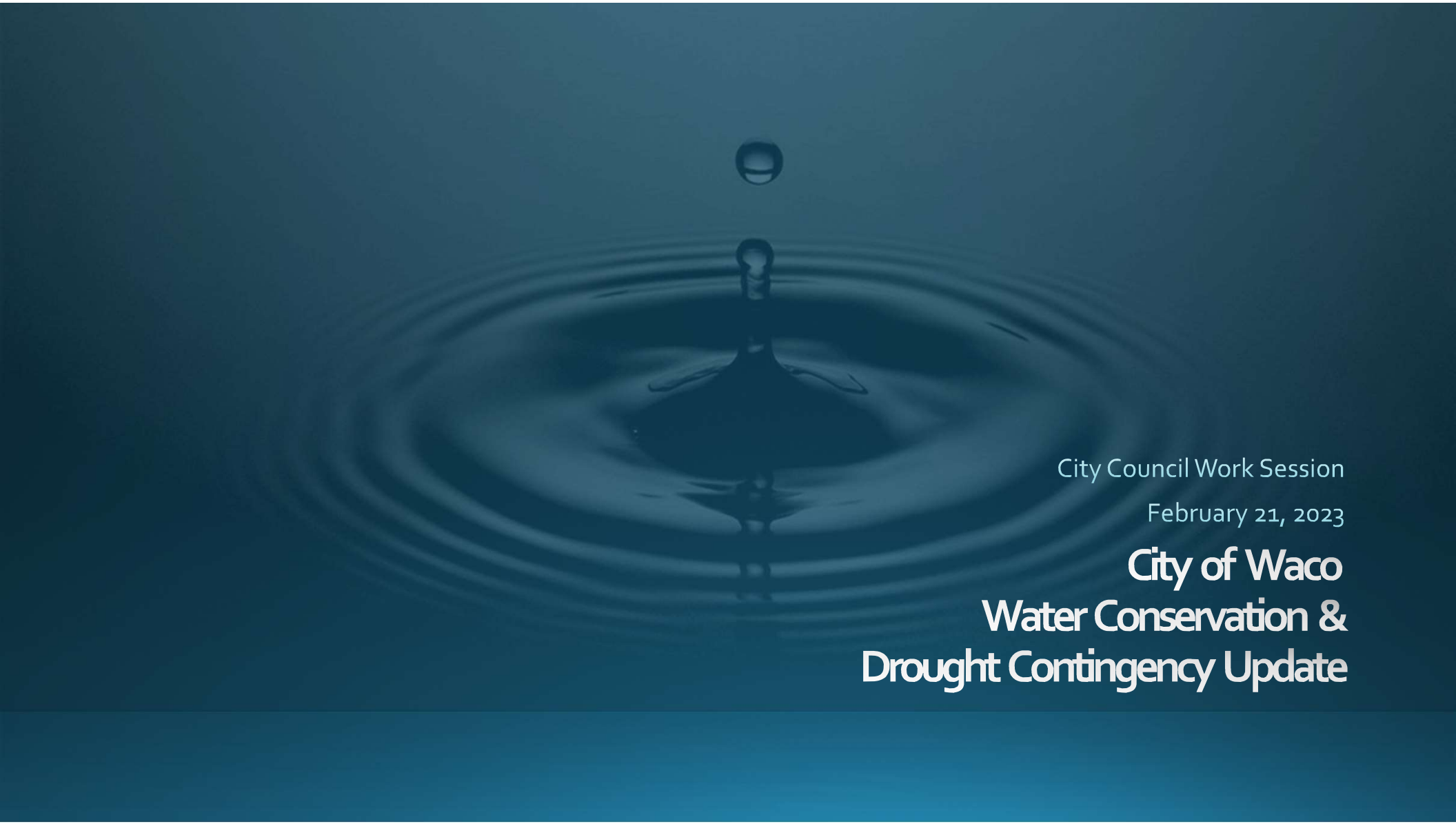


City Council Work Session

February 21, 2023

City of Waco Water Conservation & Drought Contingency Update

Why this presentation is needed

Without significant rainfall before August 2023, a water emergency is coming

- Lake levels are historically low
- Conservation required
  - Use restrictions will tighten
- Short- & Long-Term Strategies to Champion and Implement
- Community Impacts will be significant
  - Economically
  - Environmentally
  - Financially
  - Aesthetically

History of Lake Waco

- 1925 -**Waco exhausts wells and pumps the Brazos River Dry**
- 1929 - **Bonds were authorized to construct Lake Waco**
- 1930 – The first Lake Waco Dam is completed – cost $2,500,000
- 1950 – **Due to drought conditions, the City begins planning for future water needs**
- 1956 – **City Officials lobby for the construction of a new dam**
- 1958 – Congress appropriates $1,000,000 for construction
- 1964 – Lake Waco Dam is completed for $53,600,000
- 1979 – **Waco City Council authorizes a study for raising Lake Waco**
- 1984 – Army Corps of Engineers signs a contract to raise Lake Waco 7 feet
- 1988 – **Waco City Council approves Lake Waco Rise Project – cost $34,000,000**
- 2003 – Impoundment of new water begins

Lake Waco 1956 – Old Twin Bridges in background.

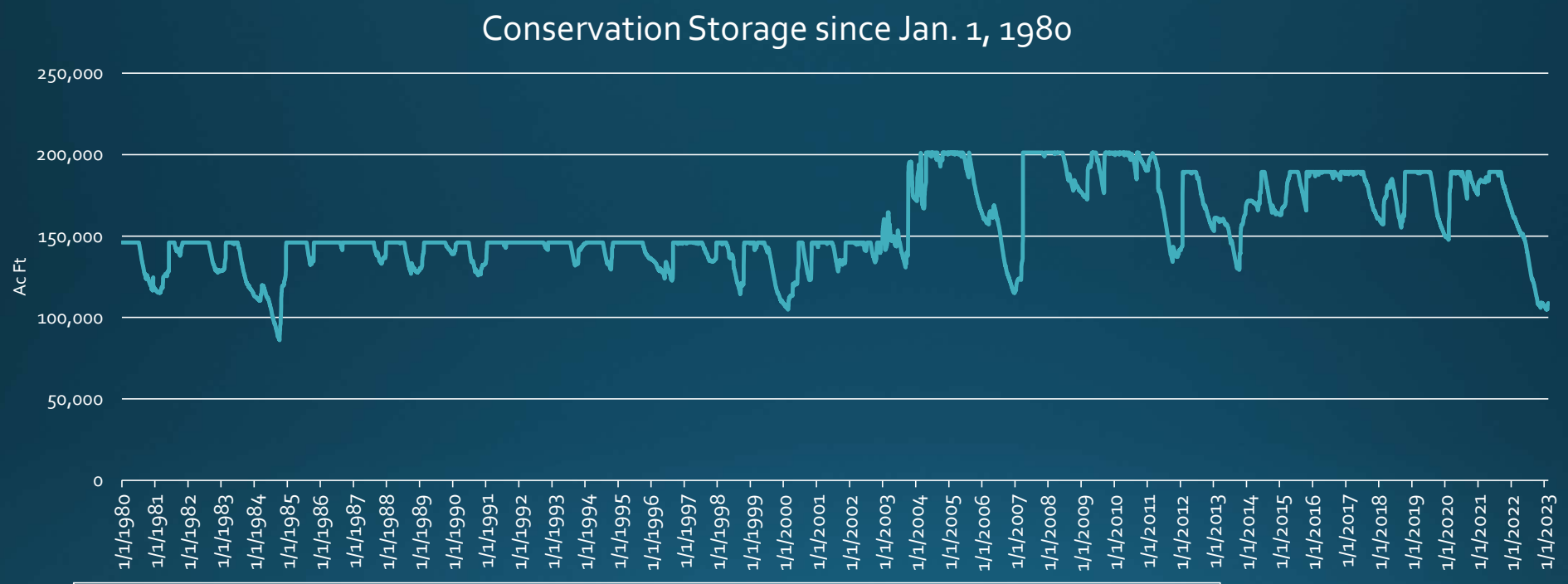

Lake Waco May 2021
Lake Waco Wetlands
N River Crossing


Lake Waco August 2022
Lake Waco Wetlands
N River Crossing

Lake level

Current Lake Level:450.97 MSL (108,851 ac. ft.)

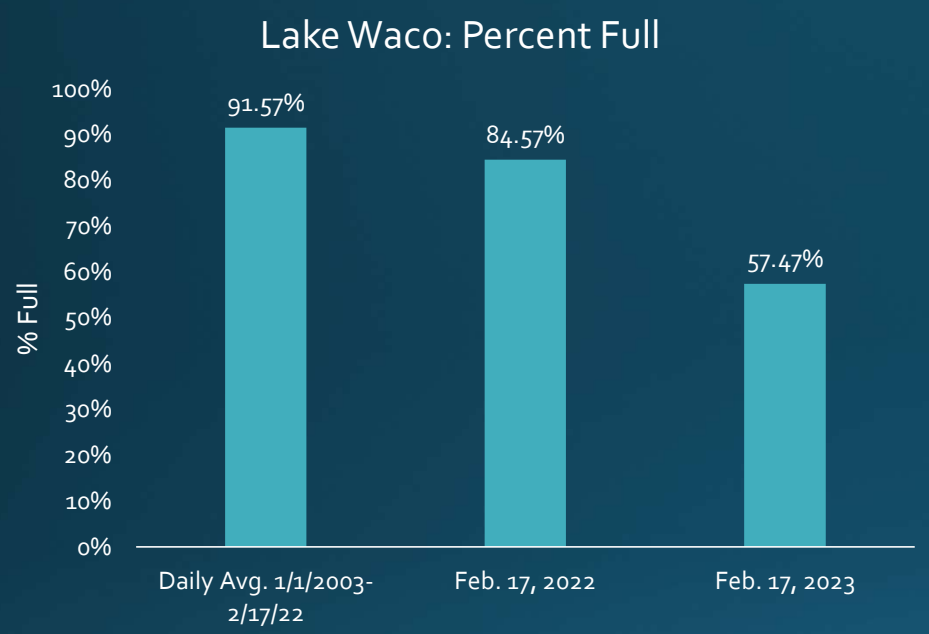
Full – 462.2 MSL (189,418 ac. ft.); 11.23 feet low

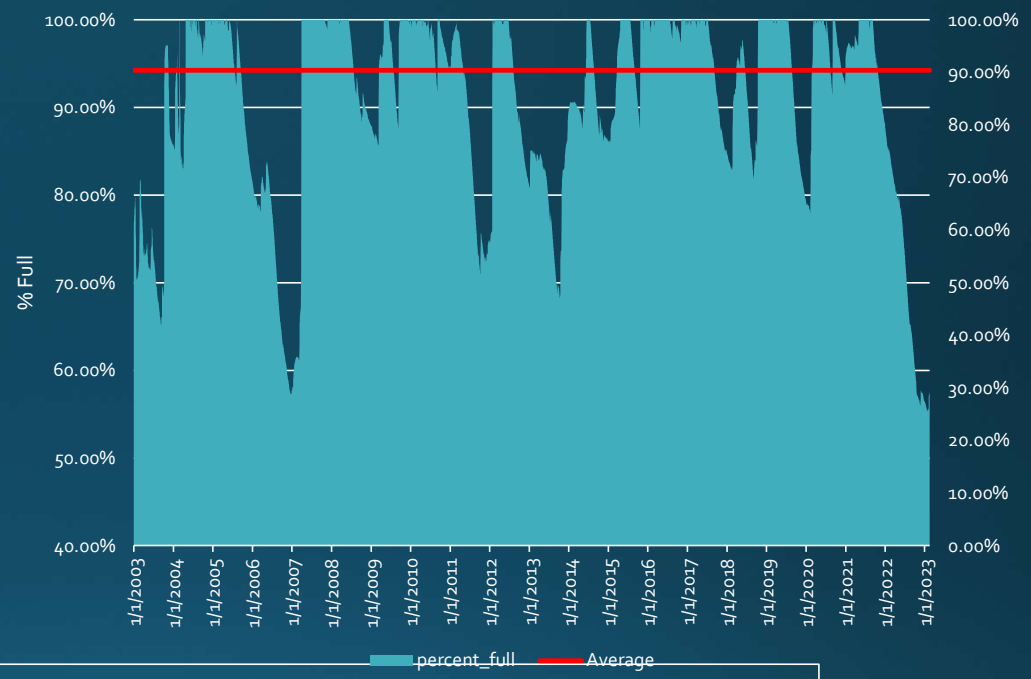


<u>*Key Takeaways:*</u>

- *Since July 7, 1984, (just under 39 years) there has been ONE day (2/22/2000) when the available storage was lower that it was on January 31-Feb 1, 2023.*
- *From 1980-2002, the average daily conservation was 138,843. Since the pool rise (2003), the average daily conservation storage was 175,632. That difference of 36,790 acre feet is 11.9B gallons of water.*

Lake Waco: Percent full since the 2003 pool rise impoundment

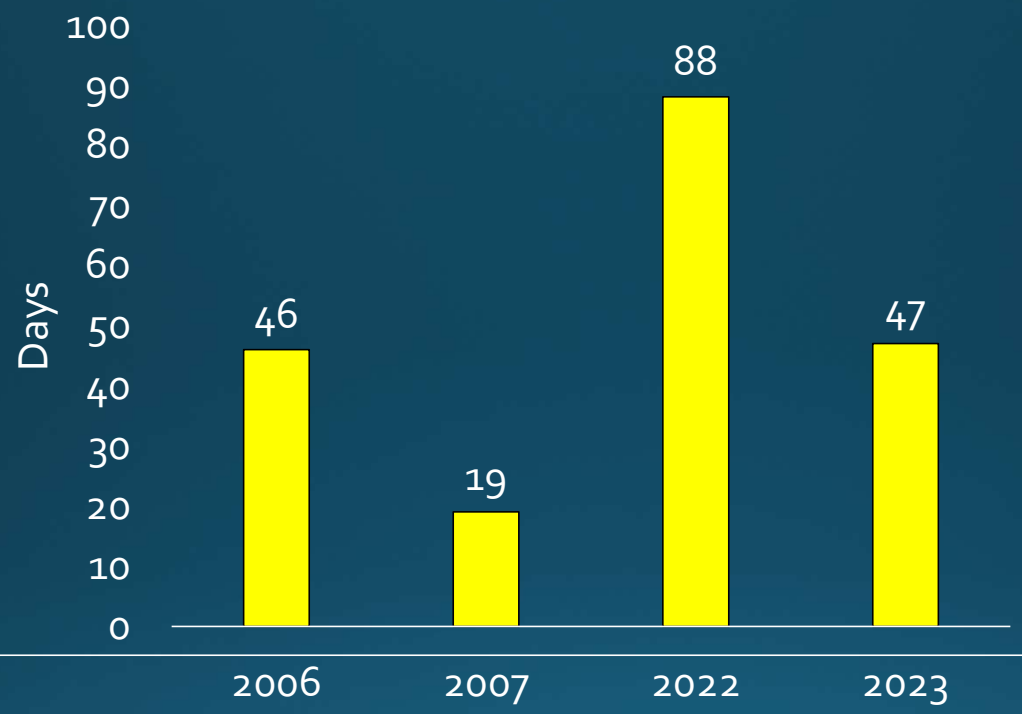




<u>Key Takeaways:</u>

- The Lake was last full 9/10/21- 524 days ago. The lake has fallen on 450 (86%) of those days & rose on only 47 days (9%).
- Since 2003, the Lake has been below 60% full on 200 days. 135 of those days (67.5%) occurred in 2022-23.
- 2022 saw more days below 60% (88) than the previous 20 years combined (65)
- Jan. 31-Feb. 1, 2023 the lake was at its lowest % full (55.3%) since the pool rise in 2003.

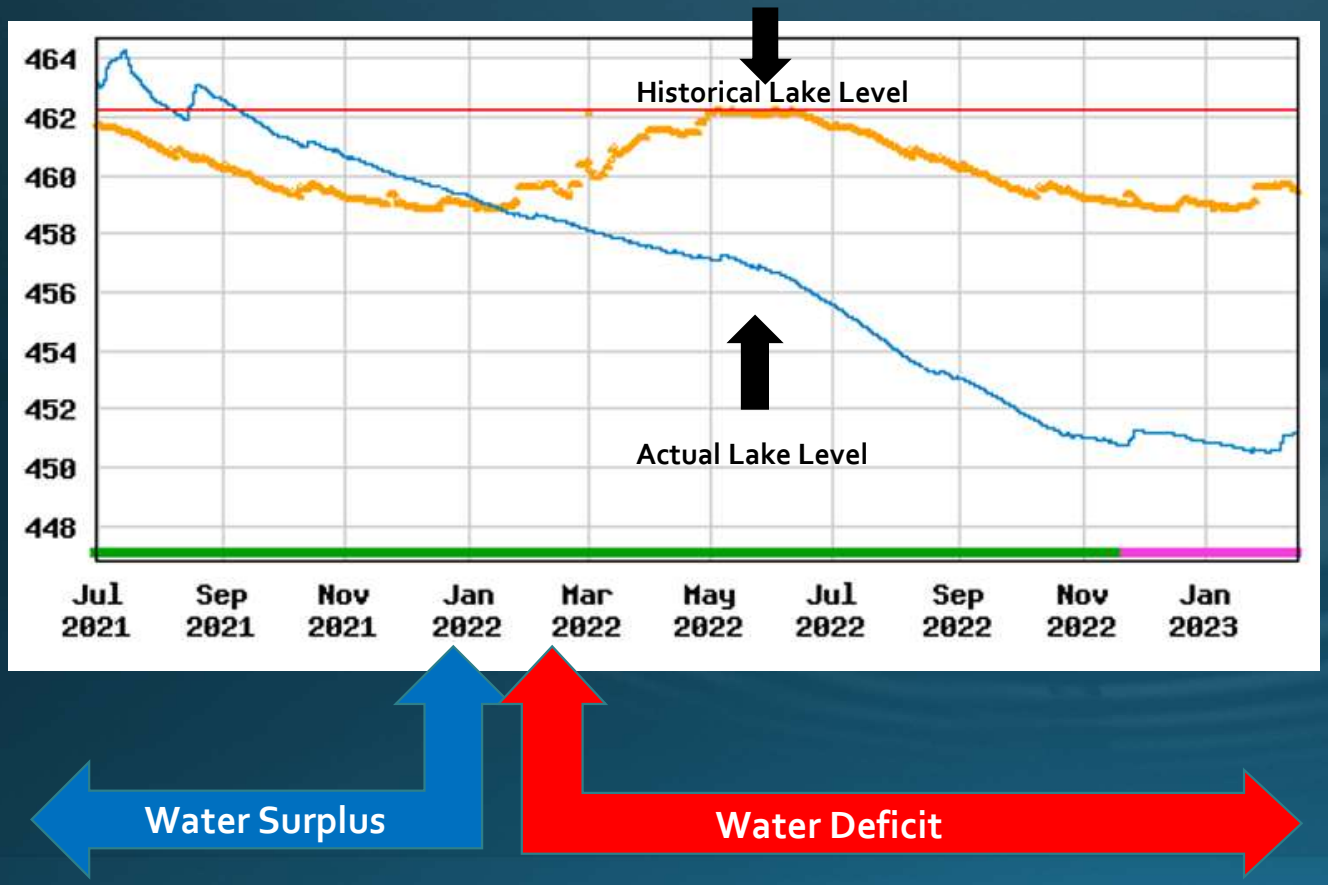
Lake Waco: Days Below 60% full since the 2003 impoundment



Key Takeaways:

- The Lake was less than 60% full for 64 consecutive days from Nov. 16, 2006 - Jan. 19, 2007
- As of Feb. 16th, the lake had been below 60% full for 134 consecutive days (since 10/5/22)

Lake Level from July 2021



Key Takeaways:

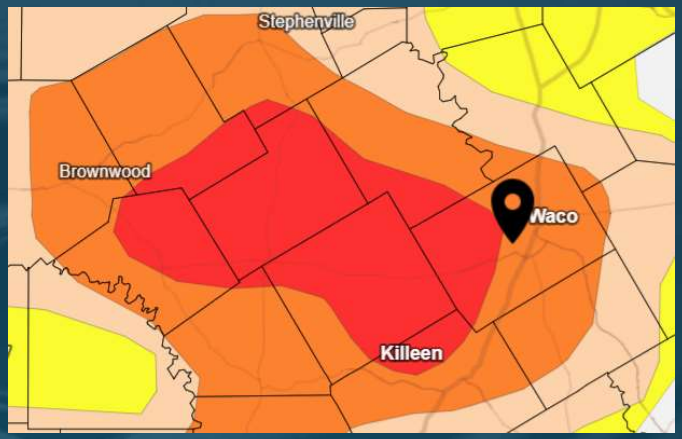
- Waco has been in a water deficit since Feb. 2022
- Lake Level has dropped 13.22 feet since July 2021
- Summertime draw down can be as high as 110MGD (40% consumption/60% evaporation)

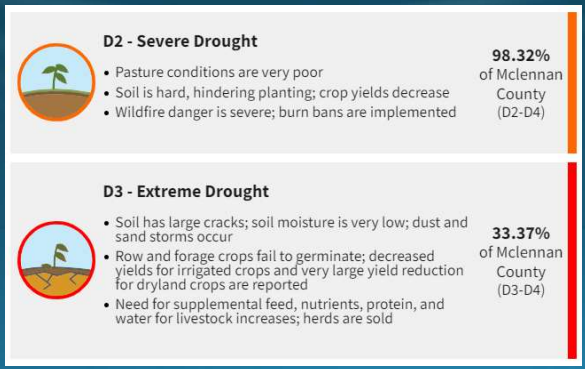
How much water do we have?

- At current levels, we have 35.5 Billion gallons in the Lake
- Annual usage is about 11 Billion gallons
- Evaporation is a significant concern
  - Accelerates as lake levels decline
  - Temperature and humidity determinant
  - Loss can be 1.5 times usage in summer months
  - Estimated annual loss at 11-16 Billion gallons annually
- **Less than two years of water supply are currently stored in Lake Waco.**

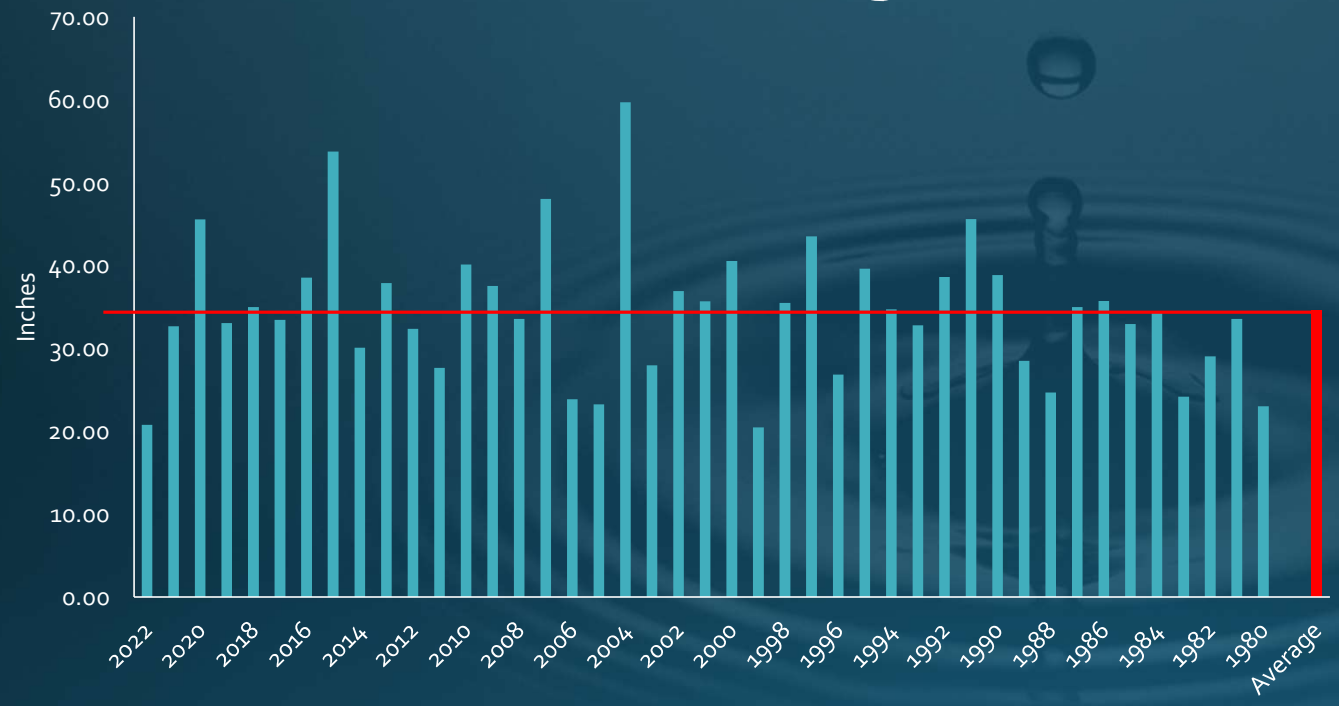
Rainfall

Drought in Lake Waco Watershed





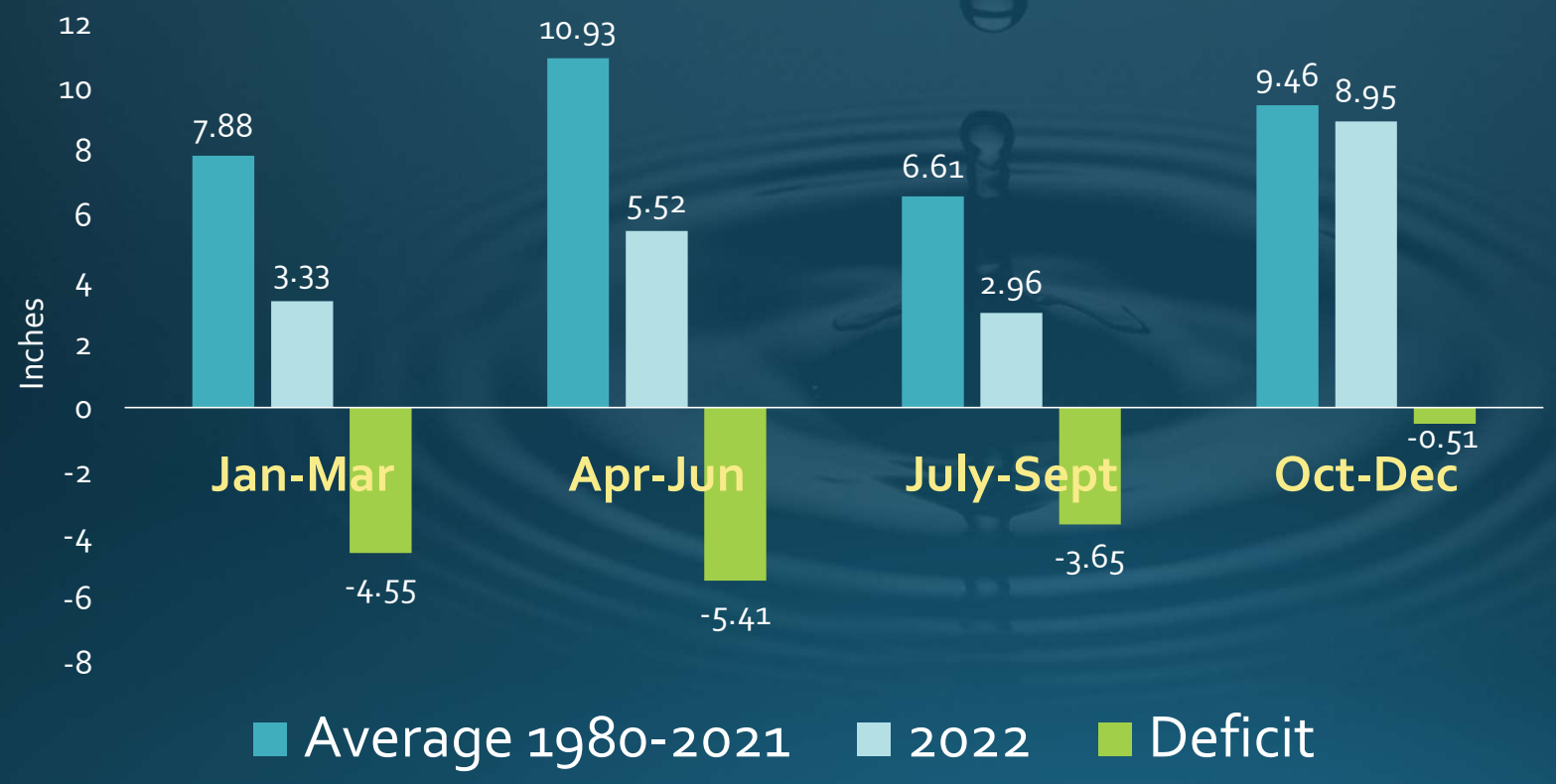
Annual Rainfall: 1980-2022



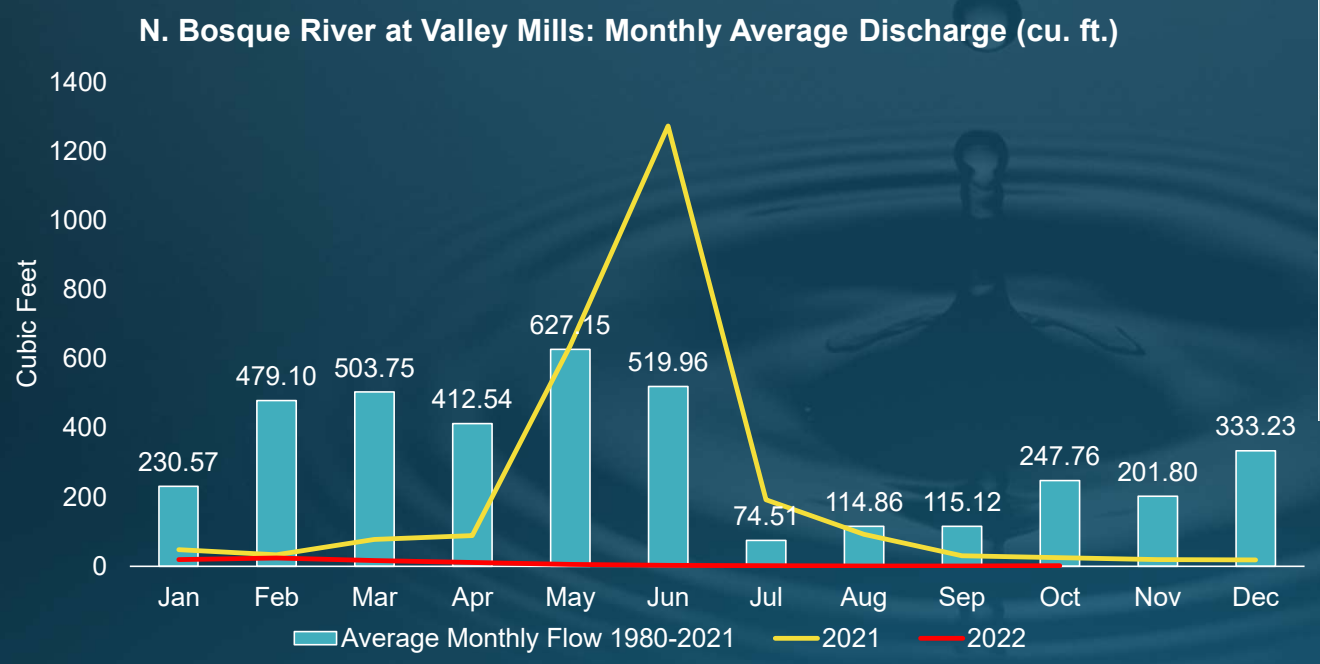
Key Takeaways:

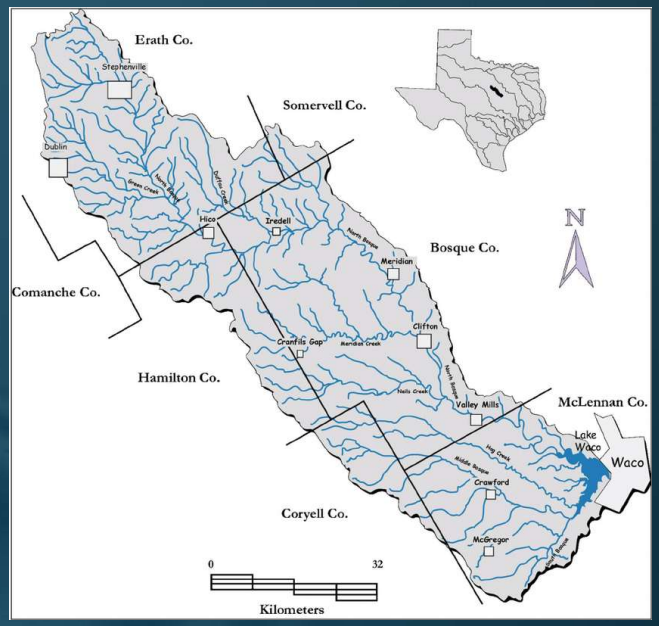
- *2022's total of 20.76 inches was next to lowest since 1980 (20.48 in 1999) and 13.85 inches below average*
- *Across Waco's 103 square miles, that's 24.8 Billion less gallons of water than an average year*

Seasonal Rainfall: The "when"…



The “where”…





<u>Key Takeaway:</u>

- *From August 2021-Oct 2022, the monthly average discharge has been 89.7% below the 41 year average.*

The "where" …

Hog Creek near Crawford	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Average Monthly Discharge: 1980-2021	23.95	23.67	43.26	32.85	33.16	36.66	4.19	1.64	13.07	45.38	17.38	18.70
2022	0.181	0.188	0.155	0.066	0.176	0.046	0.009	0.003	0.002	0		
% of Average	0.76%	0.79%	0.36%	0.20%	0.53%	0.13%	0.21%	0.18%	0.02%	0.00%		

Middle Bosque near McGregor	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Average Monthly Discharge: 1980-2021	75.64	75.42	111.60	72.29	94.68	81.87	16.11	6.92	27.57	114.94	60.82	56.32
2022	1.08	1.82	1.08	1.02	15.4	0.175	0	0.016	0	0		
% of Average	1.43%	2.41%	0.97%	1.41%	16.27%	0.21%	0.00%	0.23%	0.00%	0.00%		

N. Bosque at Valley Mills	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Average Monthly Discharge: 1980-2021	230.57	479.10	503.75	412.54	627.15	519.96	74.51	114.86	115.12	247.76	201.80	333.23
2022	19.20	23.40	16.60	10.80	5.02	2.20	1.00	0.60	0.70	0.97		
% of Average	8.33%	4.88%	3.30%	2.62%	0.80%	0.42%	1.34%	0.52%	0.60%	0.39%		

Drought Response Plan

City of Waco's Drought Contingency Plan Drought Response Stages

Stage One	Stage Two	Stage Three	Stage Four
MILD SHORTAGE 455 MSL 72% full	**MODERATE SHORTAGE** 452 MSL 60% full **(CURRENT STAGE: 57% full)**	**SEVERE SHORTAGE** 449 MSL 50% full Projected mid April 2023	**EMERGENCY SHORTAGE** 445 MSL 40% full Projected August 2023

The City Manager may exercise discretion to: 1) request special voluntary water restrictions, 2) initiate Stages 1 – 4 mandatory restrictions, and/or 3) prohibit wastage and restrict certain uses of water deemed nonessential during the emergency.

Key Takeaways:

- We are currently half-way through our response stages

Drought Contingency Plan Restrictions

Restriction	Stage 1: Mild	Stage 2: Moderate	Stage 3: Severe	Stage 4: Emergency
Reduction from 3 year average	1%	5%	15%	20%
Criminal Penalties	No	Yes	Yes	Yes
Outdoor Watering and Landscape Uses	NA	2 days per week; Prohibited 8a-7p; Prohibited Thurs; 30-day allocation for new plantings.	1 day per week; Prohibited 10a-7p; Prohibited Sat-Sun;	Prohibited
Swimming pools, hot tubs, spas, ornamental ponds and fountains	NA	NA	Existing: replenished with a hand-held hose to maintain operational purposes only. New Permits: Prohibited	Prohibited

Drought Contingency Plan Restrictions

Restriction	Stage 1: Mild	Stage 2: Moderate	Stage 3: Severe	Stage 4: Emergency
Washing or hosing down of buildings, sidewalks, driveways, patios, porches, parking areas, or other paved surfaces	NA	NA	Prohibited	Prohibited
Car Washes	NA	NA	Allowed if: 50% reuse or wand <=3gpm	Prohibited
Golf Courses, Parks, Ballfields, etc.	NA	NA	controlled irrigation system must incorporate evapotranspiration data in setting irrigation run times; subject to overall reduction goal.	Prohibited

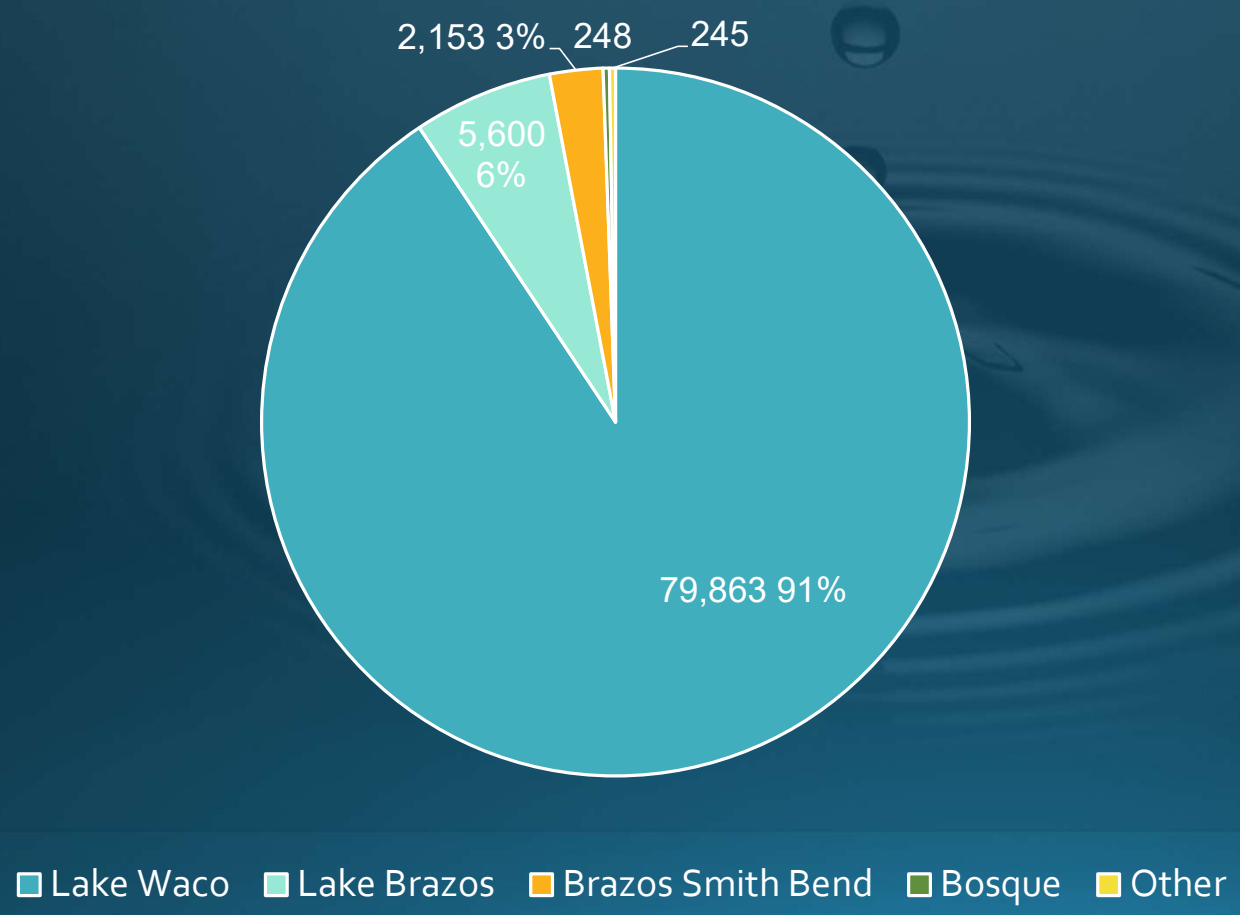
Short- and Long-Term Strategies

Water Planning

- Drought of 2022 -2023 has created a need to thoughtfully review our short and long-term water strategy
- Waco has a water surplus currently of about 5,000 acre-feet through 2040 but faces a water deficit of about 3000 acre-feet by 2070
- Existing water planning has
  - Lower than expected growth
  - Conservation strategies unbudgeted

Waco Water Rights

88,109 acre feet



Water Supply Opportunities

Blue Bonnet Water 1k ac ft

Emergency Tfer Pumps *variable*

Water Conservation 12k ac ft

Use Brazos Water Rights 8k ac ft

Re-use of WWTP Effluent 8k ac ft

Add'l 3 ft Lake Waco 20k ac ft

Short Term/Less Expensive ⟷ Long Term/More Expensive

1,000 ⟷ Acre Foot Impact ⟷ 20,000

Community Impacts

Economically

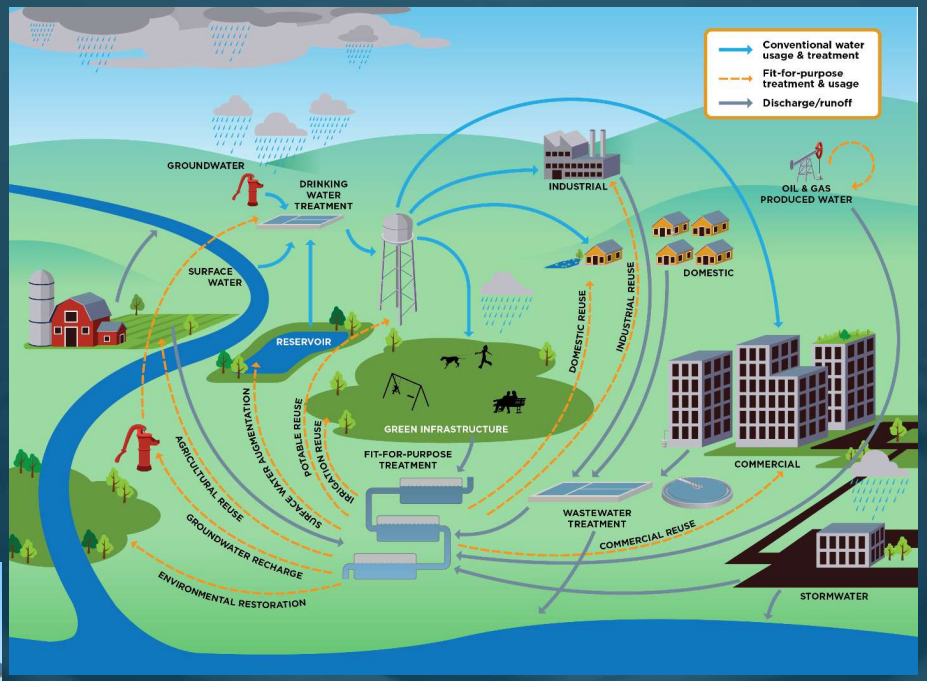







Environmentally

Financially



Aesthetically

Summary

- Historic lows:
  - Rainfall
  - Lake levels
- Historic highs: Drought severity & duration
- Halfway through our drought response phases
  - Severity of restrictions will increase
- Water supply plans must be championed… paid for, expedited, implemented
- Our community will be impacted
  - Restrictions, mandatory conservation, business closures
  - Funding of short-and long-term solutions
- Strategic Goal of Supporting Sustainability: Water is life!

Comments & Questions