

University of Nebraska-Lincoln
Institute of Agriculture and Natural Resources
Agricultural Research Division

Greenhouse Innovation Center
Policies and Procedures for Phenomics

This document establishes the policies and procedures for the use and care of the Greenhouse Innovation Center on Innovation Campus.

Section 1: Requesting Plant Growth Space for Research

- Requests for phenotyping space must be made using the online request form. This form must be completed at least one (1) month prior to the start of the project. A copy of this document will be attached to the space approval email. The link to the space request form: <https://app.smartsheet.com/b/form/7bc972acd1464fd2b4df33e1ce8575ed>
- Greenhouse and Phenotyping space will be assigned only for the specific time period required by the project.
- Users must confine their projects to the area specifically assigned to their project.
- Users cannot reassign their unused space to others; all space must be allocated using the process outlined in this policy.
- Delays in project completion should be discussed as soon as possible with the Greenhouse & Phenotyping Managers.
- Billing - Users will be invoiced on a monthly basis for space and services contracted.
- Consult with the Phenotyping Manager prior to grant submission for space availability and design.
- Experimental design and scheduling must be discussed with Greenhouse Manager and Phenotyping Manager before finalization of experiment schedule. Advice on experimental design can be sought from faculty in the Department of Statistics.
- If an experiment needs to be rescheduled phenotyping manager needs to be informed at least 2 months before the scheduled date, otherwise financial penalty will apply unless other project(s) can be accommodated.
- Upon confirmation of the experiment's schedule, cancelation within 50 days prior the starting date will result in penalty up to the full cost of the experiment, unless another project(s) can be accommodated.

Section 2: Required Training for All Greenhouse Users

- First time greenhouse users are required to schedule an orientation session with the Greenhouse Manager. In addition to introducing the user to the resources available, additional topics to be discussed will include: correct procedures to handle containers, soil mixes, fertilizers, disease and pests control, watering and supplies. A copy of this policies document will also be provided to the user.
- All greenhouse users are required to complete EPA mandated Worker Protection Standards (WPS) training prior to starting any project in the facilities. This training will be provided by the greenhouse staff throughout the year. Refresher training is required every year.

Section 3: Greenhouse Services Provided

- Standard soil mixes– all preparation & pasteurization, standard fertilizer, standard pots, pot washing, autoclaving, composting, pest control, routine maintenance, cleaning floor drains, weeding, trash & recycling, cleaning & sterilizing, & supplies for common activities – labels, tape, markers, etc.
- Planting – basic, dividing, watering, fertilizing, upshifting/transplanting, staking.
- Harvesting - research project dependent – See Greenhouse Manager.
- Tiller removal – tillers will be removed otherwise note in your space request.
- Exceptions – watering to a specific target weight off of the system, fertilizing by hand with specific treatments and/or formulations, determining field capacity (instruction sheet available).
- A fee per hour will be assessed for any services not normally provided under the maintenance categories above. Services may be requested in advance or applied at the discretion of the Greenhouse Manager where it is determined necessary or in the best interest of research plants (Manager will seek pre-approval in all cases).
- Projects requiring special cultural conditions (including restrictive photoperiod and/or temperature, isolated pest or pathogen research, non-standard cultural methods, etc.) which prohibit shared use of any greenhouse bench or bay will be assessed fees for the entire bench or bay and should budget accordingly.

Section 4: Greenhouse Cleaning Procedures

All Greenhouses will be cleaned, heated, and disinfected on a routine basis and/or as a project ends by the greenhouse staff.

Section 5: Sanitation Procedures

- Disease and insect problems must be reported immediately to a member of the Greenhouse Staff. Users are not allowed to apply pesticides or control the issue on their own, Greenhouse Staff will handle the situation.
- Media should be kept clean and free of debris. Do not re-use spilled soil or soil that accumulates on the floor. This should be placed in the compost area.
- All hose ends, water breakers, mist nozzles and other attachments should be hung up off the greenhouse floor when not in use. Water should be turned off and the pressure released. Report hose repairs to the Greenhouse Manager.
- Greenhouse benches are to be kept clean. Do not stand or put feet on greenhouse benches. This will help avoid carrying diseases or pests up to crop level.
- Greenhouse carts should be swept and sprayed with disinfectant after use and returned to the proper area in numbered order. All greenhouse carts are to be returned to the proper area every evening.
- Greenhouse space is to be kept clean and orderly by all users. Consult with the Greenhouse Manager for storage alternatives.
- All plants must be grown at the greenhouse. No plants from other greenhouses, labs, or from the field are allowed.
- No materials or equipment may be permanently stored in the headhouse areas. Headhouse areas must be cleaned up immediately after use.
- All dirty flats and pots should be placed in the proper areas. These items will be washed, disinfected, and restocked by the Greenhouse Staff.

Section 6: Plant and Soil Waste Disposal

Please contact the Greenhouse Manager directly for disposal of large quantities of materials (greater than 20 pots or trays).

- **Plant Material and Soil** can be composted unless it is contaminated and/or is recombinant material.

- **Contaminated and Recombinant Materials** (pathogens not native to Nebraska, research related insects, Genetically Modified Organisms (GMO's), or recombinant plant material, as well as potentially contaminated material such as soil, labels, containers, or plants in same space as recombinant plant material) must be autoclaved. Please consult with the Greenhouse Staff and they will ensure it is handled properly. Plastic labels, broken clay pots, paper bags, and plastic cell packs can be thrown away. Damaged plastic pots can go in the recycling bin. It is the Principal Investigator's (PI's) responsibility to determine what material requires autoclaving. In most cases this is determined by the approved Institutional Biosafety Committee (IBC) Protocol. If in doubt, please contact UNL's Biosafety Officer, Matt Anderson (402-472-9554).

Section 7: Greenhouse Equipment, Phenotyping Equipment, & Environmental Controls

- Greenhouse Equipment (autoclaves, soil carts, vacuums, etc.), Phenotyping Equipment, & Environmental control equipment (temperatures, vents, lights, etc.) will be operated by greenhouse & phenotyping staff only. Changes in environmental conditions in individual greenhouse spaces should be requested in writing via email. Greenhouse & Phenotyping Equipment is not for personal use.
- Malfunctions in the environmental control systems should be reported immediately to the Greenhouse Manager in writing. In an emergency situation, any Greenhouse Staff member may be contacted. A list of emergency contacts is posted on the bulletin board by the manager's office.
- Unless an emergency situation is involved, normal after hour/weekend emails will be answered within two (2) business days.

Section 8: Supplies

A stock of standard pots, flats, labels, fertilizer, media and other common use supplies are kept on hand for greenhouse projects. These supplies are available for research projects conducted at the greenhouse at no additional charge. Advance notice is needed/recommended for large quantity (greater than 20 pots or trays) or specialty soils, mixes, pots, trays, etc.

- Non-Standard Supplies and Extras - (specialty pots, CO₂ and tanks, special media mixes, different fertilizer, etc.) can be obtained through the Greenhouse Manager and charged to the user project. Discounts as well as free shipping are available with many vendors.
- The Greenhouse Manager will discuss with the user if a disproportionate use of supplies per square foot of space is planned for and/or used. Extra supplies will be charged to the provided cost center.
- Supplies are not to be used for laboratory work, field work and/or personal use. Supplies are also dedicated to the NIC Greenhouse only.

Section 9: Greenhouse and Phenotyping User Responsibilities

- Shoes are required at all times. No open toed shoes.
- No food or drink allowed in the greenhouse.
- Ensure that your safety training is up to date.
- Maintain open lines of communication with the Greenhouse & Phenotyping Staff concerning the course or status of the project.
- Plan space and supply needs in advance, including submitting the Space Request Form two (2) months before the project start date.
- Consult with the Greenhouse Manager if there is a requirement for large quantities (greater than 20 pots) or unusual types of supplies.
- Clearly label all material including your name, laboratory name, and the date of planting.
- Submit email requests for assistance, change in routine or change in location (i.e. special watering instructions, bench modification, moving plants, etc.)
- Greenhouse users are expected to maintain an active role in the progress of their projects.

- Promptly notify the Greenhouse Manager of required repairs, replacements needed (lights, broken glass) or any other problems with the growth facility.
- Maintain greenhouse space in an orderly manner, paying particular attention to neatness and sanitation.
- Plant materials should be disposed or harvested within 1 week after completion of the project. Allowing materials to become pest infested or overgrown will not be tolerated.
- Notify the Greenhouse Staff promptly when a greenhouse project reaches completion. The billing for the space will continue unless notified otherwise.

Section 10: Building Security

- Access to the Greenhouse Innovation Center is limited to authorized personnel only. Visitors (including children) must be properly escorted and supervised by a faculty or staff member at all times.
- Greenhouse Staff members are available Monday thru Friday from 8:00 am to 4:30 pm.
- Users requiring access to the GIC should email a copy of their N Card to the Greenhouse Manager for access. If working after hours/weekends make sure to have proper identification available in the event that it is requested by an UNL Police Officer/Tetrad Representative.
- Pets, Bikes, roller blades, skate boards, etc. are not allowed in the headhouses, hallways, or greenhouses. Bike racks are located outside of the lobby.

Section 11: Tours

- Please allow 72 hours of notice for tours led by a member of the Greenhouse Staff.
- As a courtesy, please notify Greenhouse Staff as soon as possible (72 hours is recommended) about self-guided tours of the greenhouse areas.

Section 13: Phenotyping Specifics

- Three standard pot sizes are available; 0.7 gallon, 1.5 gallon and 2.4 gallon.
- Project supplies and materials are prepared on a project by project basis.
- Plant care fee is charged if plants are not on the system (before or after imaging).
- Field soil requires extra time and planning, please contact for details. Media mixes cannot be more than 50% field soil unless 100% field soil (no amendments).
- Pots are imaged every other day unless occupancy allows for daily imaging.
- If your experiment involves random sampling from a block, the full block will be billed for the entire imaging run.
- Off belt imaging is restricted to 30 runs per week.
- Standard Greenhouse environmental conditions will be used unless the whole greenhouse is booked by one or more users requiring the same conditions.
- When plants require watering at specific levels, the researcher is responsible for the watering (i.e. weighing/drought stress experiments) when the plants are not on the automated carriers.
- When needed, if the managers are unable to get hold of the contact person or the PI of the project in a timely fashion (24 hours or less), they will have the ability to make a decision to address system failure, environmental control, pest, pathogens, etc.
- The Lemnatec system may have a failure beyond our control, therefore images are not guaranteed every scheduled day. In this event, phenotyping manager will work with the user(s) on finding solutions which may lead to no charges being incurred, or for experiment to be repeated at no charge, but the research will not be reimbursed for any costs their lab incurred.
- Pathogen and virus studies are performed on a limited basis under special conditions because of the likelihood of contamination as plants move past other experiments.
- Image configuration for IR and Hyperspectral cameras are manually adjusted so they will be determined by minimum requirements of all of the plants scheduled in both greenhouses.

- The largest project in the house determines the environmental conditions for that house.
- Small projects can be accommodated when space and favorable environmental conditions match.

Section 13: Penalties for Non-Compliance

Failure to comply with the procedures and policies above will have the following consequences:

- First offense: Written warning to the user (student, technician, lab personnel, post-doc, etc.) and the Principal Investigator (PI).
- Second offense: Meeting with the user, PI, Greenhouse & Phenotyping Managers & Directors to discuss issues and resolutions.
- Third offense: User and PI meet with the Committee to discuss issues, resolutions, and penalties.