Policy for the use of the Bond Life Sciences Center Plant Growth Facility Greenhouses and Growth Chamber Space (LSC PGF) 2019

Contacts:

Greenhouse Coordinator: Michelle Brooks brooksm@missouri.edu 882-3287 office
999-7418 cell

Greenhouse Maintenance: Richard Martin martinrich@missouri.edu

Growth Chamber Maintenance: Lahcen Amor samorl@missouri.edu

Training Requirements:

It is the responsibility of the assigned user to ensure that all personnel under their supervision are familiar with these policies. All principle investigators, staff and student workers are required to read this policy and pass a quiz with a score of at least 90% before swipe card access to the facility will be granted. Growth space will be periodically inspected by greenhouse staff and PI's (or designated contact) notified of violations. Failure to rectify violations by the given deadline will result in greenhouse staff stepping in to fix the problem at a recharge rate of $50.00 per hour. Continual violations will result in loss of greenhouse/growth chamber space.

All persons using greenhouse or growth chamber space must be Worker Protection Standards trained. Contact Michelle Brooks to schedule a 30-minute appointment.

Use of Greenhouse Facilities and Sanitation

1. General Cleanliness - All users of the LSC PGF are expected to observe good housekeeping rules by returning equipment and unused supplies to proper storage areas and by cooperating in keeping the facilities clean and orderly. Sound sanitation practices are necessary to reduce, if not eliminate, disease and insect problems. Bench tops, floors and drains should be kept clean of plant/soil debris at all times. Brooms/dust pans are provided for daily use. Please contact Richard Martin when you wish to use the power washer and he will place it in your greenhouse room. Reminder – any debris cleaned off of these areas must be autoclaved if you are growing transgenic plants in your space.

2. Tools/Containers - Use clean, sterile containers and tools. Avoid putting plant material, containers, or tools on the floor or other "contaminated" surface. The floor is not a desirable work area. All used pots and containers should cleaned/sterilized immediately and returned to proper storage areas.

3. Potting Media –Promix BX and Promix Plug and Germination mix are available on a recharge basis in the potting room. You will need to fill out the billing log sheet with DATE, PI and Promix USAGE AMOUNT (# of scoops or bags/bales) when you use this material. See Guidelines for Room 104 below for specific information regarding potting media. If you plan to use a significant amount of media at once for a large project, please let Michelle or Richard know the approximate date and amount you'll be using. If you must use media components such a perlite, vermiculite or turface in

your research, only order the amount you will use quickly. There is not room for storage of these media in the potting room and **storage of all media is strictly prohibited in greenhouses or growth chambers!**

4. Hoses - All watering hoses should be stored off the aisle walkways, and

5. breakers/nozzles must be kept off the ground. **Do not drink from hoses!**

6. Pests - Report all insect and disease problems to the Michelle Brooks immediately so that their spread can be contained. All requests must be submitted in writing either by filling out provided form in the greenhouse hallway or by email to Michelle Brooks. After the request is submitted, the room will be scouted closely to determine necessary action. If pesticide application is needed, it will be done Tues. or Thurs. evenings after 4:30 pm by trained greenhouse personnel only. A treated greenhouse will be posted and locked until the Restricted Entry Interval is expired. No early entry by greenhouse users is permitted. Arabidopsis rooms 602, 603 & 604 will be emptied for summer cleaning by July 1. It is strongly encouraged for other rooms to schedule a 2-4 week period in July that the greenhouse can be emptied, thoroughly cleaned and "cooked" out to help control pests. (See pesticide policy section for more detailed information.)

7. Storage - **Do not use greenhouse space for storage of pots or other supplies**. Do NOT order large quantities of supplies! You will have to store them in your lab! ALL items in the potting room must be labeled with the PI name.

8. Living material – No plant material, other than seed, should be brought into the LSC growth chambers, greenhouses or headhouse/potting room without prior approval by the Oversight Committee. Plants should not be moved from the growth chambers to greenhouses or greenhouses to growth chambers. Plants should not be moved from one greenhouse to another. Bringing plants from outside and moving plants between spaces only spreads pest problems and is prohibited.

9. Hazardous Materials - The greenhouse modules and growth chambers in the LSC PGF are considered laboratories. Environmental Health and Safety conducts inspections biannually. No food or drink is allowed inside the greenhouse or growth chamber units. Do not drink from hoses! **ALL substances must be stored in a closed container and clearly labeled**. This includes, DI wash bottles, fertilizers, etc. Culligan tanks must be secured to the wall.

10. Waste Disposal –

    A **"Plant & Soil"** bin is located in each of the greenhouses and in the common area for disposal of unwanted plant and soil material. Pointed stakes and other sharp-edged objects should not be put in these bags. Keep the lid on this bin. Only autoclave bags should be used in this bin. A box of autoclave bags is located in a marked box on a designated shelf in the common area. **Do not remove the insert in the bin – it is there to prevent overfilling of bags which are too heavy to handle by the student assistant.** When the bag is filled to the top of the bin it should be removed, tied shut with a tie or some autoclave tape, labeled with lab name/greenhouse number, and placed next to the autoclave. The student assistant will autoclave and dispose of the

waste. Put a new autoclave bag in the bin! **Overfilled bags will be returned to the owner for splitting.**

A **"General Trash"** bin is located in each of the greenhouses and in the common area for disposal of trash. Do not put plants and soil in these bins. Only black trash bags should be used in this bin. A box of black trash bags is located in a marked box on a designated shelf in the common area. **Do not remove the insert in the bin – it is there to prevent overfilling of bags which are too heavy to handle by the student assistant.** When the bag is filled to the top of the bin it should be removed, tied shut with a tie or some autoclave tape, and placed on the floor next to the bin for pick up. Put a new black trash bag in the bin!

Pots that will be reused must be cleaned immediately and returned to proper storage area.

Environmental Control

1. Greenhouse environmental control equipment (thermostats, vents, photoperiod shades, time clocks, environmental control system, etc.) shall be operated only by the LSC PGF Staff. These are not adjustable by the users.

2. Changes in the environmental conditions in individual greenhouse spaces should be requested in writing to Michelle Brooks. Malfunctions in the environmental control system in greenhouses should be reported to Michelle or Richard. Changes in the environmental conditions setup for growth chambers should be requested by email to Lahcen Amor. Malfunctions in growth chambers should be reported to Lahcen Amor.

Maintenance

1. Any problems with structure or non-dedicated-user equipment should be reported to Richard Martin.

2. Maintenance of plants and equipment dedicated to individual projects is the responsibility of the greenhouse user.

3. Please be aware that the greenhouse staff, as well as the Campus Facilities employees, must have access to certain areas in your greenhouse for maintenance purposes.
    a. The area in front of the exhaust fans must be kept clear so that Campus Facilities can get to the fans to service them.
    b. The area directly below the pad system and around the sump needs to be kept clear so the greenhouse staff can get to them for weekly maintenance. Please do not leave anything on top of the sumps.
    c. Do not store anything on top of or behind the fin tube heating. This area should NOT be used for drying samples.

Alteration of Facilities

Approval must be obtained from the LSC PGF Oversight Committee before any changes, deletions, or additions are made to the permanent facilities.

Experimental Hazards

1. The use of hazardous materials, organisms, or systems (e.g., radioactive materials, dangerous non-pesticide chemicals, UV lamps, pollutants, etc.) in greenhouse experiments must be approved by the LSC PGF Oversight Committee. A minimum of two weeks notice is required prior to the use of any such materials or systems in the greenhouse.

2. Rooms in which hazardous materials/conditions are present must be kept locked. The rooms must be labeled with appropriate warning signs. Emergency contacts and procedures must also be posted.

Shoes and Clothing

Appropriate footwear is required for greenhouse staff, users, and visitors. No open-toed shoes should be worn in the greenhouse.

Nicotine

Smoking/vaping/chewing tobacco is absolutely prohibited in all areas of the LSC PGF. If you use tobacco, wash hands thoroughly before entering the facility to avoid bringing in viruses that may be contained in tobacco

Termination of Occupancy after Project Completion

It is the responsibility of the **greenhouse user** to properly dispose of the plant material in a timely manner after project completion. The module must be returned to its original state when a user terminates occupancy.

PESTICIDE POLICY

1. All pesticides are to be applied by trained greenhouse personnel only, not by greenhouse users. This includes soaps, oils, etc.

2. Everyone who works in the greenhouses or growth chambers is required to go through initial and annual Worker Protection Training with Michelle Brooks. Michelle will also go over the pesticide procedures with new hires during that initial training. If you hire new people, make sure they contact Michelle to set up a time to do this 30-minute training. For annual retraining, look for email announcement at the beginning of fall semester for large group trainings to attend.

3. It is up to you, the user, to keep an eye on your plants and submit a pesticide application request in writing to Michelle when you notice a problem. The best way to do that is to email Michelle Brooks (BrooksM@missouri.edu) with your request and the specific location you are requesting treatment for. Once Michelle receives a request, her crew scouts the room to confirm which specific pests are present and she will schedule the initial application. Michelle does her best to get the room treated as

soon as possible but depending on when she receives your request and the severity of the problems in all the rooms she receives requests for, it may not be sprayed immediately. For example, if you turn in a request at 3:00 on Tuesday it will probably not get treated until Thursday. Pesticides are only sprayed on Tuesday and Thursday evenings after 4:30 pm so that you have time to get your work done during the day and the greenhouse will only be locked overnight. Warning signs will be posted on the door for the restricted entry interval during which time, the room will be locked. In the morning, they take down the signs and unlock the door. The green sign stating when and what was sprayed will be posted in the hallway for 30 days so you can go back and look to see what was done in your room. Beyond 30 days, you need to contact Michelle for that information.

4. After the initial application, greenhouse staff continue to scout the room and do follow-up treatments as needed. As required by most pesticide labels, spray intervals are at a minimum 7-10 days apart.

5. If you are taking data or something that you must have access to your greenhouse on certain Tuesday or Thursday evenings, you need to let Michelle know so she knows they can't spray those evenings. If for some reason there are plants that you do not want sprayed, you need to let Michelle know that too, however, keep in mind that if the entire room is infested, she cannot get control of the pest if there are infested plants that she can't spray.

6. Spray requests are good for 30 days. Usually in that time, with 1-3 sprays, greenhouse staff can get the pest population under control but will continue to scout and monitor that room for those 30 days. If another problem comes up a couple months later, you must submit a new request.

7. Keep in mind that you should submit a request when you first notice a problem. If the plants are severely infested, it is much harder to control plus the chances are much greater that the pest can spread to neighboring rooms. On the other hand, if you see one thrips and turn in a request, if Michelle can't find the thrips when she scouts, the room will not be sprayed. Most of her pesticides are contact pesticides so it doesn't do any good to spray if the pest is not actually there. Michelle will scout the room for the next couple of weeks and if she finds thrips she will begin treatments. There are also lots of restrictions on how many times per year that Michelle can spray certain pesticides so she must be careful to make sure the pest problem is there before she can spray.

8. Those of you who work in both growth chambers and greenhouses should always <u>go to the growth chambers before</u> you go to the greenhouses and never move plants from the greenhouse to the growth chamber room. It's very easy to carry pests on plants or yourself from the greenhouses to the chambers. Michelle also recommends that you do not wear yellow clothing in greenhouses. Whiteflies are very attracted to yellow clothes and will land on you and be moved from one place to another.

9. Michelle's crew can only apply pesticides in the greenhouses and in the growth chamber room in the basement. Any growth chambers located in labs are the responsibility of the lab personnel.

10. Cleanliness in your greenhouse can help to keep pest populations under control. Any build-up of media or plant debris on benches or on the floor are places that harbor pests. Stacks of pots being stored in the greenhouse can harbor pests. There are brooms in the hallway and Michelle has a shop vac and power washer that can be checked out for use by emailing Michelle or Richard Martin (martinrich@missouri.edu). If there is any time that a growth chamber or greenhouse can be emptied out and thoroughly cleaned it will help.

11. Please also keep in mind that when Michelle's crew sprays a greenhouse or growth chamber, complete eradication is nearly impossible. There are just no pesticides that are relatively safe for people to handle that completely kill everything. Because most of them are contact sprays it's just very hard to hit every tiny pest so they do the best they can to kill as many as possible.

Guidelines for Working in the LSC Potting Room (Rm 104)

1. The potting room is not a storage room and needs to stay that way if it is to remain functional. This means nothing is to be stored on the floors, tables, and around the sink area. Each lab has been assigned one storage shelf. A step ladder is located in the room to reach high shelves.

2. Pots and trays are no longer provided. Each lab should order their own potting supplies. The only thing that will be provided is potting media.

3. There are two large potting media bins in the potting room that will be kept full by the student assistant. One is filled with ProMix and the other is filled with Sunshine Mix. Please scoop out only what you need and log in what you take out in the logbook. **Once potting media is removed from the bins, it should NEVER be put back, so only take what you need. NO WET SCOOPS IN THE BINS.** Each lab has the option of keeping one 28-gallon gray square brute in the potting room for storage of potting media.

4. Dirty pots and flats should **not** be stored anywhere in the potting room (including assigned lab shelves) and will be removed if found.

5. Lab assistants can wash dirty flats and pots in the sink and dry them on the drying table. Bleach, soap, scrub brushes, paper towels will be stocked for this purpose. The sink area needs to be clear of all pots and flats unless the sink is being used for washing. Dirty pots and flats should not be left in the potting room unattended. Potting media needs to be brushed out of the pots/flats before washing, so the sink does not clog. Nothing should be left around the sink area. Clean and dried flats and pots need to be stacked and removed in a timely manner.

6. There are two shop vacs mounted on the wall. The hoses are long enough that you should not have to dismount them. One is for **"DRY"** and one is for **"WET"** and both are clearly marked. These will be cleaned out regularly by the student assistant. Please use these to clean up your mess. Please remount if dismounted for use and hang the cord up neatly after use.

7. Brooms and dustpans are also available for cleaning up after you are done. Please put them back where you found them.

8. A general trash can is available. In addition to general trash, please use this trash can to dispose of any "extra" and/or the small amounts of potting media that are typically spilled mixing soil.

9. No plants or seeds of any kind in the potting room.

10. Everything in 104 LSC should stay in 104 LSC. Do not take shop vacs, brooms, and other items from this location.

11. Please speak up and enforce these rules when working in the potting room.

12. Contact Dean Bergstrom (bergstromd@missouri.edu) with any questions, problems, complaints.

Guidelines for Common Area Use (LSC Rm 027)

1. The common area outside the growth chambers is not a storage room. This means nothing is to be stored on the floors and tables other than items needed for care of plants in the Conviron growth chambers (e.g., watering cans, fertilizer, etc.). Please label all items clearly with the lab name and number.

2. Dirty pots and flats should not be left anywhere in the common area outside the growth chambers.

3. Tables in the common area can be used for seed harvesting and transplanting plants. When you are through working, please vacuum the table and floor and wipe down the table. A dry vac is located in the common area for easy cleanup of floors and tables. Brooms and dustpans are also available for cleaning up. Water bottles and paper towels are available for wiping down the tables. Please put all items back where you found them.

4. Two **"Plant & Soil"** bins are located in the common area for disposal of unwanted plant and soil material. Pointed stakes and other sharp-edged objects should not be put in these bags. Keep the lid on these bins. Only clear autoclave bags should be used in these bins. A box of autoclave bags is located in a marked box on a designated shelf in the common area. **Do not remove the inserts in these bins – they are there to prevent overfilling of bags which are too heavy to handle by the student assistant.** When the bag is filled to the top of the bin it should be removed, tied shut with a tie or some autoclave tape, and placed in the designated bin for pick up by the student assistant. Put a new autoclave bag in the bin!

5. Two **"General Trash"** bins are located in the common area for disposal of trash. Do not put plant and soil in these bins. Only black trash bags should be used in these bins. A box of black trash bags is located in a marked box on a designated shelf in the common area. **Do not remove the inserts in these bins – they are there to prevent overfilling of bags which are too heavy to handle by the student assistant.** When the bag is filled to the top of the bin it should be removed, tied shut with a tie or some autoclave tape, and placed on the floor next to the bin for pick up by the student assistant. Put a new black trash bag in the bin!

6. Everything in 027 LSC should stay in 027 LSC. Do not take shop vacs, brooms, and other items from this location.

7. Please speak up and enforce these rules when working in the common area.

8. Contact Dean Bergstrom (bergstromd@missouri.edu) with any questions, problems, complaints.

Guidelines for Common Area Use (LSC 5th Floor Greenhouses)

1. The common area/corridor outside the 5th floor greenhouses is not a storage room. Nothing should be stored in the corridor.

2. Dirty pots and flats should not be left in the corridor.

3. A **"Plant & Soil"** bin is located in each of the greenhouses for disposal of unwanted plant and soil material. Pointed stakes and other sharp-edged objects should not be put in these bins. Keep the lid on this bin. Only clear autoclave bags should be used in this bin. A box of autoclave bags is located in a marked box on the designated shelf next to the autoclave. **Do not remove the insert in the bin – it is there to prevent overfilling of bags which are too heavy to handle by the student assistant.** When the bag is filled to the top of the bin it should be removed, tied shut with a tie or some autoclave tape, labeled with lab name/greenhouse number and placed next to the autoclave. Put a new autoclave bag in the bin! The student assistant will autoclave and dispose of the waste. **Overfilled bags will be returned to the owner for splitting.**

4. A **"General Trash"** bin is located in each of the greenhouses for disposal of trash. Do not put plants and soil in these bins. Only black trash bags should be used in this bin. A box of black trash bags is located in a marked box on the designated shelf next to the autoclave. **Do not remove the insert in the bin – it is there to prevent overfilling of bags which are too heavy to handle by the student assistant.** When the bag is filled to the top of the bin it should be removed, tied shut with a tie or some autoclave tape, and placed on the floor outside your greenhouse door for pick up. Put a new black trash bag in the bin!

5. Everything in the corridor of the 5th floor greenhouses should stay in there. Do not take brooms, pens, autoclave tape, and other items from this location.

6. Please speak up and enforce these rules when working in the common area.

7. Contact Dean Bergstrom (bergstromd@missouri.edu) with any questions, problems, complaints.

8. . Guidelines for Common Area Use (LSC 6th Floor Greenhouses)

1. The common area outside the 6th floor greenhouses is not a storage room. Anything stored in the corridor needs to be approved by the Jim Bixby. Please label all items clearly with the lab name and number.

2. Dirty pots and flats should not be left anywhere in the common area outside the greenhouses.

3. Tables in the common area can be used for seed harvesting and transplanting plants. When you are through working, please vacuum the table and floor and wipe down the table. A dry vac is located in the common area for easy cleanup of floors and tables. Brooms and dustpans are also available for cleaning up. Water bottles and paper towels are available for wiping down the tables. Please put all items back where you found them.

4. A **"Plant & Soil"** bin is located in each of the greenhouses and in the common area for disposal of unwanted plant and soil material. Pointed stakes and other sharp-edged objects should not be put in these bags. Keep the lid on this bin. Only clear autoclave bags should be used in this bin. A box of autoclave bags is located in a marked box on a designated shelf in the common area. **Do not remove the insert in the bin – it is there to prevent overfilling of bags which are too heavy to handle by the student assistant.** When the bag is filled to the top of the bin it should be removed, tied shut with a tie or some autoclave tape, labeled with lab name/greenhouse number, and placed outside the door of your greenhouse for pick up by the student assistant. Put a new autoclave bag in the bin! **Overfilled bags will be returned to the owner for splitting.**

5. A "General Trash" bin is located in each of the greenhouses and in the common area for disposal of trash. Do not put plants and soil in these bins. Only black trash bags should be used in this bin. A box of black trash bags is located in a marked box on a designated shelf in the common area. Do not remove the insert in the bin – it is there to prevent overfilling of bags which are too heavy to handle by the student assistant. When the bag is filled to the top of the bin it should be removed, tied shut with a tie or some autoclave tape, and placed on the floor next to the bin for pick up. Put a new black trash bag in the bin!

6. Everything in the common area of the 6th floor greenhouses should stay in there. Do not take shop vacs, brooms, and other items from this location.

7. Please speak up and enforce these rules when working in the common area.

8. Contact Dean Bergstrom (bergstromd@missouri.edu) with any questions, problems, complaints.

PHYSICAL AND BIOLOGICAL CONTAINMENT FOR RECOMBINANT DNA RESEARCH INVOLVING PLANTS

Adapted from the NIH Guidelines for Research Involving Recombinant DNA Molecules
(Amendment Effective January 24, 2002 Federal Register, November 19, 2001
(66 FR 57970)
http://www4.od.nih.gov/oba/rac/guidelines/guidelines.html

General Plant Biosafety Levels: The principle purpose of plant containment is to avoid the unintentional transmission of a recombinant DNA-containing plant genome, including nuclear or organelle hereditary material of release or recombinant DNA-derived organisms associated with plants.

The containment principles are based on the recognition that the organisms that are used pose no health threat to humans or higher animals (unless deliberately modified for that purpose), and that the containment conditions minimize the possibility of an unanticipated deleterious effect on organisms and ecosystems outside of the experimental facility, e.g., the inadvertent spread of a serious pathogen from a greenhouse to a local agricultural crop on the unintentional introduction and establishment of an organism in a new ecosystem.

Facilities (BSL1-P)

The term "greenhouse" refers to a structure with walls, a roof, and a floor designed and used principally for growing plants in a controlled and protected environment. The walls and roof are usually constructed of transparent or translucent material to allow passage of sunlight for plant growth.

The term "greenhouse facility" includes the actual greenhouse rooms or compartments for growing plants, including all immediately contiguous hallways and head-house areas, which are considered part of the confinement area.

Physical Containment Levels: Biosafety Level 1 – Plants (BSL1-P)

Standard Practices (BSL1-P)

Greenhouse Access (BSL1-P)
Access to greenhouse shall be limited or restricted, at the discretion of the Bond LSC/Sears PGF Oversight Committee, when experiments are in progress.

Prior to entering the greenhouse, personnel shall be required to read and follow instructions on BSL1-P greenhouse practices and procedures. All procedures shall be performed in accordance with accepted greenhouse practices that are appropriate to the experimental organism.

Records (BSL1-P)
A record shall be kept of experiments currently in progress in the greenhouse facility.

Decontamination and Inactivation (BSL1-P)
Experimental organisms shall be rendered biologically inactive by appropriate methods before disposal outside of the greenhouse facility.

Control of Undesired Species and Motile Microorganism (BSL1-P)
A program shall be implemented to control undesired species (e.g., weed, rodent, or arthropod pests and pathogens) by methods appropriate to the organisms and in accordance with applicable state and Federal laws.

Arthropods and other motile microorganism shall be housed in appropriate cages. If microorganisms (e.g., flying arthropods and nematodes) are released within the greenhouse, precautions shall be taken to minimize escape from the greenhouse facility.

Concurrent Experiments Conducted in the Greenhouse (BSL1-P)
Experiments involving other organisms that require a containment level lower than BSL1-P may be conducted in the greenhouse concurrently with experiments that require BSL1-P containment, provided that all work is conducted in accordance with BSL1-P greenhouse practices.

Biological Containment Practices
Appropriate selection of the following biological containment practices may be used to meet the containment requirements for a given organism. The present list is not exhaustive; there may be other ways of preventing effective dissemination that could possibly lead to the establishment of the organism or its genetic material in the environment resulting in deleterious consequences to manage or natural ecosystems.

Effective dissemination of plants by pollen or seed can be prevented by one or more of the following procedures: (1) cover the reproductive structures to prevent pollen dissemination at flowering and seed dissemination at maturity; (2) remove reproductive structures by employing male-sterile strains, or harvest the plant material prior to the reproductive stage; (3) ensure that experimental plants flower at a time of year when cross-fertile plants are not flowering within the normal pollen dispersal range of the experimental plant; or (4) ensure that cross-fertile plants are not growing within the known pollen dispersal range of the experimental plant.