



GREEN LABS AT CAROLINA



A BEST PRACTICES GUIDE



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The UNC Green Labs Best Practices Guide was created by a UNC student Environmental Studies capstone team, in conjunction with the UNC Green Labs Committee, the Office of Waste Reduction and Recycling, and the Department of Environment, Health and Safety. Please direct any comments or questions to the UNC Green Labs Committee at greenlabs@unc.edu.

EXECUTIVE SUMMARY

The University of North Carolina at Chapel Hill is a research institution, and much of the cutting-edge work conducted here takes place in the hundreds of research labs on our campus. Though UNC labs are engines of innovation, they are also energy consumers. Laboratory buildings use roughly four times as much energy, per square foot, as the average building on campus. Additionally, the purchasing policies and waste regulations required for labs make it challenging to introduce environmentally friendly practices.

This Green Labs Best Practices Guide is meant to serve as a reference of environmentally friendly practices for all lab personnel. Based on research at comparable universities, individual lab case studies, researcher interviews, and investigation of existing policies at UNC, this guide presents a general overview of ways to green UNC labs. Five areas are highlighted: 1) Energy Conservation 2) Water Conservation 3) Waste Reduction 4) Purchasing Policies, and 5) Green Office Practices. A checklist for each of these areas is included for lab, office, or building managers to improve environmental performance. Lists of environmentally friendly materials and supplies are also provided to replace materials in the lab and office. Finally, all readers are challenged to make a Green Labs Commitment Pledge.

All the resources in this guide have been designed to reduce consumption and cut costs in labs without inhibiting productivity. This Green Labs Best Practices Guide, along with additional information, is available on the UNC Environment, Health, and Safety and the Office of Waste Reduction and Recycling's websites.

CHECKLIST

ENERGY CONSERVATION

- Remove space heaters
- Keep the windows closed
- Turn off equipment when not in use
- Use properly sized appliances
- Purchase Energy Star appliances
- Shut the fume hoods
- Remove unnecessary samples/items from freezers
- Raise freezer temperatures when possible, and where this will translate to energy savings
- Share freezers with other labs
- Defrost freezers regularly and properly to maintain freezer units
- Turn off room and hall lights when not in use
- Use light switches with dimmers when feasible

WATER CONSERVATION

- Do not use single-pass cooling equipment
- Do not use water- powered vacuum aspirators
- Use tap water rather than DI water whenever possible
- Use water timers on continuous water use devices and set them to the minimum necessary time
- Install water misers on equipment such as autoclaves and sterilizers.
- Use autoclaves, ice makers and stills efficiently
- Report water leaks immediately

GREENLIGHT:

CHRISTINE COOLEY

MEDICAL UNIVERSITY OF SOUTH CAROLINA

CHRISTINE COOLEY, the Sustainability Manager at MUSC, leads a small but dedicated team in the University's Sustainability Office. The office has primarily focuses on waste reduction and energy efficiency.

One of the biggest green lab successes at MUSC has been the replacement of constant air volume fume hoods with more efficient variable air volume models. MUSC has also recently opened a lab building that is certified LEED (Leadership in Energy and Environmental Design) Gold. Cooley's office plans to tackle lab recycling next.

Cooley emphasized that enacting green lab practices at a large university requires active communication and strong cooperation between her team, lab employees, and administrators.

WASTE REDUCTION

- Encourage recycling of all materials
- Follow OWRR and EHS guidelines to recycle other materials such as batteries, fluorescent bulbs, and non-halogenated solvents
- Inventory yearly to prevent over-purchasing and dispose of expired chemicals
- Label, store, and dispose of hazardous chemicals and materials according to EHS guidelines
- Practice green chemistry principles to reduce hazardous chemicals used
- Inform EHS of lab closeouts and follow the Close Out Procedures
- Use chemicals and reagents first in/first out
- Encourage chemical sharing among labs

PURCHASING

- Consolidate orders
- Try to identify alternatives to products that are toxic or hazardous
- Order from companies that conserve materials and use recycled content for packaging
- Participate in vendor recycling programs

GREEN OFFICE

- Set printer and copier default settings
- Plug electronics into power strips and turn them off at the end of the day
- Arrange conference calls in place of traveling
- Review recycling practices periodically
- Purchase environmentally friendly office supplies and consolidate small orders
- Encourage use of reusable dishware instead of disposable

ENERGY CONSERVATION

HEATING AND COOLING

1. Shut the sash!

Close fume hoods when they are not being used. Fume hoods consume more energy than any other equipment in the lab. Shutting the sash decreases energy use because the closed hoods reduce airflow. Closing one of the newer variable air volume fume hoods can reduce its energy load 60-80%. Find out what type of fume hood you are using to make sure that you are using it properly and saving energy. Shutting the sash can save hundreds to thousands of dollars a year per fume hood and some UNC lab buildings contain hundreds of fume hoods.

2. Remove space heaters

Space heaters are prohibited on campus. Try to eliminate the need for electric space heaters by dressing for cooler temperatures. The average space heater uses ten times as much energy as the average refrigerator. Space

heaters are extremely inefficient and can be very dangerous. Space heaters also spur the building's cooling system to work harder to counteract additional heat, an inconvenient cycle of inefficiency. Radiant panel heaters are a good replacement.

3. Keep the windows closed

Improve the efficiency of heating and cooling by keeping the windows shut. Open windows in an air conditioned space means the HVAC system is pumping air directly outside. Shutting the windows can help stop energy dollars from going out the window.

4. Fine tune HVAC systems for optimal performance

Researchers often put hotplates or freezers next to automatic temperature sensors, which can affect the cooling and heating of the building. Move these items to a better location if they are not optimally placed. Ask the building administrator where thermostats are located and

“We aren’t just reducing energy—we are saving it for future use!”

Christina Lebonville, Lab Manager, UNC Chapel Hill Psychology Department

whether you are allowed to adjust temperatures. HVAC systems are the dominant energy users in most lab buildings. Equipping yourself with knowledge can reduce energy and make the building more comfortable.

DISCRETIONARY PLUG-LOAD

5. Turn off equipment when not in use

Turn off desktop lab equipment when not in use. During the day, most incubators, refrigerated centrifuges, gas chromatographs, and ovens can be turned off without much inconvenience to the next user. At night, building administrators should coordinate with lab managers and shut down autoclaves. Turn off biosafety cabinets when not in use. Put “turn me off” stickers on equipment to encourage colleagues to do the same.

6. Use properly sized appliances

Choose the right size incubator, autoclave, freezer, or oven to store and treat samples. Using an oversized autoclave may consume ten times the energy of a sufficient countertop version. Using the right size incubator or oven may save 50-80% of the energy use. Share appliances and space within the lab or even between labs to achieve the most efficient use of resources. If a large appliance is all that’s available, consider combining loads with other labs.

7. Purchase ENERGY STAR appliances

Ask your vendor for ENERGY STAR lab equipment for the next order. While the EPA has only produced ENERGY STAR standards for some freezers and refrigerators, expressing interests to vendors may help drive the market

for these products. Some ENERGY STAR appliances use only half as much energy as other models. ENERGY STAR appliances save the University money. Even if ENERGY STAR is not an option, ask for efficient features, such as timers on autoclaves or ovens. Labs21 provides an excellent resource for energy efficient lab equipment.

8. Autoclave in consolidated loads

Autoclaves are made for a specific load size. When autoclaves are not fully loaded, energy and water is wasted. By consolidating loads, energy is saved and the equipment is used at optimal efficiency. However, researchers and lab managers must also be cautious of overloading, which may cause the equipment to function improperly and not fully sterilize the items placed in the autoclave. Contact UNC Hazardous Materials Manager for questions or more information about hazardous waste reduction and disposal.

FREEZERS

9. Remove old samples from freezers

Assess freezer inventory regularly and dispose of any samples that are no longer needed. A clean freezer will also be more organized and make it easier to find samples. Consider having a lab-wide freezer clean-out event.

10. Raise freezer temperatures

Store samples at the highest temperature possible. Not all samples must be kept in freezers that run at their lowest temperature. Raising the temperature increases the life of the freezer and saves energy. Raising freezer temperatures

HOW TO: HOLD A FREEZER CLEAN-OUT EVENT

- Inform the lab in advance and encourage participation from all members.
- Create a schedule and have researchers sign up for time slots when they can remove materials from the freezer.
- All samples that are going to remain in the freezer should be labeled and entered into a database.
- Make sure the lab manager is present at the event in case anyone has questions.
- Remove excess ice using a rubber mallet (metal tools may damage freezer coils).
- Once the cleanout is complete, try to consolidate space and unplug any freezers that are no longer needed. If this is not an option, fill excess space with water bottles (filled with water) so that the freezer maintains temperature until more samples fill in.
- Contact EHS personnel to ensure that all unwanted samples are disposed of properly.

from -80 to -70 degrees saves up to 30% of the energy it uses and research shows that many samples keep just as well at -70.

11. Share a freezer with a neighboring lab

Consider sharing partially filled freezers with other labs. Combine compact freezers into one regular-sized freezer. This saves energy and floor space.

12. Defrost and clean refrigerator/freezer coils

Defrost freezers when the ice becomes about 2 cm thick and vacuum the condenser coils outside the freezer when dust collects. When an ice layer builds up covering the coils, the compressor must run longer to maintain its temperature. Defrost the freezers every time there is a clean-out of materials. Defrosting

the freezer saves energy and storage space. Investigate the possibility of setting up an annual preventative maintenance contract with Facilities Services personnel to make sure all the lab freezers are working properly. To contact Facilities Services, call (919) 962-3456.

LIGHTING

13. Turn off the lights

Make sure the last person to leave the lab turns off the lights. Use task lights when there are few people in the lab.

14. Turn hall lights off when standby lights are sufficient

Hallways often can use lower lighting, but make sure that your coworkers are able to work with reduced hallway lights.

WATER CONSERVATION

1. Do not use single-pass cooling equipment

Many lab instruments and processes require some kind of cooling, but single-pass cooling wastes a lot of water. Consider running a recirculating loop through a cold water bath, or moving the process to a cold room. Other techniques such as a recirculating system with air-cooled water may be possible with the right equipment. This fairly simple change can reduce water use by thousands of gallons each year.

2. Do not use water-powered vacuum aspirators

Most labs have a vacuum pump that may be used to power the aspirator instead of running water. Ask a colleague or PI for this equipment. It may save over 200 gallons of water per hour, and the mechanical vacuum may also be more reliable and stronger than a water-powered one.

3. Use tap water rather than deionized water whenever possible

Deionized (DI) water is easy to use; however, the stills used to filter it require a lot of energy and water. Always use the lowest water grade acceptable for the specific task. If necessary talk to colleagues about using lower-grade water for certain rinsing or flushing tasks. This not only conserves water in the lab, but ensures that higher-quality water is available when it is really needed.

4. Use water timers on continuous water use devices and set them to the minimum necessary time

Everyone forgets to turn the water off sometimes, but water timers solve this problem in an efficient and easy manner. If your lab has them, make sure to set them to

GREENLIGHT:

RANDY SMITH

DUKE UNIVERSITY

RANDY SMITH, The Biology Departmental Manager at Duke University, created a Green Labs certification program with eight areas: management/training, energy conservation, water conservation, chemical storage/use, purchasing, recycling/waste reduction, field work, and conference travel. Labs also earn bonus points for extra green behavior. For example, one lab calculated how long their machines took to start up, and made stickers that say: "This machine takes only ___ minutes to start; turn it off at night!"

The program has three certification levels: Bronze, Silver, and Gold. As of this writing, Duke has 10 Green Labs, all Gold. Certified Labs receive a sticker indicating their level; Mr. Smith said that this sparks friendly competition.

Duke's biology department has also invested in energy-reducing equipment. They have removed excess fume hoods, which costs \$5,000 per hood but pays off in energy savings.

Smith said he hopes to continue to expand his program and spread awareness of the importance of greening labs.

the minimum necessary time. If your lab does not have them, ask your PI, lab manager or building manager about installing them. If it's not possible to get water timers in your lab, the next best thing is to post signs reminding people to turn the water off.

5. Install water misers on equipment such as autoclaves and sterilizers

Water misers can reduce the water consumption of these devices by 50% or more, and may also provide significant monetary savings over time. Ask your PI, lab manager or building manager about installing water misers on equipment that does not have them.

6. Use autoclaves, dishwashers, and other devices efficiently

Try to purchase the most efficient equipment and turn off devices such as stills during times when they are not in use, such as nights and weekends. One simple way to improve efficiency is to create a sign-up sheet for autoclaves and dishwashers so lab workers can coordinate their use. This saves water and energy by ensuring that energy-dense autoclaves and dishwashers are not used for only one or two items at a time.

7. Report water leaks in the lab immediately

Make sure to turn off any dripping faucets or other sources whenever you spot them. A dripping faucet can waste over 600 gallons of water per year. Get leaks fixed by maintenance personnel. A larger problem, such as a constantly running toilet, can waste over 130,000 gallons per year. If you discover one of these larger leaks, report it to the lab manager or building administrator immediately.

WASTE REDUCTION

1. Follow proper recycling procedures

Divert waste from landfills by recycling. Aluminum and steel cans, plastic and glass bottles, non-bottle plastics #2, #4, and #5, mixed paper, corrugated cardboard, and lab plastics can be disposed of in the blue recycling bins provided by the Office of Waste Reduction and Recycling. Most lab plastics, including pipette tip boxes, plastic bottles, cases, and flasks, are non-hazardous materials labeled #2, #4, or #5. Empty chemical bottles can be recycled as long as they did not contain a hazardous chemical. Follow the guidelines in the Laboratory Safety Manual; EHS can recycle many additional materials, such as non-halogenated solvents and lead, when they are properly labeled for pick-up.

Some items require special handling; these include batteries, aerosol cans, compact fluorescent bulbs, polystyrene packing peanuts, printer cartridges, non- PCB

ballasts, metal shavings, and used oil. Please see <http://www.wastereduction.unc.edu/CampusRecycling/WhatCanIRecycle> for a full list of recyclable items and procedures.

If your lab is interested in a pilot recycling program for plastic film and packaging, email Office of Waste Reduction and Recycling at recycling@facilities.unc.edu. OWRR will provide containers, but your lab must be willing to deliver recyclables to OWRR. UNC services cannot recycle Pyrex (borosilicate) glass or block polystyrene (Styrofoam). Please call OWRR at (919) 962-1442 or email at recycling@facilities.unc.edu if you have questions,

2. Maintain a chemical inventory and audit chemical supply at least yearly to prevent over-purchasing and ensure that expired chemicals are disposed of properly

Audit chemical supplies annually and purchase only what is necessary. Only buy in bulk if you

know the chemicals will be used. The best way to reduce waste is to minimize the volume of materials purchased. All hazardous chemicals should be documented in lab safety plans and in the EHS Chemical Inventory System when purchased; the inventory can be accessed at <http://ehs.unc.edu/ih/chemical/inventory.shtml>.

3. Label, store, and dispose of hazardous chemicals and materials according to EHS guidelines

Labeling, storing, and disposing of hazardous substances according to EHS guidelines will not only improve lab safety, but will help maintain chemical inventories and reduce the volume of hazardous waste. Labs should follow four Ls for storing hazardous materials: Lids, Leaks, Labels, and Location. Fill out the online e510 forms for EHS to pick up when waste is generated, rather than allowing it to build up.

Further information about the 4 Ls can be found at http://ehs.unc.edu/environmental/docs/IIII_09.pdf and instructions for labeling hazardous waste can be found at <http://ehs.unc.edu/ih/lab/labels/>. More information about disposal can be found in the Lab Safety Manual (Chapter 12), which can be accessed at <http://ehs.unc.edu/manuals/laboratory/>.

4. Practice green chemistry to reduce the volume of hazardous chemicals used

Green chemistry can minimize hazardous waste generation. MIT's Green Chemical Alternatives Purchasing Wizard allows users to search for non-hazardous chemical alternatives for experiments. The tool provides a list of solvents and less hazardous and more environmentally benign chemicals that could

be substituted. Access this tool at <http://ehs.mit.edu/site/content/green-chemical-alternatives-purchasing-wizard>.

5. Inform EHS of lab closeouts and moves and follow lab Closeout/Move Procedures

Lab closeouts and moves have increased in recent years, and it is extremely important that PIs contact EHS as early as possible to inform them of the close out or move. Lab closeout/moving procedures can be found at <http://ehs.unc.edu/ih/lab/move.shtml>. Informing EHS of the move early allows them to collect surplus material for distribution to other labs and treat waste properly, safely recycle, or dispose it. Contact EHS at (919) 962-5507.

6. Use chemicals/reagents on a first in - first out basis

Use the oldest chemicals first to ensure that they are fully utilized. Buy chemicals at the pace you need them, not in bulk. Buying in bulk creates a surplus of unused chemicals or reagents. Researchers who have a large amount of a viable chemical can contact EHS to ensure that it can be made available to another lab (919-962-5507).

7. Eliminate all elemental mercury

Mercury is one of the most damaging environmental toxins, and UNC-Chapel Hill instituted a Mercury Free Policy in 2009. EHS has exchanged over 10,000 mercury thermometers for alcohol thermometers, but elemental mercury spills still occur on campus and pose significant risk to human and environmental health. Eliminate all non-essential mercury in your lab by contacting EHS for disposal. Further information about UNC's Mercury Free Policy can be found at <http://ehs.unc.edu/ih/mercury.shtml>.

PURCHASING

“Green actions don’t compromise research—they simply make it more efficient.”

Christina Lebonville, Lab Manager, UNC Chapel Hill Psychology Department

1. Consolidate orders and order less

Consolidating orders and eliminating small orders (such as orders under \$100) reduces packaging as well as the emissions and energy associated with transport of materials. An inventory of current materials will promote more efficient purchasing. Communicate inventories with other labs and only order lab and office materials you need to avoid a surplus.

2. Order less material

Reduce the amount of hazardous material that enters your lab by purchasing only the amount you need. Disposal costs of unused chemicals

will offset the increased initial cost of purchasing a small quantity. See if another lab on campus can share.

3. Order products that are less hazardous

Consider utilizing the MIT Green Chemical Alternatives Purchasing Wizard to help identify alternative chemicals and processes for your lab. This is a tool that was designed to help reduce the amount of hazardous waste in research labs.

Additionally, order products that can replace the hazardous materials your lab must use for experiments. See example list on next page.

WHAT DOES YOUR LAB DO TO INCORPORATE GREEN PRACTICES?

Our lab actively recycles materials collected by the Office of Waste Reduction and Recycling program: lab plastics, glass bottles, cans, and paper. We volunteered to test plastic bag recycling in a pilot effort with the Office of Waste Reduction and Recycling. We try to be conscientious about turning off lab equipment when not in use. Finally, our lab tries to reuse disposable items when feasible. This is true with lab supplies, but also with non-lab items like plastic cutlery. We try to clean and reuse plasticware used for lunches and lab parties.

4. Order products from companies that conserve materials or use recycled content for packaging

Many companies are now making an effort to utilize environmentally friendly materials and processes when distributing equipment. See examples below.

Hazardous Material Replacements:

- SYBR Safe (distributed by Invitrogen)- a DNA stain designed to replace the more hazardous ethidium bromide, it has a proven reduction in mutagenicity
- Safe Imager Transilluminator (distributed by Invitrogen) - a light box designed to replace harmful ultraviolet light used for viewing stained gels (DNA, etc.)
- Bio-Safe Coomassie Stain (distributed by Bio-Rad)- a dye designed to replace the traditional Coomassie stain used for detecting proteins in electrophoresis gels; this version is non- hazardous and also

eliminates the need for methanol and acetic acid for destaining

Recyclable Packaging Products

- Continental Lab Products pipette tip reloading systems reduce waste by 60% by using re-usable tip boxes
- Corning Labware and Fisher Scientific (companies UNC already uses) make centrifuge tubes and serological pipettes which can be bought in bulk
- Friendly Green™ Wipes (distributed by Blue Thunder Technologies) is an alternative to traditional Kimi Wipes
- Phoenix STAR Petri dishes- use 35% less plastic than conventional dishes
- Kimberly Clark recycled paper towels and wipes (also Fisher Scientific)
- VWR Next Generation Pipette Tip Refill System has 17 different tip styles and uses 100% renewable packaging

GREEN OFFICE

1. Utilize electronic document management to reduce the amount of paper used. Set printer and copier default settings to double-sided printing

Reading and storing journal articles online rather than printing hard copies reduces paper consumption. Placing a visual reminder near printer and copier stations will remind users of this practice. Keep a stack of previously used one-sided paper near printer for scratch paper. When you do have to print, decrease margin width and print on both sides to minimize paper and printing electricity. Also, consider using your printer's economy/draft printing quality to reduce ink usage or by printing multiple pages per sheet.

2. Use natural lighting instead of turning on lights when possible

Lights should be turned off when not in use during the day and always at night. Common areas, bathrooms and conference rooms are not

always occupied; installing motion detectors in these places will help conserve energy.

3. Plug computers and electronics into power strips that are easily accessible and can be turned off at the end of the day

Computers are the largest energy consumers in the office. Enabling power management settings on computers and converting to virtual desktops are two easy practices with immediate results. Plugging computers and electronics into power strips to cut off multiple devices at once prevents power surges. Implement an office policy to shut off power strips at the end of each day. Devices such as computer monitors use energy until manually powered off.

4. Use conference calls and webinars instead of traveling

Telecommuting eliminates travel time and increases workable hours. UNC offers several types of communication software with video,

“Being green means finding a home for unused supplies instead of throwing them away. Material sharing is in the best interest environmentally AND financially.”

Christina Lebonville, Lab Manager, UNC Chapel Hill Psychology Department

phone, and instant message capabilities. Microsoft Lync allows communication with another person who is on the same Activity Directory Domain (ad.unc.edu). Lync access only requires an ONYEN to access. H. 323 is a low-cost method of video conferencing with high connection speed and good video quality. ISDN (Integrated Services Digital Network) is a way of communicating over ordinary telephone lines. ISDN charges range from \$35 to \$90 per hour depending on the connection speed.

5. Introduce, review and remind staff of correct recycling practices at meetings and with visible signs near recycling bins

During lab orientation, include information about laboratory sustainability practices along with standard safety information. Review recycling practices regularly at meetings or through email to ensure that all members of the office are aware of recycling options. Place recycling containers at desks and in central locations to facilitate compliance, and publicize these policies with reminder signs.

6. Purchase chlorine-free recycled paper and consolidate office supplies

The chlorine processes used by the paper industry consumes a lot of water result in

air and water pollution as well. Purchasing chlorine-free, recycled paper is the more responsible choice, and is often cheaper as well. In addition to paper supplies, make an effort to purchase only recycled or remanufactured laser and copier toner cartridges. Coordinate with other offices and labs to purchase these supply orders so that you can order together in bulk and eliminate smaller purchases.

Reduce unwanted mailing by removing names from mailing lists and sharing periodicals, journals and other mailings among lab employees.

7. Use reusable dishware instead of disposable and encourage staff to bring their own as well

Disposable dishware and cutlery should be removed from the office entirely. In the lunch room, replace disposable dishware such as coffee cups with permanent ware and use large condiment containers instead of individual packets. A central water cooler or water bottle refill station will help reduce bottled water; encourage staff to bring their own reusable water bottles.

COMMITMENT PLEDGE

PLEDGE TO MAKE UNC LABS A LEADER IN SUSTAINABILITY

This Guide has provided you with a set of actions, everyday choices and conscious behavioral changes that can improve the environmental footprint of your lab.

Signing the Carolina Green pledge indicates your individual commitment to helping make UNC a healthier, more environmentally-friendly, and sustainable campus. Take the Sustainability Pledge online at: <http://www.carolinagreen.unc.edu/OnlinePledge>

Signing the pledge below commits your lab to adopting more sustainable practices.

"I pledge to take action to conserve the natural resources I use every day. I understand that I have the power, through my behavior and decisions, to reduce the environmental impact of my lab. I pledge to make choices that will have a positive effect on the environment, campus, and community in which I live and work."

NAME: _____

LAB: _____

DATE: _____

DEPT: _____

APPENDIX

INTERVIEWS

- Ball, Louise (Nov. 07, 2013) Professor, Department of Environmental Sciences and Engineering at the Gillings School of Global Public Health, UNC-Chapel Hill
- Cating, Emma (Nov. 01, 2013) Doctoral Candidate, Chemistry Department, UNC-Chapel Hill
- Doyle, Allen (Aug. 29, 2013) Sustainability Director, University of California-Davis
- Eskew, Nina (Oct. 31, 2013) Director, Undergraduate Labs, UNC-Chapel Hill
- Koza, Mary Beth (Oct. 04, 2013) Director, Department of Environment, Health, and Safety, UNC-Chapel Hill
- Lebonville, Christina (Sept. 12, 2013) Lab Manager, Psychology Department, UNC-Chapel Hill
- Lentz, Thomas (Oct. 10, 2013) Postdoctoral Research Associate, UNC-Chapel Hill
- Martin, Chris (Nov. 07, 2013) Director of the Office of Energy Management, UNC-Chapel Hill
- McConocha, Paul (Nov. 11, 2013) Manager, Energy Management Office, North Carolina State University
- Mulvihill, Marty (Sept. 15, 2013) Executive Director, Berkeley Center for Green Chemistry
- Parker, Steve, (Sept. 24, 2013) Hazardous Materials Manager, Department of Environment, Health, and Safety, UNC-Chapel Hill
- Ramirez-Aguilar, Kathy (Oct. 22, 2013) Green Labs Program Manager, University of Colorado at Boulder
- Smith, Randy (Sept. 19, 2013) Departmental Manager, Biology, Duke University Certification Program

RESEARCH

- Boston University Green Office
- University of Pennsylvania Green Labs Guide
- Duke University Green Labs Website
- Harvard University Green Labs Best Practices Guide
- University of California-Davis Green Labs Scorecard and Green Labs Forum
- University of California-Davis LabRATS Program
- UNC-Chapel Hill Department of Environment, Health, and Safety website
- UNC-Chapel Hill Laboratory Manual, Chapter 12
- UNC-Chapel Hill Office of Waste Reduction and Recycling website
- UNC-Chapel Hill Waste Minimization Program, Department of Environment, Health, and Safety (2009, 2013 DRAFT)
- University of Texas-Austin Green Labs Best Practices Guide

ACKNOWLEDGMENTS

Special thanks go out to:

- Elizabeth Shay, Assistant Professor, Institute for the Environment
- Susan Caplow, Graduate Student, Curriculum for the Environment and Ecology
- Amy Preble, Recycling Coordinator, Office of Waste Reduction and Recycling
- Catherine Brennan, Chemical Hygiene Officer, Department of Environment, Health and Safety
- Thomas Lentz, Postdoctoral Research Associate, Gene Therapy Center
- And the Green Labs Committee of UNC-Chapel Hill

GREENLIGHT: UNC-CHAPEL HILL

As a living laboratory for sustainability and the best value in higher education, **UNC** has an innovative, high performance campus. Two new LEED Gold lab buildings, energy efficient systems, improved operations and maintenance practices, and sustainable behaviors have helped UNC reduce its energy use by 31% per square foot since 2003 and potable water by 60% per square foot since 2000. A “Shut the Sash!” campaign, led by the Renewable Energy Special Projects Committee, reminds lab workers to close fume hoods when not in use. Newer variable air volume (VAV) fume hoods are installed in lab buildings across campus, including Caudill, Chapman, Genome Sciences, Koury Oral Health Sciences, Murray, and Venable. To save potable water, many labs have replaced water-powered vacuum aspirators with mechanical ones. In 2009, UNC adopted a mercury-free policy to eliminate all non-essential uses of elemental mercury to reduce exposure and pollution. A lab recycling program diverts waste from the landfill. Most non-hazardous lab plastics labeled #2, #4, or #5, including pipette tip boxes, plastic bottles, cases and flasks, can be recycled. Lab Closeout Procedures allow EHS to collect surplus materials for reuse in other labs and chemical inventories help reduce the volume of hazardous waste.



Contact us at:
greenlabs@unc.edu