



**2639 Spruce St.  
Boulder, CO 80302  
303-999-3820**

**PRESENTS:**

**Highlands Ranch Golf Club  
Highlands Ranch, CO 80129**

An irrigation inspection was performed by Derek Sakamoto and Ailish Cullen through the Center for ReSource Conservation's Slow the Flow Colorado Irrigation Inspection Program. The Center for ReSource Conservation (CRC) is a non-profit organization that empowers our community to conserve natural resources. Centennial Water and Sanitation District has partnered with the CRC to offer this service to their customers in an effort to maximize irrigation system efficiency and reduce water waste.

**Purpose**

The purpose of this irrigation inspection is to evaluate and report irrigation system efficiency, identify and list repair items, formulate a site-specific watering schedule, and develop a general improvements list. Recommendations are based on data collections from: soil samples, water pressure tests, catch cup tests, and visual site inspections. From this data, a recommended watering schedule for the zone(s) evaluated can be determined and may be implemented during a non-restrictive year.

**Procedure:**

Upon arrival at Highlands Ranch Golf Club, we briefly met Diane Ball, who is the property manger responsible for the property.

A visual inspection of all sprinkler heads within 100 of the 248 zones was performed under operation to 1) identify head type such as rotor, fixed, or drip; 2) list damaged, misaligned, and/or other malfunctioning sprinkler heads; 3) look for signs of leaking heads or pipes 4) inspect the control clock(s); 5) measure and record water pressure; and 6) note any other issues that negatively impact the efficiency of the system.

Catch cup tests were performed on representative zones to determine the distribution uniformity and precipitation rate of the respective areas. *Distribution uniformity (DU)* is a measurement of how evenly water is applied to the area being watered, expressed as a percentage. *Precipitation rate (PR)* is the amount of water emitted from an irrigation system and is measured in inches of water per hour. DU and PR directly influence the amount of water required to keep the landscape green.

A soil sample was collected to determine soil type and root depth, and was used, along with the precipitation rate to create a watering schedule.

## **Site Description**

The Highlands Ranch Golf Club Home Owners Association irrigates roughly 300,000 square feet of landscape. These landscaped areas line neighborhood streets and entrances into the neighborhood. There were both turf and non-turf areas that made up the landscape. The turf areas were primarily long, thin strips of turf. The non-turf areas were flowerbeds by the neighborhood entrances. Inside the neighborhood, the non-turf areas were evergreen trees, junipers, and occasionally native landscape. Ten Irritrol control clocks (MC series) control the 248 zones that irrigate the landscape. The general watering schedule for turf areas was 4 days per week, 2 cycles, approximately 10 minutes per zone for sprays and approximately 20 minutes per zone for rotor zones. The general watering schedule for non-turf areas was every day, a few minutes per zone, once in the morning and once in the evening.

## **Issues Needing Immediate Attention**

There seem to be several leaks in the lateral pipes. The most notable locations are the two turf areas on both sides of the main entrance on the north side of Town Center Drive and Creekside Lane. More detailed information can be found in the zone-by-zone inspection.

## **General Findings**

This portion of the report provides a general overview of all areas inspected. A specific zone by zone report will be detailed further down.

	<i>Precipitation Rate (inches/ hour)</i>	<i>Root Depth (inches)</i>	<i>Distribution Uniformity (%)</i>
Range	0.7-2.6	1-6	53-87
Average	1.6	3	70

It is recommended that the irrigation system be corrected to perform at a minimum 70% distribution uniformity for all zones. To avoid encouraging over-watering, irrigation schedules were not supplied for any zones with a distribution uniformity of less than 40%.

	Rotor Pressure (PSI)	Spray Pressure (PSI)
Range	38-96	45-80
Average	67	58

Depending on the brand and model, the designed pressure for rotor heads ranges from roughly 40 PSI to 80+ PSI. The designed pressure for fixed spray heads ranges from 20 to 30 PSI.

### **Incorrect Pressure**

The pressure is too high on some of the zones causing them to mist. It is inefficient when heads are emitting mist because the water can easily be blown away or evaporated. As a result, the zone has to water for a longer period of time because a large portion of the water emitted does not actually reach the turf. Moreover, when heads are consistently under too high of pressure, it will cause them to wear out prematurely. *Pressure reducers should be installed on zones with too high of pressure.*

### **Misaligned, Clogged, Blocked, Sunken and Tilted Heads**

Many of the heads were misaligned, clogged, blocked, sunken and/or tilted. Over time heads tend to sink and tilt due to the natural settling of the earth, as well as wear and tear from foot traffic and lawn maintenance. These heads, though still operational, are either not spraying water onto the turf or are spraying in an undesirable pattern. These seemingly minor issues have the potential to greatly reduce the efficiency of the system. In many cases, it results in a huge alteration of the spray pattern for that sprinkler head and can result in brown spots, misting, and wasted water. These problems are relatively inexpensive and easy to fix and once it is addressed, can increase the system's efficiency dramatically. *Raise and level all heads to grade and unclog or unblock affected heads. At the time that the grass is at its tallest, the grass should not deflect or interfere with the spray from the heads.*

### **Mixed Zones**

Design specifications for sprinkler heads are specific to the brand, type and model. Therefore, different brands and models of heads should not be placed on the same zone as one another because it will create inefficient watering.

Some zones had both fixed spray heads as well as rotor heads located on the same zone. Fixed spray heads are designed to emit an average of 50% more water than rotor heads. Since watering times can only be controlled zone by zone and not by individual heads, the areas being watered by sprays will be receiving an average of 50% more water than the areas being watered by rotors. Moreover, the optimal operating pressure levels for sprays versus rotors are very different. Fixed spray heads are designed to operate best between 20 and 30 PSI, while rotors are designed to operate best between 40 and 80+ PSI. Therefore, if the time and pressure is correct for one type of head, it will inherently be wrong for the other type of head. For the above reasons, sprays and rotors should never be located on the same zone. A direct result of this type of design is turf that has spots of overly wet and/or overly dry areas. *Make all heads within a zone as uniform as possible. If a head needs to be replaced, try to replace it with the same heads that are on the rest of the zone.*

### **Inefficient Design of Drip Irrigation**

As noted above, it is important to keep heads within a zone as uniform as possible. Oftentimes, a spray zone or rotor zone will be retrofitted to include drip. In such instances, the entire zone should be converted to drip irrigation. Drip irrigation has a much lower precipitation rate than sprays or rotors and is typically measured in

gallons/hour, vs. the inches/minute that sprays and rotors are measured in. Drip irrigation also has much lower operating requirements than sprays or rotors. Lastly, drip is generally used to water non-turf areas, which most likely necessitates a different watering schedule, including frequency and duration. *The zones containing both rotors/sprays and drip should be broken up so that each zone would contain either all drip or all rotors/sprays.*

### **Poor Spacing**

Many of the zones had heads that were spaced too far apart to be able to get adequate head to head coverage, thus creating brown spots. Head to head coverage is when the spray from one head reaches the heads next to it and visa versa. *Head spacing and or throw radius should be adjusted to achieve head to head coverage.*

### **Overspray**

Some of the heads on the property were over-spraying onto sidewalks and other hardscapes. To avoid overspray, heads should be placed several inches away from the edge of the landscape. To reduce the throw radius of a sprinkler head up to 20%, the radius adjustment screw should be utilized. If the radius needs to be reduced more than 20%, a nozzle with a shorter throw radius should be installed.

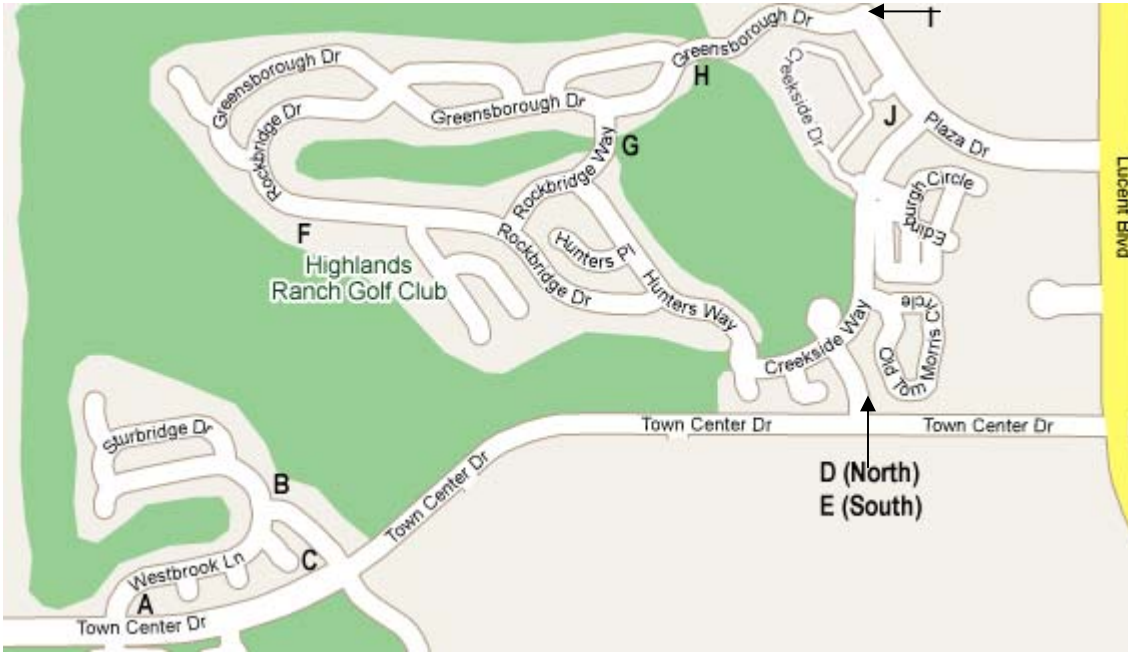
### **Incorrect Spray Patterns**

Many of the heads had incorrect arcs. When the arc is too wide it can lead to overspray onto undesired areas. Conversely, when the arc is too narrow it can lead to dry spots and poor coverage. With a few minor adjustments to the sprinkler heads, this problem can be easily remedied. *For hard to cover areas that are watered with spray heads, we recommend using a Variable Arc Nozzle (VAN) that allows a custom arc to be set.*

### **Check Valves**

After the system was turned off, water continued to run out of lower elevation heads. This was because the water left in the system was draining. It is possible to prevent this by installing heads that have check valves. Not only will this eliminate the loss of water from the system after it has been turned off, but it will also prevent excess wear and tear on the system's pipes. *Check valves can typically be retrofitted onto most head types.*

A zone by zone visual inspection was performed for the first 100 zones of the property. The following problems were encountered:



**Clock A (Irritrol MC-42 Plus)**

Northeast corner of Town Center Drive and Westbrook Lane

**Program 1**

Days: Monday, Thursday, and Saturday

Start times: 12:00AM and 3:45AM

<u>Zone:</u>	1	2	3	4	5	6	7	8	9	10	11
Type:	R	R	S	R	S	S	S	S	S	S	R
Time:	20	18	7	18	7	7			7		18

<u>Zone:</u>	12	13	14	15	16	17	18	19	20	21	22
Type:	S	S	S	S	S	S	S	R	S	R	?
Time:	7	7			7		7	18		17	

<u>Zone:</u>	23	24	25	26	27	28	29	30	31	32	33
Type:											
Time:	16	7		18							

<u>Zone:</u>	34	35	36	37	38	39	40	41	42
Type:									
Time:									

**Program 2**

Days: Sunday, Tuesday, and Friday

Start times: 12:00AM and 3:30AM

<u>Zone:</u>	1	2	3	4	5	6	7	8	9	10	11
Type:	R	R	S	R	S	S	S	S	S	S	R
Time:											

<u>Zone:</u>	12	13	14	15	16	17	18	19	20	21	22
Type:	S	S	S	S	S	S	S	R	S	R	?
Time:											

<u>Zone:</u>	23	24	25	26	27	28	29	30	31	32	33
Type:											
Time:			4	15	12	3		12	14	22	7

<u>Zone:</u>	34	35	36	37	38	39	40	41	42
Type:									
Time:	20	18	18	8	7	8	8		8

**Program 3**

Days: Sunday, Monday, Wednesday, Thursday, and Saturday

Start times: 7:00AM and 6:00PM

<u>Zone:</u>	1	2	3	4	5	6	7	8	9	10	11
Type:	R	R	S	R	S	S	S	S	S	S	R
Time:							3	3		6	

<u>Zone:</u>	12	13	14	15	16	17	18	19	20	21	22
Type:	S	S	S	S	S	S	S	R	S	R	?
Time:			6	5		3			3		

<u>Zone:</u>	23	24	25	26	27	28	29	30	31	32	33
Type:											
Time:							3				

<u>Zone:</u>	34	35	36	37	38	39	40	41	42
Type:									
Time:								3	

**Zone 1 (Hunter I-25 Rotors):**

Uneven/Poor Spacing and Design  
Trees are blocking spray from heads  
Adjust heads so that the fence is not sprayed

**Zone 2 (Hunter I-25 Rotors):**

Mixed Area  
Uneven/Poor Spacing and Design  
Sunken and tilted heads  
Trees and meter box are blocking spray from heads  
Overspray

**Zone 3 (Rain Bird 1800-SAM-PRS Sprays):**

Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Overspray (seems like intending to water sidewalk, change nozzles appropriately)

**Zone 4 (Hunter I-25 Rotors):**

Mixed Area  
Uneven/Poor Spacing and Design  
Sunken and tilted heads  
Trees are blocking spray from heads  
Overspray

**Zone 5 (Rain Bird 1800-SAM-PRS Sprays):**

Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads (especially west corner head)  
Trees are blocking spray from heads  
Overspray

**Zone 6 (Rain Bird 1800-SAM-PRS Sprays):**

Misting  
Sunken and tilted heads  
Overspray

**Zone 7 (Rain Bird 1800 Sprays):**

Non-turf area  
Misting  
Plants blocking spray from heads

**Zone 8 (Rain Bird 1800 Sprays):**

Non-turf area  
Misting  
Plants blocking spray from heads

**Zone 9 (Rain Bird 1800-SAM-PRS Sprays):**

Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Clogged nozzles  
Inappropriate nozzle types  
Plants blocking spray from heads  
Overspray

**Zone 10 (Rain Bird 1800 and Rain Bird 1800-SAM-PRS Sprays):**

Watering turf and non-turf area on same zone  
Mixed Area  
Uneven/Poor Spacing and Design  
Sunken and tilted heads  
Overspray

**Zone 11 (Hunter I-20 Rotors):**

Northwest head is broken  
Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Arc adjustment needed  
Plants blocking spray from heads  
Overspray

**Zone 12:**

Cannot find/Did not turn on

**Zone 13:**

Cannot find/Did not turn on

**Zone 14:**

Cannot find/Did not turn on

**Zone 15:**

Cannot find/Did not turn on

**Zone 16:**

Cannot find/Did not turn on

**Zone 17 (Rain Bird 1800-SAM-PRS Sprays):**

Non-turf area  
Uneven/Poor Spacing and Design  
Misting  
Different heads had risers of different heights  
Plants blocking spray from heads

**Zone 18 (Rain Bird 1800-SAM-PRS Sprays):**

Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Plants and control box blocking spray from heads

**Zone 19 (Hunter I-25 Rotors):**

Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Arc adjustment needed  
Trees blocking spray from heads

**Zone 20 (Rain Bird 1800-SAM-PRS Sprays):**

Non-turf Area  
Uneven/Poor Spacing and Design  
Misting  
Different heads had risers of different heights  
Plants blocking spray from heads  
Overspray

**Zone 21 (Hunter I-25 Rotors):**

Misting  
Sunken and tilted heads  
Overspray onto fence

**Clock B (Irritrol MC-24 Plus)**

East corner of Aspen Creek Drive and Westbrook Lane

**Program 1**

Days: Sunday, Tuesday, Thursday, and Friday

Start times: 12:00AM and 4:30AM

Zone: 1 2 3 4 5 6 7 8 9 10 11

Type:

Time: 8 8 8 8 8 8 8 18 18 8

Zone: 12 13 14 15 16 17 18 19 20 21 22

Type:

Time: 8 8 18 8 8 8 18 8 18

**Program 2**

Days: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday

Start times: 9:48AM and 6:45PM

Zone: 1 2 3 4 5 6 7 8 9 10 11

Type:

Time: 5

Zone: 12 13 14 15 16 17 18 19 20 21 22

Type:

Time: 8 8

**This clock was not part of the visual inspection.**

**Clock C (Irritrol MC-36 Plus)**

Northwest corner of Town Center Drive and Aspen Creek Drive

**Program 1**

Days: Sunday, Tuesday, Thursday, and Friday

Start times: 12:00AM and 4:40AM

<u>Zone:</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
Type:	S	R	R	R	R	R	S	R	R	?	S
Time:	7	18	18	18	18	18	8	18	18		

<u>Zone:</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>20</u>	<u>21</u>	<u>22</u>
Type:	S	S	S	S	S	S	S	S	S	S	S
Time:			8	8				8	8	8	

<u>Zone:</u>	<u>23</u>	<u>24</u>	<u>25</u>	<u>26</u>	<u>27</u>	<u>28</u>
Type:	?	R	S	S	S	S
Time:	18	18	8	8	8	8

**Program 2**

Days: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday

Start times: 9:00AM and 6:00PM

<u>Zone:</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
Type:	S	R	R	R	R	R	S	R	R	?	S
Time:											4

<u>Zone:</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>20</u>	<u>21</u>	<u>22</u>
Type:	S	S	S	S	S	S	S	S	S	S	S
Time:	10	4			5	5	10				10

<u>Zone:</u>	<u>23</u>	<u>24</u>	<u>25</u>	<u>26</u>	<u>27</u>	<u>28</u>
Type:	?	R	S	S	S	S
Time:						

**Program 4**

Days: Tuesday, Wednesday, Thursday, Friday, and Saturday

Start times: None programmed.

<u>Zone:</u>	1	2	3	4	5	6	7	8	9	10	11
Type:	S	R	R	R	R	R	S	R	R	?	S
Time:			20	20				15	10		

<u>Zone:</u>	12	13	14	15	16	17	18	19	20	21	22
Type:	S	S	S	S	S	S	S	S	S	S	S
Time:									8	10	

<u>Zone:</u>	23	24	25	26	27	28
Type:	?	R	S	S	S	S
Time:				7	10	5

**Zone 1 (Rain Bird 1800-SAM-PRS Sprays):**

- Mixed Area
- Uneven/Poor Spacing and Design
- Misting
- Sunken and tilted heads
- Plants blocking spray from heads
- Overspray

**Zone 2 (Hunter I-25 Rotors):**

- Mixed Area
- Uneven/Poor Spacing and Design
- Sunken and tilted heads
- Arc adjustment needed
- Overspray

**Zone 3 (Hunter I-25 Rotors):**

- Uneven/Poor Spacing and Design
- Misting
- Sunken and tilted heads

**Zone 4 (Hunter I-25 Rotors):**

- Uneven/Poor Spacing and Design
- Misting
- Plants blocking spray from north head
- Unmatched heads

**Zone 5 (Hunter I-25 Rotors):**

Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Plants blocking spray from south head

**Zone 6 (Hunter I-25 Rotors):**

Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Arc adjustment needed  
Overspray

**Zone 7 (Rain Bird 1800-SAM-PRS Sprays):**

Big leak by 2<sup>nd</sup> north head  
Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads

**Zone 8 (Hunter I-25 Rotors):**

Mixed Area  
Uneven/Poor Spacing and Design  
Sunken and tilted heads  
Arc adjustment needed  
Overspray

**Zone 9 (Hunter I-25 Rotors):**

Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads

**Zone 10:**

Cannot find/Did not turn on

**Zone 11 (Rain Bird 1800-SAM-PRS Sprays):**

Non-turf Area  
2<sup>nd</sup> south head broken  
Misting  
Inappropriate nozzles, different arc  
Plants blocking spray from heads

**Zone 12 (Rain Bird 1800-SAM-PRS Sprays):**

Non-turf Area  
Uneven/Poor Spacing and Design  
Misting  
Plants blocking spray from heads  
Overspray

**Zone 13 (Rain Bird 1800-SAM-PRS Sprays):**

Non-turf Area  
Uneven/Poor Spacing and Design  
Misting  
Plants blocking spray from heads  
Overspray

**Zone 14 (Rain Bird 1800-SAM-PRS Sprays):**

Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Overspray

**Zone 15 (Rain Bird 1800-SAM-PRS Sprays):**

Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Clogged nozzles  
Overspray

**Zone 16 (Rain Bird 1800-SAM-PRS Sprays):**

Leak by northeast head  
Misting  
Sunken and tilted heads  
Plants blocking spray from heads  
Watering turf and non-turf areas on the same zone

**Zone 17 (Rain Bird 1800-SAM-PRS Sprays):**

Mainly non-turf area  
Uneven/Poor Spacing and Design  
Misting  
Plants blocking spray from heads  
Watering turf and non-turf areas on the same zone

**Zone 18 (Rain Bird 1800-SAM-PRS Sprays):**

Non-turf area  
Uneven/Poor Spacing and Design  
Misting  
Plants blocking spray from heads

**Zone 19 (Rain Bird 1800-SAM-PRS Sprays):**

Watering very little turf  
Uneven/Poor Spacing and Design  
Sunken and tilted heads  
Clogged nozzles

**Zone 20 (Rain Bird 1800-SAM-PRS Sprays):**

Misting  
Sunken and tilted heads  
Clogged nozzles  
Inappropriate nozzles, arc  
Overspray

**Zone 21 (Rain Bird 1800-SAM-PRS Sprays):**

Misting  
Sunken and tilted heads  
Overspray

**Zone 22 (Rain Bird 1800-SAM-PRS Sprays):**

2 west heads are broken  
Misting  
Plants blocking spray from heads

**Zone 23:**

Cannot find/Does not turn on

**Zone 24 (Hunter I-20 Rotors):**

Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Diffusion screw tightened too tight

**Zone 25 (Rain Bird 1800-SAM-PRS Sprays):**

Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Trees blocking spray from heads  
Watering very little turf

**Zone 26 (Rain Bird 1800-SAM-PRS Sprays):**

2<sup>nd</sup> north head is broken  
Uneven/Poor Spacing and Design with other zones  
Misting  
Sunken and tilted heads  
Trees blocking spray from heads

**Zone 27 (Rain Bird 1800-SAM-PRS Sprays):**

Uneven/Poor Spacing and Design with other zones  
Misting  
Sunken and tilted heads  
Trees blocking spray from heads  
Overspray

**Zone 28 (Rain Bird 1800-SAM-PRS Sprays):**

Uneven/Poor Spacing and Design with other zones  
Misting  
Sunken and tilted heads  
Overspray

**Clock D (Irritrol MC-36 Plus)**

North Clock on west-side of Creekside Lane between Creekside Way and Town Center Drive

**Program 1**

Days: Sunday, Tuesday, Thursday, and Friday  
Start times: 12:00AM and 4:15AM

Zone:	1	2	3	4	5	6	7	8	9	10	11
Type:	S	S	R	S	S	S	S	R	S	S	S
Time:		8	18	8	8		8	18	8		8

Zone:	12	13	14	15	16	17	18	19	20	21	22
Type:	S	S	S	S	S	S	R	S	S		
Time:	8		8	12			20		8	8	8

Zone:	23	24	25	26	27	28	29
Type:							
Time:	10	4	20	20	8	8	20

**Program 2**

Days: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday  
Start times: 9:00AM and 8:00PM

Zone:	1	2	3	4	5	6	7	8	9	10	11
Type:	S	S	R	S	S	S	S	R	S	S	S
Time:	3					3				3	

Zone:	12	13	14	15	16	17	18	19	20	21	22
Type:	S	S	S	S	S	S	R	S	S		
Time:		3				10					

Zone:	23	24	25	26	27	28	29
Type:							
Time:							

**Program 3**

Days: Tuesday and Saturday  
Start times: 9:30AM

Zone:	1	2	3	4	5	6	7	8	9	10	11
Type:	S	S	R	S	S	S	S	R	S	S	S
Time:											

Zone:	12	13	14	15	16	17	18	19	20	21	22
Type:	S	S	S	S	S	S	R	S	S		
Time:					15						

Zone:	23	24	25	26	27	28	29
Type:							
Time:							

**Zone 1 (Rain Bird 1800-SAM-PRS Sprays):**

- Non-turf area
- East head broken
- Misting
- Clogged nozzles
- Plants blocking spray from heads

**Zone 2 (Rain Bird 1800-SAM-PRS Sprays):**

- Mixed Area
- Uneven/Poor Spacing and Design
- Misting
- Sunken and tilted heads
- Clogged nozzles
- Overspray

**Zone 3 (Hunter I-20 Rotors):**

Leak east of sidewalk  
Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Overspray (Watering sidewalk)

**Zone 4 (Rain Bird 1800-SAM-PRS Sprays):**

Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Clogged nozzles  
Inappropriate nozzles  
Overspray

**Zone 5 (Rain Bird 1800-SAM-PRS Sprays):**

Misting  
Sunken and tilted heads  
Inappropriate nozzles  
Plants blocking spray from heads  
Overspray (Watering sidewalk)

**Zone 6 (Rain Bird 1800-SAM-PRS Sprays):**

Non-turf area  
Uneven/Poor Spacing and Design  
Misting  
Plants blocking spray from heads

**Zone 7 (Rain Bird 1800-SAM-PRS Sprays):**

Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads

**Zone 8 (Hunter I-20 Rotors):**

South head is broken  
Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Diffusion screw tightened too tight  
Plants blocking spray from heads  
Overspray

**Zone 9 (Rain Bird 1800-SAM-PRS Sprays):**

Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Clogged nozzles  
Trees blocking spray from heads  
Overspray

**Zone 10 (Rain Bird 1800-SAM-PRS Sprays):**

Non-turf Area  
Uneven/Poor Spacing and Design  
Misting  
Plants blocking spray from heads

**Zone 11 (Rain Bird 1800-SAM-PRS Sprays):**

Leak at 2<sup>nd</sup> west head  
Uneven/Poor Spacing and Design across north-south plane  
Misting  
Sunken and tilted heads  
Trees blocking spray from heads  
Overspray

**Zone 12 (Rain Bird 1800-SAM-PRS Sprays):**

Sunken and tilted heads  
Clogged nozzles  
Inappropriate nozzles on west heads  
Trees blocking spray from heads  
Overspray

**Zone 13 (Rain Bird 1800-SAM-PRS Sprays):**

Non-turf area  
2<sup>nd</sup> east head broken  
Misting  
Plants blocking spray from heads

**Zone 14 (Rain Bird 1800-SAM-PRS Sprays):**

Northwest head broken  
Misting  
Sunken and tilted heads  
Inappropriate nozzles, radius  
Overspray  
Watering piece of turf that seems to serve little purpose

**Zone 15 (Rain Bird 1800-SAM-PRS Sprays):**

North head south of sidewalk broken

Mixed Area

Uneven/Poor Spacing and Design

Misting

Sunken and tilted heads

Plants blocking spray from heads

Overspray, causing lots of damage

Watering very little turf on north hill

**Zone 16 (Bubbler/Drip?):**

Confusing zone that is mainly watering weeds and evergreen trees

**Zone 17 (Rain Bird 1800-SAM-PRS Sprays):**

Multiple broken heads and leaks

Uneven/Poor Spacing and Design

Misting

Overspray (Watering mail kiosk)

**Zone 18 (Hunter I-20 Rotors):**

Mixed Area

Uneven/Poor Spacing and Design

Misting

Sunken and tilted heads

**Zone 19 (Rain Bird 1800-SAM-PRS Sprays):**

Southeast head has broken nozzle

\*Good Spacing \*

Misting

Sunken and tilted heads

Overspray

**Zone 20 (Rain Bird 1800-SAM-PRS Sprays):**

Possible leak by southeast head

Misting

Sunken and tilted heads

Overspray

**Clock E (Irritrol MC-36 Plus)**

South Clock on west side of Creekside Lane between Creekside Way and Town Center Drive

**Program 1**

Days: Sunday, Tuesday, Thursday, and Friday

Start times: 12:00AM and 3:30AM

<u>Zone:</u>	1	2	3	4	5	6	7	8	9	10	11
Type:	S	S	S	R	R	S	S	S	S	S	R
Time:	10			15	7	10	10	10	10	15	

<u>Zone:</u>	12	13	14	15	16	17	18	19	20	21	22
Type:	S	S	S	R	S	S	S	R	R	S	
Time:	10			15	10		10	17	18	10	

<u>Zone:</u>	23	24	25	26
Type:				
Time:	15	10	3	

**Program 2**

Days: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday

Start times: 8:00PM and 8:30AM

<u>Zone:</u>	1	2	3	4	5	6	7	8	9	10	11
Type:	S	S	S	R	R	S	S	S	S	S	R
Time:		8	8							8	

<u>Zone:</u>	12	13	14	15	16	17	18	19	20	21	22
Type:	S	S	S	R	S	S	S	R	R	S	
Time:			8								

<u>Zone:</u>	23	24	25	26
Type:				
Time:				8

**Zone 1 (Rain Bird 1800-SAM-PRS Sprays):**

- Multiple broken nozzles
- Uneven/Poor Spacing and Design
- Misting
- Sunken and tilted heads
- Overspray

**Zone 2 (Rain Bird 1800-SAM-PRS Sprays):**

Misting  
Sunken and tilted heads  
Clogged nozzles  
Inappropriate nozzles on west side  
Overspray

**Zone 3 (Rain Bird 1800-SAM-PRS Sprays):**

Non-turf area  
Misting  
Inappropriate nozzles/Arc adjustment needed  
Plants blocking spray from heads  
Overspray

**Zone 4 (Hunter I-25 Rotors):**

Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Trees blocking spray from heads  
Overspray (Watering sidewalk)

**Zone 5 (Hunter I-25 Rotors):**

Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Diffusion screw tightened too tight  
Arc adjustment needed  
Trees blocking spray from heads  
Overspray (Watering sidewalk)

**Zone 6 (Rain Bird 1800-SAM-PRS Sprays):**

Misting  
Sunken and tilted heads  
Clogged nozzles  
Inappropriate nozzles (arc)

**Zone 7 (Rain Bird 1800-SAM-PRS Sprays):**

Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Overspray

**Zone 8 (Rain Bird 1800-SAM-PRS Sprays):**

Misting  
Sunken and tilted heads  
Inappropriate nozzles (arc)  
Overspray

**Zone 9 (Rain Bird 1800-SAM-PRS Sprays):**

Misting  
Sunken and tilted heads  
Inappropriate nozzles (arc)  
Overspray

**Zone 10 (Rain Bird 1800-SAM-PRS Sprays):**

Leak at west turf area  
Mixed area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Inappropriate nozzles (arc)  
Overspray

**Zone 11 (Hunter I-20 Rotors):**

West head broken  
Mixed area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Diffusion screw tightened too tight  
Plants blocking spray from heads  
Overspray

**Zone 12 (Rain Bird 1800-SAM-PRS Sprays):**

Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Trees blocking spray from heads

**Zone 13 (Rain Bird 1800-SAM-PRS Sprays):**

Non-turf area  
2 heads on east side have broken nozzles  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Clogged nozzles  
Inappropriate nozzles (arc)  
Plants blocking spray from heads

**Zone 14 (Rain Bird 1800-SAM-PRS Sprays):**

Non-turf area  
Misting  
Different heads have different height risers  
Plants blocking spray from heads  
Overspray

**Zone 15 (Hunter I-20 Rotors):**

Mixed area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Diffusion screw tightened too tight  
Arc adjustment needed  
Overspray (watering sidewalk)

**Zone 16 (Rain Bird 1800-SAM-PRS Sprays):**

Mixed area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Trees blocking spray from heads  
North area is watering very little turf

**Zone 17 (Rain Bird 1800-SAM-PRS Sprays):**

Non-turf area  
Misting  
Plant-life blocking spray from heads  
Overspray

**Zone 18 (Rain Bird 1800-SAM-PRS Sprays):**

2<sup>nd</sup> south head broken  
Mixed area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Overspray

**Zone 19 (Hunter I-20 Rotors):**

Northwest head broken  
Mixed area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Arc adjustment needed  
Overspray (Watering sidewalk)

**Zone 20 (Hunter I-20 Rotors):**

Mixed area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Overspray

**Zone 21 (Rain Bird 1800-SAM-PRS Sprays):**

Mixed area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Clogged nozzles  
Trees blocking spray from heads

**Clock F (Irritrol MC-18 Plus)**

South-southwest side of Rockbridge Drive, south of Rockbridge Drive and Greensborough Drive, north of Rockbridge Drive and Stonecrest Way

**Program 1**

Days: Monday, Wednesday, and Friday  
Start times: 3:00AM

<u>Zone:</u>	1	2	3	4	5	6	7	8	9	10	11
Type:	R	R	S	S	S	S	S	S	R	S	S
Time:	20	20	8	10	10	10	10	10	10	10	10

<u>Zone:</u>	12	13	14	15	16	17	18
Type:							
Time:						20	

**Program 2**

Days: Monday, Wednesday, and Friday  
Start times: 6:00AM

<u>Zone:</u>	1	2	3	4	5	6	7	8	9	10	11
Type:	R	R	S	S	S	S	S	S	R	S	S
Time:											

<u>Zone:</u>	12	13	14	15	16	17	18
Type:							
Time:	5	5	5	5			

**Zone 1 (Hunter I-20 Rotors):**

Mixed Area  
Uneven/Poor Spacing and Design  
Sunken and tilted heads  
Inappropriate head type  
Light post blocking spray from heads

**Zone 2 (Hunter I-20 Rotors):**

Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Light post blocking spray from heads

**Zone 3 (Rain Bird 1800-SAM-PRS):**

Mixed Area  
Uneven/Poor Spacing and Design  
Sunken and tilted heads

**Zone 4 (Rain Bird 1800-SAM-PRS):**

Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Overspray

**Zone 5 (Rain Bird 1800-SAM-PRS):**

Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Overspray

**Zone 6 (Rain Bird 1800-SAM-PRS):**

Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Overspray

**Zone 7 (Rain Bird 1800-SAM-PRS):**

Broken nozzle west of golf cart path  
Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Inappropriate nozzles/Arc adjustment needed  
Overspray

**Zone 8 (Rain Bird 1800-SAM-PRS):**

Mixed Area  
Uneven/Poor Spacing and design  
Sunken and tilted heads  
Clogged nozzles  
Inappropriate nozzles/Arc adjustment needed  
Overspray

**Zone 9 (Hunter I-20 Rotors):**

Mixed Area  
Uneven/Poor Spacing and design  
Misting  
Sunken and tilted heads  
East head seems to be watering very little turf  
Plants blocking spray from heads  
Overspray

**Zone 10 (Rain Bird 1800-SAM-PRS):**

Uneven/Poor Spacing and design  
Misting  
Sunken and tilted heads  
Inappropriate nozzles  
North 2 heads seem to be watering very little turf  
Plants blocking spray from heads  
Overspray

**Zone 11 (Rain Bird 1800-SAM-PRS):**

Uneven/Poor Spacing and Design  
Sunken and tilted heads  
Inappropriate nozzles  
Overspray

**Clock G (Irritrol MC-36 Plus)**

Southeast of Greensborough Drive and Rockbridge Way

**Program 1**

Days: Sunday, Monday, Tuesday, Thursday, Friday, and Saturday

Start times: 12:00AM and 3:45AM

Zone:	1	2	3	4	5	6	7	8	9	10	11
Type:	S	D	R	S	R	R	D	D/S	S	S	S
Time:	10		20	10	20	20		6	10	10	10

Zone:	12	13	14	15	16	17	18	19	20	21	22
Type:											
Time:	10	12	10						20		10

Zone:	23	24	25	26	27	28
Type:						
Time:	10	10	20			

**Program 2**

Days: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday

Start times: 8:00AM and 8:00PM

Zone:	1	2	3	4	5	6	7	8	9	10	11
Type:	S	D	R	S	R	R	D	D/S	S	S	S
Time:		5									

Zone:	12	13	14	15	16	17	18	19	20	21	22
Type:											
Time:				5	5		5	8			

Zone:	23	24	25	26	27	28
Type:						
Time:				8	10	

**Zone 1 (Rain Bird 1800-SAM-PRS Sprays):**

- Mixed Area
- Misting (a little bit)
- Sunken and tilted heads
- Clogged nozzles
- Overspray

**Zone 2 (Drip):**

Only watering well-established evergreen tree

**Zone 3 (Hunter I-20 Rotors):**

Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Arc adjustment needed  
Low tree branches blocking spray from heads  
Overspray

**Zone 4 (Rain Bird 1800-SAM-PRS Sprays):**

Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Clogged nozzles

**Zone 5 (Hunter I-20 Rotors):**

Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Overspray

**Zone 6 (Hunter I-20 Rotors):**

Mixed Area  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Unmatched nozzles  
Diffusion screw tightened too tight

**Zone 7 (Drip):**

Cannot find

**Zone 8 (Drip/Rain Bird 1800-SAM-PRS Sprays):**

Mixed Zone  
Uneven/Poor Spacing and Design  
Misting  
Sunken and tilted heads  
Plants blocking spray from heads  
Primarily watering native landscape



**Program 2**

Days: Sunday, Monday, Tuesday, and Thursday

Start times: 5:00AM and 7:00AM

Zone:	1	2	3	4	5	6	7	8	9	10	11
Type:											
Time:	5	5	5	5	5	5	5			5	5

Zone:	12	13	14	15	16	17	18	19	20
Type:									
Time:	5		10	10	10	10		5	5

**This clock was not part of the visual inspection.**

**Clock I (Irritrol MC-24 Plus)**

Northwest of Greensborough Drive and Plaza Drive

**Program 1**

Days: Sunday, Tuesday, Thursday, and Saturday

Start times: 12:00AM\* and 4:30AM

(\* "1" button was not working, guess based on other clocks)

Zone:	1	2	3	4	5	6	7	8	9	10	11
Type:	S	S	S	R	R	R	S	R	R	R	R
Time:	8	8	8	22	18	18	8	18	18	18	18

Zone:	12	13	14	15	16	17	18	19	20	21	22
Type:	R	R	R	R	S	S	S	S	S	R	S
Time:	18	18	18	18						18	8

Zone:	23
Type:	S
Time:	8

**Program 2**

Days: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday

Start times: 8:00AM\* and 8:00PM

(\* "1" button was not working, guess based on other clocks)

Zone:	1	2	3	4	5	6	7	8	9	10	11
Type:	S	S	S	R	R	R	S	R	R	R	R
Time:											

Zone:	12	13	14	15	16	17	18	19	20	21	22
Type:	R	R	R	R	S	S	S	S	S	R	S
Time:					8	5	5	5	8		

Zone:	23
Type:	S
Time:	

**This clock was not part of the visual inspection.**

**Clock J (Irritrol MC-42 Plus)**

West of Plaza Drive and Creekside Way

**Program 1**

Days: Sunday, Tuesday, Thursday, and Saturday

Start times: 12:00AM and 3:00AM

Zone:	1	2	3	4	5	6	7	8	9	10	11
Type:											
Time:	8	8	8	8	20		8	8	8	8	8

Zone:	12	13	14	15	16	17
Type:						
Time:	18		5	5	5	5



## General Recommendations

- Align sprinkler heads in such a way that the end of the spray of one head reaches the next head. This head-to-head pattern creates “double coverage,” increasing efficiency and ensuring a more consistently green turf.
- Space heads evenly to apply water efficiently. For example, heads that spray an eight-foot radius should be spaced a **maximum** of eight feet apart. Uneven spacing lowers the efficiency and doesn’t allow for the double coverage mentioned above.
- Check heads for correct spray pattern. Spray patterns should match physical characteristics of site, such that patterns do not spray concrete, asphalt, fences, or buildings.
- Match precipitation rates of all heads within a zone.
- Replace irrigation heads within a zone so that all heads are uniform (i.e. same type, same brand, same model)
- Repair or replace sunken, tilted, broken, or clogged heads to improve the distribution uniformity. Such problems are relatively easy to fix and greatly improve the efficiency of a zone when repaired.
- Trees, bushes and plants should be pruned and trimmed regularly to allow the sprinkler heads to function properly. In some instances where pruning may not be feasible, we recommend relocating the affected sprinkler heads.
- Replace turf, where appropriate, with hardscape or water-conserving plants that utilize drip irrigation.
- Excessive pressure can be lowered at individual heads by installing a head with a pressure reducing stem (PRS). For entire zones it is often more economical and efficient to install a pressure reducer on the valve for the entire zone.
- Install check valves where appropriate
- Most control clocks have batteries in them for backup in case of power outages. We recommend that the batteries be checked regularly.
- Always try to use the services of a certified irrigation professional to ensure quality work. Irrigation specialists can receive certification from any of the following organizations: GreenCO, Irrigation Association, Associated Landscape Contractors of Colorado (ALCC), Partners for a Clean Environment (PACE), and WaterSense. For more information on the different

types of certification, visit our website at [www.ConservationCenter.org](http://www.ConservationCenter.org), click on the water logo and select 'Contractor Referrals.'

- Check with your water provider to see if any rebates are available to assist in irrigation efficiency and conservation efforts.

## **TEST RESULTS**

\*\*\* Catch cup, soil, and pressure tests were performed in designated zones to determine appropriate recommendations and watering schedules for the property. The results obtained from the tested zones are detailed below.

Key:

PR = Precipitation Rate (measured in inches of water per hour)

DU = Distribution Uniformity (efficiency rating of the zone, from 0 – 100% (70% goal))

PSI = Pressure at the sprinkler head, measured in Pounds per Square Inch

### **Zones A1, A21 (Rotors):**

PR = 0.8"/hr

DU = 87%

PSI = 68

Soil Type = Sandy-Loam

Root Depth = 3 inches

### **Zones A5, A6 (Sprays):**

PR = 1.8"/hr

DU = 79%

PSI = 80

Soil Type = Clay

Root Depth = 1 inch

### **Zones C3, C4 (Rotors):**

PR = 0.7"/hr

DU = 70%

PSI = 96

Soil Type = Sandy-Loam

Root Depth = 6 inches

### **Zones C15 (Sprays):**

PR = 2.1"/hr

DU = 53%

PSI = 45

Soil Type = Sandy-Loam

Root Depth = 5 inches

### **Zones D11 (Sprays):**

PR = 1.2"/hr

DU = 68%

PSI = Could not test

Soil Type = Clay

Root Depth = 3 inches

### **Zones E2 (Sprays):**

PR = 1.8"/hr

DU = 73%

PSI = Could not test

Soil Type = Clay

Root Depth = Too muddy to attain sample

### **Zones E4, E5 (Rotors):**

PR = 0.7"/hr

DU = 60%

PSI = 38

Soil Type = Clay

Root Depth = 2+ inches

**Zones E6, E7, E8 (Sprays):**

PR = 2.3"/hr	DU = 72%	PSI = Could not test
Soil Type = Clay	Root Depth = 2 inches	

**Zones F10, F11 (Sprays):**

PR = 2.6"/hr	DU = 71%	PSI = Could not test
Soil Type = Clay	Root Depth = 1 inch	

**Zones G10, G11 (Sprays):**

PR = 1.8"/hr	DU = 63%	PSI = 48
Soil Type = Clay	Root Depth = 3 inches	

## Watering Schedule

### Frequency of Intervals between Watering

Watering intervals change throughout the season because the water requirements change for plants as the seasons progress. Evapotranspiration (ET) is one of the most important things to consider when scheduling run times for your irrigation system. ET is a conversion of water from liquid to vapor and is the amount of water needed for the plant to survive. Our recommended watering schedule is based on an **average historical ET** for the Denver area of 27 inches of water per year. If the weather is significantly hotter and drier or cooler and wetter than average, you may need to adjust your watering schedule.

### Cycling

Watering in short cycles, or 'cycling' is important in heavy clay soils, on slopes, or when sprinklers have a high precipitation rate. Run through all zones at one-half or one-third the total time needed (see 'Cycles' on the watering schedule) then re-run the zones again by adding additional start times. This will help prevent puddling and runoff. In order to cycle runtimes, the control clock must have multiple start times.

### Recommended Watering Schedule\*\*\*

This schedule can be used as a GUIDE during non-restrictive years. This schedule is based on the areas of your landscape that tests were performed on. Zones that have the same head types and have other similar features can use the recommended schedule as a base starting point. Adjustments for varying microclimates, such as sun exposure, will have to be made accordingly.

\*\*\* Recommended watering schedules may be significantly different than the current watering schedules. We do not recommend drastically changing watering times in a short period of time because it will stress the turf; it is best to slowly change the watering schedule. The amount of water the turf is receiving should be reduced until the turf shows signs of stress, at which point the water usage should not be reduced any further.

**Zones A1, A21 (Rotors):**

**Current Minutes Per Week: 120    Recommended Minutes Per Week: 80**

<u>Month</u>	<u>Times/week</u>	<u>Cycles</u>	<u>Minutes</u>	<u>Total Minutes per watering</u>	<u>Total Minutes per week</u>
May	1.5	2	20	40	60
June-August	2	2	20	40	80
September	1	2	20	40	40

**Zones A5, A6 (Sprays):**

**Current Minutes Per Week: 42    Recommended Minutes Per Week: 36**

<u>Month</u>	<u>Times/week</u>	<u>Cycles</u>	<u>Minutes</u>	<u>Total Minutes per watering</u>	<u>Total Minutes per week</u>
May	1.5	3	6	18	27
June-August	2	3	6	18	36
September	1	3	6	18	18

**Zones C3, C4 (Rotors):**

**Current Minutes Per Week: 144    Recommended Minutes Per Week: 88**

<u>Month</u>	<u>Times/week</u>	<u>Cycles</u>	<u>Minutes</u>	<u>Total Minutes per watering</u>	<u>Total Minutes per week</u>
May	1.5	2	22	44	66
June-August	2	2	22	44	88
September	1	2	22	44	44

**Zone C15 (Sprays):**

**Current Minutes Per Week: 64    Recommended Minutes Per Week: 28**

<u>Month</u>	<u>Times/week</u>	<u>Cycles</u>	<u>Minutes</u>	<u>Total Minutes per watering</u>	<u>Total Minutes per week</u>
May	1.5	2	7	14	21
June-August	2	2	7	14	28
September	1	2	7	14	14

**Zone D11 (Sprays):**

**Current Minutes Per Week: 64    Recommended Minutes Per Week: 48**

<u>Month</u>	<u>Times/week</u>	<u>Cycles</u>	<u>Minutes</u>	<u>Total Minutes per watering</u>	<u>Total Minutes per week</u>
May	1.5	3	8	24	36
June-August	2	3	8	24	48
September	1	3	8	24	24

**Zone E2 (Sprays):**

**Current Minutes Per Week: 112    Recommended Minutes Per Week: 36**

<u>Month</u>	<u>Times/week</u>	<u>Cycles</u>	<u>Minutes</u>	<u>Total Minutes per watering</u>	<u>Total Minutes per week</u>
May	1.5	3	6	18	27
June-August	2	3	6	18	36
September	1	3	6	18	18

**Zones E4, E5 (Rotors):**

**Current Minutes Per Week: 120    Recommended Minutes Per Week: 90**

<u>Month</u>	<u>Times/week</u>	<u>Cycles</u>	<u>Minutes</u>	<u>Total Minutes per watering</u>	<u>Total Minutes per week</u>
May	1.5	3	15	45	67.5
June-August	2	3	15	45	90
September	1	3	15	45	45

**Zones E6, E7, E8 (Sprays):**

**Current Minutes Per Week: 80      Recommended Minutes Per Week: 24**

<u>Month</u>	<u>Times/week</u>	<u>Cycles</u>	<u>Minutes</u>	<u>Total Minutes per watering</u>	<u>Total Minutes per week</u>
May	1.5	3	4	12	18
June-August	2	3	4	12	24
September	1	3	4	12	12

**Zones F10, F11 (Sprays):**

**Current Minutes Per Week: 30      Recommended Minutes Per Week: 24**

<u>Month</u>	<u>Times/week</u>	<u>Cycles</u>	<u>Minutes</u>	<u>Total Minutes per watering</u>	<u>Total Minutes per week</u>
May	1.5	3	4	12	18
June-August	2	3	4	12	24
September	1	3	4	12	12

**Zones G10, G11 (Sprays):**

**Current Minutes Per Week: 120      Recommended Minutes Per Week: 36**

<u>Month</u>	<u>Times/week</u>	<u>Cycles</u>	<u>Minutes</u>	<u>Total Minutes per watering</u>	<u>Total Minutes per week</u>
May	1.5	3	6	18	27
June-August	2	3	6	18	36
September	1	3	6	18	18

## **Conclusion**

The Highlands Ranch Golf Club Home Owners Association is a very well maintained property. However, some problems with the design and installation of the system hurt its efficiency.

The greatest problem on the system was the initial design and installation of the irrigation system. Mixed areas, where two types of sprinkler heads watering the same area, were abundant throughout the property. This is an inefficient design because the precipitation rates vary drastically between different types of sprinkler heads (mainly rotors versus sprays). Due to the drastic differences in precipitation rates we are unable to test and make specific recommendations for these areas, which occur within most of the property. The other major design inefficiency was that spray heads watered the flowerbeds. According to the Green Industries of Colorado, this is the most inefficient way to water these areas. We recommend converting such areas to a drip system.

Fortunately the areas that we were able to test proved to be some of the best results for a home owners association. The average distribution uniformity (DU) was 70% for the ten areas tested. This figure meets our distribution uniformity goal to be classified as an efficient system, and such a high average is exceptional for a home owners association. The high DU can be attributed to the work that the landscapers have done. Problems that are noted in the zone-by-zone inspection, such as high pressure/misting, tilted and sunken heads, and leaks, were already on the landscaper's agenda before we arrived on site. The landscapers have done a great job maintaining the system.

Often we find that the job of the landscaper is to keep the property green to keep home owners and guests happy. When we arrived on site, we were told the reason why this HOA was being audited was because they were \$80,000 over the allocated watering budget. One reason that the HOA probably went over budget was the watering schedule. According to our recommended watering schedule, the Highlands Ranch Golf Club HOA was over watering by a significant amount. Before switching to our schedule there are a few points to keep in mind. First, drastically reducing watering in the middle of the summer isn't recommended, so the recommended schedule would be best implemented next year.

There are ways to decrease water usage and keep the landscape looking lush. Most turf areas were areas where little traffic would be expected, so changing out Kentucky Bluegrass for a warm season grass, such as Buffalo Grass or Fine Fescue would help decrease water usage and keep a lush landscape. Planting perennials instead of annuals will decrease water usage as well. The ideal situation would be like Castle Pines, another golfing community, where all plants planted are required to be xeric, or low water, plants. There are also some small golf cart islands with Bluegrass; converting these to non-turf areas will also help.

The last problem that was prevalent was the amount of overspray onto hardscaped areas. There was so much overspray that the excess watering was even damaging many areas.

Thank you for your participation in Slow the Flow Colorado. We hope that the data and recommendations in this report will be beneficial in helping you to maintain a beautiful landscape while also using water as efficiently as possible. If you have any questions, please feel free to contact the Program Manager at 303.441.3278 ext. 10.

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Center for ReSource Conservation

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