If the break is at the base of the sprinkler head or riser:

- Excavate a hole around and under the base of the sprinkler large enough to easily work in.
- Sprinkler heads attach to laterals using either a rigid PVC riser or swing pipe.
- If a rigid T-coupling and riser attachment has been used, it is often a good idea to replace with the swing pipe assembly.
- A Quik-fix assembly may or may not be the most convenient way to repair the attachment to the lateral.

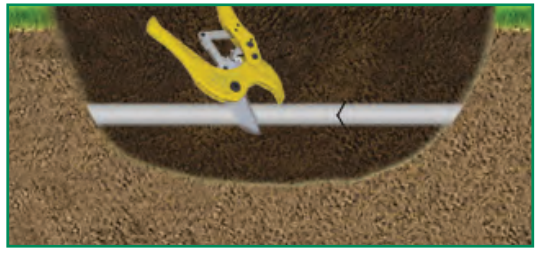
Before turning the water back on to flush out the system, make sure the sprinkler head has been replaced and the top is well above the bottom of the excavation hole. If muddy water fills the hole and covers the top of the open sprinkler, the water will be sucked back into the lateral lines when it is turned off, often carrying rocks and debris into the lines and clogging the sprinkler heads.

How do I use a "Quik-fix™" to repair a broken line or sprinkler head?

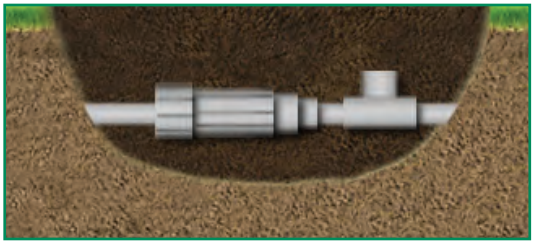
You can replace or add additional sprinkler heads to an existing zone. The steps below show how to add sprinkler heads to an existing line and demonstrate the use of a Quik-fix for repairing any PVC line.

1. Cut Pipe

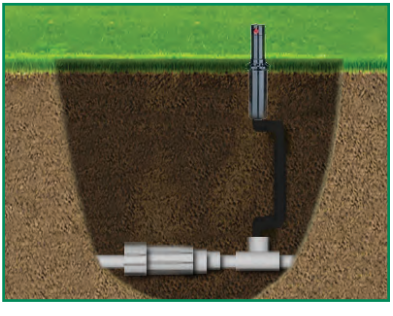
Locate the spot where you want to add a riser. Dig very carefully down to the pipe, making a hole wide and deep enough to work with the pipe easily without getting soil into the system. Using PVC ratcheting cutters, cut out a section of the PVC pipe wide enough to insert an adjustable Quik-fix coupling and a "T" fitting with a threaded outlet for the riser.



2. Install Fittings
Cement the Quik-fix to one cut end of pipe and the "T" to the other. Adjust the fittings to fit the space as necessary. Make sure to plan ahead so that the tee is facing straight up; solvent cement dries very fast.



3. Attach the Riser
Using the appropriate height and type of riser for the location (see previous illustration of a Hunter® swing joint riser), wrap the riser threads with pipe-thread tape and screw the riser into the "T" fitting.



How do I inspect and maintain sprinkler heads?

Drip lines, spray heads and rotors should be systematically checked on an on-going basis, so the entire system is checked once every month. Inspect all drip lines and sprinkler heads for misaligned irrigation heads, clogged or obstructed heads or emitters, missing or vandalized heads, low-head drainage conditions, overspray onto hardscaped areas, poor coverage and uniformity.

Problems with a sprinkler head are often detectable by a distorted spray pattern or by the presence of brown grass around the head. Simple adjustments may correct the problem. Depending on the type of head (impact, pop-up, etc.), it may be possible to adjust the spray angle and radius. Methods for adjusting vary with the type of head and the manufacturer. Correct malfunctioning systems immediately. If the irrigation is not adequate to provide uniform coverage, you will be required to upgrade the system to achieve site efficiency.

Visual observation can be used to detect irrigation problems. Below are some conditions that may indicate problems.

Problem observed	Possible cause of the problem
Water continues to come out of a sprinkler head after the zone is shut off.	Leaking valve. However, a head located in a low point where water from the entire zone will drain can also cause this.
One part of the irrigated area is constantly wet.	Leak in the mainline. A break in the lateral in that area. A missing sprinkler head. An excessive run time on the controller for that zone.
Grass in a particular zone is brown; the zone is not receiving adequate water coverage.	Poor adjustment of sprinkler head. Bad valve. Bad wiring. Leaking lateral. Broken sprinkler head which reduces pressure to the entire zone. Insufficient watering time on controller.
Grass around a particular sprinker head is brown.	Bad sprinkler head. Clogged or broken nozzle.

How do I clear clogged spray heads?

To clear clogs on spray heads:

- Remove internal assembly, clean screen filter, thread fine wire through orifice of nozzle, and reassemble head.
- Run test to confirm that clog has been cleared.

Do not attempt to clean plastic nozzles by sticking knife blades or wire into the openings. This will scratch the plastic and ruin the pattern.

Sprinkler adjustment and replacement guide

The following instructions are based on current commercial and institutional Hunter® models, and are intended as an example. You may encounter and use a variety of brands and models. For brand and model-specific instructions, please look at the manufacturer's instructions.

Sprinkler adjustment and replacement activities include:

Nozzle installation
Arc adjustments
Radius/throw distance adjustments

PGP Ultra, I-10 Ultra and I-20 Ultra

Installation

The pop-up sprinkler should be installed at finish grade as shown in the illustration (Fig. 1)

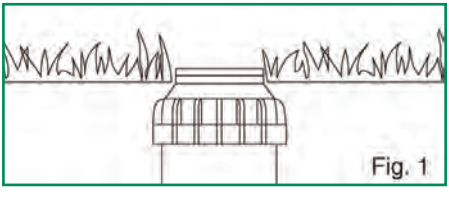


Fig. 1

Arc adjustments

Adjustable heads are preset to approximately 180°. Sprinklers may be adjusted with water on or off. It is recommended that initial adjustments be made before installation.

1. Using the palm of your hand, rotate the nozzle turret counter-clockwise to the left stop to complete any interrupted rotation cycle (Fig. 2).

2. Rotate the nozzle turret clockwise to the right stop. This is the fixed side of the arc. The nozzle turret must be held in this position for arc adjustments. The right stop does not change.

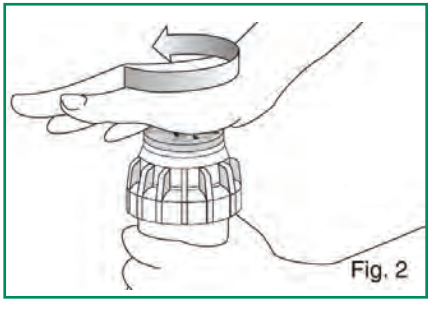


Fig. 2

To increase the arc

1. Insert the plastic key end of the Hunter® wrench into the adjustment socket (Figs. 3, 4).

2. While holding the nozzle turret at the right stop, turn the wrench clockwise. Each 360° turn of the wrench will increase the arc 90°.

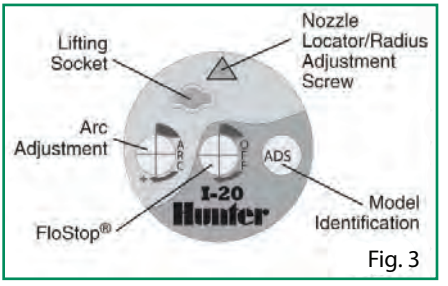


Fig. 3

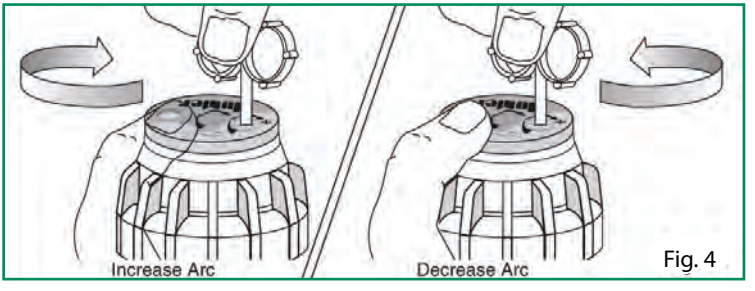


Fig. 4

3. Adjust to any arc between 50° and 360° (PGP) or 40° and 360° (I-10 & I-20) (Fig. 5).

4. The wrench will stop turning, or there will be a ratcheting noise, when the maximum arc of 360° (full circle) has been reached.

5. When set to 360, the sprinkler will rotate continually counterclockwise (PGP).

To decrease the arc

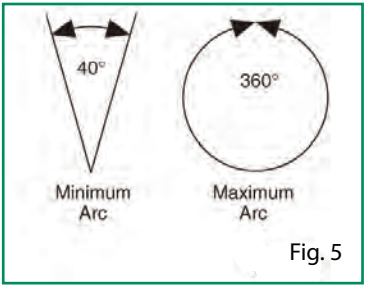


Fig. 5

1. Insert the plastic key end of the Hunter® wrench into the adjustment socket (Figs. 3, 4).

2. While holding the nozzle turret at the right stop, turn the wrench counterclockwise. Each full 360° turn of the wrench will decrease the arc 90°.

3. Adjust to any arc between 50° and 360° (PGP) or 40° and 360° (I-10 & I-20) (Fig. 5).

4. The wrench will stop turning, or there will be a ratcheting noise, when the minimum arc of 50° has been reached.

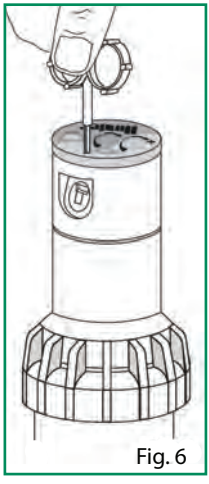


Fig. 6

Radius/distance of throw

Insert the steel hex end of the Hunter® wrench into the radius adjustment screw (Fig. 6). Turn the screw clockwise (into the stream of water) to decrease the radius, or counterclockwise to increase the radius. Radius can be reduced up to 25%.

Nozzle installation

1. Insert the plastic key end of the Hunter® wrench into the lifting socket of the sprinkler and turn 90°. Pull the riser up to gain access to the nozzle socket (Fig. 7).

2. Using the hex key of the Hunter® wrench, turn the radius adjustment screw (Fig. 6) counterclockwise to be sure it is not blocking the nozzle socket opening. If a nozzle is already installed, it can be removed by backing out the adjustment screw and turning on the water, or by pulling outward on the nozzle "ears" with a pair of needle-nosed pliers.

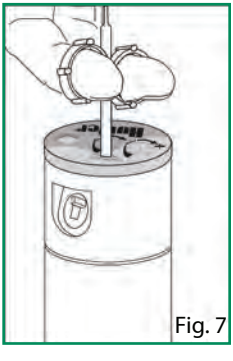


Fig. 7

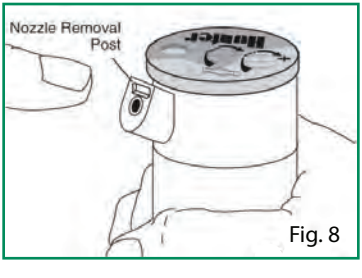


Fig. 8

3. Slip the desired nozzle into the nozzle socket (Fig. 8). Note that the socket is angled up 25°. The "ears" should be adjusted so that the nozzle range screw threads directly down between them. Then tighten the nozzle range screw. The raised bump with an arrow on the rubber cover will always indicate the location of the nozzle and direction of water flow when the sprinkler is retracted.

Problem	Likely Cause	Corrective Action
Distorted spray pattern	Nozzle is clogged with debris	Clear debris. You may need to detach nozzle to remove obstruction. Spray heads have a filter screen under the nozzle. If it becomes clogged, it should be cleaned and replaced.
Heads discharge large drops	1. Nozzle is clogged with debris	Clear debris. You may need to detach nozzle to remove obstruction. Spray heads have a filter screen under the nozzle. If it becomes clogged, it should be cleaned and repla ced.
	2. Water pressure is too low	Check for leaks in the system. If the system is not leaking, you may need heads that operate at lower pressure.
Heads discharge a fine mist	Water pressure is too high	Install remote control with flow control; install pressure regulator valve on mainline.
Rotary sprinklers do not rotate or rotate too slowly	1. Water pressure is too low	Check for leaks in the system.
	2. Bad gear drive mechanism (gear drive sprinklers only)	Replace gear drive.
	3. Break-up pin is improperly adjusted (impact sprinklers only)	Adjust break-up pin.
	4. Insufficient water is contacting lever (impact sprinklers only)	Adjust lever.
	5. Lever is impacting back of sprinkler head (impact sprinklers only)	Adjust lever.
Pop-up sprinkler will not pop up	Water pressure is too low	Check for leaks in the system.
Pop-up sprinkler sticks in up position	1. Dirt or other debris in the spindle sleeve area	Remove debris. Internal unit may need to be disassembled for cleaning.
	2. Dirt or other debris in the spindle	Remove debris. Internal unit may need to be disassembled sleeve area for cleaning.

How do I diagnose some basic irrigation problems?

There are four steps in basic irrigation system troubleshooting. It is important that you complete each step one by one and try not to skip to the next until you have completed all of the tests in the section. If followed, this process will enable you to get to the problem without any doubts in your mind that your diagnosis is correct.

1. Pressurized Water Supply

2. Automatic Controller

3. Field Wiring between Valves and Controller

4. Automatic Control Valve

Step 1 – Check to confirm pressurized water supply

Verify that the water supply is pressurized or on. (Locate the POC, a master gate valve, or backflow prevention device.) Locate a control valve and activate by way of a manual bleed. (If the sprinklers come on, the water supply is pressurized.)

Be sure that the flow control handle on top of the valve is open (this device is used to control the flow of water through the valve for fine tuning purposes. It may have been turned off to prevent the valve from coming on, as in the case of a valve stuck in the "on" position.

Step 2 – Automatic controller

Verify controller program.

- Check to see if controller is connected to a stable power source: AC electric line, battery or solar.
- If time and date are current, power is confirmed.
- Set to Automatic Mode.
- Check Start times/Run times/Program days.

Activate a manual start on each station (zone).

- If a particular station (zone) trips circuit breaker, blows a fuse, or skips to the next station, proceed to Step 3.

- If nothing comes on, verify that the controller is putting out power to the stations (using a volt/ohm multimeter).

Step 3 – Field wiring between valves and controller
Take resistance measurements on each station.

Disconnect common wire(s) from the controller.
Connect one lead of the multimeter to the common wire and the other lead to each station terminal in succession. Note the reading on each station.

1. **Less than 20 ohms is a short circuit.** Test solenoid. (If a short exists at the solenoid, the solenoid needs to be replaced.) If solenoid reads good, check field wiring for staples or cuts connecting station wire to common wire.

2. **Two solenoids wired together will produce a reading of approximately half of what the particular type reads when good.**

3. If resistance is **over 60 ohms or digital multimeter reads open,** there is a **broken wire/bad connection or bad solenoid**. Test the solenoid at the valve.

4. If the reading is still open, replace the solenoid.

5. If the reading is good, twist station wire and common wire together and take a reading from the controller (the reading should be a short).

6. If you read a short, the wiring is good and it was probably a bad connection or splice.

7. If the resistance is still high when the wires are twisted together, there is an open circuit (broken line) between the controller and the valve.

8. Wire tracing equipment should be used to locate the problem or the wiring needs to be replaced.

Step 4 – Automatic control valve

Identify type of valve to diagnose problems:

1. **Forward flow valve** – Incoming water exerts pressure on the bottom of the seat disc. The incoming water is ported to the top of the diaphragm via a hole in the diaphragm shaft to create a pressure differential, which closes the valve. When the valve is opened, either with the solenoid or manually, the water pressure pushes the seat disc open and flows downstream.

2. **Diaphragm failure (tear)** – A tear in a forward flow valve will **result in the valve not completely shutting down or staying on all the way.** This is dependent on the extent of the tear and in what position the valve was in when the failure occurred.

3. **Damaged metering rod or pin (bent)** – A bent metering rod can prevent the diaphragm from moving in its full range, thus **preventing the valve from opening all the way**.

4. **Reverse Flow Valve** – Incoming water surrounds the bottom of the diaphragm. Water is ported to the top via an external tube, a hole in the diaphragm, or ports machined in the body. This creates a pressure differential, which closes the valve.

5. **Diaphragm failure (tear)** – A tear in a reverse flow valve diaphragm will result in the valve not opening completely or in some cases failing to open at all.

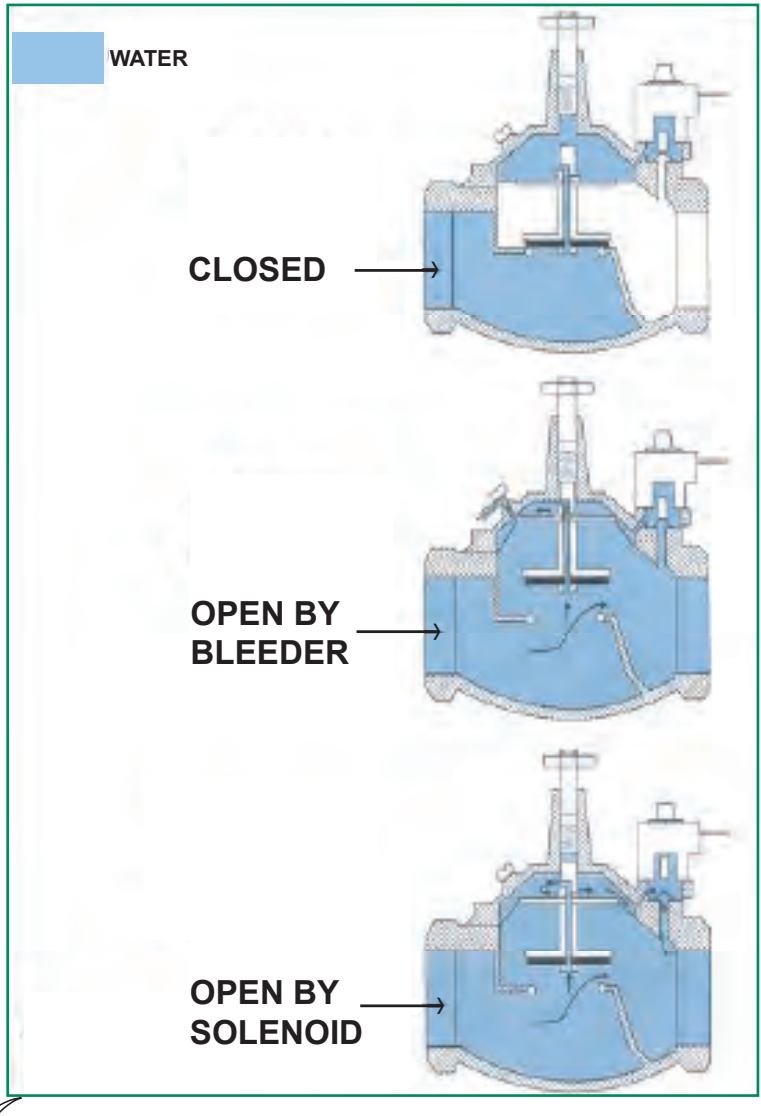
Problems common to both forward and reverse flow valves

1. **Debris** clogging either the incoming or **out-going** ports in the solenoid chamber may prevent water from leaving the upper chamber. This will **cause the valve to stay closed** when activated from the controller or when bled internally via the solenoid.

2. **Corrosion or debris in and around the solenoid plunger** and spring may prevent the plunger from moving freely and may get stuck in an open position. In these cases the **valve may be stuck on or off**.

3. **Dents or nicks in the seat washer** may cause the valve to not seat well and may result in **water weeping through the valve**. The water usually ends up dripping out of the lowest head in the line and may be misdiagnosed as low head drainage.

4. **Debris obstructing the valve seat (usually rocks) may prevent a valve from closing completely or, in some cases, may keep it on fully.**



Automatic control valves

5. **Flow control opened up too high** may cause the valve to get **stuck in an open position** due to high velocity and flow or low pressure/low flow conditions.

6. **Solenoid or solenoid seat damage** will show water constantly leaking past the plunger. This will result in **weeping of water through the valve** similar to a nick in the valve seat.

When do I need to manually water plants?

When breakdowns or malfunctions exist, you must hand water on the same schedule as the irrigation controller to maintain all plants in a healthy condition unless the Engineer determines otherwise.

Tip

Do not wait for approval to begin hand watering if it is required to save the landscape plants under your care. Failure of the irrigation system to provide full and proper coverage shall not relieve you of the responsibility to provide adequate irrigation. It is your responsibility to make sure that the irrigation system is maintained and operates properly. Plants that die due to irrigation failure will be considered to have died due to contractor negligence and shall be replaced at contractor's expense.

What can I do to reduce soil water loss?

Mulching helps to conserve water. Three to four inches of mulch around the base of trees and shrubs helps to prevent weeds and keeps the underlying soil moist. Mulch under trees and shrubs out to the edge of the drip zone to help maintain tree health. Wood chips can also be used as mulch in an entire landscape area where grass is sparse or absent.

Mulch should not come in direct contact with the bark of woody plants; keep it at least one foot away from the base of trees and shrubs.

Tree trimming contractors may find it more economical to unload wood chips around trees and shrubs as mulch, rather than pay tipping fees. Contact the Engineer to find out if there are designated sites to dump and store materials from your chipper. There may also be restrictions as to the type of wood that is acceptable.

You must obtain permission from the Engineer before spreading mulch. If approved, mulching material must be spread out in the appropriate manner before leaving the site (see Chapter 11, "Fertilizers").

Irrigation Maintenance Schedule

ELECTRIC VALVE MAINTENANCE

Monthly

- Check flow control on each valve for proper adjustment. Adjust as needed based on head operation.
- Check for valve weeping at the heads. Replace valve as needed.
- Check the condition of wire splices. Replace as needed.
- Check for leaks at all threaded connections. Tighten as needed.

Annually on May 1st

- Check each valve ohm reading from the controller and record for future reference (20-60 ohms is normal). If the ohm readings decrease significantly from one year to the next, replace solenoid even if it still operates. Confirm that this is a solenoid problem, not wiring.
- Unscrew the solenoid and check plunger for smooth operation. Check solenoid and plunger for rust or corrosion. Replace if rust or corrosion present.
- Check wire leads for cracks or exposed wires.
- Check wire splices. Ensure that the splices are good and are still waterproof. Replace as needed.
- If valves are a "dirty water" valve, check and clean screen/filter. Replace if needed.

Month of January in Years Ending in "5" or "10" (e.g., 2015, 2020)

- Replace all solenoids, diaphragms, seat, spring, wire splices, and check and clean all ports and screens.

SPRAY HEAD AND ROTOR HEAD MAINTENANCE

Monthly

- Check the body for cracks and leaks where the stem rises from the body.
- Check for leaks coming up from below the head. Repair as needed.
- Check that the nozzle is not clogged or semi-clogged. Unclog or replace. Clean the filter for spray head.
- On spray heads that appear clogged, check the filter under the nozzle. Replace as needed.
- On rotor heads, check visually for too high or too low pressure. Adjust valve flow control or pressure regulator as needed.
- On rotor heads check arc adjustment of the head. Ensure that it is covering only the landscape area for which it was designed. Adjust as needed.
- On rotor heads, check the radius of the head coverage. Make sure the set adjustment is not set incorrectly.

Annually on May 1st

- Replace the filters under the nozzles and at the base of all heads.
- Replace worn nozzles and/or nozzles that cannot easily be unplugged.
- Check that the correct nozzle is in place and has not been inadvertently changed during the year. On rotor heads check for matched precipitation rate and replace as necessary.
- Check stem seal and replace if leaking.
- Check for low or tilted heads and raise and/or straighten as needed.
- Check for low head drainage. Replace low heads with heads with in-head check valves.
- On spray heads, use a pressure gauge with adapter and check pressures at the beginning, middle and end of zone. Adjust pressure as needed and where available. If a psi variation greater than 10% exists from the first head compared to the last head on the zone, consider psi regulating nozzles or heads for replacement if not currently in use.
- On rotor heads, using a pilot tube, check pressure at the beginning, middle and end of zone. Adjust pressure as needed and where available. If a psi variation greater than 10% exists from the head compared to the last head on the zone, consider psi regulating heads for replacement, if not currently in use. If pressure regulating rotor heads are not available, consider making nozzle changes to better regulate pressure.
- On rotor heads, check rotation speed. All heads of the same type from the same manufacturer should rotate at the same speed.
- On rotor heads, check stem seal and replace if leaking.
- On rotor heads, check for low or tilted heads and raise and/or straighten as needed.

Month of January in Years Ending in "5" or "10" (e.g., 2015, 2020)

- Perform a catch can test to determine the zone Distribution Uniformity (DU).
- Replace all nozzles, filters, and stem seals. Replace entire spray or rotor head if parts exceed entire head.
- Check head locations and move as needed based on current landscape configuration and plant growth.
- Tighten all connections where the head connects to the underground piping.
- Tighten all connections where the risers or flex pipe connect to

fittings on the PVC or Poly pipe fittings. Check for unusual wear, cracks, leaks or stress. Replace parts as needed.
- Reset heads to correct elevation and check that they are level.

VALVE BOX MAINTENANCE

Monthly
- Trim intruding grass around box cover.

Annually on May 1st
- Check lid for damage. Replace if cracked or broken.
- Check for valve box settling. Raise and level box if not at finish grade.
- Check for dirt intrusion. Clean out all dirt in box.

Month of January in Years Ending in "5" or "10" (e.g., 2015, 2020)
- Replace box if warped or damaged in any way. Reinstall box to finish grade.
- Replace landscape fabric and gravel in box.

WIRING MAINTENANCE

Monthly
- Check wire connections at the controller and at the valve box. Tighten and/or replace as needed.
- Check for stress or tightness on the wires and splices in the valve box. Repair as needed.

Annually on May 1st
- Make sure all wires are labeled with controller and zone numbers. Check and replace any faded or missing labels.
- Check every splice box and check that all splices are sound and waterproof. Replace all damaged or compromised splices.
- Identify, label and ohm-out all extra and unused wires so they can be used if needed, if other wires fail.

Month of January in Years Ending in "5" or "10" (e.g., 2015, 2020)
- Replace all splices in all valve boxes and junction boxes.
- Check and re-label all wires.

CONTROLLER MAINTENANCE

Monthly
- Check that the correct irrigation schedule is selected since some controllers revert to the factory default program when there is loss of power.
- Verify that the controller has all the seasonal schedules programmed.
- Manually test rain switch. Replace rain switch if not functioning.

Annually on May 1st

- Replace backup battery.
- Record standard watering schedules and laminate and keep inside controller. Update maintenance drawings to reflect current schedule.
- Clean all insects in controller and install moth balls in cloth bags.
- Check that controller enclosure is secure and waterproof. Repair water-proofing as necessary to ensure enclosure is waterproof. Replace enclosure if lock is not repairable.
- If rain switch is electronic, then replace battery.

Month of January in Years Ending in "5" or "10" (e.g., 2015, 2020)

- Replace entire controller if not fully functional.
- Replace all rain switches and sensors.

RECORD KEEPING

Monthly

- Record and file water usage.

Annually on May 1st

- Provide Engineer the annual water usage by the month.

What do I need to report?

Reporting & Inspection

Every month you will be required to report on the water consumption for irrigation and the time spent doing irrigation maintenance work and the detection, repair and replacement costs of broken components. See Chapter 14, "Reporting."

Every month the inspector will check to ensure that the various components and functions of the irrigation system, including but not limited to dry spots, leaking valves, stuck valves and broken risers, laterals or mains, are functioning properly. You will also be required to accompany the Engineer to perform a comprehensive annual inspection of the irrigation system. See Chapter 15, "Inspecting Vegetation Maintenance Work."

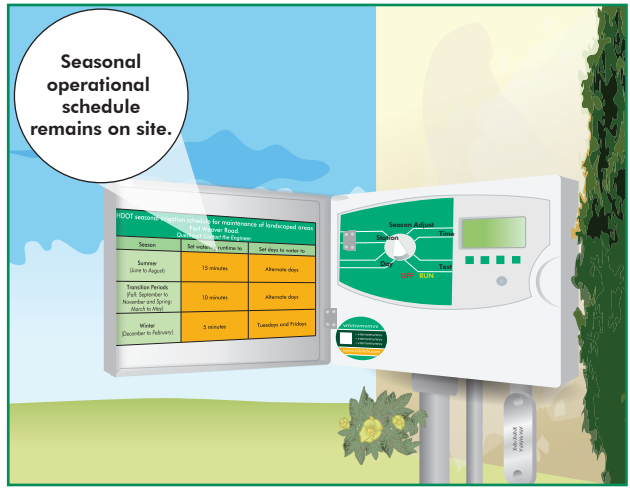
In a Nutshell

1. Wherever an irrigation system has been installed you must maintain them in good working order.
2. Follow all maintenance protocols to conserve water.
3. Record and file water usage.
4. Monthly and annual inspections should be strictly followed for irrigation systems. You must schedule an annual inspection by the Department of Health and provide a backflow inspection report.

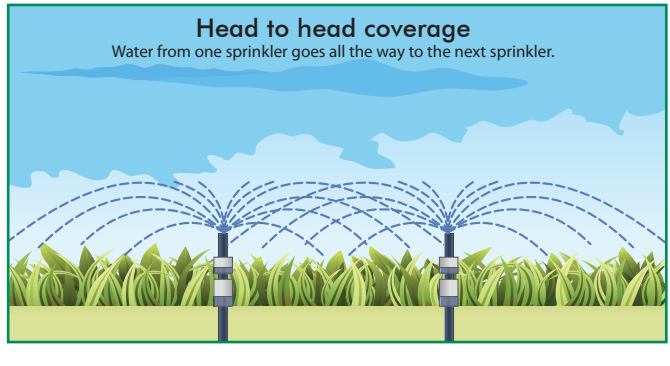
Appendix 12

Best Management Practices for Irrigation Design and Installation

1. Irrigation system plans and specifications shall include post-construction documentation, including drawings of record (as-built drawings), maintenance recommendations, design precipitation rates and manufacturer's operational guide which will be available at the Engineer's office. The seasonal operational schedules shall remain on site. Specifications shall require a coverage test prior to acceptance and LICH water conservation best management practices.



2. Design irrigation system with sprinklers spaced with head to head coverage or better. The water throw from each sprinkler head overlaps the neighboring heads and this prevents occurrence of dry spots.

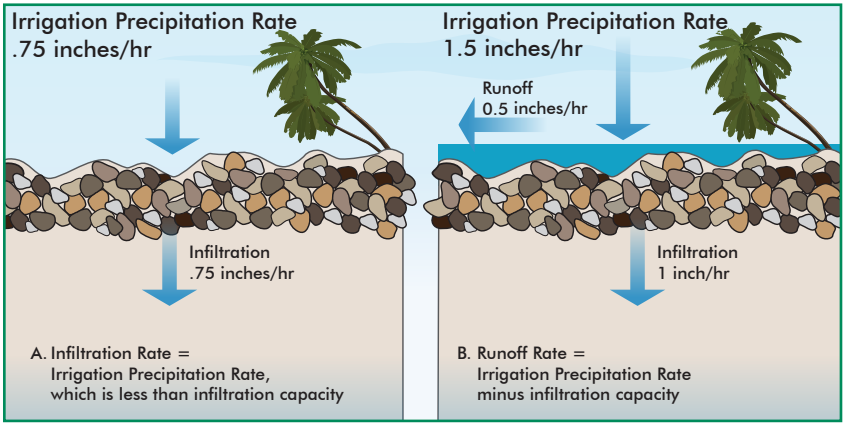


3. Irrigate with precipitation rate not exceeding soil infiltration rate. The speed at which an irrigation system applies water over a given area is referred to as the precipitation rate and is measured in inches per hour. One inch per hour is equivalent to 620 gallons per 1,000 square feet. Several factors at the design and installation stage, such as the type of sprinkler heads used, their spacing, and flow rate from each head, can affect an irrigation system's precipitation rate.

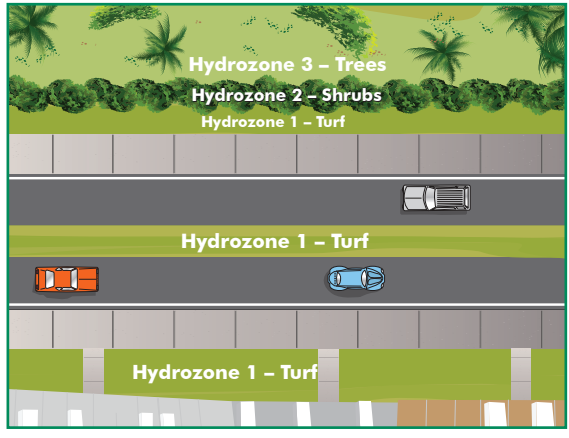
The rate at which water moves into and down the soil is called the infiltration rate. Different types of soils have different infiltration rates (e.g., clay soils absorb water slowly; loam soils have average absorption rates and sandy soils absorb water rapidly).

When the rate at which water is being applied (precipitation rate) is greater than the ability of the soil to absorb water (infiltration rate), water is wasted as runoff or by accumulating at the soil surface (ponding) and evaporating rather than being available to the plants.

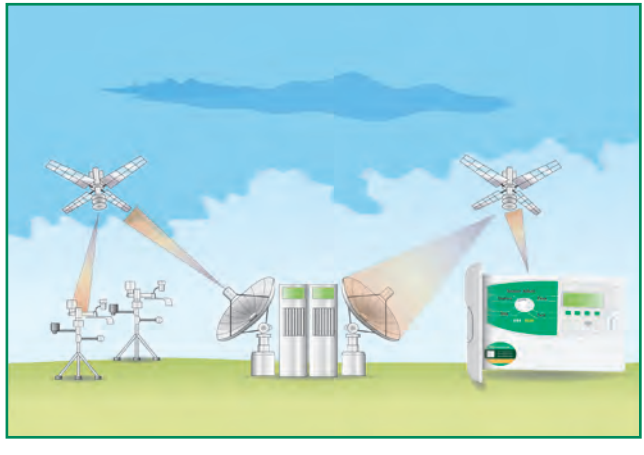
This can be avoided by designing and installing an irrigation system with appropriate components so that the precipitation rate matches the infiltration rate of the soil at any given site. For this reason, it is also very important to always replace broken sprinklers and other irrigation components with the original design specifications.



4. Design systems to irrigate similar hydrozones (sections of the landscape that have similar, slope, sun exposure, soil conditions, and plant materials with similar water use) on the same watering zone circuit. Use appropriate sprinkler heads with matched precipitation rates in different zones. Avoid irrigation overlap between high and low water demand hydrozones.

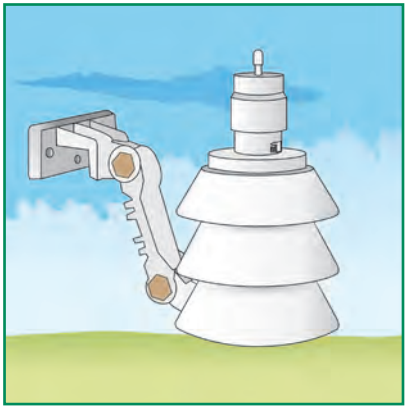


5. Use climate-based irrigation controller (Smart Controller). Climate-based irrigation controllers operate by scheduling watering based on weather conditions. Some of the products use real time or historic weather data to schedule irrigation based on evapotranspiration (ET), which is determined by weather conditions and plant type. ET is the quantity of moisture that is both evaporated (E) from the soil and plant surfaces and transpired (T) by the plant.



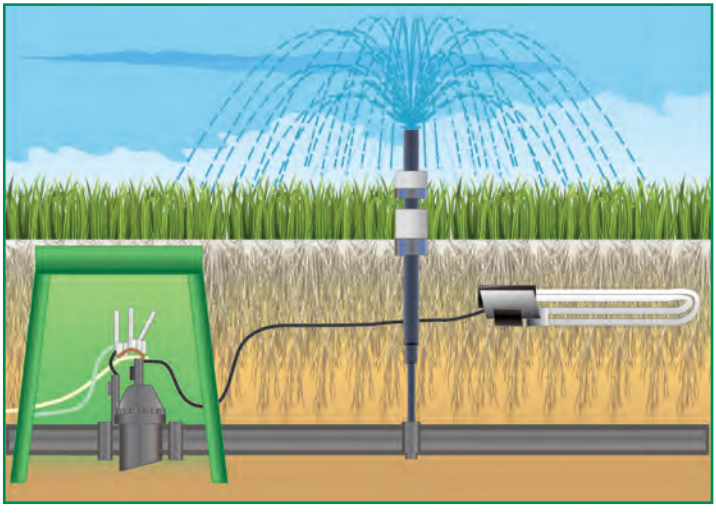
ET systems continuously measure the local evapotranspiration (ET) factor. This information is then downloaded to the host controller to create an intelligent irrigation schedule that is just right for the local landscape requirements. ET-based irrigation is considered a "best practice" by the irrigation industry and most water authorities. The result can be as much as 30% reduction in water use.

Weather Station controllers also may use a variety of other sensors that monitor weather conditions, such as rainfall, temperature, wind speed and soil moisture, to constantly adjust run times and days to water.

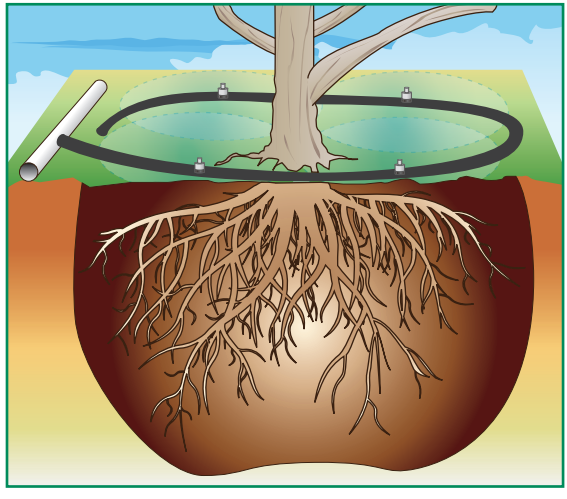


A soil moisture sensor works with the controller and valve wires to maximize convenience and water savings with minimum installation effort and cost.

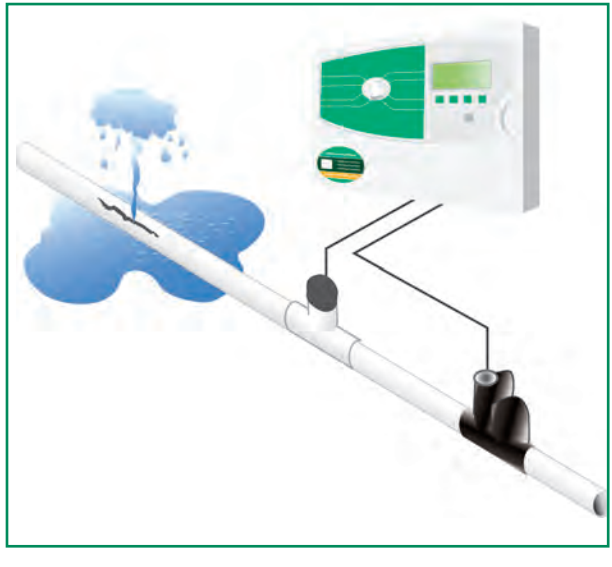
Soil moisture sensors are buried 4 to 8 inches deep in the root zone and relay real time data, such as soil moisture, back to the monitor. Once engaged, the sensor information is utilized to automatically make irrigation adjustments throughout the year. The newest models use existing valve wires and are rain sensor compatible.



6. Encourage the use of drip irrigation for individual specimen plants during establishment period. Place drip emitters around edge of root ball at planting and gradually move them farther out as the tree becomes established in order to cover the expanding root zone.

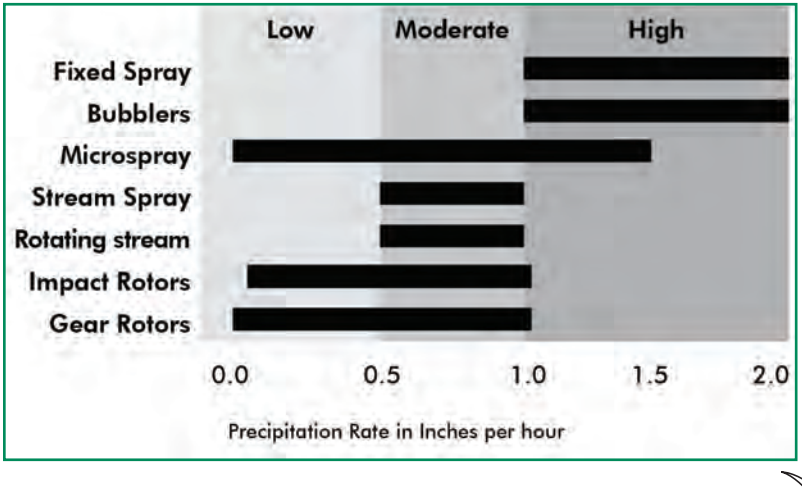


7. Use the flow sensors with smart controllers to detect leaks or drastic changes in water use.



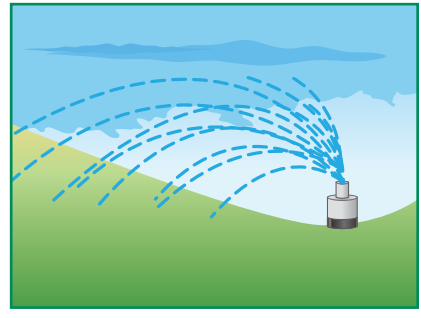
8. Use an irrigation submeter that measures water use on large sites. A water meter at the point of connection to each water installation will measure water consumption and provide useful water consumption information. Recording water use is part of the monthly inspection report. Installing an irrigation submeter saves on sewer charges because you can use the actual amount of water used for irrigation for the sewer deduction versus the standard deduction.

9. Use water conservation irrigation components, such as rotary nozzles, pressure regulated spray heads and valves, rain switches and matched precipitation rate nozzles.



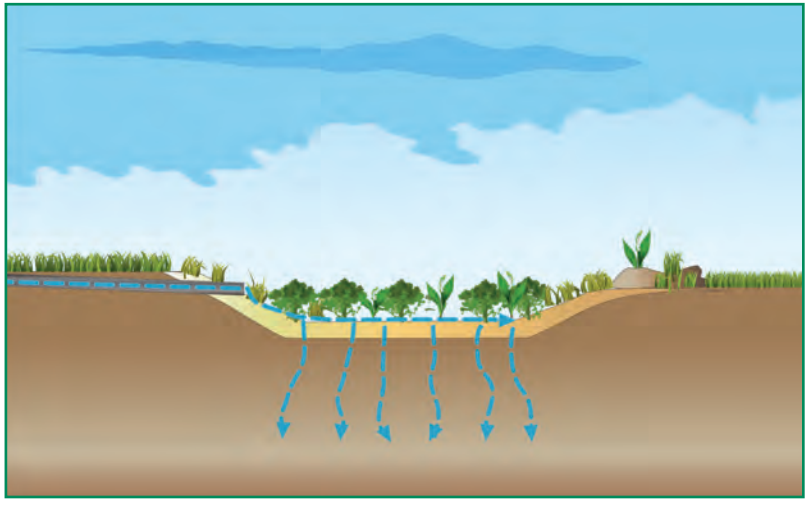
10. Sprinklers in low-lying areas and slopes should be equipped with check valves. Check valves prevent water from draining out and pond-ing at the lowest sprinkler head when the run time has ended.

Sprinkler without check valve

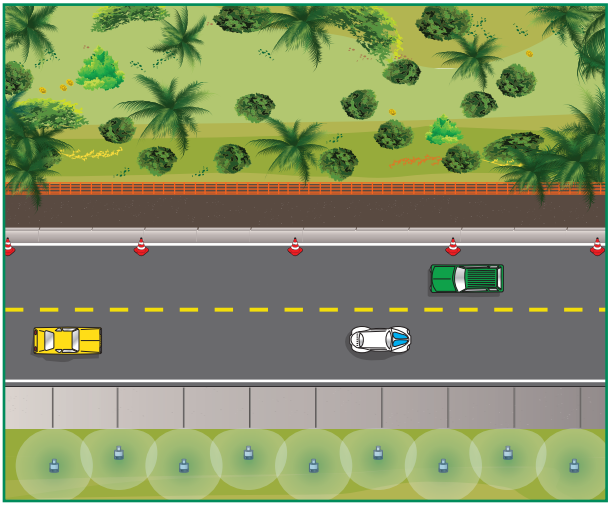


Sprinkler with check valve

11. Incorporate Low Impact Development (LID) storm water design methods, including rain gardens, infiltration beds, swales, and basins, that allow water to collect and soak into the ground on site.



12. Preserve existing native trees and non-invasive vegetation where feasible during development and do not install irrigation in these areas.



13. Incorporate compost into soils at planting. Compost is decomposed organic matter (material derived from plants and animals) that can be used as fertilizer or soil amendment. Use of compost conserves water by improving water absorption and the water holding capacity of the soil. When added to sandy soils compost acts as a sponge to help retain water that would otherwise drain down below the reach of plant roots. When added to clay soils, compost makes the soil more porous, making it drain more efficiently. Using compost also reduces green waste going into our landfills.

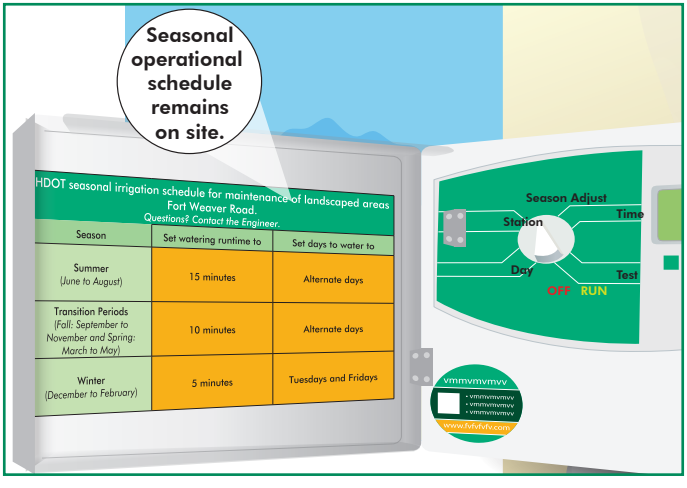
14. Xeriscaping refers to landscaping in a way that reduces or minimizes the use of supplemental water from irrigation. In other words, xeriscaping is the practice of using drought tolerant or "less thirsty" plants for landscaping. Encourage the use of xeriscaping practices to include native and non-invasive ornamental plants that are naturally occuring at the site and surrounding region. You can also use drought ornamental plants that are not invasive.

15. Encourage the use of recycled non-potable water for irrigation.

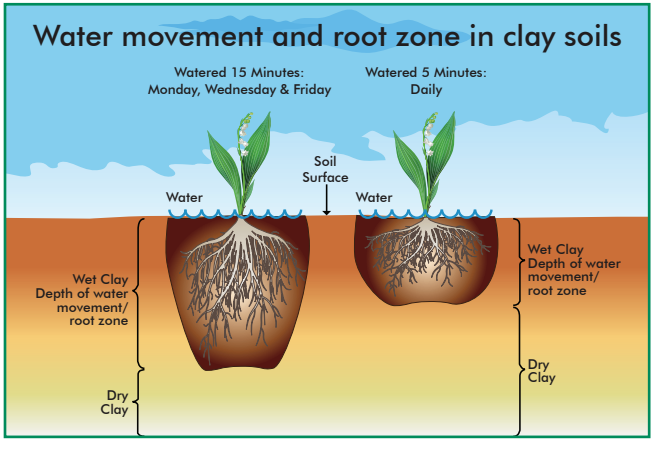
16. Use a qualified irrigation designer and installation contractor. such as those certified by the Irrigation Association.

Best Management Practices for Irrigation Operation and Maintenance

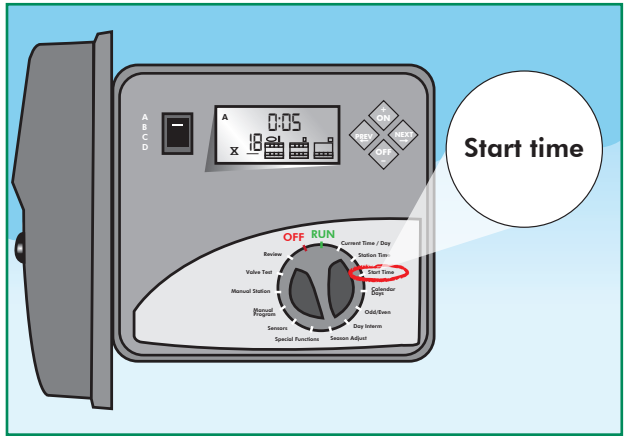
17. If not using a climate-based controller, manually manage controller run times and days to water according to soil conditions and seasonal weather conditions. Adjust runtimes at a minimum of three times a year: summer (dry season), winter (rainy season), and transition periods (fall and spring).



18. Program irrigation controller to encourage deep watering by using longer, less frequent watering times to improve rooting and increase drought resistance. Avoid short daily watering, except for sandy soils.



19. Sun and wind increase soil water evaporation. To reduce the amount of water evaporating from the soil surface, schedule night or early morning (5 p.m. to 9 a.m.) start times for established plantings. In areas where ponding or runoff occurs, set 2-3 short run time cycles.



20. Mulch helps retain soil moisture. Mulch with wood chips around base of trees and shrub beds and refresh as necessary to maintain a minimum of two inches. Do not allow mulch to contact base of trunk.