

## **Landscape Irrigation Equipment Part 1: Sprinklers & Spray Heads**

Sprinklers and spray heads are common fixtures in today's landscapes. We give them very little notice since we have seen so many of them. However, most of us do not know which one is a sprinkler, which one is a spray head, the difference between them, and why that difference is important in a landscape irrigation system.

### **Impact Sprinkler**

The typical yard sprinkler is the most common example of irrigation equipment. It is commonly said to have been developed by a citrus grower in Florida in 1932. Impact sprinklers are made of brass or plastic and come in many different sizes.



Figure 1. An impact sprinkler.  
(Courtesy Rainbird Corporation)

As the name implies, the impact sprinkler operates using an impact motion. First, the curved arm of the sprinkler moves into the water stream exiting the sprinkler nozzle. The force of the water stream then pushes against the curved sprinkler arm, forcing it away from the stream. The arm rapidly moves away from the stream, but is slowed and eventually stopped by a large spring attached to the arm. The large spring then forces the arm back toward and into the stream of water. The “impact” of the arm hitting the sprinkler frame as it is forced back into

the stream of water moves the sprinkler slightly to one side. The process then repeats itself, providing the sprinkler rotation and the familiar “chk-chk-chk” sound common to impact sprinklers.

The first impact sprinklers were of the “stand-up” variety – that is, they were permanently attached to standing pipes or risers in the area to be irrigated. Impact sprinklers are still used on risers today in many different applications, including vegetable gardens, frost protection systems for orchards and small fruits, and large landscape beds.

Mowing around permanent sprinklers in the landscape was quite a chore. Grass had to be manually trimmed near the sprinklers and occasionally one of the sprinklers was the victim of an inattentive worker on a mower. The “pop-up” sprinkler was developed to alleviate this problem. Sprinkler manufacturers made cast iron or plastic cases for the sprinklers which could be placed directly into the lawn. Each case had a 4 to 6 inch diameter lid to cover the opening and a spring-loaded extending sleeve inside. When water pressure was applied the sprinkler would extend approximately 4 inches above the landscape and irrigate the area. When the water pressure was removed the spring would pull the sleeve down, lowering the sprinkler.

The pop-up impact sprinkler provided a convenient, inconspicuous way to irrigate lawns. Mowers could mow over the sprinklers when they were retracted, eliminating a considerable amount of trimming in the landscape. Pop-up impact sprinklers are still used in many areas today, especially in larger versions for golf courses and sports fields.



Figure 2. A Pop-up impact sprinkler.  
(Courtesy Rainbird Corporation)

The pop-up impact sprinkler had two drawbacks. First, a certain brand of high-vacuum mower would pull up quite forcefully on the sprinkler lid when it passed over a retracted sprinkler. Occasionally one of the sprinklers would be drawn up and chopped off due to the intense suction of this mower. This was not a regular occurrence, but did happen often enough to irritate the homeowner. Secondly, in some landscapes sand and dirt would wash into the casing during irrigation, eventually lodging in the pop-up sleeve area and causing the sprinkler to remain extended when the water pressure was turned off. Some turf grasses would also grow into the casing, causing problems with sprinkler retraction.

### **Rotor & Gear-Drive Sprinklers**

Irrigation equipment manufacturers saw the need for a different sprinkler design to overcome the pop-up impact sprinkler problems. Some sprinkler design had to be found that did not have the large, open cavity of the pop-up impact during irrigation. The answer was a sprinkler with an internal drive mechanism.

Rotor and gear-drive sprinklers are quite similar in appearance and operation. The two designs do have different internal drive mechanisms, but both operate based on a flow of water moving past some internal component.



Figure 3. Gear-drive sprinklers.  
(Courtesy Nelson Turf)

When pressure is applied to the sprinkler, a single, one inch diameter shaft extends 4 inches above the sprinkler body. A portion of this shaft rotates, driven by the internal drive mechanism below. There is a wiper seal around the shaft to prevent dirt and soil entry into the sprinkler and thus eliminate many of the pop-up impact sprinkler problems.



Figure 4. A gear-drive or rotor sprinkler in operation.  
(Photo credit: Bryan Smith)

There is an additional benefit to this design. The one inch diameter shaft has such a small top that it is almost impossible to see in the landscape when the sprinkler is retracted.

## Stream Rotors

Stream rotors are another type of gear drive or rotor sprinkler. Their diameter of throw is usually somewhat smaller than a standard pop-up impact, gear drive or rotor sprinkler.

“Normal” sprinklers (impact, gear drive, rotor) irrigate with a single stream of water that rotates back and forth. Stream rotors irrigate with multiple streams of water (usually six or more) that rotate over the area irrigated. Many homeowners like stream rotors simply because they like to see the multiple streams of water.



Figure 5. A stream rotor in operation.  
(Courtesy Hunter Industries)

Stream rotors will not replace the larger rotor or gear drive sprinklers because their diameter of throw is smaller. They are well-suited to smaller turf areas where the normal diameter of throw of a standard gear drive or impact sprinkler would be too large. Stream rotors can be used throughout the lawn, but their smaller diameter of throw will mean closer sprinkler spacing, more sprinklers, more trenches and pipes, and a higher installation cost.

## Spray Heads

Spray heads are aptly named since they quite literally spray a pattern of water over an area. There is no moving stream of water; the spray head simply pops up and sprays water, covering the entire area to be irrigated by that spray head at once.

The pattern of irrigation for a spray head is determined by the nozzle selected. Sprinklers only offer a choice of nozzle sizes – pattern or coverage area adjustments are set in the sprinkler body. Since

the spray head does not have moving parts, the spray head nozzle must provide the “full circle” or portion of a circle setting. Spray head nozzles can be purchased in a wide variety of patterns, including full circle, half circle, quarter circle, one-third circle, and a host of others. Larger and smaller nozzles are available in each pattern for different diameters of throw (nozzles with 16, 20, 24, and 30 foot diameters of throw are common). Adjustable arc nozzles are also available, as are “rectangular-pattern” nozzles for areas between a sidewalk and a street.



Figure 6. A one-quarter circle spray head in operation.  
(Courtesy Hunter Industries)

Spray head nozzles can be placed on standing pipes or risers using an adapter if pop-up action is not required. Spray head bodies can be purchased in a number of different pop-up heights (typically from 2 inches up to 12 inches) for different applications. Spray head bodies and nozzles are usually purchased separately due to the wide array of available body sizes and nozzle patterns.

Spray heads are usually placed in shrubbery and ornamental beds. They may also be used in lawn areas that are too small for sprinklers and stream rotors.



Figure 7. Different sizes of spray head pop-up bodies.  
(Courtesy Rainbird Corporation)

***Do not place spray heads and sprinklers on the same irrigation section or “zone!”***

Spray heads apply water at a much faster rate than stream rotors and sprinklers – almost twice as quickly in most cases. Due to this fact spray heads should never be attached to a sprinkler section or “zone.” A spray head added to the end of a sprinkler zone will apply water twice as quickly as the sprinklers, which will in effect flood the area

irrigated by the spray head. If the irrigation timing for that zone is decreased to prevent flooding the spray head area, the sprinkler areas will suffer.

**Summary**

Sprinklers and spray heads are distinctly different types of irrigation equipment. Each should be on a zone or section of irrigation dedicated to that particular type of equipment.

Adapted from the 2007 *South Carolina Master Gardener Training Manual*.

---

Prepared by W. Bryan Smith, Area Extension Agent, Agricultural Engineer, Clemson University. (New 5/08.)

---

This information is supplied with the understanding that no discrimination is intended and no endorsement by the Clemson University Cooperative Extension Service is implied. All recommendations are for South Carolina conditions and may not apply to other areas. Use pesticides only according to the directions on the label. All recommendations for pesticide use are for South Carolina only and were legal at the time of publication, but the status of registration and use patterns are subject to change by action of state and federal regulatory agencies. Follow all directions, precautions and restrictions that are listed.