



Berkeley
UNIVERSITY OF CALIFORNIA

Green Labs

Sustainability Guide





What is a Green Lab?

A Green Lab performs research in the most sustainable manner possible, executing mindful experiments that excel in efficiency and waste prevention from the planning and purchasing stages throughout the duration of each project.





Why does it matter?

On a per square foot basis, research labs require about five times more energy to operate than classrooms and office spaces.

Decreasing the footprint of campus labs represents a major step in promoting the longevity of our planet, the success of our economy, and our own health. Now let's take a look at some facts...

<https://www.epa.gov/greenchemistry/benefits-green-chemistry>





50%

Of water usage at universities attributed to the purposes of research

\$65.5 Billion

Can be saved by the research industry by 2020 with the conversion to use of greener chemicals

If half of the labs in the US reduced energy consumption by 30%...



The nation would save an energy equivalent of that used by 840,000 households, save \$1.25 billion annually and reduce CO2 emissions by 19 million tons





How much does it really cost?

1 fumehood = 
Equivalents in energy consumption

 **x** ¹ **Condenser column** =  **3,600**
24 hours **Liters of H₂O**



367,193 pounds of chem waste produced
by UC Berkeley each year





5 Principles of Sustainable Science

1. Awareness and Cooperation
2. Prevention and Planning
3. Conservation
4. Efficiency
5. Safety



1. Awareness & Cooperation



Quick Tips:

Researchers can be proactive and aware.

Ask questions: “Is this the best way to store these samples?” and “How can I be more of a leader in my lab and on campus?”

Look for educational opportunities, create those where they may be lacking, and discuss green science around the community, nation, and world.

- Avoid paper towels and use a mop to clean up spills.
- Use signage with phrases such as “It’s OK to turn me off!”





2. Prevention & Planning



Start Now, Here's How!

It is easier to prevent waste and damage rather than try to rectify it after the fact.

Plan your experiment to be sustainable: avoiding waste, purchase from greener vendors, buy in bulk, use what you already have... It is never too early to start thinking sustainably.

- Implement peer review
- Store most frequently used samples in the front of freezer shelves or in the top racks in liquid nitrogen containers
- Check lid seals frequently
- Defrost freezers at least once per year
- Avoid cold shipments by seeking out companies that are willing to send DNA samples with dry room temperature storage techniques





Purchasing Tips

- Energy star equipment
- Choose vendors wisely
- Purchase autoclavable glassware
- Buy recyclable materials
- Be cognizant of packaging
- Centralize chemical purchases

Be proactive: Think about potential alternatives to your work. Discuss ideas with vendors and distributors or send them to Green Labs!






3. Conservation



Each item in this list can be conserved in a laboratory when proper practices are adopted.

Conservation involves practices such as using less, reusing more, and running economical experiments.

If you have questions or suggestions, please reach out to the Green Labs team at any time.

- Water
 - Money
 - Energy
 - Time
 - Money
- 



How to Conserve:

- Fit timers to drying ovens and other equipment; label with “turn me off!” stickers.
- Boil only the exact water you need: carefully quantify all materials needed for experiments.
- Shut fume hoods when not in use.
- Hold completed overnight PCR reactions at 10 C rather than 4 C.
- Reuse old boxes and coolers for dry ice.
- Remember: The cheapest and greenest equipment is that which you don't need to buy!

Be a minimalist!





4. Efficiency



Efficiency and sustainability are directly correlated. Efficiency reduces cost and energy consumption, minimizing the inputs required to produce outputs. An increase in lab efficiency automatically makes it more sustainable.

- Reduce waste
- Minimize steps in experiments
- Maintain equipment
- Use time and space wisely
- Perform closed-loop experiments





Efficient Habits

What would a Green Lab do...?

- Before disposal, look for opportunities for reuse or recycling.
- Donate surplus equipment to UC Surplus.
- Use stackable pipette tip boxes or refill old ones by purchasing tips in bags.
- Utilize Freezer de-icing kits.
- Use plates of the correct size.



5. Safety



Safety must be the **number one priority** in a lab.

Safety is defined as the “control of recognized hazards to achieve an acceptable amount of risk”. Taking precautions is an essential aspect of research and its importance must not be overlooked.

Don't be afraid to communicate your concerns with those around you or, if necessary, building and lab managers.





Prioritizing Safety

Keep these ideas in mind anytime you are in the lab:

- Responsible and cautious lab behavior
- Safe chemicals and methods
- Cleanliness and care
- Respect
- Avoid rushing to finish tasks
- Awareness of expiration dates, improperly functioning equipment, and the status of the building.
- Ensure that all of those working in the lab are aware of safety procedures
- Provide opportunities for lab education
- Use non-mercury thermometers
- Cover chemical beakers when not in use





20 Quick and Easy Sustainability Solutions

1. Use glass instead of plastic
2. Keep inventory up to date
3. Purchase energy efficient appliances
4. Facilitate a freezer cleanout
5. Chill up your freezer
6. Turn off lights and electronics when not in use
7. Use healthier cleaning products
8. Recycle broken equipment
9. Shut fume hoods
10. Utilize MIT's Green Chemical Alternatives Wizard
11. Speak up and be a leader
12. Participate in an annual lab cleanout
13. Post signage
14. Store chemicals in approved locations
15. Use appropriately sourced water
16. Maintain temperature of lab environment
17. Avoid cold shipments
18. Switch to sustainable pipettes
19. Make sure everyone is educated on current sustainability & safety practices in the lab
20. Get Green Labs certified!



Get Involved



- Encourage undergraduate research assistants to become involved in on-campus sustainability initiatives
- Get Green Certified!
- Subscribe to the Green Labs newsletter
- Hold lab meetings to discuss improvements that could be made in your lab





UC Berkeley Recycles plastics



#1

#2

#5

Non-contaminated plastics may be dropped off in any CiviCorps blue recycling bin located in your building.
No chemical residues, biological or infectious substances are allowed.



Other Resources



<http://greenlabsplanning.org/>

<http://ehs.mit.edu/site/content/green-chemical-alternatives-purchasing-wizard>

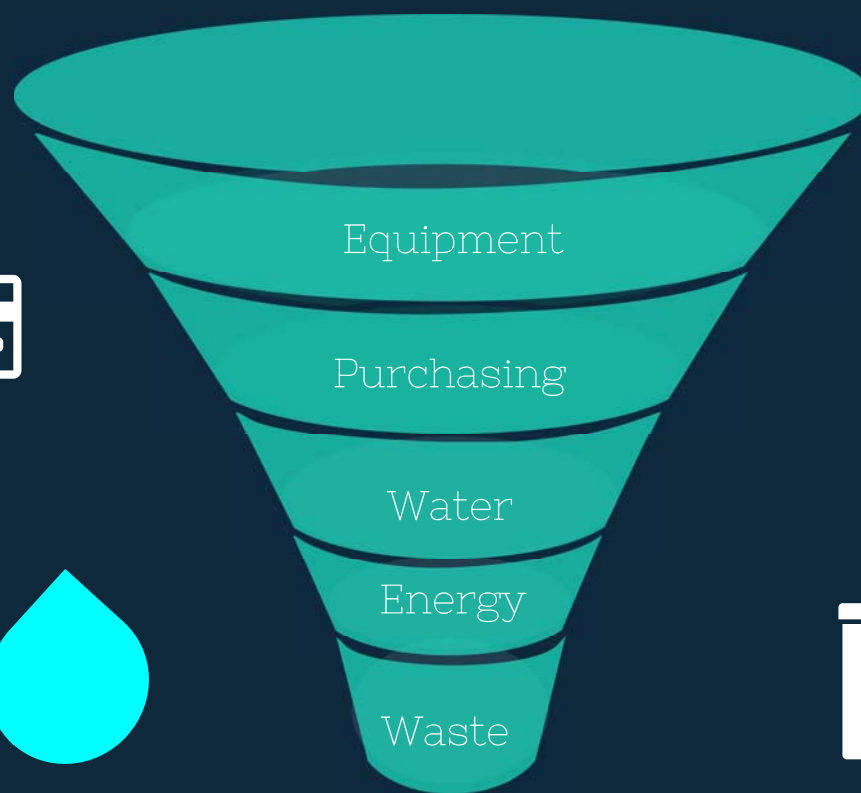
<http://www.greenchemistrycommitment.org/>


<http://repro-ecommerce.ucdavis.edu/fume-hood-stickers-387.html>

<http://www.greenchemistrycommitment.org/>




Key areas of focus





Are you interested in helping Cal take
the lead in lab sustainability?

Our process is easy!



Complete the Lab
Checklist & take
photos

Upload files to
Green Lab
folder &
schedule
walkthrough

**Get
Certified!**



UC BERKELEY GREEN LABS

PLASTIC LAB MATERIALS RECYCLING GUIDE



fully-recyclable back to original product



recyclable into lower-quality product



single-use only; avoid when possible



compostable product; single-use appropriate

#1

PETE



#2

HDPE



#3

PVC



#4

LDPE



#5

PP



#6

PS-E



#7 OTHER





Thanks!

Any questions?

Contact David Scrimger
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