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# Waste Management Guide

**University of Oregon**
**Sustainable Labs Pilot**

Fall 2024 & Winter 2025

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# Introduction

Welcome to the Sustainable Labs program! We're thrilled to have you on board as we work together to make University of Oregon labs more sustainable. In this guide, you'll find everything you need to earn your waste management badge, plus plenty of extra suggestions to help your lab go above and beyond. While some tasks are required, we've also included many optional ideas for reducing your lab's environmental impact. It's all about making the changes that work best for your space and team.

**This guide is here to support and empower you, not to make you feel like you're falling short**. Our goal is to provide practical, useful tools and information that can easily be applied in your lab. If there is anything in this guide that feels overwhelming or unattainable, we want to know. We are here to help and look forward to working with you on this journey. Now, let's get started!

~ The Sustainable Labs team

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# Badge Snapshot

The waste management badge includes three sections: reduce, reuse, and recycle. Each section has at least one required task, noted at the beginning of the section.

| Section | Requirement(s) |
|---|---|
| **Reduce** | Complete the Reduce section of the **Laboratory Waste Management Plan.** Within the plan, list the following opportunities that are applicable to your lab:<br>○ Reducing materials used in lab protocols<br>○ Product substitutions<br>○ Inter-lab product/reagent sharing |
| **Reuse** | - Complete the Reuse section of the Laboratory Waste Management Plan. Within the plan, list the following reuse opportunities that are applicable to your lab:<br>○ Chemical and non-chemical products<br>○ Items that can be sourced from or donated to UO Surplus and/or the ROSE Room<br>- Visit the online Chemical Exchange Inventory |
| **Recycle** | - Complete the Recycle section of the Laboratory Waste Management Plan.<br>- Set up a hard plastics bin in your lab<br>- Set up a small paper recycling bin in your lab (if one does not already exist) |

A large portion of the waste management badge involves completion of a Laboratory Waste Management Plan. To develop a plan that effectively implements sustainable practices within your lab:

1. Share and review this guide with lab members, especially those involved in protocol development and materials sourcing.
2. Review the plan with lab managers once it is developed.
3. Commit to reviewing the plan annually.

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# Reduce

## Submitting information to complete "Reduce" portion of badge

Please submit a **Laboratory Waste Management Plan** to satisfy the Reduce portion of the waste management badge. You can use the provided template or develop a plan of your own. The plan should include opportunities for reducing materials used in lab protocols, product substitutions, and inter-lab product/reagent sharing.

**Note:** Download the Laboratory Waste Management Plan to make edits. Whether using the template or creating your own plan, see the rest of the document for a list of ideas for how to reduce waste in your lab.

## Reducing material use

**Tips on reducing lab waste** from Nidhi Sharma, a Research Scientist and Lab Manager at Stanford University:

- "**Calculate the minimum number of tubes/plates required for an experiment.** Pause before starting the experiment and calculate the number of tubes/plates you will need for your experiment, and ask yourself, can you reduce the number of samples, such as bacterial colonies, you are going to test; can you plate more seeds on a plate, etc.?
- **Cut the plastic labels to half/quarter.** I [Nidhi] work with plants and use plastic labels to label pots. I have started to cut the labels into four since I can write the genotype easily on a shorter label. That is cutting a 10cm plastic label to 2.5cm, so generating a quarter of the waste.
- **Reduce the amount of tape (autoclave/regular).** Tape is not recyclable and goes to the landfill. Also, autoclave tapes are expensive. If you can reduce the amount of tape used, you will save some money as well! You only need a single "stripe" of autoclave tape to demonstrate that something has been autoclaved.
- **Reduce the amount of culture media.** I have started screening clones by growing a mini-culture (100µL) in a PCR tube. This way I cut down the plastic waste from a 10mL culture tube to a 200µL PCR tube per clone. This is saving a ton of plastic waste!"

### Other tips

- **Find the balance between buying in bulk and right sizing your purchasing orders to fit your needs.** Buying items in bulk can save money, reduce plastic waste, and decrease greenhouse gas emissions associated with transporting goods. However, the benefits of buying in bulk are negated if the item purchased goes to waste. Buy in bulk when you are confident you will need the bulk amount or explore inter-lab sharing opportunities. Make a note of how much of a material is wasted and order less the next time.
- Include waste reduction as part of student/employee training.
- Date chemical containers when received so older and partially-emptied ones are used first.
- When researching a new or alternative procedure, include the amount of waste produced as a factor in your decision-making process.

# Opportunities for inter-lab materials sharing

Reduce the number of reagents your lab purchases through inter-lab sharing.

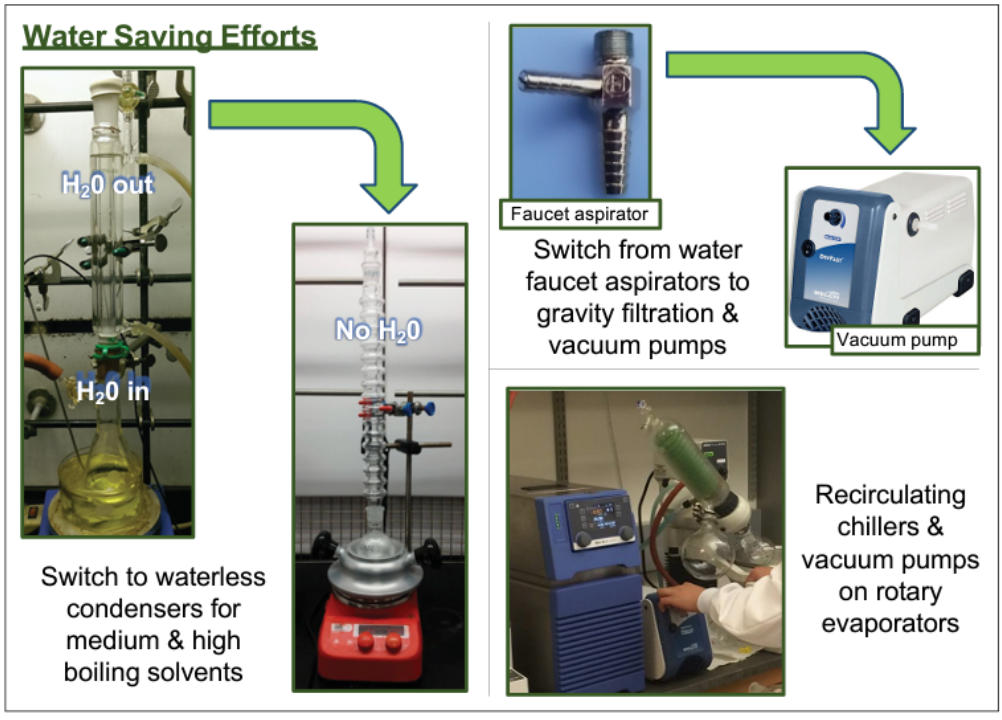
- Develop a list of labs that conduct similar types of experiments and commit to sharing reagents, especially those that require dry ice shipping.
- One lab purchases a reagent, then aliquots it and shares with partner lab(s). When the reagent is next purchased, the other lab buys it and shares.
- Give excess reagents to a neighbor, collaborator, or to the Chemical Exchange inventory.
- When testing a new reagent, ask around in your department/institute to see if anyone has excess they can share before purchasing something you may not end up using.

# Product substitutions

Purchase products that use less materials, that use recycled materials, or that are less hazardous. Hazardous materials waste must be processed in a manner that is often less environmentally friendly than landfill disposal.

## Substitution examples

| Product or process | Substitution | Notes |
|---|---|---|
| Lab consumables and kits | Some products use less material, use recycled materials, are shipped in a more sustainable manner, and/or are produced more sustainably | • Stericup/Steritop-e filtration systems<br>• PolyCarbin lab plastics<br>• QIAwave DNA Blood & Tissue Kit<br>• TopVision agarose tablets<br>• NEB sustainablility efforts |
| Nitrile gloves | Biodegradable gloves contain additives that attract microbes in landfill environments, speeding up the decomposition process to a few years compared to decades or hundreds of years for regular nitrile. | • EcoGloves<br>• Glubbs Biodegradable Nitrile Gloves<br>• Green Monkey gloves |
| RNA extraction | Extract RNA using less hazardous chemicals, reducing the amount of hazardous waste generated and improving safety. | Nwokeoji et al. RNASwift: A Rapid, Versatile RNA Extraction Method Free from Phenol and Chl. *Analytical Biochemistry* **2016**, *512*, 36–46. https://doi.org/10.1016/j.ab.2016.08.001. |
| Isolation and purification of DNA or RNA | Replace phenol-chloroform extractions with kits that use less toxic reagents. | • Zymo Quick-DNA kits<br>• Promega Wizard DNA kit<br>• Qiagen DNA kits |
| Nucleic acid gel staining | Use safer GelRed or GelGreen dyes | Hall, A.C. A comparison of DNA stains and staining methods for Agarose Gel Electrophoresis. Core Research Laboratories. 2019. https://doi.org/10.1101/568253 |
| Histology reagents | Formalin and xylene substitution with greener reagents | Products from Milestone and MilliporeSigma |

| | | |
|---|---|---|
| Cleaning products | Replace hazardous cleaning agents with greener alternatives | • Use biodegradable detergents such as Alconox in place of ethanol-base baths.<br>• Eliminate use of chromic acid cleaning solutions and use Alnochromix, Alconox, Micro, Pierce RBS-35, or similar detergents<br>• Try using detergent and hot water for cleaning of parts instead of solvents.<br>• When solvent is used for cleaning purposes, use contaminated solvent for initial cleaning and fresh solvent for final cleaning.<br>• Use non-halogenated solvents instead of halogenated solvents in parts washers or other solvent processes. |
| Water saving opportunities |  | |

## Substitution options for specific chemicals

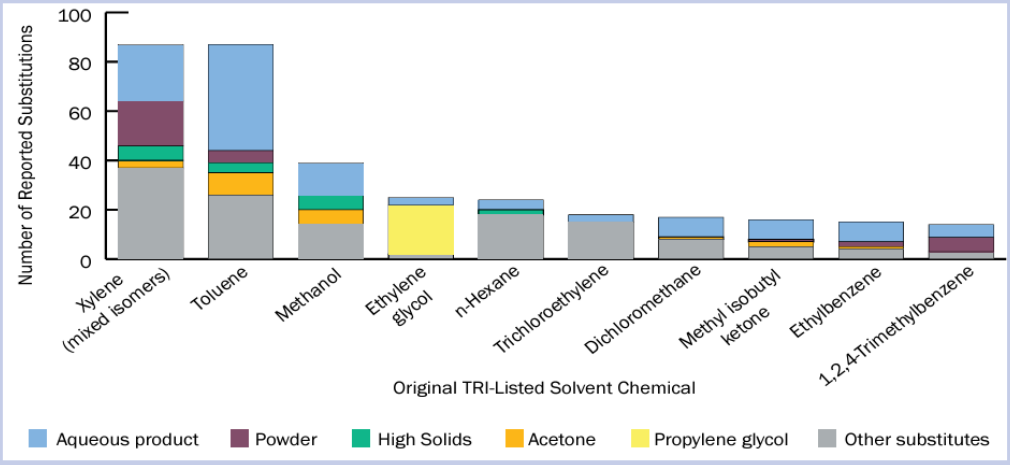
Ohio State University's Environmental, Health, and Safety department provides the following table of hazardous chemical alternatives on their website.

| Original | Substitute | Notes |
|---|---|---|
| Acetamide | Stearic Acid | In phase change and freezing point depression |
| Benzene | Alcohol | |

| | | |
|---|---|---|
| Benzoyl peroxide | Lauryl peroxide | When used as a polymer catalyst |
| Carbon tetrachloride | Cyclohexane | In test for halide ions |
| Chlorinated solvents | Non-chlorinated solvents | |
| Mercuric chloride reagent | Amitrole (Kepro Circuit Systems) | Circuit board etching |
| Mercury salts | Mercury free catalysts (e.g. $CuSO_4TiO_2K_2SO_4$) | |
| Sodium dichromate | Sodium hypochlorite | Kjeldahl digests |
| Sulfide ion | Hydroxide ion | In analysis of heavy metals |
| Wood's metal | Onion's fusible alloy | |
| Xylene or Toluene | Simple alcohols and ketones | |
| Xylene- or toluene-based cocktails | Non-hazardous proprietary liquid scintillation cocktails | |

*Original TRI-Listed Solvent Chemical refers to the starting chemical replaced which is often the TRI chemical on the Form R.*

*While most reported substitutes are not on the TRI list, some facilities transition from one TRI-listed chemical to another (e.g., from xylene (mixed isomers) to o-xylene).*




Learn more about TRI's P2 Information at www.epa.gov/p2

## TRI solvent chemicals and their substitutes

The Toxics Release Inventory (TRI), an Environmental Protection Agency initiative, includes several chemicals commonly used as solvents. Between 2005 and 2020, facilities submitted 1,926 comments related to substitutions of TRI-listed solvent chemicals. A subset of 391 comments describes specific substitutions (e.g., name the alternative chemical or process), reported by facilities in 16 industry sectors. These comments represent 116 distinct substitution combinations for TRI-listed solvent chemicals.

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# Reuse

## Submitting information to complete "Reuse" portion of badge

Please submit the following lists to satisfy the reuse portion of the waste management badge.

- List of planned and fulfilled reuse opportunities. This list should be included in the **Laboratory Waste Management Plan** – **required**
- Visit the online Chemical Exchange Inventory website – **required**
- List of chemicals utilized from EHS emails and the Chemical Exchange – if applicable
- List of any items obtained from UO Surplus or ROSE Room – if applicable
- List of any items donated to UO Surplus or ROSE Room – if applicable

## Why reuse lab materials?

Reusing products helps to reduce waste and to conserve resources. By choosing to reuse, you can save money and lower your lab's impacts on the environment.

A study evaluated $CO_2e$ emissions for four commonly used consumables for mammalian cell and bacterial culture and found that reusable labware had lower $CO_2e$ emissions compared with single-use items, even when factoring in autoclaving and drying. Costs for reusable labware in the study were similar or lower than their single-use counterparts.

Source: Farley, M., & Nicolet, B. P. (2022, January 1). Re-use of labware reduces $CO_2$ equivalent footprint and running costs in laboratories. bioRxiv. https://www.biorxiv.org/content/10.1101/2022.01.14.476337v1.full

## Accessing and using the Chemical Exchange Inventory

Select 3-4 items for possible reuse from the online Chemical Exchange Inventory. Read **Accessing the Chemical Exchange Inventory** to learn how to use the Chemical Exchange.

## Chemical and non-chemical reuse opportunities

### In the lab

*EHS emails with reuse opportunities*

EHS sends out emails with used chemical and non-chemical items collected from labs. You can reply directly to those emails to request the specified items.

*Examples of chemicals and solutions that can be reused*

- Ponceau S dye for protein membrane visualization
- Running buffer for DNA or protein gels

*Use reusable labware instead of single-use items*

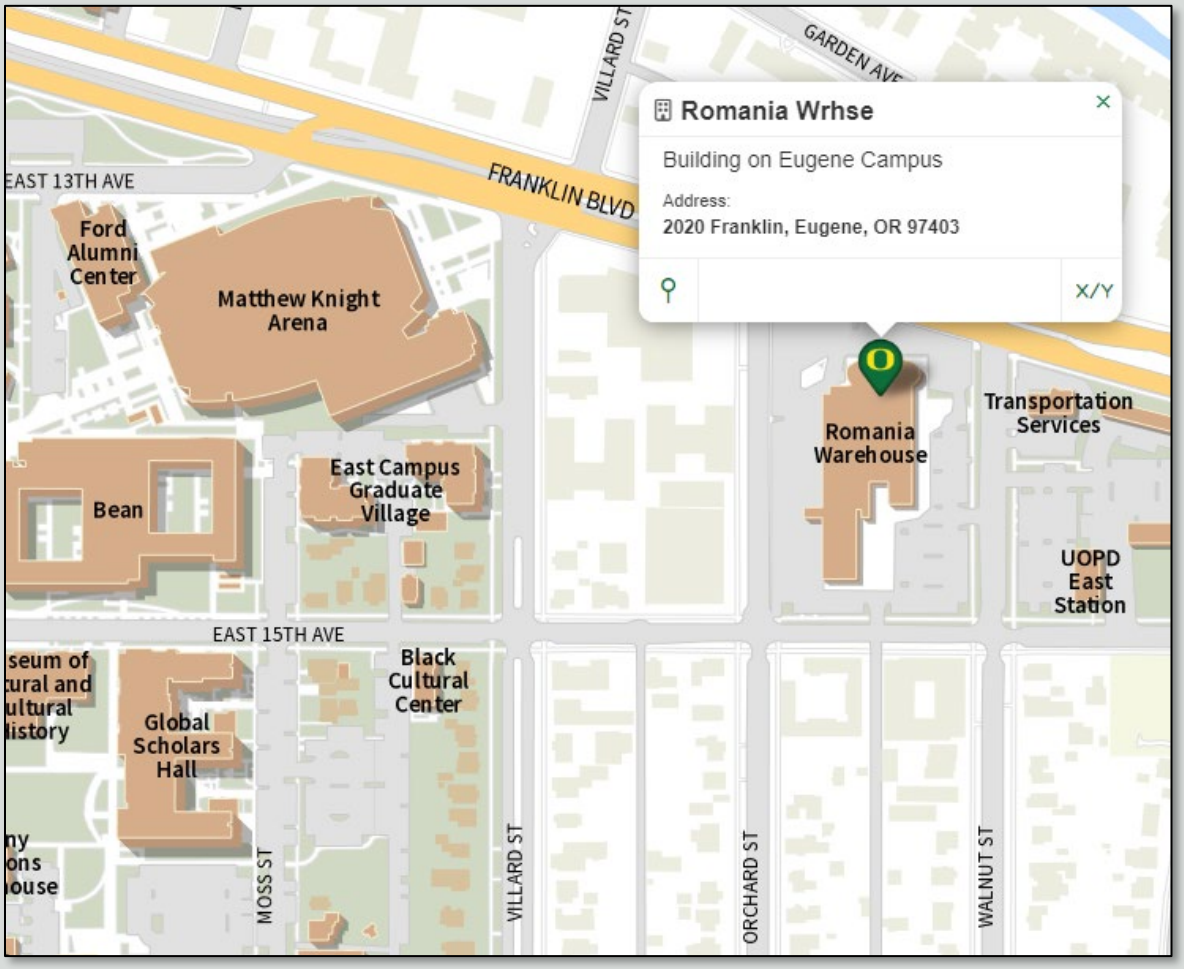
If your lab can wash and store reusable labware, consider moving away from single-use products. Consider substituting glass for plastic for items like culture tubes and serological pipettes.

## Utilizing UO Surplus and the Reusable Office Supplies Exchange (ROSE) Room

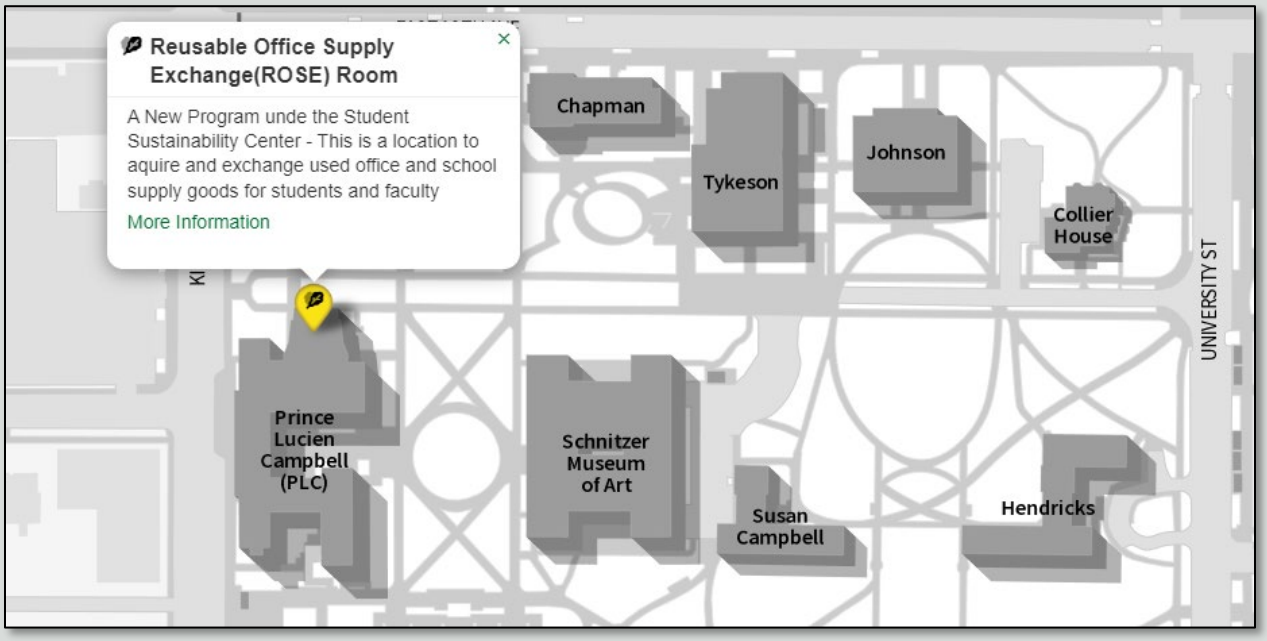
*Browse inventory before buying new*

Before purchasing new items for your lab, check UO Surplus's **online inventory** and visit the **ROSE Room** to see whether you can get those items reused.

**UO Surplus** offers items for reuse on campus, donation to non-profits, and sale to the public. Typical items include appliances, furniture, shelving, lab equipment, and office décor. Items from UO Surplus are free to reuse for faculty and staff if the items are used on campus. Surplus is currently located in the **Romania Warehouse** and will be moving to an off-campus location by early 2025. Hours of operation change by term and are listed on the **Office of Sustainability website**. **Sign up** for the Office of Sustainability newsletter to receive UO Surplus updates.



Visit the **ROSE Room** in Prince Lucien Campbell (PLC) 182 for free office and school supplies before buying new. The Student Sustainability Center leads the operation of the ROSE Room. Updates are shared through the Instagram account **@uoroseroom** and their **website**, including hours of operation and any special events.




*Donate goods instead of throwing them away*

UO Surplus now accepts lab items! Donate your lab's gently used-but-functional items to UO Surplus or the ROSE Room instead of throwing them away. All donated items should be clean and in working order. Please package glassware to prevent breakage. Common items include the following:

| Space | Items Collected |
|---|---|
| UO Surplus | Any working lab equipment, lab equipment glassware, centrifuges, microscopes, incubators, desks, chairs, filing cabinets, and pretty much any other item you can think of! |
| ROSE Room | Pens, pencils, calculators, paper clips, notebooks, and other typical and currently useful office and school supplies |

**For UO Surplus donations:**

First, post items to the UO Business Affairs Office **surplus exchange site** to see if any UO employees want to take the item(s) from you directly. Post the listing for at least seven days and organize a pickup date and time with potential buyer.

No takers? Donate items to UO Surplus in the following ways:

1. Create a work ticket with Work Control via **Call Log** or phone at (541) 346-2319 **OR**
2. Email **uosurplus@uoregon.edu** to schedule a furniture drop-off during surplus open hours. Please note: Items brought to the UO Surplus warehouse will be assessed for quality and usability and may be refused.

**For ROSE Room donations:** Take your items directly to the ROSE Room. If you have questions, reach out to uossc@uoregon.edu.

## Buy used and refurbished lab equipment

- **REUZEit** used lab equipment and consignment sales
- **Certified Genetool Inc** refurbished lab equipment
- **Cambridge Scientific** used, new, demo, and refurbished lab equipment
- **Oregon State University surplus site** used lab equipment

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# Recycle

## Submitting information to complete "Recycle" portion of badge

To complete the recycling portion of the waste management badge, complete the following tasks:

- Set up a Polycarbin hard plastics bin, with posted recycling guide. (The bin does not need to be full by the time the pilot is over.) – **required**
- Set up a small paper recycling bin. If your lab is not able to add a paper recycling bin, reach out to Katie Lucca (**klucca@uoregon.edu**) to discuss options. – **required**
- List items recycled and approximate amounts recycled with Seth Sponcey (amber and clear glass chemical containers and/or 5-gallon steel drum containers) – if applicable

## Recycle hard plastics

You can now recycle #2, 5, and 6 rigid lab plastics! We will provide you with a bin to set up in your lab. Recycle by clear or color items. Place the recycling guide near the bin to help researchers recycle the correct items. When the bin is full, email Katie Lucca (**klucca@uoregon.edu**) for pickup.

**Note:** We are not recycling nitrile gloves at this time, as we were not able to find a vendor with transparent supply chain practices, including those of vendor partner companies. We will recycle nitrile gloves when a process becomes available that does not call into question the fidelity of recycling practices, as well as fair labor practices and human rights issues.

## Support paper recycling in the lab

The Office of Sustainability conducted a lab waste audit in 2022, which showed significant amounts of paper going into the trash instead of the paper recycling bin. To ensure paper used in the lab is being recycled, set up a paper recycling bin within your lab space if one is not already provided. Paper that can be recycled includes books, magazines, newspapers, and office paper. It will be the responsibility of someone in the lab to take the paper to the recycling bin in the hallway for Zero Waste staff to pick up. You can also set up small recycling bins for items you notice getting thrown away that can be recycled on campus, like metal, plastic bottles and jugs, or glass. Reach out to Phil Chesbro (**pchesbro@uoregon.edu**) if you would like a free small recycling bin for your lab.

## Utilize existing recycling streams

### Recycle with the Zero Waste program

*Recycle non-biohazardous and non-hazardous glass, metal, plastic, and paper in your building*

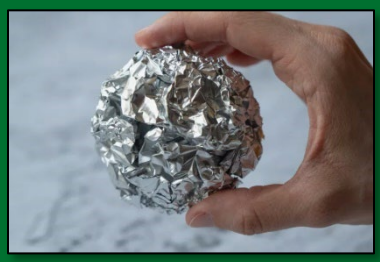
UO labs can recycle certain non-biohazardous and non-hazardous items through the campus wide Zero Waste program. Recycling bins are set up within labs and/or in hallways outside of labs.

UO recycles the following items:

- Glass, Metal, Plastic Bottles, Plastic jugs
  - Plastic bottles: opening smaller than base
  - Plastic jugs: have handles
  - No food or liquid
- Paper: Office Paper, Newspaper, Paperboard, Magazines
  - Books, notebooks, printed material OK
  - Staples, plastic windows, adhesive strips, and metal spirals OK
  - No food or liquid
- Corrugated Cardboard
  - Break down corrugated cardboard boxes
  - Flatten and move to outside bin
  - No food, liquid, or pizza boxes

## Did you know?

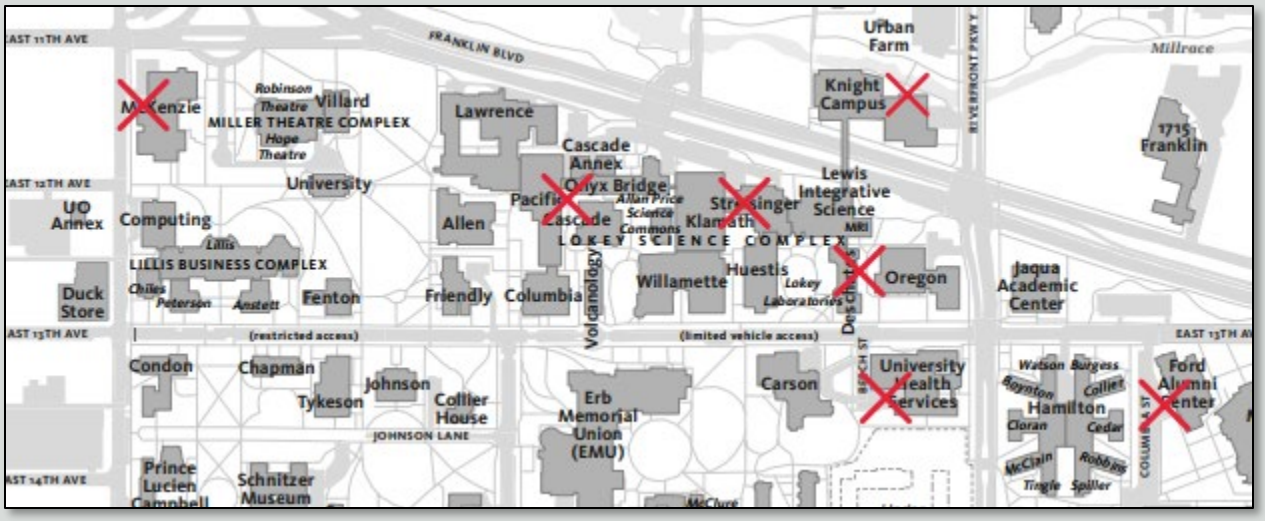
You can recycle empty paperboard **nitrile glove boxes**[1] (not the gloves themselves) in the paper recycling bin and clean **aluminum foil**[2] at least the size of a typical fist in the metal recycling bin in your building.

*Recycle lab cardboard, white block Styrofoam, and packing peanuts*

There are large bins set up outside lab buildings for specialty recycling items like cardboard and rigid, white block Styrofoam. It is the responsibility of the lab to take those items to the outdoor area for recycling. Packing peanuts can be placed in a bag or box and set next to the nearest indoor recycling bin. The image below notes the locations for Styrofoam collection in red. Each building has a bin for cardboard recycling.

[1] Photo Source: Disposable nitrile exam gloves. Intco.
[2] Photo Source: How to recycle aluminum foil. Treehugger.




There are Styrofoam recycling bins located in the breezeway between Streisinger and Klamath: https://map.uoregon.edu/f96e7ef3a

Check out the **UO Materials Handling Guide** for other specialty recycling items that can be recycled on campus, including:

- Books
- Magazines
- Toner and printer cartridges
- Sterno cans
- E-waste (drop-off located inside the Streisinger loading dock: **https://map.uoregon.edu/f6bf7451b)**

## Recycle lab glass and steel drums with Environmental, Health, and Safety

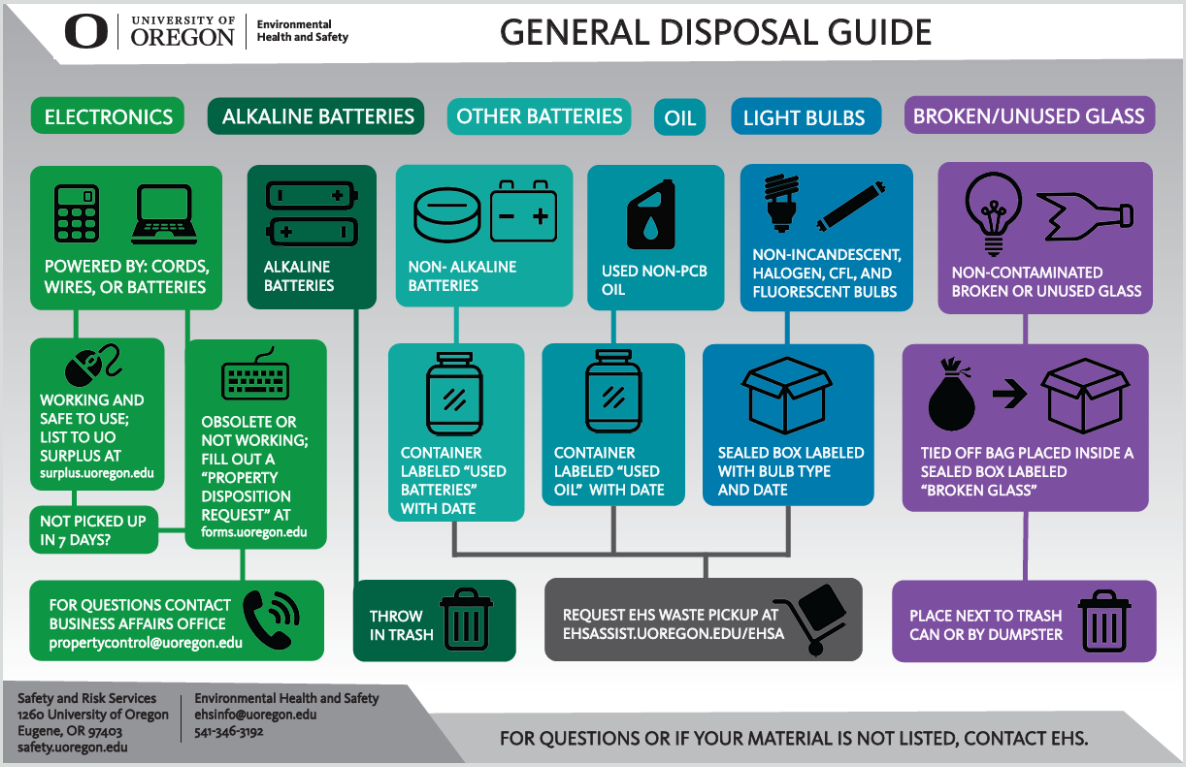
You can rinse out your **amber and clear glass chemical containers** and either drop them off at Onyx Bridge room 72 or arrange for Seth Sponcey (**ssponcey@uoregon.edu**) to pick the items up for recycling.

Throw away bottles if they meet one or more of the following conditions:

- Contain strong acids and are wrapped in plastic
- Held a P-listed material such as sodium azide. If a lab has a hazardous material that is P-Listed (i.e., acutely hazardous) then you must rinse the container out three times and collect the rinsate in the appropriate waste container. Not sure if your container needs to be rinsed? Review the **EPA's P-Listed materials**.
- Contain residue after being rinsed out

You can also recycle your **5-gallon steel drum containers**, which can be dropped off at the 72 Onyx Bridge location or be picked up by Seth Sponcey.

**Not sure how to dispose of an item?** Check the **UO Materials Handling Guide** from Zero Waste and disposal guides (next page) from EHS. Printed disposal guides are available from EHS at the 72 Onyx Bridge office. We encourage you to post the disposal guide in prominent locations in your lab.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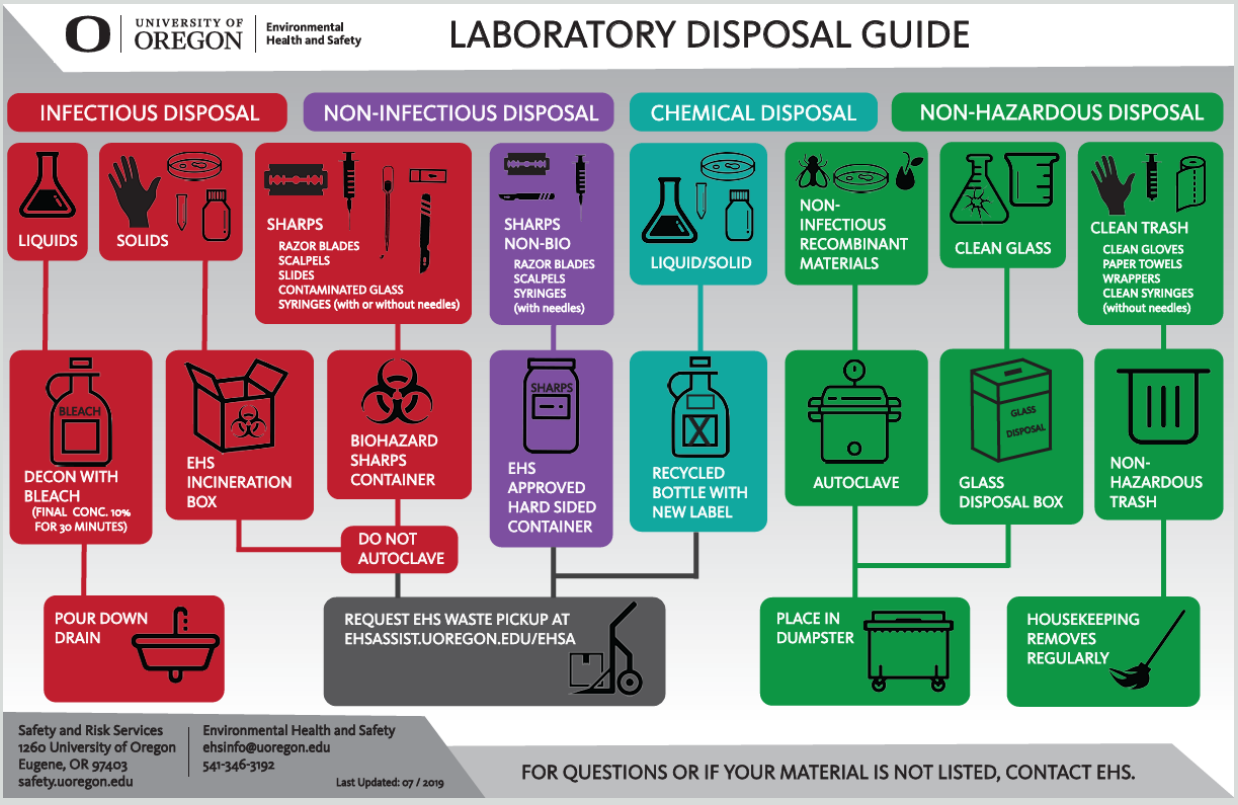
Environmental Health and Safety
GENERAL DISPOSAL GUIDE
ELECTRONICS
ALKALINE BATTERIES
OTHER BATTERIES
OIL
LIGHT BULBS
BROKEN/UNUSED GLASS
POWERED BY: CORDS, WIRES, OR BATTERIES
ALKALINE BATTERIES
NON- ALKALINE BATTERIES
USED NON-PCB OIL
NON-INCANDESCENT, HALOGEN, CFL, AND FLUORESCENT BULBS
NON-CONTAMINATED BROKEN OR UNUSED GLASS
WORKING AND SAFE TO USE; LIST TO UO SURPLUS AT surplus.uoregon.edu
OBSOLETE OR NOT WORKING; FILL OUT A "PROPERTY DISPOSITION REQUEST" AT forms.uoregon.edu
NOT PICKED UP IN 7 DAYS?
CONTAINER LABELED "USED BATTERIES" WITH DATE
CONTAINER LABELED "USED OIL" WITH DATE
SEALED BOX LABELED WITH BULB TYPE AND DATE
TIED OFF BAG PLACED INSIDE A SEALED BOX LABELED "BROKEN GLASS"
FOR QUESTIONS CONTACT BUSINESS AFFAIRS OFFICE propertycontrol@uoregon.edu
THROW IN TRASH
REQUEST EHS WASTE PICKUP AT EHSASSIST.UOREGON.EDU/EHSA
PLACE NEXT TO TRASH CAN OR BY DUMPSTER
Safety and Risk Services
1260 University of Oregon
Eugene, OR 97403
safety.uoregon.edu
Environmental Health and Safety
ehsinfo@uoregon.edu
541-346-3192
FOR QUESTIONS OR IF YOUR MATERIAL IS NOT LISTED, CONTACT EHS.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LABORATORY DISPOSAL GUIDE
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NON-INFECTIOUS DISPOSAL
CHEMICAL DISPOSAL
NON-HAZARDOUS DISPOSAL
LIQUIDS
SOLIDS
SHARPS
RAZOR BLADES
SCALPELS
SLIDES
CONTAMINATED GLASS
SYRINGES (with or without needles)
SHARPS NON-BIO
RAZOR BLADES
SCALPELS
SYRINGES
(with needles)
LIQUID/SOLID
NON-INFECTIOUS RECOMBINANT MATERIALS
CLEAN GLASS
CLEAN TRASH
CLEAN GLOVES
PAPER TOWELS
WRAPPERS
CLEAN SYRINGES
(without needles)
BLEACH
DECON WITH BLEACH
(FINAL CONC. 10% FOR 30 MINUTES)
EHS INCINERATION BOX
BIOHAZARD SHARPS CONTAINER
SHARPS
EHS APPROVED HARD SIDED CONTAINER
RECYCLED BOTTLE WITH NEW LABEL
AUTOCLAVE
GLASS DISPOSAL
GLASS DISPOSAL BOX
NON-HAZARDOUS TRASH
DO NOT AUTOCLAVE
POUR DOWN DRAIN
REQUEST EHS WASTE PICKUP AT EHSASSIST.UOREGON.EDU/EHSA
PLACE IN DUMPSTER
HOUSEKEEPING REMOVES REGULARLY
Safety and Risk Services
1260 University of Oregon
Eugene, OR 97403
safety.uoregon.edu
Environmental Health and Safety
ehsinfo@uoregon.edu
541-346-3192
Last Updated: 07 / 2019
FOR QUESTIONS OR IF YOUR MATERIAL IS NOT LISTED, CONTACT EHS.

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# Additional Resources

- **ACT database:** search for sustainable lab consumables using a free My Green Lab database
- **ACS reagent guides**: green chemistry alternatives for different chemical processes
- **MilliporeSigma DOZN tool**: quantitative green chemistry comparison tool for chemicals and processes
- **Greener solvent alternatives**
- **PolyCarbin:** lab consumables made from recycled plastics
- More resources for sustainability in labs
  - **My Green Lab**
  - **LabConscious**
  - **University of Bristol lab sustainability**
  - **Green Labs Netherlands**
  - **Laboratory Efficiency Action Network**
  - **Max Planck Sustainability Network**
  - **UC Santa Barbara lab sustainability**