

# University of Guelph Phytotron Policy



## **Management and Staff:**

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## Introduction

The University of Guelph Phytotron is located on the roof of the Summerlee Science Complex. The facility includes a 464 m<sup>2</sup> greenhouse, 215 m<sup>2</sup> header house, and 500 m<sup>2</sup> growth room/chamber area housing 33 reach-in growth chambers and 12 walk-in growth rooms. The goal of the University of Guelph Phytotron is to provide and maintain controlled environment space necessary for research and teaching. The purpose of this document is to outline the policies and responsibilities for all users and staff of the Phytotron.

Additional information about the facility, including space request forms, can be found at the [Phytotron website](#).

Any questions regarding the use of the Phytotron, requests for space, ordering of supplies, and equipment maintenance can be directed to:

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## Phytotron User Committee

Prof. Christina Caruso  
Prof. Joe Colasanti  
Leane Illman (Assistant Phytotron Coordinator)  
Prof. Hafiz Maherali (Director and Chair)  
Prof. Baozhong Meng  
Dr. Chris Meyer (Staff Representative)  
Michael Mucci (Phytotron Coordinator)  
Prof. Annette Nassuth

## General Responsibilities of Phytotron Users

Users of the Phytotron are expected to follow the guidelines outlined within this document. Users must be aware that disregarding the policies outlined here can have negative impacts on **both** their own research projects as well as the research projects of others using the facility. All Phytotron users will be responsible for:

- scheduling and participating in an orientation session given by the Phytotron Coordinator
- submitting requests for space in the Phytotron; space requests are now handled through the [Phytotron website](#)
- reporting any problems with the facility (Ex/equipment failures) as soon as possible to Phytotron staff
- caring for experimental organisms (including proper watering, fertilizing, and pruning of plants; handling, containment and feeding of insects and animals; growth, handling and containment of bacterial, viral or fungal organisms)
- preventing pests (Ex/ following guidelines for handling infested plants, respecting the order of entry protocols, assuring proper cultural care of organisms) and notifying staff of any pest issues
- keeping work areas orderly for the duration of the experiment; particular attention must be given to neatness and sanitation as this figures greatly into pest management
- disposing of all plant material and regular waste in garbage bags upon completion of an experiment and depositing them in the appropriate location in the header house (*See the document [‘Agricultural Biotechnology – Plant with Novel Traits \(PNTs\)’ for guidelines on handling and disposal of transgenic material](#)*)
- making arrangements with the coordinator to use the freight elevator

- notifying Phytotron staff when you are finished with the space; please note that billing for space will only be stopped once notification has been received and all areas have been cleaned
- faculty members who are primary users of the facility should share in the responsibility of training and supervising their students and staff members to assure that sound scientific practices as well as Phytotron policies are being followed

**Effective July 1, 2010:** Phytotron staff will give fair warning and make every attempt to contact users and labs who fail to keep their work areas clean. This includes any areas that are deemed excessively dirty by Phytotron staff (ie: excessive dirt and plant debris on greenhouse/growth chamber floors, large numbers of dead plants left for prolonged periods in greenhouse/growth chambers, large numbers of dirty pots left behind in greenhouse/growth chambers).

**WARNING: Failure in responding to notifications from Phytotron staff will result in all materials being discarded and a minimum penalty charge of \$500 (5 hours minimum @ \$100/hour).**

**Effective September 1, 2010:** Phytotron staff will handle all pot washing duties for the facility. Ensure all plant material and loose planting media has been removed from the pots and put in the appropriate waste stream. Pots can be neatly stacked and left near the sinks in the potting area.

#### *Special Considerations for Plants with Novel Traits (PNTs)*

Users working with PNTs should consult the Environmental Health and Safety document [‘Agricultural Biotechnology – Plant with Novel Traits \(PNTs\)’](#)

According to the CFIA PNTs by definition are:

- plants containing traits not present in plants of the same species already existing as stable populations cultivated in Canada, or are expressed outside the normal statistical range of similar existing traits in the plant species.
- PNTs that are subject to an environmental safety assessment are those plants that are potentially not substantially equivalent to their counterpart plants with regards to potential changes in weediness/invasiveness, gene flow, plant pest properties, impacts on other organisms and impact on biodiversity.

Consistent with the Canadian approach, the CFIA recognizes that it is the presence of a novel trait in a plant that potentially poses environmental risk, and hence is subject to regulatory oversight, as opposed to how the traits are specifically introduced, e.g., introduction of novel traits by traditional breeding, mutagenesis, recombinant DNA techniques, etc

In brief, users of the Phytotron must:

- declare all PNT material at the start of an experiment

- complete the Phytotron PNT Risk Management Assessment Form (as of September 2013, this form is part of the online space request form)
- keep detailed records of all PNT material planted, moved, and discarded in the Phytotron using the PNT log sheet
- autoclaving all PNT material and placing it in the appropriate disposal container located near the autoclave
- all relevant forms can be obtained by emailing Phytotron staff

## Health and Safety

Working in the Phytotron requires that all users be committed to safety and work so as not to endanger the health and safety of themselves or other users/staff in the Phytotron. Users are expected to be familiar with general health and safety practices at the University of Guelph. The following document outlines general health and safety practices in the Advanced Analysis Centre:

### [AAC Safety Handbook](#)

As of November 13, 2017, all users of the Phytotron are required to provide certificates of completion for the following safety courses:

- Laboratory Safety
- EHS BioSafety
- WHMIS
- EHS Worker Health and Safety Awareness

The courses can be taken online through the EHS website:

### [EHS Online Safety Training](#)

In addition, all users of the facility must register with Phytotron staff for a Phytotron orientation session which covers safety items specific to working in the Phytotron.

Users will not receive tap card access to the Phytotron until the above-mentioned safety courses are complete.

A [chemical inventory](#) is available on the Phytotron website and all SDS sheets are available electronically at the [Chemwatch](#) website.

### **Volunteers:**

University of Guelph student volunteers are not permitted key card access to the facility. They are welcome to work in the Phytotron, but only when supervised by research staff that have tap card access.

Leaving a volunteer alone in the Phytotron presents a serious safety issue as they are not permitted to have tap card access and therefore would be cut off from accessing emergency exits.

### **Access to Phytotron:**

All personnel working in the Phytotron, including volunteers, must be affiliated with the University of Guelph (ex: students, staff, and faculty). Because of liability and insurance requirements, individuals not affiliated with the University of Guelph cannot be given unattended access to the facility. Visiting scientists from other institutions, researchers from private companies and any other personnel wishing to work in the Phytotron must receive a nil-salaried appointment and have valid University of Guelph credentials before being able to gain access to the facility.

Specific health and safety items for the Phytotron are covered in the **Phytotron Safety Orientation Checklist** during the safety orientation.

### **Hydrogenation Lab Safety:**

As of 2014, the Department of Chemistry has commenced research in the Hydrogenation Lab, room 5106J. The Hydrogenation lab is a small lab dedicated to high temperature and high pressure reactions using hydrogen. This room has been specifically designed for this purpose with a set of blow-out panels, explosion proof fixtures and high flow fume hoods.

Phytotron staff have been involved in discussions around emergency procedures in the event of an alarm in the Hydrogenation Lab. The complete 'Alarm Response Procedure' for the Hydrogenation Lab will be posted on the bulletin board near the door to room 5107 (growth chamber room) along with Hydrogenation Lab contact information.

In short, if Phytotron users hear the audible alarm, or see the strobe light alarm active, they should **evacuate the 5th floor immediately**. Avoid using the freight elevator in the event of a Hydrogenation Lab alarm. Currently, there is only one alarm strobe light directly above the doors to room 5106J.

During regular work hours Phytotron users can consult with Phytotron staff about whether or not it is safe to return to the 5<sup>th</sup> floor as they will be in contact with Hydrogenation Lab staff and/or campus police.

During afterhours work, weekends, holidays, or if Phytotron staff are not available, Phytotron users should contact Campus Police to determine if it is safe to return to the 5<sup>th</sup> floor.

### **General Responsibilities of Phytotron Staff**

In general, the Phytotron staff will be responsible for monitoring, maintenance, and administration of the Phytotron space. More specifically, the staff will be responsible for:

- day to day operation and maintenance of greenhouse, growth chambers, growth rooms and all associated equipment (Ex/central control computers)

- instructing and informing facility users on operational procedures and the use of equipment through orientation sessions
- receiving requests for space, common supplies (soil, pots, fertilizers, CO<sub>2</sub> tanks), and service to equipment
- ordering of common supplies
- assigning space to users after receiving a Space Request Form
- authorizing individuals to have swipe cards activated for access to the facility (new researcher must fill out the 'Department of Integrative Biology Request for Tap Access' form, which is available in the Phytotron office)
- working along side users to develop and implement research project maintenance plans (Ex/ suggestions for proper plant care and culture, providing all necessary supplies, and integrated pest management)
- programming/setting environmental controls prior user projects
- implementing and informing users of an integrated pest management program
- conducting a standard review of equipment and cleaning after every completed project
- monitoring and maintenance of the facility during emergency situations (Ex/ power and water shutdowns)
- maintaining financial records for Phytotron expenditures (Ex/ supplies and use of space)
- constructing and maintaining a web page for the facility
- continuously planning to improve Phytotron operations and associated equipment

### **Equipment Failure and Alarm Response**

**One Phytotron staff member will be on standby to respond to alarms due to equipment failure or service interruptions with critical utilities (ie: electricity, chilled water). As of March 2018, Phytotron staff will be on standby between the hours of 7pm – midnight on weekdays and 8am – midnight on weekends and holidays. During periods of university closure (ex/December/January holidays and closures due to inclement weather) Phytotron staff will continue to follow the above standby schedule (ie: 5 hours of standby on regular weekdays and 16 hours standby on weekends/holidays).**

**During periods of university closure and weekends/holidays, Phytotron staff are not able to respond to any requests for facility services (ex/watering requests, environmental program change requests) as these do not qualify as emergency situations.**



**Phytotron staff are unable to respond to equipment failure or alarms outside of the specified standby hours. If Phytotron users notice equipment failure outside of the Phytotron staff standby hours, they should contact Campus Police (Emergency x52000, non-emergency x52245).**

**The name and contact information for the Phytotron staff member currently on standby will be posted on the Phytotron office door (5106D).**

### **Weekend/Holiday Watering Services**

**Effective July 1, 2010:** Weekend and holiday watering services are available and will be charged at a rate of \$20.40/hr with a minimum ½ hr charge.

**NOTE: Any new requests for weekend/holiday watering service must be submitted to the Phytotron Coordinator 48 hours in advance of the day the watering service is to begin. Last minute watering requests will not be accommodated except in emergency situations (family emergency, illness etc.).**

**Weekend watering is covered by a temporary part-time employee. As of March 2018: in the event the temporary part-time employee is not available, the Phytotron will not be able to offer weekend or holiday watering services.**

### **Space Allocation**

- in order to request space, every individual using the facility must completely fill out a **Space Request Form (now available online at the [Phytotron Home Page](#))**. **Submit your space requests as early as possible!**
- If supplies need to be ordered for your experiment, plan at least 2 weeks ahead for ordering and delivery
- no space will be allocated for an indefinite period; long term users must renew their space requests annually
- users may request a project extension by informing the Phytotron Coordinator at least **one week** in advance of the original end date – the Phytotron website sends out reminders about approaching end dates, simply respond to the message with a new end date
- **Effective January 1, 2011:** unoccupied growth room/chamber and greenhouse space held in reserve at a user's request will be charged to their lab as if the space were occupied with research material, **ONLY IF** there is a waiting list for similar type of space in the Phytotron.

For example, if a user chooses to hold a growth chamber in reserve and a second user puts in a new request for growth chamber space, the original user will be charged in full for the growth chamber **only if** the second user has to be placed on a waiting list.

Users will not be charged for space held in reserve if there is no waiting list for space and all new users can be accommodated. This will only apply to similar types of space (Ex/greenhouse users will not be charged if there is a waiting list for growth chamber space and vice versa)

## **Integrated Pest Management**

The University of Guelph Phytotron will operate under an Integrated Pest Management (IPM) program. IPM is a pest management strategy that uses a combination of good sanitary practices, regular plant monitoring and cultural, physical, biological, and if necessary, chemical techniques to fight pest infestation.

Sanitation is an extremely important part of an IPM program. By sweeping up soil (especially in the potting area and under greenhouse benches), removing plant debris and dead or senescing plants, one can effectively remove breeding sites for pests.

Monitoring includes both the use of sticky traps and visual inspection to detect pest populations before they reach damaging levels. Users of the Phytotron should be able to identify the major pests that could affect their research material. A picture gallery of common insects will be posted and Phytotron staff can always be consulted. If pests are detected by users they should report the problem to the Phytotron staff immediately.

Cultural control includes maintaining healthy plants through proper watering, fertilizing, and pruning, and altering the environmental conditions (if possible) to discourage any pests.

Physical control includes any means used to exclude pests from entering the growing areas. This includes the use of barriers such as vent screening and following the “Order of Entry” protocols outlined below.

Biological control includes the use of other living organisms (predators, parasites, and pathogens) to help control pest populations. Altering the environment (if possible) in order to favor the life cycle of a biological control agent is also a strategy commonly used.

Chemical control includes the use of natural or synthetically derived compounds to reduce pest populations to an acceptable level. It should be noted that the use of pesticides will under **NO** circumstances be allowed in growth rooms or growth chambers. Under the current law, none of the restricted pesticides approved for control of insect pests within greenhouse structures (or the field) may be legally applied indoors (Ex/within any other part of the Science Complex including growth chambers, growth rooms, and labs).

## IPM - User Responsibilities

The following are a set of more specific guidelines that users should follow with respect to pest prevention in growth chambers, growth rooms, and greenhouse zones.

### Sanitation

- if possible, all plants should be started from sterilized seed in clean pots
- all pots or flats should be labeled with the users name
- keep growing areas, especially under greenhouse benches, clean and free of soil, plant litter, plastic tags, dirty pots, dead or senescing plants
- plant litter should be removed and placed in sealed garbage bags within the growing zone (ie: inside growth chambers, rooms and greenhouse zones) and transported in the sealed bag to the appropriate garbage bin
- consider throwing out severely infested plants
- no “pet” plants will be allowed into the Phytotron; users are also discouraged from keeping “pet” plants in their labs/offices as any pests on these plants can also be transferred throughout the Phytotron
- all research plants should be started from seed to avoid the introduction of novel plant pests being brought into the Phytotron; if starting from seed is not an option, plants being brought into the Phytotron must first be inspected by the Phytotron Coordinator; please arrange a time with the Phytotron Coordinator for plant inspection **BEFORE** bringing the plant in to the facility; plants may be quarantined or steps may be taken to sanitize plant material in an attempt to minimize pest introductions, at the discretion of Phytotron staff
- The Phytotron Coordinator and the Director of the Phytotron reserve the right to deny the entry of plants into the Phytotron if they or their pests pose a risk to existing research projects.
- sanitation is also important in the potting area; please clean up after a potting session and ensure that no soil is left on the floor
- hose ends and parts should be kept off the floor

### Proper plant culture

- avoid over or under watering plants
- ensure that plants receive regular fertilizing if necessary
- plants being kept for long term experiments should be repotted if possible to maintain good plant health
- prune out old and infested parts of particular plants if possible
- avoid over crowding of plants on greenhouse benches, growth rooms, and growth chambers to slow the spread of any pests and ensure good air flow
- segregate plants by age wherever possible to avoid spreading pests from old plants to young plants; ideally, new plants should be started in a clean growth zone once older plants have been removed and the zone has been cleaned

### **Upon Project Completion**

- cleaning of zones is recommended after every project especially if pests were present or if PNTs were used; in the case of longer term projects, cleaning will be done on a regular basis
- **Effective January 1, 2011:** Phytotron staff will attempt to organize a once per year cleaning of each greenhouse. This will allow for sanitization of the greenhouse zone and play a part in pest control. It will also allow for routine greenhouse maintenance that is very difficult to carry out when greenhouses are filled with research material.

### **Order of Entry**

An “*Order of Entry*” protocol exists to minimize the spread of pests through the facility. Some general principles follow below:

- users should only enter growth zones that contain their work
- users should only move from clean areas to infested areas and **NEVER** back to clean areas in the same day
- movement should typically be from growth chambers/rooms (generally clean areas) to greenhouse areas (generally more prone to pest problems)
- greenhouse zones should also be entered following the same logic (from clean zones to infested zones and never back to a clean zone in the same day)
- users should try not to move plants throughout the facility, as this can spread pests and makes it difficult for Phytotron staff to monitor pest populations properly
- once a user is finished working in an infested greenhouse zone, they should leave the Phytotron immediately, take care to NOT walk back through the growth chamber area
- warning notes indicating the presence of pests will be posted on the doors of any infested growth chambers/rooms and greenhouses

### **IPM – Staff Responsibilities**

The following are a set of more specific responsibilities that relate to the duties of Phytotron staff regarding IPM:

#### **Pest Prevention**

- ensuring that all growth zones are clean and pest free at the start of a new experiment
- regular maintenance of each growth zone (Ex/regular changing of lamps and calibration of sensors) to ensure good environmental control for the duration of each experiment

#### **Monitoring**

- all plants in the facility will be inspected by staff on a regular basis for pest problems
- a pest history will be kept for each experiment detailing the severity of any infestation and the planned treatments

## **Pest Control**

- if pests are detected, pest populations will be reduced through cultural, physical, biological, or chemical means
- biological controls will be ordered and introduced as soon as possible in order to minimize the impact of an insect infestation
- if necessary, chemical control will be used to knock back a pest population to a level where other forms of control can be effectively employed
- in the event that a chemical treatment is necessary, all users will be informed via e-mail approximately 24 hours before the application
- the time reserved for any chemical treatments will be **Wednesdays from 3:00pm – 5:00pm**; please do not plan to work in the greenhouse during this time; **re-entry to the Phytotron is not permitted until 12 hours after the completion of the pesticide application**

## **Communication**

- provide all new users with a copy of this document as well as a training session of the facility
- keep users informed on the status of any pest problems and notify them of any treatments being planned
- Phytotron staff are always available to answer any questions regarding pest management and proper plant culture

## **Phytotron Equipment and Supplies**

General supplies commonly stocked include:

- Sunshine mix LA4 (standard growing mix, small nutrient charge) and LB2 (no nutrient charge)
- Turface , Perlite, Vermiculite (medium and extra fine)
- 20-20-20 water soluble fertilizer
- 13-11-11 with micronutrients Nutricote Type 100 slow release fertilizer
- 14-14-14 without micronutrients Nutricote Type 100 slow release fertilizer
- Pots (common sizes), seeding trays, covers for seeding trays, plug trays
- White and blue plastic labels
- 17-5-17 fertilizer at 200 ppm Nitrogen in all fertilizer lines throughout the Phytotron

### **A note about the fertilizer lines:**

In the **growth chamber** area, we have provided each walk in room (GR64s and GR192s) with its own fertilizer line. The hoses have quick connects so you may easily switch back and forth between reverse osmosis (RO) and fertilized water. **Don't forget to flush the lines clear of fertilized water after switching back to the RO water.**

For the rest of the reach-in chambers, we have provided 2 hoses. One near growth room 5 and the other near growth room 12. These should cover all reach in chambers. You may also use them to fill watering cans if that is more convenient.

In addition, we've also installed 2 new RO hose carts in the growth chamber area. One between chambers 40/41 and the other across from growth room 5. These should cover all of the reach-in chambers. All lines are clearly labeled as either RO or fertilizer.

In the **greenhouse** area, each zone has a line labeled "Temp fertilized". We have purchased a portable hose cart that you may use to fertilize. It will be left in the greenhouse hallway and should be returned there after use. **Please DO NOT use the hose carts currently attached to RO water for the purpose of fertilizing.** The hoses in the greenhouse are quite long and we would be wasting a lot of water if they had to be flushed every time. **Only the portable hose cart should be used for fertilizing, it will be clearly labeled.**

Please check with the Phytotron staff to make sure the supplies you need are readily available. If you require something not generally kept in stock, please allow **at least two weeks** for ordering and delivery.

### **Phytotron Equipment**

Information and specifications about the equipment in the Phytotron can be found on the Phytotron website or in the document "*Guide to Using Phytotron Growth Chambers*" available upon request from Phytotron staff.

Users are encouraged to consult with Phytotron staff regarding equipment capabilities and special project set ups.

## AAC Phytotron User fees (effective September 1, 2020)

### *General Fee Structure By Area (U of G users)\**

|                 | Cost / sq ft / day | Cost / m <sup>2</sup> / day |
|-----------------|--------------------|-----------------------------|
| Greenhouse      | \$ 0.039895        | \$ 0.430682                 |
| Growth Room     | \$ 0.070364        | \$ 0.758989                 |
| Growth Chamber  | \$ 0.167500        | \$ 1.827273                 |
| Outdoor Nursery | \$ 0.027083        | \$ 0.291807                 |

\* Cost is 2X and 3X higher for Academic Institutions and Industrial users, respectively, to account for additional service costs incurred by the facility and University. Includes common supplies and pot washing services.

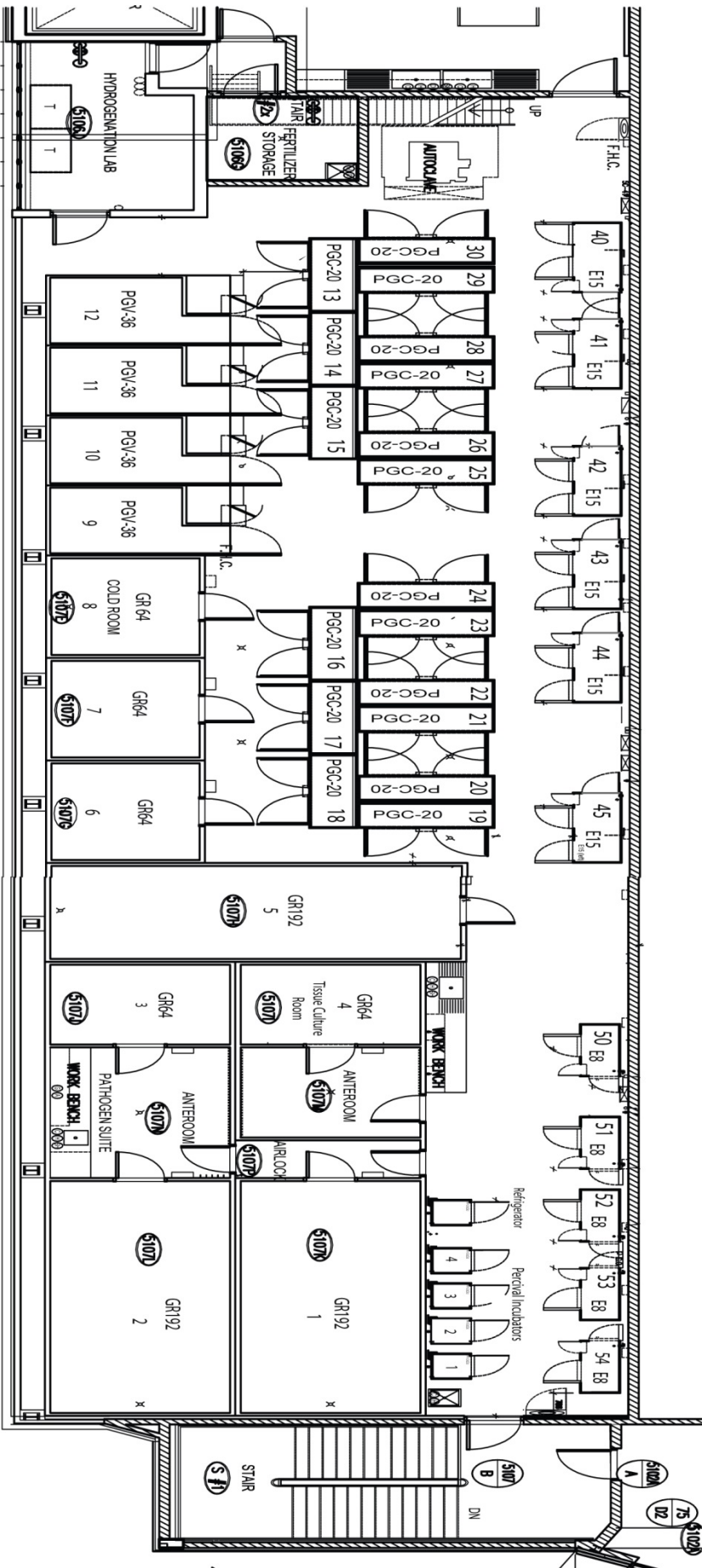
### *Fee Structure By Unit\*\**

|   |                                 |
|---|---------------------------------|
| Large greenhouse bench (95 ft <sup>2</sup> /8.8 m <sup>2</sup> ).....                       | \$ 3.79 / day                   |
| Small greenhouse bench (66 ft <sup>2</sup> /6.1 m <sup>2</sup> ) .....                      | \$ 2.64 / day                   |
| <br>  |                                 |
| GR192 growth room (192 ft <sup>2</sup> /17.8 m <sup>2</sup> ) .....                         | \$ 13.51 / day                  |
| GR64 growth room (64 ft <sup>2</sup> /5.9 m <sup>2</sup> ) .....                            | \$ 4.50 / day                   |
| GR64 Tissue Culture Room (105 ft <sup>2</sup> /9.75 m <sup>2</sup> ).....                   | \$ 7.39 / day                   |
| <br>  |                                 |
| PGV36 growth chamber (36 ft <sup>2</sup> /3.3 m <sup>2</sup> ) .....                        | \$ 6.03 / day                   |
| PGC20 growth chamber (20 ft <sup>2</sup> /1.9 m <sup>2</sup> ) .....                        | \$ 3.36 / day                   |
| E15 growth chamber (15 ft <sup>2</sup> /1.4 m <sup>2</sup> ) .....                          | \$ 2.51 / day                   |
| E8 growth chamber (8 ft <sup>2</sup> /0.7 m <sup>2</sup> ) .....                            | \$ 1.35 / day                   |
| Percival Incubator (4 shelves @ 4 ft <sup>2</sup> /shelf or 0.4m <sup>2</sup> /shelf) ..... | \$ 1.13 / day                   |
| Low temperature incubator (no lighting).....  | \$0.61 / day                    |
| <br>  |                                 |
| Outdoor Nursery Small bench (64 ft <sup>2</sup> /5.9 m <sup>2</sup> ).....                  | \$ 1.73 / day                   |
| Outdoor Nursery Large bench (96 ft <sup>2</sup> /8.9 m <sup>2</sup> ).....                  | \$ 2.60 / day                   |
| <br>  |                                 |
| Watering service (weekends/holidays).....   | \$20.40/hr, min. 1/2hr charge   |
| <br>  |                                 |
| Additive CO <sub>2</sub> (>500 ppm).....  | GR192 - \$40/month <sup>x</sup> |
|   | PGV36 - \$8/month               |
|   | PGC20 - \$5/month               |

\*\* Cost is 2X and 3X higher for Academic Institutions and Industrial users, respectively, to account for additional service costs incurred by the facility and University. Includes common supplies and pot washing services.

<sup>x</sup> As of September 2020, only one GR192 has additive CO<sub>2</sub>; but, other GR192 and the GR64 rooms can be retrofit to add CO<sub>2</sub> control.

# Growth Room and Growth Chamber Floor Plan Science Complex, Room 5107





## Greenhouse Floor Plan Science Complex, 5th floor

|  |  |  |  |   |   |   |                        |
|--|--|--|--|---|---|---|------------------------|
| GH<br>1<br><small>Teaching house</small> | GH<br>2<br><small>Air conditioned zone</small> | GH<br>3<br><small>Air conditioned zone</small> | GH<br>4<br><small>Air conditioned zone</small> | GH<br>5<br><small>Evaporative cooled zone</small> | GH<br>6<br><small>Evaporative cooled zone</small> | GH<br>7<br><small>Evaporative cooled zone<br/>High Light zone</small> |                        |
| <-- To Header House                      |  |  | Greenhouse Hallway                             |   |   |   | To Outdoor Nursery --> |

Each Zone has 5 benches, numbered 1 - 5 (left to right when looking in from the hallway).  
Benches 1 and 5 are 66 sq ft. stationary benches. Benches 2, 3, and 4 are 95 sq ft rolling benches.