Tracking UVM

An Environmental Report Card for the University of Vermont

for the years **1990-2000**

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Coordinator
UVM Environmental Council
December 2002

In partnership with

Burlington Legacy Project

Green Mountain Institute for Environmental Democracy

Institute for Sustainable Communities

Funded by the U.S. Environmental Protection Agency and the University of Vermont

Tracking UVM:

Environmental Report Card 1990-2000

Contents

Project Partners

This report is a project of four organizations working in partnership.

UVM Environmental Council

An advisory council of UVM students, staff, faculty, and alumni working to celebrate and reinforce UVM's commitment to environmental values.

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A non-profit organization that promotes effective, collaborative decisionmaking by providing information-based tools addressing the health of the environment and the people in it.

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Local Stakeholders

Preliminary findings were discussed with knowledgeable groups on and off campus who helped shape this report, including:

Campus Stakeholders

Burlington Electric Department
Campus Planning Services
Consortium for Ecological Living
Environmental Program
Environmental Safety Facility
Physical Plant Department
School of Natural Resources
Transportation and Parking Department
Vermont Student Environmental Program

Burlington Stakeholders

Alliance for Climate Action
Burlington Board of Health
Burlington Eco Info Project
Burlington Electric Department
Burlington Public Works Department
Champlain Initiative
Lake Champlain Committee
Neighborhood Action Project

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From the President

When people come to Vermont they see evidence of environmental responsibility in many quarters. The University of Vermont, as the flagship educational institution in the state, has taken some impressive steps to create a culture of environmental responsibility among its students, staff, and faculty. We are a leading land-grant university in environmental education, environmental research, and institutional environmental practices.

Already members of the UVM community are active participants in the national conversation on sustainability in higher education. In this report you will learn about UVM's successful hazardous materials programs, our high recycling rate, our experiments with biodiesel, and many other examples of campus "greening" practices.

To lay the groundwork for the future, the UVM Environmental Council has begun tracking our progress as an environmentally responsible institution in key areas. In some cases, the indicators show considerable progress toward a sustainable vision, and that is cause for celebration. In other cases, indicators point to gaps in data or areas for improvement. These quantitative measures can serve both as a history of the last ten years of effort and as a baseline for evaluating future progress.

Throughout this report, I am very pleased to see that student projects have made a difference over and over again. Faculty and students working together with committed staff have helped to reduce waste, conserve energy, monitor water and air quality, and promote public transportation. The discussions raised by this report will, no doubt, stimulate further dialogue about the role of the environmental university in the 21st century. If UVM is to keep its lead in this area, we will need to take up our own challenges of housing and transportation with a serious commitment to a sustainable future.

I am proud of UVM's best practices thus far and I look forward to taking the next important steps in making this campus a national model for environmental sustainability.

Daniel Mark Fogel

Purpose of *Tracking UVM*

During the 1990s, a "campus greening" movement blossomed in the United States. Dozens of colleges and universities initiated efforts to reduce the environmental impacts of operating their campuses, and many hired staff to coordinate "greening" efforts. Demonstration projects developed into best practices for recycling, energy conservation, water conservation, and many other activities.

How much difference do these best practices make? Which areas of campus operations create the largest impacts, and therefore deserve the most attention? This report, one of a handful of similar studies conducted by colleges and universities, addresses these questions at the University of Vermont.

The purpose of this first environmental report card is to:

- Establish a set of measures to track the environmental impacts of the university, in consultation with the campus community and citizens of Burlington;
- Identify university programs that have reduced environmental impacts;
- Stimulate discussion on the campus and in the Burlington community about the progress made so far and future actions the university could take; and
- Share findings with the larger community of higher education.

About this Report Card

This report card asks a central question:

Are the daily operations of the university creating more or fewer environmental impacts than in 1990?

Some of these impacts are local, such as untreated water running off parking lots, while others are regional or global, such as radioactive waste disposal and the release of greenhouse gases that are contributing to climate change. Collectively these impacts are called an "ecological footprint."

The environment is a wonderfully complex interaction of physical and biological actions. In order to assess progress in reducing the university's footprint, we have chosen some indicators of environmental impacts. Ideally, environmental indicators are relevant to impacts, use valid sources of data, and can be compiled using existing data.

Limits of indicators

The indicators we chose are just that – "indicators" of changes in the environment. They are not precise or comprehensive. In the future, we may be able to do a better job if we can develop more data, but even then, measures such as these reported here can only begin to describe the changing condition of the campus environment or its broader impacts.

In general, the indicators used in this report span the decade between 1990 and 2000. Land use, solid waste and hazardous waste data were not available for the entire decade. The data for all the indicators are rough, requiring estimates, judgments, and hundreds of hours of work to collect and analyze. In most cases, the indicators raise as many questions as they answer – questions that point to opportunities for student projects and funded research.

Therefore, these indicators serve as a basis for conversation, not a definitive judgment about the performance of university operations. Over the years, we expect the choice of indicators will evolve. We hope that environmental indicators will be integrated into the business of the institution, to inform this conversation in the future.

Involving local stakeholders

To ensure that this report would be relevant to community concerns, we involved on- and off-campus stakeholders in the creation of the report (see inside front cover). We presented our preliminary findings to groups of people on and off campus who were knowledgeable about environmental issues. In response to our presentations, campus stakeholders expressed greatest concern about the ***increase in trash on campus*** and a strong desire to ***build new environmentally responsible student housing*** on campus. Burlington stakeholders frequently discussed ***transportation issues*** and the need for ***more student housing on campus.***

The stakeholders changed the direction of this report significantly by posing an important question: Who could change the trends that were going in the wrong direction? We determined that in many instances, individuals have very limited control over their environmental impacts. This led us to compare the environmental impacts of different types of buildings – residence halls, laboratories, and general campus buildings – with some surprising results.

Campus and community stakeholders also made a wide range of comments that contributed to this report's findings, discussion, and recommendations.

How this report is organized

In the body of this report we show the connections among environmental ***impacts,*** the ***activities*** that create these impacts, and ***programs*** that have been and could be established to reduce the negative impacts from UVM's activities.

Major findings are in three sections:

- **Land and water use**
- **Energy and air pollution**
- **Solid and hazardous waste**

Each section contains the following subsections:

Resource map:
– where UVM's water flows, where energy comes from, where waste goes, and what environmental problems result

Campus resource use:
– a rough estimate, based on sample data from the year 2000, of who on campus uses the most land, water, energy, and materials

Trends:
– indicators of progress, or baseline data for future tracking

UVM programs & best practices:
– UVM actions that have reduced environmental impacts and demonstration projects that educate the campus community

Community comments & next steps:
– summary of relevant issues and suggestions to the campus community about where to focus next.

Because education is the institution's core mission, we also include a brief section about the role of environmental academics and culture. The report concludes with recommendations for the UVM administration and the campus community.

Summary

Between 1990 and 2000, UVM has made significant efforts towards "walking the talk" of a responsible environmental citizen. New management programs during the 1990s significantly reduced the environmental impacts of UVM's operations. Many of these programs constitute "best practices" for institutions of higher education.

Yet despite these efforts, the measurements in this report show that many of UVM's environmental impacts increased over the decade. The problem is that implementing best practices and demonstration projects is not always enough to overcome national economic trends affecting the university's environmental impacts. For example, despite aggressive energy conservation and solid waste recycling programs, UVM's trash and energy use levels increased, although at rates lower than national trends.

The grades below are given in the context of an overburdened planet. The United States, with 5% of the world's population, uses 25% of the world's resources, and resource use continues to rise. If everyone on the planet lived as we do in the U.S., human beings' ecological footprint would cover several more planets.

This perspective is the basis for asking our report card question: Did UVM have a smaller ecological footprint in 2000 than in 1990? Our tracking of that footprint indicates that, in many instances, the answer is no, although that footprint would have been larger if it were not for the many new environmental programs on campus. The grades here indicate what happened despite UVM's best efforts. The result is a sobering reminder for the campus and Burlington community about just how much work lies ahead.

Fortunately, UVM is well equipped to take on this challenge. The Academics & Culture section (page 22) describes the tremendous growth of environmentally related majors, high expectations for a sustainable campus, and high levels of volunteerism at UVM. University programs have already made a difference. With a continuing commitment to innovation and long-term planning, UVM will continue to be a leader in helping to create a truly sustainable way of living on this planet.

Land and Water Use	Energy and Air Pollution	Solid and Hazardous Waste
Main campus land use ~	**Energy sources** +	**Trash generation** –
Little change in use of green space; data not available	Electricity sources became cleaner; 20% renewable in 2000	Trash totals increased 20% since 1996
Transportation ~	**Carbon emissions** –	**Recycling** ~
Commuting miles are estimated to have increased, based on increase in parking permits	Carbon emissions up 2% above 1990 levels	Recycled at least 31% in late 1990s, but amount recycled decreased since 1996
Water use +	**Energy use** –	**Hazardous waste** ~
Water use decreased 15% despite an increase in building space	Total energy use increased 6%; heating remained the same; electricity increased 23%	Total hazardous construction, laboratory, and maintenance waste fluctuated with construction
Storm water management +	**Air pollution from heating** ~	**Radioactive waste** +
Two year peak storm water flows were reduced at least 40% by treatment ponds	Little change in regulated pollutants in 1990s; major pollutant is NOx	Radioactive waste decreased 81% over 10 years

Grading System

+ shows a positive trend towards a more environmentally sustainable campus

– shows a negative trend, with more environmental problems from campus operations

~ shows little change or inadequate data

Land and Water Use

UVM's use of land for buildings, transportation and green space affects water quality in Lake Champlain, the source of UVM's drinking water. An increasing number of buildings and parking spaces challenges the university's ability to minimize environmental impacts.

When precipitation falls on UVM buildings, lawns and parking lots, it washes off sediment, oil, and other pollutants. This storm water then either:

- filters through soil
- evaporates into the atmosphere
- is absorbed by vegetation
- collects in storm water treatment basins before release into streams
- flows to the city's wastewater treatment plant and storm water overflow system and/or
- runs off the land.

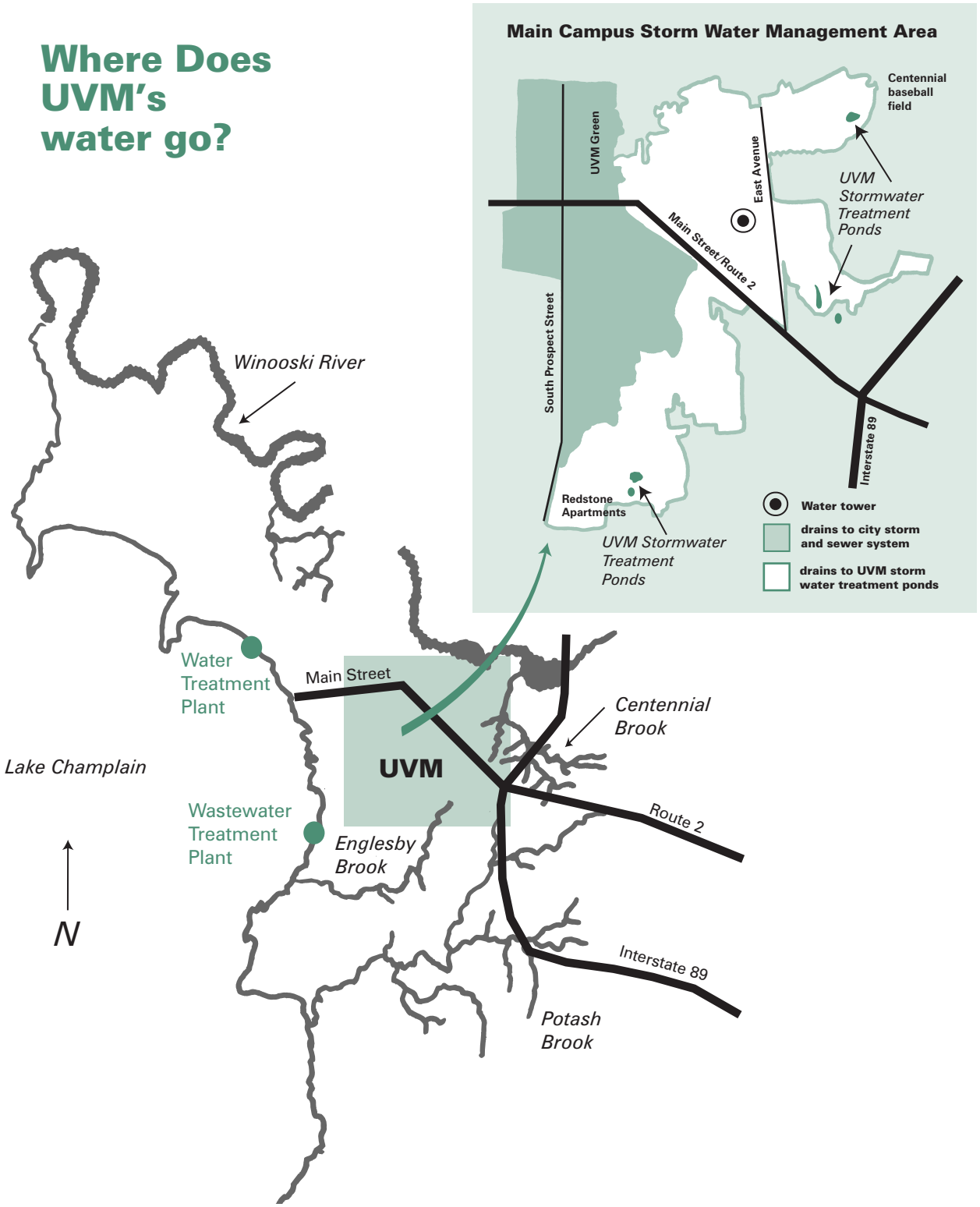
Storm water then enters Lake Champlain as treated or untreated storm water.

Storm water can carry pollutants such as phosphorus, sediment and bacteria into the lake, resulting in:

- health hazards
- excessive algae growth
- low or poor water quality.

Centennial, Englesby and Potash brooks near campus have suffered poor water quality in the past.

Where Does UVM's water go?



How is floor space used?

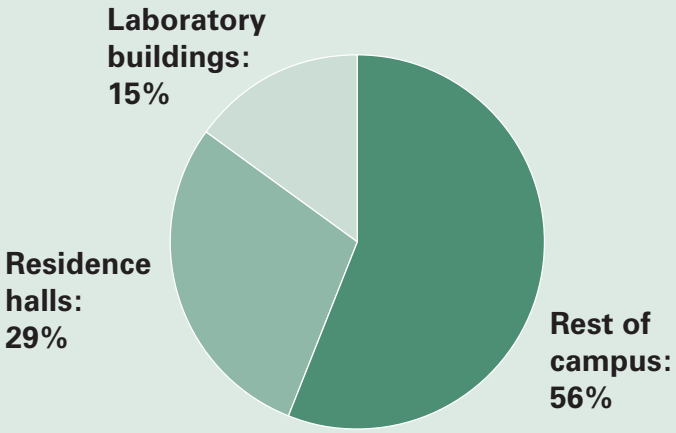
Residence halls and associated services occupy one-third of campus floor space.

We looked at three categories of building use: residence halls and associated services, laboratory buildings, and the rest of campus (classrooms, offices, public space). These categories have differing amounts of energy use, water use, and trash generation. Examining environmental impacts per square foot of floor space can help prioritize where the most significant improvements could be made.

As described in detail in later chapters of this report, the 3,735 students living and eating in residence halls use about one-sixth of the total electricity and generate half the solid waste on campus.

Laboratories occupy one-sixth of floor space.

Laboratory buildings are much more resource intensive than residence halls. Laboratories use one-third of campus electricity, and they generate one-sixth of solid waste and almost half of hazardous waste. They also use about one-third of campus water.



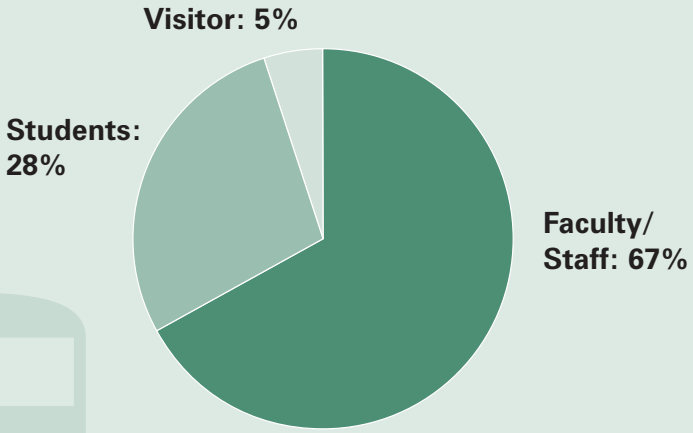
Total= 3,717,400 square feet (analysis of 86% of campus)

How is parking space used?

Faculty and staff used two-thirds of UVM's parking spaces in 2000.

A common perception among Burlington stakeholders interviewed for this report card was that UVM's 9,000 students were the primary users of parking on the UVM main campus, as well as the main contributors to traffic. The data showed that this was not true.

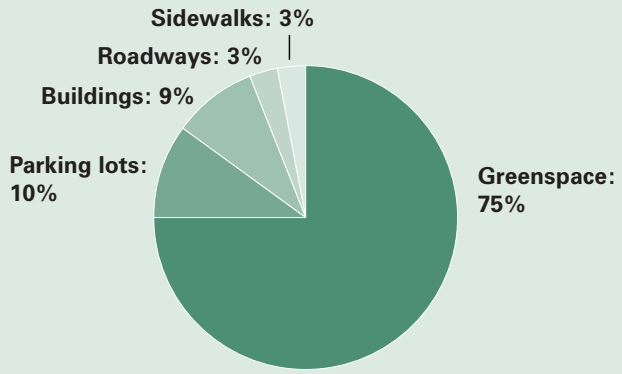
Many of UVM's 2,000 faculty and 1,000 staff live far from campus; the average one-way commute is 16 miles. In addition to burdening UVM land with parking spaces, commuting creates regional air, land, and water impacts. Continued improvement of regional public transportation systems could reduce the need for parking spaces.



Total= 4,296 parking spaces in 2000

Campus land use: what share is parking?

Campus Land Use in 2002 (Academic Core Campus)



Total = 438 acres in 2002

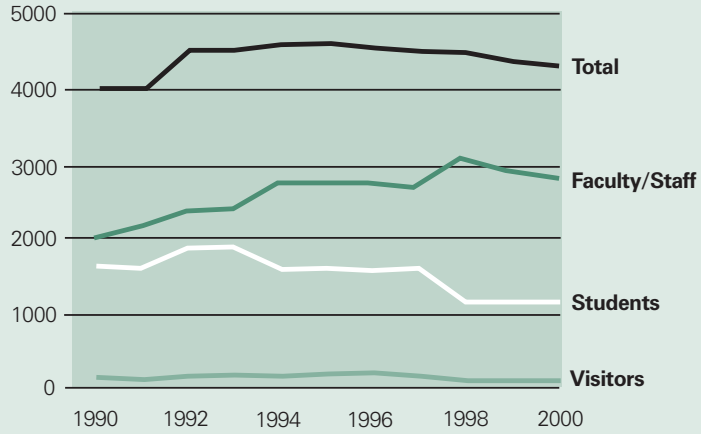
Percent of land used for parking is an informative environmental indicator, but calculating lot density is a complex process, and data were not readily available for the 1990s. While buildings and parking spaces were constructed between 1990 and 2000, many of the projects were constructed on already paved land, and reconfiguration of parking lots created some new parking spaces. The net effect appears to be that land use, including land used for parking, did not change significantly during the decade.

The 2002 data shown here provide a baseline for evaluating land use in the future. Approximately 50% of campus is mapped electronically in 2002. The chart here shows unverified estimates of land use on the Academic Core Campus, including Central, Centennial, Redstone, and Athletic Campus (not South Campus, which is primarily agricultural).

Building up, not out is the goal. The 1997 Campus Master Plan focuses on concentrating development within designated campus districts; considering transportation linkages and circulation patterns to enhance a pedestrian-friendly campus; using parking lots as first options to site a new project; and conserving green space. New parking is typically planned for the periphery rather than the center of campus.

More parking indicates more commuting miles

Main Campus Parking Spaces 1990-2000



Total parking spaces increased by 9% (344 spaces) over the decade as new buildings created new demand for parking. However, without policies to minimize new parking, the increase would have been far greater.

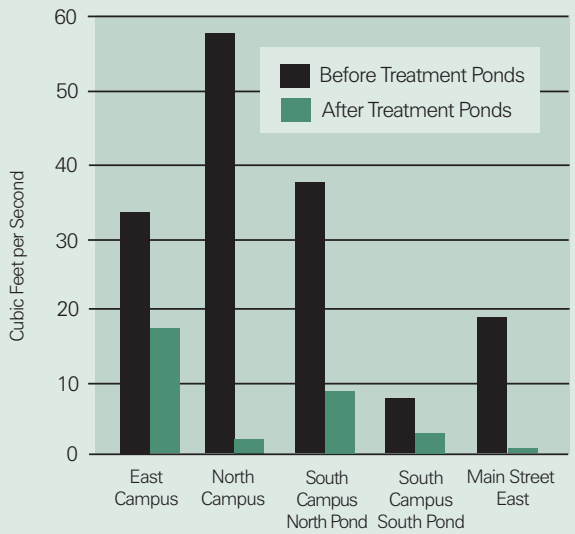
Student parking spaces decreased by 29% (478 spaces) following the creation of the bus system, and a policy that first year students are not permitted to have parking spaces, with some exceptions. Meanwhile, the number of students decreased 8%.

Faculty and staff parking increased 40% (833 spaces). Faculty and staff travel an average of 16 miles each way to UVM. Although UVM encourages multiple alternative transportation options, such as carpooling and public transportation (see page 8), regional efforts are needed to increase transportation opportunities in the greater Burlington area.

UVM commuters travel about 21 million miles per year, equivalent to driving a quarter of the distance to the sun, or 88 times to the moon. Faculty and staff commuting account for 75% of these miles. These estimates need refining before they can be useful for suggesting specific actions to reduce commuting miles.

Storm water treatment ponds reduced flows at least 40%

Average Two-year Peak Storm Water Flows

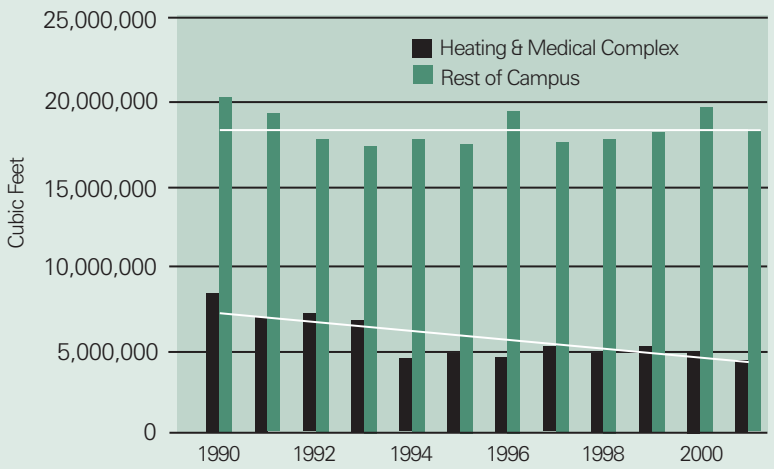


Storm water management improved significantly in the 1990s with construction of five treatment ponds designed to slow down storm water, allowing sediment to settle and reducing risk of erosion. Engineers calculate that these ponds have reduced average two-year storm water peak flows by at least 40% – and up to 90% in some parts of campus (note watersheds are of differing sizes). Storm water management systems exist for each section of campus. The storm water treatment systems are typically modified or updated as new construction projects are approved, as new regulations require modifications, or when monitoring highlights a problem. More regularly scheduled updates would provide better environmental protection.

Storm water quality would be a useful measure. Faculty and students in the School of Natural Resources are testing storm water collected at the Rubenstein Ecosystem Science Center, and the Water Center at SNR has initiated intensive monitoring of campus streams.

Water use down 15%; less used for heating and cooling

Water Use 1990-2001



Water conservation was a quiet success in the 1990s resulting primarily from the actions of energy management staff in Physical Plant. Campus water use has gone down 15% despite the fact that building square footage has increased. Water and wastewater cost UVM about $1 million per year.

Reductions are largely from heating and cooling. Investments in more efficient ways of heating at the Central Heating Plant and cooling at the Medical Complex resulted in large reductions in water use. New water conservation measures are implemented regularly as part of maintenance and construction.

Laboratory buildings use roughly 30% of campus water; residential buildings use 30%; and the rest of campus uses 40%. Water use per square foot in laboratory buildings is about twice that of residence halls.

UVM Programs

Land Use

1990 UVM created a campus shuttle system to reduce the need for parking and implemented zoned parking served by shuttles

1990 Campus Area Transportation Management Association (CATMA) was created for UVM and other institutions to plan and manage parking and transportation, and better coordinate land use

1996 Board of Trustees established UVM Natural Areas Center. Natural Areas were created in 1974; totaled 1,919 acres in 2002

1996 Physical Plant ceased routine use of pesticides and herbicides for landscaping

1997 UVM signed an agreement with The Vermont Land Trust to protect the 66-acre Centennial Woods Natural Area in perpetuity

1997 Board of Trustees adopted UVM Campus Master Plan; established principles and premises to promote best land use and encourage new development on pre-developed sites

1997 UVM formally adopted Storm Water Best Management Policy

1999 City of Burlington adopted Institutional Core Overlay zoning district, allowing growth in the core of Central Campus

Water Use

1990 Energy Policy included water conservation; eliminated single-pass, water-cooled air conditioning; established practice of minimal watering for landscaping

1992 Physical Plant began installation of water conserving devices on residential campus and in renovations and new construction

Best Practices

Commuter programs provide incentives

UVM is a member of the Burlington-based Campus Area Transportation Management Association that includes the hospital and nearby institutions. CATMA's annual survey results show a decline in the use of single-occupancy vehicles to campus, with a rate of less than 70% at UVM compared with local and national rates of 80%. Faculty and staff use mass transit at a rate of 6%, compared with a national average of 2%.

CATMA and UVM together provide incentives to commuters to walk, ride bicycles, carpool, and take public transportation:

- Coordination between campus and community public transportation systems
- Reduced rates on bus passes
- Gift certificates to downtown businesses
- Closer parking spaces for carpoolers
- Guaranteed ride home for people who commit to commuting alternatives
- Parking fees based on proximity to campus (zoned parking)
- Well-enforced parking policies with high fees for violation

In addition, UVM allows flexible work schedules and telecommuting as ways to reduce traffic congestion and provides free parking off campus served by shuttles. UVM has granted land easements to local municipalities to install bikeways providing linkages to community bikeways.

Pesticide use dramatically reduced

Because pesticides can have varying levels of toxicity and their effects on the environment depend on how and when they are applied, we did not track pesticide use as an indicator for this report. However, the data indicate that use of pesticides (including herbicides) for landscaping dropped dramatically during the 1990s. The present policy is to use pesticides only for spot applications and after consultation with the Burlington Board of Health. Signs are posted alerting the campus about these spot applications.

The Physical Plant Department focuses on aerating and minimizing compaction of lawns as the best way to encourage grass rather than weeds to grow.

Effective storm water treatment practices

In 1997 UVM formally adopted a policy for storm water, committing to best practices for storm water management after consulting with experts at the School of Natural Resources. UVM works collaboratively with key stakeholders within the region to implement the policy. For example, UVM and the Fletcher Allen Hospital recently constructed a state-of-the-art storm water treatment facility near the Centennial Baseball Field. The multi-pond facility is designed to remove 80% of total suspended solids and 40% total phosphorus, making it one of the most effective treatment facilities in Vermont.

Community Comments

Transportation and parking

Burlington stakeholders' comments on energy, greenhouse gases, and land use trends all pointed to transportation as the key land use issue. Those most knowledgeable about transportation recommended that the number of commuting miles serve as an environmental indicator for land use. A future indicator could be the number of bus trips to campus from satellite parking areas – preferably in buses run on alternate fuels, such as natural gas or electricity. These data are now being collected.

Campus stakeholders discussed the difficulty of finding parking places and the need to maintain existing green space on campus. A parking garage was seen as a necessary next step in the growth of campus.

New student housing needed

The long-term residents of adjacent neighborhoods suggested that the number of students living off campus might make a good indicator for the many environmental problems they suffer: noise, trash, traffic and loss of green space to cars. In the 1990s student enrollment dropped by 560 students and an estimated 600 fewer students lived off campus. During this same period, UVM changed its housing policy to require first and second year students to live on campus; upgraded residence halls to attract students back to campus; and constructed 214 new beds at Redstone Student Apartments.

The decline in off-campus residents surprised those interviewed, as their experience was that neighborhood problems had worsened during the decade. Building additional housing on campus would, they said, lessen the pressure on their neighborhoods, and free up scarce affordable housing.

Green student housing

Students and faculty described the construction of new "green" student housing as a vital aspect of environmental education at the university. They emphasized that a residence hall with model technologies such as solar power and natural cooling systems could not only educate the occupants of the building but also raise standards for future buildings and attract interest and funding. Campus and Burlington stakeholders alike encouraged the university to build according to LEED (Leadership in Energy and Environmental Design) standards developed by the U.S. Green Building Council.

Centennial Woods

During discussions about land use, Burlington stakeholders often mentioned Centennial Woods, including both the 66-acre Natural Area and the 81 acres adjacent to it. The Natural Area, a five-minute walk from the center of campus, serves as a resource for teaching and research. Nearby residents use the Natural Area and rest of Centennial Woods for quiet recreation in an increasingly urban area. They lauded the preservation of the Natural Area and urged the university to preserve more of the woods. Campus staff noted that the Natural Area, one of few permanently protected pieces of land in the city, was created for research and protection of ecosystems, and they expressed concern about the impacts of pets and recreational use of the Natural Area. Stakeholder interest in Centennial Woods highlights both the value and scarcity of preserved land in the Burlington area.

Next Steps

Focus on transportation as the key land use issue

- Continue to encourage UVM commuters to use alternatives to single-occupancy vehicles driving to the already crowded campus. This will reduce the need for parking and associated stormwater runoff and air pollution.
- Build a parking garage rather than new surface parking. This will minimize storm water runoff and use of green space.
- Support regional efforts to improve public transportation.

Build "green" student housing on campus

- Build new housing on the main campus to reduce pressure on downtown housing and neighborhoods.
- Strive for LEED certification of new student housing as a way to educate students and raise campus building standards.

Future research ideas:

- Complete an electronic inventory of building space and land use in Main Campus.
- Refine calculations about commuting miles traveled.
- Calculate reduction in commuting miles from use of alternate modes of transportation.

Energy and Air Pollution

Energy use results in many impacts to the local, regional and global environment. Using energy more efficiently offers the best way to reduce these environmental problems. Purchasing renewable energy also reduces pollution.

UVM's electricity came from mix of sources in 2000, as shown at right.

Impacts from using energy include:

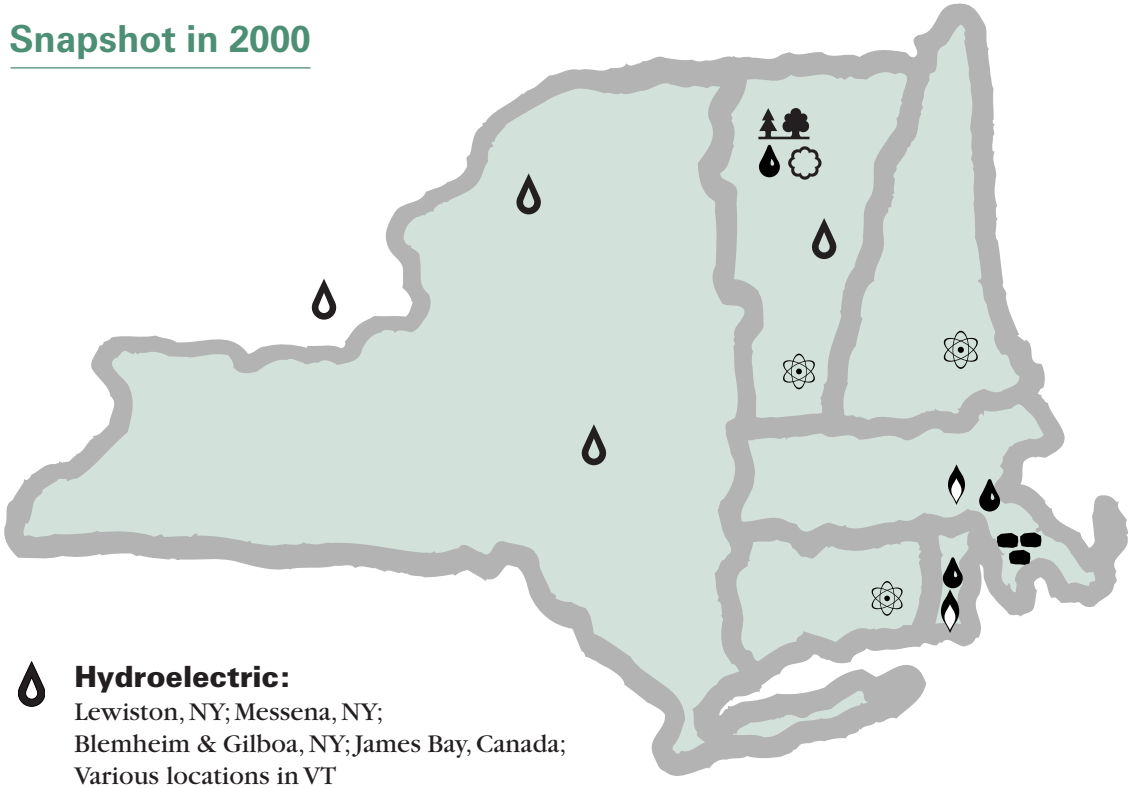
- Burning fossil fuels releases carbon dioxide, associated with global climate change
- Mining coal and extracting oil can damage ecosystems and water supplies
- Nuclear power generates waste disposal problems and poses the risk of a catastrophic accident
- Hydroelectric power can damage ecosystems along waterways
- Burning biomass wood, while renewable and cleaner than fossil fuels, still emits some pollution, particularly nitrogen oxides (NOx)

Nationally, of the six regulated air pollutants being tracked by the Environmental Protection Agency, only NOx emissions have not decreased since the 1970s. NOx can have a powerful effect on the environment:

- Aids formation of ground level ozone
- Contributes to acid rain and respiratory problems
- Reacts with other particles to form toxic products, some of which might cause biological mutations
- Blocks transmission of light, reducing visibility
- Increases nitrogen loading in water, leading to algae growth

Where Does UVM's Electricity Come From?

Snapshot in 2000



Hydroelectric:
Lewiston, NY; Messena, NY;
Blemheim & Gilboa, NY; James Bay, Canada;
Various locations in VT

Oil:
Bellingham, MA; Burillville, RI; Burlington, VT

Coal:
Brayton Point, MA

Natural Gas:
Bellingham, MA; Burillville, RI

Wood:
Burlington, VT

Methane:
Burlington, VT

Nuclear:
Waterford, CI; Vernon, VT; Seabrook, NH

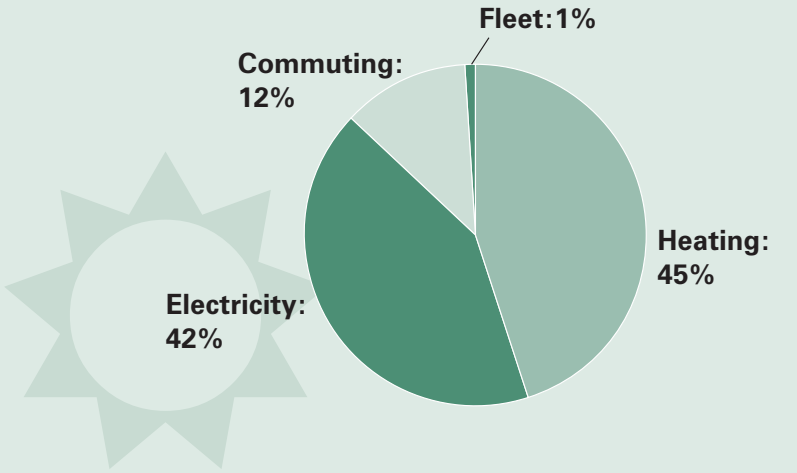
What are the main uses of energy?

The energy required for heating and electricity is about the same at UVM: 45% and 42% respectively.

To compare the amount of energy used for space heating, electricity, and transportation, we converted the amount of energy used in 2000 into a common unit (terajoules). This calculation includes the energy that was used during the creation and transportation of electricity, heating fuels, gasoline and diesel.

The result was surprising. Electricity, which costs about $5 million per year, uses slightly less energy than heating fuels (natural gas and oil), which cost $3 million per year.

Transportation (commuting and the university fleet) uses a much smaller share of energy at the university's urban campus than for the rest of Vermont. Our data show that commuting by faculty, staff, and students uses 12% of UVM's total energy, while the university fleet of buses and service vehicles uses 1%.



Total = 1,137 terajoules in 2000

What are the main uses of electricity?

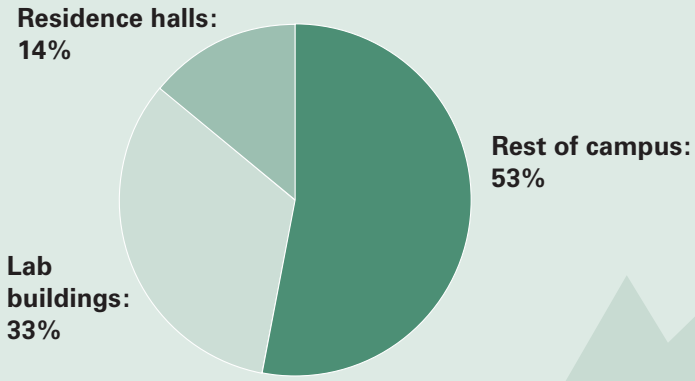
Laboratories use one-third of campus electricity while occupying one-sixth of floor space.

Residence halls use one-sixth of electricity while occupying one-third of floor space.

When campus and Burlington stakeholders identified energy use as a key concern, many felt that encouraging efficiency by students in the residence halls would yield the greatest benefits. The data indicate this is not true.

In addition to using energy-intensive equipment, laboratories require air conditioning to control experiments and more fresh air to keep indoor air quality safe. Laboratory buildings use about twice the electricity of the average campus building, and four times the electricity use of residence halls.

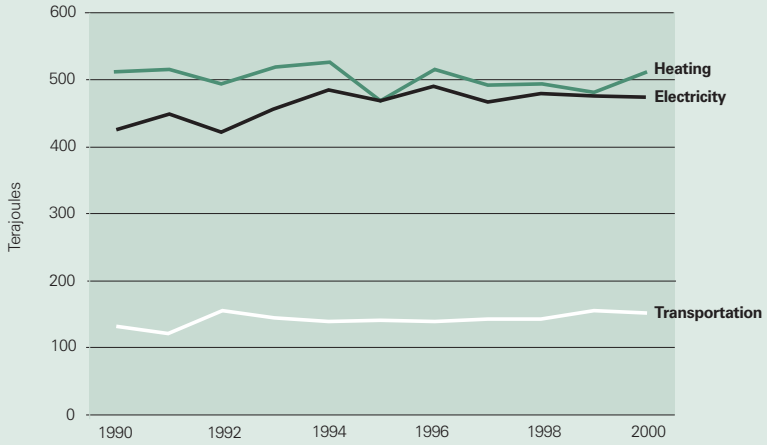
This information raises further questions: How much heating fuel do the laboratory buildings use? How much of electricity use is for equipment, versus lighting, air conditioning and ventilation? How much can be controlled by improved management and energy-saving technology?



Total = 52 million kilowatt-hours in 2000

Total energy use increased 6%

Energy Use 1990-2000 for Heating, Electricity and Transportation



Between 1990 and 2000 UVM's total use of energy for heating, electricity, and transportation rose 6%. Electricity accounted for the bulk of the increase; without improved efficiency the increase would have been much higher.

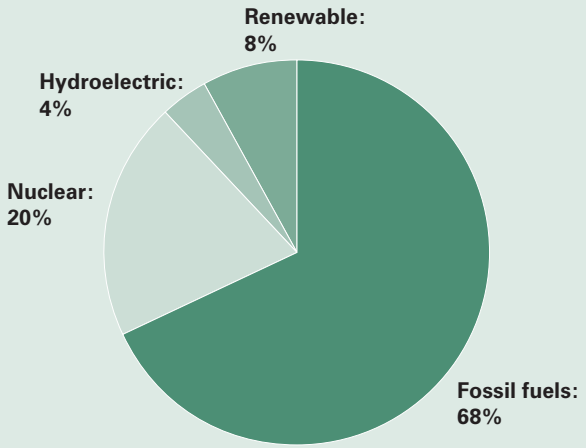
Heating fuel use remained about the same, as efficiency efforts offset a 5% increase in building space. Heating energy per square foot dropped 4%.

Electricity use increased 23%. The 1990s were marked by increased demand for energy for laboratory space, computers, air conditioning, and other equipment. At the same time, energy efficiency efforts by the Physical Plant Department reduced electricity use through the 1990s, chiefly by using more efficient lighting, cooling systems, and motors. In 1998, however, electricity use increased, largely because renovations and new construction included installing air conditioning. The result was an 11% increase in electricity use per square foot. Peak electricity use now occurs in the summer at UVM, as it does regionally.

Energy use for transportation increased an estimated 13% between 1990 and 2000. These data need to be refined.

Energy sources: 8% renewable in 2000

Energy Sources for Heating, Electricity and Transportation in 2000



Fossil fuels accounted for 68% of total energy use in 2000. UVM relies on fossil fuels for heating (natural gas and fuel oil) and transportation (gasoline and diesel). Nuclear energy accounted for 20%.

Electricity sources include more renewables than in 1990. In 2000, electricity came from the following sources.

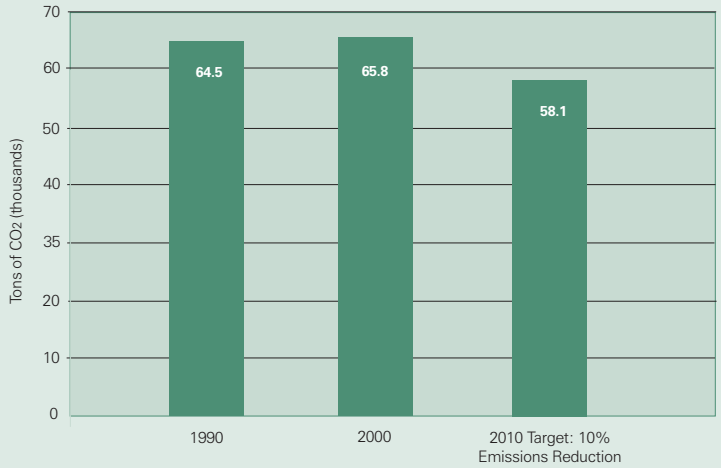
- Nuclear power (48%)
- Renewables – small-scale hydroelectric, wood, wind and landfill methane (20%)
- Natural gas (11%)
- Hydroelectric dams (10%)
- Fuel oil (9%)
- Coal and methane (1% each)

(Large-scale hydroelectric energy is not considered renewable because of long-term impacts on local ecosystems.)

The Burlington Electric Department plans to reduce purchases of electricity from nuclear energy to 20% by the year 2007, while increasing renewables to 40%.

Carbon dioxide emissions increased 2%

UVM Greenhouse Gas Inventory



The campus emitted an average of 65,500 metric tons of greenhouse gases (measured in carbon dioxide equivalents) each year since 1990, primarily from heating, electricity and transportation. UVM's emissions increased 2% between 1990 and 2000. In contrast, Burlington's emissions rose 23% between 1990 and 1997.

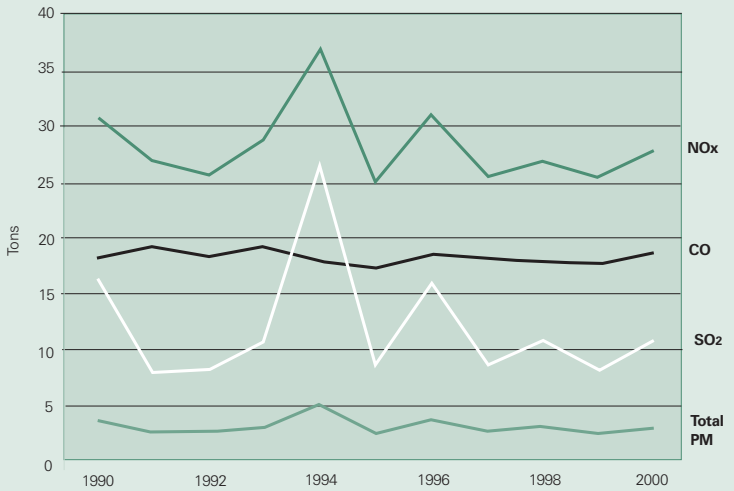
Heating fuel represents 60% of UVM's carbon dioxide load. In 2000, UVM's carbon emissions came from heating fuels (60%); transportation (20%); electricity (18%); and solid waste disposal, agriculture, and refrigerants (2%).

Cleaner electricity has offset increased electricity use. Electricity-related emissions increased 8%, while electricity use increased 23%. Heating emissions fluctuated, with 1990 levels the same as 2000. Transportation (commuting and university fleet) emissions increased an estimated 13%.

Meeting the city of Burlington's goal of 10% below 1997 levels would mean an annual reduction of 6,600 tons for the university. Reducing emissions from heating offers the best opportunity to meet this challenge (see page 15).

Air pollution from heating fluctuated

Air Pollution Emissions from Heating



Pollution levels depend on fuel type. Heating fuel use has remained about the same since 1990. Air pollution from heating increased during years when natural gas was in high demand and the central heating plant switched to fuel oil ("number six" oil) for parts of the winter. This is the main reason for increased pollution in 1994 and 1996.

NOx is the major pollutant. The State of Vermont regulates air pollutants from burning natural gas and fuel oil. At UVM these are estimated to be as follows in 2000:

28 tons of NOx (nitrogen oxides)
18 tons of CO (carbon monoxide)
12 tons of SO2 (sulfur dioxide)
3 tons of total PM (particulates)

One way to reduce UVM's peak NOx and SO2 emissions would be to use only natural gas; this would increase costs significantly.

Data about regulated air pollutants were readily available only for heating fuels. Future research could calculate regulated air pollutants from electricity and transportation.

UVM Programs

Energy Use

1990 Trustees established an energy policy and created a $125,000 revolving loan fund for energy efficiency projects; hired energy manager

1992 Trustees established a $1 million bond for energy efficiency projects; additional bonds were issued for $500,000 each in 1995 and 1998, and $1.5 million in 2002

2000 UVM installed a 5-kilowatt solar array on the central heating plant in collaboration with the Burlington Electric Department and the U.S. Department of Energy

2001 VSTEP (student group) and Physical Plant Department performed a lighting upgrade in the Living and Learning residence halls

2001 Trustees resolved to continue dialogue about the proposed community energy project with the McNeil Generating Station in Burlington

Air Pollution

1990 Physical Plant Department began purchasing low sulfur (1%) fuel oil for the heating plant for four boilers; 0.5% sulfur in fifth boiler in 2000

1998 UVM joined EPA Climate Wise program to track carbon emissions

2001 UVM joined the Alliance for Climate Action in Burlington

2001 Transportation and Parking Department tested one biodiesel bus; biodiesel bus use expanded to all buses in 2002

2002 UVM and the City of Burlington received $2.1 million grant to build the region's first fast-fill station for compressed natural gas (CNG), and for UVM to purchase five CNG buses

Best Practices

Energy efficiency partnership saved $1.6 million in 2002

Energy efficiency measures in the 1990s by the Physical Plant Department, working closely with the Burlington Electric Department (BED), resulted in avoided electricity use of 16,000,000 kilowatt-hours ($1.6 million) in 2002. More efficient lighting systems, motors for fans and pumps, equipment, and windows reduced carbon dioxide emissions by an estimated 6,700 tons per year, the equivalent of taking 15,000 cars off the road, according to BED. Efficiency efforts also reduced sulfur dioxide by 36 tons per year, and nitrogen oxides by 12 tons.

Rubenstein Lab designed for low energy use

Because research laboratories need six to twelve air changes per hour to maintain good air quality, they use a great deal of energy.UVM's lakeside research facility, the Rubenstein Ecosystem Science Laboratory, incorporates energy-efficient features that saved an estimated $37,000 in the first year and $575,000 over 20 years. Savings come from controlled ventilation and energy recovery ($494,000); reduction of infiltration ($47,000); and improved outside walls ($33,000). The laboratory's research focuses on lake water quality, and includes testing of storm water from the campus.

Solar project demonstrates power of renewables

Demonstration solar photovoltaic panels installed on the roof of UVM's central heating plant in May 2000 contribute about 5,000 kilowatt-hours of electricity to campus, more than enough to power an average Vermont home. Engineering student Nik Ponzio '01 created a website at www.uvm.edu/~solar showing real-time and historical data about electricity generation from the panels. Students of solar energy in Vermont and worldwide can use the website to learn about photovoltaic technology.

Biodiesel buses use recycled, renewable fuel

After Environmental Studies senior Joshua Cabell '01 proposed testing biodiesel in UVM buses, a year-long experiment began. One bus used "B20," a mix of 80% diesel and 20% biodiesel, made from recycled vegetable oil from local restaurants. In fall of 2002 all buses were converted to B20. The project has been popular with students and has spurred interest in alternate fuel vehicles. The next step is to use cleaner-burning natural gas in the buses.

Students active in energy issues, green design

The Consortium for Ecological Living (CEL), a student group formed in 1998, has been a vocal advocate for "green building" in construction projects at UVM. CEL and the Vermont Student Environmental Program (VSTEP), another student group, have worked with Physical Plant to upgrade lighting in residence halls. Jake Grace, Environmental Studies '02, investigated energy use in residence halls and recommended leasing students energy efficient refrigerators.

Community Comments

Many campus and Burlington stakeholders expressed concern and suggested solutions about energy issues, including transportation (see page 9). Research findings about increases in electricity use were disappointing to many, especially given the aggressive efforts to conserve.

Global warming and co-generation

At every meeting we held, people noted that Burlington has pledged to reduce its greenhouse gas emissions by 10%, and recommended that UVM do the same.

The Burlington Electric Department (BED) proposed a community co-generation project known as the Burlington Community Energy System, that is estimated to reduce carbon dioxide emissions by about 30,000 tons, or 40% of UVM's total. The project would require a $9 million pipeline to bring heat (as steam and hot water) from the woodchip-burning electric generating station 1.5 miles from campus. An Environmental Studies thesis by Laura Pagliarulo '02, and a graduate Business Administration study by Loren Doe, '99 explore this topic in detail.

In 2001 the Board of Trustees passed a resolution supporting the community energy system and authorized the UVM administration to work with the BED in applying for federal funding. The goals are for the university to participate as a customer of the system without being required to incur capital or other costs, and for the system to offer competitive rates, favorable environmental impacts, and reliable service. Many commenters on this report card expressed support for this project.

Long-term energy planning

Several campus stakeholders pointed to the need for long-term energy planning, beyond the present five-year payback horizon. Participation in the community energy system, continued energy efficiency programs, and smaller combined heat and power systems all will require longer term planning, especially in building construction and the development of integrated heating and cooling systems. Physical Plant and other key staff on campus agree that a 10-20 year energy plan codified in the Campus Master Plan could help reduce costs and improve reliability of the UVM heating, cooling, and electrical system. Long-term planning horizons also make it easier to justify and account for investments in energy efficiency and renewable energy.

Alternate fuel vehicles

Campus and Burlington stakeholders expressed great interest in using alternate fuel vehicles for UVM's buses as a way to bring energy issues to the attention of thousands of students and visitors, and to improve air quality in the immediate vicinity of the bus route. They agreed that an appropriate long-term goal is to have a larger fleet of low- to zero-emissions buses running more frequently on and off campus (see also page 9).

Next Steps

Energy use is an integral part of daily life at UVM, yet much is beyond the control of the individual. In the energy arena, the onus is on the university administration to do the difficult but necessary work of reducing total energy use through an aggressive energy policy.

Commit to long-term energy planning

- Incorporate a long-term energy plan into the Campus Master Plan, addressing both energy uses and energy sources.
- Create a plan to reduce carbon dioxide emissions.
- Continue to restrict where and how air. conditioning is used, and increase use of ceiling fans and natural ventilation for cooling.
- Continue to explore co-generation opportunities, including the Burlington community energy system.

Encourage conservation efforts

- Continue to fund the Physical Plant Department's energy efficiency program; extend allowable payback time for investments.
- Reduce commuting miles through carpooling and public transportation.
- Find ways to reduce electricity use in laboratories while still maintaining constant temperature and high air quality.

Future research ideas:

- Report on costs of community and campus co-generation options.
- Examine options to reduce peak electricity demand and resulting additional charges.
- Analyze and quantify energy use for air conditioning; research alternate cooling systems.
- Explore demonstration projects in renewable energy.

Solid and Hazardous Waste

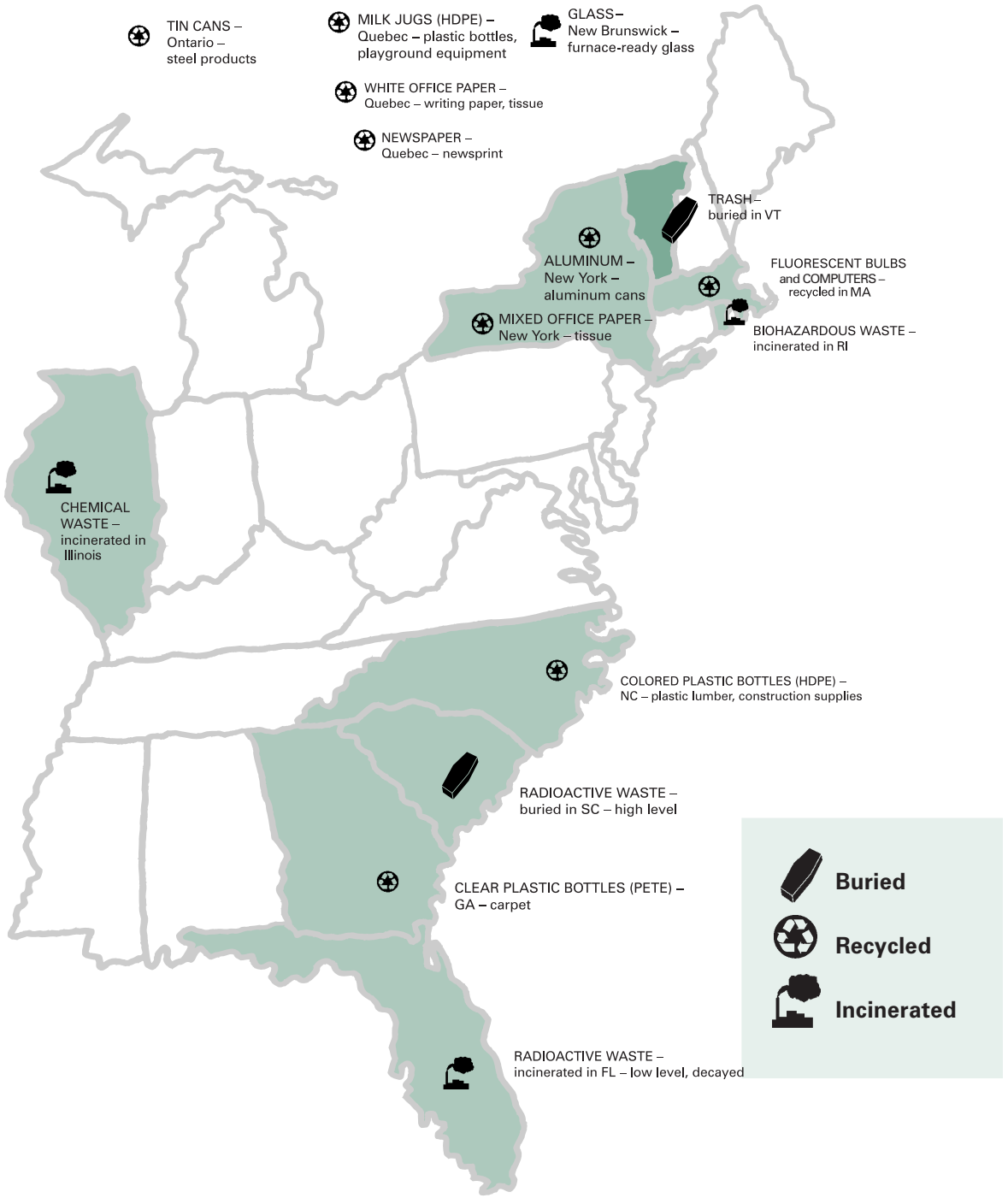
Waste produced during the course of daily life at UVM goes to many places to be recycled, buried or incinerated. In 2002 solid waste was sent to a landfill in Coventry, one of only two available in Vermont. Hazardous and radioactive waste traveled hundreds of miles for disposal.

In addition to wasting natural resources, disposal of solid and hazardous waste can create many environmental impacts. Modern landfills and incinerators are designed to minimize these impacts but they still persist:

- Ground and surface water pollution
- Explosion hazards from methane build-up, greenhouse gas emissions
- Impacts on natural areas
- Noise, dust, blowing litter
- Air pollution from incineration and transportation of waste
- Disproportionate impacts on poor communities

Creating less waste and recycling are the best ways to reduce these environmental impacts.

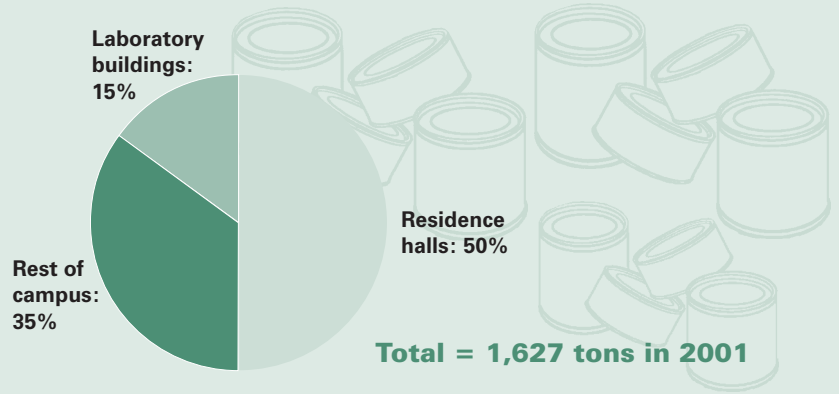
Where Does UVM's Waste Go?



Where is trash generated on campus?

Residence halls generate half of landfilled waste

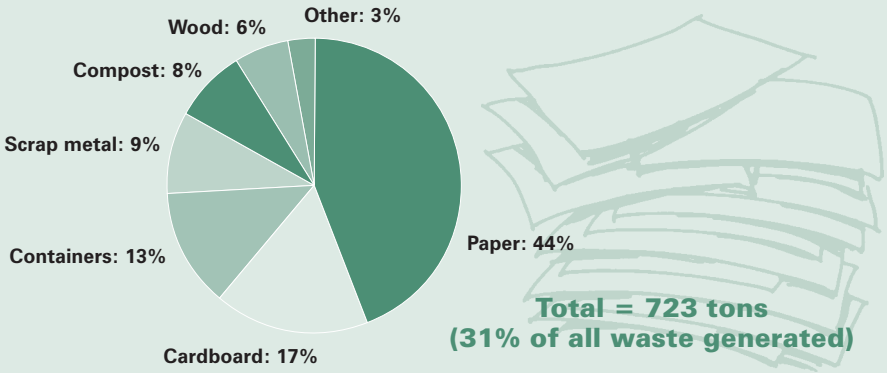
Residence halls, which occupy about one-third of the floor space on campus, create a disproportionate amount of waste. This can be partly explained by the amount of time students spend on campus. It also indicates that the residence halls are a logical place to reduce waste.



What does UVM recycle?

Paper= 44% of recyclables

Paper (newspaper, white and colored office paper, magazines) comprises the largest portion of recycled waste. Cardboard boxes and food and beverage containers, both forms of packaging, together comprise 30%. Although recycling helps reduce environmental impacts, reducing the amount of paper and packaging that needs to be recycled is far preferable.



Where does hazardous waste come from?

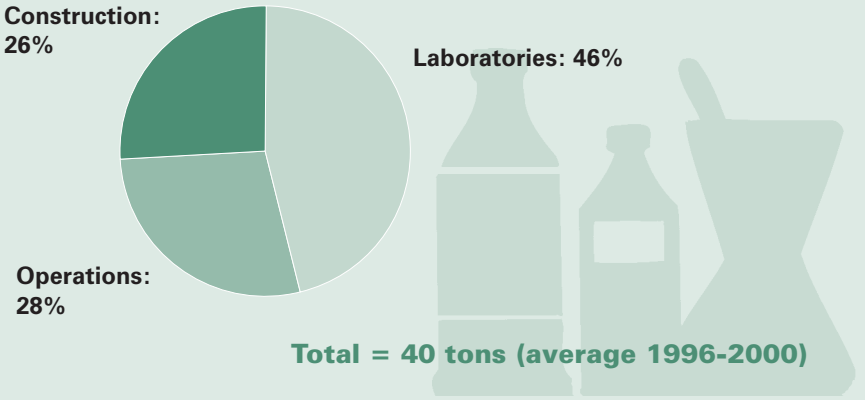
Laboratory buildings generate half the hazardous waste

Hazardous waste comes from:

Laboratories using chemicals for teaching and research, and art studios.

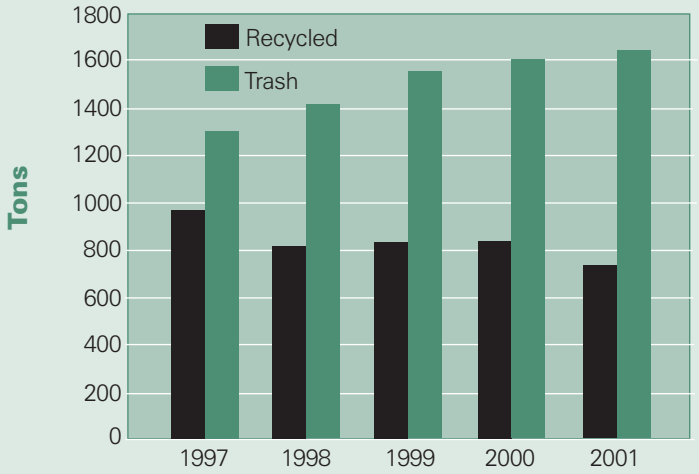
Operations and maintenance of campus buildings and vehicles, including waste oil, solvents, paints, and rust inhibitors.

Construction debris from campus infrastructure projects, especially lead paint and asbestos-contaminated materials.



Trash increased 20% since 1996; Recycled waste decreased 24%.

UVM Recycled and Landfilled Solid Waste

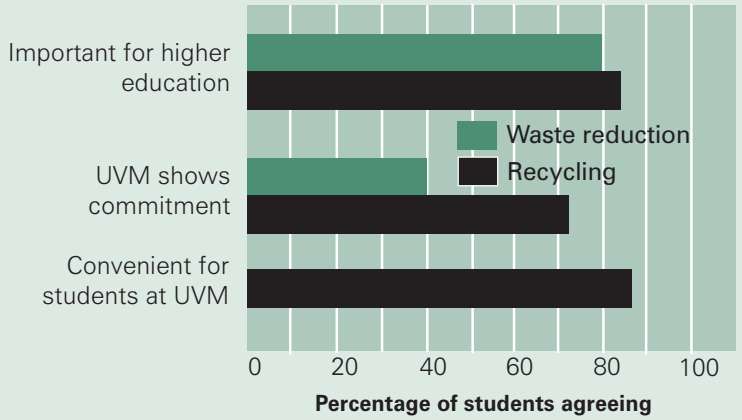


Trash is increasing at UVM and county-wide. Of all the indicators in this report card, the increase in trash is the steepest trend in a negative direction: 20% increase in five years. This is even greater than the 17% increase county-wide. Trash volume also rose across the nation.

Recycling is down since 1996. Recycling began in the early 1990s at UVM and successfully reduced UVM's waste by at least 30% in the late 1990s. Yet for unexplained reasons, the amount recycled decreased 24% from 1996 to 2001. The percent of total trash recycled dropped from 43% in 1996 to 31% in 2001. Also alarming, UVM's recycling rate decreased even as county rates increased.

Students expect recycling. 85% say recycling is convenient at UVM.

Student Perceptions about Recycling & Waste Reduction



Recycling is important to students. In a December 2000 Environmental Council survey of a random sample of students, 85% of respondents described campus-wide recycling as an important activity – more important than energy conservation, pesticide reduction, and buying recycled paper.

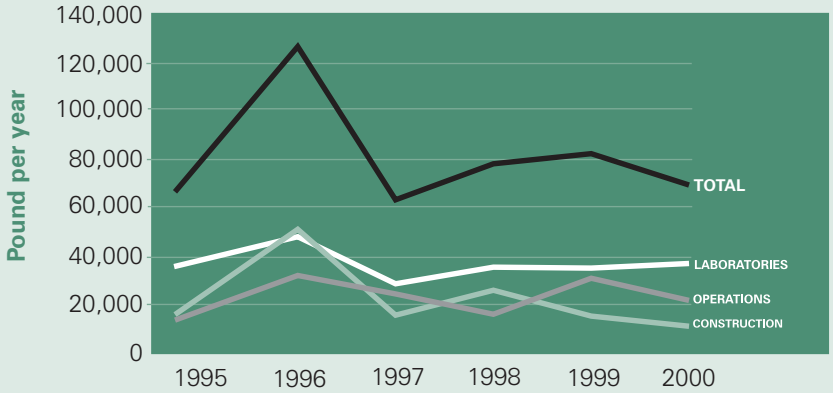
Recycling is convenient for students. Of those surveyed, 72% said UVM was doing a good job of recycling, and 85% said they found it convenient to recycle on campus. UVM's waste reduction efforts received lower marks.

Students in the residence halls could recycle more. In 2001, Environmental Studies students and the UVM Recycling Office sorted through samples of trash from residence halls. They found that 25% of the trash (by weight) was paper and containers that could have been recycled.

Educational efforts should next focus on students in the residence halls, since half of the trash comes from the residential side of campus. Staff and faculty can lead by example, reinforcing UVM's culture of environmental responsibility.

Hazardous waste fluctuated 1995-2000

Hazardous Waste Disposed 1995-2000

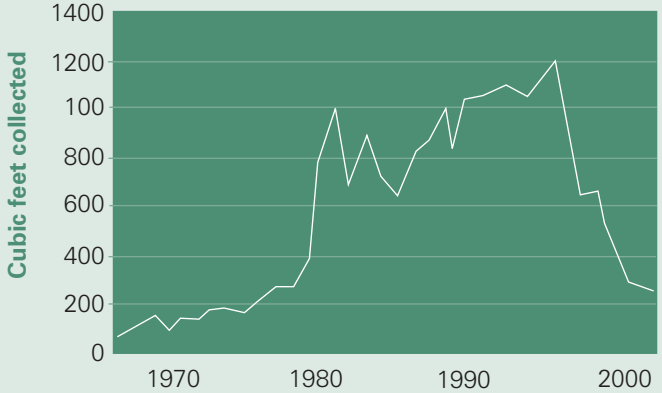


Construction drives fluctuation. The amount of hazardous waste from UVM fluctuated widely during the last half of the decade, primarily as a result of construction and renovation projects. These projects involved the removal of lead paint debris, asbestos-laden materials, and soil contaminated by underground storage tanks. Removal of excess chemicals during laboratory renovations also contributed to spikes in the amount of hazardous waste disposed. These factors confuse the historical trends associated with UVM hazardous waste. The data shown here are primarily useful for long-term analysis of the success of these clean-up efforts.

UVM's new management plan will measure progress. UVM is required by government regulation to reduce the amount of hazardous waste it generates. Laboratory waste is the leading source of these wastes. As part of its pollution prevention program, UVM is participating in a four-year pilot project with the U.S. Environmental Protection Agency to test use of an Environmental Management Plan. The goal is to measurably improve worker awareness of hazardous waste and reduce the amount of chemical waste generated in laboratories.

Radioactive waste decreased 81% 1990-2000

Radioactive Waste Disposed 1968-2000



The 1980 waste increase followed an institutional policy change. In 1980, UVM banned the disposal of low-level waste down its drains, even though such disposal was legal. The result was a rapid increase in the amount of radioactive waste collected. At the same time, disposal sites became scarce. This combination of factors prompted a re-evaluation of research methods.

Rapidly rising costs drove change. From 1990 to 2000, radioactive waste generated by UVM's medical, biomedical, biological, and animal science laboratories decreased 81%. Though research projects increased steadily, waste was held under control, in part because of the increasing cost and stricter regulations associated with radioactive waste disposal.

Changes in research techniques meant using fewer radioactive materials. Researchers also switched to shorter-lived radioactive materials and became better educated about disposal methods. Careful handling and separation of waste by the Radiation Safety Office further reduced volume and disposal costs.

UVM Programs

Solid waste

1987 Vermont Student Environmental Program (VSTEP) established, indicating strong student interest in recycling

1990 Recycling coordinator hired, campus-wide recycling began for newspaper, bottles, cans, plastic jugs

1990s Surplus property, food composting, and special materials programs began

1993-4 Waste paper used for animal bedding at the UVM farm on a trial basis

1997 End-of-year student Move-out program initiated by students, implemented by Physical Plant

1998 Environmentally Smart Office workshop presented to staff to help reduce office waste and conserve resources

1999 Office supplies reuse program started

Hazardous and radioactive waste

1980 Low-level radioactive materials prohibited by UVM to be put down drains, though legal to do so

1994 Non-regulated hazardous materials collected for recycling, safe disposal (fluorescent bulbs, batteries)

1996 ChemSource program established for central purchasing of laboratory chemicals

1998 Mercury thermometer exchange collected more than 1500 mercury thermometers

1999 Environmental management plan for hazardous laboratory waste created as part of Project XL, an EPA pilot project for four years

2000 Physical Plant began computer recycling

Best Practices

Move-out: five tons collected

Every year at the end of spring semester 3,500 students move out of UVM residence halls and another 2,500 leave downtown apartments, disposing of literally tons of waste materials. UVM Physical Plant works with local charities to collect usable furniture, clothes and food, and to encourage students to recycle and dispose of remaining trash responsibly. In May 2000 about five tons of useful items were collected through the campus Move-out program.

Increasing use of recycled paper

Paper comprises the largest component of UVM's waste. To help close the recycling loop and reduce environmental impacts, UVM adopted a paper purchasing policy in 1998. According to research by Environmental Studies student Megan Hunt '01, promotional efforts by the Purchasing and Physical Plant departments have brought 30% recycled paper to most campus copiers, with a growing number of departments using 100% post-consumer recycled, chlorine-free paper. UVM's custodial paper products (restroom tissues and towels) meet or exceed federal standards for recycled content. UVM Dining Services uses unbleached, recycled content napkins in the dining halls.

Students promote recycling

The UVM student group VSTEP (Vermont Student Environmental Program) was instrumental in starting recycling at UVM and continues to support educational programs about recycling. In 2002 VSTEP helped the Recycling Office launch a pilot food composting program in the residence halls and tested a program to certify UVM offices as environmentally "smart."

Mercury risk reduced

Nationally, broken thermometers are responsible for the release of tons of mercury into the general environment every year. Mercury pollution is responsible for advisories against eating fish from Lake Champlain and other U.S. rivers and lakes. At UVM, hazardous waste staff at the Environmental Safety Facility (ESF) were cleaning up mercury spills from broken thermometers once per week in the mid 1990s.

In 1997, as part of a pollution prevention program, the ESF worked with the 500 campus laboratories to swap 1,700 mercury-containing thermometers for non-toxic alternatives. The swap reduced potential health risks to laboratory personnel from broken thermometers and reduced costs: the onetime investment of $17,600 for the 18-month program reduced mercury cleanup costs by $8,700 per year since then. The program paid for itself in two years and received a Governor's Pollution Prevention Award in 2000.

Community Comments

Discussions about UVM's performance in managing solid and hazardous waste centered on the following themes.

Trash increase is puzzling

Of all the trends in this report, the increase in trash caused the greatest concern among campus and Burlington community stakeholders. Speculations about causes for the increase included the influence of national trends of increased trash generation and decreased recycling, more stringent quality control, an increase in packaging materials, and a booming economy.

On-campus students need incentives

Recycling is commonly perceived as a basic practice of an "environmental literate" citizen, and should therefore continue to be strongly emphasized. Students on campus suggested offering the residence halls incentives for reducing their trash and increasing their recycling. A more detailed look at the available data, as well as more precise methods of estimating the amount of waste generated from each building, could provide the basis for a focused educational program.

Reducing off-campus trash

Burlington stakeholders expressed concern about trash generated by off-campus students when they move out of their apartments in May, sometimes leaving behind unsightly piles of trash and furniture. Representatives of the city and the university have worked together to manage this problem, with some success. The challenge is to educate students and engage the cooperation of the apartment owners on whose property the trash is left.

Dining hall "foam" concerns activists

For many years, students continue to express concern about the use of Styrofoam, or "foam," in the Billings dining hall. Because there is no room for dishwashing facilities in this historic building, it serves primarily as a "take-out" food service. An experiment with foam recycling in the late 1990s did not work well. To minimize the use of foam, discounts are given to students who bring reusable cups.

No hazardous chemicals down drains?

Several community members asked whether radioactive and hazardous wastes are poured down drains. Environmental Safety staff report that the university has policy against such use of the drains. In addition, testing of wastewater from the appropriate buildings has generally not found detectable amounts of chemical contamination in the past. Dilution with the buildings' regular sewage makes such testing problematic. Safety staff focus on training laboratory personnel to manage this potential risk to water quality.

Next Steps

Help students in residence halls to recycle and reduce waste.

Cooperative efforts are needed next to:

- Help students in residence halls to recycle and reduce waste, perhaps using incentives. Preliminary data suggest that if students living on campus recycled all their paper and containers, total campus trash could be reduced by 10%.
- Reinforce a recycling-oriented culture: A new round of campus-wide education about recycling and buying recycled paper products would reinforce good behaviors.
- Continue to develop the Move-out program. This program raises awareness, contributes to charities, and reduces waste.

Continue strong hazardous and radioactive waste management programs.

- Support the environmental management plan (EMP). Because laboratory staff and experiments change frequently, proper management practices need constant reinforcement and reinvention, as described in the university's EMP. This effort warrants continued support.
- Focus on training. The university made a strong commitment to training to ensure safe disposal of hazardous waste.
- Share waste reduction successes. Researchers can look for ways to reduce specific kinds of hazardous and radioactive waste and share successes with colleagues. This can be done both within UVM and with other schools.

Future research ideas:

- Determine the percentage of the recyclable waste that actually gets recycled.
- Determine the composition of waste from residential, laboratory, and classroom buildings.
- Track the amount of biohazardous waste for future UVM report cards.

Academics and Culture

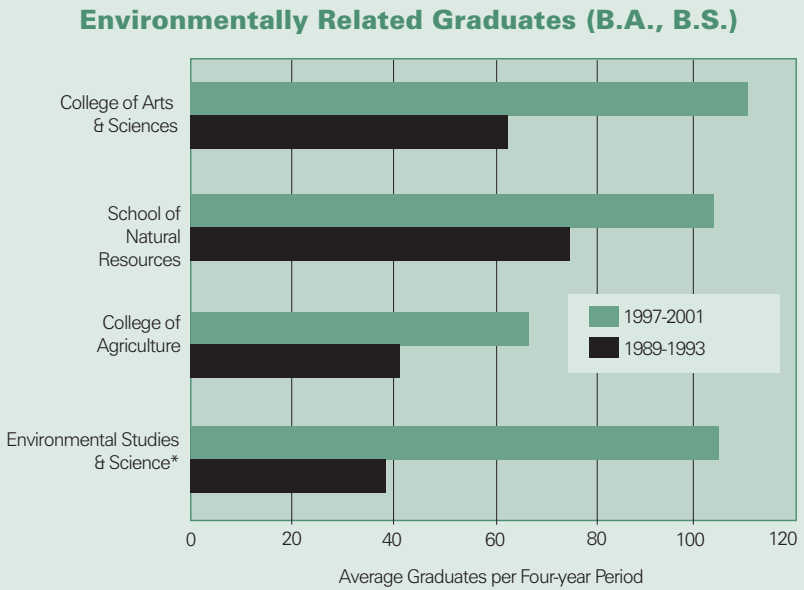
The challenge of creating an environmentally sustainable future demands that students today develop scientific expertise, social understanding, ethical concern, and an appetite for problem-solving. Institutions of higher education can lead the way both by offering education and research in relevant areas of expertise and by exposing students to a campus culture of environmental responsibility.

UVM's successes to date in reducing environmental impacts reflect the efforts of a wide variety of people. Many of the "best practices" described in this report involve collaborative efforts among concerned faculty, staff, and students who decided to act. An institution's commitment to environmental sustainability is built on such a culture of innovation, environmental responsibility, and collaboration.

This section briefly examines the culture at UVM and the growth of environmentally related academic programs in the 1990s, as they are important factors affecting the environmental footprint of the campus.

Trends

Total environmental graduates up 60% 1989-2001



**Cross-college majors shown separately here; these are also included in CAS, CALS, and SNR figures*

Graduates from environmentally related majors increased rapidly from an average of 177 per year during 1989-1993 to 282 at the end of the decade, according to a 2002 study by Public Administration student Margaret Modley '02.

- Arts & Sciences environmental graduates increased 73% with a new Environmental Sciences major and increased enrollment in Environmental Studies.
- Natural Resources graduates increased 44% and comprised one-third of all environmentally related majors.
- Agriculture & Life Sciences environmental graduates increased 66%, with the largest increase in Environmental Studies.
- Cross-college graduates increased 172%. Graduates of Environmental Studies more than doubled in the decade, and new Environmental Sciences majors were created in all three academic units in the late 1990s.

A better measure of environmentally related academic programs would include students in Environmental Engineering and graduate students in environmental fields.

Environmental majors at UVM

College of Agriculture and Life Sciences
- Biological Science
- Botany
- Environmental Sciences
- Environmental Studies*
- International Development
- Plant & Soil Science
- Urban Forestry

College of Arts and Sciences
- Biology
- Biology
- Botany
- Environmental Sciences
- Environmental Studies
- Geology
- Geography**
- Zoology

College of Engineering and Mathematics
- Environmental Engineering **

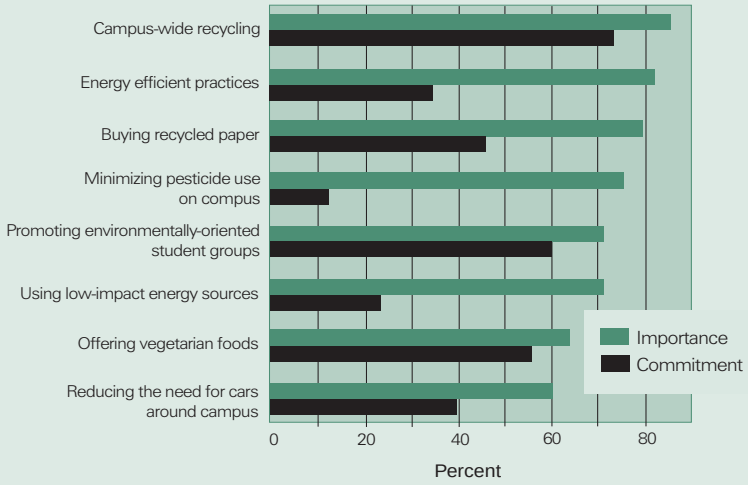
School of Natural Resources
- Environmental Sciences
- Environmental Studies
- Forestry
- Natural Resources
- Recreation Management
- Wildlife & Fisheries Biology

** Interdisciplinary program in CALS, CAS, SNR, CESS*
*** Not included in chart to left due to data limitations*

Trends

Students expect a "green" UVM

Student Perceptions of Importance vs. UVM Commitment to Greening Practices



Students think "greening" is important and UVM generally shows commitment to an environmentally responsible campus. In an Environmental Council survey in 2000, randomly selected UVM students were first asked about the importance of different campus greening issues in higher education, and later asked how committed UVM was to these same issues. Generally respondents gave UVM good marks for making recycling convenient, promoting environmental student groups, and reducing the need for cars. However, they felt UVM fell short in practicing energy efficiency, using low-impact energy sources, buying recycled paper, and minimizing pesticide use.

Many UVM students are uninformed about the extent of UVM's greening practices such as energy conservation, using low-impact energy sources, and pesticide minimization. This report's findings indicate that these low ratings are undeserved (see pages 8 and 14).

Best Practices & Next Steps

Campus as learning laboratory

The main campus and nearby natural areas owned by UVM serve as important facilities for instruction and scientific study, bringing faculty and student attention to UVM land use. Recent projects by faculty and students include:

- Undergraduate research, internships, and class projects addressing biodiesel in buses, energy efficiency, paper purchasing, and pesticide use
- A contructed wetland at the UVM farm (Civil and Environmental Engineering)
- Gardens for vines and annuals (Plant & Soil Science)
- Test plots for restoring compacted soil (Geology)
- Testing of ground, surface, and storm water (Geology, Plant & Soil Science, Environmental Science, School of Natural Resources)

Student group initiatives

Between 1990 and 2000 students launched a number of environmental initiatives:

- Vermont Student Environmental Program (VSTEP) helped propel an aggressive recycling program in the early 1990s, and has since supported recycling, energy conservation, and environmental education projects in collaboration with the Physical Plant Department and the Environmental Council.
- Consortium for Ecological Living (CEL), established in 1998, has brought a steady stream of speakers on ecological design, climate change, and campus greening.
- Earth Day celebrations have brought together diverse student environmental groups, raising awareness of environmental issues and showcasing positive alternatives.

Next steps:

- Further define UVM's strategic goals for emphasizing environment as a key academic theme through academic master planning.
- Publicize UVM's greening efforts to students. Brochures, signs, interpretive displays, news releases communicate UVM's accomplishments and encourage a culture of environmental awareness.
- Develop a greening plan for the renovation of the residence halls. Students can most easily learn how to be responsible environmental citizens if it is convenient and supported where they live.
- Provide incentive grants for greening UVM curricula to develop new courses or restructure existing courses to include an environmental perspective.

Recommendations for Greening UVM

The findings in this report card track the many ways that daily life at UVM affects the local, regional, and global environment. Based on the available data and on observations from campus and Burlington stakeholders, we identified some next steps that could be taken to reduce environmental impacts at the end of each section.

Who will take these next steps? The UVM administration established many environmentally related policies and programs during the 1990s. Professional staff began the complex task of creating systems that make it easy for the campus community to be "green." But individuals also make decisions on a daily basis that affect the institution's environmental impacts, such as turning off lights, recycling, and driving less. As we found in this report, people in residence halls and laboratories play different roles in the use of land, water, energy, and materials.

The data in this report led to the following recommendations about ways that different groups of people at UVM can best direct their efforts to reduce environmental impacts.

Land and Water

Administration:

- Build a "green" student residence hall
- Establish sustainable building design principles and construction methods for use in all building construction projects
- Build a parking garage rather than creating new surface parking
- Continue to collaborate with regional efforts to improve transportation, and facilitate more off-campus parking for faculty, staff

Faculty and staff:

- Drive fewer miles
- Take advantage of alternatives to single-occupancy vehicles

Students:

- Participate in planning for new residence halls, student apartments
- Keep cars and foot traffic off green space

Energy and Air Pollution

Administration:

- Develop a long-term energy plan that includes investigation into the proposed community energy system; development of small systems that generate both heat and power; and an environmentally responsible approach to the increased demand for air conditioning
- Make energy conservation a top priority with new buildings

Laboratory faculty and staff:

- Understand the ways energy is used in laboratory buildings and find ways to reduce their energy use

Campus-wide:

- Turn off computers and lights when not in use; buy Energy Star rated products
- Pay attention to open windows that may be letting in hot or cold air

Solid and Hazardous Waste

Students:

- Increase recycling participation and reduce solid waste generated in residence halls

Faculty and staff:

- Recycle to set an example for students; buy recycled copier paper; copy on both sides; minimize paper use

Laboratory faculty and staff:

- Continue to reduce use of hazardous and radioactive materials
- Train newcomers to follow proper environmental safety procedures

Campus-wide Action

Administration:

- Formalize UVM's environmental commitment by creating a campus-wide environmental policy and plan
- Incorporate environmental indicators into the campus master plan
- Create a long-term plan to reduce emissions of greenhouse gases

Faculty and staff:

- Help make connections between academics and operations with class projects, internships and service learning on campus
- Reinforce UVM's culture of waste reduction, recycling and energy conservation by demonstrating environmentally responsible actions

Students:

- Recycle, conserve energy
- Report problems such as leaky faucets and overheated buildings
- Conduct research about campus operations for class projects, internships

Web Resources

Many of the websites here include extensive links to relevant sites.

UVM

Administration

Campus Master Plan
http://www.uvm.edu/~plan

UVM Solar Panel Project
http://www.uvm.edu/~solar

Biodiesel Buses
http://www.uvm.edu/~bdiesel

Physical Plant Department
Energy Management & Recycling Office
http://www.uvm.edu/~uvmppd

Environmental Safety Facility
http://esf.uvm.edu

Paper Purchasing Policy
http://www.uvm.edu/~uvmppg/ppg/procure/paperpol.htm

Radiation Safety Office
(802) 656-2570
www.uvm.edu/~radsafe

UVM Natural Areas
http://www.uvm.edu/~envprog

Academics

College of Agriculture & Life Sciences
http://www.uvm.edu/~cals/

Environmental Program
http://www.uvm.edu/~envprog

Environmental Sciences Program
http://www.uvm.edu/~cals/envsci/

Civil and Environmental Engineering
http://www.emba.uvm.edu/cee/

Department of Geology
http://geology.uvm.edu/

School of Natural Resources
http://snr.uvm.edu/

Vermont

10% Challenge
www.10percentchallenge.org

Burlington Climate Action Plan
http://www.burlingtonelectric.com/SpecialTopics/climate.htm

Burlington Eco Info Project
http://www.burlingtonecoinfo.net

Burlington Legacy Project
http://www.cedo.ci.burlington.vt.us/

Campus Area Transportation Management Association
http://www.uvm.edu/~catma

Chittenden Solid Waste District
http://www.cswd.net/

Intervale Compost Program
http://www.intervale.org/compost.html

Vermont Environmental Assistance Division
http://www.anr.state.vt.us/dec/ead/eadhome/default.htm

Vermont Clean State Council
http://www.anr.state.vt.us/dec/wastediv/csc/homepage.htm

Higher Education

National Wildlife Federation Campus Ecology Program
http://www.nwf.org/campusecology/index.cfm

Sustainable Development on Campus,
International Institute for Sustainable Development
http://iisd1.iisd.ca/educate/

University Leaders for a Sustainable Future
www.ulsf.org/

Brown is Green
http://www.brown.edu/Departments/Brown_Is_Green/big/

Middlebury College Environmental Council
http://community.middlebury.edu/~enviroc/

New Jersey Higher Education Partnership for Sustainability
http://www.njheps.org/

Oberlin Lewis Center for Environmental Studies
http://www.oberlin.edu/envs/ajlc/

Pennsylvania Consortium For Interdisciplinary
Environmental Policy
http://www.paconsortium.state.pa.us/

Penn State Green Destiny Council
http://www.bio.psu.edu/greendestiny/
publications.shtml

Tufts Climate Initiative
http://www.tufts.edu/tie/tci/TCIMenu.html

UB Green at SUNY Buffalo
http://wings.buffalo.edu/services/recycling/

University of Florida's Sustainability Task Force
http://www.admin.ufl.edu/committees/sustain/

University of North Carolina at Chapel Hill
http://sustainability.unc.edu

► This report and additional links are on-line at
www.uvm.edu/environment

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Tracking UVM is the second in a series of three reports about UVM's environmental impacts:

Greening UVM
Campus Environmental Report, 1998

Tracking UVM
Environmental Report Card, 2002

Cooling UVM
Greenhouse Gas Inventory, 2002

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environmental.council@uvm.edu
http://www.uvm.edu/environment

Tracking UVM

An Environmental Report Card for the University of Vermont

for the years **1990-2000**