DIY Sprinkler System Assessment Rental Kit Instructions

Sprinkler System Assessments are an effective tool for maximizing water use efficiency in residential landscapes and can be used to improve the efficiency of existing sprinkler systems (also referred to as irrigation systems). Sprinkler System Assessments consist of three main activities:

1. Site inspection
2. Performance testing
3. Irrigation scheduling

Each activity in itself can result in significant water and cost savings. Together, these activities provide the opportunity to develop a customized irrigation program based on site specific conditions and irrigation system performance.

Step 1: Site Inspection

Over time, even the most efficiently designed irrigation system will begin to break down. In the absence of a regular maintenance program, minor operational and performance problems can continue for months resulting in excessive water use, poor efficiency, and reduced plant quality.

While inspecting your system use the list below to help identify common issues and fixes.

Common Irrigation System Issues		
Issue	**What to Look For**	**What to Fix**
Broken or Damaged Sprinkler Components 	Spewing water Water pooling Water flowing quickly Low pressure Heads that might be trickling	Replace broken head body or nozzle Replace broken or damaged piping below the surface If minor sputtering is caused by debris inside the nozzle - remove and clean the nozzle before replacing
Mixed Sprinkler Head Types Within a Zone 	Different sprinkler head types within the same zone (drip, pop-up spray, and rotor sprinkler heads should all be on separate zones)	Select the most appropriate sprinkler head type for the zone and replace any sprinkler head types that do not match with the selected type
Sunken or Buried Sprinkler Heads	Heads that are not visible when system is off Heads that cannot spray above the surrounding turf	Dig up sprinkler body until you reach the main connection pipe and install appropriate extension/riser between the main pipe and sprinkler body

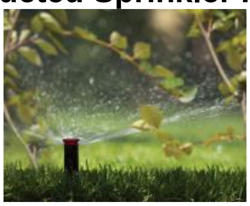
	Water spewing at the ground surface	
Tilted or Misaligned Sprinkler Heads 	Heads are not aligned perpendicular to the ground May be indicated by yellowing areas (hot spots) or overthrow onto pavement	Dig up sprinkler head and align the body upright in the ground – this may require the installation of additional soil for support
Obstructed Sprinkler Heads 	Shrub, tree, and plant limbs, lampposts, electrical boxes, fences, furniture, toys, and mailboxes that might be in the path of sprinkler head's throw	Remove the obstruction if possible or move the head away from the obstruction – turf removal surrounding obstruction might also be an option if sprinkler head is also converted to drip for any additional plantings
Insufficient or Excessive Operating Pressure 	Low water pressure – large water droplets and short sprinkler throw High pressure – excessive misting of water that is easily evaporated or carried by the wind	Check for clogged or dirty sprinkler heads that may be impacting the pressure Replace older heads with models that have built-in pressure regulation Contact a professional sprinkler repair company
Poor and Uneven Sprinkler Head Spacing 	Dry spots that indicate the heads are spaced too far apart	Replace nozzles with heads that will cover the desired area

*Photo Credit: Outdoor Water Assessment Guidebook, Aurora, CO Water, Water Conservation Division.

Step 2: Performance Testing

Sprinkler application devices, including pop-up spray heads, rotors, micro-sprays and bubblers are designed to operate within specific operating pressures and head spacing. Manufacturers' specification catalogs rate the performance - mainly flow rate (in gallons per minute) and precipitation rate (in inches per hour), based on these parameters.

Commonly, the rated performance listed in the catalogs does not accurately represent actual performance. For irrigation scheduling purposes, the most accurate determination of precipitation rate is achieved by conducting catch can tests.

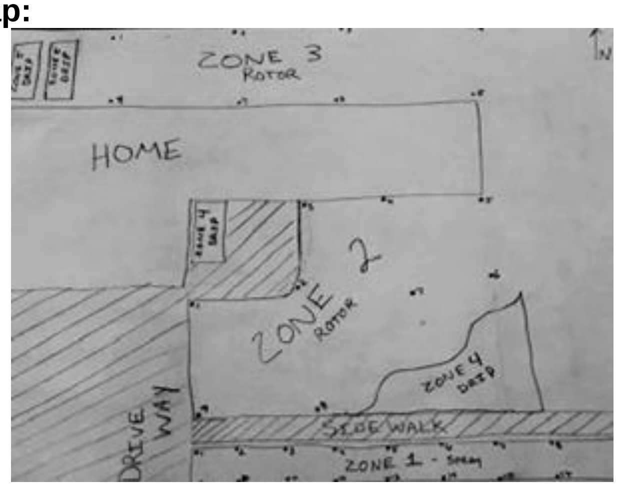
Catch can tests measure the amount of water that actually hits the ground at various points within the landscape. Since irrigation systems commonly use different types and brands of sprinklers, it is important to conduct catch can tests for each individual zone or “station” on an irrigation system.

<u>How to Conduct a Catch Can Test:</u>

1. Turn on the irrigation system, one zone at a time, to locate and mark sprinkler heads (the flags in the rental kit can be used to mark the zones).

   Note: It is helpful to draw a map of sprinkler head locations, sprinkler head type, and identify each zone. <u>Appendix A</u> includes the Site Map Form.

   Example Site Map:



2. Starting with zone 1, layout catch devices only on the part of the landscape covered by zone 1. Catch devices should be placed in a grid-like pattern throughout the zone to achieve an accurate representation of sprinkler performance.

   Note: Try not to place catch devices too close to sprinkler heads to avoid altering spray patterns.

Photo Credit: New Mexico State University

3. Turn on zone 1, allow water to partially fill the catch devices. Keep track of the number of minutes that the zone is operated (e.g. 10 minutes). Make sure enough time is given so that a measurable amount of water has fallen.

4. Using the <u>Appendix B: Catch Can Test Form</u>, measure and record the depth of water in each catch device. Also record how long (in minutes) the zone was operated.

5. Repeat steps 1-4 above for each remaining zone on the system. Be sure to empty the catch devices after testing and recording is completed for each zone.

6. Using the data from catch can testing, you can determine the precipitation rates for each individual zone on the irrigation system. Add up the amounts from each catch can in a given zone and divide by the total number of catch cans used to obtain the average volume. Then calculate the net precipitation.

NOTE: There is a corresponding excel document called the DIY Catch Can Calculator that will calculate all the following equations automatically after you enter the results from the catch can test. The calculator will provide you with the distribution uniformity of each zone as well as the suggested run times. The following instructions describe each calculation and how to do them by hand.

The simple equation for calculating the precipitation rate is:

$$\textbf{Precipitation Rate (in./hour)} = \frac{3.66 \times \text{average catch can volume (mL)}}{\text{Run Time} \times 16}$$

7. Calculate Distribution Uniformity.

Distribution uniformity (DU) is the measure of how uniformly water is applied to plants over an area. It is a major element in determining how efficient an irrigation system is. Most landscape irrigation systems have a DU of around .55 to .75.

DU is determined by using the data you collected from your catch can. This can be done per zone or for the system as a whole.

The simple equation for calculating DU is given below:

$$\textbf{Distribution Uniformity} = \frac{V_{lq}}{V_{avg}}$$

V_{lq} is the average volume of the lowest quarter of the total number of catch cans. If you placed 24 catch cans, the lower quarter would be the lowest 6 volumes from the test. The 6 cans will be selected based on the lowest amounts of water of the total number of catch cans.

V_{avg} is the average catch of all catch cans. So, in the example above, the average of all 24 cans.

If the DU is lower than .40 then you need to spend some time and effort to identify steps that can be taken to improve system efficiency.

Step 3: Irrigation Scheduling

The answer to the question, “when do I irrigate and for how long?” has been based on assumptions and generalizations in regards to sprinkler system performance and plant water requirements. Sprinkler system assessments, or audits, replace many of the assumptions made in irrigation scheduling. With irrigation auditing, we customize our irrigation schedules based upon on catch can results.

Rather than falling back on the longtime recommendation of “fifteen minutes, three times per week” run times can be adjusted for individual zones based on measured precipitation rate. Determining irrigation frequency and duration should be based upon the depth of the plants’ root zone and soil type. Together, root depth and soil type define the amount of water that is available for plant use. A six-inch clay soil, for example, will hold more water than six inches of sandy soil. Thus, the run time duration will be shorter for clay soils, even though the amount of water the plant needs will remain the same.

The first step in determining irrigation run time duration is to first determine how much water that you should apply each irrigation event. Plant water requirements vary significantly in urban landscapes due to the variety of plant species, maintenance practices and microclimates. Water requirements also vary with climate trends and rainfall patterns.

Turfgrass, which is generally assumed to be a high water user, requires 1 to 1.25 inches per week during the hottest part of the summer, with less in the spring and fall. Once it is determined how much water (in inches) is needed per week, the conversion to zone run time can be determined.

The following equation is used to determine zone run times for one week of irrigation:

$$\textbf{Run Time per Week} = \frac{\text{Desired amount of water to apply (in.) x 60}}{\text{Precipitation Rate}}$$

To determine the irrigation interval (the number of days a week to water your lawn), divide the total run time irrigation minutes by the number of days per week.

Example:

Average Precipitation Rate = .59 in/hr

$$\frac{\text{1 in x 60}}{\text{.59 in/hr}} = \text{102 minutes per week}$$

Irrigation Interval: 3 days   Cycle Starts: 2 per day   Minutes per Cycle: 17 minutes

$$\frac{\text{102 minutes per week}}{\text{(3 days x 2 cycles per day)}} = \text{17 minutes per cycle}$$

Appendix A: Site Map

Project Name: ______________________________ **Date:** ____________________

Address: ____

Appendix B: Catch Can Form

		Zone								
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Catch Can Number	**#1**									
	#2									
	#3									
	#4									
	#5									
	#6									
	#7									
	#8									
	#9									
	#10									
	#11									
	#12									
	#13									
	#14									
	#15									
	#16									
	#17									
	#18									
	#19									
	#20									
	#21									
	#22									
	#23									
	#24									
Average Catch Can Volume										
Zone Run Time										
Precipitation Rate (in/hr)										
Run Time Per Week										
Run Time Per Cycle										

Appendix C: Formulas

$$\textbf{Precipitation Rate (in./hour)} = \frac{3.66 \times \text{average catch can volume (mL)}}{\text{Run Time} \times 16}$$

$$\textbf{Distribution Uniformity} = \frac{V_{lq}}{V_{avg}}$$

V_{lq} is the average catch of the lowest quarter of the total number of catch cans. If you placed 28 catch cans, the lower quarter would be from 7 of those cans. The 7 cans will be selected based on the lowest amounts of water of the total number of catch cans.

V_{avg} is the average catch of all catch cans. So, in the example above, the average of all 28 cans.

$$\textbf{Run Time per Week} = \frac{\text{Desired amount of water to apply (in.)} \times 60}{\text{Precipitation Rate}}$$

Turfgrass, which is generally assumed to be the highest water user, requires up to 1-inch per week during the summer with less in the spring and fall.

$$\textbf{Minutes per Cycle} = \frac{\text{Desired amount of water to apply per week}}{(3 \text{ days} \times 2 \text{ cycles per day})}$$