Cleveland State University

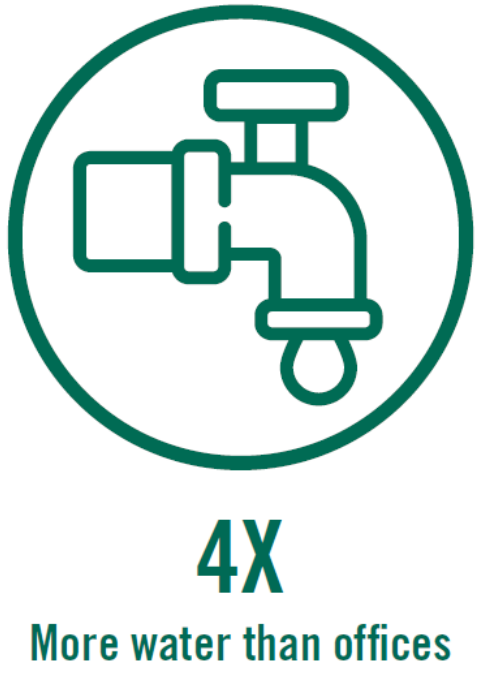
GREEN LAB PROGRAM

Strategies to reduce energy, water and waste in campus labs

Laboratories at CSU are an important part of research, innovation and education.

AND…

Labs are resource intensive and consume significant amounts of energy and water!



In fact, laboratories are often the most energy and resource intensive spaces on campuses.

You can help by designing experiments to minimize electricity and water usage, purchasing energy efficient equipment and green supplies, sharing equipment when feasible, utilizing green chemistry practices and sharing your knowledge of green lab practices.

Source: https://secondnature.org/solutions-center/green-labs/

Green Lab Themes

The CSU Green Lab program was designed to reduce resource consumption and cut costs in labs without impacting productivity. There are four focus areas:

1) Energy Conservation

2) Water Conservation

3) Sustainable Purchasing

4) Waste Reduction

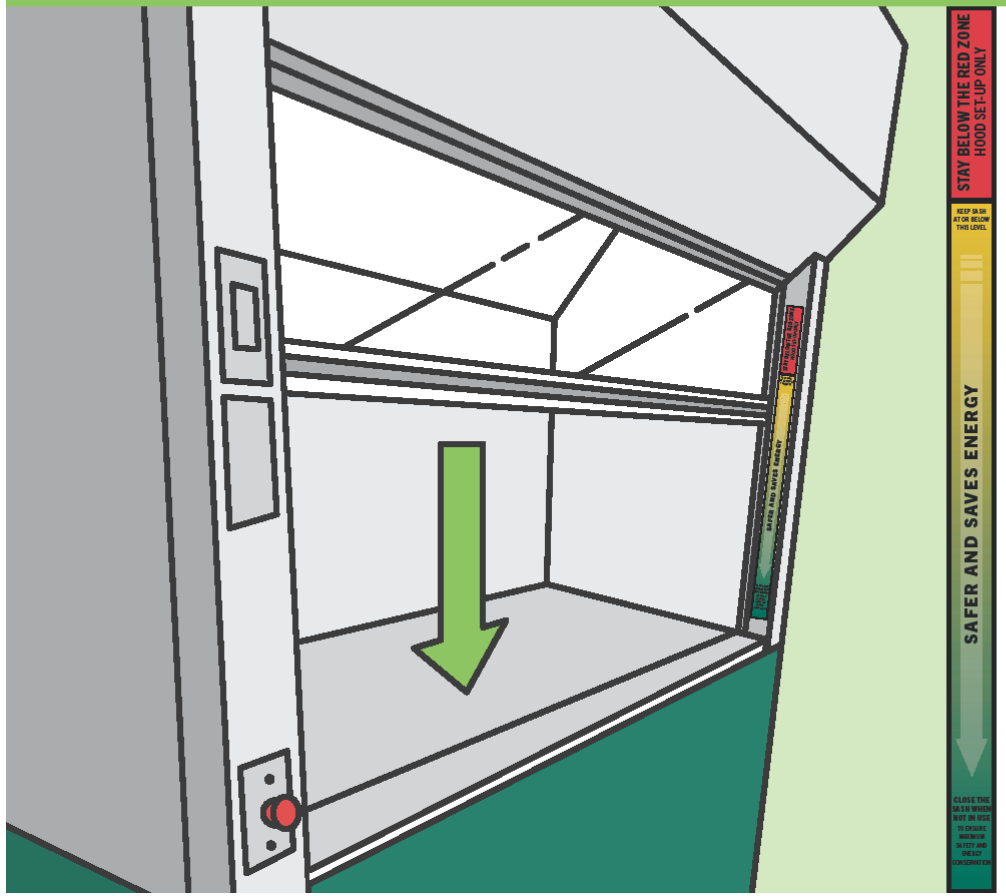
Energy Conservation

Fume Hoods

- If left open, a single fume hood can consume as much energy as **3.5 homes**!
- When the sash is left open, air that has been heated or cooled is exhausted through the fume hood. Continuously conditioning the air and running large fans for ventilation consumes a lot of energy.
- The fume hood sash should only be open when directly manipulating substances within the hood, and only to the level necessary to perform the experiment.

CLOSE THE SASH FULLY WHEN NOT IN USE!

SHUT THE SASH. BE SAFE. SAVE ENERGY.



A single fume hood left open can consume **as much energy as 3.5 homes!**

New stickers remind users that the sash should only be open when setting up and modifying experiments.

Keep yourself safe, avoid chemical exposure and reduce campus energy use by shutting the sash!

Office of Sustainability | Office of Environmental Health and Safety

The red ventilation button is only to be used in an emergency!

Pressing the red emergency button, often labeled “Ventilation Start,” increases the air exchange rates to their maximum capacity while simultaneously maintaining negative lab pressurization. While effective in an emergency, this feature is extremely energy and cost intensive and should never be used unnecessarily.

Pull the red button out to deactivate emergency ventilation.

Appliances - energy saving tips

Use properly sized appliances

- Using oversized equipment consumes significantly more energy than a sufficiently sized countertop version.

Turn off equipment when not in use

- Especially equipment that has to maintain a set temperature whether hot or cold.
- If it can't be turned off, use timers or energy-saving and stand-by modes.

Freezers - energy saving tips

Audit, clean and defrost freezers

- Assess freezer inventory regularly and remove material that is no longer needed. Keeping freezers organized will also limit the time that doors need to stand open.
- Defrost freezers, check door seals, and keep filters and coils free of dust to reduce energy consumption and increase equipment performance and lifespan.

Raise freezer temperatures

- Set refrigerator and freezer temperatures at appropriate levels for the contents instead of the lowest possible temperature.

https://www.freezerchallenge.org/blog/blast-the-ice-jam

When leaving the lab…

Turn off lights and computers

- Switch off lights when the last person leaves the lab.
- Enable power management settings on monitors and computers to enter sleep mode after 10-20 minutes of inactivity.

Water Conservation

Water Conservation

- Shut off water consuming equipment when not in use.
- Set equipment to the minimum flow rate allowable per the manufacturer's recommendations.
- Run glassware washers at full load only.

https://sftool.gov/explore/green-workspace/89/Material/500/laboratory/lab-water-consumption

Water Conservation

Reduce single pass cooling

- Single-pass cooling wastes a lot of water. Consider running a recirculating loop through a cold-water bath. Eliminating single-pass cooling can save thousands of gallons of water each year and prevent the risk of flooding.

Avoid water aspiration when possible

- A single water aspirator can consume 50,000 gallons of water per year. A vacuum pump is often available for the same task, and avoids water waste.

Limit use of de-ionized water

- It takes three gallons of water to make one gallon of deionized (DI) water. Use water purification only when necessary and match the process to the actual quality of water required.

Water Conservation

Use autoclaves efficiently

- Use the right size autoclave for the job and consolidate loads when possible. Don't run an autoclave to sterilize a single box of pipette tips.

Establish efficient lab practices

- Run dishwashers, autoclaves, and cage washers only when full.
- Turn off water when not being directly used.
- Design experiments to minimize water usage.

Report leaks promptly!

- Report all leaks to the FAST Coordination Center on 216-687-2500 as soon as possible.

Sustainable Purchasing

Sustainable Purchasing

Purchase smart and consolidate orders

- Consolidate orders to reduce packaging and emissions associated with transport and delivery of materials.
- Buy tubes and pipettes in bags and refill racks rather than buying pre-filled racks.

Maintain an up-to-date inventory

- Maintain an up-to-date inventory of lab supplies, chemicals and equipment.
- Audit chemical supplies annually and purchase only what is necessary.
- Only buy in bulk if you know the supplies or chemicals will be used before their expiration date.

Sustainable Purchasing

Purchase ENERGY STAR® equipment

- When it is time to replace a piece of equipment, choose the most energy efficient model and look for ENERGY STAR® certified products.
- If ENERGY STAR® is not an option, seek out efficiency features, such as timers on autoclaves and ovens.

Use the least hazardous product

- Identify alternative chemicals and processes for your lab and order products that can replace the hazardous materials needed for experiments.
- My Green Lab has developed **Green Chemistry**, a useful guide for choosing less hazardous chemicals.

Waste Reduction

Waste Reduction

Minimize the volume of materials purchased

- Select reusable products over disposable products whenever possible.
- Use the oldest chemicals first to ensure that they are fully utilized. Buy chemicals at the pace you need them, not in bulk.

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

- Adhering to EHS guidelines not only improves lab safety, but helps to maintain accurate chemical inventories and reduces the volume of hazardous waste generated on campus.

Practice green chemistry to reduce quantities of hazardous chemicals

- Green Chemistry utilizes chemical pathways that result in little to no generation of hazardous substances. Whenever possible, select non-hazardous chemical alternatives for experiments.

Recycling on campus

Divert waste from landfill through the following CSU recycling programs:

- **Paper:** Clean mixed papers can be put in the blue recycling bins, including copy paper, newspapers, magazines, envelopes, junk mail, greeting cards, paperboard boxes (cereal, crackers, etc.) and phone books.

- **Plastic and cans:** Recycling bins for plastic and cans are gray with green lids. You can put plastic bottles, jugs, and containers in this bin along with metal cans.

- **Cardboard:** Flatten clean cardboard boxes and leave by recycling bins for custodians to collect.

https://www.csuohio.edu/sustainability/waste-and-recycling

Additional recycling options

Batteries: Recycle batteries in recycling bins located throughout campus and in select labs.

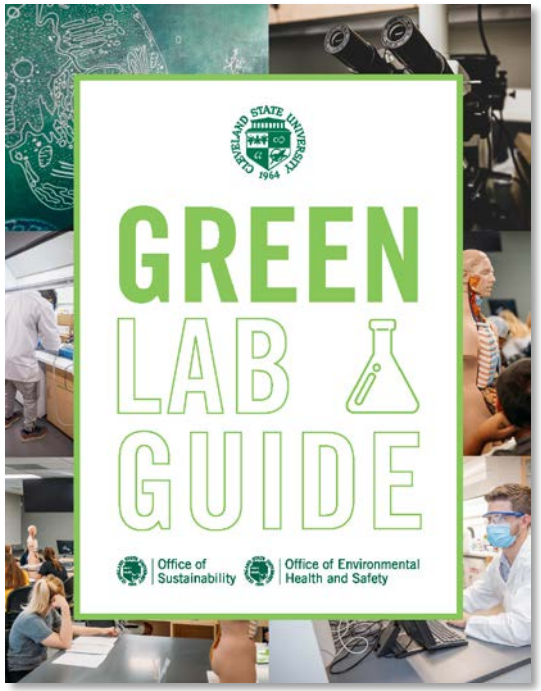
Styrofoam: Reuse Styrofoam boxes and coolers when possible. Clean Styrofoam blocks can be placed next to recycling bins.

E-waste: Recycle electronic equipment through Property Control.

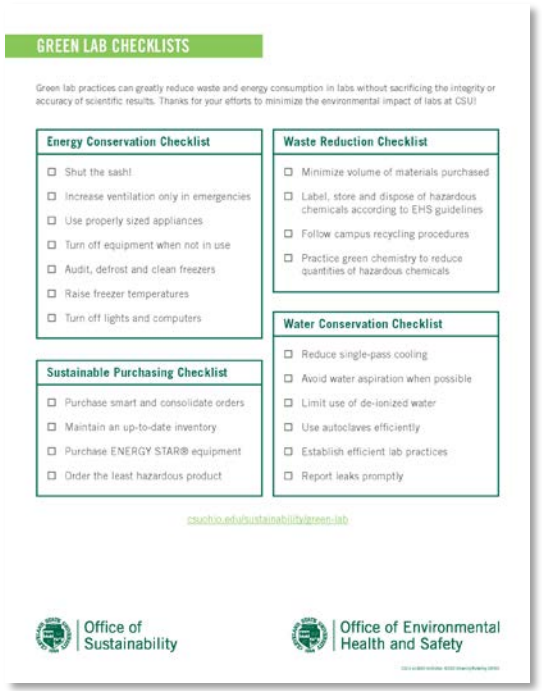
https://www.csuohio.edu/sustainability/waste-and-recycling#batteries

Resources

Green Lab Guide



Green Lab Checklist



GREEN LAB CHECKLISTS

Green lab practices can greatly reduce waste and energy consumption in labs without sacrificing the integrity or accuracy of scientific results. Thanks for your efforts to minimize the environmental impact of labs at CSU!

Energy Conservation Checklist

- ☐ Shut the sash!
- ☐ Increase ventilation only in emergencies
- ☐ Use properly sized appliances
- ☐ Turn off equipment when not in use
- ☐ Audit, defrost and clean freezers
- ☐ Raise freezer temperatures
- ☐ Turn off lights and computers

Waste Reduction Checklist

- ☐ Minimize volume of materials purchased
- ☐ Label, store and dispose of hazardous chemicals according to EHS guidelines
- ☐ Follow campus recycling procedures
- ☐ Practice green chemistry to reduce quantities of hazardous chemicals

Sustainable Purchasing Checklist

- ☐ Purchase smart and consolidate orders
- ☐ Maintain an up-to-date inventory
- ☐ Purchase ENERGY STAR® equipment
- ☐ Order the least hazardous product

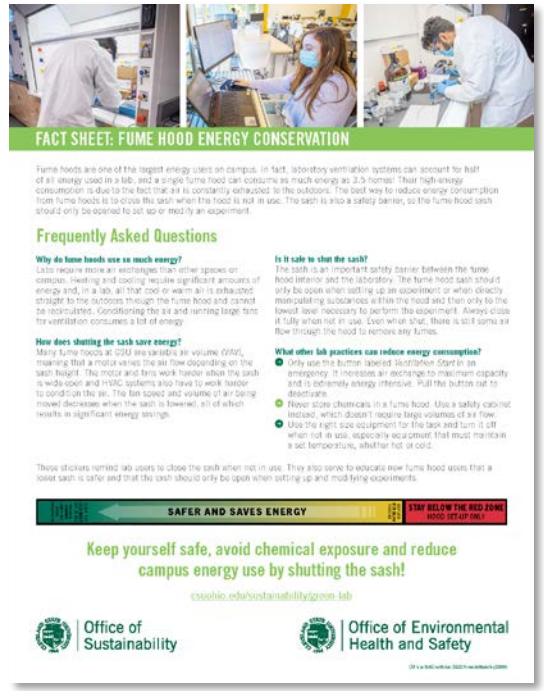
Water Conservation Checklist

- ☐ Reduce single-pass cooling
- ☐ Avoid water aspiration when possible
- ☐ Limit use of de-ionized water
- ☐ Use autoclaves efficiently
- ☐ Establish efficient lab practices
- ☐ Report leaks promptly

csuohio.edu/sustainability/green-lab

Office of Sustainability | Office of Environmental Health and Safety

Fume Hood Fact Sheet



FACT SHEET: FUME HOOD ENERGY CONSERVATION

Fume hoods are one of the largest energy users on campus. In fact, laboratory ventilation systems can account for half of all energy used in a lab, and a single fume hood can consume as much energy as 3.5 homes! Their high-energy consumption is due to the fact that air is constantly exhausted to the outdoors. The best way to reduce energy consumption from fume hoods is to close the sash when the hood is not in use. The sash is also a safety barrier, so the fume hood sash should only be opened to set up or modify an experiment.

Frequently Asked Questions

Why do fume hoods use so much energy?
Labs require more air exchanges than other spaces on campus. Heating and cooling require significant amounts of energy and, in a lab, all that cool or warm air is exhausted straight to the outdoors through the fume hood and cannot be recirculated. Conditioning the air and running large fans for ventilation consumes a lot of energy.

How does shutting the sash save energy?
Many fume hoods at CSU are variable air volume (VAV), meaning that a motor varies the air flow depending on the sash height. The motor and fans work harder when the sash is wide open and HVAC systems also have to work harder to condition this air. The fan speed and volume of air being moved decreases when the sash is lowered, all of which results in significant energy savings.

Is it safe to shut the sash?
The sash is an important safety barrier between the fume hood interior and the laboratory. The fume hood sash should only be open when setting up an experiment or when directly manipulating substances within the hood and then only to the lowest level necessary to perform the experiment. Always close it fully when not in use. Even when shut, there is still some air flow through the hood to remove any fumes.

What other lab practices can reduce energy consumption?
- Only use the button labeled *Ventilation Start* in an emergency. It increases air exchange to maximum capacity and is extremely energy intensive. Pull the button out to deactivate.
- Never store chemicals in a fume hood. Use a safety cabinet instead, which doesn't require large volumes of air flow.
- Use the right size equipment for the task and turn it off when not in use, especially equipment that must maintain a set temperature, whether hot or cold.

These stickers remind lab users to close the sash when not in use. They also serve to educate new fume hood users that a lower sash is safer and that the sash should only be open when setting up and modifying experiments.

SAFER AND SAVES ENERGY | STAY BELOW THE RED ZONE HOOD SET-UP ONLY

Keep yourself safe, avoid chemical exposure and reduce campus energy use by shutting the sash!

csuohio.edu/sustainability/green-lab

Office of Sustainability | Office of Environmental Health and Safety

Green lab practices can greatly reduce waste and resource consumption in labs without sacrificing the integrity or accuracy of scientific results.

Thanks for your efforts to improve the environmental performance of labs at CSU!

For more information

- **CSU Green Lab Program:** https://www.csuohio.edu/sustainability/green-lab
- **CSU Office of Sustainability:** https://www.csuohio.edu/sustainability
- **CSU Office of Environmental Health and Safety:** https://www.csuohio.edu/ehs

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