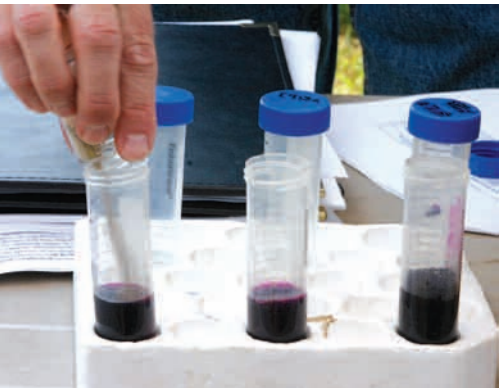
ANNUAL REPORT

for the Fiscal Year 2007

The UNIVERSITY of VERMONT EXTENSION

AES Vermont
Agricultural Experiment Station



Cheryl Dorschner

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For a full summary of this annual report visit

The University of Vermont Extension
www.uvm.edu/extension

Vermont Agricultural Experiment Station
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FRONT COVER RIGHT
Lewis Creek is the site of several UVM research projects. This stretch is in North Ferrisburgh. Vermont Agricultural Experiment Station and UVM Extension educates Vermonters about the best practices to improve water quality. Photo by Don Ross.

FRONT COVER TOP TO BOTTOM
UVM Watershed Alliance's Urban Watershed Project with Edmunds Middle School in Burlington made great strides in teaching kids science while testing water quality of Englesby Brook. UVM Extension watershed management specialist Jurij Homziak helps students measure water transparency. Photo by Don Fox.

Water test demonstrations were part of the offerings at a UVM Extension Farm field day in July 2007 at Borderview Farm in Alburgh. Photo by Cheryl Dorschner.

Research Scientist Don Ross pursued three water quality projects through VT-AES funding. In Vermont he studies soil processes, acid rain and nitrates in the waterways that flow between forests, farms and Lake Champlain. Photo by Abby Boak.

In the fifth year monitoring the Lye Brook Wilderness Area, Don Ross, students and colleagues sample soil in the stream's watershed. Photo by Don Ross.

THIS PAGE
Cosmos bloom into late autumn at the Boyden Winery in Cambridge. As the number of wineries in the state increases, Vermont Agricultural Experiment Station and UVM Extension viticulture research informs growers how to parlay short season and cold temperatures into full flavor success.

Cheryl Dorschner

Deans' & Directors' Message

At last year's UVM Extension and Vermont Agricultural Experiment Station reception at the State House, speakers were, from left, Vermont Governor James Douglas, UVM Extension Director Douglas Lantagne, UVM President Daniel Mark Fogel and VT-AES Director Rachel Johnson.

Don Ross

Guin Fredriksen '01 G'04 monitors water flow at Brush Brook with a series of weirs as part of water quality research conducted by Don Ross and colleagues through USDA Hatch and other grants.

Cheryl Dorschner

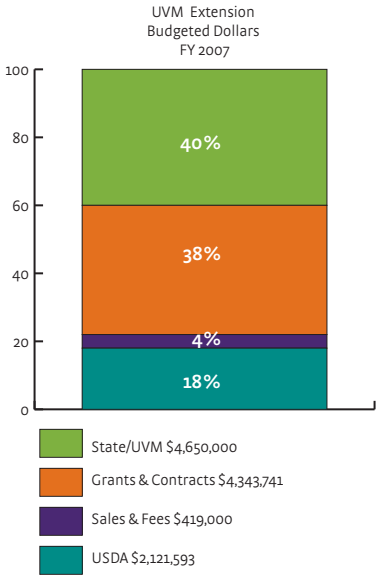
Vermont's waterways have changed dramatically in the past century — in size, depth, route, water contents and the ecosystems they form.

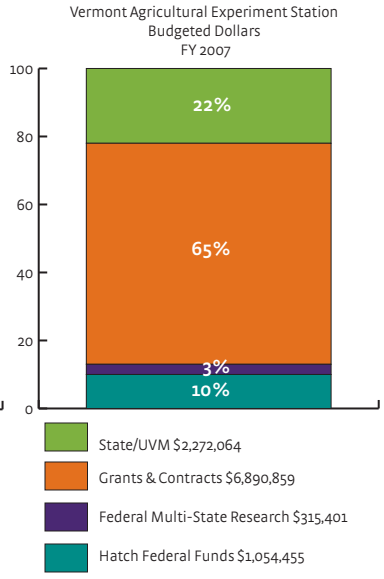
Water is one of our most precious resources. Vermont lakes and streams—especially Lake Champlain and its watershed—despite everyone's efforts, have reached pollution levels of enormous concern. Many factors contribute to this urgent problem.

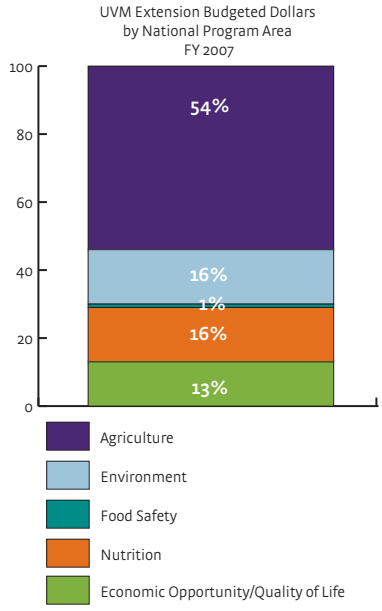
Water quality is so crucial that we at the Vermont Agricultural Experiment Station and University of Vermont (UVM) Extension feel compelled to turn up the volume on the call to action. At the same time, we are immensely proud of the progress our research scientists and educators made in 2007. Working together with state and federal governments, nonprofit organizations and citizen groups, our role is to articulate water quality problems and solutions through the lens of science, educate the public and help Lake Champlain, its watersheds and the lakes and streams throughout the Green Mountain State.

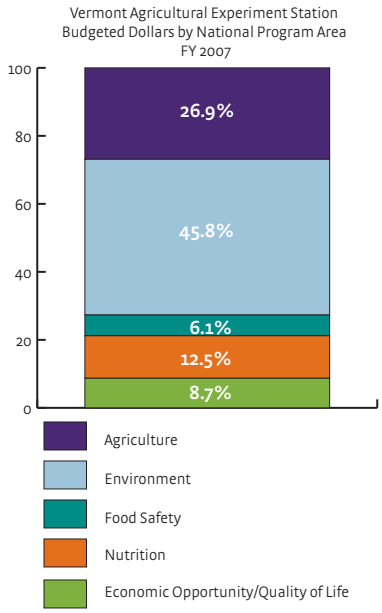
For these reasons we dedicated the cover of this 2007 Annual Report of the Vermont Agricultural Experiment Station (VT-AES) and UVM Extension to the single topic of water quality problems and solutions. For highlights of our work in this area please see page 6.

We are also proud of work we are doing in the areas of









Vermont agriculture; environment; nutrition, health and food safety; and economic development and quality of life. You will find key projects in those four areas highlighted in the pages of this booklet as well.

On this page, this annual report accounts for the financial resources of VT-AES and UVM Extension in those same four areas. The ensuing pages detail, with "bulleted" summaries, all of the other research and programs that demonstrate how we put those dollars to work for Vermonters.

In 2007 VT-AES conducted research projects representing more than $10.5 million, while Extension's more than $11.5 million budget reached Vermonters statewide through staff and offices in 11 counties. UVM Extension quantifies its reach in terms of the number of people enrolled in and attending its events and programs. In 2007, that was measured in 83,000 direct contacts, of which over 7,000 were with youth. Among these, 1,000 were educational events at least six hours long that served more than 12,500 non-traditional students. UVM Extension could not do this work without the 3,000 volunteers who worked more than 29,000 hours. In 2007 many of these volunteers (1,300) worked directly with youth. In addition, UVM Extension's bright banners hang at farm shows, equestrian events, gardening gatherings, fairs and shows. In 2007 both VT-AES and UVM Extension projects were the staples on the increasingly popular *Across the Fence* television show. *Across the Fence*, invigorated with Judy Simpson's roundtable interviews and Keith Silva's in-the-field stories grew to reach 20,000 viewers daily.

UVM Extension and VT-AES receive federal funding from the USDA, as well as state funding. In fiscal year 2007 (which ran from October 1, 2006 through September 30, 2007), the state increased its funding by 4 percent.

The state funded 40 percent of Extension expenditures; federal funding supported 18 percent. Additional grants and contracts funded UVM Extension work—some $4.3 million—an all-time high. See the chart on this page.

Meanwhile, the state supported 22 percent of Vermont Agricultural Experiment Station expenses and federal Hatch funds accounted for 10 percent.

VT-AES researchers garnered 65 percent of its total budget in grants and contracts. That's nearly $6.9 million. Once again, they brought home extraordinary grants and contracts to fund work on par with the best researchers in the country.

We thank our U.S. and state representatives and senators—like our research scientists—they too are among the best in the nation at what they do. They and our volunteer advisors, colleagues and staff whose names appear on page 13 are all partners in our continuing success.

Rachel K. Johnson
Dean and Director
Vermont Agricultural Experiment Station

Douglas O. Lantagne
Dean and Director
University of Vermont Extension

Ela Chapin

Agriculture

Tony Kitsos, UVM Extension farm management educator, from right, leads owners of Liberty Hill Farm in Rochester in a team training session. Tom, Bob and Beth Kennett are among the first to take advantage of this new program assisting farmers with their business goals and strategies.

DAIRY

Projects led by some of the nation's top animal scientists and Extension professionals:

- Demonstrate selected precision equipment and information systems to dairy farmers for enhanced crop and livestock production.
- Teach dairy farmers and students about nutrient management planning for dairy farms.
- Improve dairy productivity and efficiency.
- Gather and evaluate best management practices of Vermont dairy farms through the Dairy Stewardship Alliance.
- Understand how the science of genetics can be applied to milk production to improve yields.
- Track potential relationships between management practices and presence of disease-causing organisms such as *E. coli*, *salmonella* and *listeria* on dairy farms.
- Determine whether production of new antibacterial enzymes in the mammary gland can protect against mastitis in dairy herds.
- Lay the groundwork for future studies aimed at unraveling the roles of the individual transporters in supporting milk

uvm photo

Veterinarian and nutritionist Julie Smith researches management systems to improve the sustainability of dairy enterprises.

NEW IDEAS ON THE FARM

Even if milk prices soared in 2007, farmers can always use a hand in improving profitability. A new program offers many helping hands — management teams tailored to dairy farms.

UVM Extension farm management educator Tony Kitsos and partners received 20 initial applications; seven enrolled immediately and 17 people trained to facilitate meetings.

Enrolled farmers choose their own advisory teams from UVM Extension experts, veterinarians, lenders, business leaders and others from areas in which they seek expertise.

"Farmers may want help to make a specific change or want advice over a period of time," says Kitsos. "They present a strategic plan, and the team responds and advises."

Meanwhile, Kitsos and colleagues gather data on the program's success. Similar programs in other states showed measurable increases in farm profitability.

While Kitsos looks to improve farm business spreadsheets, Adam Lock looks over a different sort of spreadsheet in his lab on the second floor of UVM's Stafford Hall.

Lock, an assistant professor of dairy science, studies the effects of dairy cow nutrition, specifically how animals' diets impact the production of trans fatty acids beneficial to the human immune system. His results could help dairy farmers alter feed formulations to improve milk fat content. His findings may also change public perception of the effect of dairy products on cardiovascular disease and breast cancer.

He likens cows' rumen to a large fermentation vat in which millions of microbes ferment the feed. Initially the unsaturated fatty acids in the feed are toxic to the microbes, but through a process called "biohydrogenation" fatty acids are detoxified.

"We have gained a much better understanding of the complexity of this process," says Lock. "We're finding that some fatty acids may actually have beneficial effects on human health. One particular fatty acid, CLA, has been shown to be a potent anti-carcinogenic compound; in studies it was particularly effective against breast cancer." Lock's research indicates that farmers can increase the amount of CLA in milk by manipulating dairy cows' diets.

Cheryl Dorschner

With a plot of canola in the foreground, Sid Bosworth, Extension agronomy specialist, left, discusses his research on improving water quality by rotation-planting annual forages with corn for silage.

Cheryl Dorschner

Goats are increasingly popular, especially for Vermont's renowned farmstead cheeses. UVM Extension small ruminant dairy specialist Carol Delaney, right, led one of many goat-raising workshops this year to a packed house at the ECHO Science Center in Burlington in November 2007.

synthesis and maintaining glucose homeostasis during bovine lactation.
- Determine how bovine mammary epithelial cell proliferation is regulated by the estrogen receptors.
- Enhance bovine immune system health to prevent mastitis.
- Examine differences among breeds to understand the genetics of mastitis resistance.
- Analyze the mathematical and molecular epidemiology of mastitis control.
- Promote creation of low-fat, buffalo-milk yogurt to open a new niche dairy for Vermont.
- Determine the effectiveness of vaccinating milk-fed calves to improve the health and performance of these replacement dairy animals.
- Share tips, skills and knowledge to improve health and growth of calves and heifers.
- Develop, implement and evaluate a Spanish language training program for dairy farmers.
- Conduct the Vermont Large Dairy Farm Conference to present, to a wide audience, information on the management decisions necessary for a profitable and sustainable farms.
- Offer the Dairy Management Conference for all dairy farms in Vermont to showcase the latest production practices.

FARMING

Projects focus on whole-farm systems, innovations and sustainability with goals that:
- Determine the potential productivity and profitability of using perennial hay grasses as a pellet bio-fuel.
- Investigate the potential of high-yield, high-quality annual forage crops to improve or maintain water quality.
- Improve water quality by rotation-planting annual forages with corn silage.
- Provide Vermont farmers with the information, support and technical advice to create and improve grass-based farms.
- Improve farm safety measures by performing safety audits and holding farm safety meetings with farm employees.
- Assess options for grain production, storage and use; gather basic production data on organic grain systems in the Northeast.
- Improve the collaboration and quality of technical assistance for new farmers.
- Manage the $2.7 million annual federal grant program for innovative research and education aimed toward agricultural sustainability in the Northeast.
- Educate fair and field day staff, volunteers, farmers and others about biosecurity and safety when working with livestock in public settings.
- Support farmers in identifying new possibilities for their farms such as alternative enterprises and practices that enhance sustainability.

LIVESTOCK

Research and outreach expands farm diversity to sheep, goats, pigs, horses and beef cattle, as they:
- Teach ways to produce safe, wholesome beef at a profit with farming methods that are environmentally sound.
- Discuss and demonstrate how managed intensive grazing can increase the supply of high-quality lamb.
- Increase the knowledge about live lamb grading as a way to supply marketing organizations with higher quality lambs.
- Help sheep producers improve their production and management practices.


Cheryl Dorschner

Professor Lorraine Berkett and colleagues launched OrganicA, a multi-state and multifaceted resource for organic apple production in New England. The project includes a website, workshops, presentations, research and plots at the UVM Horticultural Research Center.

- Provide practical information to small ruminant dairy farmers.
- Determine the nature and function of the prolactin receptor in pigs.
- Use genetic and functional genomic approaches to improve pork production and quality.
- Act as a resource for members of the equine industry.

FRUITS AND VEGETABLES

Projects provide a foundation for fruit and vegetable production in Vermont that could change the landscape. These grants support work to:

- Explore opportunities for organic management of apple production.
- Encourage the adoption of organic apple production through integrated research, education and outreach.
- Evaluate the field performance of apple rootstocks under Vermont conditions.
- Evaluate wine grape cultivars for cold tolerance and insect disease resistance in northern climates.
- Provide high quality information on production, marketing and management techniques that enhance profitability, stewardship and community connections for Vermont's vegetable and berry farms.

HORTICULTURE

Seeking to understand cold hardiness during Vermont's changing climate, researchers and specialists:

- Evaluate the ornamental attributes of American and hybrid Asian elms as part of a nationwide study for resistance to diseases and insects, geographic adaptation, meteorological tolerance, growth rate and form.
- Trial the grafting of elm to sugar maple stock to improve the salt tolerance of elms.
- Track the effects of cycling temperatures on potted herbaceous perennial plants' hardiness.
- Determine which low-growing perennial groundcovers are most hardy, and record winter killing temperatures for each.
- Study the effects of the use of compost and fertilizer on herbaceous perennials.
- Determine the cold hardiness of herbaceous perennials and their application in Vermont.
- Evaluate the invasiveness of Japanese barberry.
- Offer garden tour and industry conferences for commercial landowner and industry professionals.


Mark Starrett

Will American and hybrid elms resist fungal disease and insect pests? Graduate student Andrew Burtt (pictured) and associate professor Mark Starrett are testing trees to find out.

MAPLE

The science behind Vermont's success as the nation's number one maple producer, VT-AES and UVM Extension researchers:

- Investigate and disseminate findings on sap yields resulting from tapping trees at various times in the spring.


Cheryl Dorschner

Maple reigns at the Addison County Fair. In 2007 UVM Proctor Maple Research Center announced findings warning that with continued climate warming trends, Vermont's maple industry would perish.

- Study the effects of maple tree defoliation on subsequent years' sap production.
- Survey maple sugarmakers about their sap collecting procedures.
- Communicate maple expertise and research findings of the University of Vermont Proctor Maple Research Center to sugar makers, researchers from related fields and news media.
- Determine the effects that the practice of air injection into concentrated maple sap has on the quality and flavor of maple syrup.
- Develop strategies to maximize maple sap yield in vacuum installations.

Karen Hills

Environment

Filtering agricultural and stormwater runoff with simple devices has proven highly successful for research scientist Aleksandra Drizo, left, and agronomist Heather Darby.

SOIL AND WATER QUALITY

Projects reflect VT-AES and UVM Extension's local research and outreach to address local, state and global environmental problems, as specialists:

- Work with farmers on water quality protection plans that keep phosphorus and other pollutants from contaminating watersheds.
- Test alternative cropping systems to reduce accumulation of phosphorus load in agricultural soils.
- Design and test filter technology for removal of phosphorus and suspended solids from dairy farm effluents.
- Research, develop and test phosphorous-reducing slag barrier technology to treat surface agricultural runoff.
- Improve and assess sustainable constructed wetlands technology as a viable solution to remove organic matter, solids, pathogens and nutrients from agricultural effluents.
- Assess farms in the Missisquoi and St. Albans Bay watersheds to document practices that address nonpoint source pollution.

Don Ross

Spodosol, richly colored soil layers with accumulated iron, aluminum and organic carbon, lie beneath a leached layer topped with a thick black organic topsoil in this woodland near Windsor. Professor Don Ross's research includes mapping some Vermont soils.

WATER CONTROL MEANS WASTE NOT WANT NOT

Since her arrival at the University of Vermont in 2004, research assistant professor Aleksandra Drizo has been the principal investigator on 18 projects on constructed wetlands and filters to remove phosphorous, suspended solids and other pollutants from water. But she studied natural control methods such as these for more than 10 years prior in Yugoslavia, Scotland, New Zealand and Canada where she discovered that iron slag—a byproduct of steelmaking—can be recycled and put in use as an effective filter for phosphorus water treatment. She has recently developed a steel slag-based technology, which is simple to build, inexpensive and uses no mechanical parts, rather operates by gravity.

In 2007, Drizo teamed up with UVM Extension agronomist Heather Darby to install filters in several St. Albans locations. The results showed that steel slag filters can reduce up to 80 percent total suspended solids and 50-70 percent of the dissolved reactive phosphorus (DRP) from agricultural nonpoint pollution sources; up to 70 percent DRP from urban stormwater runoff and up to 90 percent suspended solids and DRP from agricultural point pollution sources. In addition, filters installed at the Constructed Wetlands Research Center last summer at the UVM Miller Research Center achieved nearly 100 percent reduction in total coliform and *E.coli* reduction from dairy effluent.

"These results in the three types of situations in St. Albans are a significant start to intercepting runoff water pollution," says Darby.

"In addition, presenting my results at national and regional conferences last year spurred significant interest in this technology in Virginia and Maryland," said Drizo. "As a result, the first full-scale steel slag filter for stormwater treatment has been constructed and put in operation in Loudoun County, Virginia in January 2008."

In another water quality project in 2007, Darby, led by the farmer-driven Water Quality Initiative, designed a nutrient management course for farmers to reduce farm nutrient pollution that is being taught at various locations across the state. She also is testing alternative cropping systems to reduce accumulation of phosphorus load in agricultural soils.

The University of Vermont Extension

AES Vermont Agricultural Experiment Station

Carrie Suehs

Associate professor Jane Molofsky, right, and PhD student Robin Collins study the invasive traits of reed canary grass.

Sandra Davidson

The legume family includes many commonly grown crops. Associate professor Jeanne Harris studies the molecular signals legumes and bacteria send that trigger the plant to form nitrogen-fixing nodules.

- Consult with farmers and landowners to help them implement integrated crop management practices to improve farm profitability and water quality protection.
- Introduce and monitor alternative crops and cropping designs into existing systems.
- Create and implement watershed education for teachers, students and community members.
- Assist business managers and local officials with urban water pollution education programs.
- Develop incentives for making farm management decisions that reduce environmental impacts.
- Determine the factors that contribute to nitrogen fixation in legume roots.
- Examine how different colors of light modulate the ability of legumes to form nitrogen-fixing nodules.
- Study water and nutrient metabolism in plant roots.
- Use rain gardens in public and private settings to reduce storm water impact.

ECOLOGY AND FORESTRY

Science-based conclusions from a perspective that embraces whole ecosystems and global environmental issues:

- Pair University of Vermont field naturalist and ecological planning graduate students with nonprofit conservation organizations for the purpose of solving identified environmental problems.
- Understand the economic and social value of Vermont's natural resources to quality of life.
- Apply the principles of sustainable forest management and ecological economics to the field of forest management.
- Determine global climate change impacts on Vermont forests.
- Articulate the relationship between climate and fire regimes.
- Quantify the impact of climate change on microscopic soil animals and how that relates to soil fertility.
- Investigate the relationship between soil processes and stream nitrate export to help understand the effects of nitrogen deposition on the Northeastern forest ecosystems.
- Investigate the mineral forms of calcium in Northeastern forest soils thought to be undergoing depletion of this nutrient element.
- Determine the fate of nitrogen in acidic deposition on Vermont forested ecosystems.
- Assess the diversity and evolutionary origin of plant species.
- Develop instrumentation to measure light absorption in leaves and enhancement of photosynthetic performance of plants under diffuse light.
- Understand the ecological and evolutionary factors that influence the invasiveness of weedy plants.
- Determine the ability of the invasive reed canary grass to continue to expand its range and anticipate its response to increased climate warming.
- Conduct biodiversity surveys of nematode species in soil, litter and understory habitats.

Deb Neher

Sifting soil for aggregate size, senior research technician Tom Weicht studies soil structure to understand nematode ecosystems in the soil environment.

Cheryl Dorschner

In 2007, through UVM's PLACE program, Field Naturalist graduate student Jesse Fleisher led Williston residents into a several-month exploration of the natural, historical and cultural aspects of the town.

Joshua Brown

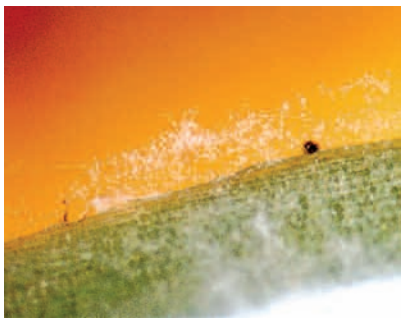
Entomologist Scott Costa's research may result in a way to use fungi to thwart invasive pests that threaten Vermont, including hemlock woolly adelgid and viburnum leaf beetle.

- Improve the interpretation of nematode community indicators used for environmental monitoring on a regional or a continental scale.
- Understand mechanisms by which Brazilian pepper invades Southeastern pinelands.
- Provide a construct for determining long-term changes in Vermont forest soils.
- Use cheese whey protein as a major ingredient in environmentally safe glue and bio-based wood-adhesive products that will protect the environment and decrease harmful effects of chemicals on human health.

PEST MANAGEMENT

Projects address the presence and anticipation of major invasive insect species and also discover and test natural solutions.

- Teach commercial growers IPM (Integrated Pest Management), the safe and judicious use of pesticides and alternatives to them, including organic options.
- Educate Master Gardeners, landscapers, school administrators, facilities managers and home gardeners in IPM and the safe, appropriate use of pesticides.
- Develop an IPM strategy for soybean cyst nematode in the North Central region.
- Provide an educational program for agricultural producers who wish to apply restricted-use pesticides.



Scott Costa

Insect-killing fungi growing on a hemlock needle aid pest management and are the subject of entomologist Scott Costa's work.

- Disseminate information on the biodiversity of lepidoptera in Vermont.
- Assess the role of insect-killing fungi for the management of elongate hemlock scale in forest stands of Eastern hemlocks.
- Evaluate insect-killing fungi for management of hemlock woolly adelgid.
- Determine the low lethal temperatures of three introduced predators of hemlock woolly adelgid.
- Develop training materials for the detection and characterization of hemlock woolly adelgid infestations.
- Develop a biological agent for control of spider mites.
- Assess the effectiveness of indicator plants for the early detection of thrips.
- Assess the potential of fungi for management of thrips in forests and greenhouse ornamental crops.
- Revise and reproduce a guide to the Asian longhorned beetle, an exotic invasive pest threatening the Northern hardwood forest.
- Investigate the potential of native natural enemies for biological control of the Asian longhorned beetle.
- Study the role of insect-killing fungi for the natural suppression of lecanium scale.
- Develop a mass-production strategy to produce insect-killing fungi for the management of lecanium scale in sugar maple woodlands.
- Screen apples and potatoes for pests that affect their import and export.
- Use the eggplant as a guardian plant to eliminate whiteflies in greenhouse production systems.
- Participate in a New England consortium on pest management issues that are important to the region's growers.

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Nutrition, Health & Food Safety

Professor Catherine Donnelly's research on the safety of raw milk cheeses influenced the FDA to drop its investigations on the safety of aged hard cheeses such as Cheddar and Swiss.

NUTRITION

Projects led by nationally recognized nutritionists, with an emphasis on reversing the national trend of obesity, seek to:

- Develop individual and institutional leadership for a 21st Century food system.
- Design nutrition classes with an emphasis on national dietary guidance to help people choose healthy diets, practice food safety and incorporate physical activity into their lifestyles.
- Teach families with limited resources to purchase and consume healthy foods.
- Implement nutrition curriculum for pre-kindergarten through grade 2 via a train-the-trainer session for volunteers and teachers.
- Lead single- or multi-session nutrition workshops for low-income Senior Farm Share participants to increase their consumption of local, fresh produce.
- Offer practical nutrition information and skills on how to prepare healthy foods designed for diabetics or those preparing food for people with diabetes.
- Include nutrition information at the point of purchase in cafeterias and similar dining service environments.

UVM EXPERTS TACKLE FOOD SAFETY ISSUES

Given her expertise, one might expect Professor Catherine Donnelly, an international expert on the foodborne pathogen *Listeria monocytogenes*, to oppose consumption of foods made with unpasturized milk. However, when her studies concluded that using raw milk in aged, hard cheeses is safe, even the FDA abandoned its investigations of the safety of aged hard cheeses and quelled talk of a ban.

Donnelly's published research lent credibility to what artisan cheesemakers long believed: raw-milk hard cheeses such as Cheddar and Swiss enjoy natural barriers to pathogens, a long safety track record and distinctive flavor and health benefits.

"The disconnect between regulators and science occurred in part because the FDA makes decisions based on peer-reviewed journal articles, which in this area have been lacking," said Donnelly. "Cheeses are processed for safety, so the risks are totally different from risks posed by drinking raw milk or from, say, surface mold on soft cheeses. With hard cheeses, salt, aging and the high temperatures at which curds are cooked all make a difference."

UVM Extension and Vermont Agricultural Experiment Station experts educate Vermonters, both consumers and those in food service businesses, how to identify issues and reduce or even eliminate risks. With a federal mandate issued in 2005 that public school kitchens adopt a standard systematic preventive approach to food safety called HACCP, UVM Extension and VT-AES outreach work has become even more important.

Every year, UVM Extension food safety specialist Dale Steen offers a 10-hour food safety and sanitation course for food service managers and workers throughout the state. This course is a prerequisite to other courses she teaches that bring food providers closer to adopting practices such as HACCP (Hazard Analysis and Critical Control Point).

In 2007, Steen embellished this work during a sabbatical by developing a training model and an HACCP course, which she launched in 2008.

Cheryl Dorschner

UVM Extension Specialists Diane Mincher, left, and Judy Branch get the word out on nutrition throughout Vermont including last year at the State House during the release of the prior edition of this annual report.

Cheryl Dorschner

The Vermont Institute for Artisan Cheese at the University of Vermont is renowned for research and educating cheesemakers. Master cheesemaker Marc Druart, left, and food sensory evaluation expert Monserrat Almena-Aliste (in Holstein coat) lead a class in the nuances of bloomy rind cheese. Students included Susan Clarkes of Doylestown, PA.

HEALTH

Leading toward healthier Vermonters and emphasizing fresh, local food purchased directly from the producer, projects:

- Recognize causal relationships between cooking skills and obesity with intention to develop recommendations for public health and nutrition interventions related to obesity.
- Develop oat- and whey-protein-based foods for the wellbeing of consumers.
- Increase the amount of locally grown produce consumed by Vermonters who have limited resources by introducing them to small-scale Vermont producers.
- Increase fresh produce purchase and consumption by low-income Vermonters through public service messages that encourage more nutritionally sound choices.
- Increase the amount and quality of fruits and vegetables offered to toddlers enrolled in WIC (Women Infants Children program) by improving the effectiveness of WIC staff's nutrition counseling with the children's parents/caregivers.
- Understand physical activity levels of preschool children enrolled in childcare centers in order to enhance childhood obesity prevention efforts.
- Communicate the importance of hand washing at fairs and county field days.
- Understand and develop new anti-fungal therapeutics for control of human fungal diseases.

Cheryl Dorschner

Associate Professor Mingruo Guo, left, and Professor and Dean Rachel Johnson, both of UVM's nutrition and food sciences department, are highly involved in the Agricultural Innovations Initiative launched in 2007. The project funds beginning stage faculty innovators to turn their research into business ventures.

- Evaluate a new and authentic model for human breast development and cancer.
- Understand the genes that lead to mammary tumor development.

CHEESE SCIENCE

Projects led by the Vermont Institute for Artisan Cheese:

- Assess microbiological risks in raw milk destined for cheese-making and evaluate microbial pathogens that can cause contamination during aging and storage of cheeses.
- Establish sensory evaluation for cheese production in Vermont.
- Apply image analysis techniques to determine the causes of calcium lactate crystals on Cheddar cheese.

FOOD SAFETY

Projects continue UVM's leadership in food safety during a time when the subject is in the global spotlight as researchers:

- Utilize infrared spectroscopy as a tool for food and environmental sample screening to control foodborne illnesses.
- Train gardeners to use food safety principles to reduce risk of contamination of fresh fruits and vegetables.
- Teach nutrition, food safety and food security issues to youth through gardening.
- Create an interactive online food safety education program for middle school children.
- Provide a food safety and sanitation course targeted to school food service managers and workers to improve food handling practice.
- Demonstrate best practices for successful HACCP (Hazard Analysis and Critical Control Point) programs used in school food service operations.

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Professor and food scientist Mingruo Guo's research on soy, coupled with Vermont farmers' efforts to grow food grade soybeans, is helping launch soy milk and tofu businesses in the state.

AGRICULTURAL PROFITABLITY

Helping farmers operate more efficiently, profitably and sustainably, UVM Extension and VT-AES:

- Develop financial planning strategies to assist farm profitability.
- Work with farmers on financial topics including farm transfers, balance sheets, budgets, buying a farm or farm planning.
- Teach established farmers, farmers in transition and new farmers the intricacies of farm operations organization, transfer and succession. This includes all aspects of farm business management.
- Identify ways farmers learn and make decisions on multi-stage organic farms in Vermont.
- Provide resources and employment skills for farmers and rural Vermonters with disabilities.
- Develop sound business management programs that help women farmers improve profitability.
- Determine factors that support and impede the adoption of broadband by Vermont's agriculture entrepreneurs.

BUSINESS JUMP-START

In a small factory in Hardwick, Andrew Meyer'92 and Todd Pinkham dream of using 100 percent Vermont-grown soybeans for their Vermont Soy organic milk and tofu.

"Working with UVM, we've incorporated as many Vermont farmers' crops as we can. We believe that all of our new tofu products will be Vermont-grown soy," says Meyer.

Sales of organic soy foods are on the rise; the localvore movement further increased demand; and Vermont climate is perfect for growing soybeans — three indicators that could add up to success.

It takes pearly white beans for milk and tofu, something Vermont farmers are attempting in seed trials with the help of VT-AES Agricultural Innovations Initiative.

Vermont Soy sought help from UVM food scientist Mingruo Guo and a USDA grant designed to promote soy.

Guo's soy research, farmers' seed trials and Meyer's fledgling business demonstrate the multi-layered cooperation among UVM, private businesses and farmers.

This is one example of how Ag Innovations capitalizes business ideas that originate at UVM 's labs with modest funding.

Hardwick's Main Street is also poised to benefit from its UVM Extension connection. Making small Vermont downtowns more vibrant for local business may seem like a pretty tall order, but Bill McMaster has had some success doing just that.

McMaster, a UVM Extension community resources development specialist, already assisted Island Pond and Newport.

Hardwick's town leaders surveyed business operators and consumers.

It's not simple, but if there is one secret it is this: "What we're finding is, most businesses just don't know about services already in place for economic development," says McMaster.

That's just one place UVM Extension can help. Another is to offer training in areas that town leaders identify as needing improvement. Extension brings together existing resources and experts in the field to help these downtowns transition in the face of change.

Amanda Kissell

Showing cattle, as Derek Vance did at the State 4-H Dairy Show, is just one of many Vermont 4-H activities.

BUSINESS ECONOMICS

Projects help Vermonters launch and maintain businesses that help the state's economy as they:

- Provide education for tax practitioners on latest federal and state income tax laws.
- Analyze direct marketing channels for local food and recommend ways to increase the amount of local food in the food system.

Cheryl Dorschner

UVM Extension specialists Glenn Rogers, left, and Dennis Kauppila (not pictured) lead "tax schools" that educate one third of all Vermont tax preparers on annual changes in regulations.

- Promote public administration and community development skills among minority or economically disadvantaged students to help them work in the field of community development.
- Conduct and disseminate research for the tourism industry.
- Train, educate and network with tourism professionals.
- Evaluate the impact that access to capital has on the business success of low-income, Vermont micro-business owners.
- Evaluate post start-up technical assistance and training on low-income micro-business owners.
- Promote and support Vermont entrepreneurship.

FAMILIES

Assisting Vermonters with life skills through UVM Extension 4-H and other youth programs, these projects:

- Provide hands-on basic outdoor skills and experiences for Vermont families.
- Provide educational assistance to youth from migrant farm families in Vermont communities.
- Help youth acquire life skills in decisionmaking, critical thinking, problem solving, communication, goal setting and everyday living in order to succeed as adults.
- Educate parents who have filed to dissolve their marriages or civil unions or changed their legal status as parents on how these changes affect their rights and responsibilities toward their children.
- Promote, teach and support personal financial literacy education for youth.

COMMUNITIES AND CITIZENS

Building community and the citizen's role in that community, projects:

- Assess and expand "community capacity" through leadership and public policy education efforts.
- Develop business district analysis to support economic expansion in Vermont's downtowns.
- Provide communities with analytical techniques that can be used for economic revitalization.
- Create and deliver instructional materials on global sustainable development.
- Help community members gain skills necessary to take part in town government, ultimately competing for town leadership positions.
- Promote stewardship of the urban and rural landscapes to improve the quality of life in Vermont communities.
- Offer educational, technical and financial assistance in tree management around the built landscape.
- Collect baseline data to measure economic impacts of the Northern Forest Canoe Trail.

Joyce Chase

Bill McMaster, left, UVM Extension community resources development specialist, and Hardwick Town Manager Rob Lewis discuss the prospects for downtown renewal .

- Study landowner attitudes and behavior in the Northern Forest toward developing strategies to promote access to private lands.
- Evaluate the impact of micro-business training and technical assistance, with a focus on lead paint safety for low-income Vermont entrepreneurs.
- Support local level decisions made by Vermonters by providing information, resources and technical assistance.
- Assist local governments and small agricultural businesses to access information technology data.
- Assess the migration patterns of young adults into and out of Vermont.

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Cheryl Dorschner

The advisory board for the College of Agriculture and Life Sciences and the VT-AES meet biannually to discuss the direction of these institutions.

THIS PAGE TOP TO BOTTOM: Farmers' markets bring direct exchange of goods and cash between Vermonters and their food suppliers. The Stowe Farmers' Market is a popular weekend destination. Photo by Cheryl Dorschner.

Videographer Keith Silva brought stories from the field to *Across the Fence* viewers. He shoots Leonard Perry and Marie Ambusk talking about Extension's Stewardship of the Urban Landscape program. Photo by Lisa Avery.

4-H members and their livestock got all "dolled up" for the a "cow-stume" contest during "4-H Sunday," Aug. 26, 2007 at the Champlain Valley Fair in Essex Junction. Photo by Stephen Mease/Champlain Valley Fair.

Grain growing increased in Vermont in 2007 thanks to biofuels and "localvores." Jack Lazor tested plots of wheat developed in the early 1900s by famed Vermont botanist Cyrus Pringle. Photo by Cheryl Dorschner.

ANNUAL REPORT
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AES Vermont Agricultural Experiment Station