applied research to support increased knowledge to improve production, marketing and processing of American agricultural products. The New Hampshire AES has established as an outcome indicator increasing the effectiveness of basic and applied projects related to New Hampshire (NH) agricultural needs. Additionally, we use the increase in agricultural production in New Hampshire and income growth to New Hampshire farm operations as indicators. Based on the most recent data available from the USDA's New England Agricultural Statistics Service*, the value of crop production increased from 94.3 million in 2003 to 96.2 million in 2004 in New Hampshire. In NH, the value of livestock production increased from $63.4 million in 2003 to $75.4 million in 2004. In NH, between 2003 and 2004, the net farm income increased from $31.9 million to 36.7 million. The January 1, 2005 New England farm real estate value, including land and buildings, averaged $4,260 per acre, up six percent from the previous year. New Hampshire average value per acre of farmland and buildings increased from $3,100 per acre in 2003 to $3,450 per acre in 2005. We continue our philosophy that the mission of the Agricultural Experiment Station is greater than solely enhancing production agriculture and thus support basic and applied sciences that help position NH to 1) develop new agricultural products and jobs, 2) augment farm based and farm related industry, 3) provide opportunities for non traditional and sustainable farming endeavors such as the Organic Dairy, and 4) create opportunities for farm and rural community development. Each of these areas contributes to the development of a highly competitive and sustainable agricultural system for the global market. The NH Agricultural Experiment Station supports the following basic and applied projects to create technology and research for the benefit of the state, region and nation. We believe these projects provided valuable results, excellent return on the investment of AES funds, and a strategic position for the NH AES to successfully achieve our goals. The research findings, developments and technologies are and will be transferred through various mechanisms and working directly with our Intellectual Property Office in such forms as publications, patents, genomic data banks, technology transfer, policy recommendations and formation of spin-off companies.

Estimated number of professional FTEs/SYs to be budgeted for this plan.

Year	Extenion		Research	
	1862	**1890**	**1862**	**1890**
2007	0.0	0.0	12.6	0.0
2008	0.0	0.0	12.9	0.0
2009	0.0	0.0	12.9	0.0
2010	0.0	0.0	12.9	0.0
2011	0.0	0.0	12.9	0.0

Merit Review Process

The merit review process that will be employed during the 5-Year Plan of Work cycle

- Internal University Panel

- External University Panel

- External Non-University Panel

- Combined External and Internal University Panel

- Combined External and Internal University External Non-University Panel

- Expert Peer Review

Brief explanation

The N. H. Agricultural Experiment Station has an External Advisory Committee, representing a diverse group (16 members) of stakeholders including representatives from industry, university and state and federal government. The group meets twice per year to exchange ideas for increasing this station's effectiveness in serving stakeholders and the citizens of our state. In addition, this committee reviews proposed programs and/or strategic plans. Scientific Peer Review All new research initiatives written as a 6 page proposal are reviewed by three to five external peer reviewers followed by an internal Research Advisory Committee composed of five faculty members from our college. The peer review process is as follows: There is an initial meeting with the NHAES and investigator to discuss the proposed project. If feasible, the investigator is encouraged to submit a proposal. Upon receipt of each project proposal that has been endorsed by the department chair, NHAES reviews it with respect to the proposal meeting all of the requirements; the appropriateness of the proposed research to the research mission, goals and programs of the NHAES and overall feasibility of performing the research. When a proposal meets these requirements, the proposal along with the peer review form is then sent to five external peer reviewers. The reviewers are asked to rate the proposal on scientific merit and appropriateness to the NHAES. The review form has 10 specific questions along with a section for written comments. Each proposal and reviews are first sent to the investigator who is asked to modify the proposal in response to the reviews. Each modified proposal along with the external reviews are sent to three of the five internal Research Advisory Committee. The committee is asked to rank the proposals in each of the following areas: scientific and technical merit; rationale of objectives and procedures; probability of success; previous year's progress report or productivity; and applicability to state and regional problems. When a project receives generally favorable ratings by both the external peer review and by the internal Advisory Committee, the project is approved as a NHAES project. External Peer Review Most projects receive feedback via manuscripts submitted to peer-reviewed journal and/or feedback when results are presented and/or discussed at workshops, regional, national or international meetings.

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 planned programs are and will be based on input from stakeholder groups including scientists who have and will identify the most critical issues. Site visits, surveys, regional listening sessions, workshops, webpages and newsletters will be used to obtain input. Comments received from peer reviewed manuscripts and submitted grant proposals will be considered.

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

Program 2: Sustaining Local Food Systems in a globalizing environment: non-traditional stakeholders are and will be involved in the farm to school program and the regional food communities Program 7: Improving Plant Food availability is targeting older adults and senior citizens in trying to increase intake of fruits, vegetables and whole grains.

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

The planned programs developed specific outcomes that will occur over five years. Impacts from these various programs will occur during the five years as well as beyond the five years. Specific progress of the outcomes and impacts from each planned program will be documented. Examples of the documentation include publications, presentations, books, reports to advisory committees, annual reports, progress reports, technical support, accession numbers of genome sequences, and newsletters.

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

At NHAES, research programs will continue to improve program effectiveness and/or efficiency. The results of the research programs will be monitored. Examples of effectiveness of the integrated programs are cited in the Planned Programs sections. NHAES has emphasized and supported multi-investigator research particularly in areas where single laboratories can no longer provide the expertise for projects. The support of multi-investigators has resulted and will result in synergy and efficiency in use of resources. There are many advantages of multi-investigator projects including the use of shared resources and staff. The

rapid advancement of technology has made many instruments and techniques prohibitive for individual laboratories or even for most individual departments. There is an economy of scale and justification for multidisciplinary research and/or purchasing high-end or high-throughput instrument for shared use by a research community.

Stakeholder Input

1. Actions taken to seek stakeholder input that encourages their participation (Check all that apply)

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey of the general public
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals
- Survey of selected individuals from the general public
- Other (Reviews from Submitted manuscripts)

Brief explanation.

Site visits will be used. Verbal and email feedback from idea/suggestions/proposals shared at annual scientific research and industrial, state, and/or federal govenement meetings. Workshops will be held and input, suggestions will be obtained, considered and used as appropriate. Interactive websites will be developed. Submit manuscripts for peer review and comments. Submit grant proposals for peer review and comments. Attend and present at professional regional, national and international meetings--questions, suggestions and input will provide feedback. Electronic feedback will be used and considered from E-newsletters.

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
- Open Listening Sessions
- Use Surveys
- Other (Steering Committees)

Brief explanation.

The N. H. Agricultural Experiment Station has an External Advisory Committee, representing a diverse group (16 members) of stakeholders including representatives from industry, university and state and federal government . The group meets twice per year to exchange ideas for increasing this station's effectiveness in serving stakeholders and the citizens of our state. In addition, this committee reviews proposed programs and/or strategic plans. Workshops with stakeholder groups including biotechnology, forestry and equine have and will be held. NHAES also has an internal Advisory Committee comprised of seven members. This advisory committee has and will be reviewing strategic areas and initiatives of individual and multidisciplinary research in NHAES. NHAES established an Organic Dairy Steering Committee. The charge of this oversight committee is to review the academic, research, management and academic plans of the newly formed Organic Dairy Farm at the NHAES. Surveys have been done and will be done to assess proposed initiatives or strategic areas.

2(B). 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. 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 with the general public (open meeting advertised to all)
- Survey of the general public
- Meeting specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public

Brief explanation

In the different programs, methods for collecting stakeholder input is varied from either one method or several methods that are noted above. As examples, we invite input in response to electronic newsletters and we hold listening session in the counties of New Hampshire.

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

Brief explanation.

Input will be considered in the planning and implementation of research programs. Each research program will have and develop management, financial and academic programs.

1. Name of the Planned Program

Agricultural & Food Biosecurity

2. Program knowledge areas

- 136 Aquatic and Terrestrial Wildlife 50 %
- 213 Weeds Affecting Plants 50 %

3. Program existence

- New (One year or less)

4. Program duration

- Long-Term (More than five years)

5. Brief summary about Planned Program

Project 1: Invasive species are considered the biggest threat to biodiversity besides habitat destruction (Schaal et al., 2003). In this project, molecular genetic methods will be used to examine the population structure of Neosiphonia harveyi and determine whether there have been one or several introductions of this species into the Gulf of Maine.

6. Situation and priorities

Invasive algal species may alter local ecosystems, disrupting juvenile fish habitats or harming shellfish beds. Two nonindigenous algae that have been identified in the Gulf of Maine, the green algae Codium fragile ssp. tomentosoides and the red alga Neosiphonia harveyi are considered invasive species because of their recent explosive growth and negative impacts on local ecosystems.

7. Assumptions made for the Program

If the mechanisms by which an introduced species becomes invasive, methods may be identified and used to control the spread of that species.

8. Ultimate goal(s) of this Program

This information will be useful to develop control methods to limit further introductions and spread of these and other invasive species.

9. Scope of Program

- In-State Research
- Multistate Research

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- Yes

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	**1890**	**1862**	**1890**
2007	0.0	0.0	0.1	0.0
2008	0.0	0.0	0.3	0.0
2009	0.0	0.0	0.3	0.0
2010	0.0	0.0	0.3	0.0
2011	0.0	0.0	0.3	0.0

Outputs for the Program

13. Activity (What will be done?)

Molecular markers will be developed to resolve population structure of Neosiphonia harveyi. These markers will be used to survey new and extant populations of the alga from Long Island through the Gulf of Maine. The genotypes of these populations will be compared to extant populations in Europe and Ireland and to populations in the Sea of Japan to determine whether there have been one or multiple introductions of the invasive alga in the Gulf of Maine, relative to the recent explosive expansion of this alga.

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

Extension	
Direct Method	**Indirect Methods**
• Other 1 (Laboratory Research) • Other 2 (Field research)	• Web sites • Other 1 (Peer Reviewed Publications) • Other 2 (Grant proposal submissions)

15. Description of targeted audience

Scientists in the discipline and ecosystem managers.

16. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	50	20	0	50
2008	50	20	0	50
2009	50	20	0	50
2010	50	20	0	50
2011	50	20	0	50

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

18. Output measures

Output Text

Peer Review Publications

2007	Target:	0
2008	Target:	1
2009	Target:	1
2010	Target:	0
2011	Target:	0

Output Text

Non peer reviewed publications including abstracts

2007	Target:	1
2008	Target:	2
2009	Target:	2
2010	Target:	2
2011	Target:	2

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text

Number of citations from publications

Outcome Type: Long

2007 Target:	0
2008 Target:	40
2009 Target:	40
2010 Target:	40
2011 Target:	40

Outcome Text

Members of the general public identifying the algal in new locations along the Gulf of Maine

Outcome Type: Medium

2007 Target: 100

2008 Target: 100

2009 Target: 100

2010 Target: 100

2011 Target: 100

20. External factors which may affect outcomes

- Appropriations changes

Description

Loss of AES funding will result in this projected terminating.

21. Evaluation studies planned

- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)

Description

During the course of the program, algal populations will be collected from different locations in the Gulf of Maine. The genotypes of the populations will be compared to those from the origin of diversity (Sea of Japan) and other locations where the alga has been identified (Ireland, Europe). Submission of manuscripts and cDNA/gene sequences to NIH Gene bank will be submitted during the duration and after the course of the program.

22. Data Collection Methods

- Other (experiments)

Description

Molecular Laboratory Research and field sampling will be done. Twenty samples will be collected at each site where the Neosiphonia harveyi is located. Genotypes will be determined by DNA sequencing, or various assays for single nucleotide polymorphisms.

1. Name of the Planned Program

Agricultural Systems

2. Program knowledge areas

- 102 Soil, Plant, Water, Nutrient Relationships 50 %
- 307 Animal Management Systems 20 %
- 205 Plant Management Systems 20 %
- 131 Alternative Uses of Land 10 %

3. Program existence

- Intermediate (One to five years)

4. Program duration

- Medium Term (One to five years)

5. Brief summary about Planned Program

This program has two projects. One project considers the prospects for sustainable agriculture and integrated agricultural systems in four New England states. The project emphasizes intensive rotational grazing and related grass farmng and livestock management to achieve the end of greater food self-sufficiency in the region. The second project will identify improved practices to protect water quality. New or improved production practices will be demonstrated to the farm community to help them to minimize any negative impacts on the environment.

6. Situation and priorities

Project 1: In recent years, the New England region has been producing less and less of its own regional food needs. This project seeks to rectify that deficiency. Project 2: If excessive nutrients move into surface or ground water, the impact will be statewide. New tools for nitrogen and phosphate management need to be developed or evaluated for New Hampshire.

7. Assumptions made for the Program

Project 1: Project will identify soils able to support strong pastures and healthy livestock and demonstrate methods of direct marketing of integrated plant and animal food products, thus protecting open space in the region. Project 2: Soil testing will continue to be used as a management tool.

8. Ultimate goal(s) of this Program

Project 1: To provide significant increase in New England regional food self-sufficiency while at the same time providing for the open space needs of the region's population. Project 2: Proper nutrient managment will result in improved production and sound environmental practices.

9. Scope of Program

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

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- Yes

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	**1890**	**1862**	**1890**
2007	0.0	0.0	0.3	0.0
2008	0.0	0.0	0.3	0.0
2009	0.0	0.0	0.3	0.0
2010	0.0	0.0	0.3	0.0
2011	0.0	0.0	0.3	0.0

Outputs for the Program

13. Activity (What will be done?)

Project 1: The potential for agricultural sustainability and food self-sufficiency and security in northern and central New England will be examined and researched with particular emphasis on pasture and grazing potential and the integration of plant and animal agriculture to acheive agricultural/farm sustainability. Project 2: Field studies will be done to identify responses to added nutrients. Workshops will be held to illustrate/demonstrate improved practices. There will be demonstrations in the use of new/improved nutrient managment tools.

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

Extension	
Direct Method	**Indirect Methods**
- Education Class - Workshop - One-on-One Intervention - Other 1 (Field Research)	- Newsletters - Web sites - Other 1 (Peer Reviewed Publications)

15. Description of targeted audience

Project 1: All farmers and future farmers in the region and indirectly, all consumers of food in the region. Project 2: All farm producers in the state and the NH residents that do soil testing.

16. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	800	7200	200	0
2008	800	9200	200	0
2009	2000	12200	200	0
2010	2000	14200	200	0
2011	2000	17200	200	0

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

18. Output measures

Output Text

Peer Reviewed Publications

2007	Target:	2
2008	Target:	0
2009	Target:	2
2010	Target:	0
2011	Target:	2

Output Text

Chapters in Books

2007	Target:	2
2008	Target:	0
2009	Target:	2
2010	Target:	0
2011	Target:	2

Output Text

Author of Book or Editor

2007	Target:	1
2008	Target:	0
2009	Target:	1
2010	Target:	0
2011	Target:	1

Output Text

Non-peer reviewed publications including abstracts

2007	Target:	18
2008	Target:	12
2009	Target:	12
2010	Target:	12
2011	Target:	12

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text
Change in farming practice

Outcome Type: Long
2007 Target: 100
2008 Target: 150
2009 Target: 150
2010 Target: 150
2011 Target: 150

Outcome Text
Change in food consumption patterns

Outcome Type: Medium
2007 Target: 100
2008 Target: 300
2009 Target: 300
2010 Target: 300
2011 Target: 300

Outcome Text
Change in public policy

Outcome Type: Long
2007 Target: 0
2008 Target: 2
2009 Target: 1
2010 Target: 1
2011 Target: 1

Outcome Text
Regulators increase knowledge

Outcome Type: Medium
2007 Target: 50
2008 Target: 50
2009 Target: 25
2010 Target: 25
2011 Target: 25

Outcome Text
Change in percent of agricultural land

Outcome Type: Medium

2007 Target: 10
2008 Target: 10
2009 Target: 10
2010 Target: 10
2011 Target: 10

Outcome Text

Change in on-farm biodiversity

Outcome Type: Long

2007 Target: 10
2008 Target: 10
2009 Target: 10
2010 Target: 10
2011 Target: 10

Outcome Text

Producers use soil testing.

Outcome Type: Medium

2007 Target: 500
2008 Target: 500
2009 Target: 50
2010 Target: 100
2011 Target: 100

Outcome Text

Change in support for small-scale farms

Outcome Type: Long

2007 Target: 100
2008 Target: 100
2009 Target: 200
2010 Target: 250
2011 Target: 250

Outcome Text

Change in farmer income

Outcome Type: Medium

2007 Target: 10
2008 Target: 10
2009 Target: 50
2010 Target: 500
2011 Target: 500

20. External factors which may affect outcomes

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

Description

One or more factors may advservely or positively effect the outcome of the projects.

21. Evaluation studies planned

- Before-After (before and after program)
- During (during program)
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.

Description

Project 1: Studies of land use change, with particular emphasis on change in pasture acreage and reduction in the decline of farm acreage and farm numbers. Specific measures to be conducted to obtain information on change in agricultural acreage and farm numbers. Project 2: Surveys at various times during the project. Workshop participants will be surveyed to evaluate the project. Soil testing will be observed. Increase in the use of improved practices will be observed.

22. Data Collection Methods

- Structured
- Unstructured
- Case Study
- Observation
- Journals
- Other (Field sampling;)

Description

Project 1: Qualitative case studies of individual farms and farm experience are important. These involve controlled observation and assessment, based on interviews, studies of the literature, and multiple farm visits over time. Project 2: Soil test results will be collected and analyzed. Survery producers and evaluate/analyze the results.

1. Name of the Planned Program

Animals & Animal Products

2. Program knowledge areas

- 301 Reproductive Performance of Animals 15 %
- 311 Animal Diseases 5 %
- 305 Animal Physiological Processes 50 %
- 702 Requirements and Function of Nutrients and Other Food Components 5 %
- 723 Hazards to Human Health and Safety 5 %
- 302 Nutrient Utilization in Animals 5 %
- 304 Animal Genome 5 %
- 308 Improved Animal Products (Before Harvest) 5 %
- 135 Aquatic and Terrestrial Wildlife 5 %

3. Program existence

- Mature (More then five years)

4. Program duration

- Long-Term (More than five years)

5. Brief summary about Planned Program

Project 1: Methodologies for domestication and hatchery production of Atlantic cod have and will be developed for culture in coastal New Hampshire waters. Project 2: The viability of stallion sperm will be examined in attempts to identify the optimal procedures for cooling and/or freezing semen for use in artificial insemination. Project 3: This project seeks to define the biochemical pathways mediating cone visual transduction so that new treatments can be designed to preserve vision and prevent retinal degeneration and blindness in humans and animals. Project 4: This project seeks to identify molecular mechanisms that regulate adipocyte development and function by addressing signal transduction systems. Project 5: This project is examing the molecular mechanisms in clams that have leukemia.

6. Situation and priorities

Project 1: Development of fish species for nearshore aquaculture will enhance those fish such as Atlantic cod that have been overfished and the fisheries highly regulated. Project 2: This project will improve the viability of stallion sperm. Currently, the sperm of some stallions does not survive well during cooling or freezing. Also fertility is typically 10% lower for sperm that have been cooled and even lower for sperm that have been frozen. Project 3: The understanding of the basic biology of cone photoreceptors is much more limited than for rod photoreceptors, in part because cones are less abundant than rods in most mammalian retinas. However, some retinal diseases involve preferential degeneration of cone photoreceptors, resulting in loss of visual acuity and color discrimination. This work will provide fundamental information for better understanding how cone photoreceptors differ from rod photoreceptors, and how to develop better treatments for retinal diseases that afflict humans and domestic and livestock animals. Project 4: Obesity is reaching epidemic levels in this country. Obesity is a risk factor for many pathological conditions--i.e. heart disease, NIDDM and cancer as examples. Project 5: The understanding of the molecular basis for a naturally occuring molluscan disease (leukemia) will eventually lead to the development of treatment and indications of treatments of leukemia in humans.

7. Assumptions made for the Program

Project 1: Various populations as determined by genetic analysis of Atlantic cod will be available for these studies. Project 2; Improvements in fertility with cooled/refrigerated and frozen sperm will be forthcoming. Project 3: The operating hypothesis is that visual transduction in cone photoreceptors will differ in discrete ways that can be quantified by examining the central enzyme of the pathway, phosphodiesterase. Project 4: Cell models will mimic or recapitulate processes that are occurring. Future work will seek animal models such as rodents so that the assumption is that in vivo animal models hold true for procceess that occur in humans. Project 5: Understanding clam leukemia at the molecular level will permit us to prevent or treat the disease. Fishermen will benefit and clam beds closed for years in NH can be opened and utilized again.

8. Ultimate goal(s) of this Program

Project 1: To improve our capability of spawning and raising Atlantic cod and offer much needed diversification for fish farmers in the northeastern U.S. Project 2: To improve fertility of refrigerated and frozen stallion spermatozoa. Project 3: To define the biochemical pathway responsible for cone vision, so that defects in vision in animals and humans that result from impaired functioning of cone photoreceptors may be therapeutically treated. Project 4: To define mechanisms that regulate adipocyte differentiation and function. Project 5: To be able to successfully treat large numbers of soft shell clams affected by leukemia. Leukemia has devasted clam beds in northeastern US and Canada.

9. Scope of Program

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

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- Yes

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	**1890**	**1862**	**1890**
2007	0.0	0.0	1.5	0.0
2008	0.0	0.0	1.5	0.0
2009	0.0	0.0	1.5	0.0
2010	0.0	0.0	1.5	0.0
2011	0.0	0.0	1.5	0.0

Outputs for the Program

13. Activity (What will be done?)

For all projects: Manuscripts will be submitted to peer reviewed journals. Presentations will be given at regional, national and/or international meetings. Grant proposals will be submitted. There will be training of undergraduate students, graduate students and/or postdoctoral fellows. There will be development and maintenance of websites. Presentations will be made to various traditional and non-traditional stakeholders. Project 1: Physiological and endocrinology research will be performed in Atlantic cod. Project 2: Physiological research will be performed on stallion sperm. Project 3: Biochemical research will be perfomed using frog and mammalian rods and cones. Preparation of antigen-specific antibodies will be done. Project 4: Cellular and molecular methods will be used to understand the molecular mechanisms of adipocyte differentiation and metabolic function. Project 5: Molecular studies on clam leukemia will be done. Workshops and open forums will be held for fishermen on clam leukemia.

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

Extension	
Direct Method	**Indirect Methods**
- Education Class - Workshop - One-on-One Intervention - Demonstrations - Other 1 (Laboratory Research) - Other 2 (Field researh)	- Web sites - Other 1 (Peer reviewed publications) - Other 2 (Presentation)

15. Description of targeted audience

Target audience will include students university classrooms, K-12 and various stakeholder groups. For indirect contacts, each of the projects will continue to have websites, submit peer review publications and present at regional, national or international conferences.

16. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	**Target**	**Target**	**Target**	**Target**
2007	500	3000	50	25
2008	700	4500	50	25
2009	700	4500	50	25
2010	1000	4500	50	25
2011	1000	4500	50	25

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	0
2008	0
2009	1
2010	0
2011	1

18. Output measures

Output Text

Peer Reviewed Publications

2007	Target:	7
2008	Target:	8
2009	Target:	8
2010	Target:	8
2011	Target:	8

Output Text

Chapters in books

2007	Target:	0
2008	Target:	0
2009	Target:	1
2010	Target:	0
2011	Target:	0

Output Text

Non peer reviewed publications including abstracts

2007	Target:	5
2008	Target:	5
2009	Target:	5
2010	Target:	5
2011	Target:	5

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text

Number of published Publications

Outcome Type: Long

2007 Target:	3
2008 Target:	8
2009 Target:	8
2010 Target:	8
2011 Target:	8

Outcome Text

Citations

Outcome Type: Long

2007 Target:	25
2008 Target:	150
2009 Target:	300
2010 Target:	300
2011 Target:	300

Outcome Text

Number of submissions of grant proposals

Outcome Type: Medium

2007 Target: 2
2008 Target: 4
2009 Target: 5
2010 Target: 5
2011 Target: 5

Outcome Text

Average Impact factor of publications

Outcome Type: Long

2007 Target: 0
2008 Target: 1
2009 Target: 2
2010 Target: 2
2011 Target: 2

Outcome Text

Number of Aquaculturists learning ovulation induction methods

Outcome Type: Medium

2007 Target: 50
2008 Target: 50
2009 Target: 112
2010 Target: 130
2011 Target: 150

Outcome Text

Number of youths and adults attending educational classes/workshops

Outcome Type: Short

2007 Target: 50
2008 Target: 50
2009 Target: 50
2010 Target: 500
2011 Target: 50

Outcome Text

Number of specific antibodies generated

Outcome Type: Short

2007 Target: 20
2008 Target: 5
2009 Target: 5
2010 Target: 5
2011 Target: 5

Outcome Text

Number of oral/poster presentations at meetings

Outcome Type: Short

2007 Target: 50
2008 Target: 50
2009 Target: 50
2010 Target: 50
2011 Target: 50

Outcome Text

Number of graduate students trained

Outcome Type: Short

2007 Target: 5
2008 Target: 5
2009 Target: 5
2010 Target: 5
2011 Target: 5

Outcome Text

Number of educational workshops held

Outcome Type: Short

2007 Target: 5
2008 Target: 5
2009 Target: 5
2010 Target: 5
2011 Target: 5

Outcome Text

Number of fishermen who have been trained in the treatment of leukemia

Outcome Type: Medium

2007 Target: 20
2008 Target: 20
2009 Target: 20
2010 Target: 20
2011 Target: 20

20. External factors which may affect outcomes

- Natural Disasters (drought,weather extremes,etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Programatic Challenges
- Other (Power failures)

Description

A variety of external factors either as a single factor or combination may have adverse effects on projects.

21. Evaluation studies planned

- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)

Description

During each project, data are analyzed and research is evaluated. Successful development and use of molecular, microscopic, biochemical and physiological techniques are measures of successful research. Success of peer reviewed publications indicates success during and after the program. Successful submission and approval of externaly funded grants.

22. Data Collection Methods

- Sampling

Description

Data collection uses physiological, molecular, cellular biochemical, and microscopic research. Specific examples include real time PCR; northern analysis; western analysis; immunocytochemistry; TUNEL apopototic assay; statistical methods; immunoblot analysis for gene expression; binding assays; protein purification; and cell membrane integrity assays.

1. Name of the Planned Program

Biotechnology & Genomics

2. Program knowledge areas

- 511 New and Improved Non-Food Products and Processes 10 %
- 212 Pathogens and Nematodes Affecting Plants 10 %
- 201 Plant Genome, Genetics, and Genetic Mechanisms 10 %
- 711 Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sourc 10 %
- 206 Basic Plant Biology 10 %
- 203 Plant Biological Efficiency and Abiotic Stresses Affecting Plants 10 %
- 305 Animal Physiological Processes 10 %
- 303 Genetic   Improvement of Animals 10 %
- 135 Aquatic and Terrestrial Wildlife 10 %
- 304 Animal Genome 10 %

3. Program existence

- Mature (More then five years)

4. Program duration

- Long-Term (More than five years)

5. Brief summary about Planned Program

Project 1: This project will determine whether Burkholderia strains are capable of infecting a wide range of hosts, including humans & agriculturally relevant organisms, or whether such strains are host-restricted and can thus be used for their significant potential as biocontrol & bioremedial agents. Project 2: This project is concerned with developing genomic and germplasm resources, and applying them to the improvement of horticultural crops, with emphasis on strawberry and mint. Project 3: This project will characterize the PUFS protein and its interaction with the CCR4-NOT complex as to their mechanism of action in controlling mRNA degradation in yeast. Project 4: This project will characterize mutations in genes that regulate the phosphorylation state of plant proteins and are likely contributors to overall plant growth & development. Project 5: This project is aimed to identify genes underlying commercially important traits in tilapia and to support the selective breeding to improve strains for aquaculture. Project 6: This project will be determining the correlation between protein charge and protein functional properties. Of particular interest is the role of charge in beta lactoglobulin gelatin (food texturizer) and IgG solubility (immunotherapeutics). Project 7: This project seeks to understand the role of polyamines in plant stress and the regulation of polyamine biosynthesis. Project 8: This project will develop and design gonadotropin-releasing hormone analogs as possible chemicals to sterilize fish and to determine the effects of recombinant hormone on reproductive activity. Project 9: This project will develop tools that will allow genetic analysis of Frankia physiology and their interactions with plants. Project 10: This project will investigate the genetic factors that influence the beneficial associations of microbes with animals.

6. Situation and priorities

Project 1: As the number of available pesticides becomes more restricted, a demand for natural pesticides (i.e. microbial) increase. It is a priority to identify whether the use of bacteria related to human pathogens can be feasible. Project 2: Horticultural productivity is constantly threatened by disese and abiotic stress. Opportunities exist to improve product quality. Genetic solutions are powerful and environmental friendly. Project 3: Characterizing conserved components involved in mRNA degradation may impact our understanding on how genes and proteins are expressed. Project 4: Understanding plant growth and development at all levels, from the molecular to the agricultural, contributes to our ability to improve food production. Project 5: Although tilapia consumption in the US is rising at about 30% per year, almost all of this product is imported, increasing the U.S.A. trade deficit for seafood. Project 6: B-lac is a widely used food texturizer, but genetic variants exhibit very different gelatin properties. IgG therapeutics are widely used, but their stability and solubility are limitng many applications. Project 7: Abiotic plant stress is a major area of research; this project seeks to understand the molecular events related to plant stress and its effects on metabolism. Project 8: Gaining a further understanding of GnRH, its analogs, its receptors, interactions with neurotransmitters and microencapsulation will be critical for the development of novel stratetgies for improving and controlling reproduction. Project 9: Importance of this project includes reclamation, reforestation, bioremediation, fuel and stabilization. Project 10: Beneficial microbes are ubiquitous and yet their role in health is poorly understood. It is a priority in animal & human

health to utilize beneficial microbes instead of chemicals & antibiotics to improve health & combat disease.

7. Assumptions made for the Program

Project 1: Not all Burkholderia are genetically & functionally capable of threatening humans as pathogens and thus the information gained can be used to specific agricultural purposes. Project 2: Molecular tools will become increasingly attractive to plant breeders. Environmental challenges and new product opportunities will be ongoing and open ended. Project 3: mRNA degradation in yeast is evolutionarily conserved and related to higher eukaryotic mRNA degradation. Project 4: An in-depth understanding of protein phosphatase activity in plants and its role in plant development will lead to improvements in agriculture. Project 5: Genetically improved strains of tilapia will increase production efficiency and lower costs to consumers. Project 6: Assumes IgG therapeutics will be of increasing importance in the treatment and diagnosis of animal diseases. Assumes b-lac will continue to be a widely used food texturizer. Project 7: Plant varieties resistant/tolerant to various forms of abiotic stress such as salt ,water, Al can be produced by genetic manipulation of plant metabolism. Project 8: GnRH is the master control of reproduction in all vertebrates and thus is available for various manipulations. Project 9: Technology can be transferred to the field. Project 10: General principles gained with this model will apply to complex systems & other animal models.

8. Ultimate goal(s) of this Program

Project 1: To understand the broader potential of Burkholderia as a part of sustainable agriculture as well as their mechanisms of causing disease in various hosts. Project 2: To develop genomic and germplasm resources for horticultural crops. To translate these basic resources into applicable tools for plant breeders. Project 3: To determine if PUFS controls SUN4 mRNA deadenylation by binding to the SUN4 3' UTR. To test the hypothesis that PUFS accelerates deadenylation by recruiting the CCR4-NOT complex. Project 4: To understand the interconnections between protein phosphorylation and plant growth and development. Project 5: To produce a higher quality tilapia, at lower costs to the consumers. Project 6: To make charge determinations a standard measurement for controlling protein functional properties. Project 7: To produce Al, salt and drought tolerant plants. Project 8: One of the ultimate goals is to develop an alternate method of sterilizing male sea lampreys using a lamprey GnRH antagonist. Project 9: To increase beneficial traits of plant symbiosis. Project 10: To improve the health of humans, and domestic livestock & animals using beneficial microbes instead of chemicals and antibiotics.

9. Scope of Program

- In-State Research
- Multistate Research

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- Yes

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	**1890**	**1862**	**1890**
2007	0.0	0.0	2.0	0.0
2008	0.0	0.0	2.1	0.0
2009	0.0	0.0	2.1	0.0
2010	0.0	0.0	2.1	0.0
2011	0.0	0.0	2.1	0.0

Outputs for the Program

13. Activity (What will be done?)

For all projects: Manuscripts will be submitted to peer reviewed journals. Presentations will be given at regional, national and/or international meetings. Grant proposals will be submitted. There will be training of undergraduate students, graduate students and/or postdoctoral fellows. There will be development and maintenance of websites. Presentations will be made to various traditional and non-traditional stakeholders. Project 1: Research potential of Burkholderia as biological control agents. Project 2: Submission of over 2 million bp DNA sequences to GenBank; Contribution of germplasm to USDA germplasm system; Project 3: Using molecular biological techniques to study mRNA degradation in yeast. Project 4: Research the role of protein phosphatase genes in the model plant Arabidopsis using molecular and biochemical techniques. Project 5: Genetic mapping will be used to identify genes underling sex differentiation and skin color of tilapia. Project 6: Measure charge on beta-lac A & beta-lac B under varying solvent conditions. Project 7: Conduct research on manipulation of gene expression and study its impact on plant cell response. Project 8: Perform molecular, biochemical and physiological research; analyze data and screen genomes. Project 10: Research genes involved in beneficial microbial association; understand how beneficial microbes maintain association & prevent pathogenic associations with animals.

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

Extension	
Direct Method	**Indirect Methods**
- Education Class - Workshop - One-on-One Intervention - Demonstrations - Other 1 (Laboratory Research) - Other 2 (Field Research)	- Newsletters - TV Media Programs - Web sites - Other 1 (Peer reviewed publications) - Other 2 (Invited speakers, workshops, sem)

15. Description of targeted audience

Target audience will include students, university classrooms, K-12 and various stakeholder groups. For indirect contacts, each of the projects will continue to have websites, submit peer review publications and present at regional, national or international conferences or workshops.

16. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	3600	4760	255	150
2008	2100	4550	205	150
2009	2950	4400	255	150
2010	2950	4400	255	150
2011	2950	4400	255	150

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	5
2008	3
2009	2
2010	1
2011	2

18. Output measures

Output Text

Peer-reviewed manuscripts

2007	Target:	23
2008	Target:	21
2009	Target:	25
2010	Target:	24
2011	Target:	26

Output Text

Chapters in Books

2007	Target:	6
2008	Target:	2
2009	Target:	3
2010	Target:	2
2011	Target:	3

Output Text

Author of book or editor

2007	Target:	2
2008	Target:	0
2009	Target:	0
2010	Target:	1
2011	Target:	0

Output Text

Non peer reviewed publications including abstracts

2007	Target:	28
2008	Target:	28
2009	Target:	28
2010	Target:	28
2011	Target:	28

Output Text

Identity and submission of cDNA, ESTs,proteins, genes, RNA to GenBank

2007   Target: 50
2008   Target: 50
2009   Target: 50
2010   Target: 50
2011   Target: 50

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text
Peer Reviewed Publications

Outcome Type: Long
2007 Target: 25
2008 Target: 25
2009 Target: 25
2010 Target: 25
2011 Target: 25

Outcome Text
Public understanding of Microbial opportunists

Outcome Type: Medium
2007 Target: 100
2008 Target: 200
2009 Target: 200
2010 Target: 200
2011 Target: 200

Outcome Text
Number of farmers considering biological control

Outcome Type: Short
2007 Target: 10
2008 Target: 15
2009 Target: 20
2010 Target: 25
2011 Target: 30

Outcome Text
Number of Readers of Peer Reviewed Publications

Outcome Type: Long
2007 Target: 500
2008 Target: 500
2009 Target: 500
2010 Target: 500
2011 Target: 500

Outcome Text
Number in audience of class or scientific meeting

Outcome Type: Short
2007 Target: 6000
2008 Target: 6000
2009 Target: 6000
2010 Target: 6000
2011 Target: 6000

Outcome Text
Number of Graduate students trained in laboratories

Outcome Type: Short
2007 Target: 25
2008 Target: 25
2009 Target: 25
2010 Target: 25
2011 Target: 25

Outcome Text
Number of undergraduate students trained in laboratory; involved in investigations

Outcome Type: Short
2007 Target: 40
2008 Target: 40
2009 Target: 40
2010 Target: 40
2011 Target: 40

Outcome Text
Number of postdoctoral fellows trained

Outcome Type: Short
2007 Target: 3
2008 Target: 3
2009 Target: 3
2010 Target: 3
2011 Target: 3

Outcome Text
Number of users of released DNA sequences, germplasm; ESTs, proteins

Outcome Type: Medium
2007 Target: 50
2008 Target: 50
2009 Target: 100
2010 Target: 100
2011 Target: 200

Outcome Text
Change in policy

Outcome Type: Long

2007 Target: 10
2008 Target: 10
2009 Target: 10
2010 Target: 10
2011 Target: 10

Outcome Text
Number of grant submissions

Outcome Type: Short

2007 Target: 30
2008 Target: 30
2009 Target: 30
2010 Target: 30
2011 Target: 30

Outcome Text
Number of meetings/workshops attended

Outcome Type: Short

2007 Target: 55
2008 Target: 55
2009 Target: 55
2010 Target: 55
2011 Target: 55

20. External factors which may affect outcomes

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

Description

One or a combination of external factors can adversely or positively affect the outcome of each project or program.

21. Evaluation studies planned

- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)

Description

During each project, data are analyzed and research is evaluated. Successful development of molecular, biochemical, genomic and physiological techniques. Success of peer reviewed publications indicates success during and after the program. Successful submission and approval of externaly funded grants.

22. Data Collection Methods

- Sampling
- Other (Laboratory and Field research)

Description

Data collection uses physiological, molecular, cellular biochemical, genomic and microscopic research. Specific examples include real time PCR; PCR, Southern blots; northern analysis; western analysis; immunocytochemistry; ; statistical methods; immunoblot analysis for gene expression; binding assays; protein purification and sequencing; cloning and sequencing of DNA/RNA sequences; bioinformatics; gel electrophoresis; microarray studies; 2-D gels; and MS-maldi.

1. Name of the Planned Program

Economics & Commerce

2. Program knowledge areas

- 611 Foreign Policy and Programs 20 %
- 610 Domestic Policy Analysis 20 %
- 608 Community Resource Planning and Development 20 %
- 602 Business Management, Finance, and Taxation 10 %
- 603 Market Economics 20 %
- 803 Sociological and Technological Change Affecting Individuals, Families and Communities 10 %

3. Program existence

- New (One year or less)

4. Program duration

- Short-Term (One year or less)

5. Brief summary about Planned Program

Project 1: A cost/benefit analysis will be conducted to determine the efficiency of drawing corporate off-shore functions to rural communities.

6. Situation and priorities

Rural communities in NH are in need of meaningful employment opportunities. Corporate America has indicated a need for specific skill sets. The match needs to be facililated to create opportunities in rural communities.

7. Assumptions made for the Program

Assuming the literature is correct in that the "brain drain" and "youth eroding" continues to be a problem in rural America. Corporations can be persuaded by tax incentives to offer a portion of off shore jobs to rural American communities.

8. Ultimate goal(s) of this Program

To create meaningful job opportunities in economically depressed rural comunities.

9. Scope of Program

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

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- No

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	**1890**	**1862**	**1890**
2007	0.0	0.0	0.0	0.0
2008	0.0	0.0	0.0	0.0
2009	0.0	0.0	0.0	0.0
2010	0.0	0.0	0.0	0.0
2011	0.0	0.0	0.0	0.0

Outputs for the Program

13. Activity (What will be done?)

Project 1: Corporations will be notified of "rural skill clusters" and communities with rural skill clusters will be notified in an effort to meet needs (employment) of both parties.

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

Extension	
Direct Method	**Indirect Methods**
● Other 1 (targeted letters)	● Web sites

15. Description of targeted audience

All rural communities in NH with a population base between 5000 and 15000 individuals.

16. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	**Target**	**Target**	**Target**	**Target**
2007	250	10000	0	0
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

18. Output measures

Output Text

Peer Review Publications

2007	Target:	1
2008	Target:	0
2009	Target:	0
2010	Target:	0
2011	Target:	0

Output Text

Non peer reviewed publications including abstracts

2007	Target:	1
2008	Target:	0
2009	Target:	0
2010	Target:	0
2011	Target:	0

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text

Peer Reviewed publications

Outcome Type: Long

2007 Target:	1
2008 Target:	0
2009 Target:	0
2010 Target:	0
2011 Target:	0

Outcome Text

Obtaining additional funding to conduct detailed cost benefit analysis to select NH communities

Outcome Type: Short

2007 Target: 1
2008 Target: 1
2009 Target: 1
2010 Target: 0
2011 Target: 0

20. External factors which may affect outcomes

- Economy
- Government Regulations
- Populations changes (immigration,new cultural groupings,etc.)
- Other ()

Description

One or more external factors may have adverse or positive effects on program.

21. Evaluation studies planned

- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)

Description

Subject to funding, followup surveys to identify additional individual community skill set matches with corporate needs, i.e. actual bridges developed between business and individual community skill set clusters.

22. Data Collection Methods

- Other (web based surveys)

Description

Questionnaires will be submitted to residents of small (5000 to 15000 individuals) communities and businesses currently engaged in off-shore activities..

1. Name of the Planned Program

Food, Nutrition & Health

2. Program knowledge areas

- 722 Zoonotic Diseases and Parasites Affecting Humans 5 %
- 724 Healthy Lifestyle 5 %
- 607 Consumer Economics 5 %
- 711 Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sourc 5 %
- 702 Requirements and Function of Nutrients and Other Food Components 25 %
- 712 Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxi 25 %
- 403 Waste Disposal, Recycling, and Reuse 5 %
- 723 Hazards to Human Health and Safety 10 %
- 304 Animal Genome 5 %
- 133 Pollution Prevention and Mitigation 10 %

3. Program existence

- Mature (More then five years)

4. Program duration

- Long-Term (More than five years)

5. Brief summary about Planned Program

Project 1: This project will examine how the brain regulates the amount of zinc especially during periods of deficient or excessive zinc consumption. Project 2: This project will evaluate the relationships between breast milk levels of polybrominated diphenyl ethers (PBDEs) and stage of lactation maternal characteristics, dietary intake & environment of women in NH. Project 3: This project will seek to identify the celluar and molecular effects of elevated glucose levels on cardiovascular health in diabetic individuals. This research is focussed on the ways in which elevated blood sugar promotes a proinflammatory state that accelerates cardiovascular disease. Project 4: This project will evaluate the effectiveness & relative safety of biosolids, Class A, for reovirus contamination that are intended for land application. Project 5: This project will examine the early events of salmonella-host interactions. Project 6: This project will develop mechanisms to prevent Escherichia coli infections leading to hemolyticuremic syndrome. Project 7: This project will focus on identifying metabolic links that would explain the relationship of obesity and development of allergic disease and the factors that may contribute to this relationship.

6. Situation and priorities

Project 1: Zinc inbalance is suspected as a contributor to neurological disorders. This may result when healthy physiological processes that regulate the amount of zinc entering the brain malfunctions. We do not yet know how these regulatory processes work in the brain. Project 2: PBDEs are ubiquitous & persistant in our environment. They may disrupt hormone signals once inside the body. This project will biomonitor lactating women to estimate the body burden of PBDEs and explore potential health implications of this burden. Project 3: Knowing how diabetes accelerates cardiovascular disease can lead to methods of prevention and treatment. Project 4: Public acceptance of biosolids needs further research to gain confidence. Project 5: Despite extensive research food-associated illness due to salmonella continues to be a major health concern. Finding ways to reduce the incidence of this disease is a continuing priority. Project 6: Zoonotic pathogen is spread from cattle to various foodstuffs (sprouts, juices, processed meats, hamburger, etc.) through fecal contamination. Antibiotic treatment makes the condition worse. Our strategies will interrupt this cycle and look to improve human health and better acceptance of food products. Project 7: Incidence of asthma is 14%, a percentage that is highest in the New England area and above the national average.

7. Assumptions made for the Program

Project 1: Brain zinc metabolism is similar in the human as in the pig. Zinc transport and metabolism in our blood-brain barrier model is similar to a living brain. Project 2: PBDEs will be present. Our subjects represent all NH women. Our lab will be functioning optimally. Project 3: The effects of abnormally high blood glucose levels on arterial health will be determined. The ways in which diabetes accelerates atherosclerosis will be better defined. Project 4: The findings will add to the data base on virus occurence in Class A Biosolids. Project 5: Reducing the incidence of food-associated salmonellosis requires multiple

intervention strategies. A focus on the early events in salmonella-host interactions can provide resources for developing such strategies. Proejct 6: Incidence of severe disease in children (infected from agricultural food products) is rising. The present work will profoundly affect this severe condition. Project 7: Finding a functional link will help delineate the mechanisms by which obesity may contribute to pulmonary disese such as allergic asthma.

8. Ultimate goal(s) of this Program

Project 1: To develop treatments for persons who are at risk of Alzheimer's Disease because their ability to regulate zinc transport at the blood-brain barrier is malfunctioning. Project 2: To biomonitor humans for PBDEs, which will increase our knowledge base on environmental chemicals. Project 3: To help develop drugs or lifestyle changes that can inhibit the adverse effects of elevated blood glucose levels on the cardiovascular system. Project 4: To help with the public acceptance of the land application of class A biosolids through research. Project 5: To reduce the incidence of food-associated salmonellosis, which will benefit both the consumer and the poultry industry. Project 6: Our molecular genetics and protein chemistry studies will result in greater and safer acceptance of food products. Project 7: To identify the mechanisms that would explain how weight gain in humans may promote pulmonary disease such as asthma.

9. Scope of Program

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

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- Yes

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	**1890**	**1862**	**1890**
2007	0.0	0.0	1.2	0.0
2008	0.0	0.0	1.2	0.0
2009	0.0	0.0	1.2	0.0
2010	0.0	0.0	1.2	0.0
2011	0.0	0.0	1.2	0.0

Outputs for the Program

13. Activity (What will be done?)

For all projects: Manuscripts will be submitted to peer reviewed journals. Presentations will be given at regional, national and/or international meetings. Grant proposals will be submitted. There will be training of undergraduate students, graduate students and/or postdoctoral fellows. There will be development and maintenance of websites. Presentations will be made to various traditional and non-traditional stakeholders. Project 1: The transport of zinc will be monitored using the laboratory model of the bood-brain barrier in conditions that are deficient or excessive in zinc. The relative abundance and location of specific zinc transport proteins will be measured in relation to the changes in kinetics to describe its regulation. Project 3: Research effects of the elevated glucose in diabetes on cardiovascular disease, specifically atherosclerosis. Project 4: Two different biosolids

prepared differently will be evaluated for virus. Project 5: To continue research on salmonella. Project 6: To do molecular and biochemical studies on E. coli Project 7: Work proposed will involve experimentation.

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

Extension	
Direct Method	**Indirect Methods**
- Education Class - Workshop - One-on-One Intervention - Other 1 (Laboratory research) - Other 2 (One on one discussions)	- Public Service Announcement - Newsletters - TV Media Programs - Other 1 (Peer reviewed publications)

15. Description of targeted audience

Target audience will include students, university classrooms, K-12 and various stakeholder groups. For indirect contacts, each of the projects will continue to have websites, submit peer review publications and present at regional, national or international conferences. Project 1: Nutritional scientists, teachers and clinicians Project 2: Scientists interested in obesity, environmental chemicals, breastfeeding & infant development. All lactating mothers in NH/New England. Project 3: all scientists in discipline; students and general public interested in better health Project 4: Farmers, homeowners, scientists Project 5: Scientists in the field Project 6: All scientists, researchers, medical personnel, farm organizers, Abbatoir systems. Project 7: General public, health community, scientific community

16. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	**Target**	**Target**	**Target**	**Target**
2007	900	5550	10	0
2008	1700	3070	10	0
2009	1700	3600	10	0
2010	600	2500	10	0
2011	600	2500	10	0

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	0
2008	0
2009	2
2010	0
2011	0

18. Output measures

Output Text

Peer reviewed publications

2007   Target: 7
2008   Target: 7
2009   Target: 7
2010   Target: 5
2011   Target: 5

Output Text

Chapters in Books

2007   Target: 0
2008   Target: 0
2009   Target: 1
2010   Target: 0
2011   Target: 1

Output Text

Author of book or editor of book

2007   Target: 0
2008   Target: 0
2009   Target: 1
2010   Target: 0
2011   Target: 0

Output Text

Non peer reviewed publications including abstracts

2007   Target: 13
2008   Target: 13
2009   Target: 13
2010   Target: 8
2011   Target: 8

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text
Peer Reviewed Publications

Outcome Type: Long
2007 Target: 7
2008 Target: 7
2009 Target: 7
2010 Target: 5
2011 Target: 5

Outcome Text
Number of graduate students trained

Outcome Type: Medium

2007 Target: 6

2008 Target: 7

2009 Target: 7

2010 Target: 7

2011 Target: 7

Outcome Text

Number of Undergraduate students trained and/or performing investigations

Outcome Type: Medium

2007 Target: 5

2008 Target: 5

2009 Target: 5

2010 Target: 5

2011 Target: 5

Outcome Text

Number of presentations/posters at regional, national or international conferences or workshops

Outcome Type: Short

2007 Target: 7

2008 Target: 7

2009 Target: 7

2010 Target: 7

2011 Target: 7

Outcome Text

Number of Grant submissions

Outcome Type: Short

2007 Target: 1

2008 Target: 1

2009 Target: 1

2010 Target: 1

2011 Target: 1

Outcome Text

Number of public presentations

Outcome Type: Short

2007 Target: 7

2008 Target: 7

2009 Target: 7

2010 Target: 7

2011 Target: 7

Outcome Text

Model Development

Outcome Type: Short

2007 Target: 4
2008 Target: 7
2009 Target: 8
2010 Target: 8
2011 Target: 8

Outcome Text
Town meetings

Outcome Type: Short

2007 Target: 0
2008 Target: 0
2009 Target: 10
2010 Target: 0
2011 Target: 10

Outcome Text
Results to NH DES

Outcome Type: Short

2007 Target: 0
2008 Target: 0
2009 Target: 1000
2010 Target: 0
2011 Target: 0

20. External factors which may affect outcomes

- Natural Disasters (drought,weather extremes,etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programatic Challenges
- Populations changes (immigration,new cultural groupings,etc.)
- Other (Private sources)

Description
One or more external factors may have adverse or positive effects on the program.

21. Evaluation studies planned

- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)

Description
During each project, data are analyzed and research is evaluated. Successful development of various techniques. Success of peer reviewed publications indicates success during and after the program. Successful submission and approval of externally funded grants. Project 2: Sufficient data for publication. Examination of pregnant moms & fetuses. Project 3: Both cells in culture and animal models will be used to investigate the effects of abnormally high glucose levels on arterial cells and the development of atherosclerotic lesions. Project 4: Better public acceptance of land application of biosolids through research. Project 6:

In-depth genetic/molecular/biochemical/protein chemistry interactions. Project 7: We will employ metabolic studies, biochemical assays and physiological assays to examine the relationship between obesity and asthma.

22. Data Collection Methods

- Sampling
- Mail
- On-Site
- Tests
- Other (Lab and Field Research)

Description

Data collection uses physiological, molecular, cellular, biochemical, and microscopic research. Project 2: Mail surveys and on-site surveys will be conducted. Examples of specific techniques include ELISA, RIA, EIA, western blot analysis of proteins; clinical assays; immunohistochemistry; image analysis; electron microscopy; light microscopy; cell culture; antibiotic assays; affinity binding assays; cell-cyel-apoptosis/necrosis assays; neutrophil apoptosis rate assays; real time RT-PCR; phenotypic & genotypic characterizations; pathogen culture; and lysogeny vs. pathogen stress assays.

1. Name of the Planned Program

Natural Resources & Environment

2. Program knowledge areas

- 314 Toxic Chemicals, Poisonous Plants, Naturally Occuring Toxins, and Other Hazards Affecting Animals 5 %
- 315 Animal Welfare/Well-Being and Protection 5 %
- 605 Natural Resource and Environmental Economics 10 %
- 403 Waste Disposal, Recycling, and Reuse 5 %
- 136 Conservation of Biological Diversity 20 %
- 122 Management and Control of Forest and Range Fires 10 %
- 123 Management and Sustainability of Forest Resources 10 %
- 112 Watershed Protection and Management 5 %
- 132 Weather and Climate 10 %
- 135 Aquatic and Terrestrial Wildlife 20 %

3. Program existence

- Mature (More then five years)

4. Program duration

- Long-Term (More than five years)

5. Brief summary about Planned Program

Project 1: This project will examine amphibian growth and survival in different upland habitat types. Project 2: This project will determine how trematode parasites affect nearshore marine species including benthic invertebrates, fish and birds. Project 3: This project plans to develop the tools for precise statements on water quality through rapid assessment using aquatic insects. Project 4: This project compares and evaluates traditional digital image processing methods with some newly developed techniques to determine if the accuracy of the forest vegetation maps can be improved. Project 5: This project will perform inventories of the biodiversity of NH forests. Project 6: This project continues to compare aquatic and wetland plant diversity in tropical versus temperate regions. Project 7: This project will seek to improve techniques for quantifying and predicting forest composition and structure, including its response to management and new stressors (especially climate). In addition to growth and production of traditional forest products, we will also focus on structural legacies that are important for wildlife habitat. Project 8: This project has and will be examining how nitrogen deposition interacts with soil warming to alter soil microbial community. Project 9: This project will involve the monitoring and enhancement of shellfish restoration projects. Project 10: This project will seek to expand economic analysis for incentives to manage waste management; to examine prospects for privatization of public services; and to examine specific issues of construction and demolition debris. Project 11. This project has and will investigate the occurrence and causes of biotoxins in lakes and ponds. Project 12. This project will use genetic analysis to determine the influence of habitat disturbances on dispersal patterns of two species of vernal pool-breeding amphibians, the wood frog and the spotted salamander in southern New Hampshire. Project 13. This project seeks to determine the effects of different silviculture practices on the success of invasive shrubs. Project 14. This project seeks to understand how invasive shrubs affect wildlife populations. Project 15. This project seeks to catalogue marine invertebrate biodiversity in the Gulf of Maine by producing high-quality genomic DNA vouchers, develop DNA barcodes based on mitochondrial cytochrome oxidase I sequences and integrate the results into an open access web page, linked to digital vouchers and GPS information. Project 16. This project seeks to characterize the species composition of benthic marine plants in a variety of critical coastal/estuarine habitats. Project 17. This project will quantify the effects of different agricultural practices on stream and tributary nutrient levels. Project 18. This project will extend its comprehensive stakeholder group studies and will allow for a better understanding of non-response error and in surveys across policy program and stakeholder groups. Project 19. This project will consider the effects of size, set and habitat type in determining the home range of lobsters.

6. Situation and priorities

Project 1: In order to manage lands effectively, we need a realistic understanding of habitat requirements of species we are managing. Project 2: Marshes and estuaries are some of the most anthropogenically disturbed environments. Trematodes may provide a fast, integrative way to index their condition. Project 3: Rapid and accurate assessment of water quality by all stakeholder groups. Project 4: There is a strong need to map and monitor our forest resources, especially from remotely sensed

data instead of just relying on ground measures. Project 5: Flora of forests on islands of large lakes are poorly studied. A need for understanding forests biodiversity is critical to conservation & protection. Project 6: The discovery under this project that temperate regions are more diverse than tropic in wetlands means we need to value our temperate aquatic and wetland habitats far more than we have in the past. Project 7: Quantifying and predicting present and future forest structures are critical steps in documenting sustainable forest management. Project 8: Forest productivity is dependent on nutrient cycling processes which may be modified by climate warming and nitrogen deposition. Project 9: Oyster populations in New Hampshire have declined 90% since 1995, and local extinctions have occurred in some areas. Because this species is one of the major habitat-producing species in NH estuaries, restoration efforts affect not only the oyster but many other species as well. Several local, state, and federal agencies support our work because of its importance. Project 10: Waste management/disposal costs have more than tripled in the past two decades. State and local governments need economic analysis of various management options. Project 11: Biotoxins (e.g. microcystins) are a growing threat to public health and recreation world-wide. Project 12: The insight into the effects of anthropogenic habitat disturbances on amphibian migration abilities, to be gained from this study, will be valuable in wetlands management. Long-term persistence of many amphibian populations will depend upon connectivity in the form of migration and gene flow between seasonal ponds. Project 13: Invasive, non-native shrubs have been shown to reduce rejuvenation of economically important forest trees. Such shrubs are increasing in abundance in mature and managed forests nationally. Project 14: Invasive shrubs threaten to disrupt terrestrial food webs and may substanially reduce regional diversity. Project 15: This project will provide a baseline of the biodiversity of the Gulf of Maine and will allow for the recognition of alien/invasive species and shifts in invertebrate communities. Project 16: The importance of understanding biodiversity patterns in assessing stability and health of various coastal/estuarine ecosystems, i.e. impacts of nutrients, climate change and other factors. Project 17: Agricultural land management is seen as lending to water quality degradation in many areas, but this may not be the case in NH. Project 18: Successful management of natural and agricultural resources require active engagement and communication with stakeholders. Project 19: The lobster fishery is the most lucrative fishery in the Northeast. Our long-term goal is to provide sound scientific data so that we can better preserve this valuable resource.

7. Assumptions made for the Program

Project 1: There is a lack of information about upland habitat requirements for amphibians. Increased knowledge about upland habitat requirements will enhance our ability to manage lands more effectively for amphibians. Project 2: Trematodes may not reflect all estuarine aspects equally. Project 3: Long-term monitoring of single-event human disturbance will generate a timeline of changing data. More accurate statements on predicted changes in water quality can be made. Project 4: Forests can be mapped from digital imagery. Mapping forest vegetation is important. Project 5: Establish baseline data for island floras & to compare with future forest conditions. Project 6: Conservation in both temperate and tropical wetlands needs to become a greater focal point. The data from this project are critical. Project 7: Forests can be managed for economic and ecological attributes simultaneously. Project 9: Funding will remain constant and be supplemented by other programs. Project 10: Waste management will always be an issue as long as there are environmental concerns, public dollars, and insufficient private markets to fully deal with the problem. Project 11: Growing demand and use of lakes for recreation and drinking water causes increased importance of understanding and controlling the problem. Project 12: Gene flow patterns are assumed to be indicative of dispersal rates. Project 13: Interest in concern about and commitment to control invasive plants will increase over time. Non-native shrubs can be controlled. Funding will remain constant or increase. Project 14: Identifying the factors that promote the spread of invasive shrubs and be used to limit their spread. Project 15: Sequence variations within species will be less than 2% so that species boundaries can be identified; at least 5 sequences of each species will be found; and universal Co-I primers will amplify products from all organisms. Project 16: Detailed knowledge of species composition (spatially and temporally) can identify problems that can be rectified by proper planning, e.g. sewage discharge changes, handling of resources in aquaculture, and planning for proper ballast discharge. Project 17: Agriculture will continue to remain as a viable land use in NH. Project 18: The design and use and evaluation of specific tools for involving, engaging with these diverse stakeholder groups is complex. Project 19: The lobster fishery is healthy, but there is concern about over-fishing and depleting the resource. We have only a fair knowledge of lobster population dynamics and their habitat preferences.

8. Ultimate goal(s) of this Program

Project 1: To manage lands more effectively for amphibian species. Project 2: To understand how physical, chemical, and biological degradation of marshes and estuaries is reflected in trematode fauna. Project 3: To develop tools for rapid and accurate statements on water quality, which will lead to an increased ability to prevent or decrease pollution events. Project 4: The goal is to show that more advanced digital image processing techniques are capable of generating highly accurate forest vegetation maps. Project 5: To establish the botanical diversity of island floras and community types. Produce baseline data. Project 6: To promote greater awareness of wetland diversity and the need for conservation in both temperate and tropical regions. Project 7: To improve management of economic and ecological attributes of forests. Project 8: To understand how climate change will impact forest ecosystems in the Northeast. Project 9: To reach the state goal of 20 acres of restored oyster bottom by 2010. Project 10: The goals are the ongoing analysis of solid waste management and reduction alternatives; working with local governments and NGOs to examine new policy options; to expand research to include more engineering and other physical science input. Project 11: Reduce the occurrence of biotoxins by understanding their causes. Project 12: To determine

the effects of anthropogenic habitat disturbance on the migration abilities of vernal pool-breeding amphibians. Project 13: To promote silvicultural methods that minimize the invasion and impact on non-native shrubs on forest productivity and biological diversity. Project 14: To develop management protocols that limit spread of invasive shrubs thus assuring wildlife communities remain intact. Project 15: To assess biodiversity in the Gulf of Maine; to have a webpage of biodiversity information of marine invertebrates including genetics, species and habitat data. Project 16: To define health and stressed coastal ecosystems; aid in planning of management of coastal resources; and evaluate the public regarding impacts and proper management of coastal resources. Project 17: Understand the impacts of agriculture as practiced in NH on environmental quality. Project 18: To develop and compare models for using and integrating qualitative and quantitative tools. To enhance the engagement and communication with specific stakeholder groups. Project 19: To measure lobster home ranges; to determine the factors that influence home ranges; and to use knowledge obtained to better assess populations and protect the fishery.

9. Scope of Program

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

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- Yes

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2007	0.0	0.0	6.0	0.0
2008	0.0	0.0	6.0	0.0
2009	0.0	0.0	6.0	0.0
2010	0.0	0.0	6.0	0.0
2011	0.0	0.0	6.0	0.0

Outputs for the Program

13. Activity (What will be done?)

For all projects: Manuscripts will be submitted to peer reviewed journals. Presentations will be given at regional, national and/or international meetings. Grant proposals will be submitted. There will be training of undergraduate students, graduate students and/or postdoctoral fellows. There will be development and maintenance of websites. Presentations will be made to various traditional and non-traditional stakeholders. Project 1: Field enclosures will be established in different upland habitat types in which to put metamorphic amphibians to examine growth and survival. Project 2: Online identification manuals, as well as hard copy identification manuals, as well as placement of species level data in online databases. Project 3: Develop and evaluate methods for more accurately mapping forest vegetation from digital remotely sensed imagery. Project 7: Re-measured, long-term forest plots will be used to refine models of forest growth and structural change. These models will be used to develop specific, applied guidance for forest stand management. Project 8: A website is being developed to inform NH residents on how global change may impact ecosystem goods and services. Project 9: Monitoring of existing restored shellfish will continue. Project 10: Participation in regional/local policy formulation. Project 11: Development of biotoxin monitoring program with NH

DES and UNH Lakes Lay Monitoring and training in techniques for measuring biotoxins statewide. Project 12: Research population genetic structure and dispersal rates of spotted salamanders and wood frogs. Project 15: Development of an open access webpage with information on marine invertebrates of the Gulf of Maine including genetic, habitat, and species data. Project 16: The assessments of natural and introduced seaweed populations will be made within major embayments in northern New England. Stressed communities and introduced populations will be characterized, including causes and vectors. Explanations of these impacts will be documented and provided to diverse interest groups. Project 17: This project will quantify the effects of different agricultural practices on stream and tributary nutrient levels at three different sites. Project 19: Ultrasonic telemetry will be used to track the movements of lobsters within NH coastal waters. Mapping, SCUBA and other methods will help define their preferred habitats. GIS will be used to calculate home range size.

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

Extension	
Direct Method	**Indirect Methods**
- Education Class - Workshop - Group Discussion - One-on-One Intervention - Demonstrations - Other 1 (Field Research) - Other 2 (Laboratory research)	- Public Service Announcement - Newsletters - Web sites - Other 1 (Peer reviewed publications) - Other 2 (Presentations)

15. Description of targeted audience

Target audience will include students in university classrooms and K-12 and various stakeholder groups. For indirect contacts, each of the projects will continue to have websites, submit peer review publications and present at regional, national or international conferences. Project 1: All scientists in the discipline, state and federal agency managers. Project 2: State level community groups; scientists interested in use of freshwater. Project 3: Spatial data users, natural resource managers. Projects 4, 5: All scientists in field; conservation groups; state agencies. Project 7: All foresters in the state and all scientists in the discipline. Project 8: All scientists in the discipline; NH residents. Project 9: Oyster license holders; governmental managers, NGOs, and other scientists working on shellfish restoration. Project 10: State, local and regional waste management professionals; other researchers within discipline; general public. Project 11: State agencies (NH DES, NH Fish & Game); Lake Associations and Lake users. Project 12: Scientists interested in molecular ecology; landowners, foresters, and wildlife managers. Project 14: Forest land owners, foresters, loggers, conservation groups, land protection groups (land trustees, etc.) forest ecologists, silviculturists. Project 15: Ecologists, conservation biologists, resource managers, aquaculture farmers, fisheries biologists, and bio-security officers (e.g. customs officials); and specialists for invasive species control. Project 16: Users/consumers of coastal resources and habitats; managers and environmental agencies; and environmental advocate groups. Project 18: Policy makers, scientists, planning board, conservation commission, general public, elected officials, outdoor recreation participants and land owners. Project 19: Lobstermen, managers, lobster and marine biologists.

16. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	6096	4400	220	4980
2008	6294	3528	150	480
2009	1202	4957	150	180
2010	1495	4220	180	80
2011	1595	4220	180	80

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

18. Output measures

Output Text

Peer-Reviewed Publications

2007　Target:　34
2008　Target:　32
2009　Target:　27
2010　Target:　18
2011　Target:　19

Output Text

Chapters in Books

2007　Target:　9
2008　Target:　8
2009　Target:　2
2010　Target:　3
2011　Target:　2

Output Text

Author of book or editor

2007　Target:　3
2008　Target:　3
2009　Target:　1
2010　Target:　0
2011　Target:　1

Output Text

Non-peer reviewed publications including published abstracts

2007　Target:　39
2008　Target:　34
2009　Target:　24
2010　Target:　24
2011　Target:　24

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text
Peer Reviewed Publications

Outcome Type: Medium
2007 Target: 15
2008 Target: 20
2009 Target: 20
2010 Target: 20
2011 Target: 20

Outcome Text
Number of Graduate Students trained

Outcome Type: Short
2007 Target: 26
2008 Target: 28
2009 Target: 26
2010 Target: 28
2011 Target: 26

Outcome Text
Number of Undergraduate students trained and/or performing investigations

Outcome Type: Short
2007 Target: 27
2008 Target: 27
2009 Target: 27
2010 Target: 27
2011 Target: 27

Outcome Text
Number of presentations/posters at regional, national or international conferences or workshops

Outcome Type: Short
2007 Target: 52
2008 Target: 52
2009 Target: 52
2010 Target: 52
2011 Target: 52

Outcome Text
Number of Grant submissions

Outcome Type: Short

2007 Target: 9

2008 Target: 18

2009 Target: 15

2010 Target: 15

2011 Target: 15

Outcome Text

Number of agencies better informed about amphibian habitat needs

Outcome Type: Short

2007 Target: 3

2008 Target: 3

2009 Target: 3

2010 Target: 3

2011 Target: 3

Outcome Text

Use of more precise biological data in making water quality statements

Outcome Type: Long

2007 Target: 10

2008 Target: 10

2009 Target: 10

2010 Target: 10

2011 Target: 10

Outcome Text

Use of biological data by aquatic entomologists

Outcome Type: Long

2007 Target: 100

2008 Target: 100

2009 Target: 100

2010 Target: 100

2011 Target: 100

Outcome Text

Number in audience of meeting presentations

Outcome Type: Short

2007 Target: 1000

2008 Target: 1000

2009 Target: 1000

2010 Target: 1000

2011 Target: 1000

Outcome Text

Number of resources managers addressed

Outcome Type: Short

2007 Target: 5

2008 Target: 5

2009 Target: 5

2010 Target: 5

2011 Target: 5

Outcome Text

Number of workshops held

Outcome Type: Short

2007 Target: 10

2008 Target: 10

2009 Target: 10

2010 Target: 10

2011 Target: 10

Outcome Text

Number of websites developed

Outcome Type: Long

2007 Target: 6

2008 Target: 6

2009 Target: 6

2010 Target: 6

2011 Target: 6

Outcome Text

Public service announcement

Outcome Type: Short

2007 Target: 0

2008 Target: 1

2009 Target: 0

2010 Target: 0

2011 Target: 0

Outcome Text

Number of trade publications

Outcome Type: Medium

2007 Target: 10

2008 Target: 10

2009 Target: 10

2010 Target: 10

2011 Target: 10

Outcome Text

Lake Management plans that consider biotoxin problems

Outcome Type: Medium

2007 Target: 10

2008 Target: 0

2009 Target: 0

2010 Target: 0

2011 Target: 0

Outcome Text

Development of NH state drinking water program with biotoxin control

Outcome Type: Short

2007 Target: 1

2008 Target: 0

2009 Target: 0

2010 Target: 0

2011 Target: 0

Outcome Text

Foresters learning about methods to reduce spread of invasive species

Outcome Type: Short

2007 Target: 6000

2008 Target: 0

2009 Target: 0

2010 Target: 0

2011 Target: 0

Outcome Text

Identification of invasive species

Outcome Type: Short

2007 Target: 0

2008 Target: 10

2009 Target: 10

2010 Target: 0

2011 Target: 0

Outcome Text

CZM manager, environmental resource groups/individuals

Outcome Type: Short

2007 Target: 25

2008 Target: 25

2009 Target: 25

2010 Target: 25

2011 Target: 25

Outcome Text

Dissemination of results to land ure planners

Outcome Type: Short

2007 Target: 0

2008 Target: 1

2009 Target: 0

2010 Target: 1

2011 Target: 0

Outcome Text

websurveys

Outcome Type: Short

2007 Target: 10000

2008 Target: 0

2009 Target: 0

2010 Target: 0

2011 Target: 0

Outcome Text

Questionnaire

Outcome Type: Short

2007 Target: 1000

2008 Target: 0

2009 Target: 0

2010 Target: 0

2011 Target: 0

Outcome Text

Enhance knowledge of lobsters, improve management; educate community

Outcome Type: Short

2007 Target: 300

2008 Target: 300

2009 Target: 300

2010 Target: 300

2011 Target: 300

20. External factors which may affect outcomes

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

Description

One or more external factors may have adverse or positive effects on the program and/or project.

21. Evaluation studies planned

- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)

Description

During each project, data are analyzed and research is evaluated. Project 1: Amphibian growth and survival will be examined every week. Comparisons of treatment effects will be evaluated statistically. Project 2: Reference sits will be maintained and sampled yearly to check for any long-term changes. Project 3: Evaluate the accuracy of each technique using an error matrix approach. Projects 4, 5: Floristic studies. Project 6: Future validation of long-term predictors. Project 7: Quantification of microbial community structure. Project 8: Time series data on shellfish densities and sizes on all monitored reefs are assessed annually. Project 9: Formal and informal observations to determine how research result are being used. Project 11: Field and laboratory studies will be conducted. Project 12: Genetic analysis of dispersal. Project 13: Invasive shrubs will be examined using wood-ring analysis under silvicultural treatment that include clear-cutting, group selection, selective cutting and no treatment. Project 14: Compare sites with and without invasive shrubs. Project 15: Changes in invertebrate communities can be detected using genetics; new invasives can be detected and their origins can be determined. Project 16: Comparison of species composition temporally and spatially, i.e. before and after impacts (sewage discharge, etc.); comparsion of impacts of introduced species on other coastal resources (e.g. shellfish). Project 17: Time series before and after organic dairy initiation. Project 18: Experimental designs and evaluation will be used. Project 19: Lobsters will be tracked for one month (20 lobsters per year). GIS/ArcView will be used to calculate daily home ranges.

22. Data Collection Methods

- Sampling
- Whole population
- Mail
- On-Site
- Structured
- Unstructured
- Case Study
- Observation
- Other (Field and Lab research)

Description

Various physiological, field, molecular and laboratory techniques will be used to collect data. Specific techniques include snout vent length; growth rates; measurement of soil temperatures; canopy cover; air temperature; rainfall; insect abundance/biomass/diversity using pitfall traps; need to observe/measure the components of the forest (species, crown closure) to compare to the maps generated remotely sensed imagery; determine vegetation, abundance, percent cover and full inventory; specimens are deposited in the herbarium; Herbarium records become permanent documentation; field measurement of forest growth, structure, mortality, and litterfall; capture of historic data from archived sources; mail survey of foresters on knowledge and training needs; soil analyzed by biogeochemistry and soil microbiology; replicate quadrat samples of all bivalves shellfish; counting and measuring all animals collected; mail and face to face surveys of general public and targeted populations; ELISA tests for microcystins; multiparameter probe profiles of physical and chemical conditions in lakes; random plot sampling used to select shrubs; benthic macrofaunal invertebrates will be collected along with GPS information and habitat data; standard PCR and DNA sequencing; a variety of statistical analysis; analyze water samples; and use of fixed-array ultrasonic telemetry system.

1. Name of the Planned Program

Pest Management

2. Program knowledge areas

- 215 Biological Control of Pests Affecting Plants 100 %

3. Program existence

- Mature (More then five years)

4. Program duration

- Medium Term (One to five years)

5. Brief summary about Planned Program

Project 1: This project seeks to understand how hormones control reproductive physiology and behavior of beetles that are opportunistic breeders. Multiple species are used as a model system this group displays a variety of life histories.

6. Situation and priorities

Little is known about the hormonal control of reproduction by beetles, many of which are pests. Better understanding of the endocrine processes will lead to better and safer methods of pest control.

7. Assumptions made for the Program

Juvenile hormone plays an important role in regulating reproductive physiology or behavior, or both.

8. Ultimate goal(s) of this Program

To understand the physiological control of the complex reproductive behavior, which includes elaborate parental care of burying beetles.

9. Scope of Program

- In-State Research
- Multistate Research

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- Yes

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	**1890**	**1862**	**1890**
2007	0.0	0.0	0.3	0.0
2008	0.0	0.0	0.3	0.0
2009	0.0	0.0	0.3	0.0
2010	0.0	0.0	0.3	0.0
2011	0.0	0.0	0.3	0.0

Outputs for the Program

13. Activity (What will be done?)

Manuscripts will be submitted to peer reviewed journals. Presentations will be given at regional, national and/or international meetings. Grant proposals will be submitted. There will be training of undergraduate students, graduate students and/or postdoctoral fellows. Beetles of several species will be trapped locally. Hemolymph will be taken at designated times and during a reproductive bout and will be analyzed using radioimmunoassay for juvenile hormone titers.

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

Extension	
Direct Method	**Indirect Methods**
- Other 1 (Field Researh) - Other 2 (Laboratory research)	- TV Media Programs - Other 1 (Peer reviewed publications)

15. Description of targeted audience

Target audience will include students in university classrooms and K-12, and various stakeholder groups. For indirect contacts, each of the projects will continue to have websites, submit peer review publications and present at regional, national or international conferences. Scientists in behavioral ecology or behavioral endocrinology.

16. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	50	50	0	0
2008	50	50	0	0
2009	50	50	0	0
2010	0	0	0	0
2011	0	0	0	0

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	0
2008	0
2009	0
2010	0
2011	0

18. Output measures

Output Text

Peer Reviewed Publications

2007	Target:	3
2008	Target:	1
2009	Target:	1
2010	Target:	0
2011	Target:	0

Output Text

Chapters in Books

2007	Target:	1
2008	Target:	0
2009	Target:	0
2010	Target:	0
2011	Target:	0

Output Text

Non peer reviewed publications including abstracts

2007	Target:	1
2008	Target:	1
2009	Target:	0
2010	Target:	0
2011	Target:	0

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text

Peer Reviewed Publications

Outcome Type: Long

2007 Target: 3

2008 Target: 1

2009 Target: 1

2010 Target: 0

2011 Target: 0

Outcome Text

Increase in knowledge

Outcome Type: Short

2007 Target: 100

2008 Target: 0

2009 Target: 0

2010 Target: 0

2011 Target: 0

20. External factors which may affect outcomes

- Natural Disasters (drought,weather extremes,etc.)

Description

Natural disaster such as drought or floods would adversely affect the project.

21. Evaluation studies planned

- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)

Description

During each project, data are analysed and research evaluated. Comparison of treatments using common statistical tests at regular intervals. Juvenile hormone titers are compared.

22. Data Collection Methods

- Sampling
- Other (Physiology and Field Studies)

Description

Physiological and Field techniques will be used including behavioral assays and experiments and radioimmunoassays.

1. Name of the Planned Program

Plants & Plant Products

2. Program knowledge areas

- 212 Pathogens and Nematodes Affecting Plants 5 %
- 201 Plant Genome, Genetics, and Genetic Mechanisms 20 %
- 206 Basic Plant Biology 15 %
- 205 Plant Management Systems 10 %
- 136 Conservation of Biological Diversity 5 %
- 204 Plant Product Quality and Utility (Preharvest) 5 %
- 202 Plant Genetic Resources 15 %
- 203 Plant Biological Efficiency and Abiotic Stresses Affecting Plants 10 %
- 211 Insects, Mites, and Other Arthropods Affecting Plants 10 %
- 216 Integrated Pest Management Systems 5 %

3. Program existence

- Mature (More then five years)

4. Program duration

- Long-Term (More than five years)

5. Brief summary about Planned Program

Project 1: This project seeks to identify genetic mechanisms involved in plant responses to DNA damage in the model plant Arabidopsis thaliana. Project 2: This project will determine whether plants have a generalized response to abiotic stress at the cellular and tissue level of organization. Project 3: This project will take a multi-disciplinary approach to plant breeding, production, integrated pest management, and shipping of vegetatively propagated young plants for horticulture. Project 4: This project aims to identify cultivars of fruit and vegetable varieties that are well adapted to NH. Project 5: This project will investigate the role of iron deficiency in reducing the effectiveness of anti-oxidant systems in photosynthesis and over photosynthesis itself. Project 6: The primary objective of this project is to improve eating quality in cultivars of Cucurbita pepo squash, while at the same time maximizing the yield potential. Project 7: This project investigates ways to modify container production systems for northern nurseries that will lower production costs and improve profitability. Project 8: This project is using molecular techniques to identify the taxonomy of the commercially important seaweed, Porphyra.

6. Situation and priorities

Project 1: To better understand ways to improve crops in response to abiotic stress such as DNA damage. Project 2: This study will deal with a little studied aspect of stress response--that is cell and tissue structural responses. It will further our overall understanding of plant responses to stress and will perhaps affect the direction of plant breeding for enhanced resistance to various abiotic stresses. Project 3: Ornamental plant production and landscaping are the major agricultural sector in NH. Vegetatively-propagated genetics are one of the fastest-growing areas within that industry. Project 4: To attain ecological and economic sustainability, NH fruit and vegetable growers must minimize crop production costs and maintain high crop quality and yields. Applied NH-based agricultural research is needed to identify crops, crop varieties, and production practices that are best suited to these conditions. Project 5: Iron scarcity in the oceans is one of two major limiting factors in primary productivity at the bottom of the food chain. The role of iron in both increasing and ameliorating oxidative stress is poorly understood. Project 6: Squash together with pumpkin are the second leading vegetables in New England in terms of production acreage. Current popular acorn cultivars being used by growers lack acceptable eating quality. Project 7: By developing better production systems in nurseries and over-wintering techniques, local production costs can be reduced and profitability increased, resulting in better local availability of appropriate landscape plants. Project 8: Native species may be useful for aquaculture.

7. Assumptions made for the Program

Project 1: To find new mechanisms in plants involved in responses to abiotic stress. Arabidopsis will serve as an excellent model system for crop species. Project 2: Different detection pathways will converge on a very limited number of cytological and tissue structural responses. Project 3: New plant genetics will be introduced to industry. Greenhouse production and shipping will be more efficient and with less negative environmental impacts. Project 4: Funding will remain constant or increase. Project

5: It is hypothesized that iron deficiency will adversely affect the key anti-oxidant enzymes superoxide dismulase, catalase, and ascorbate peroxidase and will also produce depletion of the key substrates ascorbic acid and vitamin E. Project 6: Recent studies have demonstrated the relationship of harvest period and storage to changes in attributes of eating quality. Newly developed hybrids with powdery mildew resistance have much superior eating quality to available commercial cultivars. Project 7: Sustained growth in housing and development maintains high demand for landscape plants. Research results in a more economical method for over-wintering container-grown plants. Project 8: There are many more species of Porphyra than have been previously described.

8. Ultimate goal(s) of this Program

Project 1: Better crops, better understanding of the genetic mechanisms of plants. Project 2: To understand the involvement of cell and tissue structural changes in responses to plant stress and eventually the mechanisms by which those changes are effected. Project 3: To improve profitability of greenhouse production of young plants, increase plant quality for the consumer, and reduce runoff and other negative impacts of agriculture on the environment. Project 4: To identify NH-adapted fruit and vegetable varieties and growing practices that help NH fruit and vegetable growers innovate and remain profitable. Project 5: To allow meaningful predictions of the quantitative effects of iron limitation on net primary productivity due to oxidative stress. How much ocean's productivity could be increased without extreme iron deficits can be estimated. Project 6: The introduction of new cultivars of acorn squash and adoption of these by growers should dramatically increase the demand for a very nutritious vegetable. Project 7: To modify production systems for nursery crops, resulting in lower production costs and more profitability for northern nurseries. Project 8: To sort out the taxonomy of Porphyra species native to the Northeast, and to identify the presence and source of non-native invasive species.

9. Scope of Program

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

Inputs for the Program

10. Expending formula funds or state-matching funds

- Yes

11. Expending other then formula funds or state-matching funds

- Yes

12. Expending amount of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	**1890**	**1862**	**1890**
2007	0.0	0.0	1.2	0.0
2008	0.0	0.0	1.2	0.0
2009	0.0	0.0	1.2	0.0
2010	0.0	0.0	1.2	0.0
2011	0.0	0.0	1.2	0.0

Outputs for the Program

13. Activity (What will be done?)

For all projects: Manuscripts will be submitted to peer reviewed journals. Presentations will be given at regional, national and/or international meetings. Grant proposals will be submitted. There will be training of undergraduate students, graduate students and/or postdoctoral fellows. There will be development and maintenance of websites. Presentations will be made to various traditional and non-traditional stakeholders. Project 1: This project will identify genetic mechanisms involved in plant responses to DNA damage. Project 2: This project will provide information to plant breeders who are interested in abiotic stress in plants. Project 3: Research nutrition, lighting and temperature during propagation; identify effective and low-impact controls of borytis in shipping and fungus gnats during production; investigate genetics of Nolara, Anagallis, and Browallia and develop new cultivars. Project 4: Evaluate newly developed cultivars of vegetable and fruit crops to identify those that well adapted to NH. Evaluate season extension techniques to expand the number of crops that can be grown profitably in NH or that expand growing seasons of existing crops. Project 5: This project will determine the role of iron deficiency during photosynthesis. Project 6: Vegetable twilight meetings; grower meetings; extension bulletins; seed catalogs; and seed samples to selected growers. Project 7: Conduct field trials and demonstrations leading to improved nursery production systems. Disseminate results of research to growers through seminars and publications. Project 8: Diverse coastal habitats for all porphyra species will be sampled. Morphology and DNA sequences will be compared to holotype specimens from international herbaria. New species will be formally described.

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

Extension	
Direct Method	**Indirect Methods**
- Education Class - Workshop - Group Discussion - One-on-One Intervention - Demonstrations - Other 1 (Laboratory research)	- Newsletters - Web sites - Other 1 (Peer reviewed publications) - Other 2 (Meetings; industry trade magazin)

15. Description of targeted audience

Target audience will include students in university classrooms and K-12, and various stakeholder groups. For indirect contacts, each of the projects will continue to have websites, submit peer review publications and present at regional, national or international conferences. Other researchers and scientists in the appropriate discipline. Project 3: All greenhouse growers in the US and cutting producers overseas. Project 7: Nursery owners/managers/growers/extension educators in the state and region.

16. Standard output measures

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

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2007	1210	10340	5	0
2008	1460	10490	10	20
2009	1610	10990	10	20
2010	960	10990	10	0
2011	960	10990	10	0

17. (Standard Research Target) Number of Patents

Expected Patents	
Year	Target
2007	2
2008	2
2009	2
2010	2
2011	2

18. Output measures

Output Text

Peer-reviewed publications

2007	Target:	7
2008	Target:	7
2009	Target:	8
2010	Target:	9
2011	Target:	5

Output Text

Chapters in Books

2007	Target:	1
2008	Target:	0
2009	Target:	0
2010	Target:	0
2011	Target:	0

Output Text

Non-peer reviewed publications including abstracts

2007	Target:	16
2008	Target:	17
2009	Target:	15
2010	Target:	13
2011	Target:	13

Outcomes for the Program

19. Outcome measures

Outcome Text: Awareness created

Outcome Text
Peer Reviewed Publications

Outcome Type: Short

2007 Target: 7

2008 Target: 7

2009 Target: 8

2010 Target: 9

2011 Target: 5

Outcome Text

Number of Graduate Students Trained

Outcome Type: Short

2007 Target: 4

2008 Target: 4

2009 Target: 4

2010 Target: 3

2011 Target: 3

Outcome Text

Number of Undergraduate students trained and/or performing investigations

Outcome Type: Short

2007 Target: 5

2008 Target: 5

2009 Target: 5

2010 Target: 5

2011 Target: 5

Outcome Text

Number of presentations/posters at regional, national or international conferences or workshops

Outcome Type: Short

2007 Target: 12

2008 Target: 12

2009 Target: 12

2010 Target: 8

2011 Target: 8

Outcome Text

Change in Knowledge in field

Outcome Type: Medium

2007 Target: 1000

2008 Target: 1000

2009 Target: 1000

2010 Target: 1000

2011 Target: 1000

Outcome Text

Growers improve water & fertilizer use

Outcome Type: Medium

2007 Target: 150

2008 Target: 150

2009 Target: 150

2010 Target: 150

2011 Target: 150

Outcome Text

Growers improve fungus gnat management

Outcome Type: Long

2007 Target: 300

2008 Target: 300

2009 Target: 300

2010 Target: 300

2011 Target: 300

Outcome Text

Growers improve borytis management

Outcome Type: Long

2007 Target: 50

2008 Target: 100

2009 Target: 100

2010 Target: 100

2011 Target: 100

Outcome Text

Growers adopt new genetics or new technology

Outcome Type: Long

2007 Target: 1500

2008 Target: 1500

2009 Target: 500

2010 Target: 500

2011 Target: 500

Outcome Text

No. of farmers learning about new vegetable varieties

Outcome Type: Medium

2007 Target: 100

2008 Target: 150

2009 Target: 150

2010 Target: 150

2011 Target: 150

Outcome Text

No. of farmers learning about new fruit varieties

Outcome Type: Medium

2007 Target: 0

2008 Target: 0

2009 Target: 100

2010 Target: 100

2011 Target: 100

Outcome Text

No. of farmers learning about season extension

Outcome Type: Medium

2007 Target: 150

2008 Target: 150

2009 Target: 150

2010 Target: 150

2011 Target: 150

20. External factors which may affect outcomes

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

Description

One or more factors may adversely or improve the outcome of the project.

21. Evaluation studies planned

- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)

Description

During each project, data are analyzed and research is evaluated. Project 2: Comparisons between osmotic and mechanically stressed sunflower leaves versus non stressed controls. Project 3: Annual meetings with organizations and companies that serve multiple growers to review the impacts of our projects. Project 4: Surveys and interviews at multiple points before, during and after program. Project 6: New hybrids will be tested in experimental plots for fruit yield, quality attributes, partitional biomass and population density. Project 7: Plant response to production system modification; personal obervation and informal survey of stakeholders to indicate adoption of new practices. Project 8: Number of species of Porphyra known before study versus those known after.

22. Data Collection Methods

- Sampling
- Whole population
- Case Study
- Observation
- Journals
- Other (Molecular, cellular, biochemical)

Description

Standard laboratory methods/techniques in genetics and molecular biology are employed for two of the projects such as DNA sequencing and PCR. Other projects use one or more of the following techniques: physiological; cellular; microscopy;

greenhouse; on-farm trials; laboratory research; measurement and observation of agronomic variable in controlled field experiments; determination of biomass and quality and nutritional factors of cultivars; carbohydrate analyses of root samples; electrolyte leakage assays; and morphological measurements.