



DENVER

PARKS & RECREATION

Denver Golf Drought Response Plan For City and County of Denver Municipal Golf Courses

2013

Prepared By

**Denver Parks & Recreation
Golf Division**

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DENVER GOLF DROUGHT RESPONSE PLAN

Section 1 Declaration of Policy and Purpose

Denver Parks & Recreation through Denver Golf (Denver Golf) provides an exceptional public golf experience at a fair price. Denver Golf strives to manage these facilities through continually evaluating and improving sustainable practices. Because of these practices, Denver Golf courses annually use about 20% less water per acre than an acre of bluegrass lawn.

The purpose of the Drought Response Plan (The Plan) is to forecast and quantify additional water conservation measures to meet the mandatory reductions set by Denver Water.

Section 2 Scope

The Denver metro golf course properties include seven golf course facilities which includes over 120 golf holes with a total of 840 acres. Approximately 661 acres of this golf course property is irrigated turf. Annually, Denver Golf places about 129 acres into conservation. Conservation Area lands are set aside where minimal or no inputs are allowed.

There are six Denver metro courses and one mountain course located in Evergreen, CO. Because the Evergreen irrigation water supply is governed by an authority other than Denver Water, The Plan's scope considers the six metro courses: City Park Golf Course, Harvard Gulch Golf Course, John F. Kennedy Golf Course, Overland Park Golf Course, Wellshire Golf Course, and Willis Case Golf Course.

At this time, Denver Water does not anticipate a drought response for effluent water users. Therefore, The Plan excludes effluent irrigation water in calculating drought response. Effluent water is reuse water that is not treated sufficiently to be returned to the stream system. Golf courses and parkland using effluent for irrigation act as the final treatment stage for this water. Denver Golf courses use a variety of water sources for irrigation which include: effluent, raw, potable, well, and ditch water. City Park Golf Course relies exclusively on effluent for irrigation supply. Because current drought restrictions exempt effluent water, City Park Golf Course's irrigation water will be excluded from The Plan's drought response calculations.

Section 3 Outreach and Education

Denver Golf is a leader in continually improving conservation and efficiencies. The Plan may be published and adopted for use by other golf courses. Denver welcomes inquiries from conservation groups, media, and other industries to share and discuss sustainable turfgrass management practices. Inquiries should be sent to the Director of Golf Marketing, leslie.wright@denvergov.org.

Section 4 Initiation of Drought Stages

Denver Water through their Board of Water Commissioners is responsible for the initiation and termination of drought response stages based on the triggering criteria set forth in their 2011 Drought Response Plan. <http://www.denverwater.org/docs/assets/CECFBC95-E611-03E5-FD2B05E1B8A6B497/DroughtResponsePlan.pdf>

Section 5 Stages of Drought and Denver Golf Response Measures

Denver Golf continually strives to improve irrigation efficiencies. Denver Golf Course Superintendents utilize technological and mechanical means to improve and monitor irrigation efficiencies. Even without a drought condition, Denver Golf courses are maintained with the least amount of irrigation water necessary to strike a balance between providing exceptional course conditions, plant health, and water conservation.

The following drought response measures are a guide to assist in managing throughout the various stages of drought during the in-season irrigation months of April through October. These response measures are not exhaustive and not exclusive options for managing to the drought response target. Because of the varying topography, natural precipitation, and availability of irrigation water, Denver Golf presents these measures as best management practices through the various stages of drought. There may be instances where more or less restrictive measures may be implemented. See **Attachment A** for Denver Golf 2013 Drought Response projection.

Stage 1

Projected reservoir contents between 60-95% full on July 1st.

Use Reduction Target: 10% reduction based on 2010 use.

Response Target: 37 million gallons annually conserved.

Response Measures:

- Finish in-progress construction projects
- Discontinue of projects or practices requiring seed or sod establishment that are outside of greens, tee, and fairways
- Irrigate to 60-65% evapotranspiration (ET) on greens, tees, fairways, and 55-60% on rough
- Increase hand watering of hot spots on greens
- Raise HOC of rough, fairways, tees, and surrounds as necessary
- Discontinue mowing of stressed turf areas
- Eliminate mowing whenever possible
- No herbicide applications after June 1st
- No golf carts after a significant rain event
- Reduce rough watering in low traffic and low impact areas
- Equipment washing only in rough areas
- Irrigation use recorded daily and reported quarterly

STAGE 2

Projected reservoir contents between 35-75% full on July 1st.

Use Reduction Target: 20% reduction based on 2010 use.

Response Target: 79 million gallons annually conserved.

Response Measures:

- All Stage I response measures
- Discontinue irrigation of conservation areas; ornamental and landscape
- No projects requiring seed or sod establishment between June 1st and September 1st
- Irrigate to 55-60% ET on greens; tees, fairways, and 50-55% rough
- Hand water hot spots on greens, tees, and fairways
- Limit equipment washing to once per week
- Some facilities may require carts only down middle of marked lane on fairways
- Fertilize only on greens, tees, and fairways
- Irrigation use recorded daily and reported monthly

STAGE 3

Projected reservoir contents between 0-40% full on July 1st.

Use Reduction Target: 35% reduction based on 2010 use.

Response Target: 138 million gallons annually conserved.

Response Measures:

- All Stage I and II measures
- Shut off all rough areas
- Stop mowing rough
- Raise fairway HOC to 1"
- Raise green HOC to 5/32 or greater
- Spot mow only as necessary
- Close cart traffic or carts only on paths and dedicated routes marked down middle of the fairway
- Discontinue irrigation on par 3 fairways
- Discontinue irrigation of practice areas and nurseries – hand water practice greens
- Discontinue fairway irrigation 100 – 150 yards out from tees on par 4 and 5s
- Fertilize only on greens, tees, and irrigated portions fairways

STAGE 4

Projected reservoir contents less than 20% full on July 1st.

Use Reduction Target: 50% reduction based on 2010 use.

Response Target: 198.6 million gallons annually conserved.

Response Measures:

- All Stage I, II, and III measures
- Hand water greens and surrounds
- Discontinue irrigation of all fairways and tees
- Golf course closed to carts
- Fertilizer only on greens
- Irrigation use recorded and reported daily

Section 6 Monitoring and Reporting

Irrigation water for Denver Golf employs a wide variety of sources and methods of metering. Some golf course irrigation pump stations may show more or less gallons pumped than what is reported by the metering systems on wells. Without an extensive study of precipitation, evaporation, and leaching, reliable data would be impossible to generate at those facilities using storage ponds for irrigation water. Therefore, depending on the source of irrigation water a combination of the following tools will be used to meter irrigation water use:

- Denver Water meters at potable water taps
- Denver Water meters at wells
- Golf Course central irrigation computer records
- Golf Course Irrigation pump station records

To insure consistency, the same measuring devices used to establish the 2010 use will be the same measuring standard for 2013 conservation. Where multiple meters are available, data will be available from all sources.

Denver Golf also looks at more than one data point to determine irrigation water requirements. This simulated use and reduction model confirms the close correlation to Denver Golf actuals and simulated plant requirement and conservation through drought restrictions.

Data will be collected on a daily basis and reported depending upon the stage of the drought and upon request.

Location	Property Acreage	Conservation Acreage	Impermeable	Water body Acreage	Irr Acres	normal	66 percent	2010 Use	Stage I (90%)	Stage I Saving	Stage II (80%)	Stage II Saving	Stage III (65%)	Stage III Saving	Stage IV (50%)	Stage IV Saving
						requirement	of norm									
						Bluegrass @ 18 gal/ft2	Bluegrass @ 12 gal/ft2									
City Park	139	10	3	3	123	96,441,840	64,294,560	90,092,207			90,092,207	90,092,207	90,092,207	90,092,207	90,092,207	90,092,207
Harvard	13	0	1	1	12	9,016,920	6,011,280	5,198,100	4,678,290	519,810	4,158,480	1,039,620	3,378,765	1,819,335	2,599,050	2,599,050
Kennedy	277	50	4	11	212	166,224,960	110,816,640	178,257,000				35,651,400	115,867,050	62,389,950		
									160,431,300	17,825,700	142,605,600				89,128,500	89,128,500
Overland						87,816,960	58,544,640	84,000,000				16,800,000	54,600,000	29,400,000		
	140	23	4	1	112			75,600,000	8,400,000	67,200,000					42,000,000	42,000,000
Wellshire	134	20	5	13	96	75,271,680	50,181,120	60,373,204				12,074,641	39,242,583	21,130,621		
									54,335,884	6,037,320	48,298,563				30,186,602	30,186,602
Willis Case	119	11	2	0	106	83,112,480	55,408,320	69,300,000	62,370,000	6,930,000	55,440,000	13,860,000	45,045,000	24,255,000	34,650,000	34,650,000
Totals	822	114	16	26	538	421,443,000	280,962,000	397,128,304	357,415,474	39,712,830	317,702,643	79,425,661	258,133,398	138,994,906	198,564,152	198,564,152

City Park is effluent and not included in these calculations.