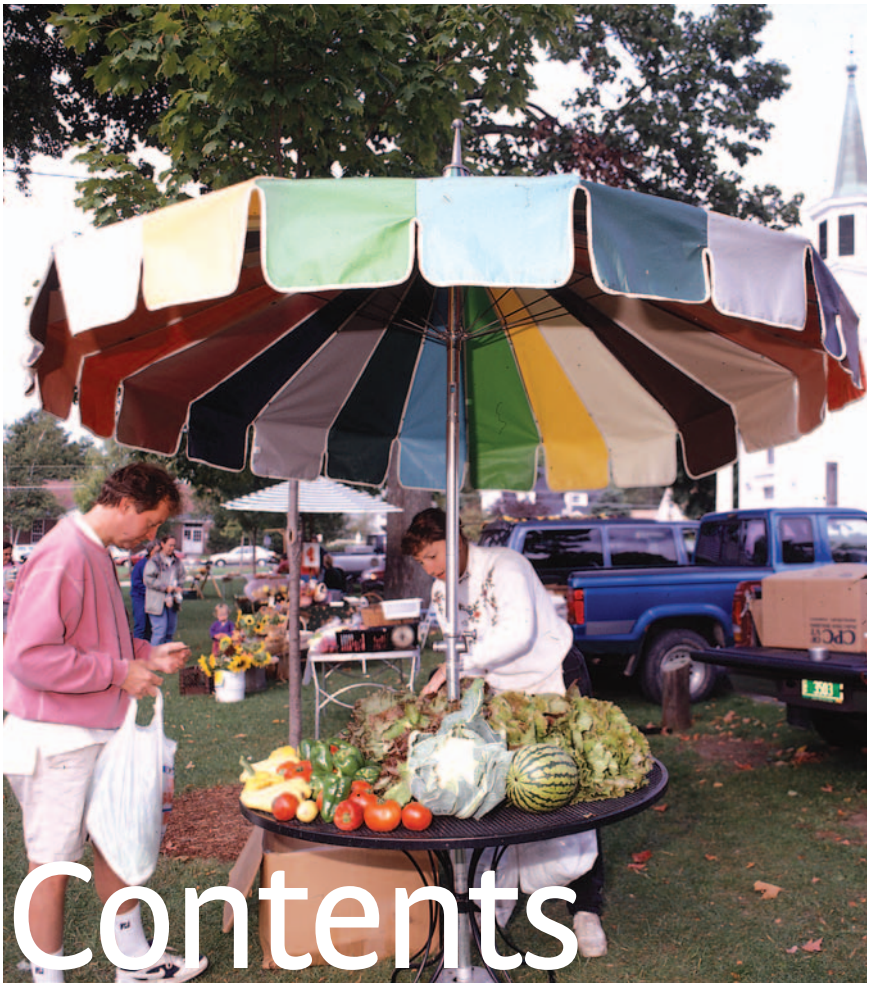
Annual Report

for the Fiscal Year 2004

AES Vermont
Agricultural Experiment Station

The University of Vermont Extension



Contents

The UNIVERSITY of VERMONT EXTENSION

AES Vermont
Agricultural Experiment Station

Outreach and Research

Partnerships are key to addressing the needs and improving the lives of Vermonters.

Entomologists Bruce Parker (left), Michael Brownbridge, and Margaret Skinner inspect an "indicator" plant that is being tested to see how early it attracts insects.

We are very pleased to present the Annual Report of the University of Vermont Extension and the Vermont Agricultural Experiment Station (VT-AES). Our programs are designed to meet the outreach and research needs of the state and are an important part of preserving and growing Vermont. Our work in fiscal year 2004—including 174 new and ongoing research projects and more than 360 significant education programs—was carried out by committed faculty, staff, students, and volunteers and was guided by dedicated and caring advisers.

We are grateful for the many Vermont citizens who serve as advisers (see page 6 for listing) at the program, region, College, and state level and help guide and evaluate our work. We meet with advisers at least twice a year to review priorities, resource allocations, and program impact. In addition, we use state-wide polls of Vermonters, meet with and listen to new and emerging partners, and seek opinions of local, state, and national policy makers to determine our program direction and research portfolio.

We are especially proud of the VT-AES and Extension faculty who have prevailed in obtaining competitive grants and contracts from both public and private organizations. In fiscal year 2004, the VT-AES faculty successfully competed for more than $8 million in funding for their research programs. Extension faculty successfully secured more than $1 million in grant and contract funds to support outreach programming in fiscal year 2004.

You will may note that our 2004 Annual Report looks different than from reports of years past due to helpful feedback and guidance from our advisers. This shorter, more colorful, and reader-friendly version highlights the ways we have been addressing the needs and touching the lives of Vermonters. If you would like to have a full project or program summary, please visit our annual reporting web site at *www.uvm.edu/vtaes*. We welcome your thoughts about this new format.

WHAT ARE THE VERMONT AGRICULTURAL EXPERIMENT STATION AND UNIVERSITY OF VERMONT EXTENSION?

The Vermont Agricultural Experiment Station was established in 1886 as a state and federal partnership to serve the agricultural needs of the state through research. In fiscal year 2004, there were 174 new and ongoing research projects conducted at the Station, funded by both public and private sources. These projects covered a broad range of critical areas including agricultural

products and other agriculture-related economic opportunities; water quality; health and nutrition; and plant and animal gene function. Station researchers are nationally and internationally recognized for their excellence.

University of Vermont Extension was established in 1912 as a state and federal partnership to provide Vermonters timely, research-based education and information. Programs are offered throughout the state with a special focus on increasing agriculture business profitability, supporting forest and farm stewardship, promoting economic development, teaching nutrition and food safety, as well as strengthening life skills for youth. Extension made more than 100,000 Vermont contacts in fiscal year 2004. Information and education were provided through more than 360 significant Extension programs, collaborative community projects, the *Across the Fence* daily television show, as well as smaller-scale workshops and individual consultations.

HIGHLIGHTS OF 2004

- Our congratulations to Vern Grubinger and **UVM's Center for Sustainable Agriculture** for being selected to receive the 2005 Higher Education State Merit Award for Program Achievement by the New England Board of Higher Education. Vern, a UVM Extension small fruit and berry specialist, directs the Center. He and the Center's capable Extension staff and faculty have provided top-quality programs—such as Pasture Outreach, Land Link Vermont, the Small Ruminant Dairy Project, and the Vermont New Farmer Network—over the course of the Center's 10-year history. While the number of Vermont farms has held steady at about 6,000 over the past 30 years, agriculture has become much more diversified. There are approximately 1,500 dairy farms with another 4,500 farms of all sizes producing fruits, vegetables, non-dairy livestock, grains, ornamentals, etc. The UVM Center for Sustainable Agriculture and UVM Extension actively support diversified agriculture with production and marketing advice, business planning workshops and consultations, and networking opportunities to learn from other producers and organizations.

Carol Delaney (right), small ruminant dairy specialist, evaluates the pasture for dairy goats at Long Field Farm in Cabot.

- Nutrition and food scientist Jean Harvey-Berino attracted national media interest through a Vermont Agricultural Experiment Station research project **addressing the national crisis related to obesity.** Jean appeared on *The Today Show* to discuss "Internet dieting" with Katie Couric and described her and colleague Stephen Pintauro's research that has provided treatment programs to more than 1,000 Vermonters. Together, they have demonstrated that the Internet is an effective vehicle for delivering interventions that promote long-term weight loss. The pilot online diet program, VTrim, helped participants lose an average of 21 pounds in six months—more than twice as much as those using a commercial weight-loss website. Research efforts also are being directed to develop obesity prevention interventions for preschool children to be delivered in preschool facilities. Other related efforts include Extension educational outreach programs leading to improved school lunches, personal food purchasing, meal preparation, and food consumption, as well as healthy activity-related knowledge, skills, and behaviors. These Extension programs impact an additional 2,700 Vermonters' lives.
- Extension's strength in youth programs increased when the **4-H After-School Program** was introduced in 2004

Students in a 4-H After-School Program in St. Johnsbury discover how a tornado is created during a 6-week weather phenomena program.

as an option for Vermont youth. Through partnerships with schools, hospitals, and other organizations to create these meaningful programs, we continue to bridge the gap between life skills taught through 4-H programs and standards-based education in the classroom. Overall, University of Vermont 4-H reached more than 10,000 youth through 4-H clubs and other programs. Eighty-seven percent of the youths involved in 4-H clubs reported an increase in important life skills such as leadership, communication, self-responsibility, healthy lifestyle choices, useful/marketable skills, and decision-making. Approximately 20% of Extension's total budget is dedicated to 4-H programming. We continue to provide statewide support for our wonderfully talented and dedicated 4-H volunteer leaders who work with our Vermont youth and with Extension 4-H Educators located in offices across the state.

- Funding from the Vermont Housing and Conservation Board launched Extension's **Farm Viability Project** to help farmers holistically assess their farm operations and establish a business plan. In 2004, faculty and staff delivering this intense one-on-one program reached out to more than 40 farms and assisted 24 agriculture operations in establishing a business plan. The results are powerful—with finalized business plans prompting farmers to expand, or to transfer assets to the next generation within a family, or to diversify their farm operations to develop value-added products. One of the people working hard to make this program a success is Ken Leach, a 2002 graduate of the UVM and Vermont Technical College 2+2 Program. This program, which builds leadership abilities within agriculture in Vermont, is generously supported by the Vermont legislature.

Pear thrips are among the insects that might be controlled by an environmentally friendly, whey-based bio-control agent being developed by a team of researchers.

- Nutrition and food scientist Mingruo Guo is collaborating on a research project with entomologists Bruce Parker, Michael Brownbridge, and Margaret Skinner to develop a **whey-based, environmentally friendly bio-control agent** that incorporates naturally occurring insect-killing fungi. If successful, this product will be usable on organic crops as well as provide an alternative pest management strategy for greenhouses and forests. Other research conducted by Mingruo includes the production of a whey-based furniture finish, another environmentally friendly product that has spawned a new Vermont company.
- Controversial issues in the **Green Mountain National Forest,** which lies within six different counties and 44 towns in Vermont, include proposed wilderness designations, timber harvesting, and trail use conflicts.

Bryant Watson (standing, left) of VAST and Jim Northup of Forest Watch discuss a map of a proposed wilderness area at a meeting in Berlin facilitated by Extension specialist Lisa Chase.

Comprehensive planning for the Green Mountain National Forest was augmented by UVM Extension efforts, led by Extension faculty member Lisa Chase, to find common ground and share information among stakeholders. An issues-education forum approach was combined with an assessment of local socio-economic status and demographic trends, forest users and uses, access and travel patterns, community relationships, economic ties, and land use patterns and perceived needs. UVM's Center for Rural Studies provided census and other valuable data that contributed to the discussion of the five-year plan.

- The **effectiveness of constructed wetlands** to remove pollutants from dairy effluent is being addressed at the Paul Miller Research Center on Spear Street in Burlington by plant and soil scientist

Open boxes provide access for sampling to determine the efficiency of different treatments in the constructed wetlands.

Aleksandra Drizo. This innovative project is testing four different strategies of wetland operation to remove dissolved organic compounds, ammonia and nitrate, and phosphorus from wastewater of the dairy operation. Initial results demonstrate the effectiveness of river bulrush in removing dissolved organics and nitrogen-containing compounds and slag filters in removing dissolved phosphorus. These efforts represent an effective system that can be implemented by Vermont dairies to help protect the water quality of Lake Champlain.

- **Forests, Fields, and Futures,** is a program designed to reduce middle school youth academic failure and dropout rates, brings together students, teachers, and administrators to work with all students on community-building projects and student mentoring. In just three years, there is evidence of academic improvement such as more students making the honor roll and fewer students failing. In addition, students, teachers, and administrators report increased student engagement with the school. A program manual is being drafted to offer to other schools interested in enhancing student success through a hands-on natural resources-related program.

Seventh graders from Oxbow High School build a two-mile community hiking trail as part of Extension's Forest, Fields, and Futures program.

On the following pages, you'll find a bulleted list of how University of Vermont Extension programs and Vermont Agricultural Experiment Station research projects are relevant—particularly to and for Vermont.

CHALLENGES

Despite these successes, this was a challenging budget year for UVM Extension and the VT-AES. Due to a decade of level federal funding, there there were insufficient funds to cover increased salary and operating expenses. This necessitated a reduction in operating expenses and faculty (four Extension faculty and two VT-AES faculty) in order to develop a short-term sustainable budget.

We will continue to provide the highest level of service to the state as we develop new and additional funding sources for UVM Extension. UVM Extension enacted efforts that include establishing an annual fund-raising campaign, improving program marketing, initiating cost recovery and cost accounting systems, and sharpening specific program focus. In addition, both Extension and VT-AES will continue to rely upon entrepreneurial faculty to secure grant funds to enhance programs and research.

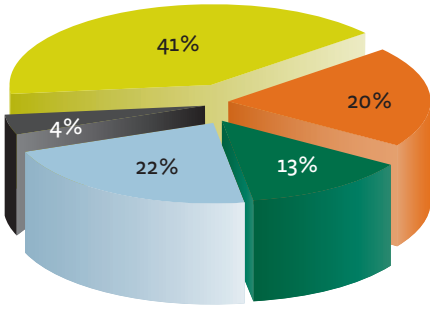
FY-2004 FUNDING: STATE-FEDERAL PARTNERSHIP

The work of University of Vermont Extension and the VT-AES is made possible through the support of a state and federal partnership. State support augments both Extension's outreach and Station research efforts by matching federal funds from the United States Department of Agriculture (USDA). These funds assist faculty in seeking other competitive funds and partnerships.

In fiscal year 2004 *(see chart on next page)*, 41% of University of Vermont Extension expenditures were supported by the State and 20% were supported by federal Smith-Lever funding. In addition, Extension faculty, staff, and volunteers were engaged in more than $1 million in other federal and competitive grants and contracts.

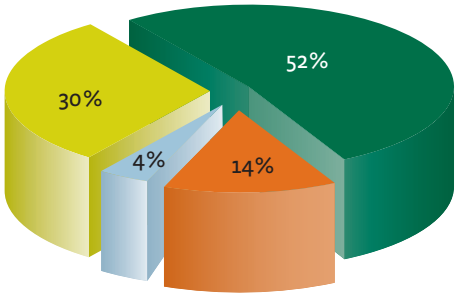
In fiscal year 2004 *(see chart on next page)*, 30% of the Vermont Agricultural Experiment Station expenditures were supported by the State and 18% were supported by federal Hatch funds. The remaining VT-AES expenditures were supported by competitive grants and contracts secured by Station researchers; faculty associated with the VT-AES successfully secured grants and contracts accounting for more than $4 million, or 52% of the expenditures.

UVM Extension Expenditures
FY 2004



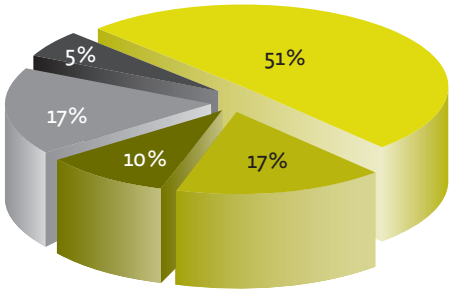
USDA-Base — $1,681,096
State/UVM — $3,360,448
USDA-Earmarked — $1,791,354
Grants & Contracts — $1,101,536
Sales & Fees — $335,271

VT Agricultural Experiment Station Expenditures
FY 2004



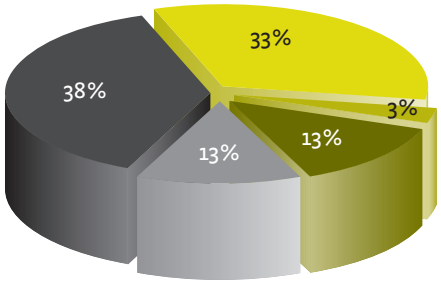
Federal Funds–Hatch — $1,067,509
State/UVM — $2,347,771
Federal Funds–Multi-state — $319,187
Grants and Contracts — $4,073,240

VT Agricultural Experiment Station Expenditures
by National Program Area — FY 2004



Agricultural Systems
Natural Resources & Environment
Food Safety
Nutrition
Economic Opportunity/Quality of Life

UVM Extension Expenditures
by National Program Area – FY 2004



Agricultural Systems
Natural Resources & Environment
Food Safety
Nutrition
Economic Opportunity/Quality of Life

"We are especially proud of the VT-AES and Extension faculty who have prevailed in obtaining competitive grants and contracts from both public and private organizations."

LOOKING AHEAD

As we conclude our report, we thank the UVM Extension and VT-AES faculty and staff for a year of hard work and dedication.

Our future lies in hiring and retaining the very best faculty and staff who focus on the educational and research needs of Vermont communities. We will seek new partnerships to enhance our program and research impact while pooling scarce resources and minimizing duplication. Our faculty will continue to work to be successful in the world of competitive grants and contracts. We are committed to being creative and ambitious to better serve the needs of Vermonters. We will explore opportunities for private donations and other new funding sources, improve the marketing of our programs and research findings, and build new relationships at the local, state, and regional levels. These and other efforts will be indicators of University of Vermont Extension and the Vermont Agricultural Experiment Station as strong organizations focused on positively impacting and improving the quality of the lives of Vermonters.

Doug Lantagne,
Interim Director,
University of Vermont
Extension

Rachel Johnson,
Dean and Director,
Vermont Agricultural
Experiment Station

Advisory Groups

COLLEGE OF AGRICULTURE AND LIFE SCIENCES' BOARD OF ADVISERS

David Abbott, Newport
Ron Allbee, Bradenton, FL
Ray Allen, South Hero
Tom Berry, Colchester
Robert Bickford, Jr., Ho-Ho-Kus, NJ
Megan Camp, Shelburne
Cynthia Danaher, Winchester, MA
Jane Folkman, Mansfield, MA
Robert Foster, Weybridge
Mitzi Johnson, South Hero
Fred "Chico" Lager, Williston
David Marvin, Johnson–*Chair*
Jenny Nelson, Ryegate
Robert Paquin, Shelburne
John Pigott, Burlington
Mark Rodgers, West Glover
Amy Rogers, Essex Junction
Peter Saama, East Lansing, MI
Robert Ullrich, Charlotte

EXTENSION STATE ADVISORY COUNCIL

E. Anne Allen, West Charleston
Ray Allen, South Hero
Lynn Bondurant, Danby
Preston Bristow, Jr., Woodstock
Michael Farmer, St. Albans
Bill Jewell, Brattleboro–*Chair*
Jolinda LaClair, Montpelier
Johanna Laggis, East Hardwick
David Lane, South Hero
Edward Larson, Montpelier
Kendal Melvin, Barre
Michael Schultz, Essex
John Titchner, Shelburne

EXTENSION REGIONAL ADVISORY COUNCILS

CENTRAL/NORTHEAST REGION

E. Anne Allen, West Charleston–*Co-chair*
Anne Brown, Lyndonville
Tammy Carpenter, Barnet
Trevor Colby, Newport
Joel Cope, Island Pond
Ruth Finn, Barre
Edward Larson, Montpelier
Francis (Topper) McFaun, Barre
Eric Paris, Lyndonville
Bruce Shields, Wolcott–*Co-chair*
Marge Trautz, St. Johnsbury
Kevin Wiberg, Barre

NORTHWEST REGION

Eric Clifford, Starksboro
Susan Coburn, Burlington
Michael Farmer, St. Albans
Leon Graves, Fairfield
Robert Hall, Starksboro
Dana Hudson, Shelburne
Roger Rainville, Alburg
Harvey Smith, New Haven
Mary West, Winooski
Robert White, Underhill–*Chair*

SOUTHERN REGION

Preston Bristow, Jr., Woodstock–*Chair*
Gary Carrier, Brattleboro
Stephen Chamberlain, Castleton
John Danielski, North Clarendon
David Hume, Andover
Beth Kennett, Rochester
Kenneth Smith, Rupert
Bethany Ann Yon, Rutland

EXTENSION PROGRAM ADVISERS

DAIRY

Kim Conant, Richmond
Paul Doton, Woodstock
Chris Dutton, Newport Center
Robert Foster, Weybridge
Myles Goodrich, West Danville
Harold Howrigan, Fairfield
Vernon Hurd, Newport Center
Johanna Laggis, East Hardwick
Chris Wagner, Enosburg Falls
Dean Wright, Enosburg Falls
David Yeatts, Woodstock

DIVERSIFIED AGRICULTURE

Pam Allen, South Hero
Hank Bissell, Starksboro
John Cleary, Richmond
Jacques Couture, Westfield
Bill Emmons, Woodstock
Dave Hamlen, Swanton
Susan Mitchell, Waterbury
Willow Smart, Milton

NATURAL RESOURCES AND ECONOMIC DEVELOPMENT

Claire Ayer, Middlebury
Megan Camp, Shelburne
Wayne Fawbush, Montpelier
Kay Henry, Waitsfield
Buzz Hoerr, Colchester
Bill Jewell, Brattleboro
Fran Keeler, Colchester
Sue Kruthers, Montpelier
Robert Paquin, Shelburne
Nancy Patch, Richford
Cynthia Scott, Swanton
Bruce Shields, Wolcott
Steve Sinclair, Waterbury
Harvey Smith, New Haven

YOUTH, NUTRITION, AND STRONG COMMUNITIES

E. Anne Allen, West Charleston
Stacie Blake, Colchester
Kristen Bolton, Burlington
Rachel Cadwallader-Staub, South Burlington
Karen Ducharme, Hardwick
Sue Farrell, Castleton
Jon Muise, Montpelier
Chantale Nadeau, Newport
Addy Smith-Reiman, Hardwick
Tom Stevens, Waterbury

OTHER ADVISORY GROUPS

LAKE CHAMPLAIN SEA GRANT PROGRAM ADVISORY COMMITTE

Megan Camp, Shelburne
Robert Carroll, Westport, NY
Karen Dickenson, Plattsburgh, NY
Phelan Fretz, Burlington
William Howland, Grand Isle
Chyi-Lyi Kathleen Liang, Burlington
James Olmstead, Plattsburgh, NY
Robert Paquin, Montpelier
Harvey Smith, New Haven
Art Stemp, Raybrook, NY
Bonnie Waninger, St. Albans

Agricultural Systems

UVM research and outreach projects are aimed at ensuring the profitability of Vermont's agricultural enterprises.

UVM faculty and staff are …

- increasing decision makers' knowledge of dairy profitability, sustainability, and water quality to achieve informed, state-wide agricultural policy
- addressing and reducing the barriers faced by new farmers, especially women, in accessing USDA programs
- helping new farmers succeed by connecting them to appropriate training and information resources
- demonstrating how modern dairy farms can be operated in financially and environmentally sound ways
- facilitating farm transitions, and providing training and support for new farmers to help keep farmland in production
- assessing dairy community members' perceptions and needs to more effectively deliver educational programs to this clientele

DAIRY *(17 projects)*

- providing agricultural engineering expertise to Vermont dairy farmers to increase farm efficiency and profitability
- collecting information on Vermont dairy farm production practices to make recommendations on model farm operations: use of VT-DHIA (Dairy Herd Improvement Association), rBST, computers, manure storage mechanisms, and debt structuring
- correlating colostrum quality with herd management practices to control Johne's Disease
- teaching and demonstrating calf management skills to improve the health and performance of dairy calves
- evaluating whether inclusion of the iron-binding protein, lactoferrin, in calf diets improves calf health, development, and later milk production
- understanding the mechanisms and regulation of glucose transport process in bovine mammary gland to improve nutrient utilization and increase milk production efficiency
- identifying genes that control mammary development, colostrum formation, and milk yield to enhance the efficiency of milk production and improve calf health
- raising biosecurity awareness and promoting adoption of management practices to prevent the introduction of diseases onto livestock farms
- developing, applying, and evaluating novel genes designed to enhance mastitis resistance in cows
- developing new genes that enable cows to prevent bacterial growth in milk
- studying how bovine mammary cells respond to infection by mastitis-causing pathogens
- developing new methods for estrus (heat) detection in dairy cows
- developing a practical method for predicting forage quality of the first harvest

- developing alternative cropping systems to decrease the potential for phosphorus buildup and runoff
- demonstrating how management-intensive grazing can help reduce costs and environmental impacts on livestock farms
- evaluating the performance of the forage, fenugreek, as an annual rotation crop

MAPLE *(8 projects)*

- determining nutrient status of sugar maple stands and the role of fertilization and liming on sugar production
- determining the biochemical changes that occur during maple syrup processing that contribute to off-flavors
- developing methods to detect adulterants and contaminants of maple syrup
- aiding maple sugarmakers and forest managers to reduce the impact of forest insects and diseases on stands used for maple syrup production
- developing educational materials for the general public, landscapers, and sugarmakers to promote awareness about the Asian Longhorned Beetle and enhance detection of infestations

Research at UVM's Proctor Maple Research Center helps sugarmakers assure a top-quality product.

- monitoring and evaluating pear thrips levels across the state to aid maple sugarmakers in making decisions regarding sugarbush tapping and management
- providing research-based information to maple producers through regional conferences

LIVESTOCK (OTHER THAN DAIRY COWS) AND POULTRY *(14 projects)*

- providing technical information about dairy goats (such as nutritional requirements) to lower feed costs, improve milk production, and engage more feed companies to provide this service
- establishing how hormones (such as prolactin) regulate mammary gland growth and physiology in swine
- educating producers of existing value-added markets and practices that improve sustainability of small beef herds
- determining nutritional effects on hormone secretion and growth in chicks
- conducting applied research and sharing results with the equine industry to demonstrate that different breeds do not have the same growth rates and nutritional needs
- demonstrating methods and techniques for equine land management to maintain water and pasture quality
- providing education on various equine topics including economics, safety, and disease prevention

FRUITS AND VEGETABLES *(12 projects)*

- providing the scientific and technical expertise necessary to help apple growers remain competitive while maintaining a sustainable agriculture system
- encouraging growers to plant the apple cultivar Honeycrisp because of its adaptability, fruit quality, and high farm-gate value
- researching and communicating how cold-tolerant apple and grape cultivars can present value-added economic opportunities
- promoting sustainable production practices that improve soil stewardship and pest management to enhance the long-term viability of Vermont's vegetable and berry farms

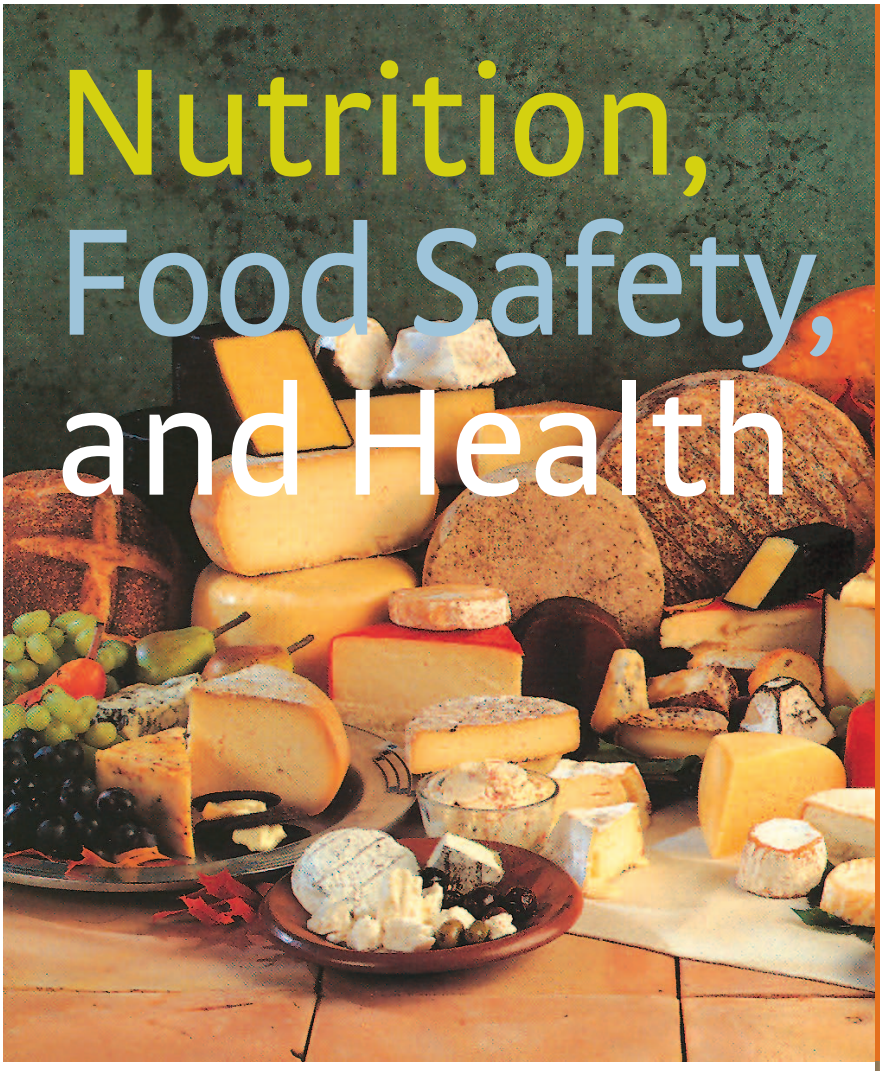
At a cover crop workshop in Brattleboro, Vern Grubinger (left), Extension vegetable and berry specialist, discusses legumes that fix nitrogen for use by subsequent vegetable crops.

- verifying the absence of quarantined pests to certify Vermont plant products free of exotic pests
- providing commercial growers and home gardeners with science-based pest and disease information and management strategies that employ Integrated Pest Management techniques, and determining the value and impact of that information
- determining the most effective uses of compost for vegetable production in a horticultural setting

ORNAMENTAL HORTICULTURE *(10 projects)*

- demonstrating improved methods of pest and disease management for the greenhouse industry in northern New England
- developing cultural techniques for elimination of overwintering thrips and plant viruses from greenhouses
- determining effects of fall acclimation on perennials to increase survival and decrease losses
- implementing the Master Gardener Program to educate Vermont gardeners about the benefits of low-impact gardening
- creating an Internet resource for greenhouse science educators
- developing salt-tolerant, grafted sugar maples for ornamental use in urban locations of northern states
- evaluating the effectiveness of different mulches as a top-dress application to control growth of liverworts

Nutrition, Food Safety, and Health



UVM research and outreach projects are addressing Vermonters' concerns about nutrition, obesity, and food safety and are working to develop new value-added products.

UVM faculty and staff are …

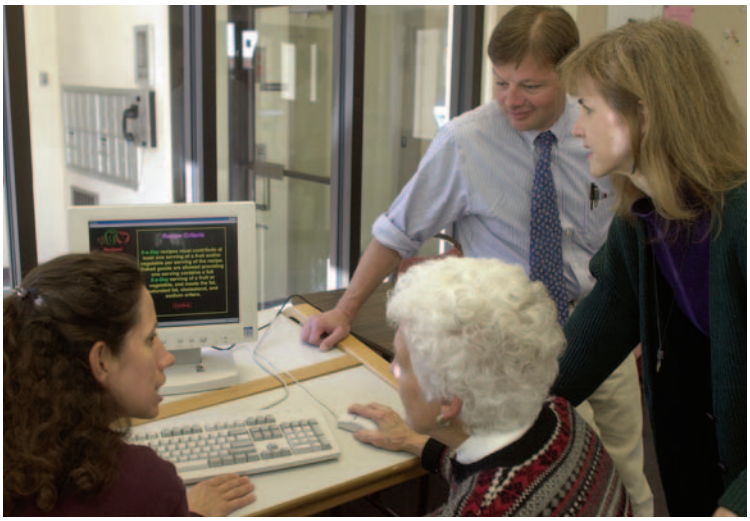
FOOD SAFETY *(11 projects)*

- researching ultrasound treatment as an alternative for pasteurization of milk and cider
- developing science-based environmental testing and control strategies for *Listeria* to improve the safety of meat, dairy, and seafood products
- developing research and management programs and providing technical assistance to ensure the safety and quality of aged raw milk cheeses throughout the entire production process
- evaluating consumer preference for produce grown using Good Agricultural Practices
- determining abundance of microbes on produce grown without and with Good Agricultural Practices
- training Master Gardeners to train home gardeners to use Good Agricultural Practices in the production, harvesting, and storage of fruits and vegetables
- demonstrating skills and responding to consumers' questions regarding home food preservation

Food science researchers Todd Pritchard and Cathy Donnelly evaluate milk quality and safety in their microbiology lab.

- developing an array of strategies to teach food safety to middle school students including an interactive, multimedia web application
- training food-service workers, managers, and students of culinary arts how and why to use recommended food safety and sanitation practices to reduce the risk of a foodborne illness outbreak

Elementary school children in Brattleboro participate in an Extension gardening and nutrition program.



Researcher Steve Pintauro and Extension nutrition specialists Linda Berlin (left) and Sara Burczy demonstrate a computer program they've developed on food safety, health, and nutrition for seniors.

Researcher Mingruo Guo is developing an environmentally safe varnish using a byproduct of cheesemaking.

NUTRITION *(15 projects)*

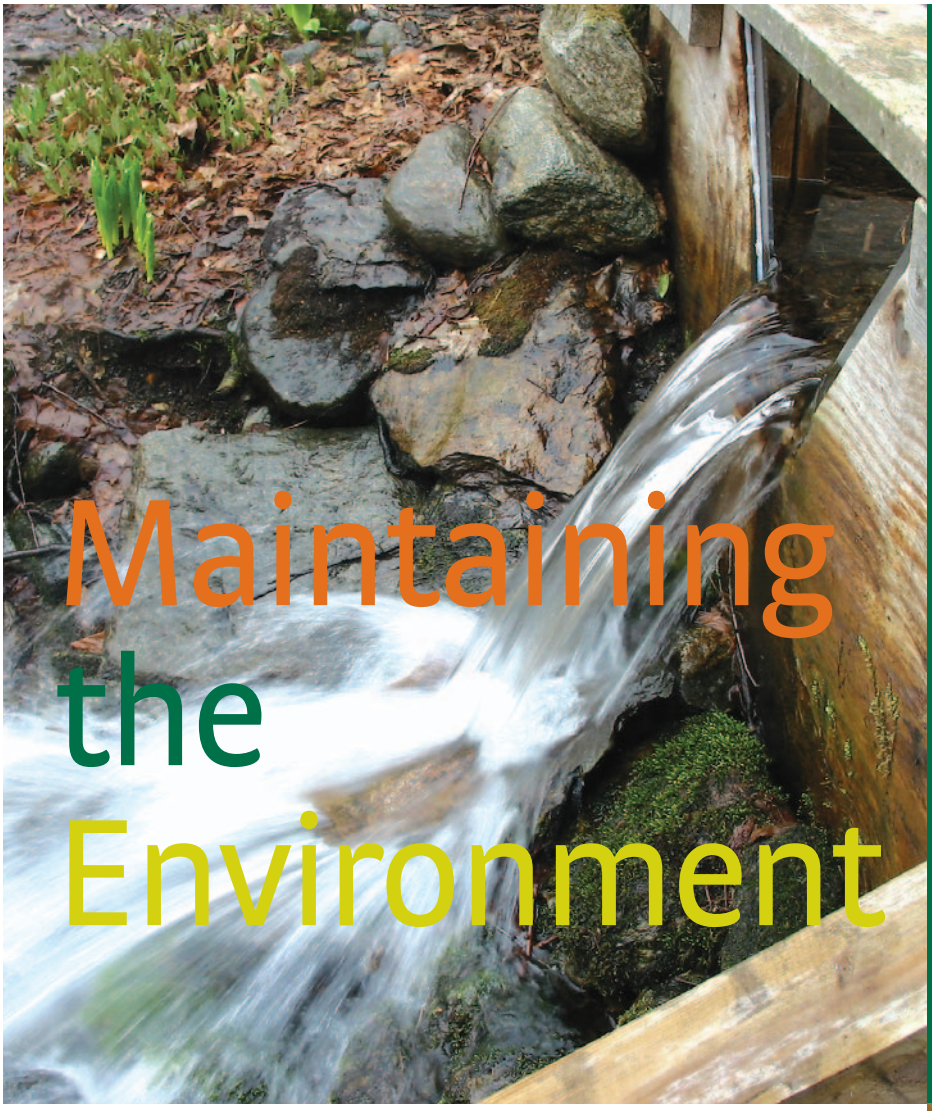
- developing interventions to offer nutritionally appropriate beverages to young children
- educating and empowering limited–resource Vermonters to make healthful choices related to food and physical activity
- building knowledge to improve dietary habits for improved health and wellbeing
- increasing children's preference for fruits and vegetables through gardening
- developing and testing the effectiveness of a multimedia, interactive, online computer program for delivering nutrition and health information to seniors
- developing a completely computerized, introductory, college-level nutrition course that can be taken locally or by distance education in an on-line, stand-alone format
- using horticulture to build the life and job skills of youth to create healthy and productive citizens with a knowledge of where their food comes from
- addressing the food needs of low-income children and their families and improving school meals for students

HEALTH *(9 projects)*

- developing obesity treatment programs that can be widely disseminated
- developing physical activity interventions to prevent obesity in young children
- measuring hormone-induced changes in breast tumors and the effect on the potential spread of cancer
- understanding normal and abnormal mammary gland development and the effect of pregnancy and lactation on mammary gland metabolism
- defining the genes involved in the adhesion of periodontal disease bacteria to teeth and heart tissues

FOOD SCIENCE *(7 projects)*

- determining strategies to obtain consistent texture of Cheddar cheese
- developing an environmentally safe wood finish using cheese whey, adding commodity value to both dairy and wood industries
- using a byproduct of cheese making to develop an environmentally safe road de-icer
- developing a niche market for organic soy products



Maintaining the Environment

UVM faculty and staff are addressing Vermonters' concerns for the environment—promoting agricultural practices that protect soil, water, and air quality.

Tom Lewis, researcher in UVM's Microbiology and Molecular Genetics Department, uses culture medium to grow bacteria that convert pollutants into harmless substances.

UVM faculty and staff are …

NUTRIENT RUNOFF AND WATER QUALITY

(9 projects)

- helping farmers develop effective nutrient management plans to improve water quality
- using constructed wetlands to reduce nutrients from dairy waste water to environmentally acceptable levels
- testing use of slag filters to prevent phosphorus pollution
- evaluating what plant species in a constructed wetlands aid removal of pollutants from dairy effluent
- improving manure management practices and measuring phosphorus runoff from agricultural fields to reduce phosphorus pollution

ENVIRONMENTAL MANAGEMENT

(10 projects)

- evaluating what genes and characteristics of invasive plant species contribute to aggressiveness
- examining ecosystem productivity and stability of arid soil as it relates to climate change
- developing models that incorporate ecological processes to aid in restoring degraded landscapes
- identifying potential nontarget effects of genetically modified corn on soil organisms

- testing the ability of bacteria to breakdown chemical pollutants
- Developing a method to communicate the dangers of toxic products in the home and to promote the use of non-toxic or less toxic alternatives

Plant ecologist Jane Molofsky and post-doctoral fellow Sebastien Lavergne measure the density of reed canary grass, an invasive plant species.

ENTOMOLOGY AND INTEGRATED PEST MANAGEMENT (IPM)

(19 projects)

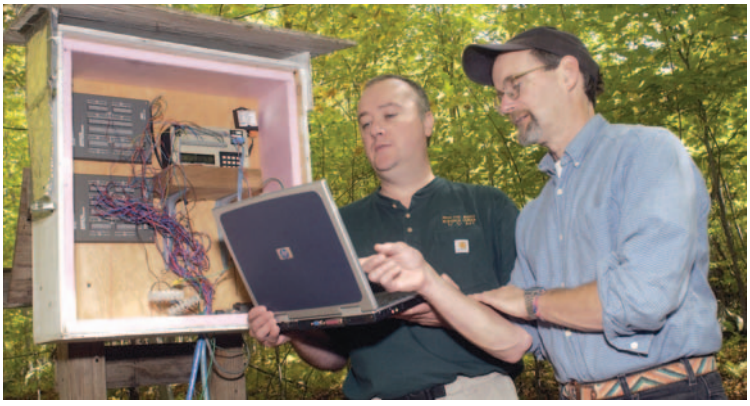
- developing a non-petroleum-based pest control delivery system
- defining optimal methods for the spray application of insect-killing fungi and educating greenhouse and nursery managers with information about biological controls for IPM to promote adoption of safer crop protection strategies
- using insect-killing fungi and other natural enemies as viable and cost-effective components of maple and greenhouse IPM programs
- developing biocontrol agents for management of hemlock woolly adelgid, an invasive insect
- determining the temperature tolerance and potential ecological range of hemlock woolly adelgid
- determining the compatibility of insect-killing fungi with predators used for biocontrol
- developing fungal biocontrol agents to address insect pests of worldwide importance
- providing information on use of organic practices to manage pests in the apple ecosystem
- providing IPM information for apple and grape industries in cold climates
- advocating and educating Vermont corn growers on the use of IPM for managing corn rootworms
- developing a web site for pesticide applicator training information

FOREST RESOURCES *(15 projects)*

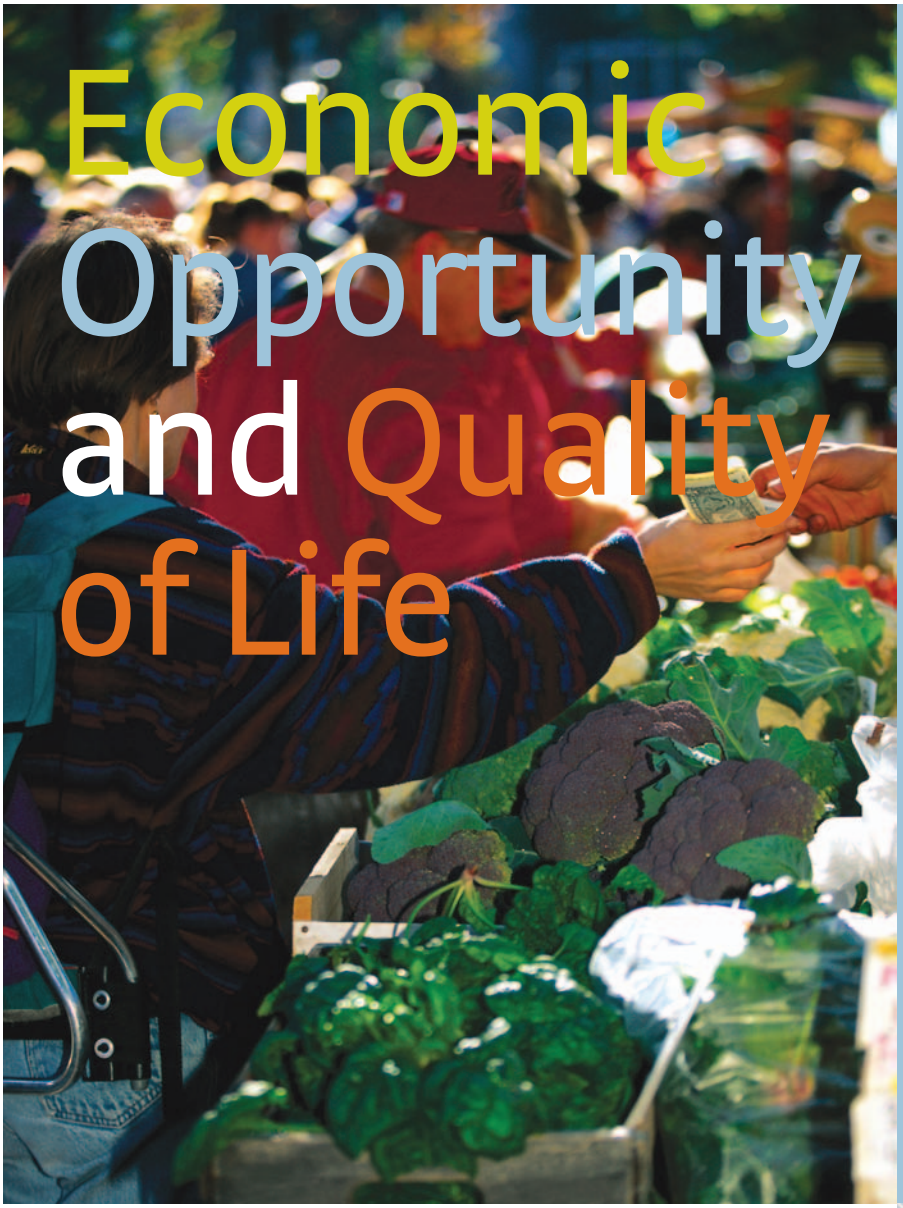
- determining the chemical behavior of nitrogen compounds in forested ecosystems for better management
- investigating the mineralogical identity of soil calcium in forest soils of the northeast U.S. to allow forecast of possible depletion
- monitoring the health of forests in Vermont and determining the impacts of air pollution on trees
- developing models of ecosystem response to global climate change

A solar panel provides power for an automated sampler that collects stream water samples at a weir.

- evaluating the impact of global change on the maple industry of the northeast
- determining the effects of traditional and alternative silvicultural methods on soil nutrient levels and the biodiversity of ground beetles and springtails
- developing educational materials about the Asian longhorned beetle to promote awareness, increase detection, and assist long-term eradication efforts
- teaching woodland owners about recreational enterprises to help them make informed decisions about economic viability and environmental sustainability
- developing recommendations for policies that promote the desirable combination of ecological, social, and economic benefits from the Northern Forest
- creating a forum for discussion and relationship-building to decrease conflict in the Green Mountain National Forest
- providing socio-economic and demographic information to support the Green Mountain National Forest five-year planning process



Botanists Tim Perkins (left) and Tim Wilmot collect temperature, pressure, and sap flow data from maple trees that will help them better understand the relationship between climate and sap flow.



Economic Opportunity and Quality of Life

UVM research and outreach activities are aimed at improving economic opportunity and quality of life by enhancing competitiveness of natural resource-based industries and planning of healthy communities.

UVM faculty and staff are …

FARM PROFITABILITY AND AGRICULTURAL ECONOMICS *(10 projects)*

- increasing farmers' business management skills to operate farms more profitably
- educating Vermont farmers about the benefits of participating in crop insurance programs
- developing marketing strategies for agri-tourism businesses to increase profits
- informing farm families about issues and options related to farm and farm business transfers
- teaching human resource skills to farmers so they can better recruit, hire, manage, and maintain an effective workforce
- educating and supporting community groups and students working to link local farms to local schools
- supporting small-scale Vermont farmers and providing fresh fruits and vegetables to low-income Vermont seniors to provide economic, health, and community development benefits

Glenn Rogers (right), Extension farm business management specialist, discusses business planning with Mike Shannon of Vermont Hots in West Addison.

CONSUMER ECONOMICS *(4 projects)*

- analyzing consumer and producer data to assess the market potential and restrictions for organic products
- providing information so that consumers can make coffee choices based on sustainable growing practices
- assessing the niche markets for milk from non-rBST treated cows

ECONOMIC AND COMMUNITY DEVELOPMENT *(21 projects)*

- analyzing the attitudes and opinions of Vermonters on issues important to researchers, decision-makers, advocacy groups, and the public at large
- developing and providing materials for use by citizen planners and local officials for effective municipal government activities
- conducting workshops that increase community leaders' knowledge of recreational and tourism systems, enabling them to create a model for their community
- creating a model for economic development in rural communities

Fred Schmidt, co-director of UVM's Center for Rural Studies, and Meaghan Murphy, research project assistant, review a community profile developed by the Center.

- providing opportunities for small business start-ups through University-small business partnerships
- ensuring that quality school and education data are being made available to Vermonters to evaluate schools' performance
- evaluating job distribution, job satisfaction, wage and other compensations, and other employment issues from both employers' and employees' perspectives
- developing a technical assistance toolkit that will help small businesses in Vermont effectively and successfully integrate e-commerce capabilities into their operations
- enabling municipal officials to use information technology and the Internet to innovate and improve the ways in which local governments disseminate information and services
- determining and assessing the impacts and outcomes of providing technology training to low-income individuals to obtain gainful employment within the community
- determining impact of technology training and technical support on the non-profit sector in Vermont and identifying effective practices to enhance service delivery for Vermont non-profits using technology
- providing assistance to food entrepreneurs to achieve food safety, economic development, and scientific/technical expertise
- providing opportunities for economically disadvantaged and minority students to participate in graduate study in Public Administration and Community Development and Applied Economics
- aiding consumers' understanding of their 'right to know' in the rent-to-own industry
- providing current information and resources for use by the Vermont tax community

FAMILY RELATIONS *(13 projects)*

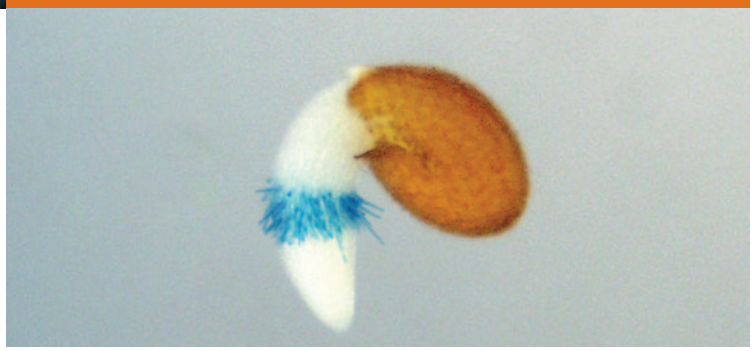
- addressing the academic success of middle school students and the school drop-out rate of youth through experiential learning
- assessing life skill development in teenagers participating in selected leadership development programs
- developing life skills in youth and acquiring appropriate attitudes and behaviors to succeed as adults
- creating an opportunity for youth to increase their knowledge and become comfortable with the local legislative process
- building leadership and communication skills of teens who plan and carry out an educational experience for Vermont youth
- providing parent education through the 'Coping with Separation and Divorce' program
- identifying eligible migrant farm families and connecting them to educational services
- increasing youth awareness of the benefits of wearing seatbelts
- providing resources and employment tools/skills for rehabilitation of agricultural and rural Vermonters with disabilities
- providing job skills in scientific research to incarcerated individuals to help them become productive members of society
- evaluating the effectiveness of the 'Childcare Business Initiative' training in Vermont
- evaluating the effectiveness of the 'LeadSafe Initiative' in Vermont

At 4-H State Day in Randolph, members of a horse club from White River Junction staff their action exhibit, demonstrating life skills they've learned.

Life Sciences

UVM researchers are addressing basic questions in biology at the molecular, cellular, organism, and ecosystem levels.

Understanding the unique aspects of legume roots that allows them to form nitrogen-fixing nodules may lead to improving the ability of non-legumes to grow in the absence of commercial fertilizer.



UVM faculty and staff are …

- developing and hosting web programs for all land-grant institutions to use to submit and manage required research documentation for USDA's online Current Research Information System
- supporting career development of young faculty, graduate students, and postdoctoral fellows in molecular genetics

MICROBIOLOGY AND CELL BIOLOGY

(10 projects)

- determining factors that control the function of root cells necessary to maintain plant nutrition and water status
- characterizing features of root cell wall structure important for interactions with soil microbes
- identifying proteins that are targets for new drugs for the treatment of microbial parasites
- investigating the molecular mechanisms that periodontal disease bacteria use to colonize their surroundings
- studying the ways that microbial cell growth is controlled
- determining cellular factors critical for HIV-1 replication to prevent viral spread and disease onset
- determining the mechanism by which stem cells can produce different tissues during development
- determining how microbial cells use chemical signals to communicate with one another
- identifying the genetic changes that lead to the development of new crop species from wild plant relatives
- examining the expression of root genes necessary to form nitrogen fixing nodules with symbiotic bacteria

MOLECULAR GENETICS *(11 projects)*

- providing clues to the roles of DNA damage in cancer and aging
- providing insight into how DNA repair enzymes recognize and repair a broad array of damaged DNA
- determining the molecular mechanisms that ensure faithful transmission of genetic information from one generation to the next
- providing insights into the molecular mechanisms underpinning cancer and other human diseases
- studying how the enzymes that synthesize RNA operate
- working to understand the basic mechanisms of how genetic machinery processes RNA in cells
- examining how RNA folds into a three-dimensional structure to become an active enzyme
- determining whether or not RNA molecules that display enzymatic activity can be developed into effective antiviral therapeutic agents

Dr. Susan Wallace and Research Associate Vishy Bandaru discuss the results from an autoradiogram showing the activity of a novel DNA repair enzyme isolated in their lab.

Contact Information

UNIVERSITY OF VERMONT EXTENSION

DIRECTOR'S OFFICE

Doug Lantagne, Interim Director
doug.lantagne@uvm.edu
Karen Schneider, Interim Assistant Director
karen.schneider@uvm.edu
Adams House, 601 Main Street, UVM
Burlington, VT 05401-3439
Phone: (802) 656-2990
1-866-622-2990 (toll-free)
Fax: (802) 656-8642

OFF-CAMPUS UVM EXTENSION OFFICES:

CENTRAL/NORTHEAST REGION

Ellen Rowe, Regional Chair
ellen.rowe@uvm.edu
(Office location: St. Johnsbury)

BERLIN OFFICE

617 Comstock Road, Suite 5
Berlin, VT 05602-9194
Phone: (802) 223-2389
1-866-860-1382 (toll-free)
Fax: (802) 223-6500

GUILDHALL OFFICE

91 Courthouse Drive, P.O. Box 20
Guildhall, VT 05905-0020
Phone: (802) 676-3900
1-800-639-1207 (toll-free)
Fax: (802) 676-3921

MORRISVILLE OFFICE

29 Sunset Drive, Suite 2
Morrisville, VT 05661-8331
Phone: (802) 888-4972
1-866-260-5603 (toll-free)
Fax: (802) 888-2432

NEWPORT OFFICE

338 Highland Avenue, Suite 3
Newport, VT 05855-4896
Phone: (802) 334-7325
1-866-260-5561 (toll-free)
Fax: (802) 334-5208

RANDOLPH CENTER OFFICE

Vermont Technical College
204 Green Hall
Randolph Center, VT 05061
Phone: (802) 728-1556
1-800-698-1581 (toll-free)
Fax: (802) 728-1582

ST. JOHNSBURY OFFICE

107 Eastern Avenue
St. Johnsbury, VT 05819-2762
Phone: (802) 751-8307
1-800-545-8920 (toll-free)
Fax: (802) 751-8800

NORTHWEST REGION

Gary Deziel, Regional Chair
gary.deziel@uvm.edu
(Office location: Burlington)

BURLINGTON OFFICE

655 Spear Street
Burlington, VT 05405-0107
Phone: (802) 656-5433
1-800-571-0668 (toll-free)
Fax: (802) 656-5422

MIDDLEBURY OFFICE

68 Catamount Park, Suite C
Middlebury, VT 05753-1292
Phone: (802) 388-4969
1-800-956-1125 (toll-free)
Fax: (802) 388-0511

ST. ALBANS OFFICE

278 South Main Street, Suite 2
St. Albans, VT 05478-1866
Phone: (802) 524-6501
1-800-639-2130 (toll-free)
Fax: (802) 524-6062

SOUTHERN REGION

Rick LeVitre, Regional Chair
richard.levitre@uvm.edu
(Office location: Rutland)

BENNINGTON OFFICE

(location: 310 Main Street)
P.O. Box 559
Bennington, VT 05201-0559
Phone: (802) 447-7582
1-800-287-1552 (toll-free)
Fax: (802) 447-8076

BRATTLEBORO OFFICE

11 University Way, Suite 4
Brattleboro, VT 05301-3669
Phone: (802) 257-7967
1-800-278-5480 (toll-free)
Fax: (802) 257-0112

RUTLAND OFFICE

Howe Center Business Park
1 Scale Avenue, Suite 55
Rutland, VT 05701-4452
Phone: (802) 773-3349
1-800-281-6977 (toll-free)
Fax: (802) 775-4840

WHITE RIVER JCT. OFFICE

212 Holiday Drive, Suite 4
White River Jct., VT 05001-2037
Phone: (802) 296-7630
1-800-278-5471 (toll-free)
Fax: (802) 296-7631

COLLEGE OF EDUCATION AND SOCIAL SERVICES*

Jill Tarule, Dean
jill.tarule@uvm.edu
Waterman Building, UVM
Burlington, VT 05405-0160
Phone: (802) 656-3424
Fax: (802) 656-0855

THE RUBENSTEIN SCHOOL OF ENVIRONMENT AND NATURAL RESOURCES*

Don DeHayes, Dean
donald.dehayes@uvm.edu
George D. Aiken Center, UVM
Burlington, VT 05405-0088
Phone: (802) 656-4280
Fax: (802) 656-8683

DIVISION OF CONTINUING EDUCATION*

Cynthia Belliveau and Carol Vallett, Co-directors
cynthia.belliveau@uvm.edu
carol.vallett@uvm.edu
322 South Prospect Street, UVM
Burlington, VT 05401-3505
Phone: (802) 656-2085
Fax: (802) 656-3891

VERMONT AGRICULTURAL EXPERIMENT STATION AND COLLEGE OF AGRICULTURE AND LIFE SCIENCES

DEAN/DIRECTOR'S OFFICE

Rachel Johnson, Dean/Director
rachel.johnson@uvm.edu
Michael Vayda, Associate Director
michael.vayda@uvm.edu
Morrill Hall, UVM
Burlington, VT 05405-0106
Phone: (802) 656-0137
Fax: (802) 656-0290

ANIMAL SCIENCE*

Tom McFadden, Interim Chair
thomas.mcfadden@uvm.edu
Terrill Hall, UVM
Burlington, VT 05405-0148
Phone: (802) 656-2070
Fax: (802) 656-8196

BOTANY AND AGRICULTURAL BIOCHEMISTRY*

Thomas Vogelmann, Chair
thomas.vogelmann@uvm.edu
Marsh Life Science Building, UVM
Burlington, VT 05405-0086
Phone: (802) 656-2930
Fax: (802) 656-0440

COMMUNITY DEVELOPMENT AND APPLIED ECONOMICS

Jane Kolodinsky, Chair
jane.kolodinsky@uvm.edu
Morrill Hall, UVM
Burlington, VT 05405-0106
Phone: (802) 656-2001
Fax: (802) 656-1423

MICROBIOLOGY AND MOLECULAR GENETICS

Susan Wallace, Chair
susan.wallace@uvm.edu
Stafford Building, UVM
Burlington, VT 05405-0084
Phone: (802) 656-2164
Fax: (802) 656-8749

NUTRITION AND FOOD SCIENCES*

Jean Harvey-Berino, Chair
jean.harvey-berino@uvm.edu
Terrill Hall, UVM
Burlington, VT 05405-0148
Phone: (802) 656-3374
Fax: (802) 656-0407

PLANT AND SOIL SCIENCE*

Deborah Neher, Chair
deborah.neher@uvm.edu
Hills Building, UVM
Burlington, VT 05405-0082
Phone: (802) 656-2630
Fax: (802) 656-4656

* These units have some Extension faculty.

1M-LB-3/05

DESIGN: Futura Design, Shelburne, VT 05482

PHOTOGRAPHY: University Photography, except as follows; page 2, right: Lynn Harvey; page 3, left: UVM Entomology Lab; page 4, left: Lisa Chase; page 4, top: Don Ross; page 4, bottom: Pamela Ainsworth; page 7, top: Bonnie Schaeffer; page 8, right: Sherry Russell; page 9, left: Vermont Cheese Council; page 10, top: Sara Coblyn; page 11, left: Don Ross; page 12, top right: Don Ross; page 13, left: Northeast Sustainable Agriculture Research and Education (SARE); page 14, right: Sarah Kleinman; page 15, left: Jeanne Harris; page 15 top, right: Mary Tierney; back cover: Bonnie Schaeffer.

The University of Vermont Extension

Visit us on the World Wide Web
UVM Extension at
www.uvm.edu/extension
VT Agricultural Experiment Station at
www.uvm.edu/vtaes

AES Vermont Agricultural Experiment Station

There are 60 to 80 registered stallions, mares, and foals at the UVM Morgan Horse Farm, noted for supplying excellent stock to Morgan breeders throughout this nation and abroad. Educational programs are also an important part of the Farm's mission.