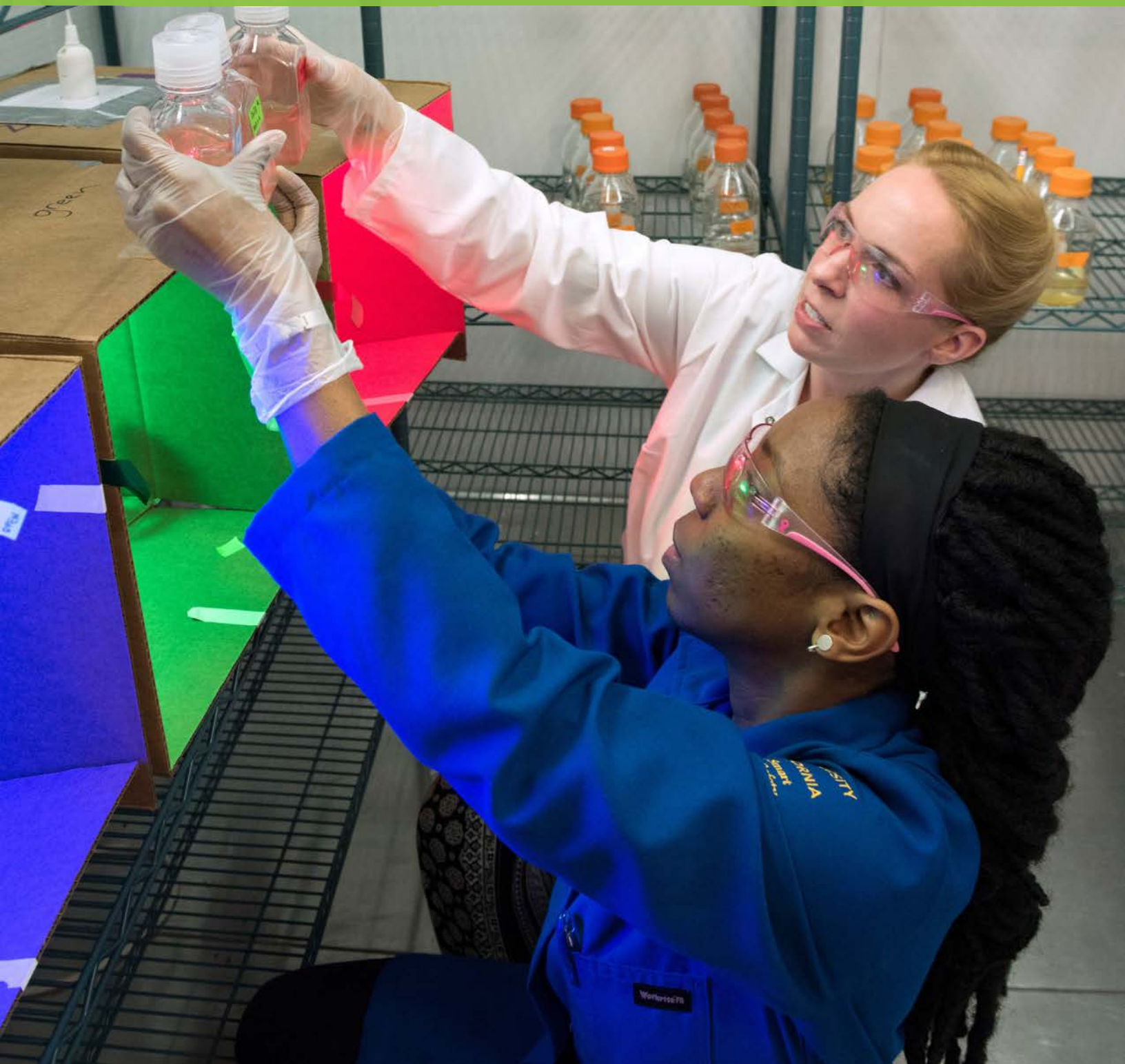
UC Irvine
Green Lab Action Plan
2021



UC Irvine

Green Lab Action Plan

January 2021

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Cover Photo: Steve Zylius

1 EXECUTIVE SUMMARY

Photo: Steve Zylius

Photos: Steve Zylius

The Green Lab Action Plan (GLAP) provides a framework for the University of California, Irvine (UCI) to achieve institutional climate and sustainability goals in support of the University of California (UC) Sustainable Practices Policy. These commitments include implementation of an ongoing Green Labs Program, designating at least one staff or faculty member from the campus to manage the program, assessing at least three research groups, and reporting annually on program progress.

The GLAP also supports UCI strategies to achieve additional systemwide sustainability and climate goals. These goals include climate neutrality for Scope 1 and 2 emissions (on-site combustion of fossil fuels and purchased electricity) by 2025 and Scope 3 emissions (commuters and University funded air travel) by 2050. The University of California has also established zero waste goals through the prioritization of waste reduction in the order of reduce, reuse, and then recycle. The Green Labs Program also supports campus efforts to reduce water usage by 36 percent per capita by 2025 and to procure 25 percent green spend per product category. UCI Green Labs builds off of the UCI Smart Labs Initiative, a comprehensive program that re-engineers building control systems to safely reduce laboratory energy use by as much as 60 percent. The Green Labs program focuses on behavioral energy conservation and UCI Smart Labs targets deep energy efficiency projects.

UCI's GLAP strategy seeks to determine strengths and areas for improvement in six key program areas: (1) energy efficiency, (2) water conservation, (3) waste reduction, (4) sustainable procurement, (5) communications and outreach, and (6) resource development. An emphasis is placed on behavioral sustainability strategies, with goals to develop greater opportunities for data-driven assessment. As the first adopted GLAP for the campus, this Plan will serve as an overall roadmap for strengthening sustainable laboratory operations and practices. Successful implementation will require campus-wide engagement and collaboration with UC systemwide efforts.

2 INTRODUCTION

Photo: Steve Zylius

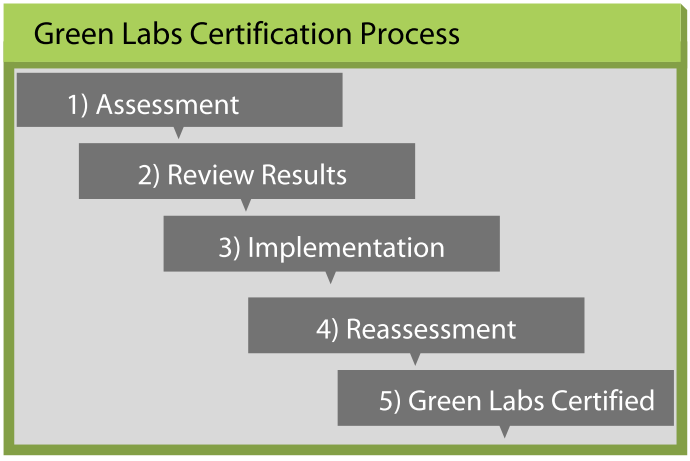
Photo: Steve Zylius

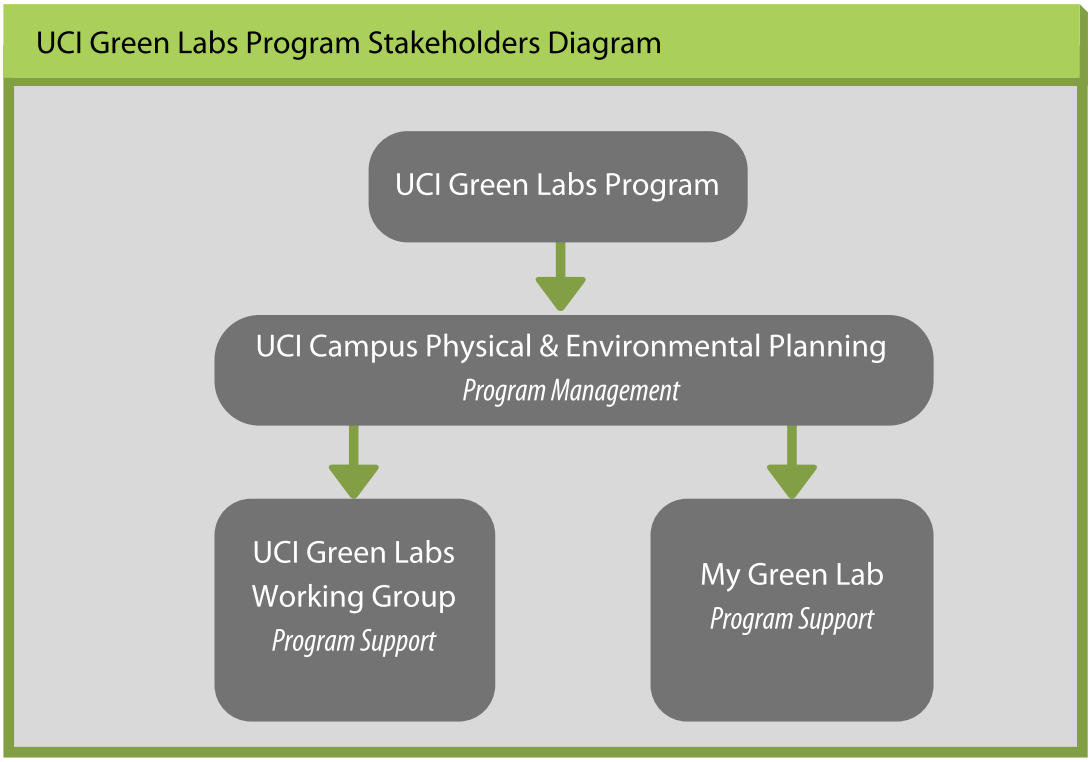
About UCI Green Labs

The UCI Green Labs program works with principal investigators, lab managers, and students to educate and assist in the implementation of more sustainable practices in campus laboratories. The program provides resources and guidance in areas including energy efficiency, waste reduction, water conservation, sustainable purchasing, and green chemistry. Upon incorporating greater sustainable practices, research groups are awarded official Green Labs certification.

All campus wet labs are encouraged to participate in the program. By participating, research groups earn recognition as lab sustainability champions, gain greater access to sustainability resources and networks, improve research safety, prolong equipment life and reduce costs, and reduce their lab's overall carbon footprint.

Research groups begin the program by completing a comprehensive self-assessment of their energy use, water use, green chemistry, field work, waste management, and purchasing. The results of the assessment provides insight into how groups may already be practicing sustainability, as well as outlines areas for improvement and greater understanding. With the support of the UCI Green Labs Working Group and My Green Lab, research groups then go at their own pace to implement more sustainable behavioral practices. Program participants demonstrate understanding and growth in sustainable lab practices through a final assessment. The results then certify the laboratory as an official 'UCI Green Lab.'





Program Stakeholders

The UCI Office of Campus Physical and Environmental Planning oversees implementation of the campus Green Labs program. Per systemwide policy requirements, the campus has designated Carrie Metzgar, Sustainability & Planning Analyst, to manage UCI's program. Carrie also serves as co-chair of the University of California Sustainable Building Operations and Labs Working Group, which meets monthly to discuss the progress and collaboration opportunities for Green Labs program across UC campuses.

To help guide program development and implementation through technical expertise, the UCI Green Labs Working was formed in 2017. The UCI Green Labs Working Group consists of faculty and staff from Facilities Management, Environmental Health & Safety, Procurement Services, Campus Physical and Environmental Planning, and the Department of Chemistry. Working group members provide participating Green Labs guidance during the implementation phase of the certification process, helping researchers gain greater understanding of more sustainable practices and alternatives. The Working Group also plays a critical role in the development of outreach and recruitment strategies.

To assist with program certification, UCI has partnered with My Green Lab, a California non-profit specializing in fundamentally and permanently improving the sustainability of scientific research. Recognized by the Association for the Advancement of Sustainability in Higher Education (AASHE), the American Energy Society, and the International Institute for Sustainable Laboratories, My Green Lab's certification process is considered the global standard for laboratory sustainability best practices. The organization is the creator and reviewer of the online assessment system used by the UCI Green Labs program. My Green Lab generates in-depth feedback reports and presentations for each participating lab, providing suggestions for improvement in 14 topics related to energy, water, waste, chemistry, and engagement.

3 UCI LAB SETTING

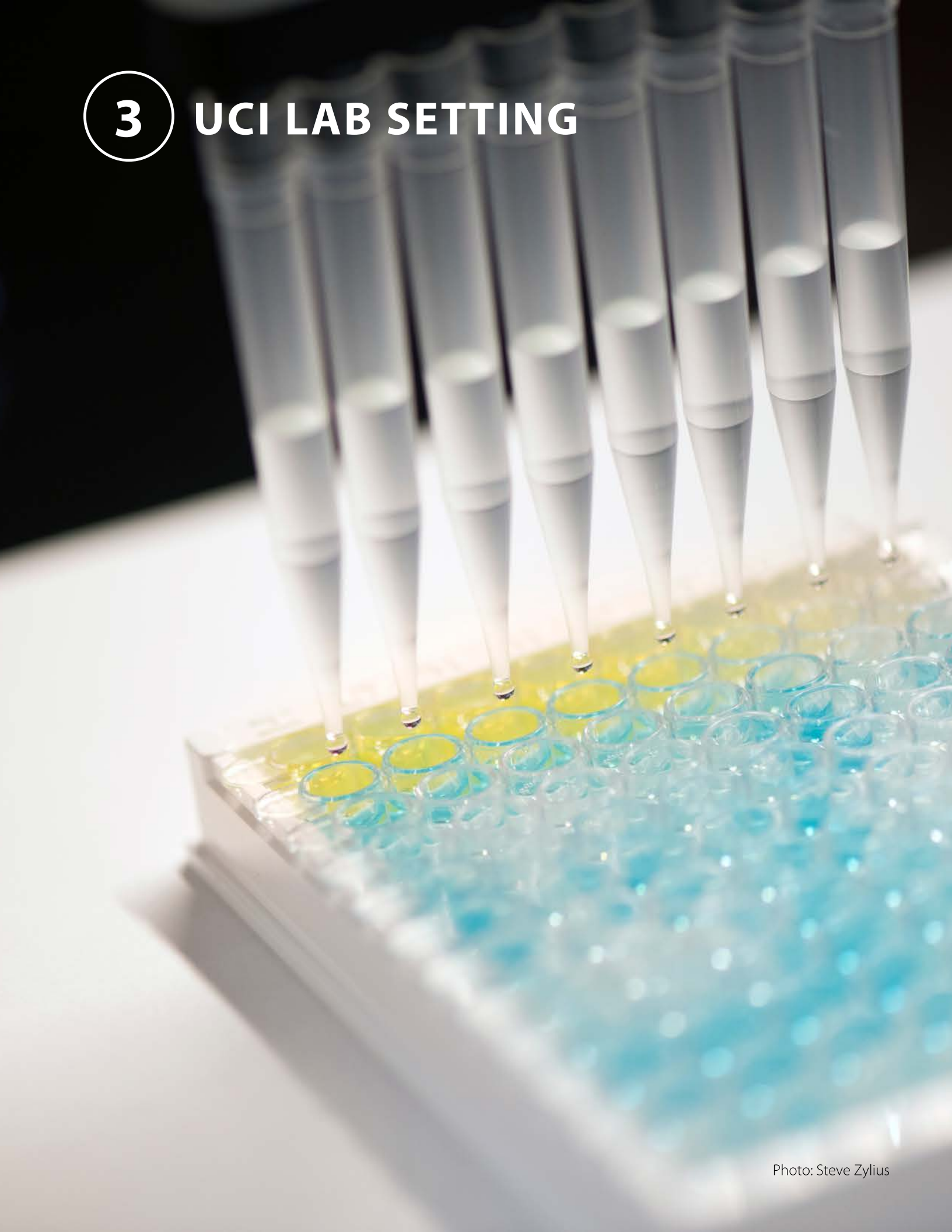
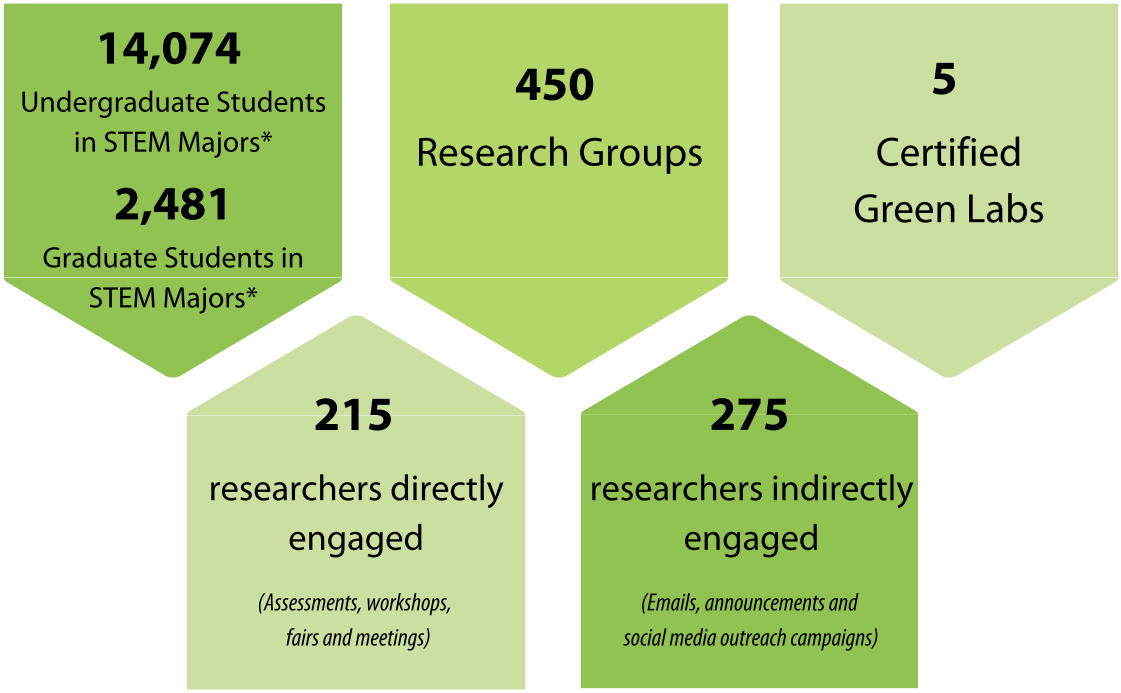


Photo: Steve Zylius



** Enrolled STEM majors from the 2019-2020 academic year*

Lab Setting and Program Engagement

Laboratories serve as a cornerstone of research at UCI, and as such, have a sizable impact on the university's carbon footprint. While only 20 percent of building space at UCI is laboratory, these buildings consume approximately two-thirds of total campus energy. There are approximately 450 research groups located on the main campus (Irvine). During the 2019 -2020 academic year, 14,074 undergraduate students and 2,481 graduate students were enrolled in STEM majors (science, technology, engineering, mathematics).

The UCI Green Labs program was developed through a pilot program in 2017. Principal investigators volunteered to participate in the pilot program and expressed an overall interest in learning about campus sustainability operations. The pilot program informed greater program management, strengthening of sustainable lab resources, and improved communications. Following the successful completion of the pilot program, the UCI Green Labs program is now made available to all wet labs located on the main campus.

The program has directly engaged with approximately 215 researchers through green lab assessments, informational workshops and meetings, and outreach fairs. It is estimated that 275 researchers have indirectly been engaged through email correspondence, announcements and articles, and marketing campaigns.

Druffel Lab, Earth System Science

Photo: Richard Demerjian

Certified Green Labs

A total of five research groups are UCI Green Labs Certified, representing academic departments including Earth System Science, Ecology and Evolutionary Biology, and Neurobiology and Behavior. There are 5 levels of certification: bronze, silver, gold, platinum and green. The level of certification is determined by the percentage of green lab best practices the research group has adopted, as calculated through final assessment responses. One research group received platinum certification, two research groups received gold certification, and two research groups received silver certification. Results show an average score increase of 18 percent between overall baseline assessment percentages to final assessment percentages.

Post-certification surveys show participants have overall rated the program excellent, with labs now incorporating sustainable lab practices on a daily basis. Participants also expressed concern with the length of the assessment and recommended visual sustainability resources would improve the program.

Certification Levels

80%+	Green
70 - 79%	Platinum
60 - 69%	Gold
50 - 59%	Silver
40 - 49%	Bronze

4 STRATEGY AND VISION

Photo: Elena Zhukova

Photo: Steve Zylius

The UCI Green Lab Action Plan sets the framework for a range of strategies targeting six key program areas: (1) energy efficiency, (2) water conservation, (3) waste reduction, (4) sustainable procurement, (5) outreach and recruitment, and (6) resource development.

These strategies support campus efforts to achieve University of California sustainability and climate goals, with a focus on behavior change and practices. In strengthening these program areas, UCI Green Labs seeks to enhance the design of the program to better provide actionable ways for laboratories to improve their environmental performance.

1: Energy Efficiency

2: Water Conservation

3: Waste Reduction

4: Sustainable Procurement

5: Communications and Outreach

6: Resource Development

1: Energy Efficiency

Progress Updates and Highlights

Visual Tools

In order to support and reinforce the daily practice of energy efficiency, UC Green Labs designed several visual tools, including signs, labels, and placards. These visual resources serve as powerful reminders for sustainable practices when using and operating fume hoods, computers, freezers, and faucets. For example, UCI's campus utilizes between 13,000 – 29,000 kWh of energy per year to power a single laboratory fume hood at the highest sash position. Data shows UCI fume hood energy consumption decreases by approximately 60 percent when at a lower sash position. All new participating labs receive copies of these labels and signs to post in their space. All visual tools are made available to download on the UCI Green Labs website.

Cold Storage Maintenance Education

All participating labs received coil dusters and ice scrapers, helping to prolong equipment life and reduce energy consumption up to 25 percent annually. Freezer condenser coils function as heat transfer surfaces to condense refrigerant and cool the contained space. However, dirty coils degrade cooling capacity and cause excessive energy consumption. Labs are educated on the importance of maintaining cooling performance in order to improve functionality and prolong lifespan of equipment. All labs are provided with signage to track the last date and frequency of coil dusting.

Chilling ULT Freezers to -70°C

All five certified labs have chilled up their freezers to -70°C from -80°C, reducing energy usage by 40 percent annually. The program provides researchers access to My Green Lab's database containing an ongoing list of samples safely stored at -70°C, helping to support decision-making for chilling up freezers.

Photo: Matt Deines

The Mackey lab adjusts the temperature of their ULT freezer to -70°C.

Action Items and Implementation Strategies

Action Item	Implementation Strategy	Targeted Goal
Develop inventory of ULT freezers that adjust temperature from -80°C to -70°C	Strengthen educational resources about energy savings associated with temperature change and the safe-keeping of samples stored at -70°C. Develop an inventory to keep track of the number of certified green labs that have adjusted ULT freezer temperatures and the types of samples stored.	Create ULT freezer inventory by 2024 and calculate annual energy use reductions.
Seek funding opportunities to purchase outlet timers for participating labs	Identify grant applications or opportunities to support the purchase of outlet timers. Determine which laboratory equipment would best utilize outlet timers.	Provide at least one outlet timer to every certified green lab by 2024 and develop inventory of equipment utilizing timers.
Retrofit lighting in laboratories from fluorescent to LED lighting	Identify which research buildings have not been retrofitted with LED lighting. Partner with Facilities Management to check for opportunities to upgrade lighting to LED or other solid-state systems.	Work with Facilities Management to determine targeted date for LED retrofitting.

Labs are provided with labels to help identify which equipment pieces should be turned off when done using, kept on at all times, or should be asked before turning off. A simple sustainable practice to support energy reduction.

2: Water Conservation

Progress Updates and Highlights

Flow Restrictor Installation

UCI was awarded a grant fund from Pepsi Co. to purchase 425 flow restrictors, supporting reductions in campus potable water use in research laboratories. The flow restrictors reduce water flow from 2 gallons per minute (GPM) to 0.74 GPM. These units are now campus standards for all new laboratory buildings. The flow restrictors were installed in five research buildings – Croul Hall, Gillespie Hall, Biological Sciences III, Gross Hall, and Rowland Hall. The Facilities Management plumbing team conducted installation. Water measurements are to be conducted to compare water usage before and after installation of flow restrictors.

Water Bottle Filling Station

Water bottle filling stations encourage greater reduction in single-use plastic water bottles. During the pilot phase of the program, all three participating labs located in Croul Hall expressed the need for a water bottle filling station in the building. In support of increasing water station accessibility on campus, the UCI Green Initiative Funded awarded grant funds to cover the cost and installation of one water bottle filling station in Croul Hall.

One of 425 Chicago Faucet low-flow water restrictors installed in research buildings.

Water bottle filling station installed in Croul Hall, helping to reduce single-use plastic water bottles.

Action Items and Implementation Strategies

Action Item	Implementation Strategy	Targeted Goal
Calculate water savings for the five buildings retrofitted with new flow restrictors	Partner with UCI Facilities Management to conduct water usage measurements, comparing water usage before and after installation as well as cost savings.	Prepare analysis report of flow restrictor water savings by 2022.
Seek funding opportunities to purchase additional low-flow restrictors	Identify grant applications or opportunities to support the purchase of flow restrictors for research buildings. Determine which buildings and labs have not yet been replaced with low-flow restrictors.	Install at least 400 flow restrictors in research buildings by 2023.
Determine retrofit opportunities for main campus autoclaves	Develop inventory of main campus autoclaves; identify how many autoclaves have been fitted with water efficiency technology and how many autoclaves have not been fitted. Research water efficiency technology, potential water savings, and costs.	Complete inventory of autoclaves by 2022 and fit 100% of autoclaves with water efficiency technology by 2024.

3: Waste Reduction

Progress Updates and Highlights

Styrofoam Recycling Program

UCI's Styrofoam Program collects Styrofoam (extruded polystyrene foam) from laboratory and health science buildings in ten campus locations. These large pieces of Styrofoam are primarily from the shipping of cold stored material to the labs. The average collection is 1.5 tons each month. The material is taken to a facility in Corona (40 miles away) where it is densified into large one ton cubes. This puts the material into a recyclable/sellable state, ready to produce other Styrofoam products. The Green Labs program aims to raise awareness of the recycling stations by providing a Styrofoam bin location map to all participants.

Laboratory Recycling Education and Signage

UCI Facilities Management created a designated laboratory recycling sign to be posted to all lab recycling bins. UCI labs can recycle all clean and dry aluminum foil, clean solvent bottles, flattened cardboard, plastic pipettes & bottles and cans. The Green Labs program ensures all certified labs have the proper signage located on their recycling bins and provides additional signage as needed.

The UCI Styrofoam Program collects Styrofoam (EPS) from ten campus locations.

Action Items and Implementation Strategies

Action Item	Implementation Strategy	Targeted Goal
Develop virtual educational module about laboratory recycling and waste management	Labs have expressed great interest in learning more about the proper disposal of commonly-used lab items. Partner with Facilities Management to host an educational module about laboratory waste reduction best practices.	Host at least one virtual educational module on laboratory recycling and waste management each academic year.
Establish Styrofoam sharing system for research buildings	To reduce the accumulation of Styrofoam packaging and storage, create an online sharing system to notify when a research group has excess Styrofoam available for others to use.	Develop and launch Styrofoam sharing system by 2023.
Conduct pilot program for glove recycling	Research glove take back programs and explore pilot program opportunities. Partner with UCI Facilities Management to determine feasibility, costs, and overall sustainability effectiveness of the program.	Launch pilot program for glove recycling by 2025.

Recycling sign posted to all lab recycling bins.

4: Sustainable Procurement

Progress Updates and Highlights

Vendor Sustainability Incentives and Opportunities
In an effort to increase program engagement and to recognize certified labs, UCI has initiated discussion with vendors to establish sustainability purchasing incentives and opportunities. The goal is to develop unique procurement offers for labs at time of certification completion. In collaboration with UCI Procurement Services and the UC Office of the President Procurement Services, the UCI Green Labs program seeks to prioritize this as an ongoing action item.

Informational Session
By request, UCI Green Labs hosted "Let's Talk Procurement", an informational training session educating research groups on how to navigate UCIBuy, the campus eCommerce portal. The in-person session demonstrated how to locate energy efficient products and complete a purchase.

Flyer for "Let's Talk Procurement," an informational session about sustainable procurement organized for UCI Green Labs.

Action Items and Implementation Strategies

Action Item	Implementation Strategy	Targeted Goal
Develop virtual educational module about sustainable lab procurement	Labs continue to express ongoing interest in learning more about sustainable lab purchasing. Collaborate with UCI Procurement and UCOP Procurement to create virtual educational module designed for laboratory purchasing.	Host one virtual educational module on sustainable procurement each academic year.
Establish green lab certification discount incentive with vendor(s)	Partner with UCI Procurement and UCOP Procurement to determine vendor discount opportunities on sustainable products. Work with labs to determine products most commonly used and/or most desired to have for incentive purposes.	Establish at least one vendor sustainability incentive for certified labs by 2022.

5: Communications and Outreach

Progress Updates and Highlights

Website Improvements

Substantial improvements were made to the UCI Green Labs website in an effort to increase readership and accessibility to resources. The enhanced organizational layout of the website enables viewers to learn about program details, understand its participation benefits, and easily submit interest to participate. The website also now serves as a central resource hub for sustainability materials such as, downloadable signs and labels for labs, informational pages on energy, water, waste, and procurement, and a dedicated page providing sustainable tips for conducting remote research.

Article Communications

UCI's Strategic Communications helped to officially launch the program campuswide in April 2018 with the press release entitled "Powering down: UCI launches Green Labs certification program." The article highlights the important role of the program in helping to support and achieve campus sustainability goals. In November 2018, ALN Laboratory featured the UCI Green Labs Program in its article, "Your lab can be greener too," which provides insight into the growing movement of laboratory sustainability around the world. Carrie Metzgar, UCI's program manager, and Professor Steve Allison, the PI of one of UCI's first certified green labs, were interviewed about their experiences in implementing more sustainable solutions and practices.

Outreach Events

Upon its official launch campuswide, UCI Green Labs has participated in several outreach events including, the UCI Green Labs Fair, UCI Student Housing Sustainability Fair, Smart Labs Workshop, and the International Conference on Learning and Memory. Attending these events have demonstrated increase awareness of the program, but have struggled to result in the recruitment of new labs.

Recruitment Campaign

A key focus area for the past two years has been the development of new and improved recruitment strategies. Outreach events, targeted emails, and in-person meetings were unsuccessful in increasing participation. In the fall of 2020, a new outreach strategy was developed, focusing on communications via social media and targeted emails with graduate student departments. Flyers, graphics, and pre-written captions and e-mails were created and posted to campus Instagram and Facebook pages, and shared among several school newsletters. This enhanced marketing effort resulted in new participation from several laboratories, and continues to expand program presence.

Action Items and Implementation Strategies

Action Item	Implementation Strategy	Targeted Goal
Expand matrix of outreach contacts to have at least one representative from every research-related department.	Expand the list of administrative representative contacts from research departments, graduate centers, and relevant schools. Share marketing toolkit of flyers, graphics, and pre-written captions and email communications.	Recruit at least five new labs to participate each year.
Develop social media presence	Determine opportunities for increased social media presence, such as creating a designated Instagram profile for UCI Green Labs or collaborating with existing UCI Sustainability social media platforms.	Schedule for a social media post to be shared at least once per academic quarter.
Explore opportunities to expand UCI Green Labs to teaching labs	Partner with My Green Lab to develop new certification assessment designed for teaching labs.	By 2025, expand program to include teaching lab participation.

Example Instagram post for Fall 2020 Recruitment Campaign. Image shared with academic departments, graduate centers, schools, and UCI Sustainability Resource Center.

6: Resource Development

Progress Updates and Highlights

Welcome Guide

To help simplify the certification process, the UCI Green Labs team created the "UCI Green Labs Welcome Guide." This user-friendly guide includes a brief overview of the certification process and five checklists containing simple sustainability recommendations laboratories can implement into their spaces, accompanied by interactive links containing additional information. The welcome guide also serves as a resourceful tool when conducting program outreach, as it provides greater insight into the types of behavioral practices the program encourages. Following challenges with recruitment, UCI Green Labs discovered there was a misconception that program participation entailed needing to make significant changes, such as the purchase of new energy efficient equipment. Since the development of the welcome guide, UCI Green Labs has successfully provided a greater overview as to how certification is achieved, placing the focus on simple behavioral actions.

Visual Tools

Following completion of the pilot program in 2018, one of the key resources participants requested was the creation of signage and labels. In order to support and reinforce the daily practice of sustainability, PI's recommended visual reminders be posted to computers, fume hoods, freezers, and sinks. Visuals also serve as an ongoing educational tool, enabling new lab members to learn about sustainability practices. The UCI Green Labs team has designed and printed nine visuals for energy efficiency, cold storage management, plug load, water conservation, and Styrofoam recycling. All new participating labs are provided copies of these labels and signs to post in their space. All signs are also made available to download on the UCI Green Labs website.

Assessment Feedback Report

In 2020, My Green Lab created a new feedback report to accompany the results of all assessments. The improved feedback report includes the preliminary scores earned for each category, recognition for where labs are already performing well, and recommendations for ways to improve. Each question in the report is now accompanied by additional text to further explain how labs can implement improvements, providing key metrics about savings and costs where applicable. For example, “Lighting accounts for nearly 15% off the energy used in a lab. LED lights can save 25-35% over CFL lights. Work with your facilities or operations group to investigate whether you have already or could upgrade the lighting to LED.”

Personalized Lab Checklist

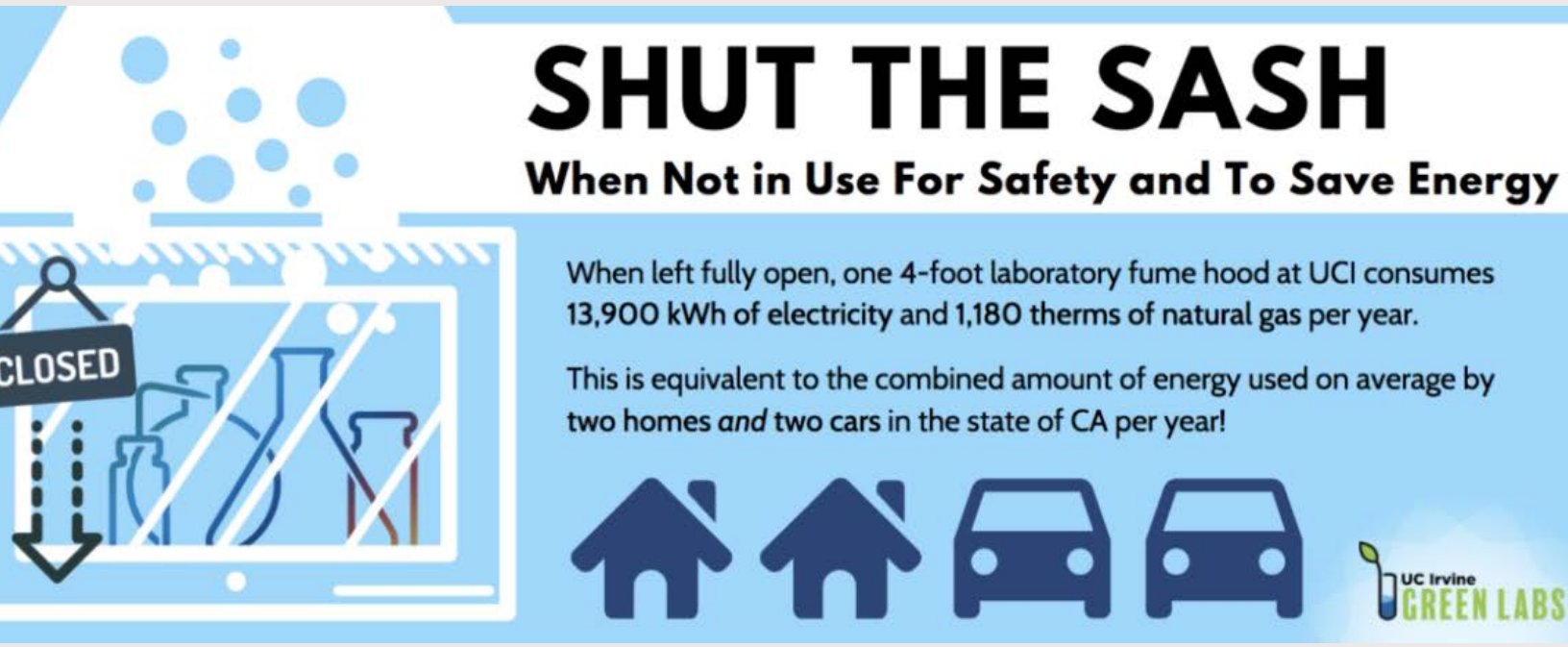
Upon completion of the baseline assessment, UCI Green Labs creates a personalized checklist for each lab. The checklist refers to the results of the feedback report and consolidates areas for improvement, categorized by topic area and ease of implementation – simple, moderate, advanced. The checklist seeks to streamline action items and simplify next steps.

Remote Research

When research shutdown in spring 2020 due to the pandemic, UCI Green Labs created a webpage dedicated to sustainable tips for remote research. The page features simple tips to stay green while conducting research remotely and communicating with other lab members. This page seeks to support labs as research schedules and regulations continue to evolve.

Action Items and Implementation Strategies

Action Item	Implementation Strategy	Targeted Goal
Create additional visual signs and labels	Expand the existing collection of signs and labels by identifying areas of opportunity for new visuals. Work with participating labs to identify types of signage needed, for example, green chemistry, resource management, procurement, etc.	Develop five new visuals by 2023.
Develop recycling and waste management resource	Partner with Facilities Management to create a laboratory-specific recycling and waste management resource, such as an online lab recycling guide or library.	Create recycling and waste management resource by 2023.
Partner in the creation of the UC system-wide Green Labs Resource Library	Collaborate with campuses to consolidate all relevant, existing green lab resources and make accessible in an online, central location.	Complete consolidation of resources by 2021. Work with UC campuses to set timeline goal for resource library completion.



5 MONITORING AND REPORTING

Photo: Steve Zylius

Photo: Elena Zhukova

The strategies identified in this plan will be implemented and monitored by the UCI Green Labs Working Group, with support from My Green Lab. The foundation of the UCI Green Labs program will continue to be behavioral, placing emphasis on habitual practices and values to drive a greater culture of lab sustainability. When feasible, the program will implement data-driven projects, allowing for greater numerical assessment of energy, water, and waste savings.

Progress will be reported annually through AASHE's Sustainability Tracking, Assessment and Rating system (STARS) and the University of California Annual Report on Sustainable Practices. Updates and progress will be provided annually to the UCI Sustainability Committee.

Acknowledgements

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