

Virtual Grower 3.0 Tutorial #3: Heating

- (0:03) Welcome to Virtual Grower tutorials, an online series designed to help users navigate different aspects of the Virtual Grower software.
- (0:13) In this tutorial, we will continue the simulation we built in the 'Getting Started and Setting Your Location' and "Greenhouse Design" tutorials by working under the Heating section of the Design menu. From the Virtual Grower main page, go to 'File', then 'Load'. Choose your .gsf file, and click 'Open'. Click on the 'Heating' button under the Design section.
- (0:38) This section allows you to define your various heating schedules. Similar to previous versions of Virtual Grower, you are able to define multiple heating schedules; however, as you create those schedules, they are not linked to one specific greenhouse as before. Later on, under the Output Section, you are able to link one heating system and schedule to as many greenhouses as you require, or mix and match multiple set-ups to several greenhouses.
- (1:06) The large white field lists all of the heating schedules you have made. A default heating schedule is already in place. To add new heating schedules, click the 'Add New Heating Schedule' button. You can change the default name to one that more accurately describes your needs by highlighting the name field and entering in the new name. The heating system you are working on from the list should be highlighted in blue.
- (1:30) Right-clicking a heating schedule in the list gives you the option to either copy or delete that schedule. Choosing 'Make Copy' transfers all of the settings to a new schedule. If you no longer need a heating schedule you have created, right-click and choose 'Delete'.
- (1:48) Next, you can set the start and end dates for your heating schedule using the dropdown menus. There are four different heating schedule types for you to choose from: 'No Heating', which doesn't apply any heat during the desired time; 'Constant Temperature', which maintains a constant temperature 24 hours a day; 'Day and Night Temperatures', which applies a differential day and night temperature that either follows the typical daylength schedule for your chosen location or starts and ends at times that you choose; and 'Hourly Temperatures', which allows you to designate greenhouse temperatures for hourly intervals throughout the day.
- (2:26) The default schedule type is the 'Constant Temperature' setting. For this schedule type, you need to enter in the constant temperature your greenhouse will maintain under the Temperature Settings portion of the page.
- (2:38) For the Schedule type, 'Day and Night Temperatures', you must fill in the daytime and nighttime temperatures you desire in the Temperature Settings portion. If you check the option, 'It is day while the sun is up', the daytime temperature is applied during a period that tracks the sun for your location, and therefore changes over the course of the year. You can bypass this option and enter in your own day and night start times, which allows you to have a set thermoperiod.

- (3:04) Choosing the 'Hourly Temperatures' schedule type activates the Hourly Temperatures section of the page. Here, you are able to set the temperature hour by hour, enabling you to apply DIF and DIP treatments that require brief, significant changes in temperature at specific times in the day.
- (3:22) For this tutorial, we'll use the settings we chose under the 'Day and Night Temperatures' schedule type.
- (3:28) Next, click on the 'Heating System Setup' button at the top of the page. This page has a similar set-up as the previous one. Clicking the 'Add New Heating System' button adds additional heating systems to the list in the large, white field on the page. Once again, the heating system you are working on will be highlighted in blue. Similar to the previous page, you can delete or copy a heating system you have created by right-clicking on the system from the list and pressing the 'Delete' or 'Make Copy' button.
- (3:59) On this page, you are able to define each heating system you have at your facility. You can change the default name for the heating system by highlighting the name field and typing in the new name. Now choose your fuel type from the dropdown menu of 30 different types. To change the cost of your fuel type, highlight the number and enter in the price that you pay.
- (4:21) Next, choose your heater type and ventilation system. If you would like to see any of the pictures in more detail, simply click once on the picture. To minimize the picture, click on it again. Often, a manufacturer will describe a heating system's efficiency and include this in the specifications. This value is often a description of the combined heating system efficiency from the heater type and ventilation. If you have such a number, press the override button located in the center of the page, just above the heat delivery section, and enter that value into the window.
- (4:57) After choosing your heater and ventilation type, choose your heat delivery method that best describes your heating system.
- (5:04) The final section to fill in regards maintenance of your heating unit. Use the dropdown menus to choose your heater's age and maintenance schedule.
- (5:13) Your previous choices help determine an estimate for your heating system's overall efficiency, from fuel use to delivery of that heat to the plants, shown at the bottom of the page. If you have had an energy audit and have a number that better represents your facility, you may choose the Override button at the bottom of the screen and enter that number in the field for Current Heating Efficiency.
- (5:37) You can save your work at any time by going to the File menu. This completes the Heating section of the Design menu. We address further sections of the Design menu in other tutorials.
- (5:50) Any time you need more assistance, you can go to the Help menu. There, you will find our email address, USDA-ARS@utoledo.edu.

