Developing a Drought-Emergency Plan

A step-by-step guide to help your golf facility prepare for mandatory water restrictions.

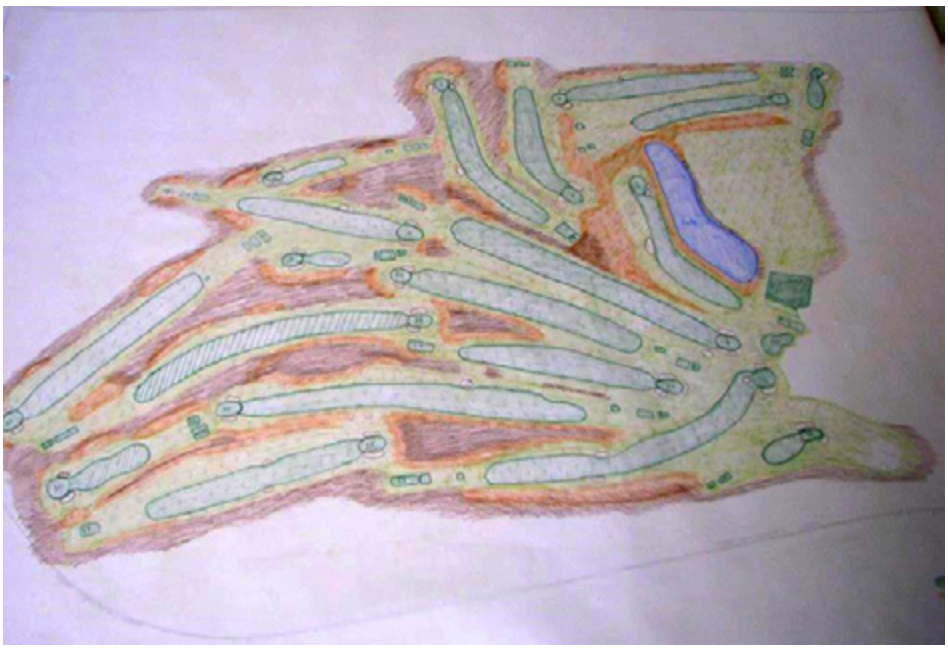
BY PATRICK GROSS

It's 100°F outside and you just received notice that water delivery to the golf course will be reduced by 30 percent in the coming weeks. What are you going to do now? Like it or not, drought emergencies and mandatory water cutbacks are a recurring situation at many golf facilities, even in relatively high rainfall areas of the United States. In some parts of the country, lack of rain for six to eight weeks can put significant pressure on water supplies and trigger a drought emergency. Planning for a drought emergency is not a pleasant situation for golf facility owners, superintendents, or golfers. Effectively preparing for the situation is best done well in advance when you are not in the middle of an emergency, which allows for more effective planning and communication between course officials and golfers.

Water regulations and drought-emergency ordinances are often written so they can be applied broadly to all customers. This often comes in the form of a percentage water reduction that is imposed on customers. Typically, this is done in a phased approach mandating customers to cut back 10, 20, 30, 40 percent or greater as subsequent drought emergency levels are reached. The concept of developing a drought-emergency plan is to determine in advance precisely how much water needs to be reduced to satisfy the 10, 20, 30, or >40 percent mandate and develop a strategy to accomplish these goals.

There are different approaches to planning for a drought emergency, but all have the following baseline factors in common:

- Precise knowledge of golf course acreage and the size of greens, teeing grounds, fairways, rough, and landscape areas.
- Knowledge of monthly water use for the various golf course areas such as greens, teeing grounds, fairways, rough, and landscape areas.



A simple color-coded map of the golf course is an effective communication tool to show golfers where water will be reduced in case of a drought emergency.

An accurate map of the golf course property is an essential starting point for developing a drought-emergency plan so that various areas can be measured and documented. (Image courtesy of Todd Eckenrode, Origins Golf Design.)

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During a drought emergency, putting green complexes and teeing grounds typically receive the highest priority for irrigation, while the rough receives the lowest priority.

- Intimate understanding of the irrigation system and its output, operation, and capabilities.
- An understanding of high-priority areas that need to be maintained to preserve acceptable playing quality and customer satisfaction.

The following five-step plan outlines a process that golf course personnel can use to develop a customized drought-emergency plan.

STEP 1

Secure an accurate map of the property.

A current and accurate map of the entire golf course property is an essential starting point for developing the drought-emergency plan. This forms the basis for measuring and analyzing the irrigated acreage. An AutoCAD map that includes an overlay of the irrigation system is best because boundaries of all irrigated areas can be accurately measured. There are other tools available for this purpose, including:

Commercially available services: Customized GPS and GIS mapping products are available, such as Course Vision™, Google Earth Pro, and others, that provide accurate measurements of the golf course property. Such products often include tools such as an aerial photograph, property map, measurement data, area calculator, and features for measuring, documenting, and calculating the size and area of the golf course.

Online tools: Area-calculator tools and planimeters are available for free on the Internet. Many of these tools use satellite imagery that is ground normalized to allow the user to obtain measurements of the property and various course features. Examples include Google Maps Area Calculator Tool and Google Planimeter.

STEP 2

Determine the size of turf and landscape areas.

Using the map, determine the square footage and/or acreage of the entire property and then break it down into specific use areas. The list must be based on irrigation zones and the ability of the control system to irrigate each area separately. This is much easier for a system with individual irrigation head control versus a block system (one valve controlling two or more irrigation heads) where a single

Table 1
Sample area calculation for various use areas of the golf course

Area description	Total area (sq. ft.)	Total area (acres)	Percentage of total area
Green complexes	178,596	4.1	4%
Teeing grounds	152,460	3.5	3%
Fairways	901,692	20.7	20%
Primary rough	2,025,540	46.5	44%
Secondary rough/ out-of-play areas	797,148	18.3	17%
Practice range	453,024	10.4	10%
Landscape areas	104,544	2.4	2%
Total	**4,613,004 sq. ft.**	**105.9 acres**	**100%**

valve may be covering both fairway and rough areas. The list may vary from course to course based on site-specific features but will generally include the following zones:

- Putting green complexes (greens, approaches, and green banks)
- Teeing grounds
- Fairways
- Primary rough
- Secondary rough/out-of-play areas
- Practice range
- Landscape areas

Once accurate measurements are determined, calculate the percentage of each area compared to the total property (see sample Table 1).

STEP 3

Determine how much water is used annually to irrigate the golf course.

Historical water-use data can be obtained from a variety of sources, including:

- Billing records from the local water agency.
- Daily logs from the irrigation pumping system.
- Data from golf course accounting or maintenance records.

Water use is reported in different ways, such as acre feet (1 acre foot = 325,851 gallons), 1,000 gallon units, or hundred cubic feet (HCF, which equals 748 gallons.) It is best to use the same terminology as the water agency to avoid confusion.

Water use obviously varies from month to month; therefore it is important to list historical water-use data in a monthly format. The reported water use will preferably reflect an average of the past three to five years (see sample Table 2).

Next, determine how much water is typically used in each area of the golf course by taking the total amount of water used and multiply by the percentage of the total area of the golf course assigned in Step 2 (see sample Table 3). Repeat this step for each month.

At this point, it is important to note that actual water use may be different for each area of the golf course. For example, *Poa annua* putting greens may use more water than these calculations suggest, and bermudagrass fairways may use less. Keep in mind that this is a theoretical exercise to understand the general scope of how much water is applied to various areas of the property.

Table 2
Sample historical average water use by month

Month	Previous 3- to 5-year average water use (gallons)
January	2,020,258
February	2,737,123
March	5,050,644
April	6,354,036
May	7,575,966
June	8,309,124
July	8,081,030
August	7,575,966
September	6,354,036
October	4,545,580
November	2,932,632
December	2,020,258

STEP 4

Develop a prioritized list for irrigation scheduling.

Next, develop a list of which areas will receive the highest priority for irrigation and which areas will be progressively cut back in case of a drought emergency. Some areas of the golf course, such as greens complexes, are obviously more important than others when it comes to playability and will receive the highest priority. Developing the priority list is best done as a collaborative effort between the superintendent, manager, golf professional, owner, and key committee members/ course officials. Everyone needs to

Table 3
Sample average water use by section of the golf course in a single month (July)

Area description	Percentage of total area	Average water use for July
Green complexes	4%	323,242 gal.
Teeing grounds	3%	242,430 gal.
Fairways	20%	1,616,206 gal.
Primary rough	44%	3,555,654 gal.
Secondary rough/ out-of-play areas	17%	1,373,775 gal.
Practice range	10%	808,103 gal.
Landscape areas	2%	161,620 gal.
Total	**100%**	**8,081,030 gal.**

Table 4
Sample water-use priority list
Level 1 = Highest priority
Level 7 = Lowest priority

Priority level	Golf course area
1	Green complexes
2	Fairways
3	Teeing grounds
4	Primary rough
5	Landscape areas
6	Practice range
7	Secondary rough/ out-of-play areas

agree to the concept at this stage so any disagreements and second-guessing can be avoided when a drought emergency is declared. The following is a sample priority list for irrigation scheduling. Please note that priorities and the level of detail may be different for each course based on business needs and site requirements (see sample Table 4).

STEP 5

Determine how much water must be reduced for each drought-emergency level and where the reductions will be applied.

At this stage, all the homework has been done and it is just a matter of manipulating the numbers developed in Step 3 (historical monthly water use) based on the priorities established in Step 4 (water-use priority list). As an example, if a second-stage drought emergency is declared and a 20-percent water reduction is mandated, where should cutbacks be made? The following points describe how it is done:

- Using the monthly water-use data from Step 3, calculate the total amount of water that must be reduced based on the percentage required by the drought-emergency level (see sample Table 5).
- Using the monthly water-use data, reduce the percentage of water applied to various use areas of the property based on the priority list developed in Step 4. Manipulate the percentages for the various use areas until the necessary water

Putting green complexes typically encompass 4 to 6 percent of the total golf course area, and continuing to irrigate these areas helps to maintain acceptable playing quality while using relatively little water. (Photo by Jim Moore, USGA.)

Table 5
Sample monthly calculation for a 20-percent water reduction

Month	Historical average water use (gallons)	Amount of water reduction at the 20 percent level (gallons)
January	2,020,258	404,051
February	2,737,123	547,424
March	5,050,644	1,010,128
April	6,354,036	1,270,807
May	7,575,966	1,515,193
June	8,309,124	1,661,824
July	8,081,030	1,616,206
August	7,575,966	1,515,193
September	6,354,036	1,269,007
October	4,545,580	909,166
November	2,932,632	586,526
December	2,020,258	404,051

During a drought emergency, the greatest amount of water saving will be achieved by reducing water applications on larger areas of the property, such as the rough.

Table 6
Sample worksheet to calculate a total 20-percent water reduction in July

Area description	Priority level	Avg. water use (gal.) in July	Percent Reduction	Water saved (gal.)
Green complexes	1	323,242	0 %	—
Teeing grounds	3	242,430	0 %	—
Fairways	2	1,616,206	0 %	—
Primary rough	4	3,555,654	22 %	782,243
Secondary rough/ out-of-play areas	7	1,373,775	45 %	618,198
Practice range	6	808,103	35 %	282,836
Landscape areas	5	161,620	30 %	14,545
Total		**8,081,030**	**(target: 1,616,206)**	**1,697,882**

reduction is achieved. Note that the greatest amount of water savings will be achieved by reducing water applications on larger areas of the property, such as the rough. Repeat the calculations for each month the drought emergency is expected to be in effect (see sample Table 6).

- Verify that irrigation programming can achieve the desired goal by making the adjustments on the central irrigation computer and performing a projected run cycle. Make further adjustments to the irrigation program as necessary until the projected water use meets the reduction goal.
- Repeat these steps for each drought-emergency level.

COMMUNICATING THE PLAN

The exercise of developing a drought-contingency plan is not only helpful for determining irrigation priorities, it is a useful communication tool to share with water agencies, owners, green committees, and golfers. Sharing the plan can be done in different ways:

- Post a brief article on the bulletin board or golf facility website describing the goals of the drought-emergency plan and how it will be implemented on the golf course.
- Display a color-coded map or satellite image of the property showing where water will be reduced in case of a drought emergency. The map can be placed in multiple locations, such as the clubhouse, golf shop, restaurant, and locker rooms.
- Consider placing informational signs on the golf course showing where water reductions will be made as part of the drought-emergency plan.
- Invite course officials, water-agency personnel, and interested golfers on a tour of the golf course to show precisely where water will be reduced. In addition to discussing the details of the plan, the tour also provides an opportunity to demonstrate the operation of the irrigation system and point out any deficiencies or potential difficulties with implementing the plan.

CONCLUSION

The process of developing a drought-emergency plan takes time and effort, but the exercise is very beneficial for several reasons. First, it requires superintendents and course officials to compile data about their property and irrigation practices. Some may find it surprising how much water is actually used on different areas of the golf course. Second, the data provide an objective baseline of information to make rational decisions in advance of a crisis situation. Third, the drought-emergency plan can be used as an essential communication tool to share with golfers, water regulators, and the community.

Some may wonder why it is necessary to go to such lengths to meet water-reduction goals. Why not just adjust the irrigation computer and cut 20 percent across the board to all areas of the golf course? Although such an approach would be relatively easy, the results are unlikely to be satisfactory and will end up damaging critical areas such as greens and fairways far more than non-critical areas such as the rough or out-of-play zones. The overall idea is to make targeted reductions while preserving playing quality to the extent possible. Given the state of water supplies, the likelihood of experiencing a drought emergency is not a matter of "if" but a matter of "when." It is always better to be prepared with a solid plan.

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The practice range landing zone at this golf course receives very little water during a drought emergency, while the practice tee is watered regularly to preserve playing quality. Painting the target greens provides great contrast to the drought-stressed bermudagrass. (Photo by Travis Moore, GCS, Ridgewood CC, Waco, Texas.)