Barton Springs/Edwards Aquifer
Conservation District

Well Owner Guide

Barton Springs Edwards Aquifer CONSERVATION DISTRICT

BSEACD

Quick Facts

Created: **1987 by Texas Legislature**
Size: **247 square miles**
Counties: **parts of Travis, Hays, and Caldwell**
Aquifers: **Edwards and Trinity**
Groundwater users: **60,000+ people**
Endangered Species: **Barton Springs Salamander**
Volume of water permitted annually: **8,500 acre feet**

Mission
To conserve, protect, recharge, and prevent waste of groundwater and preserve all aquifers in the District.

Goal
To equitably and effectively manage and protect groundwater resources for all groundwater users within its boundary. We serve the groundwater community by monitoring groundwater levels and water quality, managing the shared groundwater resource, coordinating water conservation efforts during drought, and researching aquifer dynamics.

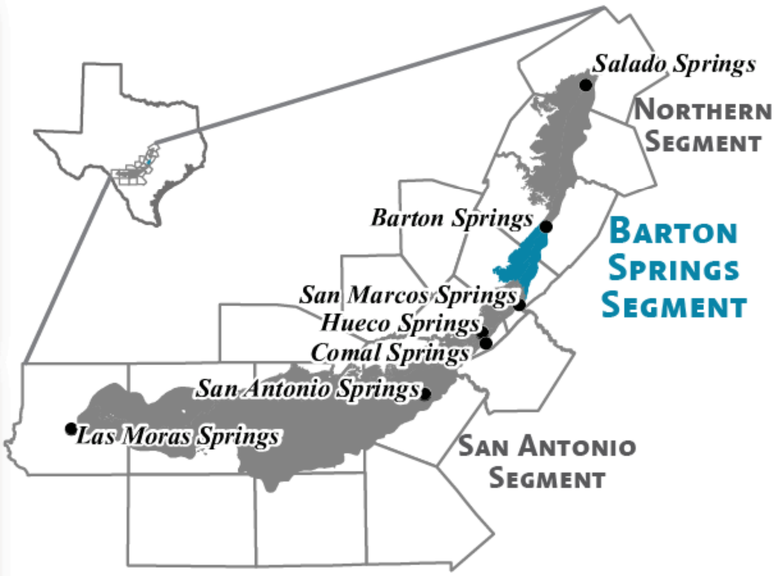
Groundwater Resources
The area covers the unconfined (recharge) zone, the confined zone, and the saline zone of the Barton Springs segment of the Edwards Aquifer and the underlying Trinity Aquifer.

Boundaries
West: Edge of the Edwards Aquifer outcrop
North: Colorado River
East: Service area limits of what are now the Creedmoor-Maha and Goforth Water Supply Corporations.
South: Generally along the established groundwater divide between the Barton Springs and the San Antonio segments of the Edwards Aquifer.

Land Use (2007 data)
56% ranchland/farmland
24% urban/suburban
20% open space/conservation land
1% mining/landfill/barren land

Permit Types and Volumes
Currently, the District is only issuing NDU, Conditional Edwards and Historical Trinity permits. All permitted wells are subject to drought restrictions.

Permit	Pumpage (acre-feet)
Historical Edwards	7,338.0
Conditional Edwards	864.8
Non-Exempt Domestic Use (NDU)	3.6
Historical Trinity	285.0
total	**8,491.4**



The Edwards Aquifer, source for some of the largest springs in Texas, is divided into 3 segments based on groundwater flow paths. Barton Springs is the lowest discharge point in the entire aquifer.

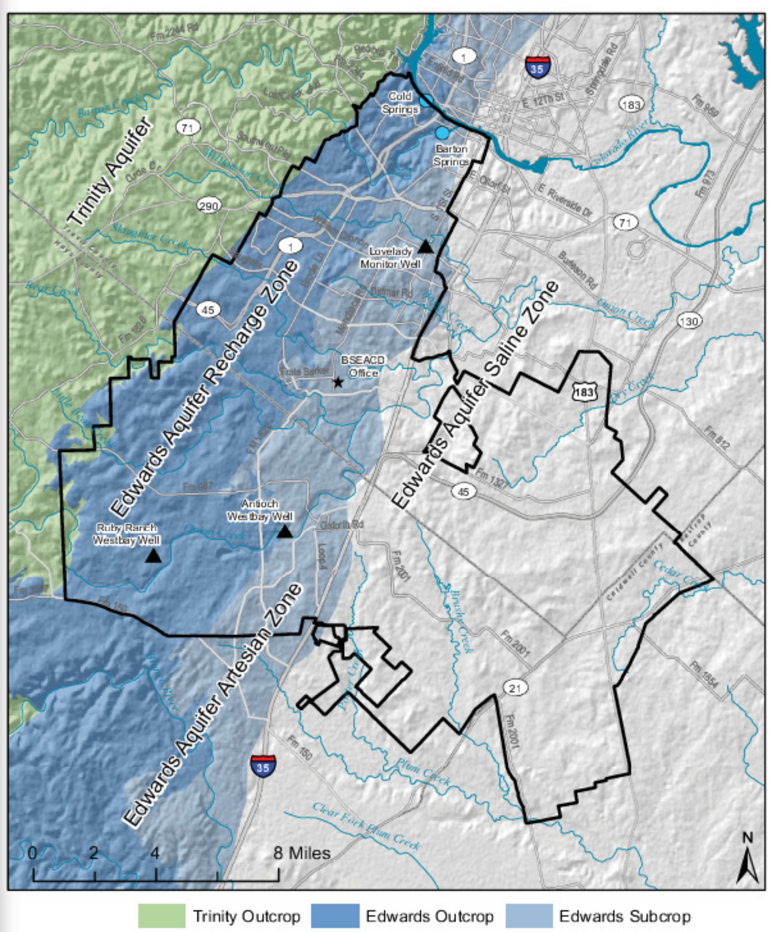
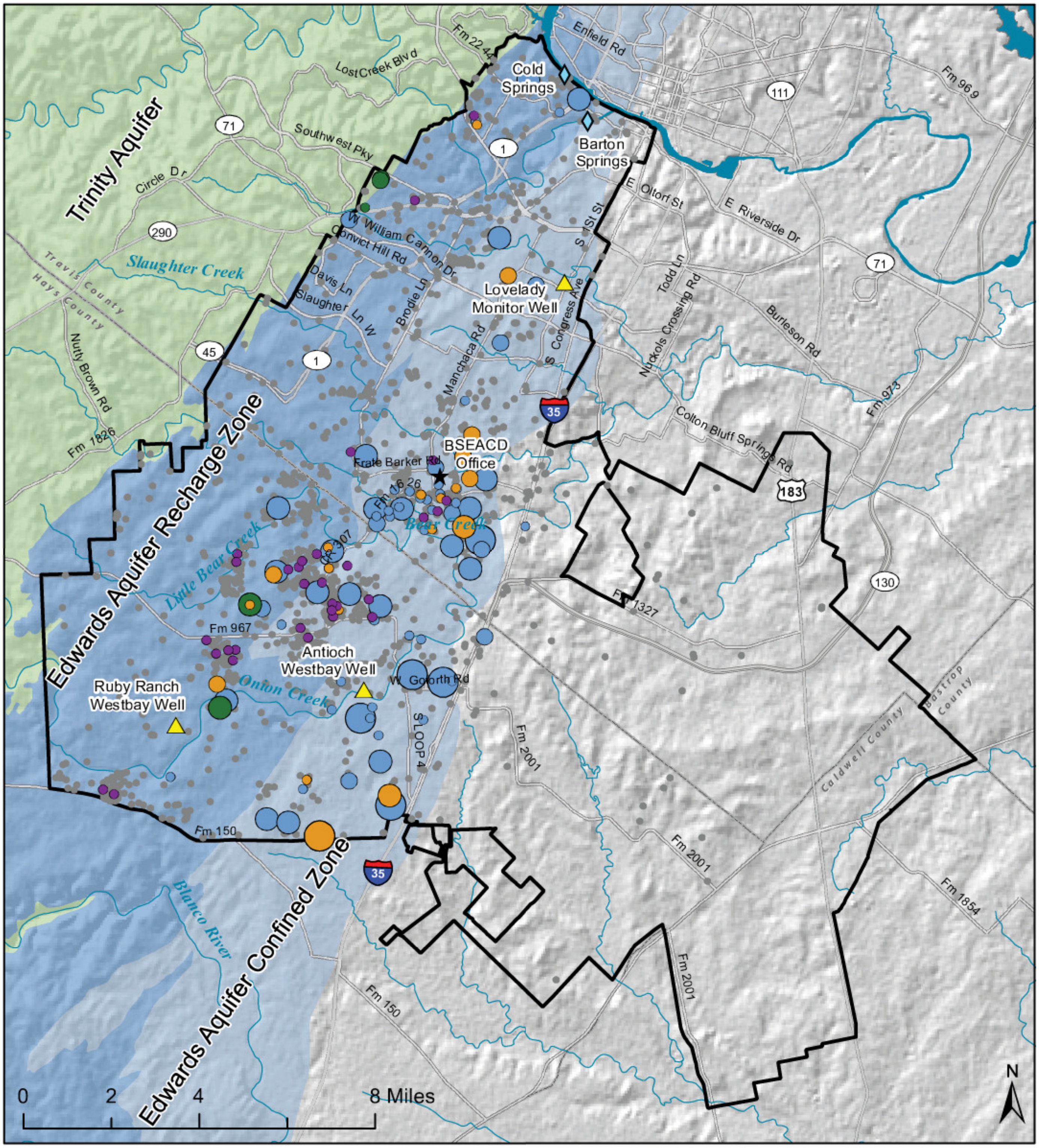


Figure 2. Generalized permitted volumes within the District by permit type and well location. Conditional permits are subject to 100% curtailment during drought.

Regional Aquifers



Conditional Permits (gallons)
- 0 - 2,000,000
- 2,000,001 - 12,000,000
- 12,000,001 - 120,000,000
- 120,000,001 - 350,900,000

Historic Trinity Permits (gallons)
- 0 - 2,000,000
- 2,000,001 - 12,000,000
- 12,000,001 - 120,000,000
- 120,000,001 - 350,900,000

Historic Edwards Permits (gallons)
- 0 - 2,000,000
- 2,000,001 - 12,000,000
- 12,000,001 - 120,000,000
- 120,000,001 - 350,900,000

NDU Permits (gallons)
- 0 - 500,000
- Registered Wells
- Trinity Outcrop
- Edwards Outcrop
- Edwards Subcrop

Well Head Protection

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A properly maintained, well-located well can provide clean, safe water for years. However, if wells are poorly constructed or poorly maintained, the water supply could easily become contaminated with bacteria, nitrates, pesticides, fertilizers, etc.

A well is a direct connection to an aquifer, so protecting the well head is the first line of defense against contamination.

Cracked well house slabs, damaged well casings, or deteriorated annular seals can provide pollutants a direct pathway into the water supply. Whether the well is in use or retired, it is still very important to protect against contamination.

Wells should be located away from surface drainages and known sources of contaminants. For example, a well downhill from a septic system or livestock yard is a greater risk of contamination than a well located uphill from these potential pollution sources. Harmful chemicals (pesticides, fertilizers, pool chemicals, paints, etc.) should not be stored in a well house.

To encourage proper well location, the District has established minimum separation distances from sources of potential contaminants. While these minimum separation distances are only required for new wells, these requirements are in the best interest for all groundwater wells.

Wells should be:

- 150 feet from an existing or proposed septic systems, absorption fields, septic spray areas, etc.
- 150 feet from livestock or poultry yards, cemeteries, out houses, pesticide mixing and loading facilities, underground and aboveground hazardous material storage tanks.
- 150 feet from critical environmental features such as caves or sinkholes.
- Located away from areas subject to flooding.
- Located away from high-traffic areas or near heavy construction activity.

A deteriorated annular seal around a well casing.

An unprotected, abandoned well with a cracked well head slab in a construction zone.

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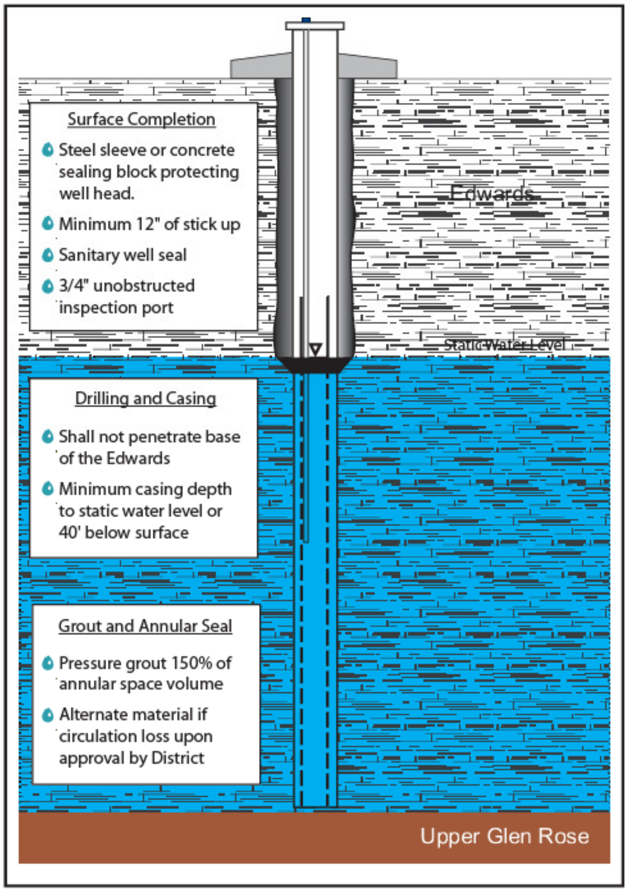
Well Construction

Drilling rig drilling a well in 2011.



Edwards well schematic.

Modern wells are drilled by drilling rigs using threaded pipe and an auger. Hydrogeologists familiar local aquifer characteristics can pinpoint optimal well depths that provide the best quality and quantity of water. Since 1991, wells within the District must comply with well construction standards that have been established to protect well owners and groundwater users alike.

At the surface, wells should either have a solid, concrete pad that sheds water way from the well head or a thick steel sleeve that protects it. The well head should extend at least a foot above the ground and be sealed with a tight fitting lid with gasket, called a sanitary well seal, to prevent surface water and contaminants from entering the well. There should be a 3/4" inspection port to allow for water level measurements.

Below the surface, the upper portion of the well should be cased, or lined, with pvc or steel pipe. Grout is then injected behind the casing to further fortify it. The casing and grout prevent unstable upper portions of the well from caving in and also help protect water quality. Typically, the inside diameter of a domestic well is 4 1/2 inches, which allows for service and installation of a submersible pump and access to take water level measurements.

Below the casing, the well is considered 'open hole', that is, the well is open to the aquifer or water bearing rock formation. The open hole portion of an Edwards well can be between 20 and 100 feet. The submersible pump is usually positioned near the bottom of the hole to maximize the water availability as the water level fluctuates. To comply with domestic pumping limits, pumps in the District are usually 1 horsepower or less and are limited to no more than 7 gallons a minute.

Wells drilled prior to 1991 were not subject to well construction standards, and consequently could be more susceptible to water quality problems. Drilling logs and drillers records can help describe well construction methods used. If you suspect poor water quality or potential water quality problems, have your well tested [see the Water Quality Protection section of this Guide].

For more information and full description of the District's current Well Construction Standards, visit:
www.bseacd.org/regulatory/well-regulations/

WATER QUALITY

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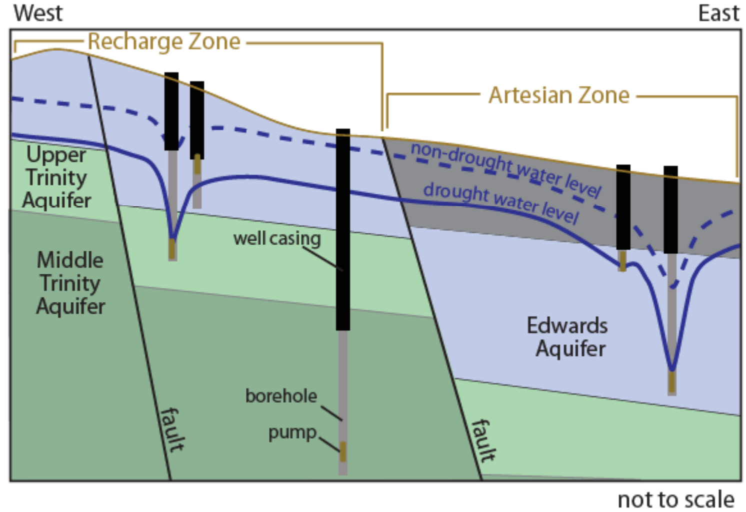
The Edwards and Trinity Aquifers within the District are heterogeneous. Water quality can vary substantially depending on location, screened rock interval, and well depth. That said, groundwater within the District often requires little treatment, but well owners are encouraged to regularly test water quality to ensure it is safe to use.

The District facilitates an annual Water Well Check-up in the Spring to screen samples from private water wells for common contaminants, including fecal coliform bacteria, nitrates, and high salinity. Contaminants such as these can jeopardize the health of its users, especially vulnerable populations like children, the elderly, or those with compromised immune systems.



A cross-section of the regional aquifers.

EDWARDS AQUIFER

Groundwater water quality in the Barton Springs segment of the Edwards Aquifer is generally exceptionally good. The Edwards aquifer has very high recharge rates compared to other aquifers in Texas, which is both a blessing and a curse.

Recharge refers to water replenishing the aquifer. The recharge zone is where the exceptionally porous Edwards limestone is exposed at the surface providing direct access to the groundwater system. Recharge occurs mainly along the six major streams [see the Regional Aquifers section] that cross the recharge zone, but also in upland areas of the recharge zone. In creek beds and in upland areas, there are very thin to no soils to help remove contaminants before they enter the groundwater system. So the blessing is that water can replenish the water supply, but the curse is that the quality of that water is directly linked to land use and surface water quality.

Conservation easements, building restrictions, impervious cover limitations, high stormwater treatment standards, and most importantly, residents' land stewardship have been effective at protecting the quality of water recharging the aquifer, so far. With increasing development, the quality of the water in the Edwards is at greater and greater risk of contamination.

TRINITY AQUIFER

The Trinity Aquifer underlies much of the Edwards Aquifer within the District. Water quality in the Trinity Aquifer varies significantly by rock layer. While water quality in the Upper Trinity (in communication with the lower Edwards) is generally good, the lower portions of the Trinity aquifer can have high salinity, high total dissolved solids, and/or high sulfates.

Recharge to the Middle and Lower sections of the Trinity Aquifer happens to the west in the Hill Country where Glen Rose limestone is exposed at the surface. In the District, water levels in the Trinity Aquifer respond more slowly to rainfall than the Edwards, indicating a slower recharge rate and lower permeability (ability to transmit water).

In the western portion of the District, the Edwards has been substantially eroded away and is either thin or absent, so the Trinity is the only reliable option for groundwater. In the central portion of the District, the lower and middle Trinity aquifers can be viable alternative water supplies, because they are hydrologically independent of the Edwards Aquifer, do not source as many wells as the Edwards, and consequently are not subject to as strict permitting regulations and drought compliance. The tradeoff: Trinity wells are much deeper and can have less desirable water quality.

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Well Maintenance

The U.S. Environmental Protection Agency's rules that protect public drinking water systems do not apply to individual water systems, such as privately owned wells. As an individual water system owner, it is up to you to make sure that your water is safe to drink.

Wells should be checked and tested ANNUALLY for mechanical problems, cleanliness, and the presence of certain contaminants, such as coliform bacteria, nitrates/nitrites, salinity, or any other contaminants of local concern. Well water should be tested more than once a year if there are recurrent incidents of gastrointestinal illness among household members or visitors and/or a change in taste, odor, or appearance of the well water.

- The presence of **fecal coliform bacteria** in water indicates that waste from humans or warm-blooded animals may have contaminated the water. Water contaminated with fecal coliform bacteria is more likely to also have pathogens present that can cause diarrhea, cramps, nausea, or other symptoms.

- Water with **nitrates** at levels of 10 parts per million (ppm) is considered unsafe for human consumption. Nitrate levels above 10 ppm can disrupt the blood's ability to carry oxygen throughout the body, resulting in a condition called methemoglobinemia. Infants less than 6 months of age and young livestock are most susceptible.

- **Salinity** as measured by Total Dissolved Solids (TDS) is also an important characteristic. Water with high TDS levels may leave deposits and have a salty taste. Additionally, using water with high TDS for irrigation may damage the soil or plants.

All hazardous materials, such as paint, fertilizer, pesticides, and motor oil, should be kept far away from your well.

When mixing chemicals, do not put the hose inside the mixing container, as this can siphon chemicals into a household's water system.

Always check the well cover or well cap to ensure it is intact. The top of the well should be at least one foot above the ground.

Common Household Water Treatment Systems

Filtration Systems

A water filter is a device which removes impurities from water by means of a physical barrier, chemical, and/or biological process. Filters are commonly used to improve taste and odor, color, and remove some contaminants.

Water Softeners

A water softener is a device that reduces the hardness of the water. A water softener typically uses sodium or potassium ions to replace calcium and magnesium ions, the ions that create "hardness." These do not remove other contaminants or reduce salinity.

Reverse Osmosis Systems

Reverse osmosis water systems (RO Systems) filters undesirable materials from water by using pressure to force the water molecules through a semi permeable reverse osmosis membrane. These systems can be used to remove a wide variety of contaminants including salinity, but stand-alone systems do not remove bacteria.

Distillation Systems

Distillation is a process in which impure water is boiled and the steam is collected and condensed in a separate container, leaving many of the solid contaminants behind. These systems can be used to remove a wide variety of contaminants, including bacteria and reduces salinity.

Disinfection

Disinfection is a physical or chemical process in which pathogenic microorganisms (like bacteria) are deactivated or killed. Examples of chemical disinfectants are chlorine, chlorine dioxide, and ozone. Examples of physical disinfectants include ultraviolet light, electronic radiation, and heat.

Drought Impacts

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Drought Stages and Triggers

Barton Springs Discharge - 10 day average (cubic ft per sec)

Lovelady Mon. Well Water Level Elevation (ft above mean sea level)

No Drought
Please, use water wisely
BARTON SPRINGS EDWARDS AQUIFER CONSERVATION DISTRICT

Use Water Wisely

38 cfs — 478.4 ft

Stage II Alarm Drought
20% Reduction in Pumping
BARTON SPRINGS EDWARDS AQUIFER CONSERVATION DISTRICT

Restrict Outdoor Watering

Target Monthly Water Budget:
Per person: less than 4,000 gallons
Family of 4: less than 16,000 gallons

20 cfs — 462.7 ft

Stage III Critical Drought
30% Reduction in Pumping
BARTON SPRINGS EDWARDS AQUIFER CONSERVATION DISTRICT

Stop Outdoor Irrigation

Target Monthly Water Budget:
Per person: less than 3,000 gallons
Family of 4: less than 12,000 gallons

14 cfs — 457.1 ft

Stage IV Exceptional Drought
40% reduction in pumping
BARTON SPRINGS EDWARDS AQUIFER CONSERVATION DISTRICT

Minimize ALL Water Use

Water Suppliers shift to alternate water sources.

Target Monthly Water Budget:
Per person: less than 2,000 gallons
Family of 4: less than 8,000 gallons

10 cfs — 453.4 ft

Emergency Response
No non-essential watering
BARTON SPRINGS EDWARDS AQUIFER CONSERVATION DISTRICT

Stop Non-essential Water Use

No outdoor watering.
Restrict and reduce indoor water use

Drought is a common occurrence in Central Texas. Groundwater levels and springflow in the Barton Springs segment of the Edwards Aquifer and the underlying Trinity Aquifer can drop significantly during drought. In fact, some wells, especially in the western portion of the District, have run dry during advanced stages of drought.

Groundwater is a shared resource. Research has shown that collectively reducing pumping slows the rate of water level decline. That means that water conservation is key to protecting water availability during drought.

	Drought Stage	Water Elevation Change		Date Range	Time Elapsed
2008-2009 DROUGHT					
2008 – 2009 Drought	No Drought	500.4' to 478.4' (Average to Alarm threshold)	Decline	Feb. 24, 2008 – Jun. 3, 2008	3 months, 10 days
	Alarm Drought	478.4' to 462.7' (Alarm to Critical threshold)	Decline	Jun. 3, 2008 – Oct. 27, 2008	4 months, 26 days
	Critical Drought	below 462.7' (below Critical threshold)	Depth of Drought	Oct. 27, 2008 – Oct. 31, 2009	12 months, 8 days
	Alarm Drought	462.7' to 478.4' (Critical to Alarm threshold)	Recovery	Oct. 31, 2009 – Dec. 21, 2009	1 month, 19 days
	No Drought	478.4' to 500.4' (Alarm threshold to Average)	Recovery	Dec. 21, 2009 – Mar. 8, 2010	2 months, 16 days
2011-2012 DROUGHT					
2011-2012 Drought	No Drought	500.4' to 478.4' (Average to Alarm threshold)	Decline	Jan. 10, 2011 – Apr. 24, 2011	3 months, 14 days
	Alarm Drought	478.4' to 462.7' (Alarm to Critical threshold)	Decline	Apr. 24, 2011 – Sept. 8, 2011	4 months, 15 days
	Critical Drought	below 462.7 (below Critical threshold)	Depth of Drought	Sept. 8, 2011 – Feb. 23, 2012	5 months
	Alarm Drought	462.7' to 478.4' (Critical to Alarm threshold)	Recovery	Feb. 7, 2012 – Mar. 22, 2012	1 month, 14 days
	No Drought	478.4' to 500.4' (Alarm threshold to Average)	Recovery	Mar. 22, 2012 – Jul. 26, 2012* (did not rise above average)	-
2012-2013 DROUGHT					
2012-2013 Drought	No Drought	500.4' to 478.4' (Average to Alarm threshold)	Decline	July 28, 2012 – Nov. 6, 2012	3 months, 11 days
	Alarm Drought	478.4' to 462.7' (Alarm to Critical threshold)	Decline	Nov. 6, 2012 – Apr. 16, 2013	5 months, 10 days
	Critical Drought	below 462.7 (below Critical threshold)	Depth of Drought	Apr. 16, 2013 – Oct. 24, 2013	6 months, 11 days
	Alarm Drought	462.7' to 478.4' (Critical to Alarm threshold)	Recovery	Oct. 24, 2013 – Nov. 19, 2013	26 days
	No Drought	478.4' to 500.4' (Alarm threshold to Average)	Recovery	Nov. 19, 2013 – (did not rise above average)	-

Table based on Lovelady Monitor Well water levels showing length of time spent in drought stages.

To lessen impacts of drought on 60,000+ groundwater users (including you), the District coordinates a large-scale, multi-faceted water conservation program. District hydrogeologists monitor the aquifer status and storitivity using two drought indicators--the Lovelady Monitor Well and Barton Springs. Both drought indicators can be used to predict what is happening in the District. Depending on the declared drought stage and permit type, well owners are required to reduce their pumpage by set amounts and follow their approved drought contingency plan.

These pumping restrictions and coordinated conservation efforts effectively protect groundwater supplies for all users by slowing groundwater declines. It is the sum of all water conservation activities--no matter how small--that makes a difference. We are all in this together.

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Water Conservation

Natural climate cycles in Central Texas require residents to constantly alternate between drought recovery and drought preparation. Given limited water resources and projected increases in demand, it is crucial that residents find innovative, water-saving strategies to live by.

From downpours to drought, Central Texas can oscillate between humid subtropical conditions in a wet year and semi-arid conditions during a dry year. At the Camp Mabry weather station, annual precipitation totals have varied from 64.68 inches during the wettest year (1919) to 11.42 during the driest year on record (1954). The average annual precipitation is 33.44 inches. With three major droughts in the last five year 'average' doesn't seem very common these days.

Water-Saving Plant Solutions

Every plant is native to some place. In other words, plants naturally occur where conditions are optimal for the needs of that plant. Think survival of the fittest. Central Texas native plants are naturally adapted to the dramatic climatic cycles of Central Texas—from wet years to dry years. Other plants, referred to as adapted or drought-tolerant, can also survive and thrive in the Central Texas climate. Relying on native or drought-tolerant plants and their characteristics, residents can have vibrant colors year-round, provide natural wildlife habitat and food sources, and save water, sweat, and time with a landscape well-adapted to Central Texas.

Landscaping

Native and drought-tolerant plants require half as much water as grass (SAWS, 2010). Replacing lawns or portions of lawns with native landscapes can reduce outdoor water use by up to 75% (AWWA, 2010) due to the lower water requirement and the ability to incorporate more efficient drip irrigation or soaker hoses into the watering system. Increasing the diversity of plants in a landscape supports an abundance of wildlife and naturally boosts the disease resistance of your yard (Damude and Bender, 1999).

Lawns

Lawns do not occur naturally in Central Texas. They usually require care, feeding, and a lot of water. However, there are several meadow turfgrasses native to Central Texas and several more grasses well adapted to weather Central Texas' climate that can be used to establish a drought-tolerant lawn. Native meadow turfgrasses include buffalo grass, blue grama, and curly mesquite. In addition to being hardy and drought-tolerant, these grasses serve as a natural food source for native Texas wildlife. Drought-tolerant turfgrasses include bermuda grass and zoysia grass. St. Augustine grass is not considered to be highly drought-tolerant, but it is included in the chart below for comparison.

	Buffalo	Blue Grama	Curly Mesquite	Bermuda	Zoysia	St. Augustine
Texas Native	Yes	Yes	Yes	No	No	No
Water Requirement	Very low	Moderate to low	Moderate to low	Moderate to low	Moderate to low	Moderate
Drought Tolerance	Excellent	Excellent	Excellent	Very good to excellent	Very good	Moderate to good (in shade)
Leaf Texture	Fine	Fine	Fine	Fine	Medium to fine	Coarse
Mowing Height	2.5 to 3 inches	3 to 4 inches	3-4 inches	1 to 2 inches	.5 to 2 inches	2.5 to 3 inches
Mowing Frequency	7-14 days	21-35 days	21-35 days	3-7 days	5-10 days	5-7 days

Aquifer Management

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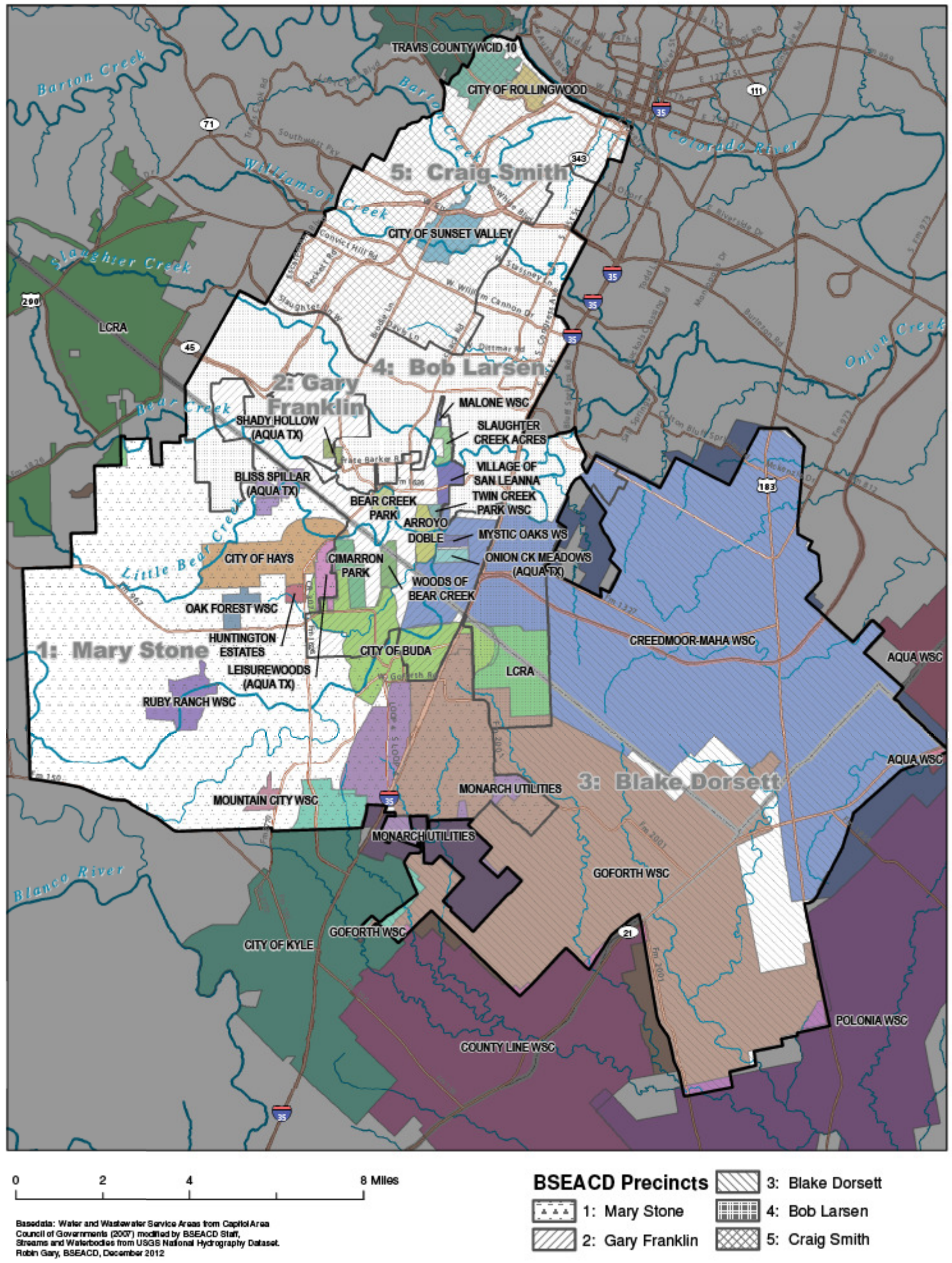
A five-member Board of Directors is the governing body of the District and ensures the District's work is consistent with the mission, District rules, and local priorities. Directors are elected in the November general elections of even-numbered years by the registered voters in five single-member precincts.

The Board sets policies and adopts rules and bylaws that guide District operations and direct permitting and enforcement decisions. Board meetings are generally held on the 2nd and 4th Thursdays each month and are open to the public. The Board also appoints ad hoc advisory committees to review various activities and procedures and make recommendations to the District. These committees are made up of local citizens and other stakeholders who are knowledgeable about environmental and economic concerns within the District as well as technical specialists in various fields.

Currently, wells are classified as exempt, nonexempt domestic use, or permitted through individual production permits. Exempt Wells are low capacity wells used solely for large tract residential or livestock needs. Wells drilled before 1987 or wells on more than 10 acres to be used solely for domestic or livestock qualify as exempt from permitting but must be registered with the District and meet District Well Construction Standards. Nonexempt Domestic Use (NDU) General Permits authorize wells used solely for the domestic needs of residences located on small lots where there is no other alternative water source reasonably available. This pumpage is subject to drought restrictions, but may be authorized during drought since it is the sole source of domestic supply. Individual Production Permits cover all other pumpage for new nonexempt Trinity and Edwards wells. Permits for new Edwards wells are designated as "Class C Conditional" Permits, which means that they are interruptible and subject to 100% curtailment during District-declared drought.



There are 24 water suppliers within the District that pump water from the Edwards and/or Trinity aquifers. The majority of these water utilities rely solely on groundwater. However, some utilities supplement supplies with surface water from either the Guadalupe Blanco River Authority or the Lower Colorado River Authority (e.g., City of Sunset Valley, City of Kyle, Creedmoor-Maha, Monarch, and Goforth). Regardless, during drought to preserve water levels and protect springflows, all suppliers must meet the mandatory groundwater pumping reductions set forth by the District Board of Directors and follow an approved User Drought Contingency Plan that establishes how water use reduction will be achieved. These plans are what drive water restrictions for residents and businesses.

Online Resources

Aquifer District Website

www.bseacd.org

Drought stage, upcoming events, and news posted on home page. Information about District History, Board of Directors, Staff, Regulatory Program, Events, Education, Scholarships, Projects, Research, Publications, etc. available online.

Aquifer Status

www.bseacd.org/aquifer-science/drought-status/

District drought triggers--Barton Springs 10-day average and Lovelady Monitor Well levels--updated approximately every two weeks.

Well Owners Web Page

www.bseacd.org/education/well-owners/

Resources and programs for District well owners including information on the annual water well check-up, local water quality labs that can analyze residential well samples, and this well owner guide.

Texas Well Owner Network

twon.tamu.edu/

The Texas A&M AgriLife Extension Service has an active Texas Well Owner Network that helps educate well owners about pollution prevention, well maintenance, and water quality issues. The District collaborates with the Well Owner Network to host an annual Water Well Check-up each Spring.

TCEQ Water Well Report Viewer

www.tceq.texas.gov/gis/waterwellview.html

TCEQ's Water Well Report Viewer is an online, map-based locator of over 800,000 historical reports for water wells drilled in Texas. A water well report includes information about the: well location, depth, and construction; water level; local geology; driller and original owner.

Texas Department of Licensing and Regulation

www.license.state.tx.us

Search for licensed water well drillers and pump installers by license number or by county. Search for violations by license type. Click on the 'Search License or Project' tab to view search options.

Better Business Bureau

austin.bbb.org/Find-Business-Reviews/

Find accredited well drillers and servicers and research or file a complaint. Search for 'Water Well Drilling & Service' and enter a zip code for well service providers in a particular area.

City of Austin Water Wells Program

www.austintexas.gov/department/water-wells-program

Water wells (existing, new or planned) located on a property that receives water or wastewater service from the Austin Water Utility must be registered with the City of Austin.

Barton Springs
Edwards Aquifer
Conservation District

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Austin, Texas 78748
(512) 282-8441
www.bseacd.org

Mission

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Goal

To equitably and effectively manage and protect groundwater resources for all groundwater users within its boundary. We serve the groundwater community by monitoring groundwater levels and water quality, managing the shared groundwater resource, coordinating water conservation efforts during drought, and researching aquifer dynamics.

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