

*Purdue University - College of
Agriculture*

**PLANT GROWTH
CHAMBER
CENTER**

USE MANUAL

*An Orientation to Policies
and Practices*

Plant Growth Chamber Center - Use Manual

Table of Contents

Contact Information	3
Plant Growth Chamber Center – Policy and Practices.....	4
Mission of the CoA Plant Growth Chamber Center	4
About the Facility.....	4
Facility Managers.....	5
Facility Team Responsibility (Rendered Services).....	5
Researcher Responsibility	6
Recharge System	6
Requesting Space in the Facility	7
To get started, set up an account.....	7
To Create a Service Request:.....	8
Prioritizing Allocation of Space in the Facility.....	8
Chamber Operating Ranges.....	8
Light Bulb Replacement Policy.....	8
Supplies	9
Storage of Supplies and Chemicals.....	10
Housekeeping.....	10
Keys	10
Plant/Cutting Inspection.....	10
Spacing Plants	11
Ensuring Proper Air Flow.....	11
"No Pesticide" Experiments.....	11
Quarantine Areas	11
Collections, "Pet Plants," and Other Long-Term Crops.....	11
Timely Harvest of Plant Material.....	12
Safety	12
Pesticide Safety.....	12
Chamber Audible Alarms	13
Policy Violations.....	13
When Things Go Wrong.....	13
Contacting Managers.....	13

Contact Information

FOR LSR AND WSLR LOCATIONS:

Bong-Suk Kim Plant Growth Facilities Coordinator (Lilly Greenhouse Complex)

Botany and Plant Pathology Dept.
Office (LSPS 102): 496-7551

Nathan Deppe Horticulture Plant Growth Facilities Manager
Horticulture and Landscape Architecture Dept.
Office (HGRH 1139C): 494-7265

FOR HGRH LOCATION:

Nathan Deppe Horticulture Plant Growth Facilities Manager
Horticulture and Landscape Architecture Dept.
Office (HGRH 1139C): 494-7265

Ali Jewell; Horticulture Greenhouse Technician
Horticulture and Landscape Architecture Dept.
Office (HGRH 1139B): 496-3745

EMERGENCY PHONE NUMBERS:

Maintenance First Responder (4-11pm): 426-8900

Purdue Police Non-Emergency: 49-48221

DIAL 911 FOR ANY MEDICAL EMERGENCY

Plant Growth Chamber Center – Policy and Practices

Mission of the CoA Plant Growth Chamber Center

To provide the Purdue University – College of Agriculture research community with controlled-environments dedicated for excellence in plant sciences.

About the Facility

In 1999, thirty-three growth chambers were initially purchased and installed within three areas of the agriculture campus as part of a decentralized multi-user plant growth facility obtained through a \$450k National Science Foundation MRI grant plus equivalent matching funds from Purdue University (Appendix A). The P.I.s on the grant were from the Department of Horticulture and Landscape Architecture (HLA): Drs. Cary Mitchell and Randy Woodson. The chamber program was deemed effective, so in 2000, Associate Dean Randy Woodson charged HLA and Botany and Plant Pathology (BPP) to develop a plan for Whistler (WSLR) chamber and light rack management. Dr. Ashworth (HLA-Head) set forth a framework and proposal for bridging all three sites into one centralized chamber facility. On July 1st, 2005, this program went live. Personnel in the departments of HLA and BPP were tasked with managing these facilities henceforth.

In March of 2016, the then Associate Dean of Research and Education, Karen Plaut invested one million dollars into the center from the Purdue Science Initiative. From this generous donation, we were able to renovate space in WSLR B014 and add nine new Percival chambers and one large walk-in Conviron unit. We added a processed chilled water supply loop, updated control boards on existing chambers, renovated needed areas, and purchased new light racks for the WSLR subbasement light rooms. At the Life Sciences Ranges (LSR) – North Chamber Room, we retrofitted lighting on existing chambers and added a plate-and-frame heat exchanger system to provide processed chilled water to all chambers. Lastly, we procured three new Percival units to replace chambers in the Horticulture Greenhouse building (HGRH). To date, this was the most significant update to the center.

In 2021, the Associate Dean of Research, Dr. Bernie Engel asked the Plant Growth Chamber Center to help oversee use of WSLR #141 Plant Growth Room. This room consists of vertical racks of ebb and flow trays with automatic irrigation. This is one of the larger and more sophisticated growth rooms at Purdue for basic plant research.

Currently, the PGCC consists of 52 chambers in three locations: The corridor, basement, 1110 (HGRH); and S007, S010-S040, and B014; and LSR-North Chamber Room. Additionally, there are 38 light racks located in the sub-basement of WSLR. Lastly, there are 36 ebb and flow trays located in WSLR 141.

Facility Managers

Nathan Deppe, Plant Growth Facilities Manager, HLA Dept (5% Appointment Only):

- Accountable for installation of all funded chambers
- Accountable for space allocation and recharge record keeping in Horticulture and WSLR #141.
- Responsible for proper functioning and programming of funded chambers
- Manage use of multi-user chamber areas in HGRH, WSLR and LILY to ensure best usage, sanitation, and storage
- Accountable for effective pest control, equipment maintenance and sanitation in WSLR #141 and HGRH facilities.
- Provide training to technician in charge of areas
- Provide orientation to new users and regular communications
- Daily oversight of equipment in common facilities
- Maintenance and minor repairs such as bulb changing and filter changing
- Ordering supplies
- Disposal of transgenic and biohazard plant materials

Bong-Suk Kim, Lilly Greenhouse Coordinator, BTNY Dept (27.5% Appointment Only):

- Accountable for space allocation and recharge record keeping in WSLR (except WSLR #141) and LSR
- Ensure proper functioning and programming of chambers in WSLR and LSR facilities
- Manage WSLR greenhouse to ensure best usage.
- Accountable for effective pest control, equipment maintenance and sanitation in WSLR (Except #141) and LSR facilities.
- Provide orientation to new users and regular communications
- Daily oversight of equipment in common facilities
- Maintenance and minor repairs such as bulb changing and filter changing
- Ordering supplies
- Disposal of transgenic and biohazard plant materials

Facility Team Responsibility (Rendered Services)

The facility team provides the following services:

- Allocating space resources within controlled environments (CE) part of the center
- Purchasing and maintaining inventory of lamps, soil mix, commonly used pots/inserts, irrigation supplies, and sanitation supplies

- Coordinating contracted preventative maintenance work to chambers
- Programming chambers and timers as requested
- Assisting with routine maintenance of CE at all locations
- Facilitating CE repairs
- Conducting weekly pest scouting, sending notifications, and rendering pesticide/biological control applications
- Replacing lamps in chambers and light racks
- Removing Stericycle containers to outside area for pick-up to be devitalized via live steam sterilization

Researcher Responsibility

Researchers share responsibility for plant quality with the facility team. Users should take the primary role in monitoring and maintaining their crops, including:

- Planning space needs and supply needs in advance
- Submitting project requests via ILAB for each piece of equipment needed
- Spacing plants properly to ensure air movement in chamber
- Watering crops
- Monitoring for insects and diseases
- Keeping growth areas and work areas sanitary and orderly
- Collecting sample plants, delivering and paying for diagnoses of infectious plants to the Plant Pest and Diagnostic Lab of Botany and Plant Path Dept. or other lab
- Terminating experiments on termination date and discarding plants
- Acquiring approval prior to moving any equipment into facility areas
- Funding expenses incurred for removal of faculty-owned equipment that is beyond repair or usefulness
- No subletting chamber space

Recharge System

In order to maintain chambers in good working order, investigators will be assessed a fee based upon the square footage of the chamber. These funds will be used to provide periodic routine maintenance, repairs, lamp replacement, potting supplies, soil, pest control. The charge will vary depending upon the area (square footage) of the chamber.

Researchers will supply an account number at the time they request plant growth chamber space. As we obtain additional information and experience with using these chambers, the recharge rate may be adjusted to more accurately reflect the costs associated with chamber operation.

Current Recharge Rates

Recharge rates are based on type of chamber and normalized by square foot capacity available in chamber. Rates were approved by campus starting September 2022.

Convion E8 (HGRH Facility)	\$2.87/day
Convion E15 (HGRH and LSR Facility)	\$5.39/day
Convion PGR-15 (LSR Facility)	\$5.39/day
Percival (HGRH)	\$7.01/day
Percival AR-75L (WSLR)	\$4.16/day
Percival AR-66L	\$4.38/day
Percival AR-66L3	\$6.57/day
Convion Growth Room	\$17.87/day
Light Racks	\$1.59/day
Light Racks with Irrigation	\$2.88/day

Requesting Space in the Facility

The Plant Growth Chamber Center at Purdue University is excited to start using an online system to streamline the process of ordering and billing for core service requests. All facility users are invited to use the system, which requires a one-time registration as discussed below. Once you are registered, the system will enable you to place service requests, provide required approvals, and monitor progress. At this time, selection of equipment in WSLR #141 is not available. Please contact Nathan Deppe directly for placement in this room.

To get started, set up an account

1. Navigate to the core page:
https://purdue.ilabsolutions.com/service_center/show_external/4388
2. In the upper-right-hand corner of the screen where it says, 'sign up or Login' please click sign-up to register,' select the click here link where it says 'Purdue user.'
3. You will be directed to an authentication page where you will need to enter your Career Account credentials
4. Once you have entered your credentials, click the 'Login' button
5. You will be directed to an iLab Registration page where you will need to select your PI/Lab, and verify your contact information

6. Once your registration has been submitted, your PI will receive a notification that you have requested membership to their lab in iLab. They will need to approve your membership and assign any Account Strings for your use.

To Create a Service Request:

1. Navigate to the core page:
https://purdue.ilabsolutions.com/service_center/show_external/4388
2. In the upper-right hand corner of the screen where it says, 'sign up or Login,' please click Login and select the click here link where it says 'Purdue user.'
3. Enter your Career Account and password, and sign in.
4. Select the Request Services tab and click on the 'Request Service' button next to the service of interest.
5. You will be asked to complete a form before submitting the request to the core.
6. Your request will be pending review by the core. The core will review your request and either Agree to the work or they will ask for more information if needed. Additional help and more detailed instructions can be found by clicking on the "HELP" link in the upper right hand corner or by navigating to help.ilab.agilent.com

Prioritizing Allocation of Space in the Facility

Priority will be given to investigations that 1) require special environments, conditions, or uniformity not available within a greenhouse or growth room and 2) are part of a sponsored research project. In addition, assignments will be made to permit efficient utilization of growth chambers and to accommodate a large number of investigators. Six months will be the longest allocation granted, after which the investigator must re-apply for space. If there are individuals waiting for growth chambers, new users will be allocated space as reservations expire.

Chamber Operating Ranges

General notes: The majority of our fleet relies on fluorescent and incandescent lamps for illumination. PGR-15s have metal halide, high pressure sodium and incandescent lamps. Our Conviron Growth Room is illuminated with ceramic metal halide bulbs which can dim as required. Regarding humidity control, PGR-15 chambers have no ability to humidify or dehumidify. All other chambers have humidification but no air driers, so low humidity settings are subject to ambient humidity. Roughly, the lowest humidity is 35% RH during winter if temperature setpoint is at or above 20°C. Under most conditions, a 65% RH is achievable in all chambers except PGR-15s.

Typical chamber parameters are:

4°C to 45°C +/- 0.1°C with no lights on.

10°C to 45°C +/- 0.2°C with all lights on.

The chambers can be programmed for temperature ramping between day/night settings. Conviron lights can be programmed to turn on/off incrementally to simulate sunrise/sunset. Also, Conviron can be programmed to chain different programs together to create varying conditions on different days. There are limitations to this approach, however.

Light Bulb Replacement Policy**Light Bulb Changing Policy**

- 1) Please provide us with the photosynthetically active radiation ($\mu\text{mol}/\text{m}^2/\text{sec}$) that you would like us to target when completing a project request via ILAB. As long as there are no chamber limitations, we will ensure the target is met at the center of chamber at height of standard insert (or different potting vessel if requested). *Adjustment of light intensity does not apply to light racks unfortunately, but bulbs will be working at time of rental.*
- 2) During your six-month rental term, we will make periodic rounds to ensure incandescent/halogen bulbs are replaced. No failed incandescent/halogen bulb will be allowed to remain for greater than two weeks. *There will be no notification of chamber entry to change these bulbs.*
- 3) If requested, we would gladly check the PAR in chamber at a 3-month interval to ensure desired output is still being provided. *Please contact us if interested.*
- 4) Fluorescent bulb failures will be addressed at the end of your six-month rental term. These take added coordination to remove and replace so we wish to not disrupt research. If you require a fluorescent bulb change, please contact us directly. We will need to schedule a time for you to remove all plants to address.
- 5) A full-scale replacement of fluorescent bulbs will take place every 10,000 hours of use. This will be done between rental terms (if expiration is approaching) or after discussion and coordination with researcher(s).
- 6) Most of our controlled-environments use fluorescent and incandescent bulbs. Controlled-environments that offer a different source of illumination are replaced based on run time or failure. LED tubes installed on light racks, for instance, are replaced every 50,000 hours of use.

Supplies

Currently, WSLR provides the following supplies: soilless substrate, tags, fertilizer, and certain potting vessels and flats. Users at other locations must coordinate supplies with contacts at LSR or HGRH.

Storage of Supplies and Chemicals

Storage in facilities is very limited. We must avoid the accumulation of items around the facilities or they will soon appear junky and unsafe. Do not use chambers or nearby sinks or counters to store items overnight or longer, especially chemicals. We will remove or discard such items as we find them without notice. Bring small items with you that you need for data collection, etc.

Special note for WSLR multi-user area (Rooms S004-S040): Small items can be stored in small totes or drawer systems in the room as long as it is authorized by the coordinator. Items should be labeled with the user's name and are subject to remove if it is deemed necessary. No chemicals or cultures can be stored.

No pesticides will be stored in the HGRH, WSLR, or LSR rooms at any time. All containers should be labeled, including those containing only water. Unlabeled items will be removed without notice. Pesticides for research use—either concentrated or in final solution (such as herbicides for screening) --cannot be stored in the greenhouse or chamber facility. They should be stored properly in a laboratory hood in your lab.

Housekeeping

The growth chamber facility is a work place, not a show place, but orderliness is still expected of all users. The facility team and Building Services assists in cleaning, but could never keep up if users don't share responsibility. Failure to keep a sanitary, orderly growth area may result in loss of facility team services or space in the facility. Users are also responsible for keeping the facility sanitary including but not limited to:

- work tables after potting
- carts after transport
- benches and floors, during experiments and after termination of experiments
- inside growth chambers and coolers during and after experiments
- sinks after use
- corridor floors if soiled by transporting of plants

Keys

Key and key card access to WSLR and LSR areas for weekend access should be requested from Building Deputies, Becky Stevenson (49-67608) and Will Werline (49-48079), respectively. Key card access for HGRH can be requested from Nathan Deppe (49-47265).

Plant/Cutting Inspection

Plants or cuttings from the field, other growing facilities, or commercial sources must be checked by a facility manager for pests before being placed in growing areas. Inspection will ensure the safety of your crops as well as other investigators. In most cases, if pests are found the plants are still allowed in and we schedule a pesticide application immediately. Some plants will not be allowed in, particularly if showing signs of infectious disease.

Spacing Plants

Plants should be spaced properly on the greenhouse bench or in growth chamber to allow for air movement and access by facility team to scout and spray. Managers will notify you if spacing needs to be changed. Failure to comply may result in loss of services or space. Please don't use close spacing to make up for lack of space allocation, or loose spacing to "hold" space.

Ensuring Proper Air Flow

Air flow exchanges through the floor of each Conviron growth chamber. Therefore, covering the chamber floor with flats will restrict air flow and reduce the efficiency of equipment. Pots should be removed from flats. No more than 75% of the floor should be covered.

"No Pesticide" Experiments

Some investigations require no pesticides be applied, such as for surface wax research or insect-plant interactions. Consult with the facility team before placing these experiments in the chambers. We will do our best to help you succeed, but we will not allow infestations that may occur in one experiment to risk the success of others' research by the infestation spreading. Facility Managers have the authority to authorize pest control on any experiment for the good of the research community in the facility. These experiments are best conducted in a facility that is not multi-user. Biological control mechanism can help reduce pest pressure in these kinds of experiments.

Quarantine Areas

Some areas may be quarantined due to the presence of a viral disease. Policies for working in these zones are posted on the doors and are often determined with input from the user. It is the responsibility of the user to read about, learn and follow these procedures. Failing to do so can contaminate others research and exacerbate the problem.

Users must let management know if plant material being transferred to the facility is suspected to be infected with viral diseases.

Collections, “Pet Plants,” and Other Long-Term Crops

Space in the facility should be used actively to fulfill a teaching, outreach or research mission. Plants should not be kept longer than necessary in the facility, particularly if they've completed their life cycle and are not actively growing. Insects and disease become a significant problem in these cases, plus space is kept unavailable for active work. Managers have authority to set termination dates for plants in the facility and to discard plants in violation of this policy.

Timely Harvest of Plant Material

Mature plants are only allowed in the facility for a limited time. Please consider using the Mature Plant Staging and Seed Harvest Area located at WSLR 101 and 101A. Follow instructions at this site to better assist you and others. Mature plants within growth rooms or chambers need to be harvested ASAP or moved to WSLR 101A until you can harvest.

Safety

The facility team is responsible for operating the facility in a safe manner, including Worker Protection Standards (WPS) compliance and handling of pesticides and other chemicals in accordance with all federal, state, local and university regulation. This is a particular challenge in a facility available to its users 24 hours a day, and so requires a great deal of communication and cooperation.

We are committed to making information available about the chemicals we use and when applied. Central information stations will be put in place in WSLR, HGRH and LSR.

Facility users must inform manager or greenhouse technician prior to chemical applications of herbicides, fungicides and other regulated chemicals to ensure compliance with all appropriate regulations.

Facility users are responsible for determining what university safety regulations apply to their work in the facilities, and for compliance. Faculty are accountable for their staff's safety compliance and their staff receiving applicable safety training. Users are responsible for working safely and keeping the facility safe for others. This includes learning emergency procedures (i.e., fire evacuation), and location of phones, fire extinguishers, safety shower/eyewash stations, and first aid kits. The same policies toward glove contamination and labeling chemicals apply in the multi-user facility as they do in labs.

Pesticide Safety

Notices of pesticide applications will be posted on doors of affected areas, including what areas are affected and time of application. EPA-approved NO ENTRY signs will always be on doors of treated areas, meaning the restricted access is currently in effect. These will be taken down shortly after the label-designated period of restriction is over. The control agents range from biologicals with no restricted access to soaps and oils with 4-12 hours restriction,

Repeated violations of entry restrictions by a user will result in the door being locked following any application in their area or loss of allocation.

Chamber Audible Alarms

The Conviron growth chambers in HGRH are alarmed for temperature emergencies. Here's what happens in those areas: An audible alarm sounds at the chamber and the alarm appears on the computer in Nathan's office. Nathan is also called by the computer one minute later. Even if it's after hours, a manager can acknowledge these alarms and fix the problem usually within 15 minutes remotely using a laptop computer.

There is currently no "call-out" alarms on the WSLR Percivals. In case a chamber fails and the temperature rises or falls above alarm set-points, you will hear a buzz coming from the chamber. Contact manager. Contact phone numbers are posted on bulletin board in hallway of WSLR chamber area

Policy Violations

Users of the facility are responsible for learning and following these policies. Managers will communicate policies and remind users when they are in violation. Policies can be changed when they are no longer appropriate, or when a better solution is proposed. Repeated, deliberate violations of these policies may result in services being suspended for that user or a loss in allocated space.

When Things Go Wrong

Things do go wrong in caring for perishable products in the dynamic environment of a greenhouse or growth chamber. If you see a problem with something a facility team member is doing, you may tell them directly. They are expected to listen, check for understanding, let you know they want to get it right, and report back to the manager. Users may also choose to tell manager or technician of problems they see.

When things go wrong with managers' performance, you can tell them directly. You can also contact Dept. Heads Linda Prokopy (HLA) and Tesfaye Mengiste (BTNY).

Contacting Managers

Managers are committed to a 24-hour (maximum) response time on messages you leave during business days. You can contact the manager in person, by phone, voicemail, text or email. Email is preferred unless the problem is vital. This will limit interruptions in tasks and provide a written record.

