



## EDUCATORS' GUIDE TO DRIP IRRIGATION

### WHAT IS DRIP IRRIGATION?

**Drip irrigation is a waterwise method of giving plants supplemental water. Using a series of pipes, hoses, and tubing, water is slowly added directly to soil, a few drops at a time. Adopting efficient watering practices like drip irrigation not only conserves water and boosts plant health — it's also another way to empower students to help protect this precious resource.**



#### Drip Irrigation:

✓ **Saves water.** Drip irrigation delivers a slow supply of water to the soil, right where plants need it. In contrast, much of the water applied by overhead sprinklers can be lost to evaporation, runoff, and overspray to non-garden areas like sidewalks. Drip irrigation uses up to 70% less water compared to sprinklers.

✓ **Benefits plants.** Drip irrigation allows you to deliver the slow, deep watering that plants need to develop healthy roots that extend deeply into the soil. Deep root systems help plants tolerate dry spells and more easily access the nutrients in the soil. In addition, foliage stays dry, which helps minimize plant disease problems.

✓ **Reduces weed competition.** By applying water directly to garden plants and not to the surrounding soil, drip irrigation “starves” weeds of water, helping to keep them in check.

✓ **Saves time and effort.** Automated drip systems eliminate the need to water by hand or to turn sprinklers on and off. They also allow you to fine-tune irrigation frequency and duration to suit your climate and weather conditions. This can eliminate the plant-stressing “drought-drown” cycles that occur when soil gets overly dry and is then flooded with water.

✓ **Saves money.** Water is not only a precious resource but also an expensive one! Waterwise irrigation with a drip system can play an important role in water conservation, which benefits the planet and keeps spending budgets in check!

## WHEN TO USE DRIP IRRIGATION

Raised beds, vegetable gardens, and ornamental plantings are all good candidates for drip irrigation. Raised beds in particular benefit from drip irrigation because:

- The closely spaced plants require optimal water availability for the best harvest.
- Dense foliage makes it difficult for water applied via sprinklers to reach the soil.
- The soil in raised beds tends to dry out more quickly than the soil in in-ground beds.



## SUPPLIES AND TOOLS NEEDED

The modular nature of drip irrigation systems makes them easy to adapt to a variety of garden layouts. Although the list of supplies may appear long, rest assured that designing and installing a drip irrigation system is a simple, logical, and straightforward process.

The following are the essential components of any drip irrigation system.

### 1. Water source

This can be any outdoor spigot or irrigation valve. It's important that the water source be equipped with a backflow prevention device to ensure potable water sources aren't contaminated. If you aren't sure if your spigot or valve has one, check with your Maintenance Department.



### 2. Timer

This allows you to automatically control the frequency and duration of water application.



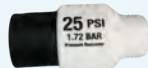
### 3. Water filter

This removes debris in the water to prevent it from clogging the holes in the dripline.



### 4. Pressure regulator

Because both municipal and well water systems use water pressures that are too high for drip systems, this regulator lowers the pressure to the appropriate level.



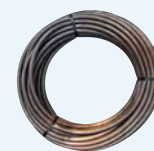
### 5. Supply lines

These carry the water from the water source to the beds and are commonly made from blank irrigation tubing (tubing without holes) and/or hoses. Work with your Maintenance Department to ensure the supply lines are sized appropriately to deliver the flow and pressure required by the irrigation application devices.



### 6. Dripline

This is arranged within beds and delivers the water to the plants. Sometimes referred to as "in-line drip tubing" or simply "drip tubing," dripline is built with internal drip emitters that release specific amounts of water through predrilled holes. Dripline is available in a number of different sizes, but 17 mm diameter tubing is the recommended size for educational raised garden beds.



### 7. Fittings

A variety of fittings are needed to connect the various components and create the proper coverage for garden beds. They include elbows, tees, couplers, shutoff valves, and end caps.



### 8. Cutting tool

This tool is used to cut pieces of tubing to the proper length.



## GETTING STARTED

### 1 EVALUATE YOUR WATER SOURCE

Note: Your water source must provide potable water if being used to irrigate edible gardens.

**Connection.** Most irrigation systems will be connected to an outdoor spigot with a standard, threaded connection. Make sure that the spigot has a backflow preventer already installed. It's common for most water sources to have a backflow prevention device added at installation. If you're unsure if your spigot has one, check with your Maintenance Department.

**Water pressure.** If you're getting your water from a municipal source or drilled well, there will likely be adequate water pressure for all but the largest plantings. Water pressure is the force of the flow and is measured in pounds per square inch (PSI). Both municipal water sources and drilled wells generally deliver water at a pressure of 40 to 80 PSI. Drip systems require a pressure between 10 and 30 PSI and, therefore, require a pressure regulator to reduce the pressure.

**Flow rate.** The flow rate indicates the amount of water available for your drip system and can help you determine how large an area you'll be able to water. Most municipal water systems have an adequate flow rate for drip irrigation in small-to-medium youth gardens, so it's not necessary to know the flow rate. However, if you'd like to measure it, here's how:



Flow rate is a measure of the quantity of water that flows over a given time period and is measured in gallons per minute (GPM) and gallons per hour (GPH). A simple way to determine flow rate is to place a 5-gallon pail beneath your water source, open the valve completely, and count how many seconds it takes to fill the pail.

If it takes 30 seconds to fill the 5-gallon pail, your flow rate is 10 GPM. Here's the math:



30 seconds = 0.5 minutes  
5 gallons divided by 0.5 minutes = 10 GPM  
10 GPM x 60 minutes/hour = 600 GPH

For some drip irrigation systems, knowing the flow rate (along with your soil type) helps you determine the type of drip tubing or emitter you'll need.

### 2 EVALUATE YOUR SOIL

Soils can have a wide range of textures that impact how water is absorbed. Clay soils are slow to absorb water, but they tend to hold moisture longer and can become oversaturated. Sandy soils drain quickly, so they dry out faster. Both can be improved by adding compost. Organic matter like compost improves water infiltration in clay soils and boosts water-holding capacity in sandy soils. Before installing drip irrigation, evaluate your soil and add any amendments, such as organic matter, that will help your system work more efficiently.

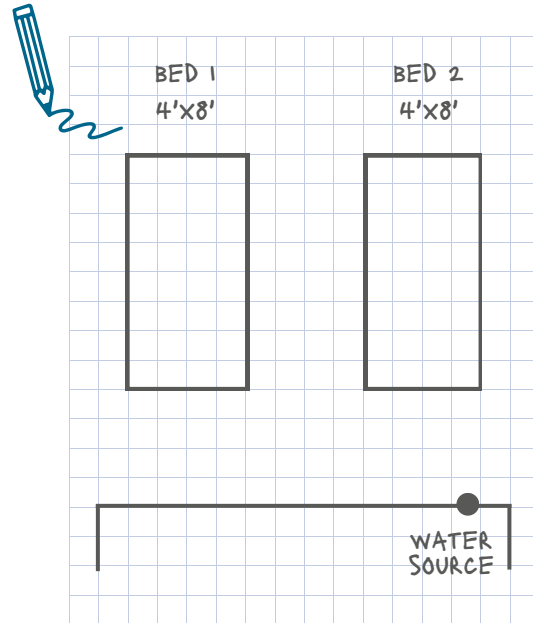
## DESIGNING YOUR SYSTEM

### In a nutshell, you will:

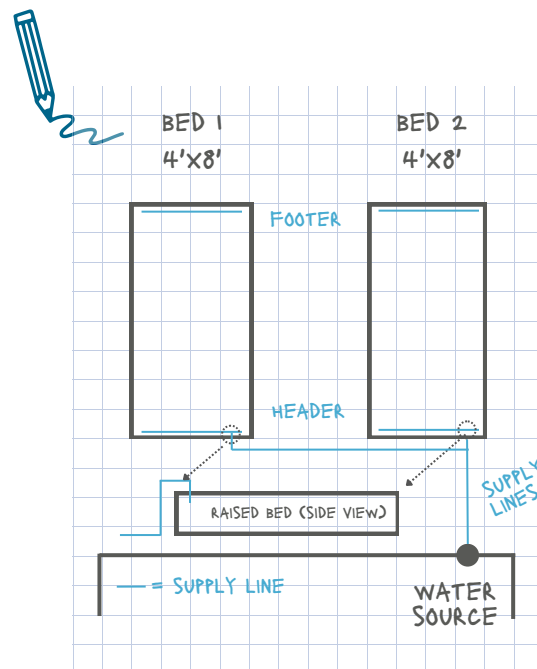
- Use irrigation line or hoses to bring water to your garden.
- Connect the water supply with supply line tubing to bring water to each bed.
- Arrange multiple rows of dripline in each bed.

Sketching your system on graph paper allows you to calculate the amount of supply line and dripline, as well as the specific adapters and other components you'll need. Use a different color for each type of component as you draw to help with final calculations.

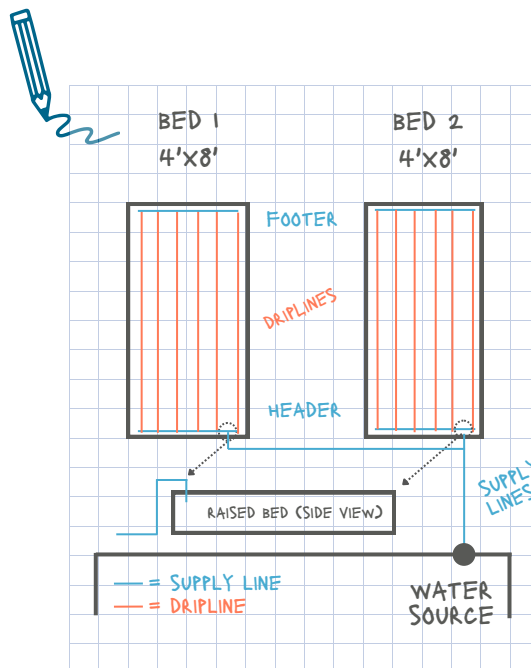
- 1 Start by drawing a rough site map of your garden area, including the beds and location of the water source (spigot) you'll be using. Drawing it to scale will simplify your calculations.



- 2 Draw in the main water supply line. In most cases, it's easiest to have one main line down the center or along the edges of all the beds. Next, add supply lines into each bed. You'll also want to place supply lines at both ends of the bed as a header and a footer.

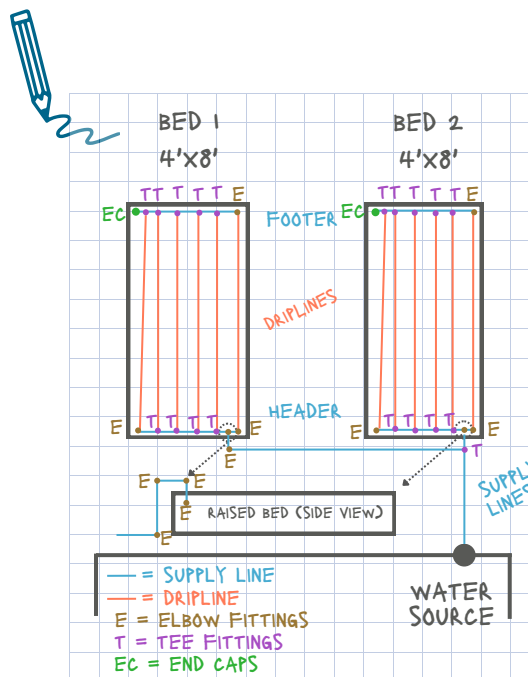


- 3 Draw the arrangement of driplines in each garden bed. Start 2" to 3" from the long side of the garden bed and place parallel dripline every 6" to 9" to ensure that the garden bed is evenly watered.

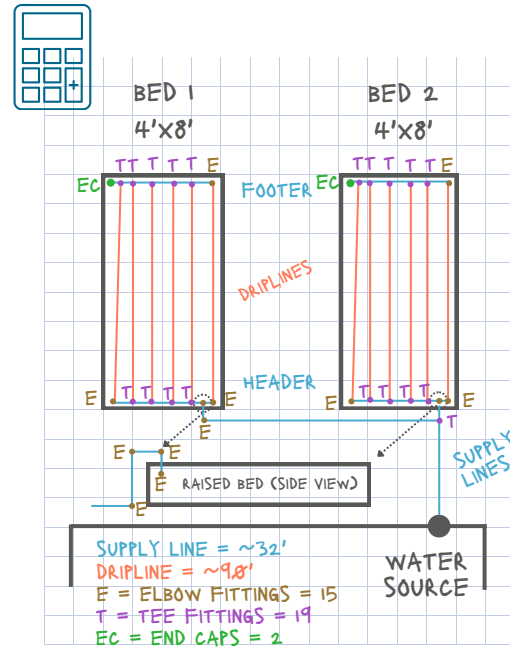


- 4 Draw in the fittings:
- Elbows for 90° turns in supply lines
  - Elbows to bring supply lines into beds
  - Tee fittings to connect dripline to supply lines
  - End caps at the end of the supply line and/or driplines at the foot of the bed\*
  - Optional: If you're connecting more than one bed, you can add a valve in each bed so you can turn water on and off in that bed.

\*If you have a limited number of end caps, you can also fold the emitter lines and clamp them in place to stop the flow of water.



- 5 Once you finish laying out your design, you'll want to calculate:
- Total length of supply lines
  - Total length of dripline
  - Number of elbow fittings
  - Number of tee fittings
  - Number of supply line end caps
  - Number of on/off valves (optional)



#### Additional optional supplies you may need:

- Hose Y connector with shutoffs for the spigot: Installing this at the spigot allows you to use one side for the irrigation system and leave the second side open for filling watering cans, attaching hoses, etc.
- Couplings: Keep several of these connectors on hand for each type of tubing to make random connections and repairs.
- Landscape staples: These extend into the soil to hold the tubing firmly in place.



**Note on supply lines:** You have a few options for running supply lines from your water source to your gardens. In many cases, blank irrigation tubing and/or garden hoses are used, though some setups use PVC pipe. If you're unable to permanently connect to your water source, using a garden hose as your supply line allows you to easily connect and disconnect the system.

For permanent installations, you can bury the supply lines 6" to 12" underground to protect them from getting crushed or damaged, such as from foot traffic or string trimmers. Or you can run the irrigation tubing and/or hoses through rigid PVC pipes to protect them. Note that in cold-winter regions, the irrigation system must be drained at the end of the growing season to prevent the water from freezing and damaging the water lines and tubing. Therefore, you don't need to bury the supply lines below the frost line.

It's important to think about safety when planning supply line type and placement. Consider burying, mulching over, or fastening supply lines to the ground to eliminate tripping hazards, protect site users, and prevent damage to irrigation equipment.

## INSTALLING YOUR DRIP IRRIGATION SYSTEM

Below are general instructions for designing and installing a drip system. Different drip systems vary in the names of the parts and design details, so follow the manufacturer's instructions.

### 1 Set up and install the water supply lines.

- Install the hose Y connector, if using, to the spigot (optional).
- Install the timer.
- Install a filter, if needed. Some timers incorporate a screen to filter out sediment.
- Add the necessary fittings, then attach your supply line.

**Note:** You can add the pressure regulator after the timer if you're using blank irrigation tubing as your water supply line, or you can install it where the supply line reaches the garden if you're using a garden hose to reach your beds.



**Tip:** Be sure that the timer is located closer to the spigot with the pressure regulator coming after it. This reduces the strain on the pressure regulator.

### 2 Run the supply line to the garden area.

- Identify the type of supply line being used. It may be blank tubing, PVC pipe, garden hoses, etc.
- Install the supply line from the water source to the garden bed(s). If digging trenches, it's a good idea to leave the trenches open and pressurize the system to identify any leaks. Backfill the trenches once they've been inspected.
- Secure the supply line appropriately to eliminate tripping hazards.



### 3 Bring water to individual beds.

If you have multiple raised beds, you'll need to use fittings to bring water to each bed. Use four 90° elbow fittings to bring the blank irrigation tubing up the side of the bed, over the edge, and into the bed, connecting it to the soil-level tubing. If you're installing the irrigation in new beds prior to filling them with soil, you can run these lines inside the beds and use fewer connections and tubing; otherwise, run them up the outside of the beds.

**Tip:** As an option, you can install a shutoff valve at each bed so you can turn the water on and off as needed for that bed.

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#### Create the header supply line.

Create a header of blank irrigation tubing to fit inside the bed where the supply line comes in. At the other end of the bed, place a footer that will have a removable end cap for draining.



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#### Run driplines.

Arrange lengths of dripline in each raised bed in parallel lines every 6" to 9" in between the header supply line and footer line. Cut the header and footer lines where the dripline will meet them. Install tee fittings and attach the dripline to the two headers. Install an end cap on the footer line.



#### Tips:

- The dripline can be left on the soil surface or buried under 1" to 2" of soil or mulch.
- Cut the driplines so that the emitter holes are staggered throughout the bed for more coverage.
- Pin the dripline in place using landscape staples (optional).



## USING YOUR DRIP IRRIGATION SYSTEM

### 1 SET THE TIMER

Start by setting the clock on the timer to the correct time. Then set the start time; in most cases, the ideal time to water plants is early morning. Know that multiple start times throughout the day may be needed to maintain soil moisture consistency for developing plants with shallow roots.

### 2 CHOOSE THE FREQUENCY AND DURATION OF WATERING

The amount of water that plants need depends on a variety of factors, including the weather, soil type, and size and type of plants. The goal is to apply enough water so that your plants' entire root systems are moistened. The best way to determine if soil is moist to the necessary depth is to reach into the soil with your finger and/or use a trowel to dig a small hole. Once you get to know your soil and irrigation system, you'll be able to estimate the amount of water needed. Here are some guidelines:

- Germinating seeds and young seedlings need frequent watering at short durations until their roots are established. For example, you might set your timer to water these beds every day for 10 to 15 minutes for the first week or two. It may also be necessary to have multiple start times throughout the day. The Hunter BTT Bluetooth® Tap Timer can water up to four times per day.
- Once plants are growing well, you can increase the volume of water applied to the garden bed (to allow water to percolate more deeply to support healthy root growth). For example, consider setting your timer to water 15 to 30 minutes twice a day for every other day. Understand that it may take some trial and error to get the watering volume right and that as the plants grow in their cycle, their water needs change as well. The most important key to garden success is to maintain even soil moisture throughout the growing period.
- Plants need more water during hot, dry weather than during cool, cloudy weather.
- A layer of organic mulch around plants helps conserve soil moisture, potentially reducing the frequency and duration of watering required.
- Natural rainfall can supply some or all of your plants' water needs; a rain gauge can help you monitor how much rain has fallen.



#### Tips:

- Most timers run on batteries. You'll want to keep an eye on the timer to ensure that the batteries haven't died. It's a good idea to replace the batteries at the start of each season and/or before you leave for extended periods.
- Regularly monitor your system. Inspect, investigate, and repair any leaks. Check that there's no dripping at the connection to the spigot.

## MAINTAINING YOUR DRIP IRRIGATION SYSTEM



### WINTERIZING

In locations where temperatures dip below freezing, your drip system must be drained to prevent damage to lines and fittings.



### CLEARING CLOGGED TUBING

Soil, plant debris, and insects can get into your tubing and prevent water flow. In some cases, sections of tubing may need to be detached and cleared or possibly replaced. Regularly remove the end caps of your system and allow water to flow all the way out.



### SEASONAL CHECKUPS

Like any irrigation system, driplines can experience cracks and leaks. It's important to check your system regularly, from source to end caps, to make sure you're maintaining maximum efficiency!

