Massachusetts Agricultural Experiment Station & UMASS Extension

FY 2006 Annual Report

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2006 Plan of Work Addendum

Certification:

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Dr. Steve Goodwin, Associate Director Date
Massachusetts Agricultural Experiment Station

_____ _____

Mr. Robert Schrader, Interim Director Date
UMass Extension

Summary

The Massachusetts Agricultural Experiment Station at the University of Massachusetts in Amherst is currently administered through the College of Natural Resources and the Environment. The director is Dean of the College Cleve Willis and the Associate Director is Steve Goodwin who oversees the day to day management of the station. The Massachusetts Agricultural Experiment Station at the University of Massachusetts in Amherst is reporting on 20 Multistate Research Projects, which have an integrated component to Extension. Several other projects are not reported on in this annual report due to the fact that they have not yet reached a degree of maturity and will be reported on in subsequent years. The stakeholder input on research projects derives from integration with Extension and the past year has seen extensive efforts to more fully incorporate that input into the research efforts. Stakeholder issues include those elements such as land use, marketing and economic development use of chemicals, production and management technologies, labor, child and elder care, food safety, food sanitation, regulations and good manufacturing practices, poverty, hunger, agrochemicals, public knowledge and education, global markets and the environment, land vs. population, and children, youth and families at risk. While all of the projects presented have some impact on the needs of the under-served and under-represented populations of the Commonwealth, several projects, MAS00882**,** NE-1012**,** MAS00916, NE-1023**,** MAS00886**,** NC-1002**,** NC-1011, MAS00886**,** NC-1011**,** MAS00876**,** and MAS00926 specifically targeted the under-served and under-represented populations of the State.

*Please note that goals were chosen for projects using the crosswalk designed for CRIS.

UMass Extension is currently administered through the office of the Vice-Provost for University Outreach and Continuing Education, Sharon Fross, with faculty and staff in the School of Public Health and Health Sciences, and the College of Natural Resources and the Environment.

UMass Extension is reporting on selected programs, as described by Program Area Directors, team and project leaders. UMass Extension continues to be challenged by University-wide budget cuts, as a result of the overall Commonwealth budget situation. The UMass Extension Board of Public Overseers continues to give leadership to overall program direction. Appointed by the Governor, this Board meets every six-eight weeks.

Planned Programs

Programs and Project Impacts Listed by Goal

Goal 1

An agricultural system that is highly competitive in the global economy

Key Themes:

Adding Value to New and Old Agricultural Products
Agricultural Competitiveness
Agricultural Profitability
Animal Genomics
Animal Health
Animal Production Efficiency
Aquaculture
Biobased Products
Biofuels
Biotechnology
Bioterrorism
Diversified/Alternative Agriculture
Emerging Infectious Diseases
GIS/GPS
Grazing
Home Lawn and Gardening
Innovative Farming
Invasive Species
Managing Change in Agriculture
New Uses for Agricultural Products
Niche Market
Organic Agriculture
Ornamental/Green Agriculture
Plant Genomics
Plant Germplasm
Plant Health
Plant Production Efficiency
Precision Agriculture
Rangeland/Pasture Management
Risk Management
Small Farm Viability
Tropical Agriculture
Urban Gardening

Agency	Total Dollars	FTEs	MSR Projects/Programs	MSR Dollars
MAES	$1,028,022	17.2	9	$231,482
UMEXT	$1,060,370	14.5	12	$14,676

Goal 1 Executive Summary –

Emphasis in Goal 1 remains directed towards apple and cranberry production. Research efforts directed towards reducing the reliance on pesticides for the production of these crops has resulted in a net reduction of 250,000 gallons of spray materials used in Massachusetts in 2006, which represents a 70% reduction in the pesticide use. Research efforts directed towards more conservative nutrient management strategies to make cranberry production more competitive and reduce pollution have led to the initiation of a revised set of best management practices for the cranberry industry. Our efforts in wine grapes have led to a coordination of research and outreach efforts within Massachusetts and are rapidly expanding to the other New England states. Within the green industry efforts have been initiated to target Spanish speaking audiences. Finally, the coordination efforts of the Massachusetts Center for Agriculture has been leveraged a $3.2 million commitment from the state for agricultural innovation.

Key Theme: Agricultural Profitability

Title of Program/Project: Rootstock and Interstem effects on pome and stone fruit trees
Contact Person: Autio, W., Greene, D., Cooley, D. (MAS00539)
Brief Description of Program/Project: Global competition increases the need for enhanced efficiency of orchard businesses. Rootstocks dramatically affect efficiency and fruit quality, but results vary greatly with climate and pest pressure. Further, new rootstocks are becoming available regularly, thus potentially enhancing efficiency. This project evaluates the performance of tree-fruit rootstocks with a variety of climates, pest pressures, cultivars, and training system in order to enable orchardists to develop orchards with the greatest likelihood of economic success and least likelihood of environmental damage.
Short Impact: Approximately 250 acres were planted to dwarfing rootstocks during the last year. All rootstock recommendations are based on the results of this project, and growers rely heavily on those recommendations when selecting the proper scion/rootstock combinations. These rootstocks, will reduce pruning and harvest labor by 50%, increase fruit quality, increase size by 10-20%, and enhance the economic return on this acreage by as much as 50%. Further, smaller trees require 70% less pesticide because of reduced canopy volume. The net effect of the planting in 2006 is to reduce the amount of spray material in total by about 250,000 gallons per year in Massachusetts. The beneficiaries of this year's research are tree-fruit growers and the citizens of the Commonwealth.
FTE's: .5
Source of Funding: Massachusetts Fruit Growers' Association, Inc., International Dwarf Fruit Tree Association, Hatch Multistate NC-140, Smith-Lever 3b & c
Scope of Impact: Multistate Extension/Research: MA, RI, NH, VT, ME, CT at other growing areas of Northeastern US and Eastern Canada, Industry

Key Theme: Agricultural Profitability
Title of Program/Project: Maximizing Yield and Value of Muscle Tissue Foods, Especially Fish
Contact Person: Hultin, H.O. (MAS00834)
Brief Description of Program/Project: Using a new isolation method based on differential solubilization of muscle components, this research will improve techniques for isolating functional proteins from low value raw materials with minimal contamination of undesirable components. Many muscle sources have low value because the proteins are difficult to isolate or have poor functional properties due to handling procedures or the presence of other muscle components.
Short Impact: Our technology of recovering proteins from low value by-products has been adopted by the seafood and meat industries for the purposes of enhancement of their products. Our technology allows this to be done without the use of phosphates which are generally looked on unfavorably by the consuming public. Four processing plants in the U.S. and one in Europe are under construction to commercially implement this technology in 2007.
FTE's: .6
Source of Funding: Hatch
Scope of Impact: State, Industry

Key Theme: Animal Genomics
Title of Program/Project: Interpreting Cattle Genomic Data: Biology, Applications and Outreach

Contact Person: Jerry, J. (MAS00873, NC-1010)
Brief Description of Program/Project: Nuclear transplantation provides robust means to create transgenic livestock rapidly. However, facile methods to introduce targeted alterations in the bovine genome are needed to take full advantage of this technical advance. Toward this goal we are developing strategies to interrupt cellular pathways that inhibit homologous recombination. Using these methods it should be possible to move genetic polymorphisms that affect production between breeds.
Short Impact: Gene targeting in bovine somatic cells remains an extremely laborious process. We have generated tools to screen cells to select individuals that support highest rates of gene targeting.
FTE's: .5
Source of Funding: Hatch, Multistate, NIH Grant
Scope of Impact: AZ, AR, CA, IL, IO, KY, MA, MI, MN, MS, NC, OH, SD, TN, TX, VT, WI

Key Theme: Animal Health
Title of Program/Project: Implication of Adam related Metalloprotease in horse laminitis
Contact Person: Alfandari, D. R.; Black, S.
Brief Description of Program/Project: Laminitis affects a large number of horses worldwide and often results in the death of the animal. This project examines the role of proteases in the development of horse laminitis, so that treatments with inhibitors of proteases may be use.
Short Impact: We have cloned 9 new genes in horses that can be used to test the level of inflammation and the progression of horse laminitis before it becomes obvious (lamness). We also provide new techniques to study gene expression in horse laminae. Our study suggest that genes responsible for arthritis in human may play a critical role in horse laminitis and therefore that drugs developed to control arthritis could be used in laminitis
FTE's: .5
Source of Funding: Hatch, Industry, NIH, Grants
Scope of Impact: State, Industry

Key Theme: Animal Health
Title of Program/Project: Transcriptional Regulation of female fertility and sexual behavior
Contact Person: Good, D. (MAS00884)
Brief Description of Program/Project: An understanding of the molecular events controlling estrous is necessary for effective management of dairy & beef cattle herds. Since the use of cows in molecular analyses is difficult, we use the Nhlh2 transcription factor knockout mice, which are hypogonadal with reduced fertility and GnRH peptide levels to examine fertility and the transcriptional and post-transcriptional regulation of GnRH.
Short Impact: Breeding programs have responded to consumer demands for meat quality for years but it is only recently that breeders have been able to use genetic markers to select for meat quality. The work in this project has translated work using mice into knowledge in an agriculturally-important species, cattle. The bNHLH2 gene is located within a quantitative trait locus for marbling in beef cattle, and we have identified several polymorphisms in the high fat Wagyu strain of cattle. Further analysis of these polymorphisms should help basic biologists as well as the cattle industry understand and correlate single nucleotide polymorphisms with body fat, marbling and fertility. These data promise to determine whether the bNHLH2 gene should be used as a genetic marker in controlled breeding programs, and have provided the basic

knowledge on the expression, regulation and function of a newly identified bovine gene.
FTE's: 1.1
Source of Funding: Hatch, Grant
Scope of Impact: State

Key Theme: Animal Health
Title of Program/Project: Runx1 in Hematopoiesis
Contact Person: Telfer, J**.** (MAS00859)
Brief Description of Program/Project: Mammals make different kind of T cells, with differing functions. It is not understood how the production of these different types of T cells is regulated. This project examines the mechanisms by which one protein turns genes off and on during T cell development, which has the potential to regulate T cell production.
Short Impact: My research addresses how a particular protein turns off or on genes that encode other proteins that are important in the formation of the cells of the blood. We study how a mutant form of this protein affects the stem cells of the blood and how the activity of this protein is regulated. This is important because understanding how the activity of the protein is regulated will enable us to devise treatments for diseases like myelodysplasia (30,000 new cases per year) and to expand customized blood stem cells for bone marrow transplants for diseases like leukemia, AIDS, and diabetes.
FTE's: .2
Source of Funding: Hatch, NSF Grant
Scope of Impact: State

Key Theme: Aquaculture
Title of Program/Project: Establishment of Zebrafish Bioassay Technology for Assessing the Acute, Developmental & Reproductive Toxicity of Toxaphene & Water Samples
Contact Person: Arcaro, K. (MAS00862)
Brief Description of Program/Project: Protection of aquatic ecosystems and drinking water supplies is one of the great environmental challenges facing us and future generations. This project examines the usefullness of zebrafish bioassays for the detection of aquatic pollution.
Short Impact: Bioassays are valuable tools to detect the presence of bioactive compounds in source water that have a potential to harm human health. Of particular concern are pharmaceuticals with estrogenic activity. The assays we have optimized are ideal for detecting hormonally active compounds in water. We are presently collaborating with a local company to detect estrogenic compounds in effluent.
FTE's: .3
Source of Funding: Hatch, Grant
Scope of Impact: State

Key Theme: Biotechnology
Title of Program/Project: WC1 & Bovine Gamma Delta T Cell Activation
Contact Person: Baldwin, C. L. (MAS00851)
Brief Description of Program/Project: Cattle have large numbers of white blood cells known as gamma delta T cells and which have a unique cell surface molecule known as WC1. Our preliminary data showed that monoclonal antibodies that bind to bovine WC1 induce or inhibit

bovine T gamma delta cell proliferation in vitro depending on the concentration of antibody used. Thus, we postulate that the natural ligand(s) for WC1 regulates bovine T cell function in vivo either through direct stimulation, or by acting as co-stimulatory molecules. We hypothesize that the ligand for BoWC1 will enhance responses by bovine T cells if the level of expression is sufficient and moreover that expression of the ligand will be increased on cells at inflammatory sites due to their activation. The identification of this WC1 ligand will provide additional insight into the regulation of gamma delta T cell function in cattle. Our objectives are to: First, clone and sequence the gene coding for the bovine WC1 ligand, make recombinant protein of this ligand and monoclonal antibodies reactive with the ligand. Second, determine if the recombinant ligand (as soluble molecule or transfected into cells) or monoclonal antibodies to the ligand affect responses by bovine gamma delta T cells. Third, evaluate the level of expression of the WC1 ligand in resting and activated cells and in normal and inflamed tissue using the monoclonal antibodies and gene probes..

Short Impact: Understanding how to activate gamma delta T cells will allow us to exploit this knowledge to generate more effective vaccines or to induce innate immune responses when needed to combat unknown pathogens. This is particularly relevant with the current threat of biowarfare agents. We have found that the WC1+ gamma delta T cells are the first to respond to antigen following vaccination and thus may influence the development of the response by other T cell subpopulations such as CD4 T cells.

FTE's: .3

Source of Funding: Grant, Hatch

Scope of Impact: State

Key Theme: Invasive Species

Title of Program/Project: Molecular Systematics and Molecular Identification of Armored Scale insects (Diaspididae)

Contact Person: Normark, B. (MAS00839)

Brief Description of Program/Project: Armored scale insects have a simplified anatomy and are hard to tell apart, but they have many strange and interesting forms of reproduction, including natural cloning. This project involves determining the DNA sequence of a few genes from many species of armored scale insects. This information could be useful for identifying these insects (including eggs and larvae, which cannot now be identified) and for understanding the consequences of natural cloning and other unusual reproductive systems.

Short Impact: This project successfully launched the molecular study of armored scale insects. Many of these are important and highly invasive pests and thanks to this project we now have molecular tools to identify them (including previously unidentifiable stages such as eggs, immatures, and males) and infer major features of their evolutionary history. The project generated critical preliminary data that helped to secure $850,000 in competitive federal grants to expand the data set, and helped to launch the careers of five graduate students.

FTE's: .4

Source of Funding: Hatch, Grant

Scope of Impact: State

Key Theme: Invasive Species

Title of Program/Project: Alternative Management Systems for Plant – Parasitic Nematodes in Horticulture and Field Crops

Contact Person: Wick, R. (MAS00917)
Brief Description of Program/Project: Plant parasitic nematodes cause decline of turf in golf greens. Fenamiphos, the only registered nematicide will not be available after 2005. Natural suppression of nematodes and biorational materials will be evaluated as a means of controlling nematode populations
Short Impact: Golf course superintends will know that sesame products and neem-based products are not reliable for controlling plant parasitic nematodes in golf greens.
FTE's: .2
Source of Funding: Hatch, Multistate
Scope of Impact: AL, CT, FL, GA, MA, MI, NY, OH, RI, TN, WV

Key Theme: Managing Change in Agriculture
Title of Program/Project: Integration of Agricultural Research and Extension in a Center for Agriculture
Contact Person: Goodwin, S., Cromack, P. (MAS00853)
Brief Description of Program/Project: This proposal is part of the operational plan for the Center, and formalizes funding that targets high-priority issues in agriculture, integrating both research and Extension components, and where possible involves other states. Funding through the Experiment Station will be matched by funding from Extension, and the money will be used to initiate joint sub-projects.
Short Impact: The Center for Agriculuture is coordinating the response of Massachusetts Agricultural Experiment Station members to the newly established Massachusetts Agricultural Innovation Center. The $3.2 million center was established by the Massachusetts State Legislature this past year. The Center for Agriculture has continued coordination efforts between MAES, UMass Extension, Massachusetts Department of Agricultural Resources and NRCS and has expanded to include the key commodity and "buy local" groups within the state. The Center participated in two state-wide listening sessions in conjunction with UMass Extension.
FTE's: .1
Source of Funding: Hatch, Extension
Scope of Impact: State

Key Theme: Niche Market
Title of Program/Project: Biology and management of flea beetle species in traditional and newly introduced Brassica crops
Contact Person: Hazzard, R., Van Driesche, R., Mangan, F. (MAS00889)
Brief Description of Program/Project: Expanded production of new Brassica crops that are highly susceptible to flea beetle damage has increased the pest status of flea beetles and created a need for better understanding and management of this pest. The purpose of this study is to understand more about the biology of flea beetles in relation to brassica crops and develop effective and safe ways to manage them.
Short Impact: Over 250 farmers have received information about flea beetle biology and management in four presentations made at educational programs in New England. Growers are reporting increased use of both between-season and in-season rotation in order to reduce infestations of spring and late summer planted crops.
FTE's: .2
Source of Funding: Hatch, Extension, Grant

Scope of Impact: State

Key Theme: Niche Market
Title of Program/Project: Development of a research and education program for Small-scale, sustainable viticulture and enology in Massachusetts
Contact Person: Cooley, D.; Coli, W.; Schloemann, S.; Greene, D.; Autio, W.; Clements, J.; Averill, A.; Caruso, F.; Sandler, H.; Weiss, J.; Hollingsworth, C. (MAS008533)
Brief Description of Program/Project: Fruit producers in Massachusetts are looking for new crops and products to improve profitability and maintain viability. This project identifies sites in Massachusetts that are best adapted for the production of wine grapes, tests wined grape cultivars at research and farm sites, and develops capacity to do enological research at the University.
Short Impact. Massachusetts presently has 35 vineyards and 29 wineries generating over $6.5 million in sales, and all indications are that this is increasing rapidly. In Massachusetts, wine making serves as both an end in itself and also as a large contributor to agri-tourism. We expect project activities to greatly impact the management activities of these businesses and their cohorts in other New England states. The 16 issues of the project newsletter reached 145 people. This project held 2 educational sessions at the December 2005 New England Fruit and Vegetable Conference (120 in attendance) and 4 vineyard meetings to deliver current information on sustainable practices to local wine grape growers (total attendance 118). Over 80% of attendees rated the meetings as very useful and said they learned one or more things at the meetings that they would implement at their farms. This project cooperates with a SARE project documenting present production practices for New England wine grape growers by collecting detailed information from 77% of total commercial wine grape growers. This data provides clear direction for impact potential for the project and will allow documentation of change. As part of establishing a MA Wine Council, this project is cooperating to develop a New England Wine Grape Growers Association including113 vineyards and wineries.
FTE's: .2
Source of Funding: Hatch, Extension
Scope of Impact: State

Key Theme: Plant Genomics
Title of Program/Project: Genetic Improvement of Floricultural Crops
Contact Person: Boyle, T. H. (MAS00827)
Brief Description of Program/Project: Continued growth in sales of floricultural crops requires the introduction of improved cultivars of existing crops. The purpose of the project is to utilize three Schlumbergera species in an interspecific hybridization program with S. truncata (Thanksgiving cactus) to increase the genetic diversity of the gene pool.
Short Impact: One of the critical procedures in most crop breeding programs is production of high-quality seed. Due to labor and time constraints, breeders aim to maximize their efficiency at obtaining seed for further breeding efforts or hybrid seed production. One factor that can affect the yield of viable seeds is the timing of pollen arrival on stigmas. Pollen grains arriving on immature or aged pistils may fail to set fruit or, if fruit set does occur, few viable seeds are produced. Determining the flower age when maximum seed set occurs will lead to greater efficiency in pollination and maximize seed yields.
FTE's: .5

Source of Funding: Hatch, Industry
Scope of Impact: State

Key Theme: Precision Agriculture
Title of Program/Project: The effect of flooding practices on resource availability in the culture of the American Cranberry
Contact Person: DeMoranville, C., Vanden Heuvel, J. (MAS00875)
Brief Description of Program/Project: Fruit set in cranberry is extremely low, likely due to carbohydrate stress. This project examines the effect of flooding practices on carbohydrate status and yield of cranberry vines.
Short Impact: Optimizing flood conditions in cranberry will reduce carbohydrate losses in uprights and roots, resulting in increased energy available for fruit production. This will allow cranberry growers to increase yield without increasing inputs on bogs.
FTE's: .4
Source of Funding: Hatch, Industrial Grant
Scope of Impact: State, Industry

Key Theme: Precision Agriculture
Title of Program/Project: Cranberry Nutrient Mangement
Contact Person: DeMoranville, C., Vanden Heuvel, J.
Brief Description of Program/Project: Nutritional factors may be limiting sustainable cranberry production in Massachusetts due to environmental constraints and lack of knowledge regarding lowest effective rates and interaction with plant physiology. The focus of this project will be to evaluate nitrogen and phosphorus nutrition in order to develop recommendations that improve cranberry crop yields while minimizing environmental impact.
Short Impact: Based on preliminary findings, the MA NRCS State Office has developed nutrient management standards for MA cranberry farms. Growers following these standards are eligible to participate in USDA environmental cost-sharing programs. Further information developed in this project will be used to modify and improve cranberry nutrient management standards, incorporating appropriate soil testing methods. Nutrient management BMPs will be revised within the next year in cooperation with farm groups. Community groups have been engaged in this process as well and have joined with the BMP development group to seek funding to conduct educational programs for farmers and community members once the revised BMPs are completed.
FTE's: .6
Source of Funding: Hatch, Industry
Scope of Impact: State, Industry

Key Theme: Agricultural Profitability
Title of Program/Project: Last-chance Chemical Thinning of Apples
Contact Person: Wesley R. Autio
Brief Description of Program/Project: Apple growers utilize chemical approaches to remove significant portions of bloom or young fruitlets each year, allowing for annual production and the development of acceptable fruit size. This process is fraught with difficulty caused by annual variation in trees' susceptibility to the plant growth regulators as well as weather. Existing approaches can work for up to three weeks after bloom, but after that point, growers are limited to hand removal of fruitlets, a very time-

consuming and expensive process. One chemical approach (ethephon) is used in other climates more than three weeks after bloom, but our weather conditions have made it very difficult to develop recommendations for the use of this chemical in New England. This project aims to study new approaches to the use of ethephon in New England to provide growers with a late alternative chemical-thinning treatment.

Short Impact:
It is estimated that approximately 1,000 acres of apples are hand thinned in Massachusetts each year. The cost of hand thinning, therefore, is approximately $700,000 annually. The successful use of ethephon as an alternative could reduce this cost by about $600,000 annually.

Source(s) of Funding: Massachusetts Fruit Growers' Association

FTE's: 0.25

Scope of Impact: Multistate Integrated Research & Extension - CT, ME, MA, NH, RI, VT

Key Theme: Plant Production Efficiency; Agricultural Profitability; Integrated Pest Management

Title of Program/Project: NC-140 – Evaluation of Pome- and Stone-fruit Rootstocks

Contact Person: Wesley R. Autio

Brief Description of Program/Project: Research is conducted at the local, regional, national, and international level to assess apple and peach rootstock characteristics and determine best practices rootstock utilization. Massachusetts participates in 10 long-term rootstock experiments. Nine are located at the University of Massachusetts Cold Spring Orchard Research & Education Center in Belchertown, MA, and one is at Clarkdale Fruit Farm in Deerfield, MA.

Short Impact: Approximately 250 acres were planted to dwarfing rootstocks during the last year. These rootstocks, as defined and recommended by this project, will reduce pruning and harvest labor by 50%, increase fruit quality, increase size by 10-20%, and enhance the economic return on this acreage by as much as 50%. Further, smaller trees require 70% less pesticide because of reduced canopy volume. The net effect of the planting in 2004 was to reduce the amount of spray material in total by about 250,000 gallons per year in Massachusetts.

Source(s) of Funding: Massachusetts Fruit Growers' Association, International Dwarf Fruit Tree Association, Hatch RRF NC-140, Smith-Lever 3b/c

FTE's: 0.25

Scope of Impact: Multistate Integrated Research & Extension - CT, ME, MA, NH, RI, VT and other NC-140 cooperators

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Key Theme: Sustainable Agriculture

Title of Program/Project: Increasing sustainability of Massachusetts cranberry production through cultural management of the bog habitat

Contact Person: Anne Averill

Brief Description of Program/Project: This project is part of the plan: "Enhancing sustainability of cranberry production". In order to preserve the MA cranberry industry, growers need access to information regarding reduced cost management options and how these can integrate into their current management. A critical area of concern identified by the industry, is the expense of the sanding practice used for plant renewal and stand management. Sand is expensive and non-renewable. A major portion of this project is dedicated to examining the possibility of substituting pruning for sanding either entirely, or to extend the interval between

sanding events. Project beneficiaries will improve the environment on their farms, managing resources wisely while not sacrificing production. To evaluate progress, we will survey growers at beginning and end of the project to determine change in practice. Demonstration sites will be established at grower farms and a replicated study will be conducted by a UMass graduate student. A large number of growers (240) attended a presentation to describe the project, 186 of them participated in the initial survey. Five growers have provided demonstration sites for project research.

Short Impact: In 2006 we surveyed 186 growers regarding sanding and pruning management practices. Interesting highlight of survey responses included:
Ice sanding is the industry choice for canopy renewal -- 93% have used this practice in the past 5 years; 73% sand their bogs every 3 years; 63% have beds that they sand but never prune while only 9% have beds that they prune but never sand. Pruning is a part of canopy management for a larger than expected number of growers -- 58% have beds that have been both pruned and sanded; 15% intentionally alternate the practices. Growers use both practices for similar reasons -- primarily for growth management/enhancement followed by pest management and light penetration.

These responses are encouraging, since a primary part of the demonstration research in this project involves inserting a pruning into a sanding regimen to extend the intervals between sanding (to reduce costs and use of non-renewable resources).

Demonstration sites to compare the integration of pruning into a sanding cycle have been established at 10 grower farms. To date, the pruning treatment had variable impacts of crop yield, with 50% of sites having increased yield with pruning (compared to unpruned areas of the same beds), 40% having lower yield and 10% having similar yield in treated and untreated areas. The replicated study of sanding and pruning showed that both sanding and pruning had variable effects on yield in the year of treatment depending on the intensity of treatment (depth of sand or amount of prunings removed). So variable impacts in the demonstration sites may relate to intensity of pruning (determined by the grower at that property).

Source of Funding: State, SARE grant

FTE's: 1.0

Scope of Impact: State (MA), Potential for implementation in other cranberry growing regions, particularly WI and NJ

Key Theme: Sustainable Agriculture, IPM

Title of Program/Project: Management of key cranberry insects

Contact Person: Anne Averill

Brief Description of Program/Project: This project is part of the plan: "Enhancing sustainability of cranberry production". In order to preserve the MA cranberry industry, growers need access to information regarding IPM and how it can integrate into their current management. A critical area of concern identified by the industry, is development of new tools to sample and manage insects. (1) Focus on the new pests, blackheaded fireworm (BHF) and winter moth. *Assessment of moth flight BHF*: Sex pheromone traps were deployed at two managed and two unmanaged beds and in their surrounding woods to monitor 1st -generation flight. Peak flight occurred ca. June 19th. Very small numbers were captured off-bog. There was low 2nd generation flight in August at all sites, likely owing to flooding at unmanaged sites and effective sprays at managed sites. *Larval sampling techniques BHF*: At five sites, sweep net sampling more effectively detected infestations of BHF. Direct observations, used widely in Canada and

WI, were inadequate; yellowheaded fireworm and *Sparganothis* larvae were confounding at the unmanaged sites. Larval patchiness within bogs was very high; thus, sampling must be intensive to detect this insect. Summer sampling showed excellent control with timed sprays, but even on abandoned sites, populations remained low (perhaps due to June flooding). There was no evidence of a 3rd generation. *Natural enemy survey BHF*: Ten percent of larvae collected produced parasitoids; IDs are pending. *Pest status of winter moth*: Early-season sweep net data from six bogs detected winter moth. However, gypsy moth sprays in May also eliminated winter moth and confounded the survey. (2) Focus on Cranberry fruitworm. This insect is the most troublesome in MA cranberry owing to annual pressure. Conventional insecticides are widely used. *Screening*: Trials with reduced-risk, environmentally-friendly compounds in the lab and field all showed high activity. These were: Cmpd (1) BASF BAS 320, metaflumizone (Na channel modulator) (2) Bayer NNI0001, flubendiamide (Ca balance at ryanodine receptor) and (3) DuPont E2Y, rynaxypyr (Ca balance at ryanodine receptor). Lab tests resulted in over 91 and 98% dead larvae on Cmpds (2) and (3), respectively, and 78% on (1). Cmpd (3) showed activity against eggs. We worked to move Cmpd (2) into the IR-4 queue for 2007. In replicated, large-field plots under high gallonage, BAS 320, diazinon (conventional industry standard), DuPont HGW and E2Y (3 rates low, medium, and high) were evaluated. E2Y at all rates and HGW performed equally as well as diazinon; BAS320 did not. *Trap development*: Insects were supplied for collaborative work with C. Rodriguez-Saona (Rutgers); several compounds isolated from blueberry (a fruitworm host) flowers, leaves, and fruit showed high antennal activity, particularly of females. We are in the process of submitting a NE-IPM proposal for 3 yr of funding to develop monitoring traps for this insect. *2006 assessment of sites with significant 2005 crop losses to fruitworm*: We monitored three sites in 2006 using sex pheromone traps, fruit sampling, and crop phenology. At two of the sites, pressure was very high, with egg populations exceeding threshold levels for the majority of the season. Under such conditions, the pest's equilibrium position must be lowered, e.g through late water, since it is not cost effective to spray all season. *Cultural management tactics*: Several thousand larvae (overwintering stage) were deployed under various sand depth/trash treatments to determine winter mortality. Survivors will be assessed in Spring '07. *Cultivar trials*: Time to develop and larval weight of individuals established in fruit of Ben Lears, Stevens, Early Blacks or Howes were quantified. Development time was significantly longer (2-4 days) on Howes than others; however, larval weight was significantly (10 mg) higher for Howes than Early Blacks.

Short Impact: Results were presented at an annual management update at which 255 growers attended. Information is currently being integrated into the 2006 Cranberry Chart Book—Management Guide for Cranberries.

Source of Funding: State, Hatch, UDDA-CAR grant, Cranberry commodity

FTE's: 1.0

Scope of Impact: State (MA), Potential for implementation in other cranberry growing regions, particularly WI and NJ

Key Theme: IPM, Sustainable Agriculture

Title of Program/Project: Research-based Extension support to Southern New England wine grape growers

Contact Person: Anne Averill

Brief Description of Program/Project:
This project is part of the plan: "Enhancing sustainability of cranberry production". While this

plan is primarily cranberry-focused, we are beginning an initiative to bring research-based Extension support to the Southern New England wine grape industry. This is an industry that is growing in importance in Southeastern Massachusetts but that has had little Extension support until recently. Part of the rationale for this project is the potential for economic development of SE Massachusetts as a wine destination. A recent survey of Southern NE grape growers showed that adoption of IPM and other best practices was inadequate primarily due to lack of access to good research-based management recommendations. This project is intended to provide that information, allowing grape production to be more efficient and sustainable. Primary activities conducted this year in support of this goal were a research project designed to determine management practices that can increase fruit phenolics and a series of educational events to provide information to growers. The participants in the project were grape growers in MA, RI, and CT.

Short Impact: Research was conducted at 6 grower farms. Data were collected and are being processed. Scouting services and on-farm educational support were provided to 9 farms. Three workshops were held for Southern New England Grape Growers: March 15, (Westport, MA) July 13 (Little Compton, RI), and August 29 (Stonington, CT) covering a range of topics including disease management, canopy management, and sprayer technology. Approximately 35-50 people attended each workshop. Practical information was presented by regional experts who were invited to attend (travel supported by SARE Grant). Powerpoint presentations and other fact sheets with photos were uploaded to the New England Wine Grape web site (http://www.newenglandwinegrapes.org/index.php)and published in the weekly extension newsletter, which is distributed electronically via listserve.

Source of Funding: Smith Lever, SARE Grant

FTE's: 0.4

Scope of Impact: Multistate Research, Integrated Research and Extension (MA, CT, RI)

Key Theme: Agricultural Profitability

Title of Program/Project: Soil and Plant Nutrition/Soil Testing

Contact Person: Allen V. Barker and Steven Bodine

Brief Description of Program/Project: The University of Massachusetts Soil and Plant Tissue Testing Laboratory provides services in soil testing, plant tissue analysis, and compost analysis. New instrumentation includes a new and more versatile and powerful ICP Spectrometer, a nitrogen auto-analyzer, and a new digital report sender. Integration of new software technologies has been an important aspect in providing services to clients public and academic sectors. The Laboratory is contacted directly by farmers, members of agricultural industries, and other individuals who need analyses of soils, plant materials, fertilizers, and composts. The Laboratory supports extension educators and faculty in their conduct of research and outreach in agriculture. Over time, due to attrition of extension educators, the Director of the Laboratory has assumed advisory functions that were formerly handled by the educators. This responsibility has become a major endeavor in the Laboratory. The Laboratory has absorbed this function and has retained its efficiency in usual analytical services.

Short Impact:
Procurement of equipment and acquiring direct experience with modern analytical technologies have allowed the Laboratory to remain up-to-date and able to provide the services needed in today's expanding demands for information concerning soil fertility and food safety. The Laboratory provides economical analytical services to the entire Commonwealth. The summary

of tests listed below present the activities in soil, plant, and media analysis by the Laboratory in 2006.

Summary of Tests (2006)

Standard Soil Test	12,000
Soil Organic Matter	6,500
Soil pH only	800
Soil Grain Size Analysis	1000
Compost w/Nitrogen	400
Greenhouse Media	300
Plant Tissue w/Nitrogen	500
Total Soil Nitrogen only	200
Plant Tissue Nitrogen only	250
Soluble Salts	900

Source of Funding: Fees, State

FTE's: 0.8 FTE Smith Lever; 2.75 FTE Soil Lab Trust Fund

Scope of Impact: State (Massachusetts) Agriculture, Environmental Protection

Key Theme: Natural Resource Based Economic Development

Title of Program/Project: Enhancing Environment Sustainability And Economic Viability of Massachusetts Landscapes and Nurseries

Contact Person: Kathleen Carroll

Brief Description of Program/Project: According to the USDA, the horticulture (landscape, nursery, floriculture) industry is the fastest growing sector of American agriculture today. In Massachusetts there are more that 4200 firms, with an estimated 28,000 full time jobs with a total estimated gross income of $1.86 B. The Massachusetts Landscape and Nursery industry holds a highly visible position in Massachusetts urban society especially with the growing awareness of the environmental, physical and economic benefits of the industry.

There is daily exposure of the public to street trees, lawns, gardens, residential landscape and parks. It is imperative that landscapers, grounds managers, nursery growers and arborists understand and implement ecological practices including proper plant selection, insect, disease and weed identification and management while sustaining economic viability. Using proper management practices can enhance the urban environment, maintain profitability while minimizing the impact of pesticide and fertilizer materials on employees, the public and natural resources. Workforce development and trained labor is also a critical need and serious problem for the Green Industry.

Another challenge for the industry is the responsibility to protect Massachusetts landscapes from destructive pathogens, pests and plants. Intentional or unintentional introduction of exotic pests or pathogens into the Northeast region including weeds, insects and diseases cause extensive damage to ecosystems and annual yield losses to crops. Federal and state agencies monitor U.S. borders for plant pest introductions and watch for pest outbreaks throughout the nation. Still, new pests do slip past the defenses and enter the country. A national plant diagnostic network has been established to provide a 'first detector' system for identification of agro-terrorists

threats and reporting pest problems. It is imperative that landscape professionals in Massachusetts, who are in the landscape on a daily basis, learn to identify, report and manage these pests and plants properly. Through extension educational efforts, landscapers and grounds managers will identify pests early before economic and environmental damage has reached devastating levels.

Short Impact:
Target Audiences
- learned about ecological practices including proper plant and site selection, insect, disease and weed identification and management of landscapes.
- learned integrated pest management strategies.
- learned how to protect themselves from exposure to potentially harmful substances.
- learned how to use best management practices to reduce the risk of adverse environmental impact.
- learned how to identify pests and manage nutrients in the most environmentally appropriate manner.
- Spanish speaking employees were trained in proper horticultural practices.
- will begin to become aware of the environmental and economic damage caused by the identified invasive plants and avoid planting these "pests".
- will implement integrated pest management practices and reduce pesticide use.

Source of Funding: Smith Lever, State, county, fees, contracts

FTE's: 4.8

Scope of Impact: State (MA)

Key Theme: Forest Resources Management

Title of Program/Project: High Grade Harvesting: Understand the Impacts, Know Your Options /Forest Resource Conservation

Contact Person: Paul Catanzaro and Tony D'Amato (Graduate Student)

Brief Description of Program/Project:
Developed a landowner outreach publication based on a literature review of the impacts of diameter limit harvesting and high grading. http://www.masswoods.net/pdf/High_Grade_Harvesting.pdf. Publication was written to help landowners make informed decisions, forest community to better understand the true impacts of high grading, and policy makers to make informed decisions regarding regulating silvicultural practices.

Short Impact:
Approximately 750 Distributed Statewide. Pending funding, we hope to survey foresters working with landowners to determine the impact of the publication.
The topics covered in the publication include:
1. Forest Management options and likely impacts
2. Importance of non-industrial, private forests to the well-being of the commonwealth
3. Contact information for assistance in decision-making
4. Latest theory and techniques of sustainable natural resource management including: water quality, wildlife, and timber management.
5. Private forest and agricultural landowners make informed decisions about their land based on accurate information regarding their options and likely consequences
6. Businesses adopt sustainable resource management approaches and utilize best management

practices
7. Policy makers base decisions on a scientific understanding of the issues

Source of Funding: State, Smith Lever, MA Rural Development Council and MA Bureau of Forestry

FTE's: .15

Scope of Impact: State (MA)

Key Theme: Forest Resources Management

Title of Program/Project: MassWoods /Forest Resource Conservation

Contact Person: Paul Catanzaro

Brief Description of Program/Project: **MassWoods.net** (http://www.masswoods.net) The website focuses on delivering information to landowners throughout the Commonwealth who are making a decision to either sell their timber and/or planning the future of their land. The site features an image map which provides contact information for the local service forester, land trusts, and conservation organizations on a town basis. In addition, the site features a gallery of "Conservation Cases", detailing stories from across the state of how landowners have protected their land through various diverse and creative ways. The latest "Case of Conservation" posted on MassWoods was developed as a video which can be viewed on-line or downloaded as a Podcast. Unlike the Mass ACORN project, this site has a statewide scope, and depends less on the focus of local relevance, and more on opportunities and information applicable throughout Massachusetts.

Short Impact: Launched in February 2006, we have almost a full year's worth of data. Monitoring of the site is done through Site Meter Plus software which enables us to determine the impact of the site, including: number of visits, visit lengths, number of page views, the pathway the visit took to the various pages, and how visitors found the site.

MassWoods has had 4,846 visitors. An average of 23 per day. The Neilson Web Ratings estimates that the average visit length to a website is approximately: 35 seconds. MassWoods has an average visit length of 3:31 seconds after a year. On average, there are over 3 page views per visit. The most commonly visited sections on MassWoods include: finding land trust and foresters by town, "how to sell timber" pages and "planning the future of your land" pages and "cases of conservation". Through an analysis of IP addresses as well as conversations with our target audiences, we know that MassWoods is used by landowners, government agencies, conservation organizations and town officials.

Topics covered on MassWoods include:
1. Forest Management options and likely impacts
2. Land protection and estate planning options
3. Role of NIPF land in a larger landscape
4. Importance of non-industrial, private forests to the well-being of the commonwealth
5. Contact information for assistance in decision-making
6. Importance of information sharing/networking/cooperative management

Source of Funding: Smith Lever 3d, state

FTE's: .20

Scope of Impact: State (MA)

Key Theme: Forest Resources Management

Title of Program/Project: Woods Forums/Forest Resource Conservation

Contact Person: Paul Catanzaro

Brief Description of Program/Project: Woods Forums are based on the premise that local owners have much to learn from one another about their woods and their experiences, and these opportunities will serve to stimulate such learning. Bringing together local woodland owners, as well as conservation professionals, to share information and experiences can also create an informal, local network of contacts to help provide information at crucial decision making times.

A brief presentation customized for each target area is presented at the beginning by Dave Kittredge, State Extension Forester, and Paul Catanzaro, Forest Resources Specialist, to provide background information and foster discussion. The Woods Forum is brought to a close by a short summary presentation.

Specifically, these are not "workshops" at which landowners are "students" who are there to "learn" or be "taught" something by someone. Instead, these events or forums are organized to stimulate a discussion forum in which landowners can ask their questions and get answers from both neighbors and professionals. The discussion forum also encourages landowner interaction with local land trusts and conservation organizations.

Short Impact:
Three Forums completed:

Total number of people reached: 52

Two Woods Forums evaluated:

Overall rating of this program 1 – 5 (1= Poor – 5 = Excellent):
4.33, 4.69

Total Acreage of Landowners in Attendance:
1,287, 1,537

Presentation and discussion topics include:
1. Forest Management options and likely impacts
2. Land protection and estate planning options
3. Role of NIPF land in a larger landscape
4. Importance of non-industrial, private forests to the well-being of the commonwealth 5. 5. Contact information for assistance in decision-making
6. Importance of information sharing/networking/cooperative management
7. Nature of NIPF ownership patterns
8. Private forest and agricultural landowners make informed decisions about their land based on accurate information regarding their options and likely consequences

Source of Funding: Smith Lever 3d and MA Rural Development Council

FTE's: .15

Scope of Impact: State (MA)

Key Theme: Agricultural Competitiveness; Agricultural Profitability; Integrated Pest

Management
Title of Program/Project: Education/outreach activities for commercial tree fruit growers in Massachusetts
Contact Person: Jon M. Clements; Wesley R. Autio
Brief Description of Program/Project 'Twilight' meetings were held on a seasonal basis throughout Massachusetts to update tree fruit growers on current integrated (pest and horticulture) orchard management strategies. An annual 'New England Fruit & Vegetable Conference' was held that included invited speakers with expertise in horticulture, pest management, and marketing. The 'Healthy Fruit' newsletter was published and distributed 22 times during the growing season with timely integrated orchard management information. The periodical 'Fruit Notes' was published with research results pertinent to Massachusetts and New England fruit growers. The UMass 'Fruit Advisor' website was continuously updated with meeting notices, publications, articles, fact sheets, and video. Approximately 1,000 grower contacts (email, mail, telephone, on-site) were made on an as-needed basis for problem diagnosis and horticulture/pest consulting or recommendations.
Short Impact: It is estimated that over 90% of the 200+ commercial tree-fruit growers (Massachusetts and regional) were recipients of program/project information via education/outreach activities. Total meeting attendance was over 1,500. 'Healthy Fruit' and 'Fruit Notes' have subscriptions of 180 and 250 respectively. Site/grower visits were important to analyze and advise on specific, local needs. No data are available on use of the UMass 'Fruit Advisor' website, however, increasing e-mail subscriptions to 'Healthy Fruit' suggests grower use of technology as an information resource is increasing. Altogether, as evidenced by strong meeting attendance and publication subscriptions, the importance of program/project information to Massachusetts fruit growers to make integrated orchard management decisions to protect the environment and human health while remaining profitable is clear. Tree fruit growers in Massachusetts have consistently cited extension as vital to the continued sustainability of the local industry.
Source(s) of Funding: State, Smith Lever, fees
FTE's: 0.50
Scope of Impact: Multistate Extension

Key Theme: Agricultural Profitability; Plant Production Efficiency
Title of Program/Project: Evaluation of new peach varieties in a high-density peach orchard system
Contact Person: Jon M. Clements
Brief Description of Program/Project From 2000 through 2006, two high-density peach orchard of new, numbered and named peach varieties were established at the UMass Cold Spring Orchard in Belchertown, MA. The training system, called the 'perpendicular-V,' purportedly allows early production of high quality fruit on easily managed trees, however, it is unproven in Massachusetts. Newer peach varieties have higher color and in some case preferable fruit quality to more commonly grown peaches, however, again their adaptability – particularly cold hardiness and disease-resistance – has yet to be evaluated in Massachusetts. Many of these varieties, as well as some numbered sweet cherry varieties, are being evaluated under an agreement with the International Plant Management Testers Network.
Short Impact: These peach orchards have already been used for several pruning demonstrations. Data has been collected on harvest date and fruit quality of these peaches as the

trees start cropping. Ongoing evaluation of fruit quality, yield, and pruning requirements will prove useful to Massachusetts growers wishing to invest in modern peach orchards and new varieties to capitalize on the high prices received for direct-market, local peaches. Evaluation of numbered variety selections as part of the International Plant Management Testers Network will prove valuable in making available to growers new peach varieties that are adapted to local growing conditions. Results have been or will be reported in 'Fruit Notes.'

Source(s) of Funding: State, Grant

FTE's: 0.05

Scope of Impact: State (MA)

Key Theme: Agricultural Competitiveness; Agricultural Profitability; Plant Production Efficiency

Title of Program/Project: Evaluation of sweet cherry cultivars on dwarf rootstocks for direct-market and pick-your-own orchards

Contact Person: Jon M. Clements

Brief Description of Program/Project A sweet cherry orchard with twelve cultivars on two dwarf rootstocks was planted at the UMass Cold Spring Orchard in 2001. Objectives of the research are to evaluate the hardiness, productivity, fruit quality, and adaptability of these cherry varieties under Massachusetts conditions. New dwarf rootstocks are being evaluated because they have the potential to create easily harvested, pick-your-own orchards. Data on tree growth and ease of training have already been recorded, and, in 2006, fruit quality and yield data were collected. Results were reported to fruit growers in extension publications and during grower meetings/field days.

Short Impact: The sweet cherry orchard has been a stop at grower field days. Several growers have toured the orchard and hence established dwarf sweet cherry orchards of their own. Already, some insight into which varieties may perform better under local conditions has been gleaned, and a clear difference in tree size between the two rootstocks has been observed. In 2006, a heavy crop was produced. Information gained from this block is vital in helping Massachusetts growers decide whether diversifying into sweet cherries is a good investment in their orchard business plan.

Source(s) of Funding: State, Massachusetts Fruit Growers' Association

FTE's: 0.05

Scope of Impact: State (MA)

Key Theme: Agricultural Competitiveness; Agricultural Profitability; Plant Production Efficiency

Title of Program/Project: Evaluation of very high density apple orchard training systems

Contact Person: Jon M. Clements

Brief Description of Program/Project

In 2002 a 0.3 ha block of apples was planted at the UMass Cold Spring Orchard using the super-spindle orchard system. 600 trees (15 cultivars) on three dwarfing rootstocks are planted at a spacing of app. 0.7 X 3.0 m. Annual data on yield and fruit quality have been collected. In 2006 another 0.3 ha block of apples on three rootstocks and two cultivars (Honeycrisp McIntosh) was planted with the specific objective of comparing the cost, yield, and fruit quality of three modern training and pruning systems with the most locally popular cultivars and rootstocks.

Short Impact: The super-spindle apple planting (2002) has already been the site of several

pruning and training demonstrations. Several growers in Massachusetts have already adopted this very modern, high-density apple growing system. Fruit Notes articles are pending. The 2006 planting is too young to provide any useful information.
Source(s) of Funding: State, Industry grants, UMass Cold Spring Orchard Horticultural Research/Trustees Fund
FTE's: 0.05
Scope of Impact: State (MA)

Key Theme: Agricultural Competitiveness; Agricultural Profitability, Innovative Farming, Integrated Pest Management
Title of Program/Project: Integrated and Sustainable Wine Grape Production in Southern New England
Contact Person: William Coli; Sonia Schloemann; Hilary Sandler; Arthur Tuttle
Brief Description of Program/Project The principle goal of this project is to work with commercial wine grape growers on research and demonstration of components of a crop and pest management system that will, when adopted, improve economic viability, maintain and enhance environmental quality, and protect worker and consumer health. Growers have expressed a strong interest in field-testing a number of specific, sustainable tactics. In order to meet this need, the project conducted a baseline survey from which to measure change, implemented on-farm trial of reflective mulches for enhancing interception of solar radiation and thereby accelerating fruit ripening, and conducting grower meetings to deliver needed training to growers on better management practices.
Short Impact: This project has documented baseline practices for New England Wine Grape Growers in order to establish a benchmark from which to measure changes by collecting detailed information from 77% of total commercial wine grape growers in the region providing clear direction for impact potential for the project in subsequent years. In FY06 the project conducted 6 meetings to deliver current information on sustainable practices to local wine grape growers (total attendance 280). Research results on reflective mulch trials, Grape Berry Moth management using mating disruption, and improved disease management strategies have been generated and reported on at meetings and in appropriate publications. This project manages a website for the purpose of delivering locally useful production information and enhanced communication among growers and between growers and resource providers (www.newenglandwinegrapes.org)
Source(s) of Funding: USDA Northeast SARE, State
FTE's: 0.30
Scope of Impact: Multistate Integrated Research & Extension - CT, ME, MA, NH, RI, VT

Key Theme: Agricultural Competitiveness; Agricultural Profitability, Innovative Farming, Niche Markets
Title of Program/Project: Development of a Research and Education Program for Small-Scale, Sustainable Viticulture and Enology in Massachusetts
Contact Person: Daniel Cooley, Schloemann, S., Greene, D., Autio, W., Clements, J., Coli, W.
Brief Description of Program/Project Primary tasks in 2006 were the care of a new grape planting at the University of Massachusetts Amherst Cold Spring Orchard (CSO), completion of the GIS study to identify potential vineyard sites in the state, and the development an advisory board/Wine Council to advocate for the industry. In addition, vineyards in Massachusetts and

southern New England were scouted regularly to identify pest problems and to implement sound IPM strategies. Grower education meetings were also held. The 0.5 ha vineyard at CSO was trained to a trellis, pruned, irrigated, and weeded. Grass alleys were established between rows. 2007 will be the first fruiting year. A prototype model for analyzing potential vineyard sites in Massachusetts using GIS was developed, and applied to most regions of the state. An advisory group of growers from Massachusetts and other southern New England states met to review the project and to discuss the development of a Massachusetts Wine Council. Alliances were formed with the MA cranberry growers' association and with grape growers and wine-makers in Connecticut. Weekly scouting of 9 blocks of 'Chardonnay' grapes in commercial vineyards by UMASS researchers was accompanied by consultation with growers. Information from this along with weather data and weather-based disease risk information (using 4 Spectrum weather stations) was published weekly by email as 'New England Grape Notes'. Volume 1 had 16 issues and 145 subscribers. The newsletter also provided educational materials and news pertinent to IPM and sustainable grape growing. Project members are helping to develop a website, newenglandwinegrapes.org, which will be linked to the seasonal weekly newsletter and is designed to enhance communication between growers and researchers in the region. A small-scale wine making facility is being planned at CSO. Space needs are being determined and an appropriate space with temperature control has been identified. Equipment is being priced for purchase in winter 2007. A group of growers interested in planting grapes was identified. Project co-investigators are working with them to help identify best sites, cultivars, and training systems. An intensive workshop was conducted on November 2, 2006 to introduce 55 new and prospective wine grape growers to best methods for establishing a new vineyard. The project provided 2 educational sessions at the December 2005 New England Fruit and Vegetable Conference as well as 4 wine grape growers meetings with invited speakers in southern New England during 2006. Topics included 'Ripe rot management', 'Use of reflective mulches for wine grapes', 'Grape canopy management', 'Veraison disease management', and 'Spray technology for grapes'. Members from the team have established research plans with the University of Connecticut and the broader regional project, NE 1020. Based on this, we have ordered 7 grape clones to be planted in 2008 and evaluated in conjunction with other NE 1020 cooperators. These clones will be planted at CSO.

Short Impact: Massachusetts presently has 35 vineyards and 29 wineries generating over $6.5 million in sales, and all indications are that this is increasing rapidly. In Massachusetts, wine making serves as both an end in itself and also as a large contributor to agri-tourism. We expect project activities to greatly impact the management activities of these businesses and their cohorts in other New England states. The 16 issues of the project newsletter reached 145 people. This project held 2 educational sessions at the December 2005 New England Fruit and Vegetable Conference (120 in attendance) and 4 vineyard meetings to deliver current information on sustainable practices to local wine grape growers (total attendance 118). Over 80% of attendees rated the meetings as very useful and said they learned one or more things at the meetings that they would implement at their farms. This project cooperates with a SARE project documenting present production practices for New England wine grape growers by collecting detailed information from 77% of total commercial wine grape growers. This data provides clear direction for impact potential for the project and will allow documentation of change. As part of establishing a MA Wine Council, this project is cooperating to develop a New England Wine Grape Growers Association including113 vineyards and wineries.

Source(s) of Funding: Smith Lever, State

FTE's: 0.50

Scope of Impact: Multistate Integrated Research & Extension - CT, ME, MA, NH, RI, VT

Key Theme: Integrated Pest Management

Title of Program/Project: Sustainable Vegetable Production and Marketing

Contact Person: M. Bess Dicklow

Brief Description of Program/Project: Diagnostic services for vegetable growers were in complete disarray in the Spring of 2005 due to financial constraints. A new, integrated (with Urban Forestry) Diagnostic Clinic was equipped, set up, organized, and stocked. Billing and data systems were integrated. Without proper identification of disease problems, nutrient disorders, phytotoxicity, environmental issues, or insect infestations, growers are unable to make correct management decisions. This situation endangers natural resource-based economic development, human health, and ecosystem management, protection, and restoration. The Diagnostic Clinic provides disease diagnosis, pathogen identification, and detailed management recommendations with an emphasis on best management practices and biorational alternatives to traditional pesticides. A total of 1,178 samples of various commodities passed through the lab; 43 vegetable specimens were invoiced. Samples submitted by Extension agents, University faculty and staff, and some homeowners are not included in that total. Numerous telephone calls and e-mails from growers and home gardeners in regards to vegetable diseases were answered. Information was also delivered to commercial growers and home gardeners:

- Edit the 2006-2007 edition of the New England Vegetable Recommendation Guide
- Contribute to Vegetable Notes.
- Contribute Fact Sheets to Vegetable Program website.
- Attend High Quality Brassica Project meetings.
- Present at Mass Aggie Seminar.
- Present at New England Vegetable and Berry Growers Association meeting.

Short Impact: Natural resource-base businesses learn disease management tactics that are environmentally sustainable and economically viable. Growers learn research-based best management practices related to water, soil, air, and integrated pest management. Agricultural businesses learn to accurately identify insects, diseases, and weeds; as well as, the importance of correct diagnosis of plant problems in pesticide use. Commercial growers and the gardening public learn sustainable resource management approaches and best management practices that protect water resources and environmental quality.

Source of Funding: Smith Lever, Hatch, State, fees.

FTE's: 0.2

Scope of Impact:
Multi-state Extension: MA, RI, CT, VT, NH, NY, ME

Key Theme: Agricultural Profitability, Plant Production Efficiency

Title of Program/Project: Chemical thinning of apples with benzyladenine (MaxCel)

Contact Person: Duane W. Greene

Brief Description of Program/Project: An experiment was designed to evaluate the effectiveness of MaxCel alone and in combination with carbaryl on Macoun. Macoun is an important variety in New England but it is difficult to thin and fruit size is frequently small. We wanted to find out not only the effect of concentration on thinning efficacy but also the effect of the timing of the application of carbaryl. MacCel also increases fruit size independently of the thinning response. Unlike most years, no carbaryl application resulted in thinning. When combined with MaxCel, carbaryl had no additional thing effect. This experiment emphasizes the importance of using more than one thinner, since a thinning failure would result in small fruit and poor return bloom.

Short Impact: There are a limited number of chemical thinners available to growers, especially those that can be classified as strong thinners. A down side of using relatively strong thinners is that over thinning may occur and fruit size may be reduced. MaxCel by itself increases fruit size. Based upon recent work it appears that severe over thinning is less likely and more predictable with MaxCel and this observation proved true this past year.

Source(s) of Funding: State, Valent Biosciences

FTE's: 0.05

Scope of Impact: State (MA)

Key Theme: Agricultural Profitability, Plant Production Efficiency

Title of Program/Project: Early prediction of chemical thinning response on apples

Contact Person: Duane W. Greene

Brief Description of Program/Project

Growth of fruit slows well in advance of the time they ultimately abscise. A method is being developed where fruit on representative spurs are selected and fruit growth measured. Spurs are tagged and fruit within the spur are numbered before thinner application. Measurement should not start until fruit reach a size of 6 mm. Fruit are measured at 2 to 3 days intervals. Under normal circumstances fruit start to respond to thinners 3 to 4 days after application and growth responses can be detected within 7 days. If temperatures are cool it will require a longer time period. Accumulation of 130 to 140 heating degree units (base 50 F) appears to be required in these cooler seasons to measure a response. Fruit are predicted to abscise if growth rate falls below 50% of the growth rate of fruit that persist to harvest. The percent fruit predicted to abscise 7 days after thinner application, or when 130 to 140 heating degree units have accumulated is used as a basis for deciding whether to apply a supplemental thinner.

Short Impact: If apple trees are allowed to overset fruit will be small and return bloom will be reduced, thus drastically reducing returns for two years. Thinners are applied to reduce crop load but results are not known, at the earliest 2.5 to 3 weeks after application, and this is too late to chemically reduce crop load. This method will allow growers to predict and apply supplemental thinners early enough so that fruit can be chemically thinned while fruit are still susceptible to thinning treatments.

Source(s) of Funding: State, Washington State Tree Fruit Research Commission

FTE's: 0.15

Scope of Impact: Multistate Research & Extension - MA and NY

Key Theme: Agricultural Profitability, Plant Production Efficiency

Title of Program/Project: Influence of CPPU on fruit abscission and fruit quality of McIntosh apples.

Contact Person: Duane W. Greene

Brief Description of Program/Project

CPPU is a cytokinin, a group of plant growth regulators that increases fruit size. It is currently being used commercially to increase the size of kiwi and grapes. It is known to increase fruit size in apple and also cause some fruit abscission. Accompanying the increased fruit size is a large increase in the number of asymmetrically shaped fruit. The erratic thinning and the tendency to cause asymmetrical fruit may limit its usefulness as a commercial compound. The asymmetry is cause by a lack of mobility of CPPU in the plant. Two approaches were used to reduce asymmetry; using a very effective silicone surfactant and apply CPPU is a smaller volume, thus reducing droplet size on the fruit. In experiments done this past year it was confirmed that CPPU could cause fruit asymmetry but use of a surfactant with CPPU that was very effective at reducing surface tension resulted in less asymmetry. Also making application with smaller more concentrate droplets reduced asymmetry. These treatments did not reduce the effectiveness of CPPU to increase fruit size.

Short Impact:

The major factor limiting the use of CPPU on apples is the increased asymmetry. The treatments used here did reduce this tendency thus opening the door for possible registration of this compound on apples to increase fruit size.

Source(s) of Funding: State, BASF Corporation

FTE's: 0.05

Scope of Impact: State (MA)

Key Theme: Agricultural Competitiveness, Agricultural Profitability, Integrated Pest Management

Title of Program/Project: NE-183 Multidisciplinary Evaluation of New apple Cultivars

Contact Person: Duane W. Greene

Brief Description of Program/Project

New and promising apple cultivars were propagated and distributed and planted in 28 different sites in 20 states and provinces. They are being evaluated for horticultural characteristics, taste, and susceptibility to insect and disease damage. Protocols were established by a subcommittee to insure that all data collected was done uniformly and over all sites.

Short Impact:

Trees in this project are now in production. We are now getting a sense of which cultivars will be the most precocious, high yielding, best tasting and disease resistant cultivars. It cost thousands of dollars to establish a new orchard. Information gathered here will allow growers to select the best and most appropriate cultivars to plant in a specific location, in our case, Massachusetts. Information gathered in this project will take the guess work of variety selection and potentially save growers many dollars by weeding out inappropriate cultivars that will not perform well in our environment.

Source(s) of Funding: Hatch, State, and industry

FTE's: 0.25

Scope of Impact: Multistate Research & Extension - CT, ME, MA, NH, RI, VT and other NE-183 cooperators

Key Theme: Aquaculture
Title of Project: Western Massachusetts Center for Sustainable Aquaculture
Contact Person: Hollingsworth, C.
Brief Description of Program/Project: Aquaculture is a growing industry worldwide. While the industry is small in Massachusetts, several new enterprises have begun in the last few years, indicating the potential for more successful enterprises. Small growers, operating independently are well positioned to benefit from an extension program that can provide a focal point for information. The UMass Extension Aquaculture Project is funded through a state grant, which established the Western Massachusetts Center for Sustainable Aquaculture (WMCSA). WMCSA supports and promotes the development of the finfish aquaculture industry in the state of Massachusetts by facilitating industry expansion and by educating the public about the opportunities and benefits of aquaculture. Educational programs on presentations and demonstrations to small farmers on pond aquaculture, presentations to fish farmers on fish health and to teachers and to school groups on aquaculture. A website (http://www.umass.edu/aquaculture/) provides links to relevant technologies and provides information on sources of fish within the state. Applied research was conducted on cage culture methods, predator mitigation and the vaccination of Atlantic salmon for furunculosis. Throughout the past year, during a period of personnel transition, the WMCSA has worked to reestablish contacts and relationships with the Massachusetts aquaculture industry and federal and state agencies, including US Fish and Wildlife Service, US Geological Survey, Mass. Department of Agricultural Resources and Mass. Division of Fish and Game.
Short Impact: A number of audiences learned about finfish aquaculture and its potential in the Commonwealth (Two talks to the Northeast Organic Farmers Association: 50 people). Growers learned about pond construction (twilight meeting attendance, 20) and management of fish health (fish health seminar attendance, 330. Publication of *Best Management Practices for Finfish Aquaculture* assisted growers throughout the state in evaluating their facilities (published copies sent to 30 growers) The WMCSA supported the transition of the Berkshire Hatchery into a volunteer-run hatchery of trout and Atlantic Salmon. School children (25) in Berkshire County participated in spawning of rainbow and brown trout. The program assisted a ten growers in technical and marketing problems. Two new aquaculture facilities in Barnstable and Franklin Counties went into operation this year with significant support by WMCSA.
Source of Funding: State, contract
FTE's: 1.3
Scope of Impact: State (MA)

Key Theme: agricultural profitability, innovative farming, niche market, pesticide application
Title of Program/Project: New Crop Production and Marketing
Contact Person: Frank Mangan
Brief Description of Program/Project: This project was part of the Sustainable Vegetable Production & Marketing Plan. Target project outcomes: 1. Food producers will adopt research-based Best Management Practices related to

water, soil, air, and integrated crop and animal management practices. 2. Individuals who use pesticides will adopt practices that lower their risk from and exposure to pesticides and fertilizers 3. Food producers will improve production efficiencies through education, technology transfer, and by adopting new and innovative practices. 4.Food producers will increase profitability through improved post harvest efficiencies, packaging, and marketing techniques. 5. Commercial farmers and food producers will pursue a broader range of sales and marketing opportunities. 6. Sales of products and services that are grown or produced in Massachusetts will increase

Research and Extension activities were developed and implemented to evaluate 43 different varieties of vegetable crops for new and expanding markets. Crop evaluation took place at the UMass Research Farm and on commercial farms. A focus was placed on these crops:

Abóbora japonesa (*Cucurbita maxima X C. moschata*). This is the most important hard squash used in the Brazilian cuisine throughout the county.
Maxixe (*Cucumis anguria*). This vegetable, very similar to cucumber (*Cucumis sativus*), is thought to have originated in Africa.
Taioba (*Xanthosoma sagittifolium*) Taioba is the leaf of tannia (*Xanthosoma sagittifolium*). This plant is originally from South America and is very similar in growth and appearance to taro (*Colocasia esculenta*) which is from Southeast Asia.
Kabocha (*Cucurbita maxima) C. maxima* was originally introduced to Japan by Portuguese traders in the mid 16th century. The word *kabocha* is thought to have originated from the Portuguese word for pumpkin, *abóbora*.
Aji dulce (*Capsicum chinense).* This is a small, light green pepper that turns red if left long enough on the plant. In Puerto Rico, it is known as *ají dulce* or *ajicito* (sweet pepper and small pepper, respectively, in Spanish).
Chipilin (*Crotalaria longirostrata)* Chipilín is a leguminous plant that is used as an herb in Central America and Southern Mexico. It is a perennial that can be grown as an annual in temperate climates. It is used in soups and in making the corn dough for *pupusas*, a type of tortilla popular in Central America.
Pipián (*Cucurbita mixta).* Pipián is originally from the tropical Americas. The fruit is harvested and used when immature. The mature, larger fruit is used for seed, both for propagation and for consumption. The seed is open-pollinated, and thus there is tremendous variation in the phenotypes.

A marketing campaign was developed and implemented to evaluate marketing strategies and the demand at target markets for specific crops.

Short Impact: Sustainable production and management strategies for these crops have been developed and refined and made available to commercial farmers via personal communications, presentations and the web (umassvegetable.org and worldcrops.org).

Project personnel worked directly with target markets in Massachusetts, New Jersey, New York, and Florida. Based on an analysis implemented of the potential of sales for target crops, it is estimated that farmers in Massachusetts can sell over $150,000 worth of these crops in 2007.

Source of Funding: State (MA), contract

FTE's: 0.5

Scope of Impact: Multistate Integrated Research and Extension, NJ, FL, NY, CT, FL, NH

Key Theme: Agricultural Competitiveness; Agricultural Profitability; Integrated Pest Management
Title of Program/Project: Education/outreach activities for commercial small fruit growers in Massachusetts
Contact Person: Sonia G. Schloemann; Wesley R. Autio
Brief Description of Program/Project: Five 'On-Farm' or 'Twilight' meetings were held in FY06 around southern New England to update small fruit growers on current integrated (pest and horticulture) management strategies. Played a key role in planning and execution of the 2005 New England Vegetable & Fruit Conference (registration chair, session chair for 4 sessions, moderator and speaker). The 'Massachusetts Berry Notes' (17 issues) and 'New England Grape Notes' (16 issues) newsletters were published and distributed during in FY06 with timely production and integrated management information. The UMass 'Fruit Advisor' website was continuously updated with meeting notices, publications, articles, fact sheets. Individual grower contacts (visits, email, phone) were made on an as-needed basis for problem diagnosis and horticulture/pest consulting or recommendations. The New England Small Fruit Pest Management Guide was produced and distributed to 800 growers regionally.
Short Impact: It is estimated that over 75% of the 1,500+ commercial berry growers (New England total) were recipients of program/project information via education/outreach activities. A total of over 1,075 attended sponsored meetings, workshops and conferences. The New England Vegetable & Berry Conference held in December 2003 was attended by over 1,300 people w/ over 900 attending the six small fruit sessions and over 2,000 pesticide credit contact hours awarded for these sessions (New England wide). 'Berry Notes' (17 issues, circulation of 250) and 'New England Grape Notes' (16 issues, circulation of 160) were published in FY06. Visits to UMass 'Fruit Advisor' website are not tabulated, however, increasing grower contacts using email and referrals to internet sources for information suggests grower use of technology as an information resource is increasing. Individual grower contacts (347; site visits, email, phone) were important to impact specific, local practices and to respond to local needs. Strong grower participation in meetings and publication subscriptions document the importance of program/project information to Massachusetts fruit growers for making integrated management decisions to protect the environment and human health while remaining profitable. Fruit growers in Massachusetts have consistently cited UMass Extension programs as vital to the continued sustainability of the local industry.
Source(s) of Funding: State, Smith Lever, fees
FTE's: 0.50
Scope of Impact: Multistate Extension - CT, ME, MA, NH, RI, VT

Key Theme: Agricultural Competitiveness; Diversified/Alternative Agriculture; Innovative Farming; Niche Markets
Title of Program/Project: Cultural Requirements for Commercial Cultivation of *Schisandra chinensis* in Massachusetts
Contact Person: Sonia Schloemann
Brief Description of Program/Project: This multi-year project seeks to define the horticultural requirements for commercial production of a new fruit crop, *Schisandra chinensis*, also known as Chinese Magnolia Vine. This ancient medicinal plant from northern latitudes of Asia is being

introduced in North America for commercial production. All commercial harvest is currently from wild plants and nothing is known about pruning, fertilization, pest management, etc. for commercial plantations of this vine.
Short Impact: Propagation requirements have been established for seed germination (stratification and scarification required) and rooting cuttings (hardwood and softwood). Literature review for sources of established information about this genus and species was conducted and compiled.) A demonstration planting was established at the UMass Cold Spring Orchard Research and Education Center to conduct further studies on vine management, pest management, fertilization requirements, etc. Additional studies on pruning practices will also be conducted at cooperating grower's site. Fruit samples were analyzed by the Food Science Dept. for antioxidant potential and further evaluations are planned.
Source(s) of Funding: The Chang Foundation, State
FTE's: 0.05
Scope of Impact: State (MA)

Key Theme: Agricultural Competitiveness; Diversified/Alternative Agriculture; Innovative Farming; Niche Markets
Title of Program/Project: Demonstration Vineyard for Seedless Table Grapes for Cool Climates
Contact Person: Sonia Schloemann
Brief Description of Program/Project: This ongoing project seeks to demonstrate the suitability of various seedless table grape varieties for commercial production under New England Conditions. Twelve varieties have been established and are being monitored for winter survival, insect and disease resistance/susceptibility, growth parameters, and fruit yield and ripening characteristics.
Short Impact: Over-wintering response assessed for each variety, insect and disease susceptibility evaluated, and fruit characteristics documented each year since FY04 and information disseminated via print (Berry Notes) and various presentation (Mass Fruit Growers Annual Meeting, CT Pomological Society, Maine Organic Farmers and Gardeners Association, etc.) with a minimum of 200 growers educated. Great interest in the potential for this crop was generated in FY06 resulting in a minimum of 6 new table grape vineyards being planted in 2007.
Source(s) of Funding: State, Federal, grant
FTE's: 0.25
Scope of Impact: Multistate Extension - CT, ME, MA, NH, RI, VT

Key Theme: Ornamental/Green Agriculture
Title of Program/Project: Sustainable Greenhouse/Floriculture Crops
Contact Person: Tina Smith
Brief Description of Program/Project: Best Management Practices (BMP's) and assisting in the development of profitable greenhouse businesses result in economic viability for farmers and sustainable practices that benefit the environment and greenhouse workers. Research and Extension for sustainable production of greenhouse and other floriculture crops is a multi-faceted program involving many individual projects and cooperating organizations. Sustainable production includes: cultural practices, including water and nutrient management for producing healthy plants, adequate water quality for irrigation, diagnosing plant diseases and

cultural problems, greenhouse management techniques (ie, heating, venting, sanitation practices), and selecting and using alternative pesticides and biological controls as part of Best Management Practices.

Short Impact:
Twenty two diversified farmers received on-site training for managing plant nutrition, water quality and pests in their greenhouses and information on sustainable greenhouse management practices.

Over 350 farmers/growers received regular email and website updates to alert them about current pests and issues. Results of an on-line evaluation showed that this project was valuable for improving their understanding of a pest problem, aiding in their choice and timing of pest management, alerting them to a pest problem they might have missed and assisting them in diagnosing a problem. More farmers are adopting sustainable practices for greenhouse production as a result of this project.

Over 1600 growers/farmers/industry professionals attended the 2006 New England Greenhouse Conference held in Worcester, MA, November 1-3. This 3-day conference featured over 50 workshops, panel discussions and educational sessions on a variety of sustainable greenhouse topics such as diagnosis, pest management (ie. biological control), alternative energy, plant nutrition, alternative crops, marketing and business management plus a trade show with over 150 exhibitors. UMass Extension Floriculture and PSIS faculty and staff contributed to the success of this conference.

Over 50 greenhouse growers participated in a multi-year water quality and growing media project involving testing water and media samples. Of the statistics tabulated, a small but significant number of growers are using water containing elevated levels of Na and Cl with the results being lower quality and crop loss. In some cases the high levels pose a health concern if used for drinking. Growers chose a variety of solutions including avoidance of over-fertilization, installation of water treatment systems, efforts to protect wells and ponds from road salt contamination by runoff; or in extreme cases, finding a new source of water.

Cranberry pomace, a waste product in the cranberry industry, is being investigated as a possible growing media for greenhouse ornamentals. Six growers are currently testing cranberry pomace on a variety of greenhouse crops.

Over 600 greenhouse growers and farmers received training in integrated pest management, nutrient management, alternative energy, alternative crops and marketing through educational group meetings; Plant Nutrition Short Course, Winter Flower Growers' Meeting, Greenhouse IPM Course (7 weeks), Summer Field Day, Alternative Energy Twilight Series.

Source of Funding: State, Grant, Fees

FTE's: 2.25

Scope of Impact: Multistate Extension (MA, CT)

Key Theme: Aquaculture

Title of Program/Project: Assistance to the Shellfish Aquaculture Industry (MRC)

Contact Person: William Walton

Brief Description of Program/Project: Southeastern Massachusetts (including Cape Cod and the Islands) is the focal point of the burgeoning shellfish aquaculture industry, which focuses on the production of two bivalve shellfish species, the quahog and the American oyster. We seek to provide technical assistance and education to these shellfish farmers to improve their environmental and economic sustainability, including the following programs:

- Quantitative assessment of spatial and temporal variations in shellfish growth
- Measuring, recording and real-time reporting of coastal water parameters
- Training to improve production, with workshops, websites and pamphlets on applied topics (e.g., insurance programs, disease management)
- Managing a Research Farm Network (RFN) to conduct applied research throughout the region in collaboration with shellfish farmers
- A prepared educational and informational response to possible red tide outbreaks
- Continued monitoring of shellfish diseases, including site visits and pathology tests of possible outbreaks
- Updating industry Best Management Practices
- Assisting with regional marketing efforts, such as the Cape Cod & Islands Cultured Shellfish campaign

Short Impact:

- Over a dozen farmers have adopted the latest technology and applied research results
- An increase in direct marketing and sales of cultured shellfish has led to at least a 10% increase in reported production
- The establishment of brand identities and expansion into new markets was supported by 3 public events, attended by over 150 people
- Employ pertinent Best Management Practices or develop Best Management Practices where none exist.
- Several agencies made use of provided materials to minimize effects of production problems (e.g., disease, red tide), with over 200 pamphlets and videos distributed upon request
- Farmers have been encouraged to implement strategies to minimize economic, environmental, production and human resource risks through two public meetings and a bulletin, of which over 250 copies were distributed

Source of Funding: County Smith Lever

FTE's: 3

Scope of Impact: State (MA)

Goal 2
A safe and secure food and fiber system

Key Themes:

Food Accessibility and Affordability
Food Handling
Food Quality
Food Recovery/Gleaning
Food Resource Management
HACCP
Food Safety
Food Security
Foodborne Illness
Foodborne Pathogen Protection

Agency	Total Dollars	FTEs	MSR Projects/Programs	MSR Dollars
MAES	$245,941	3	2	$137,289
UMEXT	$7,382	.1	1	$7,382

Goal 2 Executive Summary –

Food safety continues to be an important emphasis within Goal 2. These efforts range from analysis of the impact of food safety and nutritional attributes on consumer preferences to techniques for monitoring for the presence of pathogenic bacteria on specific food items. A strong research effort has been focused on Listeria monocytogenes. Our efforts to develop novel antimicrobials for promoting food safety have been especially fruitful. The impact of food policy on decision making in the areas of food safety, food quality and food security is a growing emphasis for the program. Of particular importance are our educational efforts in the realm of food safety education. These efforts have been very successful with food producers, food processors and food service professionals.

Key Theme: Food Quality
Title of Program/Project: Determinants of Food System Performance: Product Quality & Prices
Contact Person: Caswell, J.A., Lass, D. A., Lavoie, N. (MAS0894)
Brief Description of Program/Project: The combinations of quality attributes and prices offered to consumers in food products are changing, affecting the performance of the food system. This project uses case studies to examine the factors the influence the quality and price combinations offered to food consumers.
Short Impact: This project is providing current analysis of the performance of the domestic and international food system. It analyzes how the system operates domestically, the prices and values it offers to consumers and producers, its competitiveness in international markets, and its ability to assure food quality, particularly food safety and nutrition. The results of this project were used in decision making by the private and public sectors (state, national, and international), including being cited by the Government Accountability Office (GAO) and the United Kingdom Food Standards Agency.

FTE's: .4
Source of Funding: Hatch
Scope of Impact: State

Key Theme: Food Quality
Title of Program/Project: Postharvest Biology of Fruit
Contact Person: Greene, D. W., Weis, S. A. (MAS00895)
Brief Description of Program/Project: Fruits which are of high quality at the time of harvest are often reduced to poorer or even unacceptable quality by the time they reach the consumer. This project seeks to find ways to extend storage life of fruit and to contribute to providing consumers with attractive, nutritious, and flavorful food.
Short Impact: Use of SmartFresh has lengthened the postharvest life of many apple cultivars. Effectiveness has been inconsistent on McIntosh, but use of controlled atmosphere storage and ReTain may improve SmartFresh's effectiveness. If these products and processes could be used more effectively on McIntosh, fewer fruit would be culled, consumers would have a higher quality apple, and fewer postharvest chemicals would be needed for quality maintenance. Massachusetts has areas of very good climate for growing McIntosh and therefore has potential for a great niche product. McIntosh does not grow well where cool nights and warm sunny days do not reign in the fall. Similarly, increased calcium is associated with improved quality of stored apples, and high quality fruit benefits both the seller and the consumer of the fruit. If these products deliver the improved fruit quality hoped for, then the benefits will be realized.
FTE's: .5
Source of Funding: Hatch Multistate
Scope of Impact: MI, NC, Ontario, British Columbia, ME, MN, NY, MD, MA, WA, CA

Key Theme: Food Safety
Title of Program/Project: Bacterial Adhesion and Growth at Phase Interfaces
Contact Person: McLandsborough, L. A. (MAS00837)
Brief Description of Program/Project: Although most research is performed in liquid systems, microorganisms can be found in foods and processing environments at solid-liquid, gas-liquid, and solid-gas interfaces. The purpose of this project is to study bacterial growth at solid surfaces-liquid and liquid-liquid interfaces. Our efforts will be using Listeria monocytogenes and Escherichia coli O157:H7 in each of these interfacial systems, respectively.
Short Impact: We have identified a genetic determinant needed for adhesion and biofilm formation of L. innocua that is also present in L. monocytogenes. Knowledge of the molecular events will be used to design unique strategies for biofilm prevention and removal from processing plants, leading to large economic savings for the food industry.
FTE's: .3
Source of Funding: Hatch
Scope of Impact: State

Key Theme: Food Safety
Title of Program/Project: Characterization of the Transfer of Listeria Monocytogenes Between Processing Surfaces and Foods
Contact Person: McLandsborough, L.

Brief Description of Program/Project: L. monocytogenes contamination is responsible for the majority of Class I recalls of processed foods. The presence of L. monocytogenes in processed foods is thought to be due to post-processing contamination from established organisms in the processing environment. Although research has focused upon adhesion and biofilm formation by Listeria monocytogenes, no one has studied the potential of bacterial transfer from food processing surfaces to foods, and from foods to processing surfaces. The overall purpose of this research is to obtain a more precise understanding of the potential for Listeria monocytogenes transfer and the influence of moisture on this transfer. Ultimately, the results of this research will answer the question: should food safety advice specify drying of food contact surfaces after cleaning and sanitizing?
Short Impact: Post processing contamination of food products with Listeria monocytogenes is one of the greatest economic challenges facing the food industry. Knowledge of the influence of processing surface composition, food composition and the role of moisture in cross contamination will be critical to assessing the risks involved in cross contamination.
FTE's: .3
Source of Funding: Grant (MAS0200303112)
Scope of Impact: State

Key Theme: Food Safety
Title of Program/Project: Seafood Safety
Contact Person: Levin, R., McLandsborough, L., Shetty, K., Labbe, R., Decker, E.
Brief Description of Program/Project: The bacterium Plesiomonas shigelloides is known to cause meningitis in addition to gastroenteritis. The mortality rate of patients with resulting Plesiomonas septicemia is high with most seafood borne outbreaks historically derived from oysters since they are eaten raw. However, the increased consumption of raw fish (sushi) can be assumed to greatly enhance the public health threat from this organism which this study will assess. Outbreaks of food infections and intoxications derived from spore forming bacteria still occur in the U.S. annually. Documenting the extent of the public health threat from these organisms in the Northeast will assist in delineating the extent of the problem locally. Outbreaks of listeriosis derived from consumption of fish contaminated with L. monoctogenes still occur annually in the U.S. The development of new methods for inhibiting the refrigerated growth of the organism and destroying L. monocytogenes on seafood in addition to optimizing sanitary practices of seafood processing plants will assist in greatly reducing the numbers of this organism in processing plants and on fish tissue and in eliminating or reducing further seafood derived outbreaks The purpose of these studies is to reduce the public health hazard of human pathogenic bacteria associated with seafood by reducing the number of human pathogenic bacteria in processing plants, identifying optimized plant sanitation practices, and by reduction of psychrotrophic human pathogenic bacteria on seafood.
Short Impact: Studies to develop real-time PCR enumeration of viable cells of the pathogenic bacterium Plesiomonas shigelloides in oysters will enable rapid assessment of potential health risks from consumption of raw oysters due to this organism. Our studies on the development of elicitor-inducible pea phenolics against L. monocytogenes and the development of fungal fermented soy phenolics against L. monocytogenes will allow efficient production of phytochemical agents active against L. monocytogenes on seafood. Studies on biofilm formation entrappng growing Listeria monocytogenes will facilitate developing efficient methods of sanitizing fish processing plants. Our development of a better seaweed strain, capable of growth

in reduced saline concentrations, will facilitate its use in seaweed-fish aquaculture effluent management systems. We have found that the concentration of the two most-commercially valuable polyunsaturated fatty acids found in Porpyra yezoensis (EPA and AA) can be increased significantly by exposure to low temperature.
FTE's: .3
Source of Funding: Grant (MAS0200406163)
Scope of Impact: State

Key Theme: Foodborne Pathogen Protection
Title of Program/Project: Isoflavonoid Synthesis and Pathogen Control in Sprouts in response to Rosemary Phenolic Clonal Extracts
Contact Person: Shetty, K. (MAS00835)
Brief Description of Program/Project: Sprouted soybean is potentially an excellent source of iso-flavonoid genistein that has implications for diet-based therapeutic applications. Sprouted legumes are also potentially susceptible to bacterial pathogens like Salmonella and E.coli. This project will utilize elite clonal extracts of high phenolic rosemary generated via tissue culture to stimulate genistein as well as simultaneously control bacterial pathogens in sprouted soybean
Short Impact: Phenolic phytochemicals from soybean as a part of the diet have significant and diverse health benefits due to their disease chemopreventive potential. Our studies from this Hatch project (2000-2006) have clearly indicated that sprouting and microbial bioprocessing both in solid-state and liquid fermentation can enrich soybean phenolics and further enhance and extend their chemopreventive potential. Such extracts also have antimcicrobial potential to counter food-borne pathogens such as Listeria monocytogenes, Salmonella and Staphylococcus aureus and also ulcer-linked Helicobacter pylori. Further they have excellent potential to inhibit carbohydrate metabolism by inhibiting key enzymes modulating glycemic index and therefore show anti-diabetes potential and equally important inhibition of key enzyme linked to Hypertension. It is clear that where oxidation-linked inhibitory structure-function link to disease and infection exists, soybean has very interesting disease preventive potential be it diet-linked as in Type 2 diabetes or pathogen-linked as in the case of food-borne bacteria and ulcer bacteria. Based on these studies Soybean based foods and ingredients can be designed as an important set of strategies for countering chronic diet-linked diseases such as diabetes that is projected grow globally from current 200 million to 300 million in 2020. Equally exciting is the bacterial pathogen inhibiting potential in foods and feeds in an era where antibiotic use have to be replaced.
FTE's: .3
Source of Funding: Hatch, Industry
Scope of Impact: State, Industry

Key Theme: Food Safety
Title of Program/Project: Antimicrobial Delivery Systems to Improve Food Safety
Contact Person: Weiss, J. (MAS00200500648)
Brief Description of Program/Project: Application of nanotechnologies may improve food safety. Naturally-occurring antimicrobials capable of preventing the growth of pathogenic

organisms have generally low activities in foods because of undesirable interactions with food components. In this project we will develop new food preservation strategies based on nanotechnological approaches to produce nanometer sized antimicrobial systems in the form of particles that improve antimicrobial activity in food formulations and food process operations. Three different encapsulation systems have shown promise. These include: (1) natural phenolic compounds encapsulated in surfactant-based micelles for application in liquid/semi-fluid food systems (2) phospholipid liposomes for encapsulation of polypeptide antimicrobials and application in liquid or solid systems and (3) natural phenolic and polypeptide antimicrobials encapsulated in emulsion droplets for delivery in liquid/semi-fluid and solid food systems. We expect that the new systems will have either substantially higher antimicrobial activity or higher stability than free antimicrobials. Because of the small size of capsules, no change in appearance and texture of foods should be observed. This research has the potential to dramatically improves the safety of processed foods and may have counter-bioterrorism as well as military applications.

Short Impact: The encapsulation of antimicrobials in nano- or microscale carrier systems can greatly increase the activity and in some cases broaden the spectrum of activity against pathogens growing in foods. Thus, the required concentrations of antimicrobials to achieve inhibition of growth decrease when a carrier system is used. The carrier systems can be manufactured form inexpensive, abundantly available materials. Thus the combination of antimicrobial and carrier system can greatly reduces cost for food manufacturers. For some systems, we have demonstrated that required concentrations of antimicrobials can be decreased by >50%, leading to cost savings between 15 - 30% depending on the price of the antimicrobials and the price of raw material for the capsules. Simultaneously, the health and wellbeing of the US consumers can be increased, Our systems broaden the applicability of antimicrobials to a variety of foods were use of antimicrobials was previously not feasible. With these systems it now becomes possible to build in an additional level of protection against growth of pathogens and spoilage organisms.

FTE's: .3

Source of Funding: Grant

Scope of Impact: State

Key Theme: Emerging Infectious Disease; Invasive Species; Bioterrorism

Title of Program/Project: National Plant Diagnostic Network-Northeast Region

Contact Person: M. Bess Dicklow

Brief Description of Program/Project: Established by the Secretary of Agriculture to the Cooperative State Research, Education, and Extension Service (CSREES), has developed a network linking plant and animal disease diagnostic facilities across the country. The National Plant Diagnostic Network (NPDN) will focus on the plant disease and pest aspect of the program. The network is a collective of Land Grant University plant disease and pest diagnostic facilities from across the United States. The mission of the network is to enhance national agricultural security by quickly detecting introduced pests and pathogens. This will be achieved by creating a functional nationwide network of public agricultural institutions with a cohesive, distributed system to quickly detect deliberately introduced, high consequence, biological pests and pathogens into our agricultural and natural ecosystems by providing means for quick identifications and establishing protocols for immediate reporting to appropriate responders and decision makers. The network will allow Land Grant University diagnosticians and faculty, State Regulatory personnel, and first detectors to efficiently communicate information, images,

and methods of detection throughout the system in a timely manner. The UMass Extension Plant Diagnostic lab processed 1,178 specimens in 2006. Activities include: • Attend Northeast Region and National Conferences. • Participate in NPDN Scenario Exercises. • Upload plant specimen data to national database. • Conduct First Detector trainings
Short Impact: The UMass Extension Plant Diagnostic Lab through its participation in NPDN plays an integral role in the avoidance, detection, early containment, and management of exotic pests, emerging infectious diseases, and invasive species.
Source of Funding: Federal
FTE's: 0.1
Scope of Impact:Multi-state: MA, RI, CT, NH, VT, ME, NY, NJ, PA, MD, DE, WV

Goal 3
A healthy, well-nourished population

Key Themes:
Birth Weight
Health Care
Human Health
Human Nutrition
Infant Mortality
Medicinal Plants
Nutricueticals

Agency	Total Dollars	FTEs	MSR Projects/Programs	MSR Dollars
MAES	$120,406	2.9	2	$38,513
UMEXT	$95,984	1.3	0	0

Goal 3 Executive Summary –

Goal 3 efforts emphasize improved youth health through research and education projects focused on food choice decision making as well marketing of vegetables to ethnic audiences. In addition, research seeks to increase the use and availability of omega-3 fatty acids in food products, providing health benefits. Research also continues to focus on understanding the importance of biological products such as genistein and carnosine on human health.

Key Theme: Human Health
Title of Program/Project: Nutrient Bioavailability--Phytonutrients and Beyond
Contact Person: Decker, E., Clydesdale, F. (MAS00881)
Brief Description of Program/Project: Many components in foods can have positive effects on

health yet little is know about how they work. This project will investigate how non-essential nutrients from foods improve health.
Short Impact: This research project will impact the citizens of the U.S. in several ways. First, the development of foods containing omega-3 fatty acids could provide an easy vehicle to increase the incorporation of beneficial fatty acids into the diet. These foods would be beneficial to the general population but in particular to populations at risk for coronary heart disease and pregnant and lactating women who must provide high levels of omega-3 fatty acids to their infants. A second benefit would be to fishing communities. Underutilized fish species such as herring, mackerel and menhaden are naturally high in omega-3 fatty acids. If technologies can be developed to stabilize the oil from these fish, an increased market would be developed thus increasing the value of the fish stock which would provide new harvesting opportunities.
FTE's: .9
Source of Funding: Hatch, Multistate, Industry
Scope of Impact: OK, IA, ME, MA, MI, CT, KS, AZ, OR, NM, CA, WA, ARS, Industry

Key Theme: Human Health
Title of Program/Project: Investigating Conditions and Mechanisms by which Conjugated Linoleic Acid Improves Bone Mass
Contact Person: Park, Y. (MAS00919)
Brief Description of Program/Project: Osteoporosis is one of the major diseases in the elderly and can affect the quality of life. Thus the prevention of osteoporosis is of interest and conjugated linoleic acid may help to reduce its incidence. This proposal will help to understand how and under what conditions CLA may be beneficial, looking toward an eventual use in helping to control osteoporosis. The purpose of this proposal is to study CLA's effects on bone metabolism by two separate approaches; first, to identify the conditions under which CLA can improve bone mineral mass, and second, to clarify the effect of CLA on differentiation of bone marrow mesenchymal stem cell into adipocytes, osteoblasts, or chondrocytes.
Short Impact: Approximately 10 million people in the US were estimated to suffer from osteoporosis in 2002, and 44 million or 55% of people 50 years of age and older, are at the risk for developing this silent disease. Current knowledge applied to osteoporosis prevention has either had limited success or caused adverse effects, thus efforts using food components along with calcium to reduce or prevent osteoporosis will be very useful and also have significant implications. The results obtained from this research may allow us to use dietary components and calcium more effectively and result in significant improvement of bone mass as part of prevention strategies for osteoporosis, which is a major health issues particularly for older populations in the United States.
FTE's: .7
Source of Funding: Hatch, Industry
Scope of Impact: State, Industry

Key Theme: Human Nutrition
Title of Program/Project: Improving Plant Food: Fruit Vegetable and Whole Grain Availability and intake in older Adults
Contact Person: Cohen, N. L. (MAS00916)
Brief Description of Program/Project: Despite the importance of fruit, vegetable and whole

grain intake in maintaining health and functional status, older adults are not meeting minimum dietary recommendations. This project will examine behavioral approaches to encourage older adults to increase their intakes of these beneficial foods.
Short Impact: This research is a collaborative effort of the Universities of Massachusetts (MA), New Hampshire (NH), Maryland (MD), Minnesota (MN) and the District of Columbia (DC). A qualitative semi-structured interview was developed and modified by the cooperating scientists to identify barriers and motivators to purchase and consumption of whole grain foods. MA began to actively recruit participants in the summer of 2006 through two local area Councils on Aging (COA) and with support of the State Executive Office of Elder Affairs. Subjects are 65 years of age or older, living independently and responsible for buying and preparing at least one meal daily. Ten participants have been interviewed thus far, and recruitment is continuing toward reaching the goal of 15-20 subjects per state. For each subject, the qualitative semi-structured interview was administered in person at local Senior Centers and the sessions taped. All tapes collected will be transcribed at UNH for consistency. A template has been created enabling coding of the interview instruments by individual stations. Data collection and analysis will continue through the fall, 2006 and winter, 2007.
FTE's: .3
Source of Funding: Hatch, Multistate
Scope of Impact: CT, WDC, LA, MA, ME, MN, NH, PA, RI, Industry

Key Theme: Human Nutrition
Title of Program/Project: Online Education for Secondary Science Teachers: An Integrated Approach to Food Safety Training
Contact Person: Cohen, N., Olson, R., Mclandsborough, L (MAS00203912)
Brief Description of Program/Project: Food borne illness continues to plague American health and economy. While many children are responsible for food preparation, they do not learn safe food preparation practices from their parents or at school. Few teacher training institutions offer courses in food safety to educators. This collaboration will promote and enhance food safety education by developing an online training program for teachers to use with students, parents and other school community members.
Short Impact: The Food Safety FIRST program (Online Education for Teachers: An Integrated Approach to Food Safety Training) has increased teacher confidence, improved food safety practices of science teachers, and resulted in increased food safety education of youth. Through this project, teachers and youth may thus reduce the risks of foodborne illness for themselves, their families, and other consumers.
FTE's: .1
Source of Funding: Extension, Hatch, Grant
Scope of Impact: State

Key Theme: Nutraceuticals
Title of Program/Project: Isoflavonoid Synthesis and Pathogen Control in Sprouts in response to Rosemary Phenolic Clonal Extracts
Contact Person: Shetty, K. (MAS00835)
Brief Description of Program/Project: Sprouted soybean is potentially an excellent source of iso-flavonoid genistein that has implications for diet-based therapeutic applications. Sprouted

legumes are also potentially susceptible to bacterial pathogens like Salmonella and E.coli. This project will utilize elite clonal extracts of high phenolic rosemary generated via tissue culture to stimulate genistein as well as simultaneously control bacterial pathogens in sprouted soybean.

Short Impact: The results of the work indicate the potential for diet-based management of ulcers caused by Helicobacter. The antioxidant and health promoting benefits of wine, especially red wine, are established. The addition well-known and accepted plant extracts suggest their addition to alcoholic beverages may increase the health benefits of such beverages used in moderation. The identification of a molecule controlling toxin formation may lead to methods to inhibit its formation or inactivation.

FTE's: .3

Source of Funding: Hatch, Industry

Scope of Impact: State

Key Theme: Human Nutrition

Title of Program/Project: Tween POWER

Contact Person: Jean Anliker

Brief Description of Program/Project:
Tween POWER is a 4-year obesity prevention project funded by the US Department of Agriculture. It involves experts at the Universities of Massachusetts, Connecticut, and Maryland. The Institutional Review Board on Human Subjects at the University of Massachusetts, Amherst, has approved all project procedures.

Childhood overweight is increasing, at least partially due to decreases in physical activity and increases in the consumption of high-calorie foods. At the same time, U.S. adolescents spend billions of dollars annually, especially on foods and beverages. Adolescents also have a strong influence over family shopping. Tween POWER seeks to learn more about adolescent spending patterns and ways this spending affects their nutrition and health. For example, through interviews and focus groups, we have been exploring:

- What do White and Latino "tweens" (youth aged 11-14) spend on foods and beverages? Where does their money come from? How much do they spend? Where do they spend it? What do they buy?
- What factors influence tweens' choices of foods and beverages?
- How do tweens influence family spending on foods and beverages?
- What are adolescent interests about nutrition, and what kind of programs would they like?

Based on what we have learned through this formative research, and using a marketing model as a framework, we have been developing an innovative after-school program for middle-school White and Latino adolescents. The program features physical activity and healthy eating, with an emphasis on marketing strategies and how to see through them. We will conduct pilot tests in FY07-FY08, and a full-scale study in MA and CT in FY08. We will evaluate the program using a variety of research assessments, including BMI, dietary and physical activity assessments, and food purchasing assessments.

Short Impact:
In FY06 we completed three major tasks:

1) established a relationship with the schools in North Adams and Holyoke, where we will be testing our program
2) conducted focus groups to develop effective interventions. There were four focus groups, 1 for each gender for White adolescents, and 1 for each gender for Latinos (total number of participants = 21).
3) Developed the framework and overview for the Tween POWER intervention, which will be called "Strength and Power in Nutrition" (SPIN).

Source of Funding: USDA CSREES NRI

FTE's: 0.958

Scope of Impact: State (MA) in FY06

Key Theme: Human Nutrition, Agricultural Competitiveness

Title of Program/Project: Increase consumption of fresh vegetables by low-income immigrant groups

Contact Person: Frank Mangan

Brief Description of Program/Project:

This project was part of the Sustainable Vegetable Production & Marketing Plan. Target project outcomes: 1) Target audiences will improve diet and physical activity behaviors, to prevent overweight and obesity. 2) Minority and low-income families will improve lifestyle behaviors to reduce health disparities.

Focus groups and individual interviews were held with low-income members of the Salvadoran, Guatemalan, Cape Verdean and Brazilian communities in New Bedford. From these interviews and focus groups information was learned about fresh vegetables that are used by these groups that can be grown locally.

Specific crops were grown at the UMass Research Farm in Deerfield that are popular among these groups (more information on these crops are available in the report entitled "New Crop Production and Marketing").

Culturally-appropriate, nutritionally balanced recipes popular among Spanish and Portuguese-speaking groups in New Bedford were researched and developed with an emphasis on vegetables and herbs that can be grown locally. Nutritionally-balanced recipes using these vegetable crops were developed by project personnel and tested by UMass Nutrition Educators in the UMass Nutrition Office in Fall River. Here are the recipes developed:

1. Taioba sauté – available in English and Portuguese
2. Maxixe salad - available in English and Portuguese
3. Salvadoran Minestrone Soup – available in English and Spanish
4. Pipian Stir-fry – available in English and Spanish

These recipes are available at the UMass Nutrition website.

Demonstrations of recipes were held at farmers' market located in New Bedford. An extensive publicity campaign was implemented to publicize the event at the farmers' Market in New Bedford on August 19

Short Impact: A survey of people who came to the UMass Nutrition Table during the event was

implemented. Bilingual (Spanish-English and Portuguese-English) project personnel took the surveys. Some observations based on the results: ▪ 39% of those surveyed came to the market for the first time, most likely due to implemented publicity. ▪ 36% oft hose surveyed knew about the event through the WIC office ▪ 69% of the Latinos interviewed only spoke Spanish and 100% of the Brazilians interviewed spoke Portuguese. This emphasized the importance of providing information in these languages
Source of Funding: State, grant
FTE's: 0.25
Scope of Impact: State (MA)

Goal 4
Greater harmony between agriculture and the environment

Key Themes:

Agricultural Waste Management
Air Quality
Biodiversity
Biological Control
Drought Prevention and Mitigation
Endangered Species
Energy Conservation
Forest Crops
Forest Resource Management
Global Change and Climate Change
Hazardous Materials
Integrated Pest Management
Land Use
Natural Resources Management
Nutrient Management
Pesticide Application
Recycling
Riparian Management
Soil Erosion
Soil Quality
Sustainable Agriculture
Water Quality
Weather and Climate
Wetlands Restoration and Protection

Agency	Total Dollars	FTEs	MSR Projects/Programs	MSR Dollars
MAES	$580,494	5.6	6	$174,332
UMEXT	$1,484,518	20.2	10	$163,440

Goal 4 Executive Summary –

A building emphasis under Goal 4 has been park, forest, and watershed management. Watershed models are being adapted to both farm and forested ecosystems. Nutrient and crop cover management are integrated into the broader programs. Outreach efforts are closely coordinated with pesticide education. Our efforts have also targeted pests that are critical to Massachusetts and the northeast. Some of the targeted pest include: Coleophoma, Colletotrichum, Phyloosticta,

and Physalospora (cranberry fruit rot); apple maggot flies and plum curculio (key pests of apples); and strawberry sap beetle (primary pest of strawberries and other crops). We continue to develop integrated approaches to pest management. For instance, we have added the biocontrol Trichogramma ostriniae to the perimeter trap cropping approach and 77% of growers report reduced pesticide use.

Key Theme: Agricultural Waste Management
Title of Program/Project: Application of Sewage Biosolids to Agricultural Soils in the Northeast: Long-Term Impacts and Benefit Uses
Contact Person: Barker, A. (MAS00841)
Brief Description of Program/Project: To evaluate the utilization of sewage biosolids in soil management in the Northeast by assessing the sustainability of soil quality, water quality and food safety (for people and other animals) where sewage biosolids are applied to agricultural land. To develop appropriate outreach materials and educational events for the Northeast that links the current research to actual field management of sewage biosolids products in the Northeast.
Short Impact: This research indicates that grasses such as tall fescue (Festuca arundinacea Schreb.) and leersia (Leersia orizoides Swartz) can be used to remove metals such as zinc from contaminated soils. Grasses are effective because of their fibrous root system, which permeates through the soil. Fescue has high potential in phytoremediation because of its robust growth under widely varying soil and other environmental conditions. Fertilization of these grasses, particularly with nitrogen, stimulates their growth and increases their potential to remove metals from media. Selected nitrogen fertilizers such as urea may further enhance extraction of metals by plants through an effect on their increased solubility and availability of the metals for absorption by plants.
Source of Funding: Hatch
FTE's: .2
Scope of Impact: State

Key Theme: Biological Control
Title of Program/Project: Molecular Dissection of Bacterial Resistance Mechanisms to Plant-Derived Bacteriostatic Compounds by Functional Genomics
Contact Person: Pomposiello, P (MAS00866)
Brief Description of Program/Project: The interaction between plants and microbes in the environment is essential for a wide range of processes, from nitrogen fixation to plant disease. This project examines the global responses of a bacterial species to plant-derived toxic compounds, and aims at identifying novel genes with roles in bacterial resistance to environmental toxins.
Short Impact: Through our work, we have advanced in our understanding of the global transcriptional response of a model bacterium to plant-derived oxidants. We have dissected the role of glucose metabolism in bacterial resistance to oxidative stress, and shown that glucose transport and gluconeogenesis play a capital role in the antioxidant response. We continue to refine our model of global transcriptional responses using genomic approaches. Since many soluble plant compounds induce oxidative stress in bacteria, the knowledge on the genetic determinants of bacterial resistance to oxidation will result in more predictive power for plant-microbe interaction models.

FTE's: .1
Source of Funding: Hatch
Scope of Impact: State

Key Theme: Global Change and Climate Change
Title of Program/Project: Characterization and mechanisms of plant responses to ozone in the Northeast
Contact Person: Manning, W. J. (MAS00880)
Brief Description of Program/Project: Our results are fundamental to understanding factors that affect O3 uptake and plant injury. This has direct bearing on air quality standards for plants and people. We are also identifying new bio-indicators for O3 that will increase public awareness of the O3 problem.
Short Impact: An improved understanding of how ozone impacts ozone-sensitive and ozone-tolerant plants will be important to agronomists and plant breeders, who are involved in increasing the quantity and quality of our food supplies
FTE's: .2
Source of Funding: Industry Grant, Hatch, Multistate
Scope of Impact: ARS, CA, NJ, NYC, VPI, MN, PA, MA

Key Theme: Natural Resources Management
Title of Program/Project: Benefits and Costs of Resource Policies Affecting Public and Private Land
Contact Person: Stevens, T. (MAS00877)
Brief Description of Program/Project: Recreational fees are being increased but little is known about the impact on low income users. Forest ecosystem management programs are being proposed but little is known about how landowners will respond.
Short Impact: A conjoint study of public opinion about alternative funding options for Acadia National Park indicates that local residents strongly favor the status quo. Analysis of factors related to cooperative forest management in a rural area of India show that population heterogenity with respect to both cast and wealth have a nonlinear impact on degree of cooperation.
FTE's: .4
Source of Funding: Hatch Multistate
Scope of Impact: CA, AZ, TX, LA, GA, NYC, IA, KY, WA, MA, OR, CO, PA, OH, WV, NH, MI, ND, ME, UT, NC

Key Theme: Natural Resources Management
Title of Program/Project: Mitigating Hypothetical Bias in Natural Resource and Environmental Decision Making
Contact Person: Stevens, T. H., Murphy, J., Allen, G., Lass, D. (MAS00858)
Brief Description of Program/Project: Respondents to contingent valuation surveys often overstate the amount they would actually pay. This has motivated development of several techniques designed to either eliminate or reduce this problem. This project examines and compares alternative ways of reducing hypothetical bias and an improved method for dealing with this problem will be developed.

Short Impact: Experiments with induced and homegrown values suggests that hypothetical bias results in the process of formulating homegrown values. Another set of experiments tested for whether prediction theory can be used to correct for hypothetical bias. This theory suggests that instead of asking individuals to value a commodity, by asking them to predict the behavior of others hypothetical bias may be reduced or eliminated.
FTE's: .1
Source of Funding: Grant, Hatch
Scope of Impact: State

Key Theme: Nutrient Management
Title of Program/Project: Whole farm dairy and beef systems for environmental quality
Contact Person: Herbert, S (MAS00924, NE-1024)
Brief Description of Program/Project: 1. Nitrogen from manure applied in the fall is subject to loss leaching if no cover crop is planted for N uptake or if the cover crop is planted too late to be effective for N uptake. 2. Nonpoint source pollution is dependent on spatial configuration of sources. Assessment of the relative contribution to nutrient loading at a watershed scale is important information for water quality management. 1. To determine effective cover crop seeding dates to thereby reduce nitrogen leaching. 2. The project aims to identify spatial influence of nutrient loading from animal operations at varying spatial configuration to assess impacts on watershed systems.
Short Impact: Recommendations for choice of cover crop species for seeding at time top dressing nitrogen fertilizer will enable farmers choosing this approach to be more successful. Most farmers indicated they would likely have used winter rye which failed at all evaluation sites. Dairy farmers wishing to maximize the recover of nitrogen in the fall now have better information on when to seed cover crops after corn. Upward of 80 lb per acre or more of nitrogen can be recovered by seeding cover crops early.
FTE's: .7
Source of Funding: Hatch Multistate
Scope of Impact: Industry, CA, IL, IA, IN, MD, MA, MI, NJ, NY, PA, OR,UT, VA,WA, WV, WI

Key Theme: Pesticide Application
Title of Program/Project: Impact of Dissolved Organic Matter from Organic Amendments on Pesticide Leaching on Turf
Contact Person: Xing, B., Ebdon, S., Owen, M. (MAS008532)
Brief Description of Program/Project: Dissolved organic matter (DOM) from organic amendments used on turf may increase leaching potential of pesticides. The project examines how DOM from organic amendments affects pesticide leaching in turf soils with a goal to develop a scheme to manage an environmentally friendly turfgrass ecosystem.
Short Impact: Preliminary data indicate that dissolved organic matter (DOM) could be leached out with irrigation and rainfall, particularly right after application of the fertilizers. Currently, we are testing the leaching of pesticides, nitrogen, and phosphorus. From the laboratory research, we observed that bulk DOM from two organic fertilizers apparently reduced sorption coefficients of organic compounds by soils. We also characterized the dissolved organic matter (fulvic acid) of soils and tested the effect of soluble organic acids on uptake of metals and other dissolved organic acids in soils.

Source of Funding: Hatch, Extension
FTE's: .2
Scope of Impact: State, Industry

Key Theme: Water Quality
Title of Program/Project: Integrated Watershed Management to protect Water Quality and Ecological Integrity
Contact Person: Randhir, T. (MAS00864)
Brief Description of Program/Project: Safe drinking water and sustaining healthy aquatic ecosystems through watershed planning will be the direct issue involved.
Short Impact: A regional watershed model is completed and several parameters were assesses that include runoff, sediment, and nutrients. A regional model of watershed dynamics is completed and evaluated at varying dynamics, resulting in a Masters thesis. The regional model evaluates ecosystem habitat potential at varying dimensions. A comprehensive watershed model is developed to study performance related to water quantity, water quality, and ecosystem health, which resulted in a Masters thesis. Currently, we are developing modeling studies on on-farm dynamics and aquatic ecosystem impacts in endangered species.
FTE's: .1
Source of Funding: Hatch
Scope of Impact: State

Key Theme: Nutrient Management, Sustainable agriculture
Title of Program/Project: Determination of best parameters for the development of vine stock for bed renovation: pruning, fertilization, and management of nurse beds
Contact Person: Anne Averill
Brief Description of Program/Project: This project is part of the plan: "Enhancing sustainability of cranberry production". In order to preserve the MA cranberry industry, growers need access to new technologies and the information on how to use these effectively. A critical area of concern identified by the industry, is the need to 'retool' their farms by renovating beds and replanting to higher-yielding modern cultivars. One part of the information needed to accomplish this goal is the proper protocols for developing vine stock for these renovated plantings. Such methods need to be cost-effective, efficient, and with minimal environmental impact. We are working on two grower farms to study these parameters and formulate recommendations. Four nitrogen treatments (0, 50, 100, and 150 lb/A) and four pruning intensities (none, low, medium, and high) were applied in all combinations at both sites (cultivar Stevens) for 4 years. After three years of data analysis (2006 is still being processed), several outcomes can be noted. In Year 2, incremental increases of 50 lb/A N (above 50 lb/A per year) gave ~15% increase in spring biomass production. In Year 3, each incremental increase gave ~45% more biomass. Marketable yield declined markedly in Year 3 with increasing N rate (especially above 50 lb/A) and was unaffected by pruning intensity. Mean income over the 3-year period indicated that the highest net incomes were with the high pruning/0 N combination and low pruning/low N combinations (~$5,000 per acre); net income exceeding the estimate for fruit production alone (~$4,600/A). At this point, data indicated that medium and high-N rates were not net profitable (especially if a grower is seeking to produce vines and fruit). In Year 1, N rate had the most influence on net income, with income decreasing with increasing N rate. For Years 2 and 3, the same general N rate influence can be seen, but it varies a bit for each pruning

intensity. The economic analysis will be of vital interest and purpose to the grower community as they reformulate their business plans.

Short Impact:
It is estimated that up to 50% of the MA cranberry acreage is in need of renovation. Grower advocacy groups are pursuing funds to support such endeavors. If funding becomes available, renovation activity will skyrocket. Even without outside funding, many companies have embarked on a schedule of bed renovations. The information from this project will be used for such endeavors. Two-year results were presented at an annual management update meeting at which 255 growers attended. Information on the interaction of pruning and nitrogen application has been published in one Cranberry Station Extension newsletter. In this year, at least 10 growers were given one-on-one advice on renovation, utilizing data from this project.

Source of Funding: Smith Lever, Industry grants

FTE's: 0.3

Scope of Impact:
State (MA)
Potential for implementation in other cranberry growing regions, particularly WI and NJ

Key Theme: IPM, Sustainable agriculture

Title of Program/Project: Use of flood management for pest control, including the development of best management recommendations for the control of dodder with flooding.

Contact Person: Anne Averill

Brief Description of Program/Project:
This project is part of the plan: "Enhancing sustainability of cranberry production". In order to preserve the MA cranberry industry, growers need access to new technologies, pest management options, and the information on how to use these effectively. Understanding of system ecology and implementation of methods to reduce chemical inputs is critical to farming in a wetland setting. The goal of the main plan is to generate the research-based information that MA cranberry growers will need to remain competitive, to communicate that information to growers and to assist growers in its implementation. This particular project is designed to build on a grower anecdote that briefly flooding a cranberry bed could control the parasitic weed, dodder. By using demonstration sites and controlled condition research, our aim is to validate the use of flooding for dodder control and then to communicate that information to cranberry growers in the form of a set of management recommendations. During this year, we conducted research in the field to determine the flooding parameters that are required to get dodder control by flooding. The audience for this project is first cranberry growers that had already tried these floods and secondarily other growers that will adopt the practice.

Short Impact: Preliminary results were presented at an annual management update meeting at which 255 growers attended. Information on the utilization of short-term floods has been published in Cranberry Station Extension newsletter and is included in the current recommendations for growing cranberries (2006 Chart Book-Management Guide for Cranberries). According to recent survey, 15% of respondents used short-term floods for dodder control. This is particularly encouraging since these flooding activities occurred prior to the formal recommendation of the practice in the management guide. A grower survey will be conducted in 2008 to capture any changes in the use patterns for dodder management.

Source of Funding: Smith Lever, Industry grants
FTE's: 0.3
Scope of Impact: State (MA) Potential for implementation in other cranberry growing regions, particularly WI

Key Theme: Forest Resources Management
Title of Program/Project: Coverts/Forest Resource Conservation
Contact Person: Paul Catanzaro and Dave Kittredge
Brief Description of Program/Project: The **Coverts** program seeks to "seed" communities with people enacting forest conservation. Since 1988, Coverts (http://forest.fnr.umass.edu/coverts/) has trained over 325 people who have direct control of 17,391 acres and are involved with 169,000 acres (e.g., work with a land trust, local conservation commission, sportsmen club). The goal of Coverts is to identify local community opinion leaders, train them on forest conservation in a 3 day program, and connect Coverts cooperators with resource professionals and land protection experts. Program evaluation has shown that Coverts "arms" cooperators with information, contacts, and confidence to then return to their communities to actively "spread the good word" of forest conservation in a peer-to-peer format. In addition, to the main training program Coverts Cooperators from eastern and western Massachusetts gathered this fall to reconnect with fellow alumnae, hear about the future of Coverts and get some important information about cost share funding for habitat restoration.
Short Impact: Based on the Coverts class of 2006, between the privately owned land and that land which is managed or overseen by Cooperators through their activity on municipal boards or other groups, we reached the owners or decision-makers responsible for *almost **5,300*** **acres** of highland region forest land. Based on the amount of funds invested in the Coverts project this year, this translates to a per-acre investment of $2.17. Also, considering the per-acre investment is a serious underestimate of the overall value, since the spin-off benefits to other acres are less easily estimated. These are not average landowners- but citizens who own land and are also quite influential in their own communities, and in an excellent position to further disseminate the information and experience they gained through Coverts (e.g. conservation commissioners, planning board members, land trust personnel, open space committees, etc….). **The FY 2006 Coverts Training was highly rated. Below are some selected quotes**: "Made me appreciate the range of possible decisions a landowner can take in managing a forest" "Much better knowledge base and appreciation for the role of managing forests specifically for wildlife." "I've learned a tremendous amount from the program as well as the other participants." "Validates need for permanent conservation" "Learning about sustainable forestry and timber harvesting methods that can actually enhance wildlife habitat. Also, resources available in conservation efforts." A 14-year survey of the Coverts program showed that coverts cooperators are instilled with confidence to make a significant impact in their various community roles. These impacts include: permanently protecting their land and talking to other landowners about land protection, helping other landowners

find information and resource professionals, implementing habitat work on their land or land they are involved with (e.g., land trust land), working on town land management and open space projects.

Presentations, resource materials and discussion topics include:
1. Forest Management options and likely impacts
2. Land protection and estate planning options
3. Role of NIPF land in a larger landscape
4. Importance of non-industrial, private forests to the well-being of the commonwealth
5. Contact information for assistance in decision-making
6. Private forest and agricultural landowners make informed decisions about their land based on accurate information regarding their options and likely consequences

Source of Funding: Smith Lever, The Trustees of Reservations – Highland Communities Initiative, The Nature Conservancy, MA Bureau of Forestry, and MA Woodlands Institute

FTE's: .25

Scope of Impact: State (MA)

Key Theme: Forest Resources Management

Title of Program/Project: Your Land, Your Choices /Forest Resource Conservation

Contact Person: Paul Catanzaro

Brief Description of Program/Project: Development of a landowner publication (http://www.masswoods.net/pdf/YourLand_YourChoices.pdf) to provide a resource to landowners when they are at two critical conservation decision points: 1.) the sale of timber and 2.) planning the future of their land. The publication also describes the critical role private landowner's play in our NIPF dominated landscapes and how each decision a landowner makes about their land affects the landscape in which they live. The publication was done in collaboration with The Trustees of Reservation's Highland Communities Initiative.

Short Impact: There have been 673 requests for the publication and over 3,425 have been distributed through conferences, workshops (e.g. Woods Forums), town halls and organizations. After one year of distribution, it is our plan to mail a survey to all those individuals who have requested a publication to determine its impact. The survey is dependent on appropriate funding.

Publication topics include:
1. Forest Management options and likely impacts
2. Land protection and estate planning options
3. Role of NIPF land in a larger landscape
4. Importance of non-industrial, private forests to the well-being of the commonwealth
5. Contact information for assistance in decision-making
6. Importance of information sharing/networking/cooperative management
7. Nature of NIPF ownership patterns
8. Private forest and agricultural landowners make informed decisions about their land based on accurate information regarding their options and likely consequences

Source of Funding: TTOR's Highland Communities Initiative, Smith Lever 3d

FTE's: .10

Scope of Impact: State (MA)

Key Theme: Integrated Pest Management, Pesticide Application
Title of Program/Project: New England Pest Management Network, Surveys, Crop Profiles and Pest Management Strategic Plans.
Contact Person: Natalia P. Clifton
Brief Description of Program/Project: The primary objective of this project is to understand the impact of current and future changes to the registration of pesticides on the management of pests in certain important New England crops. As part of a New England Network, the Pesticide Education program completed final summary reports on the 2004 New England Sweet Corn and Apple Pest Management Surveys that were distributed to hundreds of growers throughout New England. Data from a previous survey sent to winter squash growers was used to complete the New England Winter Squash Crop Profile and the New England Winter Squash Pest Management Strategic Plan. Working in cooperation with University of Connecticut Extension, data was summarized for a New England Pepper Pest Management Survey conduct in Spring of 2006. As member of a New England wide network UMass also coordinates with other states and federal agencies to gather information on additional pesticide registration issues.
Short Impact: There is currently no other source for gathering specific information on pesticide use and integrated pest management practices used by New England growers. Using a Dillman survey methodology, the Pesticide Education program has had successful survey response rate for the following surveys: winter squash (55%), apples (56%) and sweet corn (63%). Data from these surveys have and will be used to develop crop profiles and strategic plans as well as identifying the future research and outreach needs for these crops.
Source of Funding: USDA Northeast IPM Center grant
FTE's: 0.25
Scope of Impact: Multistate (MA, CT, RI, VT, NH, ME)

Key Theme: Pesticide Application, Integrated Pest Management
Title of Program/Project: Pesticide Applicator License Exam Training
Contact Person: Natalia P. Clifton
Brief Description of Program/Project: The Pesticide Education team offers a two-day workshop to help individuals prepare for the state administered pesticide applicator license exams. These workshops are held throughout the year approximately 16 times. Topics covered in the workshop include pest identification, pesticide types and formulations, health effects of pesticides, impacts of pesticides on the environment, pesticide label comprehension, integrated pest management, and pesticide laws and regulations. In addition, the UMass Outreach Bookstore distributes several pesticide exam study documents to individuals and businesses.
Short Impact: Although the workshop is voluntary, there were 501 workshop participants who represent approximately 28% of the individuals who take the state exams. A comparison of passing rates was made for twelve exams administered by the state pesticide regulatory agency. There were 273 individuals who took the workshop and then the state exam. Approximately 49% of these individuals passed the exam compared to 550 individuals who did not take the workshop and has an exam passing rate of 36%. Evaluations were distributed at three workshops with 61 respondents. Over 90% reported that they increased their knowledge a "moderate" and/or "a lot" on topics ranging from integrated pest management to laws and

regulations. One hundred percent would recommend this workshop to other who are preparing for the state exams. The passing rate for this population of participants (60) was 57%.
Source of Funding: fees
FTE's: 0.57
Scope of Impact: State (MA)

Key Theme: Pesticide Application, Water Quality, Biodiversity, Biological Control
Title of Program/Project: Pesticide Education and Recertification Training
Contact Person: Natalia P. Clifton
Brief Description of Program/Project: The Pesticide Education team cooperates with the Massachusetts Department of Agricultural Resources to provide recertification training to licensed and certified pesticide applicators. In addition to working with other UMass Extension teams, the Pesticide Education team conducted 19 recertification training workshops. Topics included: Massachusetts Pesticide Laws and Regulations; Pesticides and Pest Resistance; Pesticide Exposure Studies; Pesticide Impacts on Wildlife; Biological Control; EPA Worker Protection Standard Regulations for Agriculture; Turf Insect Pest Identification; and Pesticide Applicator Safety: Laws and Personal Protective Equipment. There were a total of 1,580 participants. Lectures on pesticide legislation, EPA worker protection standard, health effects of pesticides, personal protective equipment, and pesticide laws and regulations were given to University of Massachusetts-Amherst students. Three pesticide sprayer calibration workshops/labs were given with approximately 120 participants. The Northeast Sprayer calibration guide was distributed to over 1000 growers and landscapers. A presentation on pesticide safety and label comprehension was given to 15 individuals participating in a New Entry Farmer Program. A workshop concerning West Nile Encephalitis, Lyme's Disease and Rabies was presented to 50 participants through the Mass Aggie Seminar series.
Short Impact: Participants completed evaluations in the pesticide recertification training workshop series. Their self reports indicate that: Three hundred and eighty-five participants increased their knowledge of biological control and 315 individuals increased their knowledge of pesticide laws and regulations. Two hundred and seventy-eight pesticide applicators increased their knowledge of pesticide exposure studies and 209 pesticide applicators increased their knowledge of pesticide resistance. One hundred and sixty-four participants increased their knowledge of pesticide applicator safety and 107 participants increased their knowledge of pesticide impacts on wildlife. Approximately 63% of the participants who completed evaluations (1063) agreed "very much" that they increased their knowledge attending these workshops. Approximately 51% of the participants who completed evaluations agreed "very much" that they would use the information provided.
Source of Funding: Smith Lever 3D, fees
FTE's: 0.57
Scope of Impact: State (MA) (some out of state participants)

Key Theme: Land Use Management
Title of Program/Project: Citizens Planner Training Collaborative
Contact Person: Michael DiPasquale
Brief Description of Program/Project: CPTC provides a unique educational & training service to the people in local communities in the Commonwealth who take on the challenging task of serving on Planning Boards, Zoning

Boards of Appeal and other municipal bodies that make decisions relating to land use. Those who are new to it find the technicalities of planning and zoning daunting. For those with some years of experience, the fundamentals might need reinforcement, or they might need a greater level of detail and understanding to render sound decisions. Planning practitioners also take CPTC courses. The courses are taught by some of the most respected and experienced land use attorneys and practicing planners in the state. The CPTC Board of Directors includes representation from every sector of the planning community and its professional organizations. In the future, the use of other methods of information delivery, such as CD's and on-line learning, will be explored.

In 2006 the CPTC program provided a series of 29 fall workshops held in different parts of the state. Topics comprised basic learning areas such as "Writing Defensible and Reasonable Decisions", "How to read a Subdivision Plan" and "How to Hold the Perfect Public Meeting". In addition, the annual Spring Conference, held in March 2006 was well attended and included more advanced subject matter such as "Inclusionary Housing", "New Urbanism" and "Sustainable Practices". Three on-demand training sessions were facilitated by CPTC in Northampton, Ludlow, and Lee, Massachusetts.

Short Impact:
In 2006 CPTC drew almost 550 participants. This included over 250 at the annual conference, 270 at the fall workshops, and over 30 at the on-demand trainings.
Additional marketing, and use of the CPTC website lead to an increase over 2005.

Planning Boards in Lee, Northampton, and Ludlow requested specific trainings on holding public meetings and increasing public participation, indicating an interest and motivation by local officials to promote sustainability in their communities.

The over 250 local officials that attended the Annual conference participated in workshops that provided guidelines for legal and procedural standards for increased transparency in the land use decision process.

53% of the participants in our 2006 fall workshops statewide indicated through evaluations that they are able to use the knowledge gained in their work as members of planning and zoning boards.

Source of Funding: State, Smith Lever

FTE's: 0.5

Scope of Impact: State (MA)

Key Theme: Land Use Management

Title of Program/Project: Five Town Action Initiative

Contact Person: Glenn Garber (also Paul Catanzaro)

Brief Description of Program/Project: **The Five-town Action Initiative** (FTAI), a two-year demonstration project conceived and managed at the University of Massachusetts Amherst (UMA), is an effort of the Center for Rural Massachusetts, a collaboration of UMA Extension and the Department of Landscape Architecture & Regional Planning, in partnership with the locally-based Highland Communities Initiative, a private, non-profit organization underwritten by the Trustees of Reservations, a nationally respected land trust and conservation organization.

The process, however, is strongly citizen-driven.

In 06, the project entered its second, or Implementation, year, moving forward aggressively into specific initiatives following the joint education and regional visioning activities of the first project year: The 5-Town process has developed two priority areas: **Open Space Protection initiatives** and **Village Center Zoning** as a multi-purpose planning tool.

Short Impact:

- The five communities are now focused on implementation, rather than short-term permitting duties.
- The project has established the groundwork for a model of cooperative rural planning, on a "think regionally--act locally" basis. Because this approach can be employed throughout the Commonwealth, state planning officials have expressed interest in seeing the project's results and exporting them to other groupings of towns in the state.
- It is pointing the way the way toward a more efficient and locally-attuned mode of investing state support for local planning, one of the principal future-oriented expectations of the project.

Specific Implementation Pieces Emanating from Process: Further Detail:

Ashfield Village Center By-Law--the town, principally through its Planning Board, requested the creation of a village center zoning district.. The visioning and major concepts were driven by a stakeholder participation process conducted in 4 workshops: the physical and regulatory nature of the present center; useful laws from other places and infrastructural constraints (particularly the sewerage collection and treatment system); and future development scenarios. Village center visioning and zoning can serve a variety of long-term purposes: economic development, housing, neighborhood conservation and other benefits, while offering the community an alternative to conventional, high impact suburban growth modes.

The 4-Town Village Center Zoning Report--for the other 4 communities, the existing zoning and zoning districts that apply to (what is generally perceived as) the village center were analyzed in fall of 2006 for their appropriateness, capacity to attain long term goals, and likelihood of bringing about negative impacts or unintended consequences. Where appropriate in 07, specific amendments will be offered for consideration. Related infrastructural and cultural issues will be discussed in a general way, as a set of opportunities and constraints. This less detailed product will lay the groundwork for possible new or amended village center by-laws, and provide a slate of interim zoning actions that might help to avoid mistakes that would otherwise be difficult to reverse.

The Open Space Initiatives--this two-stage effort began in earnest in summer and fall of 2006 , starting with preparation of a geographic information system-based analysis in all five of the towns, in which parcels are prioritized based upon advanced techniques that primarily emphasize ecological/natural resources value. Then, a participation program of outreach & education involving towns, landowners, land trusts and other interested parties was launched in fall of 2006, to push preservation, land planning and individual protective efforts closer to reality. Workshops will follow in 2007. The impact of this project in five contiguous rural towns could have significant long term benefit the region.

Source of Funding: Jessie. B. Cox Foundation, Mifflin Foundation, State
FTE's: .39
Scope of Impact:State (MA)

Key Theme: Land Use Management
Title of Program/Project: Comprehensive Land Use Program
Contact Person: Glenn Garber
Brief Description of Program/Project: **Advanced Tools Initiative, Phase II** This project lies at the core of Center for Rural Massachusetts' work and new vision. This is an unparalleled analysis of the highest impact tools and strategies actually employed in Massachusetts communities to accommodate development in ways that encourage preservation of natural resources and community character, while enhancing rural and small town development opportunity. The use of alternative or conservation subdivision design in residential development (traditionally called "cluster development") can achieve natural resources preservation and other goals in the public interest. This regulatory tool has been in existence and in a state of evolution for close to 35 years in the United States, and at least 264 communities in Massachusetts employ some kind of land use controls of this type. The Advanced Tools project, is a three-phased effort that is examining the use of these and related tools and techniques to conserve open space and resource areas, as well as to better fit residential development into the landscape, retain some elements of community character, and even attain affordable housing objectives. The problem is that conservation design is in many cases used too little, or applied poorly. The Advanced Tools project, in its first phase, compiled a data base of every community in the state with some law of this type and evaluated each one in terms of how advanced and explicit the law was, applying a wide array of assessment criteria. Working from that base, Phase two is now focusing especially on the wide array of regulatory strategies and incentive mechanisms that the cities and towns use to channel development into conservation design, rather than accepting only conventional subdivision layouts. Examples include density bonuses, an assortment of streamlined permitting options, and compulsory clustering for larger development proposals. This study identifies a representational sample of approximately 45 communities and examines them in detail, with 20 to 25 interviewed in person. The intent is to present a set of case studies that indicates how successful the various strategic approaches have been in getting the development community to employ this type of design. **The State Planning Laws Study** States approach the management of their growth, development and resource protection in substantially different ways. The statutes that embody these approaches and philosophies therefore vary just as much. The state that has the most top-down planning and development structure is Hawaii, with a critically central state role and only four local (county) planning jurisdictions. Massachusetts in certain ways represents the other end of that spectrum, with home rule empowering the Commonwealth's 351 cities and towns to do planning on a town scale. Some states create a strong interim layer of planning and regulation via counties or

special regional districts. A number of states have developed statewide land use policy maps which create different policies for areas prioritized for conservation and those targeted for development. However, the degree to which they meaningfully use these maps to direct state investments accordingly or put other fiscal and/or regulatory teeth into the maps varies widely.

The State Planning Laws Project began work in the fall of 2006, and will research and compare these differing methods of state-level planning and critically evaluate them. The intent of this analysis is to understand the opportunities and constraints that the various methods represent and how they could be improved. The study will be instructive to legislators, other public officials, practicing professionals and members of the development community who are concerned with the big planning picture. Nine states are currently being considered for in depth case study analyses, including Oregon, New Jersey, Maryland, Rhode Island, Connecticut, Hawaii, Florida, Washington and Vermont.

A written report will be produced for this activity. However, conference presentations and workshops are intended to be the primary means of delivery to a wider audience. The first such committed presentation will be at the Citizens Planner Training Collaborative Conference in March/07.

Land Use Education and Training

The Land Use Management activities embrace a variety of workshops, conference presentations, special training initiatives and the like, in order to reach a wide variety of audiences and participants. The 2006 venues included: include: the Citizen's Planner Training Collaborative conference; the Citizen's Planner Training Collaborative training courses; the Smart Growth conference; the Southern New England Regional American Planning Association conference; the MA Association of Planning Directors conference; the Five Town Action Initiative workshops; and the MA Association of Regional Planning Agencies. There were also web postings of relevant materials.

Short Impact:

The focus of this project in 06 was research rather than outreach. However, there were several opportunities through the year to provide preliminary information and training based on this research to a variety of audiences. By means of several conference presentations, production and dissemination of written and/or electronic reports and materials, a training course, in-person interviews to support the required research, web postings and direct individual communications, we believe that the following positive impacts among targeted audiences occurred on FY06. In future years, we expect to be able to provide program evaluation data to demonstrate these outcomes:

1. Local land use officials and professional planning practitioners have increased their knowledge, skills and motivation to promote sustainability and equity through comprehensive planning and effective regulation.

2. Practicing planners, land use lawyers, faculty and student researchers in the field, citizen planners/board members, elected officials & related parties have increased their knowledge of effective planning practice.

3. Municipal boards and policy makers have increased their knowledge, skills and motivation to

consider or pursue opportunities for public/private partnerships and initiatives which foster protection of land and natural resources

4. Land developers have increased their knowledge, skills and motivation to integrate smart growth principles and compact development patterns into their business planning

Source of Funding: State, Smith Lever

FTE's: .49

Scope of Impact:State (MA)

Key Theme: Plant Production Efficiency, Agricultural Profitability

Title of Program/Project: Nutrient and cover crop management; soil health, and conservation.

Contact Person: Masoud Hashemi

Brief Description of Program/Project:
This project was a part of Sustainable Vegetable Production and Marketing Program. In this project various aspects of nutrient management were studied. The study included:

- Our studies indicated that current cover crop management in Massachusetts is not suitable for effective N uptake. Various alternative techniques for early planting cover crops in fall including use of early maturity corn hybrids and inter seeding cover crops into standing corn plants were studied.
- Cost of nitrogen fertilizer in recent years has been increased considerably and sweet corn growers are interested in whether their nitrogen fertility program is appropriate. The concentration of nitrogen in the lower portion of sweet corn stalk and the current nitrogen testing i.e. the presidedress soil nitrate test (PSNT) were used to evaluate the current nitrogen fertility and determine if the nitrogen application was sufficient or excessive.
- FarmSoft, a computer program that is being used for generating nutrient management plan was updated to include vegetable crops.

Short Impact: Participants in one field day (45) and two twilight meetings (150) learned how to maximize the use of on-farm nutrient sources and therefore, reduce fertilizer purchase.

Growers participated in field day and twilight meetings (195 in total) learned how to use Best Management Practices (cover crop) to reduce the risk of environmental pollution.

Using FarmSoft, three nutrient management plans were generated for dairy farmers who also grow vegetable crops.

Source of Funding: Grant, State

FTE's: 0.16

Scope of Impact: State (MA)

Key Theme: Agricultural Profitability, Small Farm Viability, Organic Agriculture, Risk Management

Title of Program/Project: Sustainable Vegetable Production & Marketing: Improving safety,

efficacy and cost-effectiveness of pest management methods (advanced IPM); Expanding/selecting crops and varieties; expanding and accessing viable markets

Contact Person: Ruth Hazzard

Brief Description of Program/Project:

1.) To evaluate several Brassica species for winter survival, productivity, and flea beetle resistance for fall planting, compared to spring planting

2.) Ongoing 'Achieving High Quality Brassica Crops on Diversified Vegetable Farms' project. The core of the project is a group of nine vegetable farmers who set goals for how they would like to improve brassica quality in their unique production system. They are working with project staff, consultants and each other to achieve this by changing their cultural and pest management practices over two growing seasons. They are being supported by consultants in areas of variety selection, nutrient and water management, business planning and record keeping, pest management, and marketing as well as by technical staff who visit their farms to assist them implementing and evaluating changes. Researchable questions regarding heat tolerant broccoli varieties and cabbage maggot scouting methods are being addressed in several replicated field experiments in CT and MA. Outreach to a wider circle of farmers is being accomplished through multiple channels; including farm tours, winter educational programs, newsletters, and publications (both electronic and printed).

Short Impact:

1.) Pilot data taken in 2005 and 2006 regarding the evaluation and selection of Brassica species and greens types for winter hardiness/survival, flea beetle resistance, and spring productivity has produced information on crop quality and productivity to be distributed to growers. Pilot data showed higher flea beetle resistance in greens from overwintered plants. Seed collected from selected plants in the summer of 2006 was distributed to growers for on-farm analysis of cold hardiness and flea beetle resistance. All plant material was donated from growers and a donation of one thousand dollars was made to the vegetable program for conducting this research. Students in Robert Bernatzky's plant breeding class assisted with selections and evaluation.

2.) Two separate experiments, suggested by growers, were conducted evaluating broccoli varieties for an extended harvest were conducted at the South Deerfield Crop Research and Education Center. Participating growers met over the winter to evaluate their progress toward their goals, receive peer feedback and professional advice from extension staff and consultants, and set their goals for the coming season. With field days, farm tours, presentation, meetings, and workshops we have presented information about sustainable crop and pest management practices for Brassicas directly to 238 growers and ag. professionals. Surveys collected at several of those meetings indicate that the majority of attendees have learned something they intend to try on their own farms. Through newsletter articles and fact sheets, we have indirectly provided information to over 300 growers additional growers. On August 4, 2006 one of our growers was featured in a front page article in the Springfield Hampshire Gazette focusing on his work with this project. The Gazette is the leading newspaper in the area, with a subscription base in the tens of thousands. Combined with the 510 direct contacts and 593 indirect contacts from 2005, this project has so far provided direct information to over 1600 agricultural professionals and growers. Including the wider

audience reached by last years Boston Globe article and the 2006 Hampshire Gazette feature, we have brought the work being done with local brassica production to the attention of over half a million people across the New England area. In addition, research projects conducted as part of this project have provided valuable information on variety selection and improved cultural practices to improve quality and extend the harvest season for broccoli and Brussels sprout crops.

Source of Funding: grants, fees

FTE's: 0.2

Scope of Impact:Multistate Research, Integrated Research and Extension – research is centered in MA and CT, but extension and outreach has extended across the North East.

Key Theme: Innovative Farming, Agricultural Profitability, Plant Health, Organic Agriculture

Title of Program/Project**:** Sustainable Vegetable Production and Marketing; **Developing and Implementing Advanced IPM in Sweet Corn**

Contact Person: Ruth Hazzard

Brief Description of Program/Project: Growers are learning about and testing advanced biointensive and reduced risk integrated pest management methods in **sweet corn** through on-farm trials, educational programs, and publications. Priority pest management needs in sweet corn are being identified through a northeast region-wide sweet corn Pest Management Strategic Plan.

Short Impact:

1) Through this program the extension staff worked one-on-one with growers to educate them about alternative pest control methods and the benefits of using trapping data generated on their own farms as part of an IPM program. Participants consisted of 12 growers, with a total sweet corn acreage of 208 acres, who used alternative methods of pest control including; on-farm trapping and scouting to monitor pest populations, release of *Trichogramma ostriniae* as a biological control for European corn borer, and using biopesticides and reduced-risk pesticides when necessary.

2.) A survey was given to growers at the end of the season which provided positive feed back on many objectives of the program. Of the growers surveyed, 100% reported improved crop quality and yield, 100% reported that they learned more about IPM techniques, 77% reported making fewer pesticide applications 77% reported reducing environmental impact, 67% increased applicator and worker safety and 55% reported that they improved public relations among their customers. Every grower surveyed stated that they will continue to use the practices on their own. At least 11 applications of carbamates and pyrethroids were saved as a result of this program. Release of Tichogramma in early corn resulted in reduced sprays as well as cleaner corn throughout the season. At one farm in Hatfield, trapping data from previous years showed that the peak of the second-generation European corn borer ranged from 29-37 moths captures per night. With the release of *Trichogramma ostriniae* in 2006, the peak of the flight was 1.7 moths per night.

Forty growers learned about sweet corn scouting, reduced risk products and use of Trichogramma at an August on-farm training program held in Dracut MA. Conservation benefits of these methods were highlighted by the host farmer and by staff from the USDA

Natural resource Conservation Service.

3.) Weekly sweet corn pest trap captures were collected from 25 locations across New England and were published in the Vegetable Notes newsletter and on the regional website Pestwatch. The newsletter publication is sent to over 530 growers and professionals throughout the region. The hundreds of growers who read newsletter now use the published trapping data and monitor for pests in their own corn, resulting in fewer sprays.

4.) The regional sweet corn PMSP was released in fall 2006, and posted at both the National and Regional IPM Center websites (http://www.ipmcenters.org/pmsp/pmsp_form.cfm?usdaregion=National%20Site). This document highlights educational, regulatory and extension needs which are common to the approximately 3000 sweet corn growers (110,800 acres, crop value $158M for fresh market sweet corn and $29M for processing sweet corn) in the Northeast region It is based on input from growers obtained via workshops and regional surveys. These will be used by researchers and regulators to guide policy decisions and programs in the region.

5) A research trial was conducted to study the effect of applications of corn oil and an organic insecticide (Entrust) directly to the corn silk in 6 different sweet corn varieties grown by Organically Certified growers. Results will be presented on the Umassvegetable.org web site and submitted to academic journals for publication.

Source of Funding: State, grants, industry

FTE's: 0.2

Scope of Impact: State (MA)

Key Theme: IPM, Innovative Farming, Agricultural Profitability, Plant Health

Title of Program/Project: Sustainable Vegetable Production & Marketing: Improving safety, efficacy and cost-effectiveness of pest management methods (advanced IPM); Northeast Vegetable Working Group

Contact Person: Ruth Hazzard

Brief Description of Program/Project:
The Northeast Vegetable Integrated Pest Management (IPM) Working Group (R. Hazzard, Chairperson) was established in 2002 under the umbrella of the Northeast Pest Management Center. The group represents diverse types of vegetable farmers, consultants, University, state agency, and other agricultural professionals from the Northeast Region. The mission of the Northeast Vegetable IPM Working Group is to foster the development and use of IPM as a means to achieve ecological and economic sustainability of vegetable farms in the Northeast.

Two of the group's goals are to identify and prioritize regional vegetable IPM needs, and to strengthen partnerships and information exchange among vegetable farmers, agricultural professionals and other stakeholders throughout the Northeast region.

Two projects to address these goals include the creation of a Pest Management Strategic Plan for Sweet Corn, and the initiation of a collaborative partnership between vegetable IPM educators, consultants and farmers with NRCS agencies across the northeast region.

Short Impact: The Vegetable Working Group identified sweet corn as a key vegetable crop throughout the Northeast with critical issues that should be addressed through region-wide pest management strategic plan. In 2006 the Northeast Region Sweet Corn Pest Management Strategic Plan was produced through the Vegetable Working Group. It is posted on the NE IPM Center website: www.ipmcenters.org/pmsp/pdf/NE_Sweet_Corn.pdf.
In December 2005, we coordinated the Northeast IPM Vegetable Working Group's annual meeting. The Vegetable Working Group hosted a Northeast regional conference, ultimately aimed at increasing the adoption of IPM on farms throughout the Northeast through the utilization of NRCS programs such as the Environmental Quality Incentive Program. The meeting of 38 people included IPM practitioners, farmers, and federal employees from National Resource Conservation Service (NRCS), the EPA and CSREES. Connections between those in attendance were established at this groundbreaking meeting and have resulted in ongoing collaboration. The NE Vegetable Working Group has since continued to collaborate with NRCS on regional and state levels to establish and/or strengthen local programs on the state level.

In MA Ruth Hazzard met with Tom Akin and Deborah Johnson at the Massachusetts state NRCS office and updated the Pest Management Calculator, which is used to determine how much growers will get in cost share for IPM practices in the NRCS EQIP program in MA. Specific advanced IPM approaches were included, such as conservation and release of beneficials, spot or perimeter trap crop treatments, use of low-risk pesticides as identified by WIN-PST, and weather, crop or pest monitoring using traps, forecast networks or weather stations. The UMass Crop-Specific IPM Guidelines are used by NRCS to define pest management practices funded by EQIP. Through additional funding the Massachusetts IPM Guidelines (1999) will be reviewed, revised and expanded to better serve the NRCS programs.

Another funded project will enhance collaborations between NRCS, Extension educators and researchers, and farmers with support from the NE IPM Center infrastructure.

In a third grant an IPM practitioner from another region who attended the conference submitted a successful grant proposal to duplicate in the Midwestern region of the US the conference that was hosted by the Vegetable Working Group.

Source of Funding: Grants, State

FTE's: 0.2

Scope of Impact: Multistate Extension MA, CT, RI, ME, NH, VT, NY, PA, NJ, DE, MD, WV and others (Midwest, North Central)

Key Theme: Agricultural Profitability, Innovative Farming, Plant Health, Risk Management

Title of Program/Project: Sustainable Vegetable Production and Marketing: Improving safety, efficacy and cost-effectiveness of pest management methods (advanced IPM); Developing perimeter trap cropping systems to control cucumber beetle in winter squash & other cucurbit crops.

Contact Person: Ruth Hazzard

Brief Description of Program/Project:
Research was done both in small experimental plots and in commercial fields. PTC is a systems approach, which reduces the costs and risks associated with traditional pest

management practices while maintaining or enhancing their effectiveness. Hundreds of growers across New England learned about these systems through on farm trials, conferences, newsletter articles, and other venues. Many of them have expressed interest in adopting these practices or reported that they are using them. In 2005 & 2006, we focused primarily on grower driven experiments to evaluate more marketable trap crops, looked at the potential effects of the system on pollen limitation and yield, and refined the methods for implementing this system.

Short Impact: Our research has determined that buttercup squash can be used as a more marketable substitute for Blue Hubbard squash in this system, and that there are no adverse effects on yield due to changes in pollinator behavior in this system. Fourteen growers in the Pioneer Valley experimented with the system this year, many of them for the first time, and most of them will continue to use it to their advantage. Pesticide reduction with PTC is 90-95% compared to conventional systems, with equivalent or better control. Articles detailing our work were sent out in the Vegetable Notes newsletter in the summer of 2006, reaching a subscription base of over 500 growers and interested professionals. Our results were presented to an international audience at the 2006 International Cucurbitacea conference in Ashville, North Carolina and to New England and Mid Atlantic growers and researchers (>200). Thirty growers learned about PTC system first hand at a Twilight Meeting at Twin Oaks Farm in Hadley, MA. Organic approaches to the system were studied in a collaborative research project at Hampshire College which demonstrated effective methods for one of the most difficult pests in organic vegetable systems and 50 growers learned about the study in field tours.

Source of Funding: Grant Funded

FTE's: 0.2

Scope of Impact:State (MA) Multistate Research, Integrated Research and Extension – research is centered in MA, but extension and outreach has extended across the North East in addition to NC.

Key Theme: Agricultural Profitability, Organic Agriculture, Risk Management, Pesticide Application

Title of Program/Project: Vegetable Guide, Vegetable Conference, and Vegetable Website. This project was a part of the Sustainable Vegetable Production & Marketing Plan

Contact Person: Ruth Hazzard

Brief Description of Program/Project: The vegetable industry faces many challenges; to remain viable, this industry needs cutting edge research that unites basic scientific investigation with applied and practical solutions, and well-educated farmers who are ready for the changes of the next fifty years. Up to date and cutting edge research and recommendations are available to growers and educators through the bi-annual New England Vegetable and Fruit Conference and Trade Show, the UMass Extension Vegetable Program website, and the New England Vegetable Management Guide.

Short Impact: The **2005 New England Vegetable and Fruit Conference and Trade Show** was held in Manchester NH on Dec. 13-15, 2005. It was planned by 30 people from 7 states representing extension, farmers, industry and research. There were 25 half-day educational sessions containing 118 individual presentations, plus 6 farmer-to-farmer discussion sessions on topics from alternative energy to winter growing. The sessions offered a total of 26 hours of pesticide applicator recertification credits. The trade show had 117 commercial and non-profit exhibitors.

Total attendance over 3 days was 1,290 people, including 238 people associated with the trade show, and 138 speakers and conference workers. Evaluations were completed by 160 people; of these, 91% said that information obtained at the conference would help them improve pest management, 85% said it would improve soil or nutrient management, and 79% said it would help improve farm profitability. A new source of information was obtained by 89% of respondents, and 78% said they would adopt a new practice in the following year as a result of attending the conference. A 328-page conference proceedings summarizing 76 presentations was published and posted online at www.nevfc.org.

The **2006-2007 New England Vegetable Management Guide** was published in December 2005. 1500 copies have been distributed throughout New England; it is also available online at NEVegetable.org. Four of the five primary editors of the guide are from Massachusetts. In a 2005 survey of New England sweet corn growers, the New England Vegetable and Management Guide was ranked as the most important source of information for making pest management decisions. It was scored as very important by 69% of those answering the question, and somewhat or very important by 88% of those answering the question. Similar results have been obtained in other surveys of vegetable growers in New England.

The UMass Extension Vegetable Program website,**UMassvegetable.org,** was redesigned and updated in 2005. Information and pictures on each of the pests, crops and diseases in Massachusetts is included. The site contains research reports, resources and links for vegetable growers, and averages around 200 hits per day. The website includes links to the conference and Management Guide websites, and the Vegetable Notes newsletter, which is published weekly during the growing season.

Source of Funding: State, Fees, Grants

FTE's: 0.25

Scope of Impact:Multistate Extension MA, RI, CT, ME, NH, VT

Key Theme: Plant production Efficiency, Grazing, Agricultural Profitability

Title of Program/Project:
Crops, Dairy, Livestock and Equine Environmental Stewardship

Contact Person: Stephen J. Herbert

Brief Description of Program/Project:
In this project various aspects of nutrient management to minimizing non-point source pollution from dairy and livestock operations were studied:

- Our studies indicated that current cover crop management in Massachusetts is not suitable for efficient uptake of residual nitrogen. Various alternative techniques for early planting cover crops in fall including use of earlier maturity corn hybrids and inter seeding cover crops into standing corn plants were studied.
- Various demonstrations and outreach programs were provided to horse owners and the equine industry. These educational activities included use of self-guided signage at Hadley UMass Equine Center, and Mass Aggie Seminar Series where management practices that threaten the environment were discussed. We provided various best management practices including mud and manure management, pasture grazing and hay quality, weed and poisonous plants to the participants.

The CDLE Team organized and presented pertinent information on pasture and grazing

management at public gatherings and assisted in “pasture walks” and pasture related conferences. We also coordinated the planning to establish a Pasture Research Center for New England to study the ecology and management of short season grassed-based grazing and mixed farming systems.

Short Impact: Participants in one field day (45) and two twilight meetings (150) learned how to maximize the use of on-farm nutrient sources and therefore, reduce fertilizer purchase.

Growers participated in field day and twilight meetings (195 in total) learned how to use Best Management Practices (cover crop) to reduce the risk of environmental pollution.

Participants in Mass Aggie Seminar Series (100 in total), visitors at Hadley UMass Equine Center (400+) greatly increased their knowledge of environmental issues and their ability to reduce the threat of pathogens and nutrient loss from stables, barnyards, exercise lots, and pasture.

An Upper Northeast Pasture Research and Education Center is proposed to promote the adoption and sustainability of pasture-based livestock enterprises in the region. The Center will bring energy saving methods to animal agriculture by lowering production costs and focusing on energy conservation and on-farm use of biofuels.
The Center will be located at the University of Massachusetts Crop and Animal Research and Education Center (CAREC) farms in Deerfield and Hadley MA.

Source of Funding: State, Grants

FTE’s: 0.85

Scope of Impact: New England States

Key Theme: Biodiversity, Endangered Species, Forest Resources Management, Natural Resources Management, Riparian Management, Wetlands Restoration & Protection

Title of Program/Project: Fish, Wildlife & Biodiversity Conservation

Contact Person: Scott Jackson

Brief Description of Program/Project:
The project takes advantage of the extensive research base in the Department of Natural Resources Conservation to provide information and training, and implement specific projects that address the conservation of fish, wildlife and biodiversity. Educational programs provide information on the importance of biodiversity, fish and wildlife habitat and conservation, use of ecological assessment and natural resource inventories to establish conservation priorities, wildlife habitat evaluation and protection of habitat during project review and permitting, and the impacts of roads and highways on wildlife and ecosystems and techniques for mitigating those impacts. Specific projects include the: Conservation Assessment and Prioritization System (CAPS), River and Stream Continuity Project, Mill River Watershed Project, Evaluation of Wildlife Crossing Structures on the Bennington Bypass, VT, and Route 2 Wildlife Passage Project.

Short Impact:

- 1,500 road-stream crossing structures in MA, CT, RI, VT & NH evaluated as part of a standardized protocol
- Creation of an online multi-state database for assessments of road-stream crossings (http://www.streamcontinuity.org/cdb)

- Incorporation of road-stream crossing standards developed by the River and Stream Continuity Partnership into state and federal policy
    - Massachusetts Programmatic General Permit (USACOE)
    - Maine Programmatic General Permit (USACOE)
    - Georgia Nationwide permit
    - MA DEP Guidance Document on the protection of wildlife habitat
- Based on road-stream crossing assessment methodologies developed at UMass The Nature Conservancy completed an evaluation of barriers to fish passage and river/stream continuity in the Westfield River watershed as well as an action plan for mitigating movement barriers
- Wildlife habitat evaluation techniques and field data forms developed at the University of Massachusetts were incorporated into the MA DEP Guidance Document on the protection of wildlife habitat
- The Conservation Assessment and Prioritization System (CAPS) developed at UMass was adopted by the MA DEP for identification of Habitat of Potential Statewide and Regional Importance; maps produced for 50 communities
- CAPS highlighted in the Federal Highway Administration publication "EcoLogical"
- CAPS maps of ecological integrity were produced for 50 communities and made available from the MassCAPS.org web site
- Seven wildlife crossing structures were monitored and data collected on their effectiveness
- 1660 people whose appreciation for the need to conserve biodiversity and use an ecosystems approach for the management of wetland and aquatic systems increased
- 2000 people whose knowledge of wildlife natural history and ecology, wildlife conservation issues, and techniques for protecting and enhancing wildlife habitat increased
- 550 people whose understanding of how to use ecological assessments and natural resource inventories for conservation planning increased
- 1600 practitioners and municipal board members that increase their understanding of development impacts and the balancing of development with resource protection and sustainability
- 1100 people whose understanding of the impacts of roads, railroads and highways on fish, wildlife and ecosystems increased and whose knowledge of tools and strategies for mitigation the impact of roads, railroads, and highways on fish, wildlife and biodiversity also increased
- 1375 people whose knowledge about BMPs for protecting wetland functions including wildlife habitat increased
- 775 people whose knowledge of MA Wetlands Protection Act regulations and policies increased
- 580 Conservation Commissioners whose confidence and competence in administering wetlands protection regulations increased
- 780 people whose knowledge and skill in preparing and reviewing wetlands assessments and permit applications increased

Source of Funding: State, Smith Lever, contract

FTE's: 1.25 FTE

Scope of Impact: Multistate Research, Integrated Research and Extension: MA, CT, VT, NH, RI, ME, MI, GA

Key Theme: Forest Resources Management
Title of Program/Project: Mass ACORN (A CoOperative Resource Network) /Forest Resource Conservation
Contact Person: Dave Kittredge, Jennifer Fish (Grad Student) and Paul Catanzaro
Brief Description of Program/Project: **Mass ACORN** (http://www.massacorn.net) is an interactive website designed for landowners, conservation organizations, land trusts, state agencies and others interested in forests and natural resources in the Westfield and Deerfield watersheds. The site includes information of ***local relevance*** and encourages interactive participation through a mapserver (providing spatial information), threaded discussion, and an "Ask the Forester" page. The intent of ACORN is to provide continuously updated, locally relevant information to encourage forest landowners to make informed decisions, to communicate with one another, to see their property as part of a larger whole, and to interact with local organizations in their watershed Mass ACORN also aims to attract landowners not currently engaged in forest conservation. In short, we are trying to promote informed land decisions (management and protection) and to encourage cooperation through information sharing in order to promote landscape scale considerations. It is our hope that a website specifically designed for a local watershed will help promote communication among landowners and interaction between landowners and organizations such as land trusts, watershed associations, town boards, and state foresters. This is a 3-year funded project. The site was developed in FY 06 and has been launched in FY 07.
Short Impact: Since FY 06 was a development year, the impacts from the project revolve around bringing local partners together to determine the needs of landowners in the ACORN target area. Representatives from the local land trust, watershed associations, conservation organizations, and state service foresters have met three times to help shape Mass ACORN as a local resource that will help the collective forest conservation goals of the project area and organizations. In addition, the ACORN team made great strides in understanding how people use the web to retrieve information and therefore how to best design, market and monitor the product. Impacts for next year will largely based on web monitoring software as well as an on-line survey.
Source of Funding: State, USDA National Research Initiative, Managed Ecosystems Project grant
FTE's: .3
Scope of Impact: State (MA)

Key Theme: Fish, Wildlife and Biodiversity Conservation

Title of Program/Project: Land Conservation

Contact Person: Robert A. Levite

Brief Description of Program/Project:
This program is designed to provide technical assistance, as well as outreach, education and facilitation to land trusts, communities, watershed associations, non-profit organizations, professionals and government agencies on issues related to land protection. This includes the following issues: Conservation tax issues ; public policy issues, smart growth/sustainability; Community Preservation Act, conservation funding, chapter land reduced property tax issues, property tax exemptions, stewardship and monitoring of preserved lands, land trust standards and practices and accreditation . It also includes the creation of web articles and learning materials, policy guidelines for protection of existing and new conservation restrictions and new web information.

At least 220 individuals were educated at 7 workshops or conferences on such issues as land trust standards and practices of operation, legalities of conservation restrictions and conservation issues as they pertain to town planners and zoning.

Proposed impacts included: (1) Large landowners, farmers and foresters are aware of a full array of operational and disposition-with-development options; (2) Local officials effectively manage issues related to natural resource protection; (3) The State, municipalities and private non-profit organizations increase the rate of land protection and the quality of the land protected; (4) Legal and land protection communities strengthen and improve mechanisms which enforce Conservation Restrictions; (5) Municipal governments, homeowners associations, land trusts, and other land use managers improve implementation of post-development stewardship responsibilities in constructed projects.

Short Impact:
As a result of Extension's work in the Commonwealth:
(1) 150 land trusts throughout Massachusetts were provided with new Conservation Restriction Enforcement Policy Guidelines to assist them in properly and adequately handling conservation restriction violations; (2) 150 land trusts were given the opportunity to assist in drafting new guidelines for Conservation Restriction amendments (3) 150 land trust were able to participate in and can utilize a rewritten Conservation Restriction Handbook to help shore up the permanency of new restrictions; (4) 25 towns with different types of cluster/OSRD bylaws have taken advantage of an opportunity review the nature, operation and end results of their use of this type of smart growth mechanism; (5) 30 Central Mass. planners have been educated on several new types of smart growth/sustainability programs.

Source of Funding: Smith Lever, State

FTE's: .4

Scope of Impact: State (MA)

Key Theme: Land Use Management

Title of Program/Project: Private Land Protection Strategies**:** Green Valley Institute

Contact Person: Robert Levite

Brief Description of Program/Project: This program reflects the full Extension/NREC

awareness of—and commitment to addressing—the fundamental role of land use and development in diminishing (or preserving) rural economies, landscapes and environmental quality. The consumption of land that is involved in characteristic sprawl type-growth, and the attendant loss of natural, cultural, forestry and agricultural resources that might lie on and under the land and water, is a well documented societal problem, with negative impact on the natural and man-made environment, concerns about long term sustainability, and high demands on public capital investment. The purpose of the land use management component of the Extension work program is to identify effective ways of addressing these growth issues and to develop & help to apply better models for attaining more sustainable outcomes, on the part of local communities, other public officials, land owners, organizations, professionals and educators. The Private Land Protection Strategies include outreach, education and facilitation to towns, land trusts, watershed associations, non-profit environmentally focused organizations, government agencies and private citizens, all located in the Mass. portion of the Quinebaug/Shetucket National Historic Corridor.

The program completed at least 13 workshops and trainings affecting over 500 attendees in 9 towns, and at one Northeast venue, and were viewed by an estimated 1100 television viewers. These covered such topics at canoe/kayak put-ins, legal issues on conservation restrictions, standards and practices for land trust operation, the Community Preservation Act and water resource protection.
Proposed 2006 impacts included: (1) Municipalities implement regulatory strategies that result in retention of working landscape operations. (2) More Planning Boards, master plan committees or related boards have updated master plans, zoning, and subdivision regulations, with greater emphasis on sustainability. (3) Municipal board members are more proficient participants in the planning process, making informed, supportable and timely decisions. (4) The State, municipalities and private non-profit organizations increase the rate of land protection and the quality of the land protected. (5) Legal and land protection communities strengthen and improve mechanisms which enforce Conservation Restrictions. (5) Municipal governments, homeowners associations, land trusts, and other land use managers improve implementation of post- development stewardship responsibilities in constructed projects. (6) The development community produces more projects with compact development and smart growth form and location.

Short Impact: As a result of Extension's work: (1) 3 Municipalities implemented regulatory strategies that result in retention of working landscape operations. (2) 1 town updated its master plan, zoning, and subdivision regulations, with greater emphasis on sustainability. (3) 25 Municipal board members are more proficient participants in the planning process, making informed, supportable and timely decisions. (4) 6 municipalities and private non-profit organizations increased the rate of land protection and the quality of the land protected. (5) The Massachusetts land protection community protection community strengthened and improved at least 2 mechanisms which enforce Conservation Restrictions. (6) At least 3 homeowners associations and 2 land trusts, improved implementation of post-development stewardship responsibilities in constructed projects. (7) At least 3 developers committed to working with compact development and smart growth form and location. (8) 75 high schoolers were educated on water resources impact (9) two municipalities completed updated Open Space Plans; (9) 1 community received a technical assistance grant; (10) 1 community achieved passage of one water protection overlay district; (11) one community protected

945acres of land, (12) one community completed a draft of a Master Plan,; (12) 8 attorneys in Connecticut received continuing legal education credits after completing a seminar on land protection tax law; (13) one new open space committee member ran a very close run for the Board of Selectmen; (14) 85 local planners and planning officials from all over southern New England were educated about smart growth programs in Massachusetts; (15)Web viewers were given complete updates on relevant information about programs and issues offered by the Green Valley Institute.

Source of Funding: Smith Lever, contract

FTE's: .30

Scope of Impact:State (MA)

Key Theme: Water Quality

Title of Program/Project: Barnstable County Water Quality Program

Contact Person: Marilyn Lopes

Brief Description of Program/Project:

This program increases consumer knowledge and understanding of groundwater as a resource and the effects of solid and hazardous material disposal to water quality issues. The Barnstable County Hazardous Materials Program and Hazardous Materials Hot Line offers technical assistance and educational support to town household hazardous waste coordinators for household hazardous waste collections and the implementation of permanent collection programs for recyclable hazardous materials. Staff specialists also provide the public easy access to up-to-date information on the proper disposal of household hazardous materials on Cape Cod. This project is also engaged in a cooperative effort with public agencies and non-profit groups to provide educational programs and materials to schools, businesses, and individuals to promote understanding of Cape Cod's fragile water resources and change individual and group practices to protect groundwater.

Short Impact:

- A regional/cooperative hazardous waste collection effort was established with the towns of Eastham and Orleans
- 3000 marine and road flares were collected and recycled
- Cape Cod communities disposed of more than 4750 rounds of ammunition and 85 guns
- Forty-two 30-galoon boxes of medical sharps were disposed of through a licensed medical waste disposal contractor
- 5535 households participated in hazardous waste collections removing 155 tons of hazardous materials from the waste stream; 57% of all participants were first time participants
- 219 gallons of liquid and more than one ton of dry pesticides were collected from agricultural businesses and properly disposed of
- 101.5 pounds of elemental mercury was collected and removed from the waste stream as a result of a thermometer, thermostat and switch collections program
- Over 7,100 people increased their knowledge of how to properly dispose of household hazardous waste

Source of Funding: Smith Lever, County

FTE's: 1.0

Scope of Impact: State (MA)

Key Theme: Water Quality, IPM

Title of Program/Project: Environmentally Sensible Turf Management

Contact Person: Owen, M.

Brief Description of Program/Project:

Management of residential, landscape, municipal, school, and recreational turf is necessary in an urban/suburban environment. Best management practices have the potential to enhance and protect the environment while improper practices have the potential to cause harm.
Professional turf managers need to learn best management practices and integrated pest management strategies that protect water quality and quantity.
Consumers, environmental and community advocates, and decision makers need to learn clear, research based information about caring for lawns using best management practices and about protection of water resources.
The purpose of this program is to provide information and opportunity for the various segments of the audience to learn that information.

Methods included but were not limited to: seminars; workshops; field meetings; invited presentations; communications via web, e-alerts, and other vehicles; and publications and fact sheets.

Short Impact: Professional turf industry participants learned how to: implement BMPs and IPM strategies and techniques; implement strategies to protect their own health and safety and that of the public, as well as the environment from exposure to lawn management materials; and how to protect their own health and safety related to animal and insect (and similar agent) transmitted human diseases; and implement BMPs that result in water conservation and protection.

Consumers, environmental and community advocates, public and private entities and decision makers learned clear, research based information about protection of water resources and caring for lawns using best management practices and IPM.

Overall we determined that during this fiscal year:

- 5250 people took direct advantage of these programs
- 1288 subscribers received 49 turf management updates
- 49,347 unique visitors viewed our web page
- 20,411 visitors downloaded our online publications

The audience for our programs is comprised of: professional turf managers and associated professionals (Lawn Care Operators, Sport Turf Managers, Golf Course Maintenance Personnel), Natural Resource Agencies, Environmental protection groups and organizations, Master Gardeners, Regulatory Agency personnel, Public and Private Water Managers, Municipal Boards.

Specific impacts from the UMass Turf Research Field Day and the Annual Lawn Care Seminar follow. 430 people attended these educational events. Approximately 50% of these returned evaluations. Program attendees asserted their learning as a result of program attendance:

Best Management Practices

- 96% of participants learned about turfgrass wear tolerance mechanisms and selection of wear tolerant cultivars
- 94% of participants learned about the differential and combined effects of wear and soil compaction on turf health.

Integrated Pest Management

- 100% of participants learned about timing of product application for maximum control of grubs and surface feeding insects
- 100% of participants learned about new and forthcoming insecticide products for the turf management market.
- 99% of participants learned how to effectively scout for weeds as part of an IPM program.

Applicator, public and environmental protection

- 100% of participants learned about how to modify pesticide application methods to minimize applicator and golfer exposure.
- 99% of participants learned about diseases like West Nile virus, Lyme disease, and other diseases of public health concern.
- 99% of participants learned how to protect themselves and others from diseases of public health concern.

Water protection and conservation

- 99% of participants learned about low maintenance plants suitable for use in places where it is difficult to grow turf.
- 99% of participants learned about low maintenance grasses and other plants to use when inputs are limited.

Source of Funding: Smith Lever, fees, State

FTE's: 4.35

Scope of Impact: Multistate Extension: MA, ME, NH, VT, RI, CT, NY

Key Theme: Biodiversity, Endangered Species, Wetlands Restoration and Protection

Title of Program/Project: Northeast Instream Habitat Program

Contact Person: Piotr Parasiewicz

Brief Description of Program/Project:

The Northeast Instream Habitat Program (NEIHP) focuses on delivering effective research tools to state and federal water resource agencies, industry professionals, researchers, and environmental stewards. The purpose of these tools is the assessment of available habitat within flowing, freshwater systems and the prediction of biological response to the modification of these systems as required by the Clean Water Act and water policies of the individual northeastern states. NEIHP strives to improve upon existing methods in order to better understand the relationships between aquatic biota and their physical environment. The program is a multidisciplinary effort combining the techniques and ideas of environmental engineering, biology and the geosciences. Our core tool is the MesoHABSIM modeling

software used for the simulation of habitat availability at different flows. MesoHABSIM allows for the quantitative evaluation of river management scenarios, and consequently the justification of restoration measures.

Short Impact:

- NEIHP conducted two pilot projects to determine Protected Instream Flow and Water Management for the state of New Hampshire. These projects create a methodological foundation for state laws regulating water use.
- Completion of a Feasibility Study of the removal of the Advocate dam on the Mill River (Hatfield, MA). Decision-makers have access for scientifically-based information on the environmental costs and benefits of dam removal as well as alternative management scenarios for the Advocate Dam.
- Instream habitat studies completed and management opportunities identified for the Eight Mile River in Connecticut.
- 15 agency personnel and other natural resource professional significantly increased their knowledge of river and stream ecology and techniques for evaluating the impact of hydrological alteration on riverine systems.

Source of Funding: State, Smith Lever, grants

FTE's: 0.35

Scope of Impact: Multistate Research, Integrated Research and Extension (NY, CT, NH)

Key Theme: Integrated Pest Management; Biological Control; Sustainable Agriculture

Title of Program/Project Refinement and Delivery of Bio-Based Approaches to Reducing Insecticide Against Two Key Apple Pests

Contact Person: Arthur Tuttle, Daniel Cooley

Brief Description of Program/Project

This project supported 5 years of experiments that developed biologically-based methods for managing plum curculio (PC) and apple maggot (AMF), the 2 most important insect pests of apples in the northeastern USA. Together with work funded by other sources, this work represents the culmination of Ronald Prokopy's career. For monitoring plum curculio in 2001, we evaluated sticky clear panels on poles and pyramid traps on the ground. Traps were baited with fruit odors, pheromone, or combinations of the two. Results revealed a winning combination and release rate of odor and pheromone that was synergistic. In 2002 further tests confirmed the best release rates for the odor and pheromone. For monitoring AMF in 2002, we evaluated within-tree positions of sticky spheres baited with a 5-component blend of synthetic fruit odor. The most effective spheres had 25-50 cm of space around them. Spheres placed in the outer third of tree canopy captured more AMF than spheres placed in the inner third. In 2003, over-wintering sites of PC and patterns of movement into orchards were studied. Pyramid trap captures showed that as many PCs were found over-wintering beneath perimeter-row apple trees as beneath trees in woods 30 m away. None were found over-wintering in grassy areas. Circle traps were placed around trunks of perimeter- and interior-row trees to capture crawling PCs. All PCs either immigrated into orchards before the first insecticide spray or over-wintered there. 60% of trapped PCs were captured on perimeter trees and 40% were captured on interior trees. 2004 studies with circle traps showed that regardless of tree size, PCs were found up to 40 meters inside the blocks. By petal fall, in blocks having large trees,

most PCs were found on perimeter trees compared to interior trees. If trees were small the opposite was true. More PCs over-wintered in unmanaged weedy plots than in managed weed-free plots. Trapping PCs with pyramid and panel traps continued in 2005. Data will be used to determine the relationship between apple phenology and PC immigration. The 'bomb tree' approach was tested. A single tree was baited with odor and pheromone to lure PC and arrest their immigration at the edge of the block. This trap tree was treated periodically with pesticide, but all other trees remained untreated after petal fall. This approach worked in three of four orchards. In association with IPM Innovations, Inc., the development of the AMF sphere trap (CurveBall) continued. The CurveBall with the five-component odor blend was as successful as any other approach, including sticky traps and a spinosad bait. After research ended in Fall 2005, results were presented at grower meetings in MA and VA, at a regional IPM workshop in VT, and at the national entomological meeting in FL.

Short Impact:
We expect that over the next three years, approximately 50 growers in MA and neighboring states will adopt these advanced IPM strategies to some degree, i.e. perform them in specific blocks within their orchards. This would be take place in approximately 600 acres throughout the region. A larger group of growers (150 in MA and about 500 in other states and countries growing apples on 4,500 acres) was significantly impacted by many of the components of the work and will use that information to alter their management practices. For example, 2003 and 2004 experiments revealed that presence of PCs within orchard blocks could be explained by successful overwintering and by penetration of adults into interior trees, particularly if trees were small. A full block spray at petal fall was justified, but after that, growers could manage the pest by spraying only the perimeter 2 rows. Those later sprays could be timed precisely using the trap tree or the bomb tree approach. The apple maggot could be managed without sprays using the advanced AM sphere trap (CurveBall) and placement methods tested in by this project. The CurveBall is now ready for commercialization.

Source(s) of Funding: State

FTE's: 0.5

Scope of Impact: Multistate Integrated Research & Extension - CT, ME, MA, NH, RI, VT

Key Theme: Natural Resources Management

Title of Program/Project: Management of Coastal Shellfisheries (MRC)

Contact Person: William Walton

Brief Description of Program/Project: A number of shellfish species are commercially harvested along the Massachusetts' coastline, including quahogs, oysters, soft shell clams and bay scallops. In addition to the economic importance of shellfish to the region, shellfish are an important component of the tourist industry on Cape Cod. On Cape Cod alone, the towns sell thousands of non-resident shellfishing permits, raising revenue and attracting visitors to the region. Furthermore, culturally, many year-round residents, including members of the native Wampanoags, consider their ability to harvest fresh shellfish themselves an important part of their lives. To help improve management of these coastal shellfisheries, we conduct the following programs:

- Assist with formal certification training of Massachusetts Shellfish Officers at Massachusetts Maritime Academy

- Development and implementation of techniques to restore oyster fisheries
- Development of pilot techniques to restore bay scallop fisheries
- Technical support of ongoing efforts to restore quahog fisheries
- Provide technical information to citizen groups, public boards, etc.
- A prepared educational and informational response to possible red tide outbreaks
- Continued monitoring of shellfish diseases, including site visits and pathology tests of possible outbreaks

Short Impact:

- 20 natural resource officers obtained training and certification in management of shellfisheries
- Local communities are learning to effectively manage, protect and enhance water resources, with over 50 requests for information responded to and 12 meetings attended
- Natural resource agencies, municipalities and conservation organizations have adopted and implemented strategies that effectively protect and enhance aquatic/wetland ecosystem integrity and biodiversity
- Restoration attempts continue and expand with our assistance at over 10 sites
- A well-educated citizenry has promoted conservation and sustainable use of natural resources, including the organization of over 100 recreational shell fishermen

Source of Funding: County, Smith Lever

FTE's: 3

Scope of Impact:State (MA)

Key Theme: Natural Resources Management

Title of Program/Project: Restoration of Coastal Living Marine Resources (MRC)

Contact Person: William Walton

Brief Description of Program/Project:

Shellfish have been increasingly recognized as important natural components of the ecosystem, and worth preserving and restoring aside from their commercial or recreational value, as species indicative of water quality (e.g., bay scallops), of inherent habitat value (e.g., oyster beds), or as elements of nutrient cycles. Additionally, eelgrass is recognized as valuable habitat. To help improve management and restoration of these coastal living marine resources, we conduct the following programs:

- Field testing of pilot eelgrass restoration techniques
- Demonstration of oyster bed restoration and measurements of the effects on water quality

- Development of field techniques to restore bay scallops to local waters
- Technical assistance to tidal restoration efforts

Short Impact:

- Target audiences have learned the value of quantitative assessment of the success of restoration programs, with at least 3 presentations made at local meetings
- Local communities are more effectively managing, protecting and enhancing water resources, with the help of advice provided at 6 technical advisory meetings
- Natural resource agencies, municipalities and conservation organizations have adopted and implemented strategies that effectively protect and enhance aquatic/wetland ecosystem integrity and biodiversity, as demonstrated by the development of action plans for Wellfleet's Herring River and Truro's East Harbor
- Policy makers base decisions on a sound scientific understanding of water quality issues
- Researchers, policy makers, and conservation organizations monitor the environmental health of water bodies, aquifers, wetlands and coastal areas through the implementation of comprehensive strategies that include modeling, sophisticated monitoring and assessment methods/technology, and appropriate use of data collected by volunteer monitoring groups, including 2 citizens' groups
- Local officials effectively manage issues related to natural resource protection
- A well-educated citizenry has promoted conservation and sustainable use of natural resources, including the organization of over 100 recreational shell fishermen

Source of Funding: County Smith Lever

FTE's: 3

Scope of Impact: State (MA)

Goal 5
Enhanced economic opportunity and quality of life for Americans

Key Themes:

Aging
Agricultural Financial Management
Character/Ethics Education
Child Care/Dependent Care
Children, Youth, and Families at Risk
Communications Skills
Community Development
Conflict Management
Consumer Management
Home-based Business Education
Impact of Change on Rural Communities
Jobs/Employment
Leadership Training and Development
Literacy
Parenting
Promoting Business Programs
Promoting Housing Programs
Retirement Planning

Estate Planning
Family Resource Management
Farm Safety
Fire Safety
Home Safety
Supplemental Income Strategies
Tourism
Workforce Preparation - Youth and Adult
Workforce Safety
Youth Development/4-H
Youth Farm Safety

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Agency	Total Dollars	FTEs	MSR Projects/Programs	MSR Dollars
MAES	$32,008	1.6	1	$1034
UMEXT	$897,462	12.2	1	$29,353

Goal 5 Executive Summary

Goal 5 projects focus on youth development, principally via the 4-H program as well as research and education projects targeted to improving rural communities through planning and access to software routinely used for community planning. Youth development impacts focused on animal science, general science literacy, leadership development, and communications skills. Specific efforts focused on at risk youth audiences, youth in military families.

Key Theme: Impact of Change on Rural Communities
Title of Program/Project: Opportunities and Constraints for Interstate Greenway Planning in New England
Contact Person: Ryan, R., Lindhult, M., Fabos, J. (MAS00848)
Brief Description of Program/Project: There is a need to coordinate greenway and open space planning across politically fragmented New England, in order to preserve the region's unique natural, cultural, and environmental resources. This project will explore the physical and institutional barriers to creating a New England-wide greenway network.
Short Impact: This study created a consortium of over two hundred greenway planners across New England that work toward creating a New England wide greenway plan to preserve the regions' natural, cultural, and historic resources while developing a network of thousands of miles of recreation trails. This project worked to coordinate the efforts of state, regional, and local agencies and non-profit groups to develop interstate trail systems. This work was achieved through five annual symposia, newsletters, and a project web-site. In addition, research on collaborative greenway planning strategies was conducted that informs large-scale regional planning projects both nationally and internationally. Research on greenway trail users was one of the first to empirically identify a linkage between greenway trail use and public health, in the form of personal well-being and self-reported physical activity levels. This project has been identified in the realm of international planning as a leader in large-scale greenway planning, research, and outreach.
FTE's: .1
Source of Funding: Hatch, Grant
Scope of Impact: State

Key Theme: Impact of Change on Rural Communities
Title of Program/Project: Rural Low-Income Families: Tracking their Well-Being and Function in an Era of Welfare Reform
Contact Person: Mammen, S., Mietlicki, S. A. (MAS00886, NC-1011)
Brief Description of Program/Project: The smooth functioning of the family is important to the well-being and viability of rural communities. This project will add to the understanding of rural low-income families over time using the primary longitudinal data set collected by the NC-223 multi-disciplinary research team.
Short Impact: Key findings: The Federal Earned Income Tax Credit (EITC) afforded cash-strapped and credit-constrained rural working families the opportunity to increase their purchasing power and savings potential. With the EITC, they paid bills and loans, improved access to transportation, purchased various consumer durables and non-durables, established savings and built assets, engaged in leisure activities, and made human capital investments. However, only two-thirds of those eligible claimed the EITC.
FTE's: .4
Source of Funding: Hatch, Multistate, State
Scope of Impact: CA, IA, KY, LA, MA, MD, MI, MN, NB, NH, NJ, NY, OH, OR, SD

Key Theme: Impact of Change on Rural Communities
Title of Program/Project: Development of a Gradient-Based Landscape Pattern Analysis Methodology
Contact Person: Mcgarigal, K. (MAS00863)
Brief Description of Program/Project: The analysis of landscape patterns to aid land management is currently constrained by the lack of accessible methods for quantifying surface patterns. The purpose of this project is to develop and incorporate a suite of surface pattern metrics into the existing landscape pattern analysis software program, FRAGSTATS.
Short Impact: My lab is exclusively responsible for the development, distribution, and support of FRAGSTATS. We are currently working on a major revision (4.0) of the software which we expect to release in mid-2007. As evidenced by the listserve membership demographics (several hundreds worldwide) and the frequency of use in scientific publications in the field of landscape ecology (I estimate that 10-20% of the papers published in the discipline's leading journal, Landscape Ecology over the last 5 years used FRAGSTATS), it is clear that FRAGSTATS is being used by hundreds of scientists, managers, and conservationists from academia, agencies, industry, and NGO's from around the world. There is no question that FRAGSTATS has had a major impact on the field of quantitative landscape ecology and has led to significant disciplinary progress and stimulated new directions in the state-of-the-art of landscape pattern analysis. FRAGSTATS has become the world's leading software package for the calculation of landscape metrics and has greatly facilitated landscape level approaches to the understanding and management of natural resources. The ease of use of the software and efficient access to technical assistance has allowed landscape-level research and management activities to progress at a much faster rate than would be otherwise possible.
FTE's: .5
Source of Funding: Grant, Industry Grant, Hatch
Scope of Impact: State

Key Theme: Workforce Preparation – Youth and Adult; Children, Youth and Families at Risk

Title of Program/Project: New Communities Project in North Adams and South Roxbury

Contact Person: Karen Barshefsky

Brief Description of Program/Project:

UMass Extension continues to develop programs with CYFAR funds. This fourth generation of CYFAR funding again has supported programming efforts that focus on high risk and diverse youth in rural and urban areas. In North Adams youth offenders participate in workshop sessions on character education and workforce readiness. Included in this project, is a summer work component that a number of youth participate in where area organizations provide an opportunity for an eight week work experience. In the South end/Lower Roxbury neighborhoods of Boston, youth peer leaders from a variety of youth serving organizations participate in workforce preparation and youth development workshops; they, in turn work with younger children or their peers at their organizations in a stipend position.

Short Impact:

North Adams:

- Forty-three youth participated in the workshop sessions. The majority of youth in the workforce readiness program over the course of the year indicated that they had gained knowledge, skills, and confidence for the job search during the program. More than 85% indicated that they had learned what a job interview would be like , and that they knew what to bring when they applied for a job and how to act during a job interview. 35 of the 39 respondents indicated that they were somewhat or very much confident that they could get a job.
- A remarkably strong majority of youth in the character program over the course of the year indicated agreement that the experience had been beneficial in almost all categories.

More than 80% agreed with the following statements, indicating the development of a general positive attitude: I have a better sense of what it will take to be successful in my life; I will work harder to earn the trust of others; and I will take more responsibility for my actions.

- The probation officer's assessments of individual youth indicated that nearly all CYFAR participants (38 of 41) had gained overall through the year in terms of self confidence, respect for others, responsibility, cooperation, and positive attitude.

South End/Lower Roxbury:

- Twenty-one youth participated as peer leaders in the Boston NCP program.
- A solid majority of youth indicated that 14 out of 15 of a list of positive statements about the program experience were true for them most or all of the time. Several statements were rated true most or all of the time for more than 80% of respondents: I worked well with others in the group; I got good work experience; I communicated well with adults in the project; and I took pride in doing a good job.
- Also rated high (more than 70% responding that the statements were true most or all of the time) were several items relating to safety: It helped me stay out of trouble; I felt safe here; and The adults care about me here.
- Growth in skills and knowledge could be found in the Working With Children and Rocketry modules. Youth involved with the Working with Children module perceived their greatest gain in these areas: I can explain why an activity is or is not appropriate for a group of children, based on their stage of development; and I can introduce rules to a group of children so that they will want to follow them.

- Youth serving organizations see the main benefit of their association with the New Communities Project as: Help in establishing youth programs, particularly in the form of providing training and leadership for structured activities (the modules). In part, NCP staff were valued for their particular expertise, in part they were valued simply as an additional pair of caring hands to work with the community's youth.
- A total of 204 K-6th grade students and a total of 116 7th -12th grade students were reached through this project.

Source of Funding: Smith-Lever, State funding, CYFAR

FTE's: 1.3

Scope of Impact: State

Key Theme: Youth Development/4-H, Communication Skills

Title of Program/Project: 4-H

Contact Person: Sherrie Guyott

Brief Description of Program/Project:
Our mission is to prepare youth to become independent and contributing members of society by providing them with the supports and resources needed to develop life/work skills to advance positive long-term development. Our primary vehicle is the 4-H club where youth work with a caring adult(s) over a prolonged period of time in a safe environment. Education is accomplished through the experiential learning model in 4-H clubs as well as through special interest programs, school enrichment and 4-H camps.

- ✓ 18,418 youth participated in special interest, school enrichment and camping programs.
- ✓ 2670 youth were enrolled in 4-H clubs.

Short Impact:
Of the wide variety of knowledge and life skills learned in 4-H activities in Massachusetts this year, the following were documented:

Communications Skills:
724 youth across the state (27% of all enrolled) participated in local Visual Presentation Day contests. In the 2005 VP evaluation 96% of parents responding said that this program helped their child be a better public speaker, 87% said it helped their child do better presentations in school and 69% said that it helped their child learn to set goals and work to achieve them.

Organizational, Goal Setting and Record Keeping Skills:
4-H records were completed by 498 youth (19% of those youth enrolled in clubs), demonstrating development and practice of organizational, goal setting and record keeping skills.

Subject Matter Skills:
100% of youth that submitted records reported learning new skills in their project area(s). Approximately 70% of youth enrolled in 4-H clubs are enrolled in animal science projects.

Community Service Activities:
100% of youth submitting records reported being involved in community service activities. Youth reported developing a variety of skills and a commitment to providing community service. Written statements made by youth include, "Before I was in 4-H I didn't do any

community service", and "Community service takes commitment."

Source of Funding: Smith Lever, County, State, Grants and Fees

FTE's: 7.83

Scope of Impact: State (MA)

Key Theme: Youth Development and Engagement

Title of Program/Project: 4-H Operation Military Kids

Contact Person: Gretchen May

Brief Description of Program/Project:

The goal of Massachusetts Operation Military Kids (OMK) is to support the "newly military" youth and families here in the Commonwealth, to help the children in those families be safe, healthy and supported and to educate the public on the effects of deployment on youth and families. "Newly military" children are those children whose parent is a member of the National Guard or Reserve component of any military service and whose parent is in the deployment cycle. Since 9/11 there have been over 9500 deployments from MA. In this its first year of operation, MA OMK:

- built 1 state wide team and 3 regional teams of collaborators.
- conducted 7 trainings on the effects of deployment on children and families.
- distributed Hero Packs, containing support and communication items, to children of deployed service members.
- conducted 6 Speak Out for Military Kids trainings with military and non-military teens participating at each.
- worked with National Guard staff to develop a teen council
- participated at Family Readiness Group meetings and Family Events of the National Guard reaching hundreds of families.

Short Impact:

MA OMK partnerships combine the efforts of 25 military and civilian organizations.

Of the 160 adults who attended the trainings on the effects of deployment on youth and families 64% reported the following:

- 54% indicated a definite increase in knowledge related to the unique issues of children and youth with deployed family members;
- 60% indicated a definite increase in knowledge on the cycle of deployment;
- 47% indicated a definite increase in knowledge in the stressors impacting military families;
- 43% indicated a definite increase in knowledge in the strategies for coping with deployment issues;
- 71% indicated that they would share the information with their colleagues and at their places of employment.

Locating the "suddenly military" children was – and is - challenging; but once found 136 of them received Hero Packs. The 50 teens who attended the Speak Out for Military Kids (SOMK) trainings reported increased knowledge and skill in the areas of public speaking and preparing and delivering SOMK presentations for a variety of audiences. Two of these teens gave presentations at their local fairs reaching several hundred people. Of the 16 teens who participated in the Teen Leadership Trainings (Gear Up!) for the National Guard, eight have completed applications for the National Guard Teen Council. OMK participated at 13 Family Readiness Group meetings and Family Events of the National Guard providing hundreds of

families with a social and recreational respite in their otherwise hectic lives. Educating the public was also done via 10 newspaper articles, write-ups in 3 organizational publications and 3 radio show interviews.

Source of Funding: Grants, Smith-Lever, State

FTE's: 1.5

Scope of Impact: State MA

Key Theme: Youth Development/4H; Children, Youth, and Families at Risk; Communications Skills; Workforce Preparation - Youth

Title of Program/Project: 4-H Partnerships for Environmental Education

Contact Person: Shirley A. Mietlicki

Brief Description of Program/Project:

Partnering with other Massachusetts organizations concerned with youth development can greatly extend the 4-H program's impact. This report combines results from two such initiatives.

The Boston Urban Stewards (BUS) program is a year long environmental education program that involves multiple collaborations with youth programs, government agencies, and community organizations in Boston. High school youth are trained in tree identification and maintenance, GIS techniques, identification of invasive plants, environmental stewardship and job readiness skills during out of school hours. They, in turn, work with middle and elementary school children to clean up and plant school yards, local parks and other recreational areas; conduct tree inventories of local streets; tap maple sugar trees and produce maple syrup; and conduct community workshops on environmental stewardship. This past year, 127 youth, ages 13-17, participated in BUS activities and were recruited from the local middle and high schools, the Mayor's Youth Fund, and the Cacique After School Program; of the 29 teens, 6 were returning BUS participants who became junior staff members.

The Envirothon is a high school environmental education program that engages teams of youth in developing knowledge and skills for environmental protection and natural resource management across North America. The Massachusetts Envirothon program is a collaboration among Massachusetts environmental agencies, conservation districts, businesses, and environmental protection organizations. UMass Extension provides leadership to the "Current Issue" program component, which engages teams in environmental issue research and problem solving in their own communities (The 06 topic: *Climate Protection for Massachusetts Communities*). In 2006 the Envirothon involved, by the most conservative estimate, more than 400 youth and 50 educators in more than 40 communities across Massachusetts. In November, UMass Extension organized a workshop on campus attended by 132 youth and 39 coaches representing 32 Massachusetts communities. 40 teams and approximately 240 youth participated in the May event, as did 68 judges representing state and federal agencies, environmental businesses, higher education, and community and environmental organizations. UMass Extension also took the lead on revising the judging format for the Current Issue, including new training for judges, to provide a better environment for youth development. UMass Extension continues to provide leadership to program evaluation for the Envirothon as well.

Short Impact:

BUS junior staff, in collaboration with the BUS program staff and participants, tapped 61 maple

sugaring trees resulting in production of three gallons of maple syrup; led gardening and planting activities for 18 elementary school children for five weeks; maintained seven schoolyard outdoor classrooms that included 770 hours of trail/pathway maintenance, 50 hours of weeding and mulching and 23 tree pits mulched, edged and regularly watered; planted 100 trees in seven sites for National Arbor Day in collaboration with Eagle Eye Institute and the Boston Urban Forest Coalition; assessed 55 trees on Tremont St; provided demonstrations on transplanting a pansy and tapping trees to 331 people at the New England Flower Show; and worked with 35 youth and adults to remove invasive plants at Franklin Park. In 2006, 55% of the BUS middle school summer crew reported that they increased their knowledge and skills in basic tree care and urban forestry skills by fairly well, very well, or well enough to teach other people; 83% of the BUS summer crew indicated that their skills and knowledge improved a lot. The funding for the BUS program ended in fall 2006. Over the three year period of funding, BUS youth organized 19 educational and community outreach projects that focused on the value and importance of trees in the urban environment reaching 2,469 people.
Source of Funding: Smith Lever, Grants (Barr Foundation, CYFAR)
FTE's: 1.2
Scope of Impact:State (MA)

Stakeholder Input Process –
No significant changes from last year's addendum.

Overview:

Program Review Process

No significant changes have been made to the review process since the 5-Year Plan of Work was written.

Evaluation of the success of Multi and Joint Activities –

No significant changes from last year's addendum.

Appendix C

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multistate Extension Activities and Integrated Activities
(For summaries see Planned Programs Section)

Institution **University of Massachusetts**
State **Massachusetts**

_X_ Multistate Activities (Smith-Lever Act Funds)

Title of Planned Program/Activity	**Actual Expenditures FY 2006**
Goal One	
Sustainable Vegetable Production and Marketing	$14,676
Goal Two	
National Plant Diagnostic Network-Northeast Region	$ 7,382
Goal Four	
Crops, Dairy, Livestock and Equine Environmental Stewardship	$36,691
Fish, Wildlife & Biodiversity Conservation	$80,720
Environmentally Sensible Turf Management	$18,345
Northeast Instream Habitat Program	$25,684
Goal Five	
Rural Low-Income Families: Tracking their Well-Being and Function in an Era of Welfare Reform	$29,353
Total	**$212,852**

Robert Schrader, Interim Director **Date**
Form CSREES-REPT (2/00)

Multistate Extension Projects

Sustainable Vegetable Production and Marketing: Natural resource-base businesses learn disease management tactics that are environmentally sustainable and economically viable. Growers learn research-based best management practices related to water, soil, air, and integrated pest management. Agricultural businesses learn to accurately identify insects, diseases, and weeds; as well as, the importance of correct diagnosis of plant problems in pesticide use. Commercial growers and the gardening public learn sustainable resource management approaches and best management practices that protect water resources and environmental quality.

National Plant Diagnostic Network-Northeast Region: The network is a collective of Land Grant University plant disease and pest diagnostic facilities from across the United States. The mission of the network is to enhance national agricultural security by quickly detecting introduced pests and pathogens. This is achieved by creating a functional nationwide network of public agricultural institutions with a cohesive, distributed system to quickly detect deliberately introduced, high consequence, biological pests and pathogens into our agricultural and natural ecosystems by providing means for quick identifications and establishing protocols for immediate reporting to appropriate responders and decision makers.

Crops, Dairy, Livestock and Equine Environmental Stewardship: Various aspects of nutrient management to minimizing non-point source pollution from dairy and livestock operations were assessed an addressed. Focus was placed on (1) alternative techniques for early of planting cover crops in fall including use of earlier maturity corn hybrids and inter seeding cover crops into standing corn plants; demonstrations and outreach programs for horse owners and the equine industry focused on best management practices including mud and manure management, pasture grazing and hay quality, weed and poisonous plants; and delivery of pasture and grazing management via “pasture walks” and pasture related conferences.

Fish, Wildlife & Biodiversity Conservation: The project provides information and training, and implements specific projects that address the conservation of fish, wildlife and biodiversity. Educational programs provide information on the importance of biodiversity, fish and wildlife habitat and conservation, use of ecological assessment and natural resource inventories to establish conservation priorities, wildlife habitat evaluation and protection of habitat during project review and permitting, and the impacts of roads and highways on wildlife and ecosystems and techniques for mitigating those impacts. Specific projects include the: Conservation Assessment and Prioritization System (CAPS), River and Stream Continuity Project, Mill River Watershed Project, Evaluation of Wildlife Crossing Structures on the Bennington Bypass, VT, and Route 2 Wildlife Passage Project.

Environmentally Sensible Turf Management: Management of residential, landscape, municipal, school, and recreational turf is necessary in an urban/suburban environment. Best management practices have the potential to enhance and protect the environment while improper

practices have the potential to cause harm. Professional turf managers learn best management practices and integrated pest management strategies that protect water quality and quantity. Consumers, environmental and community advocates, and decision makers learn clear, research based information about caring for lawns using best management practices and about protection of water resources. Professional turf industry participants learned to implement BMPs and IPM strategies and techniques; implement strategies to protect their own health and safety and that of the public, as well as the environment from exposure to lawn management materials; and how to protect their own health and safety related to animal and insect (and similar agent) transmitted human diseases; and implement BMPs that result in water conservation and protection.

Northeast Instream Habitat Program: The Northeast Instream Habitat Program (NEIHP) focuses on delivering effective research tools to state and federal water resource agencies, industry professionals, researchers, and environmental stewards. The purpose of these tools is the assessment of available habitat within flowing, freshwater systems and the prediction of biological response to the modification of these systems as required by the Clean Water Act and water policies of the individual northeastern states. NEIHP strives to improve upon existing methods in order to better understand the relationships between aquatic biota and their physical environment. The program is a multidisciplinary effort combining the techniques and ideas of environmental engineering, biology and the geosciences. Our core tool is the MesoHABSIM modeling software used for the simulation of habitat availability at different flows. MesoHABSIM allows for the quantitative evaluation of river management scenarios, and consequently the justification of restoration measures.

Rural Low-Income Families: Tracking their Well-Being and Function in an Era of Welfare Reform: The smooth functioning of the family is important to the well-being and viability of rural communities. This project will add to the understanding of rural low-income families over time using the primary longitudinal data set collected by the NC-223 multi-disciplinary research team.

Appendix C

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multistate Extension Activities and Integrated Activities
(For summaries see Planned Programs Section)

Institution__University of Massachusetts
State_____Massachusetts

_X_ Integrated Activities (Smith-Lever Act Funds)

Title of Planned Program/Activity	**Actual Expenditures FY 2006**
Goal Two	
National Plant Diagnostic Network-Northeast Region	$7,3832
Goal Four	
Fish, Wildlife & Biodiversity Conservation	$80,720
Northeast Instream Habitat Program	$25,684
Total	**$106,404**

_____ _____
Robert Schrader, Interim Director Date
Form CSREES-REPT (2/00)

Integrated Extension Projects

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U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Actual Expenditures of Federal Funding for Multistate Extension and Integrated Activities

Fiscal Year: 2006

Select One: ☐ **Interim** **X Final**

Institution: University of Massachusetts Amherst

State: MA

		Integrated Activities (Hatch)	Multistate Extension Activities (Smith-Lever)	Integrated Activities (Smith-Lever)
Established Target %		25%	0%	0%
This FY Allocation (from 1088)		$ 2,079,515	$ -	$ -
This FY Target Amount		$ 519,879.00	$ -	$ -
Title of Planned Program Activity				
MAS00539	NC-140	$ 5,524.00	$ -	$ -
MAS00647	NE-9	1,013.00		
MAS00850	NE-1006	4,692.00		
MAS00873	NC-1010	85,925.00		
MAS00878	NE-1007	129,295.00		
MAS00880	NE-1013	1,865.00		
MAS00882	NE-1012	3,317.00		
MAS00917	NE-1019			
MAS00895	NE-1018	135,489.00		
MAS00890	NC-1016	1,800.00		
MAS00881	W-1002	12,767.00		
MAS00916	NE-1023	25,746.00		
MAS00496	NRSP-3	1,017.00		
MAS00877	W-1133	35,280.00		
MAS0896	NE-1015	7,462.00		
MAS00918	NE-1021	25,815.00		
MAS00886	NC-1011	1,034.00		
MAS00924	NE-1024	103,825.00		
MAS00927	NECC-1009	784.00		
	Total	$ 582,650.00	$ -	$ -
	Carryover		$ -	$ -

Certification: I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays represented here accurately reflect allowable expenditures of Federal funds only in satisfying AREERA requirements.

Director **Date**

Integrated Research Projects

MAS00539 Global competition increases the need for enhanced efficiency of orchard businesses. Rootstocks dramatically affect efficiency and fruit quality, but results vary greatly with climate and pest pressure. Further, new rootstocks are becoming available regularly, thus potentially enhancing efficiency. This project evaluates the performance of tree-fruit rootstocks with a variety of climates, pest pressures, cultivars, and training system in order to enable orchardists to develop orchards with the greatest likelihood of economic success and least likelihood of environmental damage.

MAS00647 This project helps to introduce a new crop to local growers for the benefit of fresh markets and good nutrition for this growing ethnic population. We have been able to supply virus-free seed to interested commercial growers, community groups, and institutions. We have begun a breeding program to select for genetic resistance to the virus. In addition, we continue to select for increased fruit size and productivity.

MAS00850 Plum pox disease or "Sharka" is one of the most devastating and economically important diseases of stonefruit worldwide. Surveys are being undertaken to determine the extent of incursion into new areas.

MAS00873 Nuclear transplantation provides robust means to create transgenic livestock rapidly. However, facile methods to introduce targeted alterations in the bovine genome are needed to take full advantage of this technical advance. Toward this goal we are developing strategies to interrupt cellular pathways that inhibit homologous recombination. Using these methods it should be possible to move genetic polymorphisms that affect production between breeds.

MAS00878 Several possible reasons exist for the low reproductive success & importantly among them are the environmental and metabolic stresses that these animals must bear to achieve high milk production yields. We will assess possible detrimental effects on oocyte maturation and developmental competence of the female gamete. We expect to find abnormalities & since we will evaluate the molecules involved in such effects, appropriate preventive measures can be taken.

MAS00880 Our results are fundamental to understanding factors that affect O3 uptake and plant injury. This has direct bearing on air quality standards for plants and people. We are also identifying new bioindicators for O3 that will increase public awareness of the O3 problem.

MAS00882 Presently the majority of crops for these ethnic groups are imported from outside the state. We are going to encourage farmers to produce locally in order to increase value added products to this market.

MAS00917 Plant parasitic nematodes cause decline of turf in golf greens. Fenamiphos, the only registered nematicide will not be available after 2005. Natural suppression of nematodes and biorational materials will be evaluated as a means of controlling nematode populations

MAS00895 Fruits which are of high quality at the time of harvest are often reduced to poorer or even unacceptable quality by the time they reach the consumer. This project seeks to find ways to extend storage life of fruit and to contribute to providing consumers with attractive, nutritious, and flavorful food.

MAS00890 Consumers worldwide have an increased demand for differentiated products suiting better their needs. The objective of this study is to examine various aspects of the impact of product differentiation on international trade, market power, and on the validity of tests for market power in trade.

MAS00881 many components in foods can have positive effects on health yet little is know about how they work. This project will investigate how non-essential nutrients from foods improve health.

MAS00916 Despite the importance of fruit, vegetable and whole grain intake in maintaining health and functional status, older adults are not meeting minimum dietary recommendations. This project will examine behavioral approaches to encourage older adults to increase their intakes of these beneficial foods.

MAS00496 Acid rain and atmospheric pollution continues to be a regional and national problem. The site's data contributes to the accurate assessment of precipitation chemistry and the effectiveness of the nation's air pollution laws and regulations.

MAS00877 Recreational fees are being increased but little is known about the impact on low income users. Forest ecosystem management programs are being proposed but little is known about how landowners will respond.

MAS00896 Cryphonectria parasitica has been identified as the causal agent of chestnut blight which has been responsible for the widespread loss on the American Chestnut. The goal of this study is to reestablish the American Chestnut for agricultural production, and to elucidate the fungal community on American Chestnut bark, in hopes of identifying a possible biocontrol agent(s) to the pathogen Cryphonectria parasitica.

MAS00918 Results of this research will improve siting of septic systems thereby enhancing quality of ground- and surface waters. The research results will provide a greater scientific foundation for wetland delineation and facilitate delineation of wetlands with problem soils. To provide better information to regulatory officials, to NRCS and similar agencies. It will allow us to predict water tables in soils that we can, at present.

MAS00886 The smooth functioning of the family is important to the well-being and viability of rural communities. This project will add to the understanding of rural low-income families over time using the primary longitudinal data set collected by the NC-223 multi-disciplinary research team.

MAS00924 Nitrogen from manure applied in the fall is subject to loss leaching if no cover crop is planted for N uptake or if the cover crop is planted too late to be effective for N uptake. 2. Nonpoint source pollution is dependent on spatial configuration of sources. Assessment of the relative contribution to nutrient loading at a watershed scale is important information for water quality management. 1. To determine effective cover crop seeding dates to thereby reduce nitrogen leaching. 2. The project aims to identify spatial influence of nutrient loading from animal operations at varying spatial configuration to assess impacts on watershed systems.

MAS00927 Establishment of tree fruit plantings is expensive and it requires several years to determine the worth of new and untested cultivars. Uniform plants, with common protocols for evaluation in several locations will facilitate identification, not only the good cultivars, but the places where they may grow best. The purpose of this project is to provide a structure and protocols for evaluating tree fruit.