

# Caltech

## Green Labs Action Plan

### 2023

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## 1. Summary

The Green Lab Action Plan aims to provide a framework for Caltech to achieve climate and sustainability goals. The Institute has committed to supporting sustainable practices, including facilitating the Green Labs in their endeavour to make labs more sustainable and efficient.

Green Labs supports Caltech's sustainability commitments. As labs are estimated to produce over [5.5 million tons of plastic waste a year](#), it is increasingly important for labs to become more sustainable. To meet this goal, Green Labs is promoting reduction, reuse, and recycle programs for plastics and other types of waste in labs on campus, as well as green chemistry to reduce the hazardous waste production in the Institute. Green Labs also supports Caltech's goals to reduce emissions from fossil fuel combustion, commuters, and travel. Further, Green Labs supports efforts to reduce water usage on campus by recycling water where possible, changing flora on campus to be more water-friendly, and reducing lab burden on water through actions like only running autoclaves when loads are full. Other actions Green Labs aims to support include sustainable purchasing, encouraging all of Caltech to purchase items such as 100% recycled office supplies, and working with vendors to reduce the cost of sustainable consumables and equipment such as ultra-low-temperature freezers.

Green Labs aims to focus on developing behavioural changes throughout campus by providing resources and Guides with helpful and targeted information in six key areas: 1. Energy Efficiency, 2. Water Conservation, 3. Waste Reduction, 4. Sustainable Procurement, 5. Communications and Outreach, and 6. Resource Development. As this is the first Action Plan developed for Green Labs, this document will help serve as a guide for Caltech to develop sustainable laboratory practices without compromising scientific integrity. Implementation will require engagement of the entire campus, and will bridge work done by the Biosafety Offices, Health and Safety Offices, Facilities, Sustainability, and the Resnick Institute. This allows normalization of sustainable practices while increasing the safety, efficiency, and sustainability throughout the entire campus.



## 2. Introduction: About Green Labs

As biologists, we are challenged to protect our environment and advocate for sustainable practices to protect the very thing we study: life on Earth. Caltech Green Labs aims to meet this challenge by proposing lab practices that are energy efficient and resource efficient, without compromising research objectives. This group aims to create an equitable and inclusive space, where we can incentivise a discussion among staff, students, and faculty, and utilize their talents to promote innovation and normalization of sustainable laboratory practices. The Caltech Green Labs group ultimately aspires to be a resource for sustainable lab practices including energy efficiency, water conservation, green chemistry, waste management, sustainable purchasing, and sustainable education. These resources will strengthen the Caltech community and further the Institute's goal to positively impact the community at large.

### Goals:

- Demonstrate Caltech's commitment to promote sustainable and inclusive environment
- Work with BBE and Caltech to better integrate and adopt sustainable practices, especially in research groups
- Improve general knowledge and transparency of existing campus sustainable practices and resources
- Increase awareness, advocacy, and education about sustainable initiatives and best practices
- Participate in sustainable events held on Caltech campus
- Establish a Green Labs website
- Develop a Green Labs Guide
- Pilot sustainable initiatives within appropriate research groups and report findings
- Decrease energy and water usage
- Reduce waste production, especially of single-use plastics in labs
- Decrease hazardous waste production and promote innovation by engaging in green chemistry
- Encourage sustainable purchasing

### 3. Caltech Lab Setting and Engagement

Green Labs encourages all labs to participate and be recognized as champions of sustainability. In this way, participants will not only be benefiting the environment, but will also be making their labs more innovative, efficient, cost-effective, and safe. Participating labs will gain greater access to resources and networks dedicated to sustainability. Green Labs members will also be able to assess their labs with comprehensive tools that provide greater understanding of how your lab works, evaluate where your lab is already achieving sustainability goals, and assess areas where your lab has the potential to become more efficient and sustainable.

Interested labs are assessed through an [easy survey](#), with points given for sustainable practices. This informs your lab's initial Green Lab Score. After various categories are assessed for strength or weakness, labs are encouraged to make adjustments. Once adjustments have been completed, labs are scored again, and this final assessment informs your final Green Labs Certification Score. When you submit your final assessment, your lab is given a "Certified Green Lab" plaque!

As of January 2023, there are three labs at Caltech that are Green Lab Certified!

#### Benefits of voluntary participation:

- Reduce overhead costs
- Increase research efficiency
- Reduce carbon footprint and pollution
- Recognition for sustainability efforts on grants
- Strengthen team building and community
- Prolong equipment life
- Greater access to sustainability resources and funding
- Recognition as lab sustainability champion
- Increase scientific innovation
- Enhance lab visibility and attractiveness to students

### Caltech

#### Green Lab Certification Dashboard

Current Level	Gold
Total Points	25
Points Needed to Achieve Next Level	5

Leaf Level	Points Required
Bronze	5
Silver	15
Gold	25
Platinum	30



#### What categories are you strongest/weakest in?

Category	Total Points Achieved	Total Points Available	Progress
Commitment	2	2	100%
Administrative	2	2	100%
Education	2	2	100%
Energy/Refrigeration	6	13	46%
Materials	6	7	86%
Purchasing	4	6	67%
Water	3	4	75%
TOTAL	25	36	69%

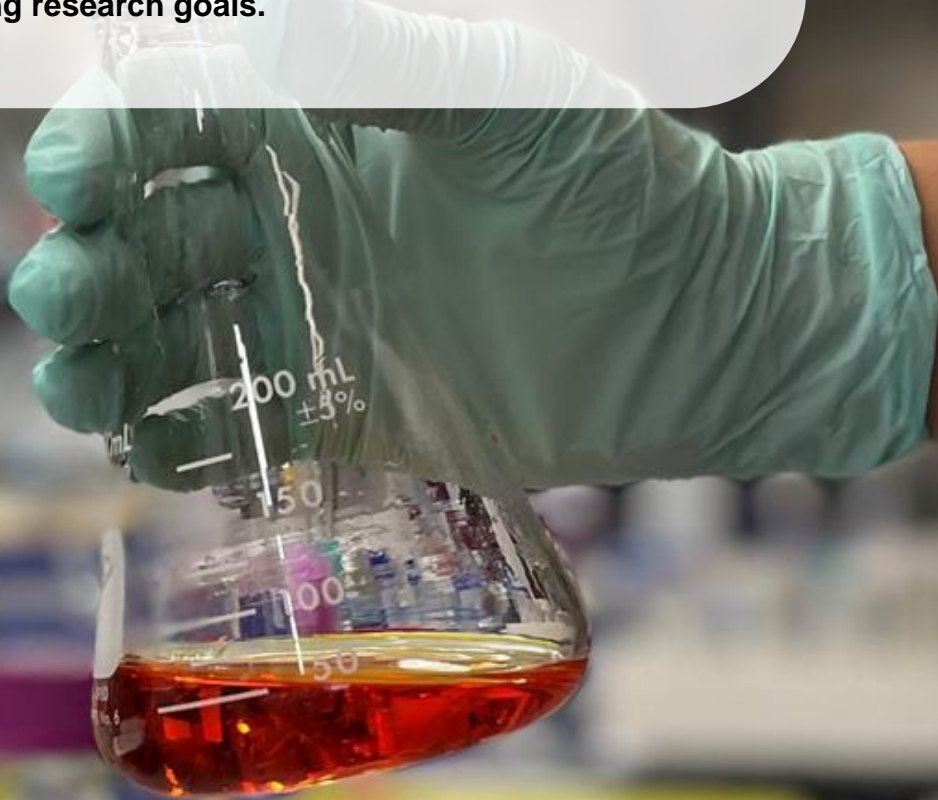


## 4. Strategy and Vision

Green Labs aims to outline an Action Plan for each of the following six areas of interest: 1. Energy Efficiency, 2. Water Conservation, 3. Waste Reduction, 4. Sustainable Procurement, 5. Outreach and Recruitment, and 6. Resource Development.

This plan establishes achievable Action Items, Implementation Strategies, and Targeted Goals for each area of interest.

In setting out goals for 2023, Green Labs seeks to better provide actionable ways for Caltech labs to improve their sustainable practices. By focusing on simple, often inexpensive, behavioural changes or practices, Green Labs aims to increase innovation, safety, and efficiency, all without compromising research goals.



## Energy Efficiency

Action Item	Implementation Strategy	Targeted Goal
Develop signage for equipment that can never be turned off, if someone should ask before turning off, or turned off when done	<ol style="list-style-type: none"> <li>1. Develop stop “sign system” and implement in Green Labs</li> <li>2. Provide stickers or printouts of three “stop sign” labels</li> </ol>	<ol style="list-style-type: none"> <li>1. Propose program to BBE and ask for funding to develop and print stickers</li> <li>2. Produce newsletter for BBE</li> <li>3. If successful, incorporate stickers into welcome package for new Green Labs members</li> </ol>
Develop ULT freezer information to encourage adjustment from -80°C to -70°C	<ol style="list-style-type: none"> <li>1. Collect resources about energy savings associated with temperature change</li> <li>2. Collect information on safe-keeping of samples stored at -70°C</li> <li>3. Working with facilities and building managers, inventory ULT freezers storing samples at -70°C to encourage others</li> </ol>	<ol style="list-style-type: none"> <li>1. Produce an updated newsletter for BBE email and website</li> <li>2. Develop inventory of ULTs and update website with inventory, working alongside facilities and building managers</li> </ol>
Outlet timers	<ol style="list-style-type: none"> <li>1. Collect resources about energy savings and risks associated with utilizing timers</li> <li>2. Inventory equipment utilizing outlet timers</li> </ol>	<ol style="list-style-type: none"> <li>1. Develop a pilot program for BBE approval involving the purchase, distribution, and tracking of timers</li> <li>2. Produce a newsletter</li> <li>3. If successful, incorporate timers into welcome package for new Green Labs members</li> </ol>

# Water Conservation



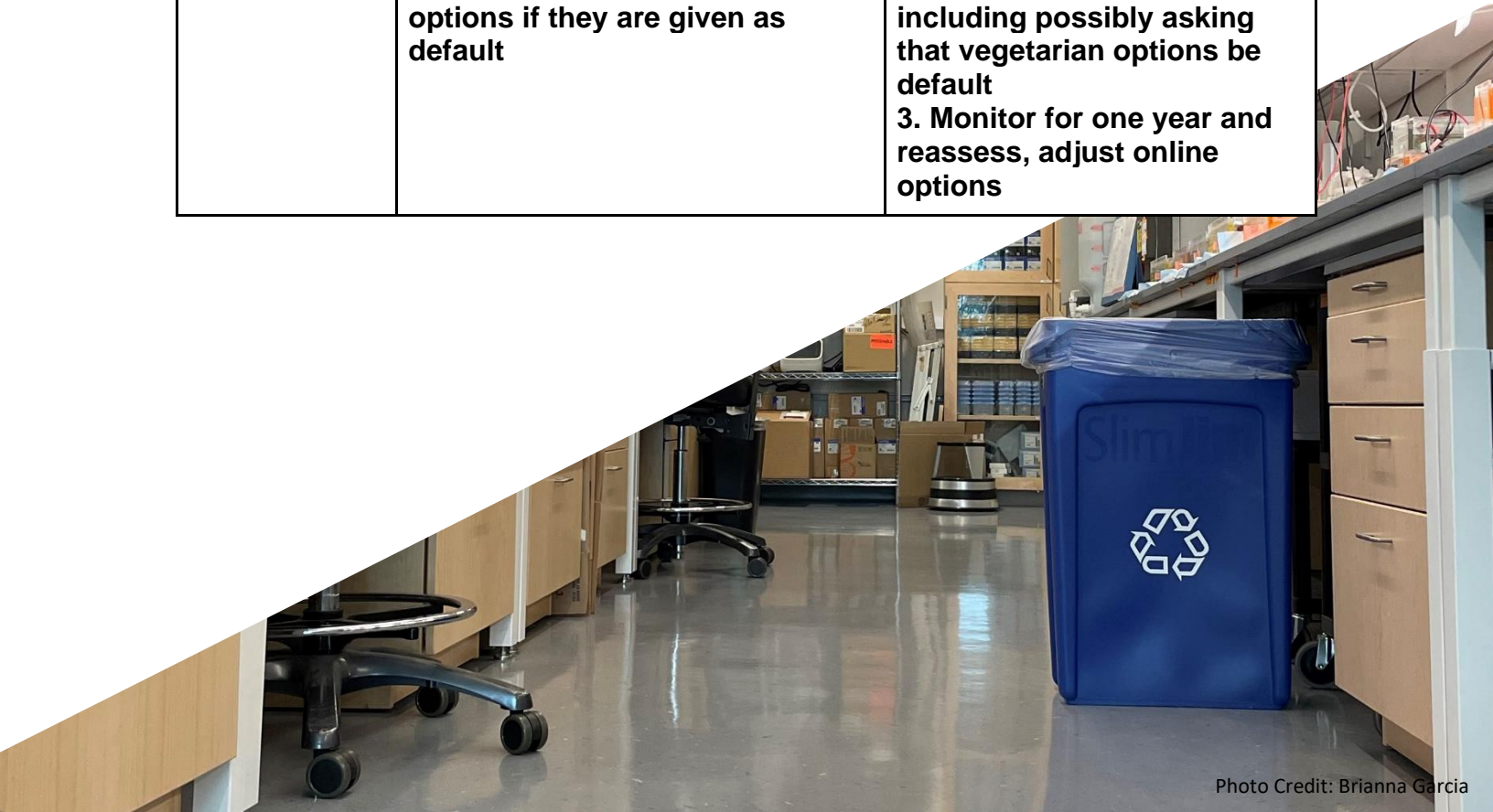
Action Item	Implementation Strategy	Targeted Goal
Autoclave usage	<ol style="list-style-type: none"> <li>1. Collect resources about energy savings and water efficiency</li> <li>2. Collect information about lab behaviours and identify areas where labs could be encouraged to use autoclaves only when full, only run the autoclaves once a week instead of multiple times, and/or share an autoclave with another lab</li> <li>3. Working with facilities and building managers, inventory autoclaves with single and multiple users</li> </ol>	<ol style="list-style-type: none"> <li>1. Produce an updated newsletter for BBE email and website</li> <li>2. Develop inventory of autoclaves and update website with inventory and opportunities for sharing the resource, working alongside facilities and building managers</li> </ol>
Autoclave retrofits	<ol style="list-style-type: none"> <li>1. Collect resources about energy savings and risks associated with retrofitting autoclaves with water efficiency technology</li> <li>2. Collect water usage and energy measurements and before and after installation and cost savings</li> <li>3. Working with facilities and building managers, inventory autoclaves with and without retrofits</li> </ol>	<ol style="list-style-type: none"> <li>1. Develop a pilot program for BBE approval involving autoclave retrofits</li> <li>2. Produce a newsletter for BBE</li> <li>3. If successful, develop new strategies for adopting other retrofits and explore funding opportunities to retrofit more/all autoclaves, working with facilities and building managers</li> </ol>
Water restrictors	<ol style="list-style-type: none"> <li>1. Collect resources about energy savings and risks associated with utilizing water restrictors</li> <li>2. Collect water usage measurements and compare water usage before and after installation and cost savings</li> <li>3. Working with facilities and building managers, inventory taps using water restrictors</li> </ol>	<ol style="list-style-type: none"> <li>1. Develop a pilot program for BBE approval involving the purchase, distribution, and tracking of restrictors</li> <li>2. Produce a newsletter</li> <li>3. If successful, incorporate restrictors into welcome package for new Green Labs members, coordinating with facilities for installation</li> </ol>



## Waste Reduction

Action Item	Implementation Strategy	Targeted Goal
Styrofoam and tip box recycling program	<ol style="list-style-type: none"> <li>1. Collect resources about styrofoam and tip boxes, investigate different recycling options</li> <li>2. Poll labs to find where recycling/share points are most needed</li> <li>3. Develop consistent signage to be distributed and posted at share points</li> </ol>	<ol style="list-style-type: none"> <li>1. Produce newsletter with resources and recycling/share points information</li> <li>2. Post and implement recycling/share points in various locations across BBE</li> <li>3. Monitor for one year, and reassess locations and effectiveness of program</li> </ol>
Ice pack recycling program	<ol style="list-style-type: none"> <li>1. Collect resources about ice pack usage and investigate different recycling options</li> <li>2. Poll labs to find where recycling/share points are most needed</li> <li>3. Develop consistent signage to be distributed and posted at share points</li> </ol>	<ol style="list-style-type: none"> <li>1. Produce newsletter with resources and recycling/share points information</li> <li>2. Post and implement recycling/share points in various locations across BBE</li> <li>3. Monitor for one year, and reassess locations and effectiveness of program</li> </ol>
Lab recycling signage	<ol style="list-style-type: none"> <li>1. Collect resources about recycling</li> <li>2. Develop consistent signage to be used in lab-specific settings, and coordinate with facilities to make signage consistent</li> <li>3. Work with facilities to develop pickup strategies</li> </ol>	<ol style="list-style-type: none"> <li>1. Produce an updated newsletter for BBE email and website</li> <li>2. If successful, incorporate signage into welcome package for new Green Labs members, coordinating with facilities for implementation</li> </ol>

Action Item	Implementation Strategy	Targeted Goal
<p><b>Develop an online Recycling Guide</b></p>	<ol style="list-style-type: none"> <li>1. Collect resources and develop a Recycling Guide to be posted on website, including locations for recycling services</li> <li>2. Develop strategies for wet labs, dry labs, and teaching labs</li> <li>3. Investigate transparency of Caltech recycling programs</li> </ol>	<ol style="list-style-type: none"> <li>1. Produce a Recycling Guide and appropriate lab-specific signage be posted online, with resources and tips for waste reduction</li> <li>2. Work with facilities for implementation</li> <li>3. Monitor for one year and reassess, adjust signage as needed</li> </ol>
<p><b>Encourage sustainable food options at BBE and lab functions</b></p>	<ol style="list-style-type: none"> <li>1. Investigate what kinds of foods are favoured at BBE and lab functions</li> <li>2. Investigate sustainable food alternatives and advertise them on our website, especially favourability of vegetarian options if they are given as default</li> </ol>	<ol style="list-style-type: none"> <li>1. Produce a newsletter and resources on our website about sustainable food items and vendors</li> <li>2. Encourage BBE to adjust policy encouraging sustainable food practices, including possibly asking that vegetarian options be default</li> <li>3. Monitor for one year and reassess, adjust online options</li> </ol>





# Sustainable Procurement

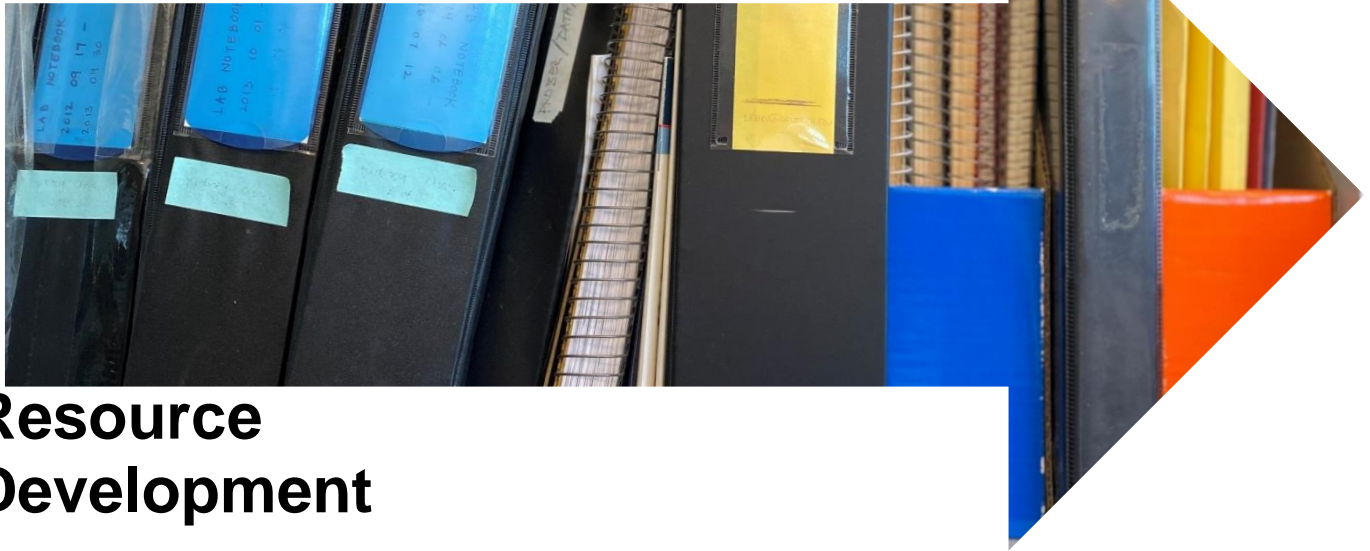
Action Item	Implementation Strategy	Targeted Goal
<p><b>Education</b></p>	<ol style="list-style-type: none"> <li>1. Collect resources and develop a sustainable purchasing guide based on lab needs with helpful hints</li> <li>2. Develop strategies for wet labs, dry labs, and teaching labs</li> <li>3. Work with procurement to develop strategies for promoting sustainable purchasing</li> </ol>	<ol style="list-style-type: none"> <li>1. Produce a guide and with resources and tips for eco-friendly purchasing, and post online</li> <li>2. Work with purchasing for implementation</li> <li>3. Monitor for one year and reassess, adjust guide as needed and poll purchasers/lab managers to see if there are other things we could add or request purchasing to work with us</li> </ol>
<p><b>Vendor outreach and event(s)</b></p>	<ol style="list-style-type: none"> <li>1. Reach out to vendors known for eco-friendly products and ask if they would participate in an eco-friendly event</li> <li>2. Work with Caltech procurement and BBE to have an event focused on eco-friendly purchasing</li> </ol>	<ol style="list-style-type: none"> <li>1. Work with BBE to advertise and run an event focused on sustainable purchasing</li> <li>2. Collect purchaser comments and investigate needs for the future during the event to improve utility</li> </ol>
<p><b>Vendor incentives and opportunities</b></p>	<ol style="list-style-type: none"> <li>1. Investigate incentive programs for purchasing sustainable products (that are perhaps more expensive than traditional products)</li> </ol>	<ol style="list-style-type: none"> <li>1. Partner with BBE procurement and vendors to establish Caltech-wide discounts on sustainable products</li> <li>2. Monitor usage of quotes or discounts and adjust according to polls or comments</li> </ol>
<p><b>Develop equipment and chemical share program</b></p>	<ol style="list-style-type: none"> <li>1. Poll purchasers and lab managers on what kinds of equipment they would like to share</li> <li>2. Develop an equipment and chemical share tool/program</li> </ol>	<ol style="list-style-type: none"> <li>1. Partner with purchasers and lab managers to develop a tool or email to share chemicals and equipment</li> <li>2. Monitor usage and adjust as needed</li> </ol>

# Communications and Outreach

Action Item	Implementation Strategy	Targeted Goal
Outreach	<ol style="list-style-type: none"><li>1. Write newsletters of our work for the BBE quarterly email</li><li>2. Post newsletters and resources online</li><li>3. Coordinate with IonCaltech and Caltech Weekly to post newsletters there as well</li><li>4. Investigate other outreach avenues such as Slack, Facebook, or Instagram</li></ol>	<ol style="list-style-type: none"><li>1. Assess visibility and access to information and adjust as needed</li><li>2. Create website with all resources (after approval of BBE)</li><li>3. Assess traffic and work with BBE newsletter, IonCaltech, Caltech Weekly etc to enhance visibility</li></ol>
Green Labs Certification Program	<ol style="list-style-type: none"><li>1. Encourage members to participate in the Green Labs Certification program</li><li>2. Assess the spreadsheet and see if there are obvious barriers to completing the certification</li></ol>	<ol style="list-style-type: none"><li>1. Post links to Sustainability website GLCP</li><li>2. If necessary, implement changes to make certification easier</li><li>3. Goal of adding 1 new lab by 2024</li></ol>







# Resource Development

Action Item	Implementation Strategy	Targeted Goal
<p><b>Develop a website</b></p>	<ol style="list-style-type: none"> <li>1. Collaborate with members to consolidate relevant resources and post information (including Aciton Plan, Green Labs Guide, newsletters, signage, meeting minutes, calendar of events, useful resources, and group contacts) in one easy-to-find location</li> <li>2. Create a user-friendly website with easily accessible resources alongside Caltech IT</li> <li>3. Ensure accountability and monitoring tools are available</li> </ol>	<ol style="list-style-type: none"> <li>1. Work with BBE and sustainability to consolidate and post resources as completed and approved</li> <li>2. Adjust website as resource library grows and continue to ensure information is easily accessible</li> <li>3. Accountability and monitoring will be conducted by the Green Labs group and BBE and reported annually</li> </ol>
<p><b>Develop an Action Plan</b></p>	<ol style="list-style-type: none"> <li>1. Develop an Action Plan to be posted on our website</li> <li>2. Include relevant areas of interest and information about the group and our plans</li> </ol>	<ol style="list-style-type: none"> <li>1. Work with BBE and Sustainability to develop and implement an Action Plan for 2023</li> <li>2. Post online when complete and work with BBE, IonCaltech, and Caltech Weekly to post information regarding development of this plan and establishment of our group</li> </ol>

Action Item	Implementation Strategy	Targeted Goal
<p><b>Develop a Green Labs Guide</b></p>	<p>1. Gather Caltech- and California-specific resources to develop a Green Labs Guide with all categories described above included, to be posted on the website            2. Develop strategies for wet labs, dry labs, and teaching labs            3. Include information on sustainable office purchasing throughout</p>	<p>1. Produce and publish a Green Labs Guide in modules            2. Work with BBE and Sustainability to develop a finalized completed Guide for Fall 2023            3. Monitor and assess effectiveness after one year by asking lab members not involved GL to assess success, adjust Guide as needed</p>
<p><b>Develop Recycling Signage</b></p>	<p>1. Develop universal lab-specific signage for various kinds of recycling bins</p>	<p>1. Work with facilities to assess and implement            2. Assess effectiveness and accept feedback            3. If effective, will include in welcome package</p>
<p><b>Hire a full-time Green Labs Coordinator by 2024</b></p>	<p>1. Ask BBE to start collaborating with other Divisions and Sustainability to set aside funding for a full-time GLC            2. Compile resources and ideas for how this person can facilitate GL initiatives across Caltech</p>	<p>1. Hire a GLC by 2024            2. Roles would include collaborations with all Divisions, EHS, security, procurement, new faculty, etc</p>

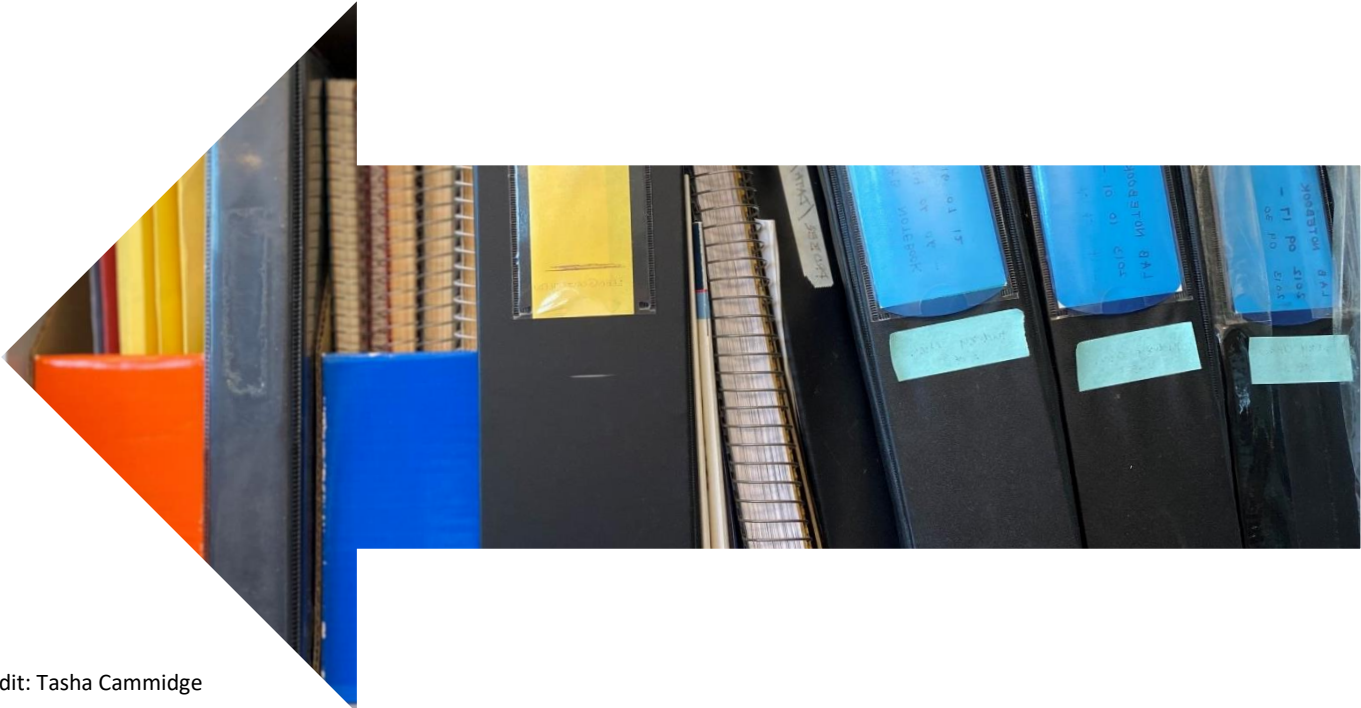


Photo Credit: Tasha Cammidge



## 5. Monitoring and Reporting

Each strategy outlined in this Action Plan will be implemented and monitored by Green Labs. This group is focused on changing behaviour in laboratories on campus to encourage normalization of eco-friendly lab practices and culture at Caltech. Each data-driven Action Item will be assessed and reported to the Caltech community.

Progress and updates will be reported annually to the Sustainability Office. Each Action Item will be evaluated for success, and advice will be given as needed, in future years as to how to improve.



## **Green Labs Members:**

Altyn Rymbek	Prober Lab
Anne Yeouyoung Kil	Pachter Lab
Elisa Gonzalez	CCSL
Elisha Mackey	Gradinaru Lab
Emily Echevarria	Prober Lab
Erick Bonilla	Grant Manager, BBE
Gina Mancuso	Anderson Lab
James Linton	Elowitz Lab
Jasmine Emtage	Prober Lab
Karen Lencioni	OLAR
Kate Malecek	Berkeley Lights Beacon Instrument
Mate Borsos	Gradinaru Lab
Matthew Langley	Elowitz Lab
Michelle Ravel	CCSL
Neehar Kondapaneni	Perona Lab
Sarah Torres	Sternberg Lab
Sina Boeshaghi	Pachter Lab
Tasha Cammidge	Prober Lab
Vijaya Kumar	Research Technician
Wen Chen	Sternberg Lab
Yvette Garcia-Flores	Mazmanian Lab

## **Special Thanks:**

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Procurement  
WiBBE  
GSA  
Carrie Metzgar – University of California Irvine  
Kathryn Ann Ramirez Aguilar – University of Colorado Boulder