

## Creating a Safe and Healthy Campus

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## **Long-Term Vision**

*The campus creates a safe and healthy learning and working environment through efforts to minimize hazardous waste, advance pollution prevention programs, and minimize exposure to toxic chemicals and pesticides.*

## **Background, Needs and Trends**

As a result of increased chemical exposure, the development of chemical sensitivity disorders are becoming more prevalent in today's society. People experience side effects after exposure to even low levels of chemicals within indoor environments. The use of chemicals and materials containing Volatile Organic Compounds (VOC's) decrease the quality of indoor air in the home and workplace. The term "sick building syndrome" describes chronic illness that results from chemicals within the environment of a building. Indoor air pollution increases the number and frequency of sick days and decreases the productivity within building environments. Sick building syndrome costs America \$60 billion every year in health care costs and lost productivity.

Chemical exposure poses risks to the health and safety of humans and the environment. In particular, pesticide use has been shown to cause adverse health effects including cancer, neurological disruption, birth defects, genetic alteration, reproductive harm, immune system dysfunction, endocrine disruption, and acute poisoning. Environmental effects range from groundwater pollution to disruption of predator-prey relationships.

Hazardous materials—such as laboratory chemicals, chemical by-products, chemical handling supplies, paints, and solvents—can cause pollution and present risks to health, safety, and the environment. The improper use and disposal of hazardous chemicals have consequences on both the health of those who handle the material and those whose water, air, and land may be polluted by leaks, spills, and volatile emissions.

Accordingly, both the campus community as individuals and the university as an institution are committed to seeking and employing waste minimization and pollution prevention measures to better manage the potential risks and responsibilities inherent in these activities.

The Precautionary Principle is becoming a framework for reducing risk and liability. Using the Precautionary Principle in decision-making regarding chemical use on campus would allow the university to better ensure the safety and health of all campus users. The principle simply states that if the consequences of an action are unknown, but are judged to have some potential for major or irreversible negative consequences, then it is better to avoid that action. The concept includes risk prevention, cost effectiveness, ethical responsibilities towards maintaining the integrity of natural systems, and the fallibility of human understanding. For more detailed

information on what the precautionary principal is and how it can be applied to environmental practices, refer to Appendix I.

# Part I: Integrated Pest Management

## Goal

*CU will reduce the need to use of harmful chemicals and volatile pesticides in buildings and grounds through “integrated pest management” (IPM) techniques.*

## Background, Needs and Trends

With over 10 million square feet in 200 buildings spread across roughly 1100 acres, there are numerous opportunities for pests to thrive in CU’s halls, residences, outbuildings, open spaces, and landscaped areas. The pests of major concern on campus are ants, roaches, mice, rats, raccoons, wasps, bees, dandelions and invasive weed species. Controlling these pest populations with traditional techniques of repeated and routine application of synthetic chemicals poses a major health concern to humans, as well as non-pest animals on campus, such as birds, deer and fish in Boulder Creek. The health concerns associated with synthetic pesticides are further exacerbated by the fact that less than 1 percent of these chemicals reach their intended targets and can migrate from room to room, as well as vertically, through a building.

The campus-wide IPM policy was passed in 2002. The policy, signed by the Director of Environmental Health and Safety, assigns the Executive Director of Facilities Management (F.M.) with the responsibility of implementation. The Executive Director of F.M. in turn appointed the department’s Environmental Operations Manager as the Campus IPM Coordinator.

The IPM policy established a process for the review and approval of pesticide applications on campus. This policy forbids the use of privately acquired pest control products (e.g., Raid, ant killers, etc.) by individual students, staff or faculty. Departments designate an IPM liaison. The liaisons submit pest control plans to the IPM coordinator for review prior to any pesticide applications. Based on action thresholds for each pest, a treatment is selected based on the following criteria:

1. Least hazardous to human health
2. Least damaging to the environment
3. Effective at controlling the pest
4. Has minimal impacts on non-target organisms
5. Within available resources

The full campus integrated pest management policy can be found at:  
<http://ehs.colorado.edu/Download/pest.pdf>

Overall compliance with the new IPM policy has been very good. The majority of campus departments responsible for building and/or land management have established a protocol to work with Facilities Management to address pest control needs. The biggest concern with compliance originally centered around the use of outside contractors, their techniques, and the ability to secure accurate records from them. Thus far, this has been much less of an issue, as all structural pest control is done in-house. The use of contractors for ornamental or natural areas has been closely monitored. Contractors are chosen based on their track records and lack of

complaints lodged with the Colorado Department of Agriculture. The single largest category of non-compliance continues to be the use of privately acquired pesticides for use in residence halls, family housing units and individual offices. These products are confiscated immediately upon discovery.

Integrated pest management (IPM) makes sense—both economically and environmentally. Traditional pesticides are expensive and often ineffective because they fail to address the underlying causes of pest problems. IPM seeks to disrupt or destroy the conditions favorable to infestations. In many cases, the cost of the less-toxic IPM solution is comparable to or less than traditional pesticide-based programs. In 2004 alone, the in-house IPM specialist saved the university \$103,000. There is potential for even longer-term savings, as IPM often eliminates the need for future actions. As the university continues to practice integrated pest management, it will save increasing amounts of money.

### **Current Programs and Accomplishments at CU**

With some exceptions, CU has made progress over the past few years in moving from traditional pest management methods to less-toxic methods and has significantly reduced the volumes of chemicals used to control indoor and outdoor pests on campus. For outdoor pest and weed management, biological, mechanical, and cultural methods are increasingly utilized. However, there is still room for improvement (refer to “Challenges” section below).

#### *Indoor Pest Control*

For indoor pest management, pesticides are still used but their use is generally safer, more effective and more responsible. They are no longer applied in powder or aerosol form, nor are any volatile chemicals used for indoor pest management.

In the past, the Department of Housing and Dining Services hired private contractors to spray once each week and would fog kitchens twice each year. These techniques changed in 1998 when Housing staff decided the results were not meeting expectations. Over \$20,000 was expended annually on pest control in dining service areas. Utilizing less toxic techniques, Housing and Dining Services have kept pests under control, while spending less money. Integrated pest management has proven a successful practice for Housing Dining Services. Additionally, the Department of Housing practices least-toxic IPM in Family Housing apartments and Residence Hall units through prevention and baits--not sprays.

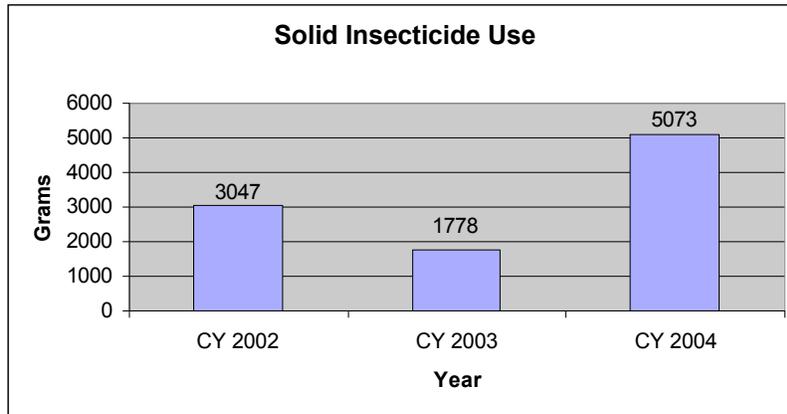
In 1998, CU employed the use of parasitic wasps to control campus roach populations. Very small, harmless wasps were released in the steam tunnels where roaches have found the perfect habitat for breeding. The wasps prey on roach eggs; thereby, controlling the roach population at the source. What started as a trial has been heralded as a success.

In the fall of 1999, Facilities Management hired an IPM technician to implement better practices of pest control. Baits, vacuums, sticky traps, mechanical and biological controls have been shown effective and safe and are now the standard in campus pest control. The cornerstone of the IPM policy is the knowledge of pests and their habitat for long-term prevention. The additional

benefit of the IPM technician is education of the campus about Integrated Pest Management. The campus is seeing results, is satisfied with safe and healthy approaches, and is also gaining an understanding of pest prevention. There are no longer any buildings on campus relying on pesticide sprays which has greatly improved learning and working environment and reduced risk.

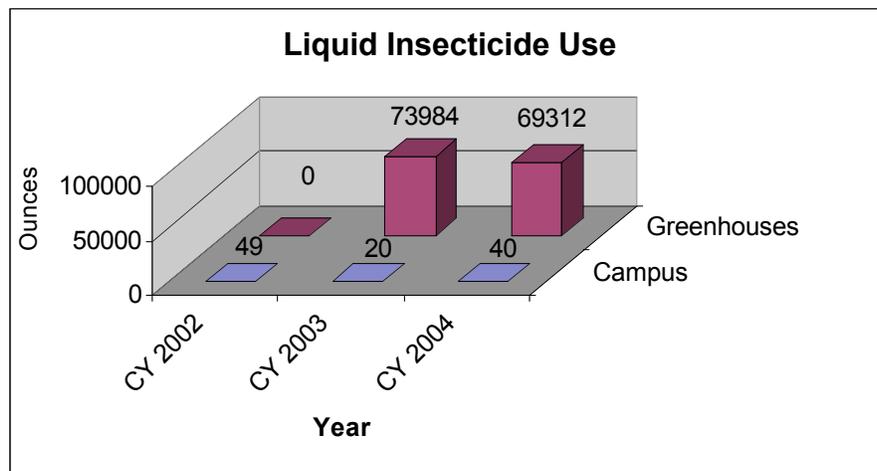
*Campus Insecticide Statistics*

**SOLID INSECTICIDES**



- Total of 5073 grams of solids applied in CY04
- 99.96% of total grams were in the form of baits (5071g)
- 00.04% of total grams were in form of contact poison (2g – Delta Dust)
- Total of 11.32 lbs. of pesticides used in roughly 10 million square feet

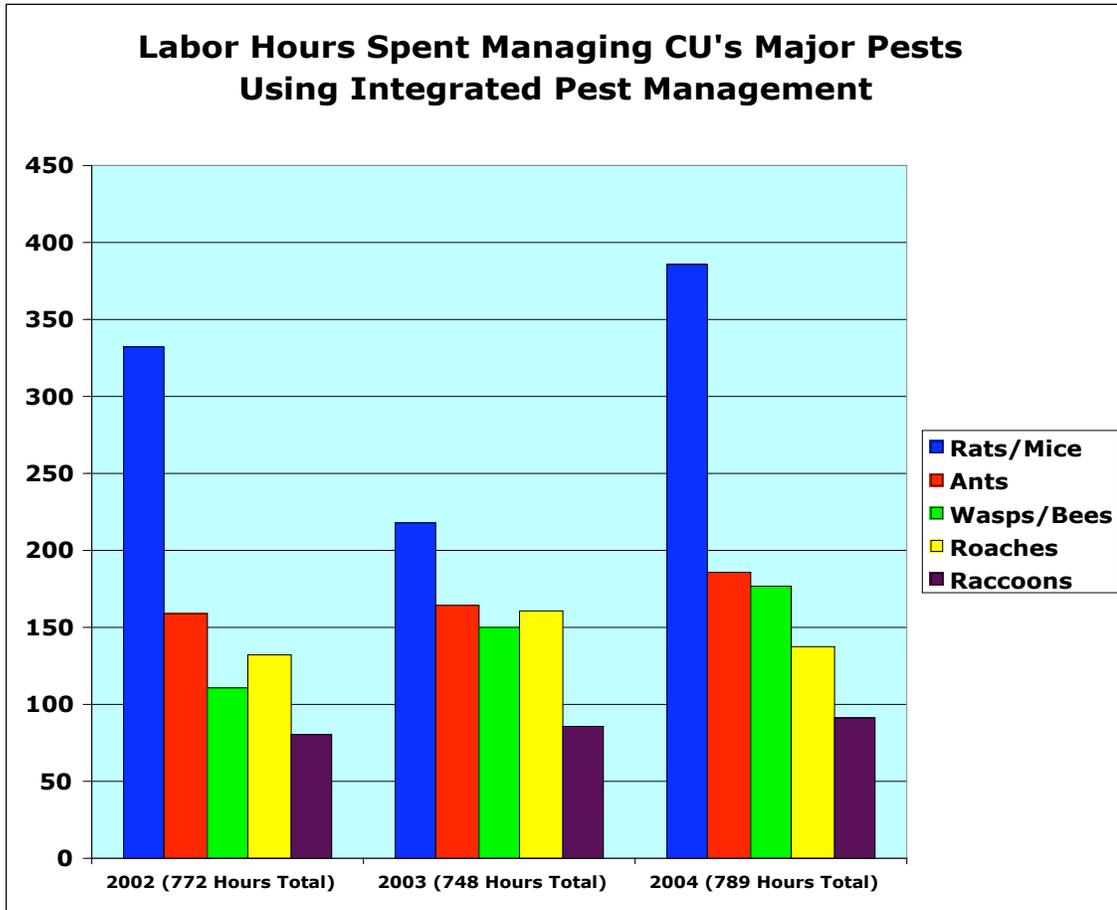
**LIQUID INSECTICIDES**



- 542 gallons (69,312 ounces) of liquid/aerosol spray applied in CY04

- 542 gallons represents the total mixed product used, not the concentrate
- 99.94% of all indoor spray applications were done in the three campus greenhouses

*Time and Money Considerations of IPM*



Though the above graph indicates that a considerable amount of money and labor has been spent on IPM programs, the approach actually saves the university on the order of \$100,000 per year by keeping most of the operations in-house, as opposed to paying considerably more to outside contractors for pest management.

**Avoided Structural Costs (includes office labor hours)**

|                                    | <b>CY 2004</b>   | <b>CY 2003</b>   | <b>CY 2002</b>   |
|------------------------------------|------------------|------------------|------------------|
| <b>Contractor Cost (projected)</b> | \$187,422        | \$176,705        | \$135,645        |
| <b>In-House IPM</b>                | \$84,465         | \$66,923         | \$35,005         |
| <b>Avoided Cost</b>                | <b>\$102,957</b> | <b>\$109,390</b> | <b>\$100,640</b> |

*\* Facilities Management staff carefully record what it would cost for a contractor to do the same job done in-house for each individual call received. Contractor rates are adjusted annually and conservatively.*

The savings are particularly significant for the Department of Housing. The total CY04 avoided cost of \$102,957 includes \$26,784 in avoided costs across all Housing Department kitchens. The average avoided cost from 2002-2004 in Housing Dining Services is \$25,741 per year.

*Noxious Weeds*

The noxious weed program continues to move toward a more consistent approach but is struggling due to a lack of resources. The main objective has been to reduce the densities of noxious weeds (including diffuse knapweed, Canada scotch, musk thistle, leafy spurge, and yellow toadflax) while encouraging native competition through re-seeding. To date, this has been an effective containment technique on the lands it has been applied to. The control methods are primarily mechanical, in the form of mowing, hand removal, and grazing. Volunteers and seasonal employees are used for a good portion of this work. The program has also been working with a biology professor to release weed-eating insects (bio-controls). This is showing very promising results.

*Turf Management*

Facilities Management Grounds Department formally started a turf management program in 2002. The program seeks to improve and maintain healthy soils which result in healthy turf. Since its inception, the turf program has improved irrigation practices, restored nutrients, invested in capital equipment necessary for implementation of cultural practices, and implemented a variety of non-chemical cultural practices. Cultural practices including fertilization, aeration, seeding and mowing focus on weed control and prevention while building soil and turf health.

The turf management program has the goal to reduce the use of synthetic chemicals, primarily fertilizers derived from synthetic sources such as ammonium nitrate. These synthetic fertilizers have a fast release nitrogen which greens turf very rapidly but does not sustain a green appearance or build a healthy root system. Slower release, water soluble organic fertilizers will promote plant growth and stimulate root development and density, reduce soil compaction, balance pH, and increase potash and iron levels.

The turf program seeks to reduce broadcast applications of synthetic herbicides which degrade soil health. Synthetic herbicides have been applied in targeted areas as a post-emergent (targeting established plants) in 2003, 2004 and 2005. Pre-emergent non-toxic herbicides (specifically corn gluten meal) have been applied to control the spread of broadleaf weeds.

Student environmental surveys in 1999 and 2003 showed that the student body overwhelmingly supports the idea of organic management of campus lawns without the use of pesticides, even if this lead to the presence of more dandelions. In 1999, 84 percent of those surveyed supported organic lawn management, even if it meant greater prevalence of weeds. In 2002, the figure stood at 74 percent.

In spite of survey results and effective cultural practices, broadcast use of synthetic herbicide use continues on campus. Facilities Management reserves the option to use pesticides as a “last resort” for pest control outdoors. In the springs of 2003, 2004 and 2005, outdoor herbicide spraying was used to manage the worst dandelion populations. While 2002 was one of the driest years on record, the spring of 2003 was the wettest in recent years. This abundance of moisture, combined with the amount of seeds in the ground from the previous year (high due to drought), as well as a general reduction in turf density, led to an unusually high level of infestation by broadleaf weeds in certain areas.

The use of broadcast herbicides is inconsistent with the Integrated Pest Management Policy which aims to attack the root problems of pest propagation. Continual spraying of synthetic herbicide is symptomatic of pest control methodology that is inconsistent with the goal of stopping problems before they arise. Spraying of hazardous chemicals on campus is also inconsistent with keeping the community safe from avoidable danger in the pursuit of aesthetic aims.

Grounds crews have employed a variety of cultural methods to decrease the reliance on sprays to control dandelions. These non-chemical approaches build healthy soil and turf. The challenge is that cultural methods require labor and supply resources. Resources for cultural practices must be consistently committed to control weeds. If the program is forced to resort to toxic herbicide use, doing so indicates a failure of the cultural program.

The Department of Housing also utilizes an IPM approach to manage their grounds. In 1994, the use of pesticides was banned on the grounds surrounding residence halls. However, in 2003, herbicides were sprayed to control broadleaf weeds on Housing grounds on main campus (not at Family Housing).

Housing uses a corn gluten meal pre-emergent control on weedy areas of turf, and a slow-release, alfalfa-based fertilizer. Cultural practices are also being modified so that grass is mowed regularly and at a proper height, and watering is done at optimum times of day, as well as in the appropriate amounts. The objective is to reduce the spread of dandelions and other visible weeds in turf areas, and to build soil health so that the turf is more able to out-compete weeds. Housing initiated a major turf-replacement effort in summer of 2005 in areas where soil health was poor and weeds were beyond thresholds.

### *Trees*

In the fall of 2004, the Grounds division restructured its program by creating a dedicated arborist position. This position has increased the amount of time that the campus tree inventory receives direct attention. Specifically, the arborist has improved working relationships with CU’s tree

work vendors, has become active in the construction/damage mitigation area and has been getting more 'hands on' work done on the trees than they have received for years. This position has also allowed the program to move more steadily toward a true IPM approach including improved cultural practices, increased direct watering (especially in the winter), more visual inspections, and better and more frequent sanitation pruning.

### *Wildlife Issues*

Prairie dog relocations from Potts Field were completed. The effort to document and manage campus bat populations was in full swing in 2004 with populations managed in a total of nine campus buildings. Beaver activity was relatively quiet in 2004 except for additional consultations with private and public agencies in an effort to finalize a beaver management plan.

### **Action Steps CU Can Take to Achieve IPM Goal**

CU has been practicing Integrated Pest Management for nearly ten years. IPM has proven effective in maintaining greater control over our institutional environment. This has resulted in more satisfied utilization, fewer pests, fewer problem infestations, and lower pesticide use. To continue to implement a strong indoor and outdoor IPM policy, CU needs to enact the following steps:

- Institute a decision-making structure which places least toxic pest control methods as the highest priority and reviews campus-wide pest control methods
- Provide consistent and adequate funding and staff for indoor and outdoor pest control. Particularly, funding and staff for grounds cultural IPM needs to be a priority for building healthy soils, or the campus will continue to have a reliance on broadcast herbicide sprays.
- Build soil health with a phase out synthetic fast-release nitrogen fertilizers and emphasize slow release organic fertilizers.
- Address and plan for IPM in Campus Building Standards
- Agreement to no longer use chemicals determined to be hazardous to human health by organizations such as the World Health Organization. This list should be approved by an IPM review board and include of websites and resources that are compiled by campus IPM/Facilities Management personnel. These standards will improve upon the EPA's list of pesticides that are "registered," but not necessarily "approved."
- Emphasis on native and drought resistant plants through improved dialogue with landscape architects by university decision makers. The ultimate goal will be for CU to eventually compile an adaptive list of species approved to be planted on the campus.
- Review of the current campus building standards with regards to weed barrier installation. Weed barrier is not currently being installed properly. This diminishes its effectiveness and wastes money. The standards should be reviewed and revised so that the installation serves its intended purpose.

- Explore the expanded use of organic fertilizers, by utilizing more effective soil amendments and providing the corresponding training for grounds crews.
- Setting goals for increased interaction and communication between all entities in Boulder concerned with harmful pesticide applications. This includes experts and interested parties from the University of Colorado and its neighbors, the City of Boulder, school districts within Boulder, Boulder County, and citizen groups.
- Continue to manage noxious weeds with alternative methods when and where possible
- Adopt Integrated Weed Management Practices. These practices should reflect the most current state of Colorado rules and regulations; establishing prudent standards and thresholds for weed control. These Weed Management practices would be contingent upon a number of action steps: A) Complete a campus weed map; B) Reestablish a full-time noxious weed coordinator position; C) Review our current biocontrol policy and protocol; D) Formulate and fund a program which continues to use and promote proven techniques (e.g. the grazing of Cashmere goats).
- Include contract language that stipulates non-payment to outside contractors for violation of campus policies when limited pesticide spraying is the only option. Examples of noncompliance would be: not using a required directional funnel, application in 85+ degree weather, application in 10+ mph winds, not using preferred application equipment and methods (e.g. funnel sprayer).
- Education of campus users and visitors on efforts to reduce pesticide and chemical use
- Creation of an online notification system to inform campus users of pesticide applications which is easily accessible to all those who utilize campus facilities. The website should include detailed information of applications, hazards, and a registration for chemically-sensitive individuals so they can be notified of applications that may put them at risk.
- Conduct a survey of campus users about turf quality.
- Continue education efforts about the use of privately acquired pesticides.

### **Metrics and Assessment**

In order to track the success of the IPM program, it is important to collect adequate campus-wide data, including:

- Tracking what pesticides are applied in what volumes
- Monitoring the circumstances leading to pest occurrences and reoccurrences
- Evaluating and monitor the methods used to completely eliminate pest invasions
- Accounting for costs of damage incurred and/or avoided

| <u>Metrics</u>                                 | <u>Measurement Methods</u>                 |
|--|--|
| Improve soil health                            | Increase use of organic fertilizers        |
| Decrease amount of weeds with cultural methods | Decrease of quantity of weeds, decrease of |

|                           |   |
|---------------------------|---|
| and without herbicides    | broadcast herbicides (volume and area)                                      |
| Control noxious weeds     | No spread of infestations; implement IWM program with monitoring            |
| Increase compliance rates | Reduction in complaints regarding purchase of privately acquired pesticides |

### Further Planning and Research Needs

- Conduct research to identify which chemicals comprise the “approved list” of pesticides which will delineate what pesticides will and will not be tolerated for use on campus. A similar list has already been established by Facilities Management for indoor cleaning products. A pesticide databank could be created in a similar fashion.

### Challenges

- Reducing non-compliance of existing IPM policies in residence halls, family housing units and individual offices has been difficult.
- Broadcast application of synthetic herbicides has increased on campus and is often used instead of less toxic methods controlling weeds. As stated in the campus IPM policy, broadcast application should be a “last resort.” This inconsistency needs to be addressed.
- There is not yet 100 percent compliance with the campus IPM policy at all locations. Many athletic fields on campus, for example, have been treated with chemical pesticides with less-than-adequate IPM oversight.
- Lack of resources has been an obstacle in implementing a consistent IPM approach to noxious weeds.

### Social Impacts

Pesticides impact all sectors of society in many stages from production to application and disposal. By reducing our use of pesticides, the most direct benefit is a reduction of human health risk. Pesticide use has been shown to cause adverse health effects including cancer, neurological disruption, birth defects, genetic alteration, reproductive harm, immune system dysfunction, endocrine disruption, and acute poisoning. According to the National Institute of Health, “Of the 40 most commonly used lawn chemicals, 12 are linked to cancer, 21 are linked to liver, kidney and nervous system damage, and 36 cause irritation.” By setting and following its IPM policy and program, the campus takes the lead in shifting away from these avoidable dangers.

### Links to Other Blueprint Topics

**Water:** Water quality and the use of pesticides and herbicides are closely linked. The chemicals used on campus grounds will run into boulder creek and harsh chemicals used in buildings commonly find their way down campus drains where they can prove difficult to remove at treatment plants.

**Purchasing:** Adopting integrated pest management strategies and practicing green purchasing habits are two sides of the same coin. The key idea of green purchasing is to preferentially choose products with that pose minimal environmental threats. This is consistent with IPM which stresses pest control products that pose a minimum risk, or adopting alternative pest control measures, whenever possible.

**Literacy:** One of the central ideas in environmental literacy is to maintain a campus with the smallest possible environmental footprint so students and researchers are able to use the surrounding ecological environment as a “living classroom” as well as to foster general ecological awareness by making the campus a working example of a sustainable institution.

**Waste and Recycling:** By instating IPM practices, the amount of chemical waste can be reduced. Less need for pesticides means fewer containers with chemical residue will enter the waste stream, as well as reduced risk of chemical pesticides being discarded in an inappropriate fashion.

**Climate:** Integrated pest management focuses mainly on limiting exposure of people to toxic chemicals. However, a truly comprehensive approach to IPM would also take larger-scale consequences of pest management into account. Lawn mowers and similar motorized equipment (weed-eaters, chainsaws, chippers, etc.) release carbon dioxide, polycyclic aromatic hydrocarbons (a known carcinogen) and ozone precursors into the air. And since these appliances are largely unregulated, they often account for disproportionately large share of summertime air pollution. A lawn mower produces more than 10 times the amount of smog-causing gasses as a typical car on an hourly basis. CU can evaluate the efficiency and pollution controls of all motorized grounds equipment before purchase to minimize greenhouse gas and particulate matter emissions.

## Part II: Indoor Air Quality

### Goal

*Campus buildings provide high indoor air quality through adequate ventilation and control of indoor air pollution sources.*

### Background, Needs and Trends

Indoor air quality is essential to creating a healthy campus. Poor air quality can lead to decreased employee productivity, decreased student performance, and even acute and chronic illness. Prolonged exposure in an educational setting can lead to Sick School Syndrome. Symptoms include headache, fatigue, and shortness of breath sinus congestion, sneezing, coughing, nausea, dizziness, and eye, nose, throat, and skin irritation. The syndrome is best prevented by proper ventilation for the indoor environment. By minimizing exposure to pollutants in campus building, CU will benefit immensely by increasing staff productivity, student learning, and decreasing sick days for sick building syndrome-related illnesses. “Good indoor air quality contributes to a favorable learning environment for students, performance of teachers and staff, and a sense of comfort, health, and well-being. These elements combine to assist a school in its core mission – education.” (*US EPA Indoor Air Quality Tools for Schools*).

The following are common sources and causes of IAQ problems:

- Building maintenance, renovation and construction projects, including paint and adhesives
- Asbestos abatement
- Mold and mildew infestations
- Unmaintained HVAC systems
- Off-gassing of furniture and carpet
- Chemical cleaners
- Non-HEPA vacuum cleaners
- Smoking in and near buildings
- Vehicle exhaust entering buildings
- Laboratory chemicals

CU has solid programs for managing IAQ. The two highest areas for opportunity are with the use of cleaners and paints on campus. This section will primarily focus on how to make advancements in this arena.

#### *Cleaners:*

According to the Center for a New American Dream:

“Cleaning products are a more pervasive problem for human health and the environment than one might think. Besides janitors, who directly use cleaning

products, office workers are also at risk for developing health conditions associated with the toxic chemicals present in many cleaning products. Additionally, millions of tons of cleaning products are washed down the drain every month, which can have adverse effects on the natural environment.

“Consider the following statistics:

- Each year, the institutional cleaning industry contributes \$150 billion to the economy and uses five billion pounds of chemicals, many of which are known hazards to human health and the environment.
- The Janitorial Products Pollution Prevention Project estimates that the average janitor uses about 23 gallons of chemicals per year, weighing 194 pounds. Hazardous ingredients comprise 25% of this total.
- U.S. institutions spend more than \$75 million a year on medical expenses and lost time wages for janitors due to chemical-related injuries.
- Green Seal reports that cleaning products are responsible for approximately eight percent of total non-vehicular emissions of volatile organic compounds (VOCs). Furthermore, a U.S. Environmental Protection Agency (U.S. EPA) study of six communities nationwide found that indoor levels of VOCs are up to 10 times higher than outdoor levels. VOCs contribute to smog formation, inhibit plant growth, and can cause respiratory problems in certain people.
- Using safer cleaning products, in addition to better ventilation and cleaning, could improve worker productivity by between 0.5 percent and 5 percent, an annual productivity gain of \$30 billion to \$150 billion.
- The chemicals most frequently involved in poisonings reported to the U.S. Poison Control are cleaning products.

“Numerous institutional purchasers are switching to green cleaning products in order to improve human health, reduce potential liabilities, and lessen adverse environmental impacts. As a result, some institutional purchasers have even experienced significant savings through better prices as well as increased worker health and productivity.”

Reasons to purchase green cleaners, as cited by the US Department of Interior, include:

- 35 percent of cleaners require *extreme care* during use because they can blind the unprotected user, can cause severe skin damage, or can be absorbed through the skin or be inhaled to harm internal organs
- An average of *58.2 lbs.* of chemical cleaning products are used *per janitor* per year
- 6 percent of cleaners should be avoided because of serious health/environmental threats
- Worker injuries can include: acute blindness, skin damage, lung damage, permanent damage to a fetus, hormone modification, cancer and organ damage

Green cleaners as defined by GreenSeal pose the following standards:

- The undiluted product shall not be toxic to humans.
- The undiluted product shall not contain any ingredients that are carcinogens or that are known to cause reproductive toxicity.
- The undiluted product shall not be corrosive to the skin or eyes.
- The undiluted product shall not be a skin sensitizer, as tested by the OECD Guidelines for Testing Chemicals, Section 406.
- The undiluted product shall not be combustible.
- The product as used shall not contain substances that contribute significantly to the production of photochemical smog, tropospheric ozone, or poor indoor-air quality.
- The product as used shall not be toxic to aquatic life.
- Each of the organic ingredients in the product as used shall exhibit ready biodegradability in accordance with the OECD definition except for a FIFRA-registered ingredient in a bathroom cleaner and the polymer portion of a carpet cleaner.

In addition, GreenSeal products have standards for eutrophication, packaging, concentrates, fragrances, prohibited ingredients, training, animal testing, and labeling requirements.

The quality and availability of “green” cleaners have rapidly increased. They are more regularly and effectively used across campus. Facilities Management has reviewed and ranked over 200 green cleaners.

### *Paints*

Another major contributor to Indoor Air Quality is paint. The Center for a New American Dream, outlines the following environmental and health impacts of paint:

“Traditional paints contain human carcinogens and substances known to accumulate in the environment. They can also cause headaches, nausea, and dizziness. While some symptoms disappear after the paint dries, other more chronic problems such as kidney and liver damage or respiratory problems can persist long after the initial exposure.

VOC emissions are one significant impact associated with paint. According to an EPA study, architectural paints contribute nine percent of the VOC emissions from consumer products. Many VOCs are toxic or are known human carcinogens. VOC emissions also contribute to smog formation, which can irritate lungs and make breathing difficult.

According to EPA, paint also poses a significant disposal problem. As a result,

EPA encourages and RCRA requires the use of recycled-content paint. Recycled-content paint is made from paint collected at household hazardous waste programs that is sorted by color and rebled into "new" paint. The paints are sold with recycled contents between 1 and 100 percent. Recycled-content paints, however, tend to have much higher VOC levels and to contain many of the heavy metals and organic compounds purchasers are hoping to avoid.”

Green Seal recommends maximum acceptable VOC levels and recommends avoiding paints containing specified levels of heavy metals and organic compounds.

## **Current Programs and Accomplishments at CU**

### *Low VOC Products*

Campus buildings are now being built and maintained with products (i.e., adhesives, paints, stains, cleaners) that contain lower levels of volatile organic compounds (VOCs). Facilities Management is evaluating the performance of these lower-VOC products. Federal regulations have gone into effect for the eventual phase-out of high-VOC products. In campus construction projects the use of low-VOC products is up to the contractor and project managers.

### *Evaluating Cleaners*

Facilities Management Environmental Services is currently reviewing and rating all cleaners and disinfectants used by custodians based on toxicity. This is an ongoing project. To date, over 200 cleaners have been reviewed and ranked. Housing and Dining Services is using Ecolab products in dining units.

### *Ventilation*

Facilities Management has made the following progress on improving ventilation and controlling indoor air pollution sources.

- Environmental Services has phased out the use of upright vacuum cleaners in lieu of more ergonomically correct canister and backpack vacuums that do not emit as many particulates into the air. Environmental Services has reduced the total number of vacuums needed by moving toward a “team cleaning” concept. All vacuums used (55-60 total) are backpack vacuums capable of filtering out 99.99% of particles less than or equal to 0.3 microns.
- Perform upgrades to campus ventilation systems such as balancing and improving ventilation of fume hoods, removing obstructions, and improving make-up air.
- Funded significant improvement to Fine Arts duct work and ventilation system including removal of unused fume hoods, improving fans, lowering of exhaust drops to sit directly over emissions sources, and adding exhaust vents to photo lab hazardous waste SAA.
- Performed major upgrades to ventilation systems through deferred and controlled maintenance projects. These have included significant improvements in Chemistry (fume

hoods), Imig Music (raising of fresh air intakes from street level), the Grounds Building (emissions exhaust system and HVAC improvements), Environmental Design (raising of air intakes), Chemical Engineering, Regent (retrofitted with two air handling units and a chiller to correct inadequate airflow), and Ramaley (cadaver room ventilation system).

- Ongoing purchases and use of low/no VOC paints, finishes, and adhesives have improved air quality campus wide.
- All outside-air intake louvers have been retrofitted with outside screens which makes them easier to keep clean. This has increased the amount of fresh air that is brought into the buildings.

**Action Steps CU Can Take to Achieve Indoor Air Quality Goal**

- Design for improved indoor air quality. Design needs to address source control (building materials, furnishings, equipment, cleaning agents), ventilation control, occupant activity control, and building maintenance.
- Institute a campus wide program mandating the use of “green” cleaners. The current ERP taskforce is evaluating the use and availability of campus cleaners and expects to make a policy recommendation in spring of 2006. A more formal program would identify safe and effective alternatives to chemical cleaners for use by all campus custodial staff.
- Establish campus-wide procedures ensuring that products such as paints, wood stains, and adhesives contain the lowest possible levels of VOCs (volatile organic compounds). This should apply to all campus uses of these products including maintenance, renovations and new construction. No- and low-VOC products need to be used as a standard practice in building construction and maintenance to ensure the air quality our campus expects.
- UCSU and Housing should phase out the use of upright vacuum cleaners in lieu of more ergonomically correct canister and backpack vacuums that do not emit as many particulates into the air.
- Identify UCB’s IAQ management structure within different departments and assess whether or not the formation of an IAQ management team is warranted. If formed, the team should be modeled after CSU’s successful group which handles mitigation, remediation, and education. The team should include representatives of EHS, Facilities, Housing and Auxillaries to compile a report of campus IAQ problems and issue a plan for preventative and responsive measures.

**Metrics and Assessment**

| <u>Metrics</u>   | <u>Measurement Methods</u>  |
|--|---|
| Design for improved indoor air quality                     | Address in campus building standards  |
| Implement consistent use of low toxicity chemical cleaners | Standard use of green cleaners in all departments                                       |
| Establish procedures which minimize VOC exposure           | Increased use of no and low VOC paints and adhesives; measure effectiveness of products |

## **Social Impacts**

By aiming to improve Indoor Air Quality, the campus improves working and learning productivity and decreases risk associated with paint and cleaning products. The most direct health benefit is realized by custodial and maintenance staff. Office workers and students are also at risk for developing health conditions associated with the toxic chemicals present in many cleaning products. Additionally, by reducing VOC emissions, we reduce the contribution to smog formation, which can irritate lungs and make breathing difficult.

## **Links to Other Blueprint Topics**

**Purchasing:** Clearly green purchasing habits are closely linked with reducing use of toxic cleaners. By implementing a strong green purchasing program at CU, any added cost or effort incurred by a green cleaners program will be negated. The same is true for shifting to more safe office products and furniture.

**Green Building:** Designing buildings to have improved indoor air quality ties in directly to construction, maintenance, remodeling and furnishing practices addressed in the green building section of the Blueprint.

## **Part III: Minimizing Hazardous Waste**

### **Individual Goals**

1. CU reduces the amount of hazardous waste generated by the campus while maintaining the quality and quantity of research.
2. CU continues to advance pollution prevention programs to reduce the quantity of hazardous material present on campus and to promote a safer working and learning environment.
3. CU faculty, students, and staff are continuously involved in a joint effort towards reducing hazardous waste on campus

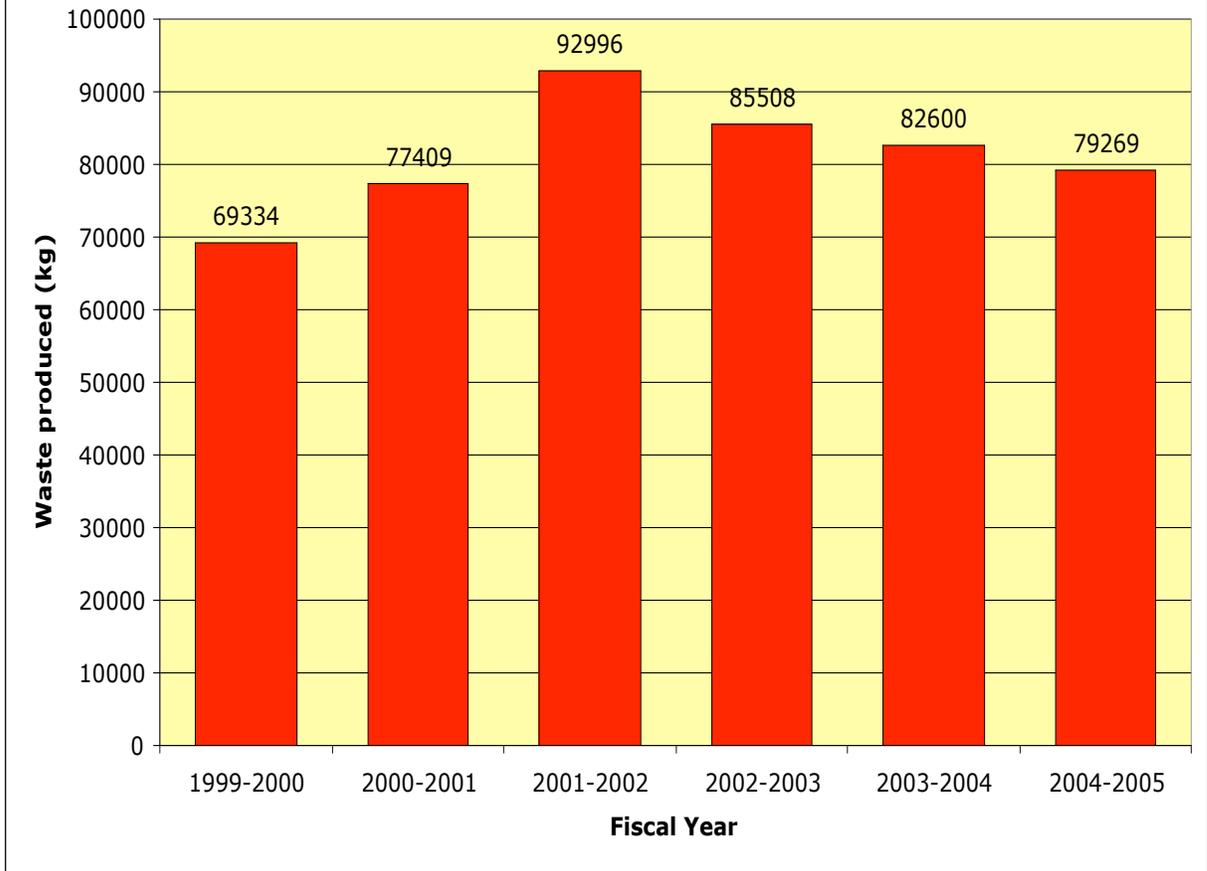
### **Background, Needs and Trends**

As with all safety and environmental protection goals, campus-wide pollution prevention and waste minimization efforts are responsibilities shared by the entire campus community. Faculty, staff and students have already made significant, ongoing efforts in support of these goals. These developments must be further encouraged and enabled by providing clear and direct information, innovative support programs and focused expertise. Individual waste minimization and pollution prevention efforts must also be better publicized to better foster an environment of innovation and community-wide commitment.

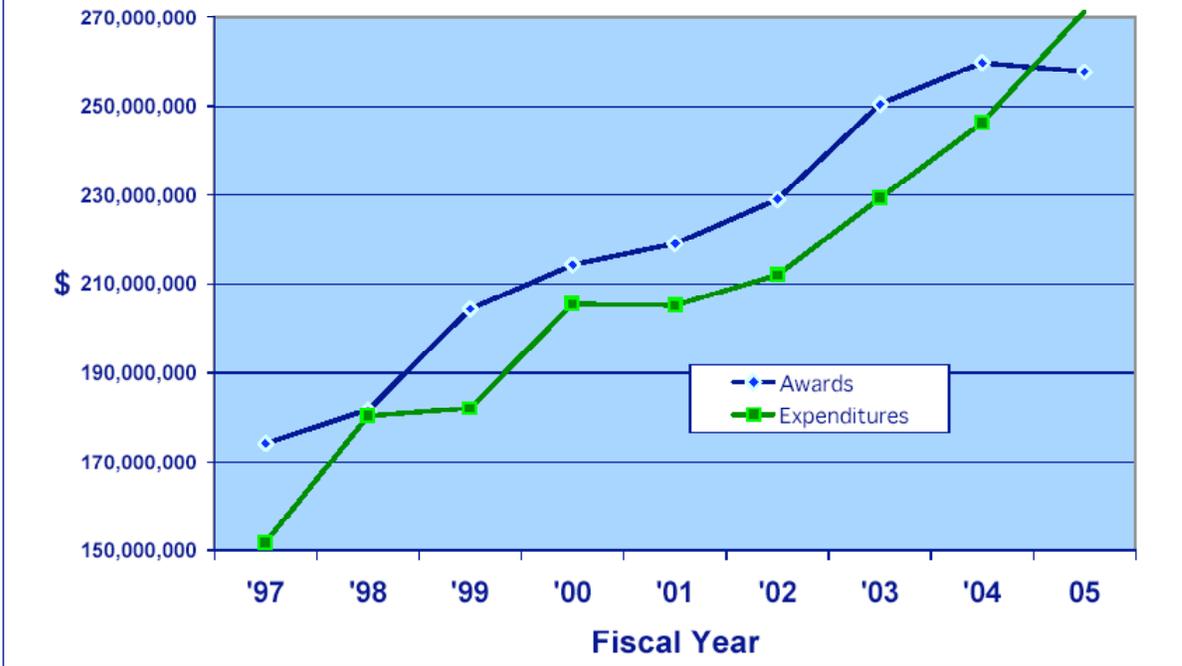
The University of Colorado at Boulder uses many different hazardous materials (flammables, corrosives, toxics, radioactive isotopes, and biohazards) in its labs, art/photographic studios and workshops. This collective accumulation categorizes the campus as a large quantity generator. The aggregate of hazardous waste generated at CU-Boulder is consistent with the amount of research and has drastically increased in past years. During the 1990s, CU's hazardous waste production increased nearly six-fold. In CY 1989, CU produced 12,337 kilograms of hazardous waste. By 1999, CU topped 70,000 kilograms of hazardous waste.

In the 2001-2002 fiscal year, CU began treating a much larger portion of its hazardous waste. The increase in on-site treatment led directly to substantially lower shipping costs (see graph below). Additionally, CU-Boulder has seen a shift in hazardous waste production habits. The 2001-2002 fiscal year was the last year in a decades-long trend of increasing hazardous waste production. Since then, CU's total hazardous waste has decreased at an average of 4 percent per year, while funding for research has continued to grow.

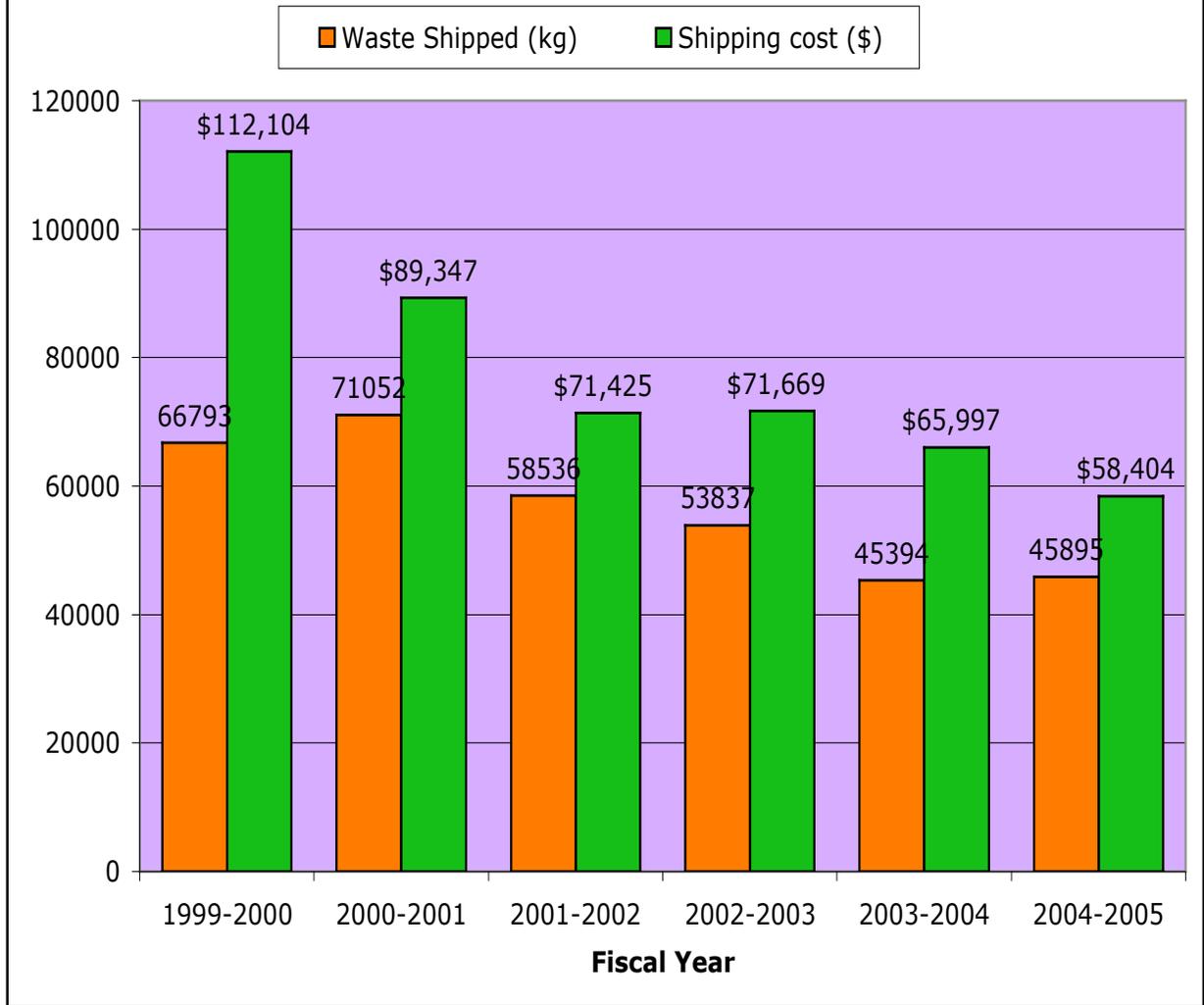
### CU Hazardous Waste Production

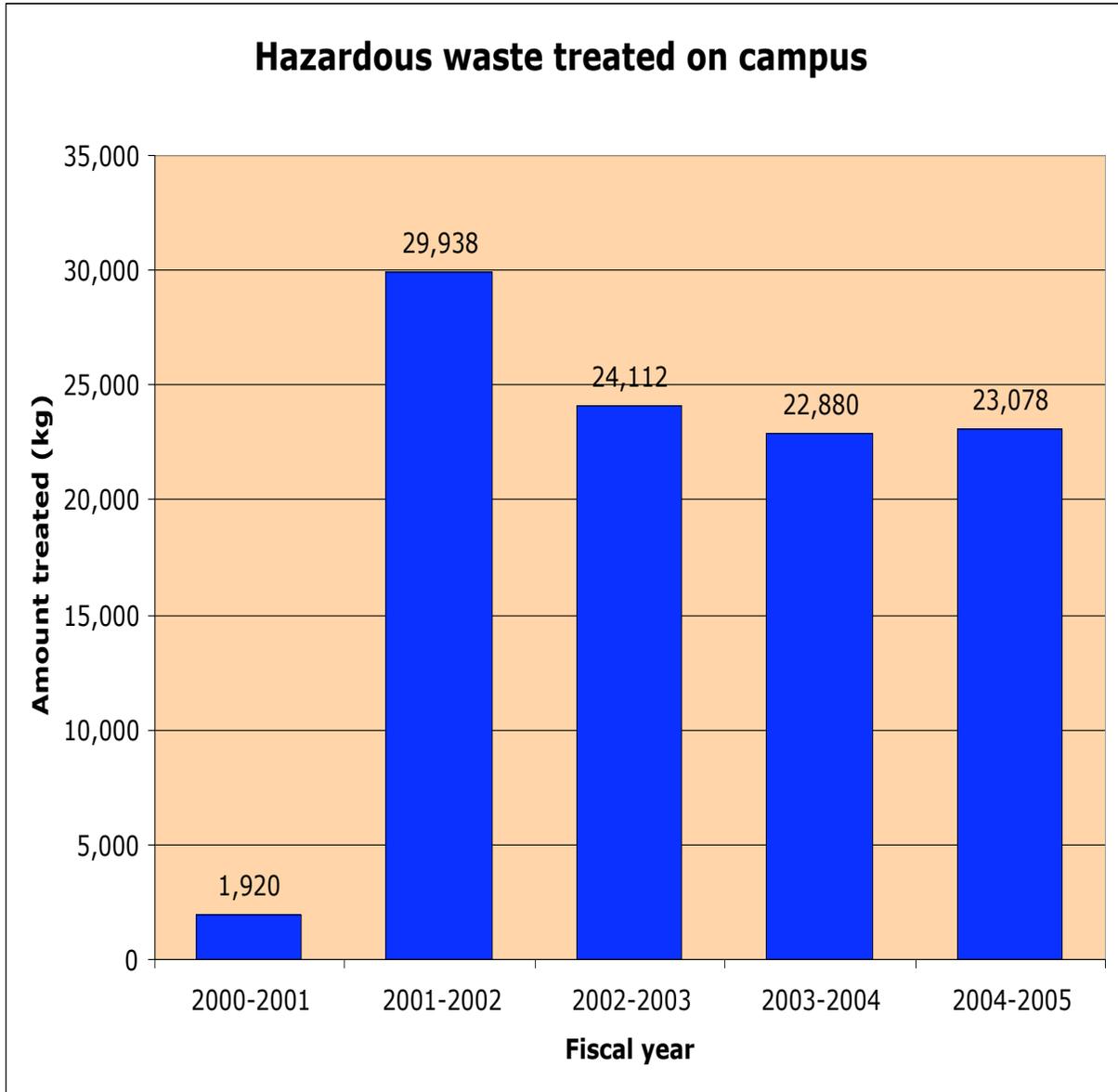


## Annual Research Dollars



## CU hazardous waste shipment trends





*\*Due to storage times that overlap between fiscal years, amounts of waste shipped and waste treated will not add up to the total managed for a given time period.*

### **Current Programs and Accomplishments at CU**

CU's hazardous waste treatment facility, in operation since 2001-02, has proven its capability to effectively and efficiently handle the campus' hazardous waste.

Substantial progress has been made toward the eight action steps to reduce the amount of hazardous waste and to promote pollution prevention programs laid out in the *2000 Blueprint for*

*a Green Campus.* These accomplishments cover a large number of campus activities and affected dozens of departments. For a complete list of the original action steps and the progress made since 2000, refer to Appendix II.

In addition to the encouraging amount of progress toward the 2000 *Blueprint* goals, EH&S has also undertaken several additional efforts to advance environmental health and safety at CU-Boulder.

- The on-line chemical management inventory has been in place now for over a year. Over 90 percent of the campus chemical inventories are now in the system. Additional chemicals and their chemical properties and safety information are constantly being added to the system with the goal of having information for every chemical being used and stored on campus.
- Last year, new chemical storage cabinets, primarily in the Chemistry Department, were acquired to provide chemical security and pollution prevention measures. However, due to lack of funding this fiscal year, no additional cabinets were purchased.
- A fourth edition of The Generators' Guide to Hazardous Material/ Waste Management, effective March 2004, has been created and published by EH&S. Limited distribution has begun with plans for campus wide distribution early in the 2004 fall semester.
- In an effort to promote water quality awareness and to prevent stream pollution, EH&S & Facilities Management initiated a program several years ago to identify and mark storm sewer inlets throughout the UCB campus with vinyl and painted stencils. Weather, traffic and time have taken their toll on these markers and many have since worn away. EH&S will again work with Facilities Management to replace worn storm water inlet stencils with new, long lasting, environmentally friendly, traffic and UV resistant pavement emblems. The brilliantly visible new emblems will help alert the community that the marked inlets drain into our sensitive creeks and waterways and will help remind members of the campus community to carefully consider what they allow to spill into the inlet drains.
- Spill Prevention Control and Countermeasure (SPCC) regulations, which stemmed from the EPA's Clean Water Act, have been expanded and now require management plans for portable equipment, tanks, elevators, grease traps, sewer interceptors, vehicles and other potential sources with capacities of 55 gallons or more. EH&S is working with a number of other campus entities to bring the campus into compliance with the expanded regulations, which are intended to help prevent releases of petroleum products (oil, diesel fuel, gasoline, etc.) into waterways.
- In addition to efforts to meet and exceed EPA regulations for storm water management, EH&S also continues to work with the Colorado Department of Public Health and Environment (CDPHE) Water Quality Division towards finalizing UCB's Storm Water permit. Meanwhile, required storm water practices remain mandated and efforts continue to ensure that these practices are followed by all faculty, staff, and students of the UC-Boulder community.
- UC-Boulder received Perfect Compliance Awards in 2002 and 2004 from the City of Boulder Water Quality Division for meeting or exceeding compliance requirements. This

achievement was analogous to a small city going a full year without discharging restricted substances into the waste water system and was accomplished through cooperation and environmental awareness throughout the UC-Boulder campus.

- EH&S worked with the Resources Conservation Unit of Facilities Management in a collaborative effort to lessen the waste of conditioned air from UCB buildings. Fume hood face velocity containments were evaluated and chemical fume hood use standards for UC-Boulder were revised to save energy without compromising safety.

### **Action Steps CU Can Take to Achieve Goals**

Though a lot progress has been made since the original Blueprint for a Green Campus, there is still potential for advancing the original eight goals. Additionally, other key areas of hazardous waste management and pollution prevention have been identified as needing improvement. The end goal is to establish as comprehensive campus hazardous waste program as possible.

As with all safety and environmental protection goals, campus-wide pollution prevention and waste minimization efforts are responsibilities shared by the entire campus community. Faculty, staff and students have already made significant, ongoing efforts in support of these goals. These developments must be further encouraged and enabled by providing clear and direct information, innovative support programs and focused expertise. Individual waste minimization and pollution prevention efforts must also be better publicized to better foster an environment of innovation and community-wide commitment.

Formalize microscaling programs and continue to promote microscaling efforts. Microscaling involves conducting experiments on a smaller scale thus reducing the quantity of hazardous substances use in experiments, manufacturing, and routine cleaning. Microscaling efforts continue to be a consideration for faculty, instructors, and researchers at UCB. More can be done to track the extent to which it is or can be occurring in labs. The campus should conduct a microscaling practices survey to assess the current use and opportunity for use as well as possible concerns and challenges.

Consideration of a UCSU of BFA resolution to further encourage microscaling efforts among professors and researchers on campus, thus complying with our RCRA permit which requires the university to continuously look for ways to minimize waste.

Attaining better communication and collaboration between Wardenburg Health Center and the custodial staff, the medical lab, the Sport Medicine Clinic, and the General Clinical Research Center to take a problem solving approach with regards to minimizing hazardous waste.

Further exploration of ways to discourage bulk purchasing by the laboratories.

Further advance 'Best Management Practices' already adopted by many laboratories and shops to maximize safety and minimize waste. Further disseminate information on Best Management Practices to faculty, administrators, and students. Explore more effective and creative means.

An exploration of mechanisms for better communication among all applicable entities on the CU campus, including: BFA, UCSU, faculty, administrators, students, Environmental Health and Safety, and Facilities Management.

### Metrics and Assessment

| <u>Metrics</u>  | <u>Measurement Methods</u>   |
|---|--|
| Formalize microscaling                                    | Increase in regular practices  |
| Discourage bulk purchasing by university                  | Decrease in disposal of unused product   |
| Improved communication between applicable campus entities | Increase in number of lab proctors, BMP guides distributed, trainings conducted. |
|   |  |

### Challenges

Lack of effective communication among campus departments poses a major hurdle to overcome in maintaining a strong hazardous waste reduction program.

Procurement procedures and available funding have impeded the conceptual advancement of an ‘advanced disposal fee,’ a centralized chemical procurement system databanks and expanded microscaling operations. These programs could realize cost and labor efficiency as well as discourage bulk purchasing of chemicals which results in excessive waste.

Another challenge is educating the campus community about the relationship between hazardous waste and research opportunities. Through a variety of creative approaches, CU continues to decrease toxic waste while fostering a thriving research community. This idea is counter-intuitive to many people and in order to make effective intuitional changes regarding hazardous waste, this attitude needs to be modified through effective outreach and education.

### Social Impacts

As a general rule, under-resourced communities generally suffer disproportionately highly from poor environmental practices. Hazardous waste is no exception. In fact, hazardous waste that is either shipped or carried via natural processes to disadvantaged communities is one of the most well-known environmental problems of the past 50 years in this country. These communities generally lack the monetary resources or political clout to prevent waste disposal in their back yards, and are equally unable to initiate cleanup projects once the waste accumulates. By reducing its overall hazardous waste production and strengthening its treatment practices, CU will lessen the burden it places on the communities where waste can end up.

## **Links to Other Blueprint Topics**

**Purchasing:** Obviously, campus purchasing and striving to reduce hazardous waste are closely tied. AS CU moves forward with more sustainable purchasing practices, the amount of hazardous waste on CU will decrease accordingly.

**Waste and Recycling:** Hazardous waste must be dealt with either on-campus or by an outside contractor. As CU is discovering, it is more fiscally desirable to treat much of this waste on-site., as the cost savings are substantial. As a result, the departments and personnel who handle hazardous waste are generally part of the larger campus waste and recycling divisions. By exploiting this overlap of personnel, CU can cut costs further, while fostering a safer campus environment.

**Water:** CU sits on Boulder Creek—a river that is critical for wildlife, drinking water and regional agriculture. Mishandled hazardous waste at CU has major implications for humans and animals that live downstream. It is therefore in CU's best interests—both ethically and financially—to maintain the best possible practices when handling potentially harmful compounds.

## **Appendix A: Additional Information on the Precautionary Principal**

A new principle for guiding human activities, to prevent harm to the environment and to human health, called the “Precautionary Principal” has taken shape over the past decade.

An international group of scientists, government officials, lawyers, and representatives from environmental and labor groups met in 1998 at Wingspread in Racine, Wisconsin to define and discuss the precautionary principle. After meeting for two days, the group issued the following consensus statement:

"The release and use of toxic substances, the exploitation of resources, and physical alterations of the environment have had substantial unintended consequences affecting human health and the environment. Some of these concerns are high rates of learning deficiencies, asthma, cancer, birth defects and species extinctions, along with global climate change, stratospheric ozone depletion and worldwide contamination with toxic substances and nuclear materials.

"We believe existing environmental regulations and other decisions, particularly those based on risk assessment, have failed to protect adequately human health and the environment--the larger system of which humans are but a part.

"We believe there is compelling evidence that damage to humans and the worldwide environment is of such magnitude and seriousness that new principles for conducting human activities are necessary.

"While we realize that human activities may involve hazards, people must proceed more carefully than has been the case in recent history. Corporations, government entities, organizations, communities, scientists and other individuals must adopt a precautionary approach to all human endeavors.

"Therefore, it is necessary to implement the Precautionary Principle: When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. In this context the proponent of an activity, rather than the public, should bear the burden of proof.

"The process of applying the Precautionary Principle must be open, informed and democratic and must include potentially affected parties. It must also involve an examination of the full range of alternatives, including no action."

Thus, as formulated here, the principle of precautionary action has 4 parts:

1. People have a duty to take anticipatory action to prevent harm. (As one participant at the Wingspread meeting summarized the essence of the precautionary principle, "If you have a reasonable suspicion that something bad might be going to happen, you have an obligation to try to stop it.")
2. The burden of proof of harmlessness of a new technology, process, activity, or chemical lies with the proponents, not with the general public.
3. Before using a new technology, process, or chemical, or starting a new activity, people have an obligation to examine "a full range of alternatives" including the alternative of doing nothing.
4. Decisions applying the precautionary principle must be "open, informed, and democratic" and "must include affected parties."

The precautionary principle is not really new. The essence of the principle is captured in common-sense aphorisms such as "An ounce of prevention is worth a pound of cure," "Better safe than sorry," and "Look before you leap." However, environmental policy in the U.S. and Europe for the past 70 years has been guided by entirely different principles perhaps best reflected in the aphorisms, "Nothing ventured, nothing gained" and, "Let the devil take the hindmost."

This description was adapted from:

*Environmental & Health Weekly*

Environmental Research Foundation

#586 February 19, 1998

"The Precautionary Principal"

<http://www.monitor.net/rachel/r586.html>

## **Appendix B: Progress in Hazardous Waste Habits Since the 2000 *Blueprint***

**Action Step in 2000:** Add a waste treatment specialist to the EH&S staff to run the waste treatment process and to advise on waste minimization techniques.

**Current Status:** The waste treatment specialist has innovated and implemented several hazardous material management techniques that have enabled UCB to decrease waste volumes. The waste treatment specialist continues outreach efforts with waste generators on campus, to segregate and minimize wastes and maximize volumes of wastes that can be treated at the EH&S waste treatment facility rather than shipped off campus.

**Action Step in 2000:** Continue to utilize and expand treatment techniques at the EH&S facility to significantly decrease hazardous waste volumes.

**Current Status:** For the fiscal year July 2003 through June 2004, the treatment facility has processed 22,880 liters of materials (6,050 gallons, equal to 110 55-gallon drums). This is a decrease from FY 02-03 of 5%. The volume of water discharged by the EH&S waste treatment facility for return to the City of Boulder wastewater treatment plant was reduced to 17,755 liters (4,735 gallons) in FY2003-04. This further demonstrates the overall reduction in wastes having to be managed and treated at the Boulder campus. Within the last fiscal year, EH&S has expanded the acid/base neutralization treatment process to include metals removal from aqueous solutions using ion-exchange filters, allowing for a broader range of waste materials to be treated.

**Action Step in 2000:** Institute a central chemical procurement system.

**Current Status:** A centralized chemical procurement system is not being pursued due to cost and logistical constraints. However, the EH&S Chemical Management Specialist is able to utilize the new web-based chemical inventory system to monitor the locations and quantities of most existing campus chemicals and use that information to achieve regulatory compliance, prepare summary reports and improve emergency preparedness.

**Proposed action in 2000:** Further advance 'Best Management Practices' already adopted by many laboratories and shops to maximize safety and minimize waste.

**Current Status:** The Best Practices project, sponsored by the Howard Hughes Medical Institute and in which UCB participated along with Federal/State regulators and representatives from each of the 10 EPA regions across the nation, submitted its findings to congress and the EPA. As a result, in part, of these findings, the EPA selected Colleges and Universities Sectors as one of its eight new partner sectors in its Sector Strategies Program. The Sector Strategies Program focuses on three primary areas: (1) promoting the voluntary use of Environmental Management Systems (EMS), (2) overcoming regulatory or other barriers to performance improvement, and (3) environmental performance measurement. EH&S's Director, Dave Wergin, was selected to act as Chair of the performance measurements work group. Six organizations participate in the

Colleges and Universities Sector: American Council on Education (ACE), National Association of College and University Business Officers (NACUBO), Campus Safety, Health and Environmental Management Association (CSHEMA), Howard Hughes Medical Institute (HHMI), Campus Consortium for Environmental Excellence (C2E2) and Association of Higher Education Facilities Officers.

The Colleges and Universities Sector program is working on three focus areas: Regulatory Change, Environmental Management Systems, and Performance Measurements. These groups will collaborate their efforts towards considering regulatory changes that will enhance the efficiency of college and university operating systems while still maintaining good environmental supervision.

**Action Step in 2000:** Reduce photographic chemical waste by utilizing new technologies and procedures.

**Current Status:** EH&S witnessed a reduced amount of silver recovered over the previous fiscal year. This demonstrates the success of education efforts with those who utilize photographic processes on campus and the increasing willingness to change to digital photographic processes. Though traditional chemical photographic processing continues, the EH&S facility is able to treat most of the remaining photographic wastes that continue to be generated at UCB. Only a small amount of photographic waste requires off-campus disposal.

**Action Step in 2000:** Establish a battery recycling program so that rechargeable and alkaline batteries are recovered for recycling.

**Current Status:** A study was completed which determined that, although most battery types are regulated and require proper disposal, alkaline batteries are trash disposable. Laws prohibiting the production of alkaline batteries with added mercury have been in effect since 1993, and levels in current batteries, are well below regulated levels. It was determined that recycling of alkaline batteries on the UC-Boulder campus is not required. All other types of batteries, other than alkaline batteries, are collected and recycled by EH&S. These include all rechargeable batteries, such as those commonly found in palm pilots, cell phones, digital cameras, laptops, desktops, backup power supplies for PC's, etc. Drop-off sites for used batteries are available throughout campus.

## **Major Accomplishments by EHS for FY 2004-2005**

- Managed approximately 163 unknown chemicals from various labs on campus.
- Completed disposal of 9 gas cylinders through in-house valve removal; completed amnesty shipment of 34 gas cylinders at a cost of \$8,500 utilizing budget saved from other cost-cutting measures.
- Completed 37 laboratory clean-outs of old/expired chemical wastes.
- Assisted with the remediation of 9 potentially contaminated equipment disposal requests.

- Recycled 1,112 kilograms (2,446 pounds) of lead-acid batteries from campus.
- Recycled 4,173 liters (1,098 gallons) of oil from campus.
- Recycled 800 kilograms (1,760 pounds) of crushed fluorescent bulbs from campus.
- Recycled 120 kilograms (264 pounds) of mixed battery types from campus.
- Recycled 105 kilograms (231 pounds) of lead from campus.
- Participated in 2 CDPHE/EPA compliance inspections of the Treatment Storage and Disposal Facility (TSDF) and main campus, resulting in no violations/fines.
- Completed strobic fan exhaust and capture hood upgrades to the Treatment Facility.
- Finalized local discharge limits for City of Boulder Industrial Wastewater Discharge Permit, in conjunction with the City of Boulder Publicly Owned Treatment Works (POTW) and the EH&S ECIH Group.
- Assisted UCB Environmental Center with dormitory move-out mixed battery collection/recycling project.
- Published a technical paper about the Treatment Facility operations in the June 2005 issue of *Water Conditioning & Purification Magazine*.
- Assisted Chemical Engineering Environmental Separations class with waste treatment project.
- Provided assistance to the following various other campus and community groups: local Boulder businesses, Boulder County Household Hazardous Waste Facility, UCB Housing Department, UCB MCDB Department, CU-Colorado Springs and the UCB Recycling Operations Group.

## Appendix C: Highest-Risk Cleaners

| <i>Product Type</i>   | <i>Hazardous ingredients</i>          | <i>How these can harm users</i>   |
|---|---------------------------------------|---|
| Glass Cleaner,<br>General Purpose Cleaner,<br>Carpet Spot Remover | Butoxyethanol                         | Butoxyethanol is absorbed through the skin and is poisonous to blood, liver, & kidneys.   |
| Toilet Cleaner  | Hydrochloric acid,<br>phosphoric acid | These acids are very good for removing hard water rings, but they can also blind users in seconds.  |
| Oven Cleaner,<br>Heavy Duty Degreaser                             | Sodium hydroxide                      | Oven cleaner in a spray can is very convenient, but also very dangerous. Sodium hydroxide can blind users, and the vapors can cause permanent harm to users' lungs. |

## Appendix D: IAQ Resources

<http://www.epa.gov/iaq/schools/toolkit.html>

The Indoor Air Quality (IAQ) Tools for Schools Kit (Kit) (see below for HTML, MS Word, and PDF versions of the kit contents) shows schools how to carry out a practical plan of action to improve indoor air problems at little or no cost using straightforward activities and in-house staff. The voluntary guidance in Indoor Air Quality Tools for Schools can save schools time and money so that attention can be directed to educating children. Indoor Air Quality Tools for Schools is co-sponsored by the National PTA, National Education Association, Council for American Private Education, Association of School Business Officials, American Federation of Teachers, and the American Lung Association.

EPA's IAQ Tools for Schools kit includes checklists for all school employees, a flexible step-by-step guide for coordinating the checklists, an Indoor Air Quality Problem Solving Wheel, a fact-sheet on indoor air pollution issues, and sample policies and memos. "Poor indoor air quality remains one of the top health concerns that NEA members face! What's more, as teachers and education support professionals, we are also concerned about our students, because we know full well that our working conditions are the students' learning conditions. We need EPA's Indoor Air Quality Tools for Schools Program because it works!" Reg Weaver, President of the National Education Association In addition to the kit, the EPA, in conjunction with the cast and crew of the popular television series This Old House, has produced a short video about how to properly operate and maintain ventilation systems in schools.