2025 Water Shortage Contingency Plan

Discussion Draft

This plan identifies actions to reduce water demand incrementally in response to conditions that range from routine conservation to catastrophic deficiencies. Disasters – earthquakes, wildfires, critical infrastructure failure, prolonged drought or supply contamination – can occur unexpectedly. Having a uniform plan helps to ensure all community members can stay safe, healthy and resilient during disasters or disruptions to the water supply.

Executive Summary

As one of Utah's hottest and driest regions, and one of the nation's fastest growing metropolitan areas, Washington County is vulnerable to impacts of reduced water supply and shortage. To prepare for emergency water shortage conditions, the Washington County Water Conservancy District (district) developed this Water Shortage Contingency Plan (plan). The plan was developed in partnership with its municipal partners to provide a collaborative system for prioritizing drinking water under circumstances of diminishing supply. The district's municipal partners are the cities of St. George, Washington, Hurricane, Santa Clara, Ivins, Toquerville, La Verkin, and the town of Virgin.

Additional stakeholders and an established task force (see Appendix A) were involved to help guide and inform the planning process. In addition, guidance was sought from more than 60 elected officials and technical experts through a survey instrument. The plan includes mitigation measures, drought monitoring, identification of shortage stages, response actions, a vulnerability assessment, operational framework, and an update process.

While drought is an ever-present threat in the region, other circumstances can result in water shortages, earthquakes, power interruptions or necessary infrastructure repairs can interfere with the ability to deliver water. The measures in this plan may be used to curtail demand in any scenario that diminishes the supply or distribution of water.

Mitigation Measures

The district and municipal partners have invested over $60 million in conservation measures and programs to reduce water demand, successfully reducing per capita usage by nearly 40% from the year 2000. The county's ongoing conservation efforts serve to increase shortage resiliency and mitigate impacts of water supply issues.

Drought Monitoring

The district developed a drought monitoring tool for identifying drought, quantifying conditions, and assessing severity. The monitoring tool consists of a drought model and dashboard. The drought model processes historical and current data to categorize water supply conditions into five numerical categories of increasing drought severity. These categories, or drought stages, will be directly linked to response actions. As this region moves from one stage to another, as defined in this report, the drought monitoring tool will update the drought dashboard and identify needed responses.

Water Shortage Stages

The five shortage stages range from "0" (normal conditions) to "4" (extreme shortage). The descriptors for each stage were carefully selected with consideration of public perception, and response actions were set to best communicate desired responses to varying shortage conditions. The response actions describe, in one word, how the district, its municipal partners, and the public should respond to the shortage stage.

WATER AVAILABILITY AND RESPONSE STAGES					
	Stage 0	**Stage 1**	**Stage 2**	**Stage 3**	**Stage 4**
	Normal	**Dry**	**Prolonged Shortage**	**Escalated Shortage**	**Extreme Shortage**
Response Stage	**Conserve**	**Caution**	**Concern**	**Alarm**	**Crisis**

Response Action Plans

Shortage response actions (actions) are directly linked to the stages, prioritized by severity. The actions align with necessary reductions in water consumption at each stage and are detailed for each response group.

Vulnerability Assessment

This assessment identifies areas of vulnerability in existing facilities, system capabilities, and water practices of the district and its customers. Additionally, the vulnerability assessment factors in climate, Utah state policy, supply, demand, and climate change.

Communication Plan

The task force will meet periodically to review technical information and make recommendations to the district's Board of Trustees, who will decide whether to announce a shortage stage change.

The district will coordinate with its municipal partners to provide information to the public via websites, social media and newsletters. Public outreach will extend to include press announcements, advertising, signage, and enhanced collaboration as necessary.

Plan Maintenance and Updates

The district will evaluate and update the plan every five years. Evaluation of the plan will focus on the accuracy of the shortage model and associated dashboard, response actions, and the communication plan.

Chapter 1 Plan Introduction and Background

Introduction

Washington County is Utah's hottest and driest region and one of the nation's fastest growing metropolitan areas. Population projections estimate a 155% increase in the county by the year 2060. The sole water source for Washington County's population centers, the Virgin River basin, is a small desert tributary prone to drought and climate variability that is fully appropriated. As the county approaches full utilization of its annual reliable water supply, the need for more stringent water resource management increases. Local municipal partners depend on the district to manage water supplies and provide for current and future use.

Background

To prepare for emergency shortage conditions and comply with Utah's water conservation requirements, the Washington County Water Conservancy District (district) developed this Water Shortage Contingency Plan (plan) in partnership with municipal partners that include the cities of St. George, Washington, Hurricane, Santa Clara, Ivins, Toquerville, La Verkin, and the town of Virgin.

This collaborative process designed a system for prioritizing drinking water under circumstances of diminishing water supply. A task force was developed to help guide this system, which included 18 technical experts from the district and its municipal partners (see Appendix A).

In developing the response actions described in Chapter 7, the district surveyed more than 60 stakeholders, including the elected council members, mayors and city managers of all municipal partners.

Elements

The plan was developed to include six elements: drought monitoring, vulnerability assessment, mitigation actions, response actions, operational and administrative framework, and plan development and update process.

Implementation

The task force reviews technical information and makes recommendations to the district's Board of Trustees. The board serves as the policy arm of the district and determines plan implementation.

The task force membership is comprised of representatives well-versed in water management and technical resources. The board is comprised of appointed officials who are policy and political decision makers.

Chapter 2 Vulnerability Assessment

The goal of the vulnerability assessment is to identify areas in which the district and its municipal partners are vulnerable to shortage. The assessment quantifies the impacts of climate change, drought, and water demand on supply.

Climate

The district is in an arid region subject to frequent and prolonged dry periods and is one of the fastest growing areas in the US. These environmental and demographic dynamics make it challenging to plan for, manage, and operate a water system. Climate uncertainty further compounds this challenge and presents additional vulnerabilities. Washington County is extremely vulnerable to shortage for the following primary reasons:

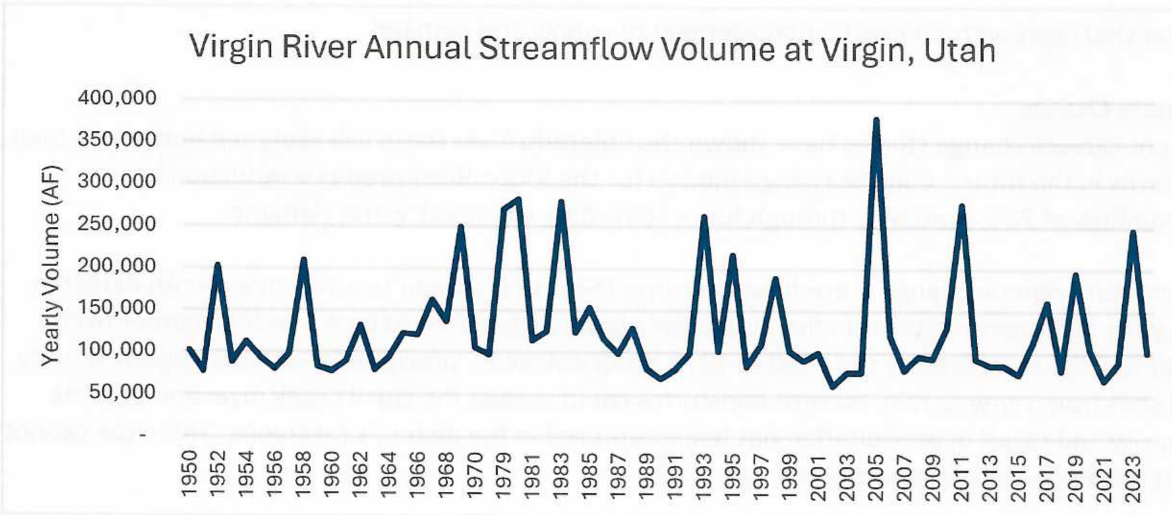
- Exclusive reliance on the Virgin River basin for its supply
- Prone to meteorological drought with long periods of drier than normal conditions
- Virgin River May-July streamflow is predicted to decline 20% based on the Bureau of Reclamation's 2014 climate change analysis
- County population growth has averaged nearly 3.5% per year over the past 10 years. Over that same period, Utah's growth was 2% annually
- Current annual water demand is approaching the annual reliable system supply

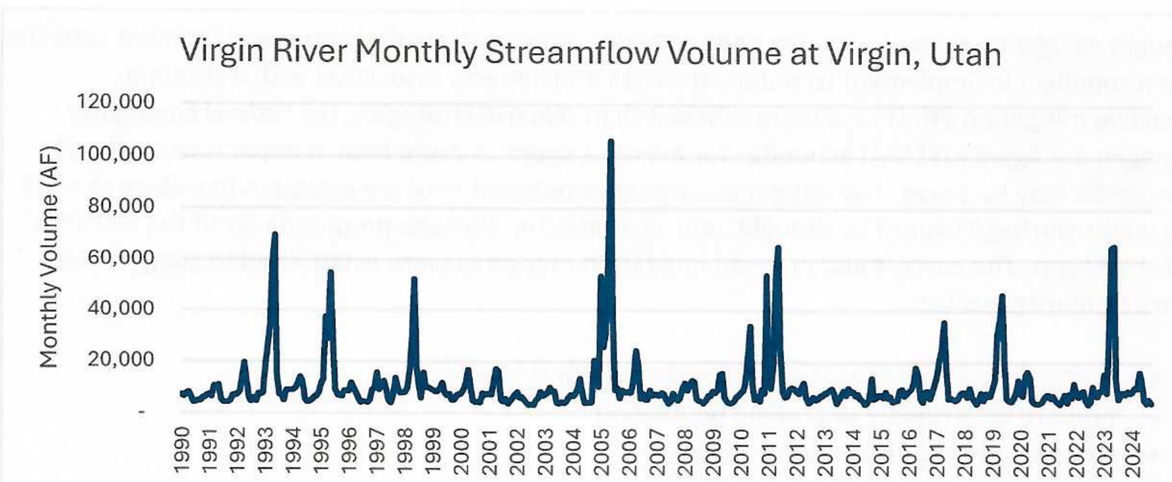
The district and the Utah Department of Natural Resources have taken a proactive approach to these challenges by frequently assessing water supplies, demand dynamics, and developing plans to improve resiliency. Visit wcwcd.gov for previous studies and reports related to this issue.

Water Supply

The district's water supply is approximately 80% surface water and 20% groundwater in the Virgin River watershed.

Surface water storage is highly dependent on annual flow in the Virgin River. Streamflow gage data for the Virgin River has shown a gradual decline over the past 100 years. While the precipitation, snowmelt and soil moisture that determine the amount of surface flow in the Virgin River are variable, there has been a demonstratable drop in available yield from this source over the last century.





Water Demand

The district is a wholesale water provider to its municipal partners. Based on the 2020-2024 five-year average, the current monthly demand for district water is 664 AF December through February and 3,562 AF June through September. The combined volume of water deliveries as reported by the district's municipal partners is 1,465 AF for the winter months and 2,503 AF for the summer months.

Drought History

Washington County is within a naturally drought-prone climate. The district's reservoir and groundwater supplies provide drought resilience; however, future climate models predict more extreme drought conditions in both magnitude and duration. Prolonged drought could result in water shortages without careful management of supply and demand.

Climate Change
Recent climate change studies have shown the Colorado River Basin will likely see hotter and drier patterns in the future. Climate change models for the Virgin River predict a reduction in streamflow of 20% from May through July – coinciding with peak water demand.

In addition, climate change is predicted to cause the runoff season to arrive one month earlier in the year. With temperatures in the Virgin River Basin anticipated to be 4.5 to 5°F warmer from 2050 to 2079 compared to the 1950 to 1979 historical mean, precipitation in Washington County will shift from snow to rain. Intense rainstorms could exceed the Quail Creek diversion pipeline capacity and result in precipitation not being captured in the district's reservoirs. This issue cannot be resolved by increasing water storage.

Chapter 3 Mitigation Measures

Drought mitigation refers to actions and strategies outside of regular water management activities that a supplier can implement to reduce the risks and impacts associated with a shortage. Proactive mitigation efforts are more efficient than reactive strategies: the Federal Emergency Management Agency (FEMA) estimates for every $1 spent to avoid known impacts of a natural disaster $4 may be saved. The mitigation strategies outlined here are intended to reduce the risk of a water shortage caused by drought and increase the shortage preparedness of the district's water systems. The current and planned mitigation measures were established to support the plan's primary goals to:

- Protect and extend the district's limited water resources
- Prepare for a rapidly expanding population
- Provide regional economic resiliency
- Preserve the natural environment
- Prolong the longevity of water infrastructure

All mitigation measures described are generally compatible with the district's Water Conservation Plan and Best Management Practices suggested by the Utah Division of Water Resources. These include current, in-progress, and future or planned mitigation strategies, which are broken down into two general categories:

Institutional Strategies: These are non-engineered, administrative or legal strategies that include economic incentives, education and outreach, and development standards. Mitigation measures in this category address water use.

Water Supply Augmentation Strategies: These are engineered strategies that address water supply by increasing the district's water supply resiliency to drought and water shortages. These may include the addition of new water sources, increased storage capacity, and expanded distribution systems for both potable and secondary supplies.

Current and planned institutional and watery supply augmentation mitigation strategies are highlighted below and described in more detail in the district's Water Conservation Plan, available on wcwcd.gov.

Summary of Current Shortage Mitigation Measures

	Mitigation Measures	Description
Institutional Strategies		
CURRENT	Tiered Water Conservation Rate	Increased charges for higher use customers to incentivize conservation
	Excess Water Use Surcharge	Accounts with excess water use are assessed substantial surcharges of up to $10/1,000 gallons
	Financial Incentives for Conservation Efforts	Includes incentive to install weather-based irrigation controllers, high-efficiency appliances, water-wise landscaping
	Education and Outreach	Provide education on outdoor water use to all citizens
	Water Loss reduction	Establish a Water Loss Management Committee to identify projects that will reduce non-revenue water throughout the system.
	New Development Standards	Coordinate with municipalities to enact new construction standards requiring water efficient fixtures and landscapes
	Advanced Metering Infrastructure (AMI)	Provide automated meter reading and data collection to inform property owner of use and mitigate loss to leaks; most municipal connections have AMI meters
Planned	Advanced Water Modeling	Refinement of the Virgin River Daily Simulation Model for increased real-time data on the impact of river changes on the overall water supply
Water Supply Augmentation Strategies		
Current	Aquifer Recharge at Sand Hollow Reservoir	Recharge of the Navajo Sandstone Aquifer by the Sand Hollow Reservoir to be stored and reserved for dry periods to supplement supply
	Reuse Facility at St. George Regional Water Reclamation Facility (SGRWRF)	The reuse facility filters and chlorinates effluent from the SGRWRF to Type I reuse for agricultural, commercial, and residential irrigation. Currently treats 7 MGD but can be expanded to 10.5 MGD
Plann ed	Additional storage, wells, and pipelines	Addition of several new wells, pipeline, and water storage to increase distribution system flexibility

	Treatment Plant Expansion	Expanding treatment plant capacity to capitalize on high flows to offset periods of drought
	Gunlock Groundwater Optimization Study	Study the Gunlock aquifer recharge and define the actual sustainable yield for water supply optimization
	Regional Reuse Purification System	Expand non-potable reuse so additional irrigation water can free up quality drinking water for potable use. Future treatment will purify reuse water for potable use
	System Connectivity Strategies	New system connections to add redundancy and reliability
	Lake Powell Pipeline Project	Utilize a small portion of Utah's water right on the Colorado River

Water Supply Augmentation Strategies

The district and its municipal partners have several projects underway that are intended to increase the resiliency of their water supply. These projects encompass both potable and secondary water supplies or distribution improvements including:

- Recharging the Sand Hollow Aquifer, adding 5,000 to 18,000 AF per year depending on available supply
- Adding additional groundwater storage tanks for the Cottam, Sand Hollow, Quail Creek and Sullivan wells
- Expanding well fields in the Cottam, Sullivan and Sand Hollow regions
- Creating additional surface water storage in reservoirs including Graveyard Wash, Chief Toquer and Kolob
- Expanding the Quail Creek Water Treatment Plant from 60 to 90 million gallon per day (MGD) plant
- Performing groundwater studies in the Gunlock region
- Developing a regional reuse purification system that will produce about 24,000 AF per year of additional supply
- Enhancing system connectivity between Toquerville Springs and the town of Virgin, and wells in the Sand Hollow region
- Constructing the Lake Powell Pipeline

Additional project information is available in the district's 2023 10-Year Capital Improvement and System Replacement Recommendations.

Planned Mitigation Measure Prioritization

Mitigation measures are prioritized based on three evaluation criteria: water savings/addition, ease of implementation, and drought tolerance. The criteria for each mitigation measure were scored on a scale of 1-5 with 1 being the least and 5 being the greatest. The sum of criterion scores for each strategy determined overall priority. Scores of 10 and above are considered high priority, 8-9 are medium priority, and a score of 7 or below are low priority. The results are displayed below.

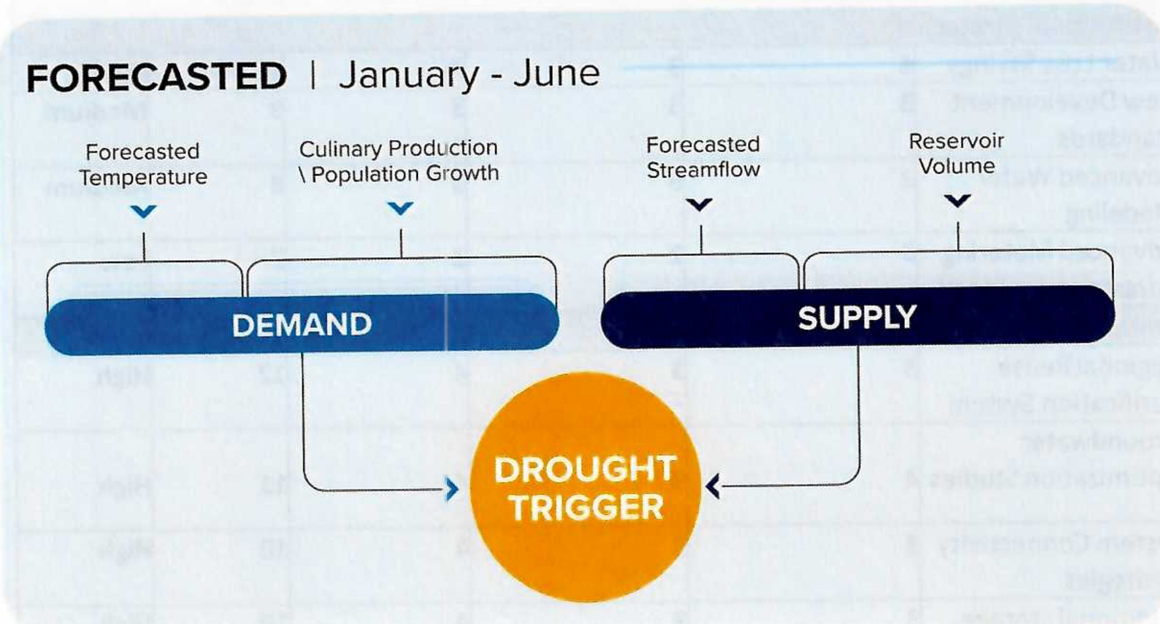
Mitigation Measure Prioritization Matrix

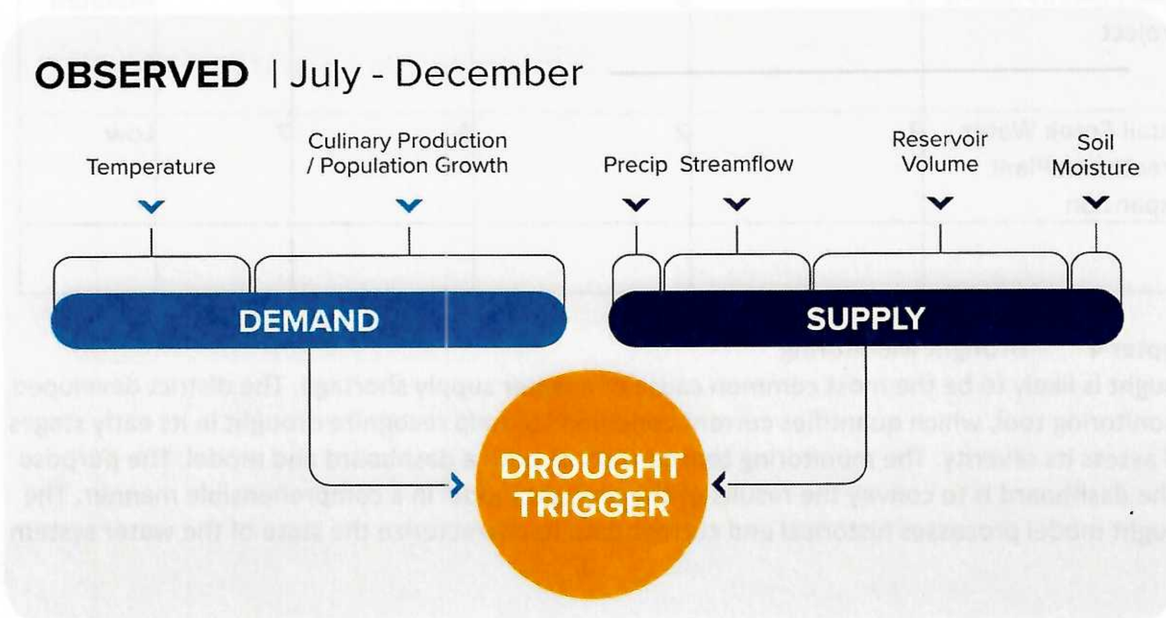
Mitigation Measures					
	Water Savings/Addition	**Ease of implementation**	**Drought Tolerance**	**Total Score**	**Priority**
Institutional Strategies					
Water Loss Savings	**4**	**3**	**4**	**11**	**High**
New Development Standards	**3**	**3**	**3**	**9**	**Medium**
Advanced Water Modeling	**2**	**3**	**3**	**8**	**Medium**
Advanced Metering Infrastructure (AMI)	**3**	**2**	**2**	**7**	**Low**
Water Supply Augmentation Strategies					
Regional Reuse Purification System	**5**	**3**	**4**	**12**	**High**
Groundwater Optimization Studies	**4**	**3**	**4**	**11**	**High**
System Connectivity Strategies	**3**	**3**	**4**	**10**	**High**
Additional storage, wells, and pipelines	**3**	**3**	**4**	**10**	**High**
Lake Powell Pipeline Project	**5**	**1**	**3**	**9**	**Medium**
Quail Creek Water Treatment Plant Expansion	**2**	**2**	**3**	**7**	**Low**

Chapter 4 Drought Monitoring

Drought is likely to be the most common cause of a water supply shortage. The district developed a monitoring tool, which quantifies current conditions to help recognize drought in its early stages and assess its severity. The monitoring tool consists of both a dashboard and model. The purpose of the dashboard is to convey the results of the drought model in a comprehensible manner. The drought model processes historical and current data to characterize the state of the water system into five numerical categories of increasing drought severity (see shortage stages). These categories will be directly linked to drought response actions (see action plans). The drought model is programmed to automatically communicate with existing data sources to minimize the need for manual data upload; however, some datasets will still need to be routinely updated by the district.

The forecasted drought trigger components are illustrated in the following figures showing the observed components.





Water Supply Data Sources

Precipitation, reservoir volumes, streamflow, and soil moisture are used to calculate the supply component of the drought trigger.

Precipitation

The precipitation record used consist of measurements taken from nearly 13,000 stations owned by COOP, SNOTEL, Snowcourse, RAWS, CDEC, Agrimet, and EC (Canada). The data period of record ranges from January 1895 to the present.

Reservoir Volumes

The reservoirs considered for use in the model include Gunlock, Ivins, Kolob, Quail Creek, and Sand Hollow. Quail Creek and Sand Hollow Reservoirs were used in the drought monitoring model as a combined indicator in terms of percent capacity; together they constitute 86% of the district's current reservoir storage capacity.

Observed Streamflow

Monthly streamflow volumes were calculated from daily average flow and then ranked against the period of record.

Forecasted Streamflow

Streamflow forecasts in the winter are used to help predict water supply in the spring. Forecasts for the Santa Clara River near Pine Valley (USGS 09408400) and Virgin River at Virgin, UT (USGS gage 09406000) stations are available through the Natural Resources Conservation Service (NRCS) Web Service tool. The NRCS uses statistical models to produce streamflow forecasts.
These statistical models are equations expressing a fitted mathematical relationship between the target streamflow volume and predictor variables, including snow water equivalent, precipitation, and antecedent streamflow.

Soil Moisture

Modeled soil moisture information was obtained from NASA's North American Land Data Assimilation System (NLDAS). Soil moisture content is available at different levels; the model uses, the moisture content from ground level down 100 cm using the VIC model configuration.

Water Demand Data Sources

Air Temperature

Air temperature measurements are used to calculate the irrigation-driven component of the demand score due to its cause-and-effect relationship. Records for air temperature over the Washington County area will be accessed using the same methodology as the precipitation data. The period of record covers January 1895 to the present day on a monthly timestep. The county-wide monthly average temperature can be calculated by taking the average of all grid cells within Washington County.

Forecasted Air Temperature

Forecasted air temperatures in winter are used to predict irrigation-driven demand in spring. Seasonal temperature forecasts are available in 3-month increments and provided by the National Weather Service's Climate Prediction Center. Forecasts are given in terms of percentages above and below normal. Seasonal temperature forecasts are based on climate and weather models, recent trends, and historical records showing what temperature conditions resulted from similar patterns in the past.

Population

Annual Washington County population estimates are used to calculate the component of the demand score until 2020. Historical population data from 1900-1940 were linearly interpolated from available U.S. Census Bureau decennial census data. Population estimates from 1941-2020 were collected from the Kem C. Gardener Policy Institute of the University of Utah. For use in the drought monitoring model, a percentage change from the rolling 3-year average was used as the population indicator.

Production

Production data refers to all groundwater and surface water pumped and diverted into the water system by the district and its municipal partners. The historical record for production data consists of monthly volumes from 2017-2021. Monthly production volumes will be uploaded each month by the district. For use in the drought monitoring model, a percentage change from the rolling 3-year average is used as the production indicator. Production data is used to estimate the component of the demand score after 2020.

Data Server

For automated monthly updates, most of the datasets discussed in this plan will be retrieved directly from their respective sources; however, some data will come directly from the district. The district will need to upload two datasets to an FTP Server:

- Reservoir volumes (weekly)
- Production data (monthly)

The model will be programmed to automatically search for and retrieve these datasets from the FTP server.

Future Model Improvements and Ongoing Calibration

The drought monitoring model will require ongoing calibration as changes to existing data sources occur. It is recommended the task force convenes monthly to review, discuss, and confirm the district's current drought status.

Additionally, whenever a new major supply or demand data source is added to the model, or software is updated, a model revision will be required.

Without the addition of new or major changes to existing supply or demand data sources, the rate of recalibration and updates to the model are left at the discretion of the district. However, it is recommended that the model be updated at a maximum of every five years to evaluate accuracy and efficiency, account for changes in production growth rates, reservoir operation, and a longer period of record on all data sources affecting probability distributions.

Chapter 5 Shortage Stages

The shortage model applies the variables described in Chapter4 to generate a value that corresponds to one of five shortage stages (stages). Stages range from "0" for abnormally wet to normal conditions up to "4" for extreme shortage. These stages communicate the severity of shortage and water supply conditions to district partners and the public. Each of the five stages were assigned meaning, descriptions and associated actions that will help communicate the plan and necessary response actions (actions). The actions are discussed in more detail in Chapter 6.

To make a declaration of a particular stage, or to transition from one declared stage to another, the condition must persist for at least three calendar months, or ninety days. This measure was implemented by the task force to provide continuity of messaging and policy. Once declared, it would require three consecutive months of stage conditions to transition into a declaration of another stage. The district board, however, may advance or repeal a stage declaration at any time and for any duration if conditions merit such action.

Each stage is intended to produce enough water savings to abate the shortage and decrease the likelihood of experiencing advanced conditions.

Stage 0 – Normal

Stage "0" occurs when water supply meets current demands and is adequate to maintain or increase stored supplies. This stage reflects the region's typically dry and arid conditions with seasonal monsoon rains. This will be the stage when the district wants to communicate that regular conservation efforts are sufficient to support the water demands being placed on the system for the foreseeable future.

Stage 1 – Dry

Stage "1" describes meteorological conditions when water demands tap into stored supplies faster than they can be replenished. When stored supplies are dropping, additional actions will need to be taken to slow drawdown and bring the demand back in line with sustainable supplies.

Stage 2 – Prolonged Shortage

Stage "2" is established when water supply has been diminished (e.g. reservoir levels are low) and the meteorological conditions have failed to replenish the supply. This can occur if the actions of stage 1 were ineffective in reducing the demand to match supply, or when there is lower than normal precipitation over an extended time. In this stage, responses become more intrusive and aggressive to conserve available water in case the dry meteorological conditions persist.

Stage 3 – Escalated Shortage
Stage "3" identifies a significant deterioration in available water supply, approaching critical levels. This stage will likely occur when there have been abnormally dry meteorological conditions for an extended time, or the precipitation levels continue to decrease from previous shortage conditions. Response actions in this stage command a prioritization of water uses. At this stage, water will be rationed and redistributed to maintain life sustaining uses and fire protection. Due to sufficient storage and quality infrastructure, a period of escalated shortage has yet to occur within the county's recent history.

Stage 4 – Extreme Shortage
Stage "4" is the most extreme stage and occurs when the region is in a declared state of emergency. Storage supplies have been depleted and water use will be limited to what becomes available in each season. Infrastructure will be unable to capture and store what precipitation may fall. All non-essential water use will be terminated and human health and safety will be the highest priority with water primarily allocated to health, sanitation and fire protection. A period of extreme shortage as defined here has yet to occur within the 53-year period for which modeling occurred.

The descriptors for each stage were selected to communicate the desired response and public perception of the shortage conditions. The descriptors escalate in severity and, in one word, describe how the district, its municipal partners, and the public should respond to the shortage condition.

Even though the model incorporates weather conditions, the stages refer to the water availability status. This was done intentionally to reinforce the message that not all precipitation is available for public consumption. The weather conditions impact how much water is recharging the system and how much of that water will become available to store for use; but are not direct drivers of the demand versus supply equation. This plan strives to connect the public's effectiveness in conservation actions directly to how much water can be left in the existing reservoir storage system and therefore available for future use.

The following table shows the results of applying the shortage model to 30 years of past conditions in Washington County. A historic review of the model for a period of more than 50 years showed the region would have been in stage 0 (normal) conditions 62% of the time, stage 1 conditions 29 percent of the time, and stage 2 conditions 9 percent of the time.

Historical Frequency of Shortage Conditions

YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	DROUGHT DECLARATION
1993	0	0	0	0	0	0	0	0	0	0	0	1	NO
1994	2	1	1	1	1	1	1	1	1	1	1	2	YES
1995	0	0	0	0	0	0	0	0	0	0	0	0	NO
1996	1	1	1	2	2	3	2	3	0	0	0	0	YES
1997	0	1	1	0	1	0	0	0	0	0	0	0	NO
1998	0	0	0	0	0	0	0	0	0	0	0	0	NO
1999	0	0	0	0	0	0	0	0	0	1	1	1	YES
2000	1	0	0	0	0	1	1	1	1	0	0	1	YES
2001	0	0	0	0	0	0	0	0	1	1	0	0	NO
2002	1	1	2	2	2	2	2	2	1	1	1	1	YES
2003	1	1	1	1	2	2	2	2	2	2	1	1	YES
2004	2	2	2	2	2	2	2	1	1	0	0	1	YES
2005	0	0	0	0	1	0	1	0	0	0	0	0	NO
2006	0	0	0	0	0	0	0	0	0	0	0	0	NO
2007	1	2	2	2	2	2	2	1	1	1	2	0	YES
2008	1	1	1	1	1	1	1	1	1	1	1	0	YES
2009	0	0	0	0	0	0	0	0	1	0	1	0	NO
2010	0	0	0	0	0	0	0	0	0	0	0	0	NO
2011	0	0	0	0	0	0	0	0	0	0	0	0	NO
2012	0	0	0	0	0	0	0	0	0	0	1	0	NO
2013	1	1	1	1	1	1	0	0	0	0	0	0	YES
2014	1	1	1	1	1	1	1	0	0	1	1	0	YES
2015	0	0	0	1	0	1	0	1	1	0	0	0	NO
2016	0	0	0	0	0	0	0	0	0	0	0	0	NO
2017	0	0	0	0	0	0	1	0	0	0	0	0	NO
2018	0	0	0	1	1	1	1	1	1	0	0	0	YES
2019	0	0	0	0	0	0	0	0	0	0	0	0	NO
2020	0	0	0	0	0	0	0	0	0	0	0	0	NO
2021	1	1	2	1	1	1	1	1	1	0	1	0	YES
2022	1	1	1	1	1	1	1	0	0	0	0	0	YES

Chapter 6 Response Action Plans

Shortage Response Actions (actions) correspond to each of the five stages discussed in Chapter 5. The actions prioritize the response based on the level of the shortage's severity.

Principles of the Response Plan

Whereas water is critical to the region's economy, this plan seeks to protect core economic functions to the extent possible. This plan focuses heavily upon discretionary, consumptive and large water uses. The plan uses incremental measures that are intended to moderate user impacts and negative economic consequences.

The plan calls for water use reductions across every sector: residential, commercial, industrial and institutional. Despite that, some sectors may be more impacted than others due to the nature of water use (landscape vs. domestic), the relative value of the use (ornamental lawns vs. active spaces), or the enormity of the demand (top tier water users).

Landscape

Seventy percent of urban water in the region is used consumptively. Consumptive uses include, but are not limited to, landscape irrigation, evaporation from water surfaces, mist cooling systems, water system leakage and evaporative cooling systems. Collectively, consumptive uses are estimated at about 12 billion gallons each year. Irrigated landscape is estimated to account for 75% of consumptive use, or 9.4 billion gallons.

Type of Landscape	Estimated Annual Water Use	Percent of total water supply (2023)
All landscape types	9.4 billion gallons	54%
All lawn grass	7.0 billion gallons	40%
Functional lawn grass	4.2 billion gallons	24%
Ornamental lawn grass	2.8 billion gallons	16%
Other landscape types	2.4 billion gallons	14%

A 2023 analysis conducted by the district estimated there are 180 million square feet of lawn in the region and as much as 70 million square feet that are primarily ornamental.

Ornamental lawns are those that provide no recreational function, either because of their size, shape or accessibility. Whereas irrigated lawns use about four times as much water as drip irrigated plantings, this plan calls for restrictions on the use of spray irrigation and ornamental lawns before prohibiting drip irrigated plantings. Where development has been allowed, the installation of irrigated lawn areas may be deferred or prohibited, depending upon shortage stage.

Prohibiting irrigation of ornamental lawns could yield up to a 16% reduction in water demand without sacrificing active lawn areas or risking loss of mature trees and shrubs. In combination with such a measure, the district would provide an increased incentive for the permanent conversion of ornamental lawns to drip irrigated plants.

For purposes of shortage response, ornamental lawns would include, but not be limited to, decorative lawn areas at businesses and homeowners' associations and front lawns of residential homes. Areas that don't meet a municipality's definition of an active recreation area are also ornamental.

Allowing drip irrigated landscape to be installed and sustained will be critical to sustaining the region's tree canopy and mature plants and will help sustain economic activity in the landscape industry. By converting lawn areas to drip irrigated plantings during water shortage, the region will also improve long-term shortage resilience.

> **What is an Active Recreation Area?**
> Dedicated active play areas where irrigated lawn is used as the playing surface, such as a sports field or park designed for public use.
> Minimum requirements:
> - 1,500 contiguous square feet of lawn area
> - not less than 30 feet in any dimension
> - not less than 10 feet from vehicular traffic
> - accessible to large populations
> - co-located with amenities, such as benches, tables, walking paths, drinking water and play equipment.

Water Recreation

Water recreation is a discretionary use. Home swimming pools are usually about 425 square feet in surface area and require 20,000 gallons annually to maintain. Homes with pools may use 20% more water than those without. Most of a pool's water demand is attributable to evaporation, however, some estimates suggest up to 30%of pools have leaking shells that lose water into the surrounding soil.

This plan calls for improved management practices on existing pools and a reduction of new pools during a declared drought condition. Because swimming pools may not be left empty without damage to the shell, and unmanaged pools can pose health and safety hazards, this plan allows the water level to be maintained in existing pools but calls for more efficient operational practices, such as the use of a vapor barrier (cover) to reduce evaporation and a prohibition on draining and refilling.

Community swimming pools provide recreation for hundreds or even thousands of people. In areas where a community pool exists, homeowners are less likely to install private swimming pools. Due to the economy of scale, this plan allows community swimming pools to continue to be constructed to a conservation standard during stage 1 and 2 conditions. This allows community pools to serve as a viable option to private swimming pools and also helps sustain employment.

Commercial water parks use 15 to 30 million gallons annually, which places them among the top one percent of commercial and industrial users in the region. Water parks typically operate for just 4-5 months each year and cater to a limited sector of the population. Where not already prohibited, permits for construction of these projects are suspended in stage 1 and operation of existing facilities is suspended in stage 3.

Splash pads are water-play areas without a ponded water surface, most of which are associated with municipal parks. These facilities use about 300 gallons per square foot of play area annually and typically operate 5 months of the year. Most splash pads operate as single-pass water use, where water delivered through nozzles sprays onto bathers and then directly flows to the wastewater collection system where it may be recovered for reuse. Some splashpads may recirculate water through a swimming pool filtration system or recover the water for landscape irrigation on-site. Seventy percent of splashpad use is estimated to be captured to the drain, while the remaining 30% is lost to evaporation from the play surface and bathers. Operations of these facilities can be curtailed or suspended with little or no concern about damaging the infrastructure.

New Development

Increasing water demand during a water shortage is precarious. New permits for non-critical facilities are restricted at various stages of shortage, but projects with existing water commitments and appropriate permits that have already initiated construction may have a legal basis to proceed. Allowing previously permitted projects to advance while simultaneously restricting certain types of new permits creates a "glide path" for reduction of activity in the construction and development industries. This approach will soften economic impacts as compared to a sudden and absolute prohibition.

In some cases, the shortage plan requires the district or municipalities to refuse new service for certain types of water intensive facilities, such as, but not limited to, golf courses, water parks and data centers.

Even in a declared drought, the district foresees the need to construct facilities that meet a critical need for the community. There are also benefits in approving the construction of facilities that have nominal water demands during and after construction. Municipalities will determine what constitutes a critical facility, a low water use project, or a project that merits additional permits to reach completion. The district will honor these determinations where reasonable.

The district has adopted the following guidelines for determining whether a project merits designation as a critical facility:

- A critical facility is one that meets a pressing need for the general population, such as health care facilities or utility infrastructure.
- Depending upon supply conditions, housing may be deemed a critical facility, but preference should be given to multi-family dwellings and ultra-water efficient (UWE)

communities intended to serve as primary residences.

- Where UWE housing development is occurring, communities should be given consideration to develop community parks or swimming pools subject to the UWE design standard.
- Construction already permitted may proceed, subject to specific direction or intervention by a municipality. For example, if building lots have been prepared and transportation and utility infrastructure installed, construction of homes may be a nominal part of the total water demands of the project. However, if a permitted project has substantial water demands, a municipality may determine water shortage is a compelling reason to suspend or defer the project, within the scope of the jurisdiction's powers.
- Permits for facilities that require nominal water to construct or operate may be approved, even if they are not critical facilities.
- Permits issued should include clear stipulations that allow the municipality to suspend construction in water supply shortage conditions.

Drought Stage and Action Summary

Shortage Stage 0: Conserve
Water availability is at normal supply

- Implement Conservation Plan

Shortage Stage 1: Caution
Water availability is abnormally dry or decreasing supply
Target 10% reduction in water use

- Deploy stage 1 communications
- Promote stage 1 watering guidelines
- Reduce irrigation of public facilities by 10%
- Stage 0 actions plus:
    - Leverage smart metering systems to strengthen messaging
    - Monitor and report reservoir levels as a percentage of total surface water storage
    - Prevent lawn installations May through September
    - Limit residential swimming pool permits to 500 square feet or less surface area
    - Reject new connections for non-critical facilities with demands over 9 million gallons/year (MGY)
    - Implement stage 1 water rate structure
    - Increase enforcement of municipal water waste policies

Shortage Stage 2: Concern
Water availability is at prolonged shortage, or diminished supply
Target 20% reduction in water use

- Deploy stage 2 communications
- Promote stage 2 watering guidelines
- Reduce irrigation of public facilities by 20%

- Implement stage 2 rate structure
- Stage 1 actions plus:
  - Defer new grass installation. Drip irrigated, water-efficient plants only
  - Prohibit irrigation of ornamental lawns in all sectors
  - Defer new private swimming pool permits
  - Require new housing to meet Ultra-Water-Efficient standard
  - Reduce operation hours of public splashpads
  - Reject new connections for non-critical facilities with demands over 3 MGY
  - Restrict car washing frequency to 1x per week
  - Prohibit ornamental fountain operation
  - Prohibit comfort mist cooling systems
  - Implement golf water budgets for 20% reduction
  - Increase incentives for water efficient landscape 50%

Shortage Stage 3: Alarm
Water availability is at escalated shortage, or deteriorated supply
This is a critical stage to minimize the likelihood of reaching stage 4 conditions
Target 40% reduction in water use

- Deploy stage 3 communications
- Promote stage 3 watering guidelines
- Reduce irrigation of public facilities by an additional 10% (40% total)
- Turn off outdoor water features, including splash pads
- Implement stage 3 rate structure
- Stage 2 actions plus:
  - Spray irrigation prohibited except for communal active recreation areas
  - Watering limited to drip irrigation or hose with positive shut-off nozzle
  - Implement water budgets for golf courses to reduce demand 40%
  - Planting only allowed for conversion of lawn areas to water-efficient landscape
  - No new connections approved except critical facilities or low-water demand facilities
  - Swimming pools must be covered when not in use (where swimming pools are allowed). Only make up water is allowed, no draining and refill.
  - Recreational water parks and splash pad operations suspended

Shortage Stage 4: Crisis
Water availability is at extreme shortage, or depleted supply. Health, sanitation and fire protection are primary objectives
Target 60% reduction in water use

- Deploy stage 4 communications
- Deploy stage 4 watering guidelines
  - Irrigation prohibited
  - Implement stage 4 rate structure
  - Stage 3 actions plus:

- All outdoor water recreation suspended
- Car washing prohibited, except dry wash products

MEASURES	Stage 1 - CAUTION	Stage 2 - CONCERN	Stage 3 - ALARM	Stage 4 - CRISIS
Landscape	Municipalities target 10% reduction Increase enforcement of municipal water waste policies Planting lawn grass prohibited May through September Spray irrigation prohibited 11A to 7P May through September	Municipalities target 20%reduction Drip irrigated plant installs only. Ornamental lawn irrigation prohibited Operation of ornamental fountains over 25 square feet prohibited	Municipalities target 40%reduction. Outdoor irrigation limited to 1x per week using a handheld hose or drip irrigation system. Conversion from lawn to drip irrigated landscape allowed	Irrigation prohibited.
Water recreation	Private residential pool permits limited to 600 square feet surface area Public/semi-public facilities scaled based upon number of eligible users	No permits for new private residential pools. Public or multi-family pool facilities permitted. Municipal splash pad operation hours reduced or suspended	Pool evaporation barriers required when not in use (where allowed). Drain/refill prohibited. Make up water only. Water park and splash pad operations suspended.	All outdoor water recreation facilities suspended.
New Development	Water efficiency standard applies, but allowable lawn may not be planted May through September District defers	New residential construction permits subject to ultra-water efficiency standards. District defers connections for	District defers all connections except critical facilities or low-water demand projects (see guidance).	

	connections for new non-critical facilities with demand greater than 9 MGY Permits with water commitment may proceed using approved design	new non-critical facilities with demand greater than 3 MGY		
Incentives		Water Efficient Landscape incentives increase 50%		
Golf Courses	Stage 1 golf water budget applied	Stage 2 golf water budget applied	Stage 3 golf water budget applied	Irrigation prohibited
Car washing	Caution advised	Limited to 1x per vehicle per week using a commercial facility or hand wash with bucket and positive shut off Mobile wash limited to 10 gal per vehicle	Stage two techniques, but 1x per vehicle per month.	Car washing prohibited
Rates	Stage 1 rates may apply	Stage 2 rates may apply	Stage 3 rates may apply	Stage 4 rates may apply
Other		Comfort mist-cooling systems prohibited		

Chapter 7 Communication Plan

The district has developed a toolbox of resources to reflect conditions for each stage so any changes can be accomplished easily once a board decision is made. The district will encourage each municipal partner to publish the current stage and link to the district's water shortage page on wcwcd.gov.

Outreach and Communication Plan

Public awareness and adoption are vital to the plan's success. The district will coordinate with its municipal partners to provide information regarding water supply availability and response stages to the public via the following sources:

- **Website** – the district will have dedicated pages on wcwcd.gov with information; the district will encourage the county and all municipal customers to link their respective websites to this page
- **Social media** – the district will post information on its various social media platforms and encourage the county and all municipal partners to do the same
- **E-newsletter** – the district will draft and distribute information in its electronic newsletter and share this content with the county and all municipal partners for distribution to their respective subscribers

Public Outreach

When needed, the district may enhance outreach to include:

- **Press announcement and/or press conference** – the district will prepare and distribute information to media representatives with the intent of generating news coverage
- **Advertising** – the district has a robust media campaign that includes online, social media, broadcast production and billboard advertisements that may be used to communicate messaging
- **Speakers' bureau** – District representatives will speak at events hosted by community and civic organizations
- **Signage** – the district will work with the county and cities to post educational materials at public facilities including libraries, community centers, recreational facilities, and other centralized public locations.
- **Enhanced collaboration** – the district will request the use of county and/or city resources to communicate information. Potential resources include newsletters, utility bill inserts, direct mail pieces, marquees/signs, and any other available means for reaching a broad, diverse audience.

Chapter 8 Plan Maintenance and Updates

The district will update the plan as needed and once approximately every five years. As the district begins the update process, it will ensure the new plan incorporates any changes recommended by the task force, as well as any new federal or state requirements.

The task force will meet monthly during active periods of declared shortage conditions. Evaluation of the plan will center around three main topics to assure it is working effectively. These topics include:

- Shortage monitoring (the model)
- Shortage response actions
- Communications

The Model

The model output will be vetted based on actual experiences. The model factors in weather conditions along with system demand and storage and was built to be sensitive to these inputs. Comparisons with actual conditions and system demand and storage will be evaluated to determine the model's effectiveness and to identify any concerns with accuracy or sensitivity.

Response Actions

While technical issues will be handled by the model and recommendations, the municipal partners will be responsible for enforcing the response actions. Task force evaluation will determine if actions are being implemented and are effective.

Communications

Successful implementation of the plan relies on effective communication with municipal partners and their respective constituents. Ongoing evaluation will allow for the task force to revise or implement additional strategies to communicate more effectively.

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