

Drought Response Plan



May, 2004



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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Denver Water’s goal for drought response is to preserve the quality of public life and economic activity to the extent possible in the face of water shortage.

Droughts, a natural phenomenon, occur with unpredictable frequency and variable intensity. During drought, flows into Denver Water’s reservoirs may be below normal, causing customers to have to reduce their typical water use. In addition, weather conditions in Denver Water’s service area may be drier than normal and may stress vegetation.

This Drought Response Plan is intended to assist the Denver Board of Water Commissioners in making policy decisions during times of drought and watering restrictions. The current plan, which incorporates lessons learned during the 2002–2003 drought in Denver Water’s service area, will be updated regularly to ensure that it addresses current conditions.

The plan approaches drought response from four perspectives—triggers (which indicate the severity of a drought), drought response measures, public outreach, and internal communication.

Triggers

Actual water supply and supply projections trigger drought response. The severity of the water supply picture determines the stage of drought declared and the corresponding level of response. The Drought Response Plan recommends a progressive response to worsening drought conditions. Recommended drought response measures are aimed at reducing water use by varying percentages, based on predicted reservoir storage.

Each set of responses is triggered by expected or actual reservoir storage on July 1 of any given year. (July 1 was chosen as the trigger date because storage in Denver Water’s system usually reaches its annual maximum around that date.) Four stages of drought, each signaled by a specific storage level trigger, are designated:

Drought Stage	Trigger
Stage 1	Reservoirs are less than 80% full
Stage 2	Reservoirs are less than 65% full
Stage 3	Reservoirs are less than 40% full
Stage 4	Reservoirs are less than 25% full

July 1 storage levels are forecast monthly from February through June each year. These forecasts consider past, present and future conditions in Denver Water’s watersheds. The closer the forecast date is to July 1, the more accurate the forecast. Even the April forecast involves a high degree of uncertainty because spring (April through June) precipitation, still unknown, can dramatically affect July 1 reservoir storage levels.

Drought Response Program

In 2002, the Board of Water Commissioners adopted a policy stating that Denver Water’s goal for drought response is to preserve the quality of public life and economic activity to the extent possible in the face of water shortage. The Drought Response Plan outlines specific

measures designed to maximize available water supplies and minimize water use. Because every drought is different, the Board will adjust and refine drought response measures based on actual conditions.

Denver Water's prime response to drought is to budget water use so supplies will be available for the most essential uses. The water use restrictions imposed during the 2002–2003 drought indicated that no single “silver bullet” was effective at encouraging all customers to reduce water use. Instead, a “basket of programs”—restrictions, surcharges, enforcement, incentives, and monitoring and evaluation—is recommended to create an overall atmosphere that encourages water savings.

Restrictions

The Board has adopted a set of principles to guide the development of drought restrictions:

- Avoid irretrievable loss of natural resources.
- Restrict less essential uses before essential uses.
- Affect individuals or small groups before affecting large groups or the public as a whole, allowing as much public activity as possible to be unaffected.
- Minimize adverse financial effects on the community.
- Eliminate water waste.

The basic response to a Stage 1 Drought is voluntary measures; to a Stage 2 Drought, mandatory restrictions; to a Stage 3 Drought, a general prohibition on lawn watering; and to a Stage 4 Drought, rationing of water supplies for essential uses. Because Stage 2, Stage 3 and Stage 4 Drought restrictions are mandatory, they must be incorporated into Denver Water's Operating Rules, where they become enforceable pursuant to the Denver Charter, the Denver Revised Municipal Code and provisions in Denver Water's water service agreements and water leases.

Drought restrictions should not be confused with ongoing water conservation efforts. Restrictions may be harsh, cannot always be fair, and are not intended for long-term use. Water-dependent businesses will be negatively affected by water use restrictions. **Denver Water encourages water-dependent businesses to develop their own Drought Response Plans to guide them through periods of drought and restrictions.**

Surcharges

During drought conditions, Denver Water must confront three overriding objectives: (1) to quickly reduce the volume of water used by its customers, (2) to maintain adequate revenues to meet its financial obligations, and (3) to consider the opposing needs of existing demand and growth. Drought pricing can be an effective tool in managing these objectives, and drought surcharges must be considered as part of an overall demand reduction and financial stabilization program.

Enforcement

Drought monitors enforce the drought restrictions and water waste rules. **The goal of the drought monitors is to help customers comply with the rules, not merely to penalize violators.**

Incentives

To encourage immediate water savings during a drought, Denver Water may develop incentive programs such as rebates, educational programs that teach water savings skills, and clinics on drought-tolerant landscaping and watering practices.

Monitoring and Evaluation

Denver Water's staff will begin monitoring and evaluation activities as soon as the Board declares a drought. Water savings will be tracked and compared with normal water use and weather-adjusted expected use. **If water use is not being reduced, modifications to the drought response efforts may be recommended.**

Recommended Responses to Stage 1 Drought

A Stage 1 Drought is triggered by actual or expected July 1 reservoir storage of 80 percent or lower. The goal in a Stage 1 Drought is to reduce water use by 10 percent. Declaration of a Stage 1 Drought is meant to warn customers that water levels are significantly below average and that continued dry weather could trigger a Stage 2 Drought. Recommended responses to a Stage 1 Drought include:

- Set the tone for a dry irrigation season.
- Reduce water demand to prevent progression to a Stage 2 Drought.
- Request that customers voluntarily reduce their water use by 10 percent.
- Enact the Stage 1 Drought restriction clause in contracts.
- Activate the water budget program for large-volume customers.
- Warn of and prepare for a Stage 2 Drought.
- Implement a public awareness campaign.

Recommended Responses to Stage 2 Drought

A Stage 2 Drought is triggered by actual or predicted July 1 reservoir storage of 65 percent or lower. The goal in a Stage 2 Drought is to reduce water use by 30 percent. (When July 1 storage levels are forecast at or below 70 percent, Denver Water's staff will begin planning for a potential Stage 2 Drought and may recommend that a Stage 2 Drought be declared before reservoir storage reaches 65 percent.) A Stage 2 Drought activates mandatory water use restrictions and requires a significant effort on the part of customers. Recommended responses to a Stage 2 Drought include:

- Allow watering only two days per week.
- Set a limit on the watering time allowed per watering day.
- Restrict or eliminate nonessential water uses.
- Implement a water use reduction goal of 30 percent for large-volume customers.
- Consider giving high-public-use customers special consideration.
- Implement industry-specific water restriction programs.
- Activate the enforcement program.
- Enact the Stage 2 Drought restriction clause in contracts.
- Design a surcharge program to support the mandatory drought restrictions.
- Implement a public awareness campaign.

Recommended Responses to Stage 3 Drought

A Stage 3 Drought is triggered by actual or predicted July 1 reservoir storage of 40 percent or lower. The goal in a Stage 3 Drought is to reduce water use by 50 percent. A Stage 3 Drought activates prohibitions on most lawn watering and other mandatory water restrictions. Stage 3 Drought restrictions are severe and may result in significant damage to landscapes.

Recommended responses to a Stage 3 Drought include:

- Allow one day of watering per week for trees and shrubs (no turf watering except on high-public-use areas).
- Set a limit on the watering time allowed per watering day.
- Eliminate all nonessential water uses.
- Implement a water use reduction goal of 50 percent for large-volume customers.
- Implement industry-specific water restriction programs.
- Enact the Stage 3 Drought restriction clause in contracts.

Recommended Responses to Stage 4 Drought

A Stage 4 Drought is triggered by actual or predicted July 1 reservoir storage of 25 percent. The goal in a Stage 4 Drought is to reduce water use by 66 percent. A Stage 4 Drought activates a rationing program for Denver Water's customers. Restrictions under a Stage 4 Drought are severe and will probably result in long-term damage to landscapes. Though it is highly unlikely that conditions would ever warrant declaration of a Stage 4 Drought, recommended responses include:

- Limit outdoor watering to monthly tree watering.
- Eliminate nonessential water uses.
- Design a water-rationing program to provide customers water for essential uses for an indefinite period of extreme drought.

Public Outreach

In order for the Drought Response Plan to be effective, Denver Water must communicate effectively with all its customers. The three major components of Denver Water's Drought Communication Program are public involvement, customer information, and media relations.

Internal Communication

Communication among Denver Water's divisions is crucial to ensure that all activities at Denver Water support the drought response efforts. Three committees will oversee implementation of the Drought Response Plan: the Drought Response Committee, the Executive Drought Committee, and the Drought Compliance Committee. The Drought Ambassadors Program will disseminate timely, accurate drought information to all employees.

INTRODUCTION

INTRODUCTION

The DRP outlines a plan for drought response that maximizes available water supplies and minimizes water usage.

This Drought Response Plan outlines procedures by which Denver Water could manage water supply and water use during drought. The procedures are designed to protect the community as a whole while considering individual customer priorities as much as possible. Because each drought is different, it is not practical to develop a set of hard and fast rules to apply to all droughts. These guidelines are intended to assist the five-member Denver Water Board in making decisions throughout the course of a particular drought. **The Board may adjust or refine these procedures in response to actual drought conditions.**

Drought Response Plan History

Recognizing the need for a plan to deal with short-term water shortages caused by drought, Denver Water created its first Drought Response Plan in 1991 with the help of a Citizen's Advisory Committee task force. The staff revised that plan several times, most recently as part of updating its Integrated Resources Plan, which was completed in February 2002, just months before the current drought began.

The Drought Response Plan described in this document follows two years of drought restrictions in Denver Water's service area during 2002–2003 and incorporates lessons learned. As the population in Denver Water's service area continues to grow, the buffer in the reservoirs will diminish and droughts will have to be dealt with more quickly and more intensely. Accordingly, the Drought Response Plan must be updated regularly so that it is relevant to current conditions.

Before drafting the current Drought Response Plan, Denver Water's Planning Division thoroughly examined a range of drought scenarios, quantified the severity of Colorado's past droughts, revisited the history of water use restrictions in Denver, reviewed the lessons of past droughts, and projected options for obtaining additional water supplies in times of drought. These reports and analyses are published in a separate volume of technical appendices for interested readers.

Drought Response Plan Components

The Drought Response Plan consists of four interrelated sections:

- **Triggers**—This section specifies the reservoir levels that activate four distinct stages of drought.
- **Drought Response Program**—This section provides guidelines for augmenting water supplies and reducing water use during times of drought.
- **Public Outreach**—This section outlines options for seeking customer suggestions and involvement in decisions, as well as methods to keep customers informed before, during and after a drought.

- **Internal Communication**—This section presents a process for keeping all Denver Water employees up-to-date on drought conditions and on the drought response measures adopted by the Board.

Defining Drought

Drought is a normal, recurrent aspect of climate. Droughts occur in virtually all climatic zones, though their characteristics vary significantly from one region to another. When the amount of water flowing into streams and then into reservoirs is less than average, Denver Water will more closely monitor its water supply outlook. If continued low stream flows stress water supplies, Denver Water will work with customers to implement this Drought Response Plan.

Figure 1 depicts the variability of natural stream flows in Denver Water’s raw water collection system. Troughs in the plot indicate that droughts are a recurring natural phenomenon.

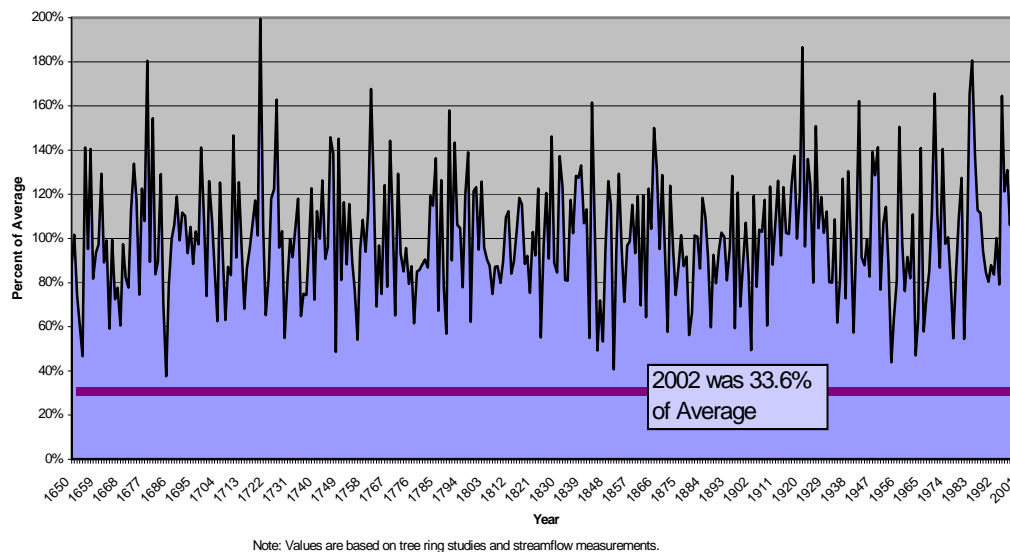


Figure 1. Natural stream flow in Denver Water’s collection system

Denver Water’s collection system is designed to dependably meet the needs of customers through hydrologic conditions similar to those of the past 50 years without supply shortages. Unfortunately, no one can predict how long drought conditions will continue once they begin. Timely response—neither too early nor too late—is Denver Water's goal.

Firm Yield

Denver Water defines the term “firm yield” as the estimated amount of water available to meet annual average demand without the need to restrict water use (Figure 2). A key word in this definition is "average" because, in practice, customers use more water in warm, dry weather than in cool, wet conditions (Figure 3). Furthermore, shifts in weather patterns can be substantial from year to year and decade to decade, affecting both water supply and water use.

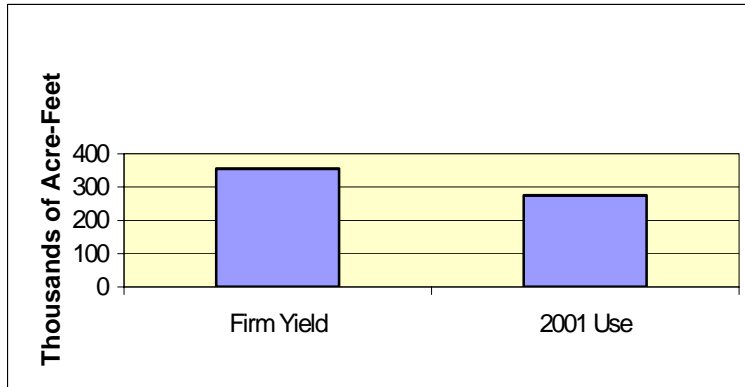


Figure 2. The firm yield of Denver's water system—estimated at 375,000 acre-feet per year—compared with 2001 use

Firm yield is an estimate rather than an exact calculation. Of the many factors that affect firm yield estimates, weather is perhaps the most inexact. If the Denver area experienced a drought more severe than any ever recorded, this could stress the water supply system even more than is accounted for in the estimated firm yield. Still, in relation to reasonable predictions based on a century of measured stream flows, the firm yield estimate appears to be a relatively safe, prudent way to view the water supply for drought planning purposes. **Although 2002 was the driest year on record for Denver Water's system, a recurrence of the multiyear drought that occurred in the 1950s would be worse than a recurrence of a single dry year such as 2002.**

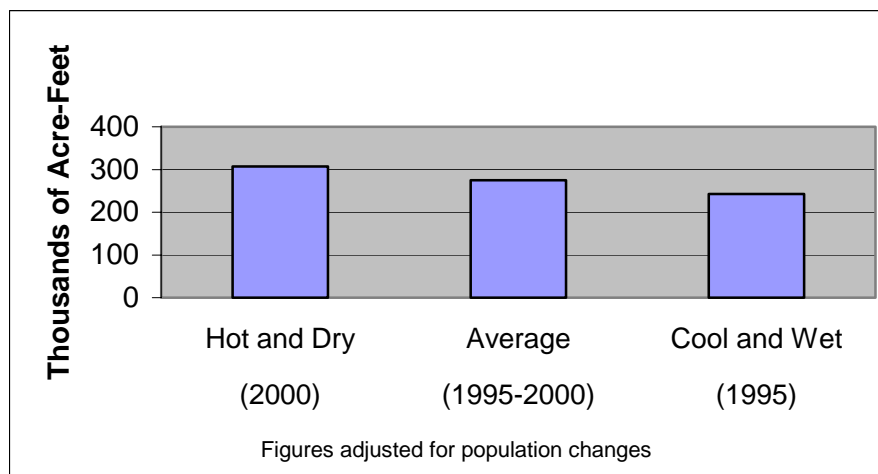


Figure 3. Effect of weather on water use

Long-term Conservation Efforts

On the whole, Denver Water's customers are conserving water. Denver Water first launched an aggressive program to promote water conservation in the mid-1970s. By 1979, the Denver Water Board had adopted a formal Water Conservation Plan and set goals for reducing water use.

To track water use and water savings, Denver Water looks at customer water demand over the years and compares these numbers with population growth in its service area. Figure 4 shows 20 years of comparisons. The two biggest dips, in 1983 and 1995, occurred in very wet years. The good news is that, on average, customers appear to be reducing water waste. The bad news is that much more effort—by customers and water providers—may be required to achieve additional reductions during a severe drought.

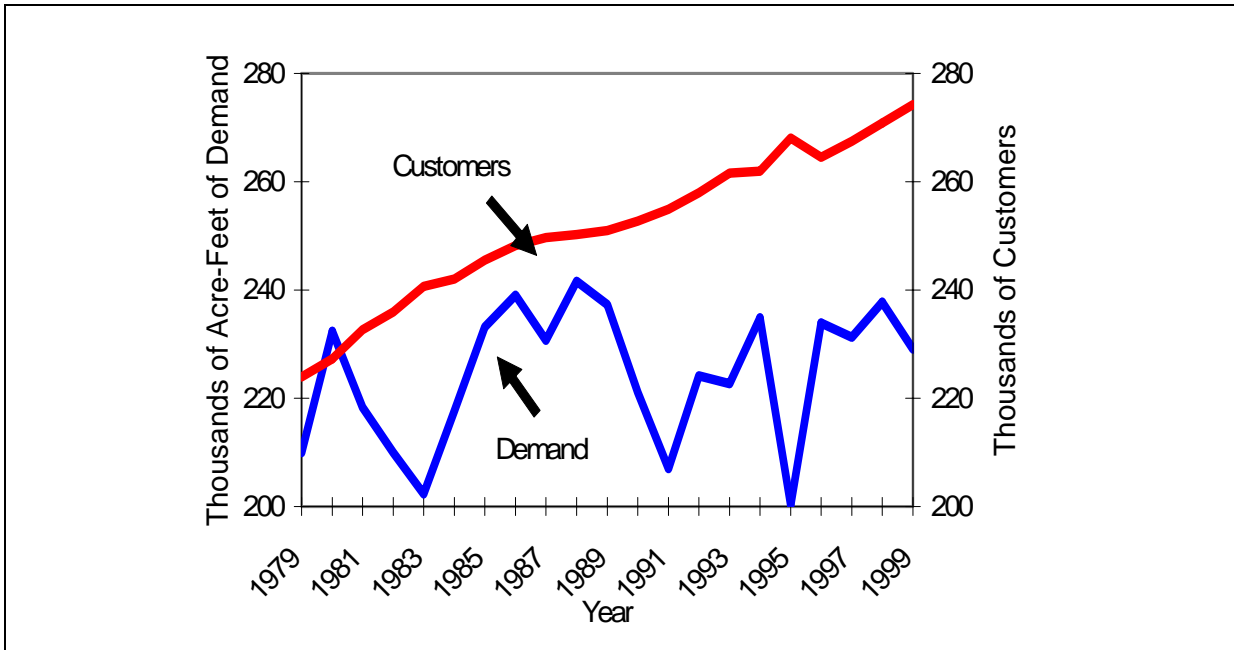


Figure 4. Customer water demand and population growth in Denver Water's service area (1979–1999)

TRIGGERS

TRIGGERS

The impact of drought can generally be divided into two categories: effects on water supplies and effects on society.

Drought affects our water supply, our customers, and many other aspects of our communities and environment. Monitoring these effects and deciding how to respond are critical activities under drought conditions. The impact of drought can generally be divided into two categories: effects on water supplies and effects on society. Water supply effects can be measured or estimated by scientific means, but societal effects are less tangible. Individual water customers are impacted by these intangible societal effects. Societal effects also have ramifications in the broader context of economics, politics, relations with surrounding communities, and the environment.

Societal Effects

How a drought affects individuals—plus public perceptions about how the drought should be addressed—will influence how customers respond to Denver Water’s calls to save water. The drought response activities of other water suppliers in the metro area, as well as news media and political responses, will also affect customer reaction. Although societal effects cannot be viewed in terms of simple formulas, they can be monitored and described for consideration in the Board’s decisions about drought response.

Response of Other Water Suppliers

Droughts affect the supplies of each metro area water providers in different ways. The northern suburbs with single watersheds may be better or worse off, depending on the localized effects of a drought. Other systems such as Aurora’s have less senior water rights and could be affected much sooner or more severely than Denver’s system. The Denver Water Board will weigh the importance of developing a unified metro-area response against the potential of restricting our customers’ water use either sooner or later than warranted by water supply conditions. As in 2002–2003, Denver Water will monitor the drought response decisions of other local water suppliers.

News Media Response

Much of the information customers receive about drought comes from the media. Members of the media can be very helpful in conveying factual information to customers, and they also play a key role in shaping public perception of drought. In 2002, for example, the media sometimes ignored or discounted the fact that the drought did not affect all metro-area water suppliers in the same way or to the same degree.

Political Response

Political response to the drought can take many forms and depends on the constituents affected. For example, the Board might be asked to save some of its water supply for use by providers with less reliable systems. Another example of a political response would be the reaction of other communities in Denver Water’s watershed to lowered water levels in nearby reservoirs.

Economic Impacts

Water restrictions imposed in response to drought affect businesses in different ways. In 2002–2003, some water-dependent industries, including landscape-related businesses and water bottling companies, felt that restriction programs unfairly affected them economically. As part of its public outreach efforts, Denver Water will continue to carefully coordinate restriction programs with these industries. **Denver Water also encourages water-dependent businesses to develop their own Drought Response Plans to guide them through periods of drought and restrictions.**

Environmental Effects

Reduced stream flows and lower reservoir levels caused by drought can affect the environment, recreation, fisheries, economic activity, and surrounding communities. As in 2002–2003, Denver Water will monitor stream and reservoir levels so that environmental effects are taken into account in drought response decisions.

Differences in Mountain and City Weather

City weather is considered in water supply forecasts, but weather in Denver Water’s mountain watersheds, which can differ considerably from that in the city, is the biggest single factor affecting our water supply. If conditions are dry in the city but wetter in the mountains, customer and media perception might be that drought is having a greater impact on supply than it actually is. The reverse could also occur, making it more difficult for customers to understand the severity of the drought. As during the 2002–2003 drought, Denver Water will monitor the difference between city weather and mountain watershed weather.

Long-Range Weather Forecasts

Denver Water’s drought response may differ depending on whether long-range weather forecasts indicate a prolonged drought or a short-term dry period.

Water Supply Triggers

Because most of the water supply during drought comes from storage reservoirs, reservoir levels are the best indicator of a drought’s impact on supplies. **Reservoir levels are the “bottom line” result of most of the factors affecting supply—including weather, snowpack, soil moisture, runoff, water rights, bypass requirements (minimum stream flows required after diversion points are passed), collection system limitations, and water use.** In the overall water storage picture, normal or generous stream flows (and thus higher reservoir levels) in one area of the water system can compensate for poor stream flows (and lower reservoir levels) in another. Customers benefit from a water system that is flexible enough to take advantage of circumstances such as these.

The water supply triggers that most heavily influence drought response are the storage levels forecast for July 1. Forecasts for July 1 are used because water storage in the Denver Water system usually reaches its maximum by this date each year; most of the snowpack has melted, and the high-water-use days of summer are ahead.

Denver Water will make its first official assessment of whether to declare a drought as soon as staff members can predict with reasonable certainty the total amount of water that will be stored in Denver’s reservoirs on July 1.

July 1 storage levels are forecast during the first weeks of February, March, April, May and June. Predictions are based on measurements of snowpack, stream flows, and the amount of water already in storage on the forecast date. Obviously, the ability to predict July 1 storage improves as that date approaches. Typically, forecasts of July 1 reservoir storage do not begin to be reliable until the April forecast. Thus, Denver Water would not declare a drought before April except under unusual circumstances.

Once a drought is declared, Denver Water will carefully watch day-to-day changes in stream flow, snowpack, precipitation, temperature, and water use until the drought is over.

If conditions change after a drought has been declared, the declaration can be lifted or the level of drought response can be adjusted. Denver Water’s drought response decisions must be adequate to deal with the lack of water without causing unnecessary hardships for its customers. The downside of starting restrictions in the spring is that wet spring weather can quickly extinguish the need for restrictions.

The following triggers are recommended as signals to declare a drought:

If predicted or actual		the declaration would be . . .
July 1 storage is less than . . .		
80 percent full >>>>>		Stage 1 Drought
65 percent full >>>>>		Stage 2 Drought
40 percent full >>>>>		Stage 3 Drought
25 percent full >>>>>		Stage 4 Drought

The threshold for declaring a drought—reservoir storage at 80 percent—was chosen for two reasons. The first reason: 80 percent is the amount of water that, with increasingly cautious use over time, is projected to see Denver Water’s existing customers through a drought more severe than they experienced in the 1950s. The second reason is to avoid inconveniencing customers more often than necessary. **As growth occurs or firm yield estimates change, this threshold may need to be changed.**

Here is an example of how the process of drought assessment works. If in April of a given year, Denver Water predicts its reservoirs will be 90 percent full on July 1, declaring a drought would not be recommended.

***April prediction of July 1 storage: 90% full
No drought declaration
Continue monitoring conditions***

But suppose that May is unusually dry and the June prediction of July 1 storage drops to 78 percent full. In this case, Denver Water would likely recommend declaring a Stage 1 Drought.

June 1 prediction of July 1 storage: 78% full
Declare Stage 1 Drought
Take appropriate actions (see Stage 1 Drought Response)
Continue monitoring conditions: revise response level if conditions warrant

If the supply situation becomes significantly worse, the drought declaration would likely be changed to Stage 2. Generous rain, on the other hand, would likely cause the drought declaration to be lifted.

Triggering Action: To Wait or Not To Wait?

Denver Water staff spent a great deal of time analyzing and debating the advantages and disadvantages of taking early action in response to a possible drought versus delaying action until drought conditions are more clear. Tradeoffs are shown in Table 1.

Table 1. Tradeoffs of early versus delayed action in case of possible drought

Early Action	Delayed Action
Customers are frequently asked or required to reduce water use.	Customers are infrequently asked or required to reduce water use.
Reservoirs stay relatively full.	Reservoirs are less full.
A severe drought can be withstood before storage water runs out.	A less severe drought can be withstood before storage water runs out.

A primary focus in the debate over early action versus delayed action was the potential hardships caused by reducing water use and drawing reservoir storage to lower levels. Reducing water use could affect metro-area businesses and damage water-intensive landscapes. Low reservoirs reduce or prevent recreation, affect the environment and create aesthetic problems. In the final analysis, Denver Water staff judged proposed storage levels and drought responses on the basis of three questions:

- **How severe a drought could Denver Water withstand with a range of potential storage levels?**
- **With these storage levels, how often and to what degree would customers be asked to reduce water use?**
- **How low would storage levels get?**

To answer these questions, the staff used the following assumptions:

- Current average annual demand is 285,000 acre-feet.
- Current annual firm yield is 375,000 acre-feet.
- Through close cooperation, Denver Water and its customers would cut annual water use by 10 percent during a Stage 1 Drought, 30 percent during a Stage 2 Drought, 50 percent during a Stage 3 Drought, and 66 percent during a Stage 4 Drought (Table 2). Water use reductions were estimated on the basis of how customers use water during normal periods and how they have used it during past dry periods.

Table 2. Triggers and water use reduction goals for four stages of drought

Reservoir Storage	Drought Stage Declared	Water Use Reduction Goal
80%	Stage 1	10%
65%	Stage 2	30%
40%	Stage 3	50%
25%	Stage 4	66%

How severe a drought can the Denver system withstand?

The proposed trigger levels would enable Denver Water and its customers to endure a drought more severe than the 1950s drought. So far, the current drought has not stressed Denver Water’s supplies as much as a recurrence of the 1950s drought would. At the current level of water use, adopting the trigger levels proposed in Table 2 would enable Denver Water to withstand approximately four consecutive 2002-type drought years before depleting storage. If the Board chooses to maintain this level of system reliability as the population in Denver Water’s service area grows, the recommended water-savings goals will need to be increased.

How often and to what degree would customers be asked to cut water use?

At current water supply and water use levels, the triggers delineated in this plan would result in Denver Water’s customers having no water use restrictions about 90 percent of the time. During the other 10 percent of the time, Stage 1 or Stage 2 restrictions would be in effect. As water demand increases with population growth, Denver Water expects drought declarations to occur more frequently. System maintenance or repair activities that temporarily take a storage or conveyance system out of service could prevent Denver Water from storing all available water and thus make drought declarations more likely.

Risk Associated with Forecasts

Sometimes a drought appears to be at hand, but Mother Nature has other ideas. Figure 5, for example, shows what happened in the South Platte River Basin in 1995. The South Platte basin is a major source of Denver Water’s supply. From February through mid-April of that year, water supplies from this source were below normal and drought conditions looked probable. The situation changed, however, as a result of higher-than-average precipitation during late April and most of May.

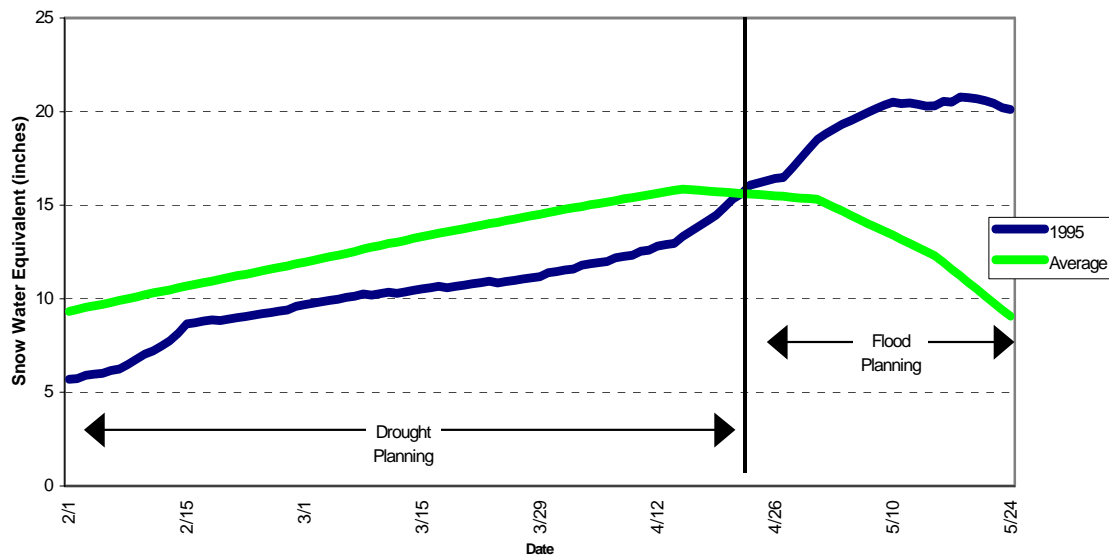


Figure 5. *Snowpack in the South Platte River Basin—1995*

Unfortunately, Denver Water is no better at predicting weather than anyone else. Forecasting a drought—and even knowing with certainty if one exists—can be difficult. When a dry year occurs, for example, we don’t know whether we are in the first year of a three-, five- or ten-year drought or merely in a dry year somewhere in a series of average-to-wet years. Even though droughts cannot always be predicted, customers will be kept advised of the latest information on Denver Water water supplies so they may take this into account in their own planning.

DROUGHT RESPONSE PROGRAM

DROUGHT RESPONSE PROGRAM

As reservoir storage declines, efforts to reduce water use or to add to water supplies increase.

Denver Water's Drought Response Plan consists of two components—the **triggers** that signal which stage of drought should be declared and the corresponding **responses** recommended for each stage. The plan delineates four stages of drought severity; each stage is based on the percentage of storage expected in Denver Water's reservoirs at the end of the runoff season on July 1. For each stage, progressively more stringent responses are recommended.

As reservoir storage declines, efforts to reduce water use or to add to water supplies increase. Some drought response measures, particularly those designated for mild episodes of drought, require minimal customer effort. Measures become mandatory, more costly, and sometimes intrusive as drought progresses. Basically, the recommended response to a Stage 1 drought is voluntary measures; to a Stage 2 drought, mandatory restrictions; to a Stage 3 drought, prohibitions on lawn watering; and to a Stage 4 drought, rationing of water supplies for essential uses.

To activate a particular drought response, the Board of Water Commissioners declares a drought of specific severity and adopts an effective date for imposing applicable restrictions. Because Stage 2 and Stage 3 droughts involve mandatory restrictions, they are incorporated into Denver Water's Operating Rules and become enforceable pursuant to the Denver Charter, the Denver Revised Municipal Code and provisions in Denver Water's water service agreements and water leases. Chapter 19 of the Operating Rules contains the restrictions that apply during a Stage 2 or Stage 3 drought, as declared by the Board.

In September 2003, Denver Water commissioned a survey to gauge customer attitudes toward the drought. This survey, conducted by a professional marketing company, is included in the technical appendix. Results of this survey were used to refine Denver Water's response to drought. The drought measures discussed in this section reflect the attitudes and current conditions of customers, as documented in the customer survey.

Drought Response Within Master Meter Districts

Water service provided by Denver Water within master meter districts is governed by the Operating Rules, including Chapter 19. Under master meter water service agreements, master meter districts retain the right to make and enforce their own rules that are not inconsistent with the Operating Rules; these districts also agree to exercise their powers to assist Denver Water in enforcing the Operating Rules.

Increasing Water Supply

In addition to managing water use during a drought, Denver Water will try to augment its supplies by gaining access to other sources. Each augmentation option presents unique intergovernmental and technical issues and must be considered individually. Some of the possible options are described here.

Call back water rights that we allow others to use. Under contract, Denver Water allows ranchers to divert its Williams Fork water rights into the Big Lake Ditch. Under certain contract conditions, Denver Water may prevent the ranchers from diverting this water, allowing more water to flow into Williams Fork Reservoir and increasing the yield from Dillon Reservoir.

Pay another water user downstream of a Denver Water diversion point to not place a river "call." A river call is an administrative mechanism used by the owner of a senior downstream water right to prevent or reduce water use by the owner of a junior upstream water right. One example of this alternative is Denver Water's contractual option to pay Xcel Energy, the public service company, to not place its Shoshone Power Plant "call" on the Colorado River. Without the Shoshone call in effect, Denver Water might be able to divert more water during a prolonged drought.

Seek waivers of minimum bypass requirements. Denver Water must allow minimum amounts of water to pass beyond some of the locations where it takes water out of a river or stream. By contract, some of these minimum amounts can be reduced during a drought.

Develop Groundwater. Denver Water is in the process of obtaining the legal right to use the nontributary groundwater (groundwater not hydraulically connected to a stream) that is stored in aquifers deep beneath our city. Once this right is granted, Denver Water could drill wells to gain access to this water. This well water is not available for current supply needs.

Pump water not available through gravity flow. Normally, water flows from reservoirs and other water storage facilities by means of gravity. Sometimes water in the lower portions of these facilities is at a level below the pipe that carries the water to a treatment plant. Pumps could be used to pull this water up and into the transmission pipe.

Implement legal clauses allowing reservoir storage to be drawn below minimum levels. At Chatfield Reservoir, for example, Denver Water is legally permitted to draw the water level below its normal minimum during a drought that is considered severe.

Decreasing Water Demand

Denver Water's primary response to drought is to manage water use so that supplies will be available for the most essential uses during the drought's duration. During the 2002 and 2003 periods of water restrictions, we learned that no single approach was effective at encouraging all customers to reduce their water use. The concept of a "basket of programs" proved more effective at creating an overall atmosphere that promotes water savings. These five programs include restrictions, surcharges, enforcement, incentives, and monitoring and evaluation.

Restrictions

Once the Board has declared a drought, Denver Water will activate the corresponding set of recommended responses. Denver Water's goal for drought response is to preserve the quality of public life and economic activity to the extent possible in the face of water shortage. In 2002, the Board adopted policy guidelines for developing a drought restriction program. Denver Water will follow these principles in restricting water use during a drought.

Avoid irretrievable loss of natural resources.

- Allow watering of irreplaceable trees.
- Avoid killing perennial landscaping if possible.
- Tailor water restrictions as much as possible to known landscape needs.

Restrict less essential uses before essential uses.

- Restrict water use for misters, fountains and other aesthetic water features first.
- Avoid using water as a substitute for something else (for example, cleaning impervious surfaces or washing personal vehicles).
- Curtail outdoor water use (except for watering trees and shrubs), along with restrictions on commercial use, before restricting domestic indoor use.

Affect individuals or small groups before affecting large groups or the public as a whole, allowing as much public activity as possible to be unaffected.

- Preserve community pools rather than residential pools.
- Restrict golf courses before public parks.
- Restrict water use on less heavily used areas of parks where grass can go dormant before restricting use on formal and informal playing fields, where recreational activity would either kill the grass or have to be prohibited.

Minimize adverse financial effects.

- Try not to put people out of business, although businesses that depend on purely discretionary water use will be affected.
- Restrict seasonal commercial use, which is likely to be outdoors.
- Restrict nonessential uses of water in businesses before affecting fundamental business functions.
- Work with large-volume water users to reduce use in the least disruptive manner.
- Engage in ongoing dialogue with the green industry to obtain input and allow these businesses to plan for future months.

Eliminate waste.

- Enforce restrictions and permit limitations in an effective manner.
- Adopt restrictive criteria for exemptions from restrictions.
- Discourage or prohibit irrigation of medians.
- Prohibit installation of new landscaping if its survival next season is in doubt.
- Develop incentive programs to promote savings.
- Perform audits to identify water waste and recommend solutions.

Adopt extensive public information and media relations programs.

- Inform customers about the problems caused by drought and what they can do to help.
- Hold and attend public meetings as necessary to receive input.

Surcharges

During drought conditions, Denver Water will be forced to confront three potentially conflicting objectives: (1) to quickly reduce the volume of water used by its customers, (2) to maintain adequate revenues to meet its financial obligations, and (3) to address the opposing needs of existing demand and growth. Drought pricing can be an effective tool in managing these objectives, and drought surcharges must be considered as part of an overall demand

reduction and financial stabilization program. Denver Water will consider several guiding principles in developing surcharges.

There is a relationship between price and demand. In theory, customers respond to an increase in price by reducing demand. The question is at what price level will the customer respond? The answer varies based on a number of factors.

Surcharges will be incorporated into an overall program to increase customer awareness of the drought's severity and the importance of saving water. Customers respond to the “basket of programs” concept, which includes surcharges. Drought pricing plays a role in creating an environment in which customers recognize the importance of reducing water use.

Surcharges may apply to current water demands, new taps, or other demands on the water supply. There is concern about issuing new taps when existing customers are subject to surcharges. Applying various forms of surcharges to different types of demands on the water supply provides an equitable method allowing all customers to share the burden of the reduced supply.

Surcharges are less effective by themselves. Industry studies and Denver Water’s own customer surveys indicate that surcharges are more effective at reducing water use when combined with other restrictions to create an atmosphere that promotes water savings. Customer response to price signals varies depending on several factors such as affluence, billing frequency, and the normal cost of water. Empirical data show that customers respond to temporary water pricing strategies as part of a water savings environment.

Surcharges are separate from rates. Rates are based on cost. They are established to recover particular kinds of costs specified by the Denver City Charter. The purpose of drought surcharges, on the other hand, is to raise awareness of the value of water, to reduce water use, and to penalize those who don’t comply with drought restrictions. These goals are better accomplished when surcharges are implemented as a temporary measure outside the cost-of-service rate structure.

Surcharges should match the severity of the drought. Because every drought is different, each one may require a different set of responses. Surcharges must be structured to help create an atmosphere of appropriate water savings.

Surcharges must be feasible for computer systems to handle. Denver Water must be able to respond to drought conditions quickly and efficiently. Any change in water use charges must be manageable with only moderate modifications to existing computer systems. Substantial changes reduce response times and contribute to errors. Because internal coordination is critical, staff members from Customer Service, Information Technology, Accounting, and other relevant sections will be included in discussions of surcharge options.

Surcharges should be tailored for different customer groups and monitored for effect. A one-size surcharge does not fit all. Commercial and industrial customers use water differently from residential customers. Large-volume public use customers may need some accommodation. The surcharge structure must be flexible enough to promote water savings while still addressing diverse customer needs.

Surcharges should reflect overall drought response philosophies. Because all surcharge structures divide customers into groups, no surcharge structure is 100 percent “fair.” Some customers may pay a surcharge even if they comply with the other restrictions. In addition to raising awareness of the value of water and encouraging temporary reductions in use, surcharges can supplement revenues if necessary.

Surcharges may need to be seasonally adjusted. In Colorado’s semi-arid climate, water use is greater in summer than in winter. Outdoor use is more discretionary than indoor use, and surcharges should be adjusted to assist in maintaining a water savings environment. Because restrictions to reduce indoor use are difficult to design, adjusting surcharge thresholds can be more effective at monitoring and reducing indoor water demand in winter.

Public input and information are key to customer understanding of surcharges. When surcharges are designed and implemented, the public must have adequate opportunities for input, the surcharge must help create an atmosphere of water savings, and the public must receive adequate information to fully understand the surcharge program.

Surcharges are temporary measures. The criteria that determine when surcharges will be lifted should be specified before the surcharges are imposed. This will reinforce the temporary nature of the surcharge in the minds of customers.

Equity issues related to removing the surcharge should be addressed in advance. The specified conditions leading to termination of surcharges do not always occur at the end of a billing period. Criteria for lifting the surcharge once the specified conditions occur should be considered ahead of time.

Enforcement

The enforcement program is designed to support the water use and drought restriction rules, as described in Chapters 12 and 19 of the Operating Rules. Drought monitoring staff will patrol Denver Water’s service area to identify customers who are not complying with the rules. The primary mission of the drought monitors is to help customers comply. Drought monitors will hand out educational materials, help customers operate their irrigation systems, and answer questions about the drought response measures. Violators may receive written warnings and may be fined for repeat violations. Flow restrictors may be installed at properties with serious repeat violations.

Philosophy: drought monitors want to help customers comply, not just penalize violators. The goal is to use education to help customers save water.

Recruitment. A drought monitor’s only responsibility is to enforce the drought response measures. Temporary employees will be recruited for this function, and those hired must be able to interact with the public and communicate the drought restrictions. Thorough background checks are required.

Training. Drought monitors will undergo an intense training program to prepare them to patrol the service area. Dispatchers and data entry staff will participate in the training program, which will address:

- Dealing with irate customers

- Reading meters
- Understanding the drought restrictions
- Operating irrigation systems
- Passing driving tests
- Knowing the boundaries of their patrol area
- Understanding the data entry equipment

Documentation. Drought monitors will use hand-held data entry devices that allow them to issue tickets in the field. This system will keep track of the number of violations for each customer and enable the drought monitor to ascertain the appropriate-level violation. Drought monitors will also keep track of stops that did not result in a ticket or written warning but were merely educational in nature.

Appeals. Any person subject to a charge for violating a drought restriction may appeal, as stipulated in Chapter 19 of the Operating Rules. Although the customer must pay the water bill by its due date, the disputed charge will be credited on the next bill if the appeal is approved.

Incentives

A program of incentives will be designed to encourage immediate reductions in water consumption. This program may or may not be an extension of Denver Water's long-term water conservation program and may include such features as:

- Rebates
- Contests
- Drought Hero Awards
- Landscape clinics
- Conservation kits.

Monitoring and Evaluation

When the Denver Water Board declares a drought, the staff will intensify its monitoring and evaluation activities. The monitoring and evaluation program will track water savings and compare them with normal use and weather-adjusted expected use. If water use is not being reduced, modifications to the Drought Response Plan may be recommended.

Historical demand. Denver Water will compare water use during the drought with historical, population-adjusted average use. Comparing water use trends helps Denver Water plan for water use during various seasonal periods. These comparisons can also be used to predict expected water savings.

Weather-adjusted demand. Customers' water use patterns during the irrigation season are significantly correlated with weather. Denver Water has developed a weather model to track typical water use under actual weather conditions and in the absence of restrictions.

Reservoir levels. Denver Water always monitors its reservoir levels. During a drought, reservoir storage levels are included in weekly reports because they are the determining factor when the status of a drought is evaluated.

Tracking forecasts. Denver Water has developed a model to predict spring runoff based on factors that affect supply (weather, snowpack, soil moisture, runoff, water rights, bypass

requirements, collection system limitations, and water use). Denver Water tracks three forecasts: one for average conditions, one for wet conditions, and one for dry conditions. The wet and dry conditions used in the model have a 10 percent probability of being exceeded.

Snowpack readings. When first snow falls in Denver Water’s watersheds, staff members begin to collect snowpack readings. These readings convert snowfall depth into equivalent measurements of water.

Precipitation. Spring weather has a significant impact on runoff into reservoirs and thus on the health of landscapes in Denver Water’s service area. Denver Water continuously collects precipitation data from weather stations in its watersheds and in its service area.

Monthly Financial Updates. The Finance Division will provide monthly updates on Denver Water’s billed revenue and budget status.

Use of Water Not Provided by Denver Water

Some customers may have access to water sources that are not owned, controlled or provided by Denver Water. Though the use of such water during a Stage 2, 3, or 4 Drought is not under the direct control of Denver Water, the following rules apply to the owner or occupant of a licensed premise using non-Denver water. Failure to comply with these rules will be deemed a violation of drought restrictions under Denver Water’s Operating Rules.

To ensure that the water is, in fact, not Denver Water’s, the customer shall provide certification of the source of the water and demonstrate that the water is being used in compliance with any legal restrictions on the use of water from that source.

To avoid confusing the public, any premises where non-Denver water is being applied shall display prominent signage indicating that Denver Water is not supplying the water.

To avoid potential contamination of Denver Water’s potable water supply system, any irrigation or other system using non-Denver water shall be physically disconnected from Denver Water’s potable system. In addition, the Denver Water service line providing potable water to the premises must include an approved backflow prevention device, and the customer must execute a Dual Water Supply Agreement with Denver Water.

To prevent water waste, which could increase the customer’s need for Denver Water’s supplies, irrigation with non-Denver water shall be prohibited during the hours from 10:00 a.m. to 6:00 p.m.

Stage 1 Drought Response

July 1 Storage Trigger: Reservoirs less than 80% full

Use Reduction Target: 10%

Description

A Stage 1 Drought is triggered by actual or forecast July 1 reservoir storage of 80 percent. This stage is meant to warn customers that water levels are significantly below average and continued dry weather could trigger a Stage 2 Drought. Recommended responses to a Stage 1 Drought include:

- Set the tone for a dry irrigation season.
- Reduce water demand to prevent progression to a Stage 2 Drought.
- Request that customers voluntarily reduce their water use by 10 percent.
- Enact the Stage 1 Drought restriction clause in contracts.
- Warn of and prepare for a Stage 2 Drought.

As a part of responding to a Stage 1 Drought, Denver Water will:

- Acquaint customers with measures they can expect if the drought continues or intensifies.
- Invite public discussion on water use priorities and ways to cut water use.
- Contact special interest groups that use large volumes of water (for example, water recreation groups) to get their ideas and support.
- Publish suggestions for temporarily reducing water use.
- Require master meter water distributors to activate similar programs with their customers.

Denver Water's Drought Response Committee will monitor drought conditions and evaluate the effectiveness of the Stage 1 Drought response. Recommendations for adjusting the response will be submitted to the Board of Water Commissioners.

Voluntary Restrictions

Restaurants

Restaurants and catering businesses will be asked to voluntarily restrict serving water with meals except at the customer's request.

Lodging

Lodging establishments will be asked to voluntarily reduce the frequency of sheet changing for guests staying more than one night, except for health or safety reasons. Food service operations in lodging establishments will be asked to voluntarily restrict serving water with meals except at the customer's request.

Irrigation

Customers will be asked to voluntarily reduce outdoor water use, using their own methods and Denver Water's suggestions.

Watering during the heat of the day is less efficient than watering during the morning and evening hours because of water losses through evaporation. To minimize water waste, watering is prohibited between the hours of 10:00 a.m. and 6:00 p.m. In addition, all permissible watering shall be conducted without any water waste (for example, avoid runoff on driveways or sidewalks).

Water Budgets for Large-Volume Users

Customers in the High Public Use category shall manage water use in a way that reduces their seasonal water use by 10 percent.

Surcharges

A surcharge program may be designed to help achieve overall water reduction goals.

Fixed–Amount Water Contracts

Water deliveries to customers who receive untreated water, nonpotable water or potable water under fixed-amount contracts will be restricted as follows:

- For agreements with provisions allowing reduced deliveries under drought conditions, the amount delivered shall be reduced by 10 percent.
- For agreements with provisions requiring the lessee to adopt the same or similar water use restrictions as Denver Water, the lessee shall implement the water use restrictions adopted by the Board.
- For agreements without these provisions, the Board may adopt drought surcharges or other methods to reduce water consumption outside Denver as necessary to provide an adequate supply of water to the people of Denver.

Stage 2 Drought Response

July 1 Storage Trigger: Reservoirs less than 65% full

Use Reduction Target: 30%

Description

A Stage 2 Drought is triggered by actual or forecast July 1 reservoir storage of 65 percent. When July 1 reservoir levels are forecast at or below 70 percent, Denver Water will begin planning for a potential Stage 2 Drought. The staff may recommend activating a Stage 2 Drought response at a reservoir storage level of higher than 65 percent, depending on drought conditions and other indicators. A Stage 2 Drought imposes mandatory water use restrictions and requires a significant effort on the part of customers.

Mandatory Restrictions

Restaurants

Restaurants and catering businesses shall not automatically serve water with meals but may serve water when a customer requests it. Restaurants must comply with Denver Water's signage requirements to explain this restriction.

Lodging

Lodging establishments shall not change sheets more often than every four days for guests staying more than one night, except for health or safety reasons. Food service operations in lodging establishments shall not automatically serve water with meals but may serve water when customers request it. Lodging establishments must comply with Denver Water's signage requirements to explain these restrictions.

Turf Irrigation

Assigned times. Each turf zone shall receive no more than 15 minutes of irrigation on average on the assigned watering day. All irrigation control systems must be programmed or operated manually to limit irrigation to 15 minutes per zone on average. Any area irrigated by a sprinkler attached to a movable hose shall also be limited to 15 minutes of watering on average on the assigned watering day. The Board of Water Commissioners may by formal action establish a maximum total amount of time during which irrigation may occur at a single property.

Watering during the heat of the day is less efficient than watering during the morning and evening hours because of water losses through evaporation. To minimize water waste, watering is prohibited between the hours of 10:00 a.m. and 6:00 p.m. In addition, all permissible watering shall be conducted without any water waste.

Assigned days. Watering shall be limited to two days per week in accordance with the schedule outlined in Table 3.

Table 3. Landscape irrigation calendar under a Stage 2 Drought

Type of Property	Watering Days
Single-family residential properties with odd-numbered addresses	Saturday and Wednesday
Single-family residential properties with even-numbered addresses	Sunday and Thursday
All others (multifamily residential properties; homeowners associations; commercial, industrial and government sites)	Tuesday and Friday
Parks, schools, athletic fields	Monday

Irrigation of New Turf Sod

Denver Water will work cooperatively with the landscape industry and customers to achieve compliance with recommended new turf sod installation guidelines. Denver Water staff may also conduct spot inspections of point-of-purchase sites and installations to ensure adequate education of customers and appropriate soil preparation.

New turf sod installations may be watered daily for up to 21 days, but not between 10:00 a.m. and 6:00 p.m.

Irrigation of New Turf Seed

New turf seed applications may be watered daily at any time for up to 28 days. This exemption does not apply to over-seeding of existing lawns.

Water Budgets for Large-Volume Users

Customers in the High Public Use category will be required to manage water use in a way that reduces their seasonal water use by 30 percent. Turf watering restrictions will not apply to them, so long as they accomplish irrigation without water waste.

Irrigation of Trees and Shrubs

Trees and shrubs may be watered by means of a hand-held hose or low-volume nonspray irrigation on assigned watering days. From May 1 to October 1, trees and shrubs may not be watered between the hours of 10:00 a.m. and 6:00 p.m.

Irrigation of Flowers and Vegetables

Flowers, vegetables, and plantings in community gardens may be watered any day except Monday by means of a hand-held hose or low-volume nonspray irrigation. From May 1 to October 1, nonspray irrigation may not occur between the hours of 10:00 a.m. and 6:00 p.m.

Irrigation System Installation, Operation and Repair

An irrigation system may be operated outside the watering schedule for installation, repair or reasonable maintenance, so long as the system is attended throughout the period of operation and water waste does not occur. All irrigation control systems must be reprogrammed or operated manually to operate in compliance with the watering calendar.

Early Winterization and Spring Watch Programs

Outdoor lawn watering shall be prohibited between October 1 and May 1. Watering turf areas that are heavily used by the community—for example, athletic and playing fields, tees and greens at golf courses—is not prohibited but must be conducted without water waste.

Outdoor Nonirrigation Uses

Fountains and waterfalls. Customers shall be prohibited from operating any existing outdoor fountain or waterfall that sprays water into the air.

Outdoor misting devices. Operating outdoor misting devices shall be prohibited.

Vehicle Washing

Personal vehicles. Personal vehicles may be washed using only a bucket or a hand-held hose equipped with an automatic shutoff nozzle. From May 1 to October 1, personal vehicles may not be washed on Monday or between the hours of 10:00 a.m. and 6:00 p.m. From October 1 to May 1, personal vehicles may be washed without day-of-the-week or time-of-day restrictions.

Fleet vehicles. Vehicles used in commercial operations or fleets may be washed no more often than once per week, unless public safety requires more frequent washing, and only by means of a car wash or washing equipment certified by Denver Water.

Commercial car washes. Commercial car washes are subject to a certification program requiring implementation of industry best management practices to achieve a 30 percent water savings compared with the water use of nonrecycling car washes. Any commercial car wash that is not certified or in the process of becoming certified shall be deemed in violation of this provision.

Power Washing

Power washing by individuals. Using water instead of a broom or mop to clean outdoor impervious surfaces such as sidewalks, driveways and patios is prohibited, except when cleaning with water is necessary for public health or safety reasons or when other cleaning methods are impractical. Power washing that is permitted may occur only on the assigned watering days indicated in Chapter 19 of Denver Water's Operating Rules and not between the hours of 10:00 a.m. and 6:00 p.m., except for immediate health or safety reasons.

Commercial power washing. Commercial enterprises for which cleaning with water is an essential element of business are not subject to day-of-the-week or time-of-day restrictions but shall use only high-efficiency equipment certified by Denver Water and must assure that water waste does not occur.

Swimming Pools

No restrictions will be imposed on the on use or operation of swimming pools.

Surcharges

A surcharge program will be designed to support the water use restrictions and to help achieve overall water use reduction goals.

Fixed-Amount Water Contracts

Water deliveries to customers who receive untreated water, nonpotable water or potable water under fixed-amount contracts will be restricted as follows:

- For agreements with provisions allowing reduced deliveries under drought conditions, the amount delivered shall be reduced by 30 percent.
- For agreements with provisions requiring the lessee to adopt the same or similar water use restrictions as Denver Water, the lessee shall implement the water use restrictions adopted by the Board.
- For agreements without these provisions, the Board may adopt drought surcharges or other methods to reduce water consumption outside Denver as necessary to provide an adequate supply of water to the people of Denver.
- Any water delivered by Denver Water between May 1 and October 1 shall not be used for spray irrigation between the hours of 10:00 a.m. and 6:00 p.m.

Enforcement

The customer (owner or occupant of the property) shall be responsible for complying with drought restrictions and with the terms of any exemption granted. Those who violate any Stage 2 Drought restriction will be subject to penalties.

First Violation

The owner or occupant will be advised in writing that a monetary charge will be added to the water bill for subsequent violations.

Second Violation

The owner or occupant will be advised in writing, and a \$250 charge may be added to the water bill.

Third Violation

The owner or occupant will be advised in writing, and a \$500 charge may be added to the water bill.

Fourth and Subsequent Violations

The owner or occupant will be advised in writing, and a \$1000 charge may be added to the water bill. In addition, Denver Water may install a flow restrictor on the service line to remain in place during the irrigation season or may temporarily suspend service until the cause of the violation is corrected and all outstanding penalty and water service charges have been paid.

Stage 3 Drought Response

July 1 Storage Trigger: Reservoirs less than 40% full

Use Reduction Target: 50%

Description

A Stage 3 Drought is triggered by actual or forecast July 1 reservoir storage of 40 percent. A Stage 3 Drought imposes mandatory water restrictions on Denver Water's customers. Stage 3 Drought restrictions are severe and may result in significant damage to landscapes.

Mandatory Restrictions

Restaurants

Restaurants and catering businesses shall not automatically serve water with meals but may serve water when a customer requests it. Restaurants must comply with Denver Water's signage requirements to explain this restriction.

Lodging

Lodging establishments shall not change sheets more often than every four days for guests staying more than one night, except for health or safety reasons. Food service operations in lodging establishments shall not automatically serve water with meals but may serve water if a customer requests it. Lodging establishments must comply with Denver Water's signage requirements to explain these restrictions.

Turf Irrigation

Irrigation of turf shall be **prohibited**.

Irrigation of New Turf Sod

Irrigation of new turf sod shall be **prohibited**.

Irrigation of New Turf Seed

Irrigation of new turf seed shall be **prohibited**.

Water Budgets for Large-Volume Users

Customers in the High Public Use category will be required to manage water use in a way that reduces their seasonal water use by 50 percent. Turf watering restrictions will not apply to them so long as they accomplish irrigation without water waste.

Irrigation of Trees and Shrubs

Existing trees and shrubs may be watered by means of a hand-held hose or low-volume nonspray irrigation no more than once a week in accordance with the schedule outlined in Table 4. From May 1 to October 1, trees and shrubs may not be watered between the hours of 10:00 a.m. and 6:00 p.m. No new trees or shrubs may be planted.

Assigned days. Irrigation of trees and shrubs shall be limited to one day per week in accordance with the schedule shown in Table 4.

Table 4. Tree and shrub irrigation calendar under a Stage 3 Drought

Type of Property	Watering Day
Single-family residential properties with odd-numbered addresses	Saturday
Single-family residential properties with even-numbered addresses	Sunday
All others (multifamily residences; homeowners associations; commercial, industrial and government sites)	Wednesday

Irrigation of Flowers and Vegetables

Existing flowers, vegetables, and plantings in community gardens may be watered any day by means of a hand-held hose or low-volume nonspray irrigation. From May 1 to October 1, these plants may not be watered between the hours of 10:00 a.m. and 6:00 p.m. No new flowers or vegetables may be planted.

Irrigation System Installation, Operation and Repair

An irrigation system may be operated for installation or repair, so long as the system is attended throughout the period of operation and water waste does not occur.

Outdoor Nonirrigation Uses

Fountains and waterfalls. Customers shall be prohibited from operating any existing outdoor fountain or waterfall that sprays water into the air. No new outdoor fountain or waterfall may be put into operation during a Stage 3 Drought.

Misting devices. Operating outdoor misting devices shall be prohibited.

Vehicle Washing

Personal vehicles. Washing personal vehicles shall be prohibited except at commercial car washes certified by Denver Water.

Fleet vehicles. Vehicles used in commercial operations or fleets may be washed no more often than once a month, unless public safety requires more frequent washing. Fleet vehicles may be washed only by means of a car wash or washing equipment certified by Denver Water.

Commercial car washes. Commercial car washes are subject to a certification program requiring a 50 percent water savings compared with the water use of nonrecycling car washes. Any commercial car wash that is not certified or in the process of becoming certified shall close down its washing operations three days each week, as designated by Denver Water, in order to save water.

Power Washing

Power washing by individuals. Using water instead of a broom or mop to clean outdoor impervious surfaces such as sidewalks, driveways and patios is prohibited, except when cleaning with water is necessary for immediate public health or safety reasons.

Commercial power washing. Commercial enterprises shall clean with water only for health or safety purposes and shall use only high-efficiency equipment certified by Denver Water and assure that water waste does not occur.

Swimming Pools

Single-family residential pools shall not be filled or refilled. Operation of other pools will be permitted.

Hydrant Permits

Water obtained by means of a hydrant permit shall not be used to clean equipment or for any other use prohibited during a Stage 3 Drought.

Surcharges

A surcharge program will be designed to support the water use restrictions and to help achieve overall water use reduction goals.

Fixed-Amount Water Contracts

Water deliveries to customers who receive untreated water, nonpotable water or potable water under fixed-amount contracts will be restricted as follows:

- For agreements with provisions allowing reduced deliveries under drought conditions, the amount delivered shall be reduced by 50 percent.
- For agreements with provisions requiring the lessee to adopt the same or similar water use restrictions as Denver Water, the lessee shall implement the water use restrictions adopted by the Board.
- For agreements without these provisions, the Board may adopt drought surcharges or other methods to reduce water consumption outside Denver as necessary to provide an adequate supply of water to the people of Denver.
- Any water delivered by Denver Water between May 1 and October 1 shall not be used for otherwise permissible irrigation between the hours of 10:00 a.m. and 6:00 p.m.

Enforcement

The customer (owner or occupant of the property) shall be responsible for complying with the drought restrictions and with the terms of any exemption. Those who violate any Stage 3 Drought restriction will be subject to penalties.

First Violation

The owner or occupant will be advised in writing that a monetary charge will be added to the water bill for subsequent violations.

Second Violation

The owner or occupant will be advised in writing, and a \$1000 charge may be added to the water bill.

Third and Subsequent Violations

The owner or occupant will be advised in writing, and a \$1500 charge may be added to the water bill. In addition, Denver Water may install a flow restrictor on the service line to remain in place during the irrigation season or may temporarily suspend service until the cause of the violation is corrected and all outstanding penalty and water service charges have been paid.

Stage 4 Drought Response

July 1 Storage Trigger: Reservoirs are 25% full

Use Reduction Target: 66% reduction

Description

A Stage 4 Drought is triggered by actual or forecast July 1 reservoir storage of 25 percent. A Stage 4 Drought activates a rationing program for Denver Water's customers. **Conditions that would lead to a Stage 4 Drought are highly unlikely.** However, if combined reservoir storage falls below 25% full, Denver Water will implement a **rationing program** to ensure that customers receive water for essential uses for an indefinite period of time. No outdoor watering will be allowed, and indoor water use will be restricted. Stage 4 Drought restrictions are severe and will probably result in long-term damage to landscapes.

Mandatory Restrictions

Turf Irrigation

Irrigation of turf shall be **prohibited**.

Irrigation of Trees and Shrubs

Outdoor watering shall be limited to monthly tree watering.

Outdoor Nonirrigation Uses

Nonessential water uses shall be eliminated.

Indoor Water Use

A rationing program will be designed to minimize indoor water use.

PUBLIC OUTREACH

PUBLIC OUTREACH

If the Drought Response Plan is to be effective, Denver Water must communicate effectively with its customers. Drought affects a wide variety of water users, and Denver Water's ability to inform the public of the water supply situation will determine the success of the plan.

Communication During Drought

A communication program designed for a drought crisis involves three components:

- Public involvement
- Customer information
- Media relations.

These efforts will overlap somewhat, and some will be conducted simultaneously. For example, the news media will always provide the most immediate means of communicating with the public because their representatives will be present at every Board meeting to report any change in drought conditions or response measures as soon as they are announced. But Denver Water cannot rely exclusively on the media for communicating with customers because news stories cannot be guaranteed to cover information in sufficient detail. Denver Water must also have direct communication with our customers.

If the drought is severe and requires the Board to impose mandatory restrictions on water use or surcharges for higher levels of water use, public involvement efforts will be necessary along with direct notices to customers. Only a printed notice mailed to every customer can assure that customers have the information they need to comply with a set of restrictions. Designing a surcharge program requires at least one public meeting to sample public opinion about water use levels and charges.

Drought, like any other crisis, demands immediate and frequent communication with customers and with the public as a whole. During a drought, Denver Water will use all its means of communicating, including direct mailings to every customer, daily Web site updates, water bill inserts, electronic newsletters, announcements in neighborhood and homeowners association newsletters, the Speakers Bureau, public meetings, interest group meetings and consultations, Citizens Advisory Committee mailings and meetings, mass market advertising and media relations.

Outline for a Drought Communication Plan

Once the Board has identified a specific drought stage, Denver Water's Community Relations staff will develop an appropriate communications plan based on the elements specified in the Outline for a Drought Communication Plan.

February

- Select advertising agency to assist staff with mass media advertising campaign.
- Announce "Spring Watch" (voluntary ban on lawn watering), subject to Board decision.
- Promote relevant news story topics to media and respond to media inquiries.

March

- Begin developing message-of-the-week program.
- Reinforce voluntary ban on lawn watering.
- Board contracts with ad agency.
- Community Relations staff and agency begin work on campaign.
- Hold public meeting about surcharges.
- Promote relevant news story topics to media and respond to media inquiries.

April

- Begin disseminating message of the week.
- Reinforce voluntary ban on lawn watering.
- Promote relevant news story topics to media and respond to media inquiries.
- Board determines drought stage and corresponding drought response measures.
- Post drought stage and response measures on Web site.
- Intensify media relations.
- Community Relations staff prepares and mails notices to all customers.
- Board approves ad campaign.

May

- Disseminate message of the week.
- Ad campaign begins.
- Mail notices of drought response measures to all customers.
- Promote relevant news story topics to media and respond to media inquiries.

Customer Survey

In September 2003, Denver Water commissioned a survey to gauge customer attitudes toward the 2002–2003 drought. Focus group sessions were also conducted. The majority of survey and focus group respondents stated that Denver Water's response to the drought was "about right." Most participants supported restrictions, viewing them as a positive step in managing water use. Survey results showed that customers wanted Denver Water to initiate a strong response in times of drought. Most respondents agreed that restrictions during the 2002–2003 drought were easy to understand and that changes in the restrictions were not confusing.

Results of the survey influenced this Drought Response Plan and will continue to shape future plans. Further consultation with customers through surveys and other means may be required if future Drought Response Plans differ significantly from this one.

Communication with Interest Groups

Conservation and Community Relations staff and certain members of the Drought Enforcement Committee will continue ongoing discussions with groups that are particularly affected by drought restrictions, e.g., members of the green industry, car wash businesses and manufacturers. These groups will receive advance notice about any restrictions under consideration and will have an opportunity to articulate their positions at Board meetings.

Other Front Range Water Providers

Experience has shown that not all Front Range water providers face water shortages of the same severity and that each provider responds to shortages accordingly. What other water providers are doing can affect how customers perceive Denver Water's policies, and Denver Water's manager serves as its link to other water providers in the area. An open question is whether a meeting of all these utility managers could facilitate agreement on certain fundamental policies such as watering schedules and times. An effort to jointly sponsor a mass media campaign in 2003 was a limited success at best; some water districts lifted restrictions before the campaign was ready to begin, whereas others continued restrictions throughout the summer.

Comments from the Public

Community Relations staff will collect comments from the public through e-mail and telephone messages, compile and submit them to Board members at each Board meeting.

INTERNAL COMMUNICATION

INTERNAL COMMUNICATION

Communication among divisions is crucial to ensure that all activities at Denver Water support drought response efforts. Three committees will oversee implementation of the Drought Response Plan: the Drought Response Committee, the Executive Drought Committee, and the Drought Compliance Committee. During periods of drought, members of these committees will incorporate drought management as a crucial part of their jobs.

Conditions leading up to and during a drought change rapidly and unpredictably. To respond effectively, all Denver Water employees must receive timely and accurate information. Members of the Drought Ambassadors Program will disseminate drought information to all Denver Water employees.

Drought Response Committee

Drought Response Committee (DRC) members will manage the Drought Response Plan's implementation. They will meet frequently during droughts to coordinate efforts and to identify issues that need to be considered by the Executive Drought Committee. The DRC will select an internal drought coordinator to focus on all issues related to the potential drought and to lead overall drought response efforts.

Although other committee members may be added, the core committee should consist of the following staff members from specific Denver Water divisions:

Engineering Division

Coordinator of Recreation

Finance Division

Manager of Rates

Legal Division

General Counsel

Operations and Maintenance Division

Superintendent of Source of Supply

Manager of Water Quality

Planning Division

Manager of Water Resources

Manager of General Planning

Manager of Raw Water Supply

Public Affairs Division

Manager of Water Conservation

Manager of Customer Services

Manager of Community Affairs

Manager of Media Relations

Sales Administrator

Human Resources

Manager of Training

Executive Drought Committee

The Executive Drought Committee consists of Denver Water’s manager, senior staff and the internal drought coordinator.

Drought Compliance Committee

Enforcement managers, customer service representatives, and the internal drought coordinator will meet as needed to manage day-to-day implementation of the Drought Response Plan.

Drought Ambassadors Program

Denver Water employees live and work in the community and have daily contact with customers; thus they are all drought ambassadors. This role requires that all employees receive accurate and timely drought information. The Training Department staff, supported by members of the Drought Response Committee, will facilitate the dissemination of drought information to all Denver Water employees.

SUMMARY

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Though predicting exactly when a drought will occur is difficult, Denver Water wants its customers and stakeholders to understand drought conditions and challenges as fully as possible. Denver Water is committed to communicating with its customers about how much water needs to be saved and what specific methods must be used to achieve those savings. Although the Denver Water Board's drought response decisions will be based on specific circumstances during a drought and cannot be known with certainty ahead of time, this plan is intended to help Board members, staff, customers and stakeholders better prepare for eventual droughts.

Watching for Drought

If drier-than-normal conditions exist, public interest in the potential for drought may intensify before Denver Water is able to make a reasonably certain projection of July 1 reservoir storage. The effects of less snowfall, reduced reservoir storage and increased forest fire danger will already have generated a general awareness of the possibility of drought. In addition, other metro-area water suppliers may already have imposed restrictions on their customers.

In the early stages of a dry period, Denver Water will communicate that it is closely watching conditions throughout the water system and that it is ready to act when conditions specific to its water system and customers call for action.

Even if dry conditions do not eventually lead to declaration of a drought for Denver Water customers, the Public Affairs staff, as well as members of the Board and the Citizens Advisory Committee, need to be prepared with consistent information to field queries from the media, customers and recreation enthusiasts.