Where will Austin's water come from over the next 100 years?

Robert E. Mace, Ph.D., P.G.
The Meadows Center for Water & the Environment
Texas State University

Austin WATER

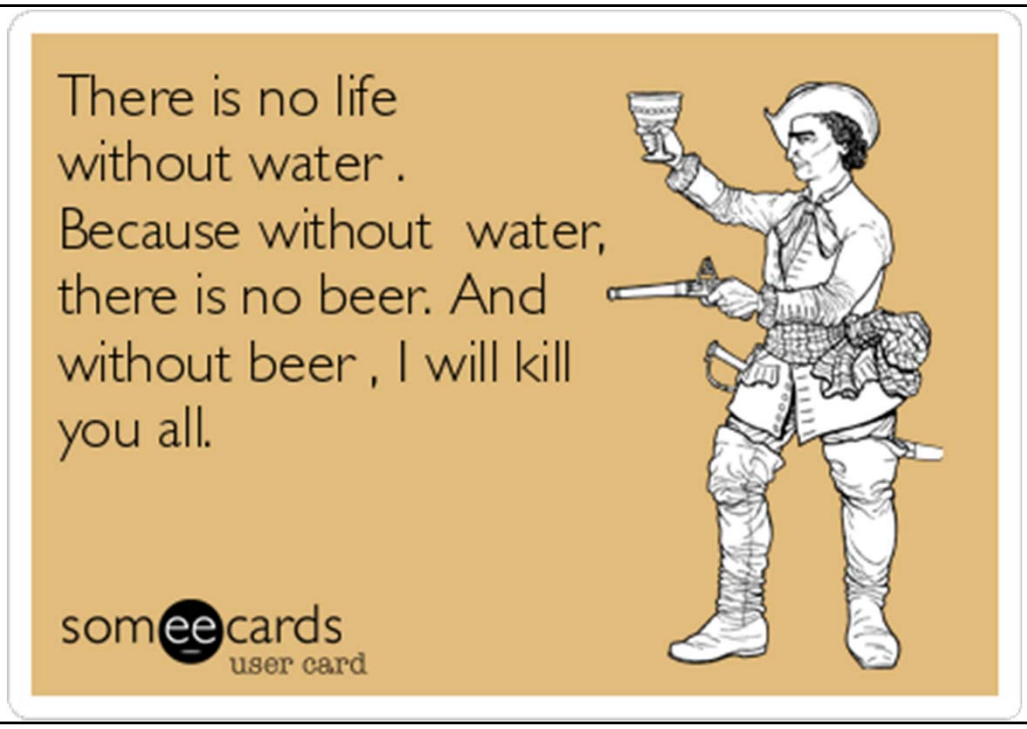
presented to

Austin Regional Group of the Sierra Club
Austin, Texas; September 11, 2018

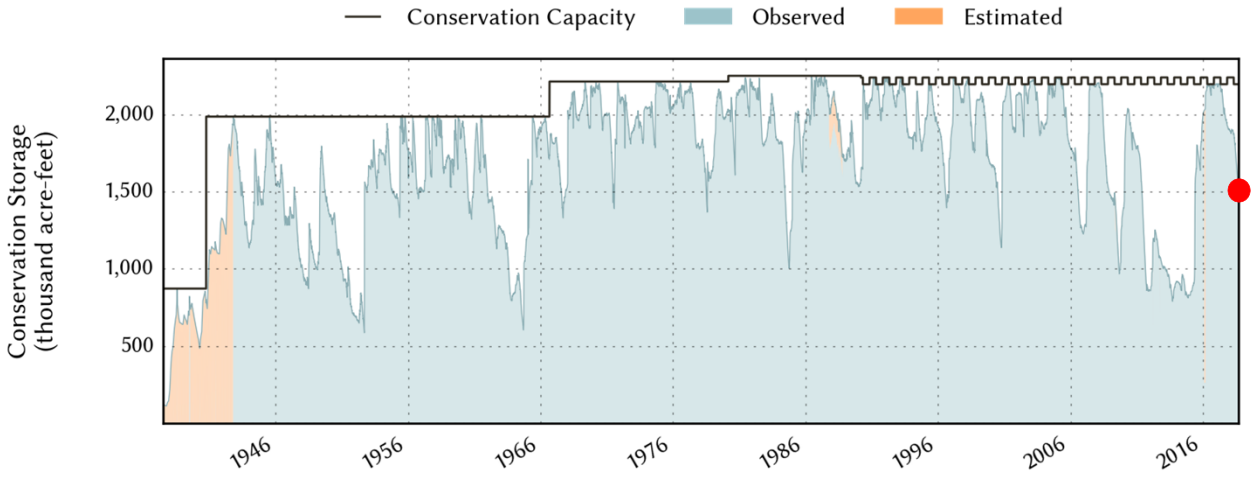
WATER FORWARD
INTEGRATED WATER RESOURCE PLAN

presentation available at sosecretoccultandconcealed.com

1

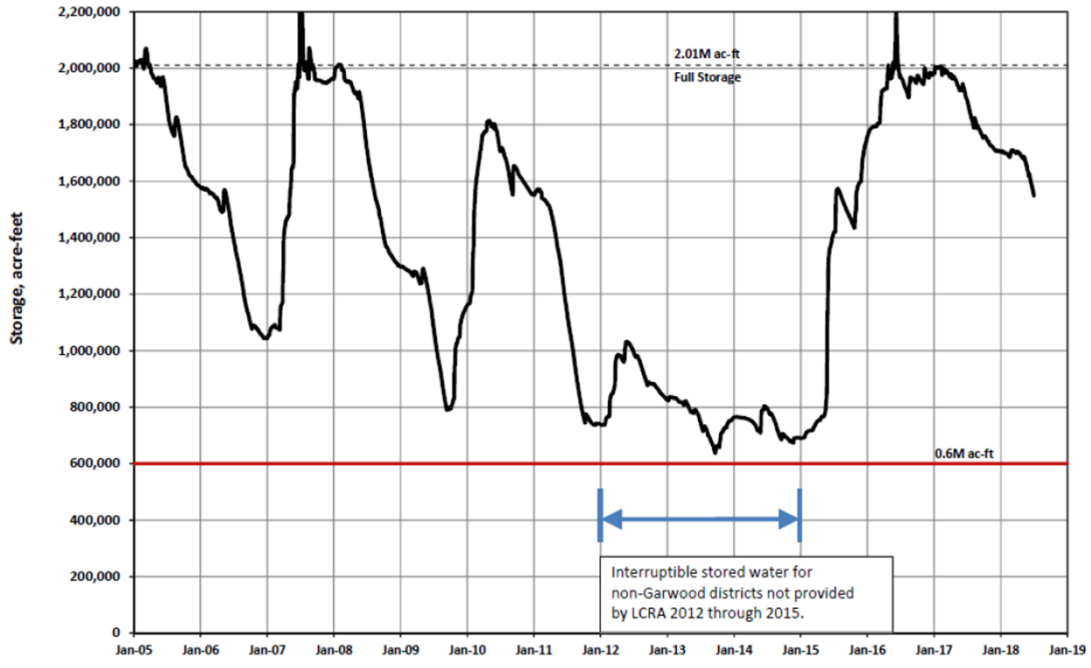


Historical storage in Austin area reservoirs



includes lakes Buchanan, Georgetown, Stillhouse Hollow, and Travis; graphic from TWDB's waterdatafortexas.org

Combined storage in lakes Buchanan and Travis

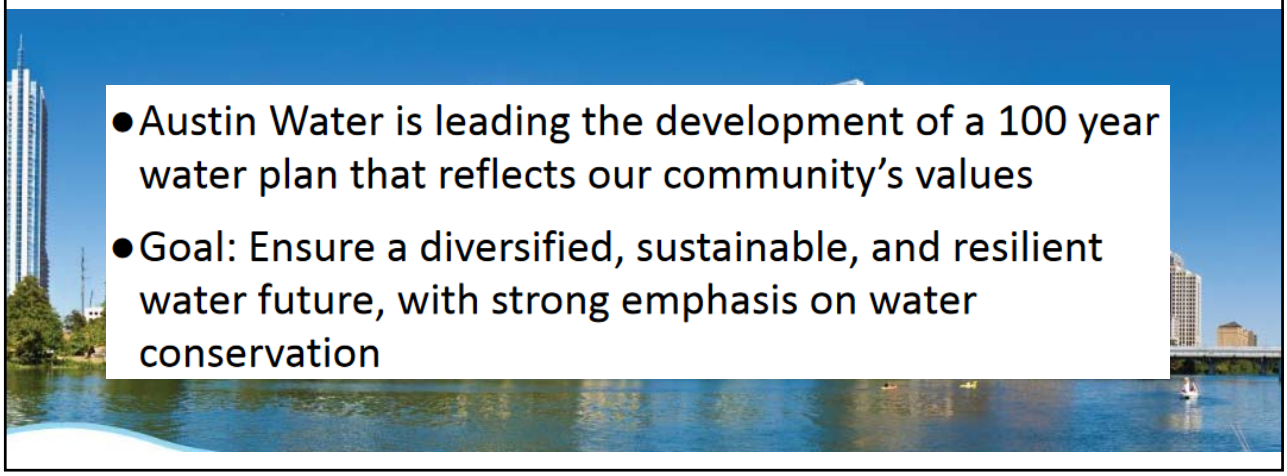


- 2008: drought starts in March
- 2011: Lake Travis recedes to 35 percent full
- 2013: Lake Travis bottoms out at 29 percent full
- 2014: City Council creates the Austin Water Resource Planning Task Force
  - Task Force recommends developing an Integrated Water Resources Plan
    - Council creates a task force to develop plan
- 2015: Water Forward Task Force convenes
- 2016: Drought ends
- 2018: Draft water plan released
- 2018: Lake Travis at 61 percent full
- 2018: Seek Council approval

timeline

Austin WATER

WATER FORWARD
INTEGRATED WATER RESOURCE PLAN

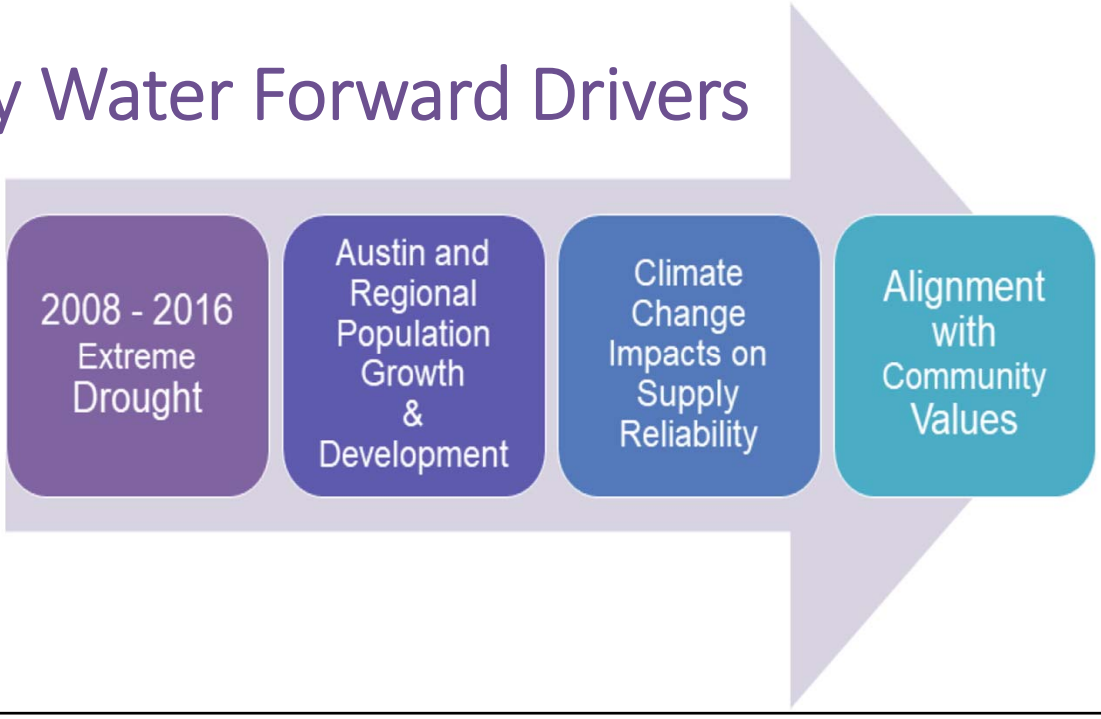


- Austin Water is leading the development of a 100 year water plan that reflects our community's values
- Goal: Ensure a diversified, sustainable, and resilient water future, with strong emphasis on water conservation

guiding principles

- **the Colorado River is our core supply**
- **focus on conservation**
- **strengthen sustainability, reliability, and diversity through local sources**
- **avoid severe shortages**
- **use projects that are technically, socially, and economically feasible**
- **protect the environment**
- **meet drinking water standards**
- **coordinate with regional partners**
- **engage the public**

Key Water Forward Drivers

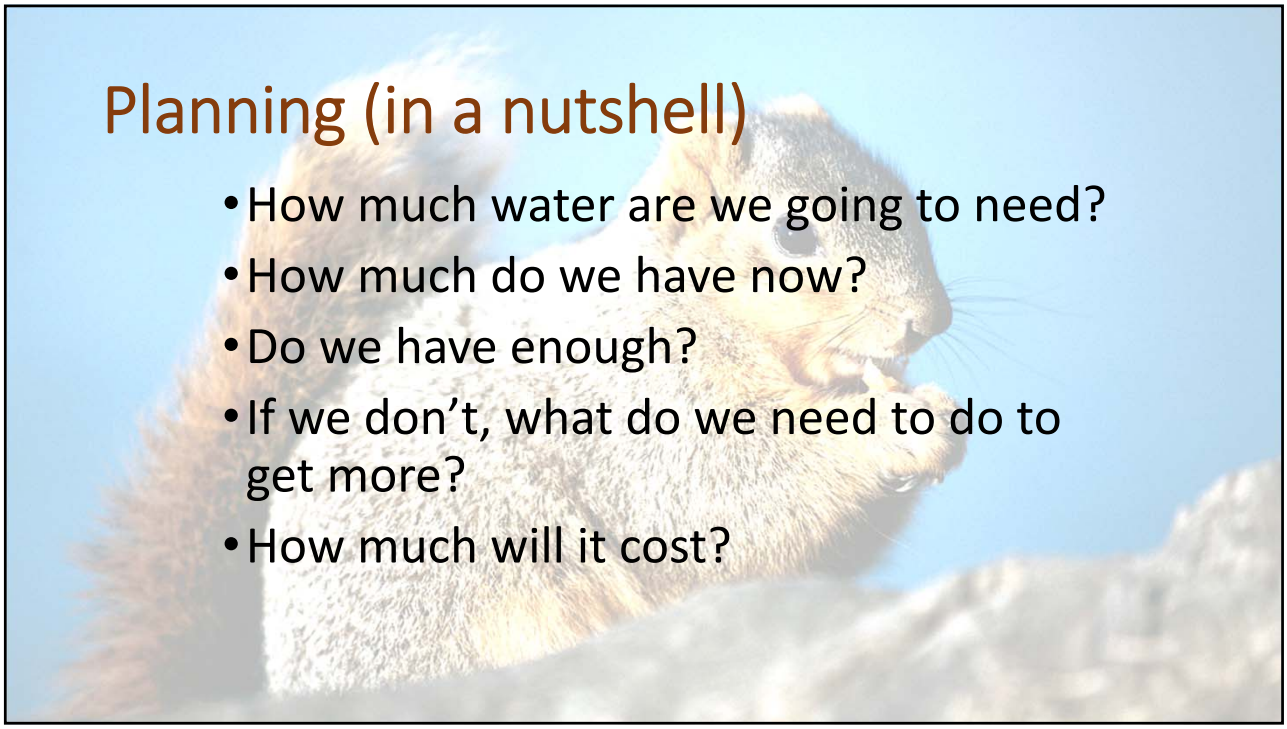


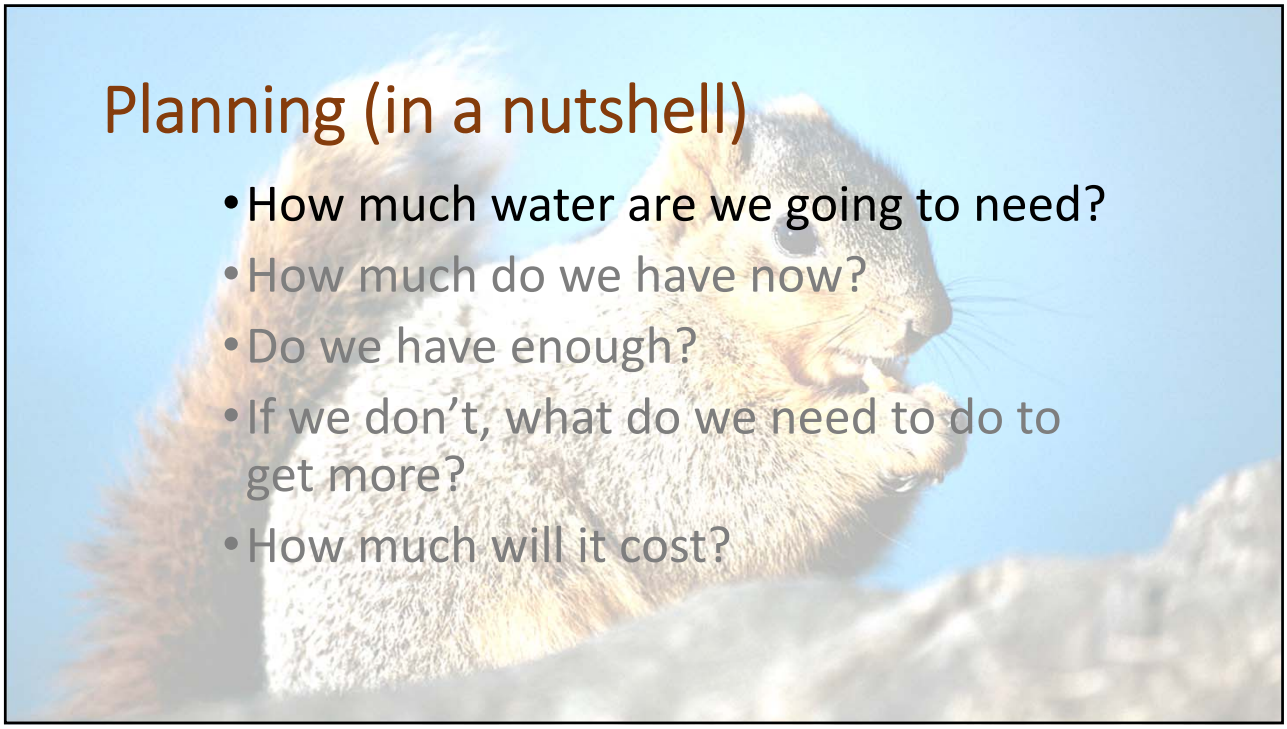
The Council-appointed Task Force members are shown below:

Sharlene Leurig (Chair) District 4 - Council Member Casar	Lauren Ross District 5 - Council Member Kitchen
Jennifer Walker (Vice-Chair) District 9 - Mayor Pro Tem Tovo	Todd Bartee District 6 - Council Member Flannigan
Bill Moriarty Mayor Adler	Robert Mace District 7 - Council Member Pool
Clint Dawson District 1 - Council Member Houston	Marianne Dwight District 8 - Council Member Troxclair
Sarah Richards District 2 - Council Member Garza	Diane Kennedy District 10 - Council Member Alter
Perry Lorenz District 3 - Council Member Renteria	

The Task Force also included Ex Officio members from several City of Austin departments:

Austin Water Greg Meszaros, Director	**Office of Innovation** Kerry O'Connor, Chief Innovation Officer
Austin Energy Kathleen Garrett, Director of Environmental Services	**Office of Sustainability** Lucia Athens, Chief Sustainability Officer
Austin Resource Recovery Sam Angoori, Director	**Parks and Recreation** Sara Hensley, Interim Assistant City Manager
Neighborhood Housing and Community Development Josh Rudow, Planner Senior	**Watershed Protection** Chris Herrington, Supervising Engineer


Planning (in a nutshell)
•How much water are we going to need?
•How much do we have now?
•Do we have enough?
•If we don't, what do we need to do to get more?
•How much will it cost?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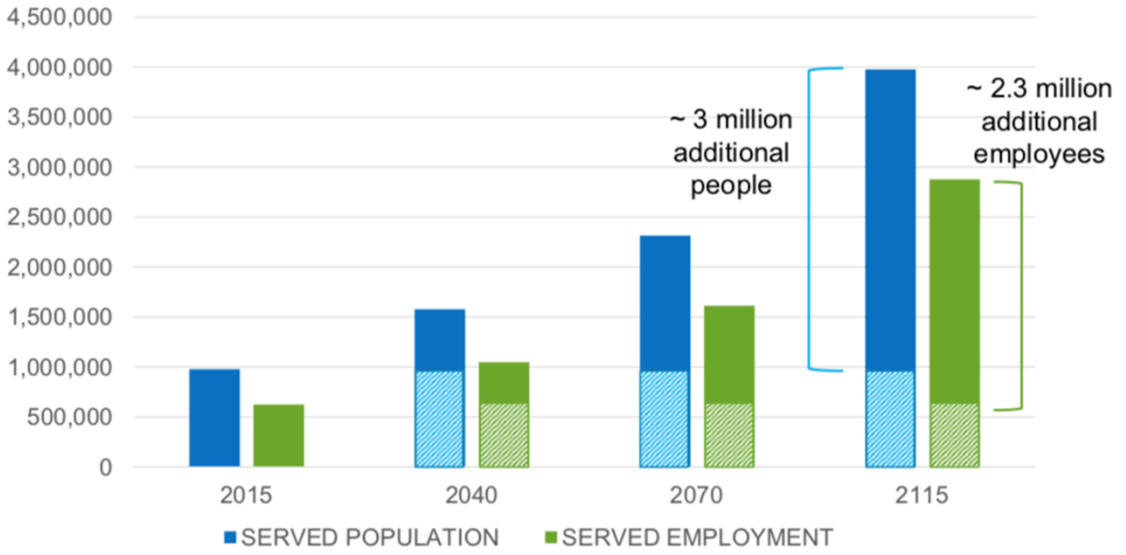
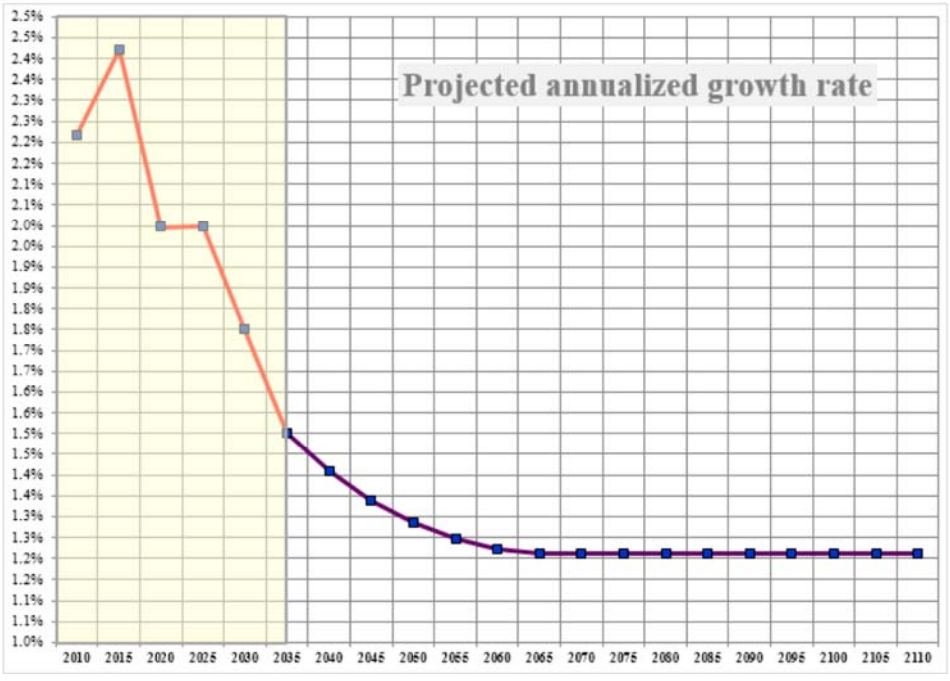
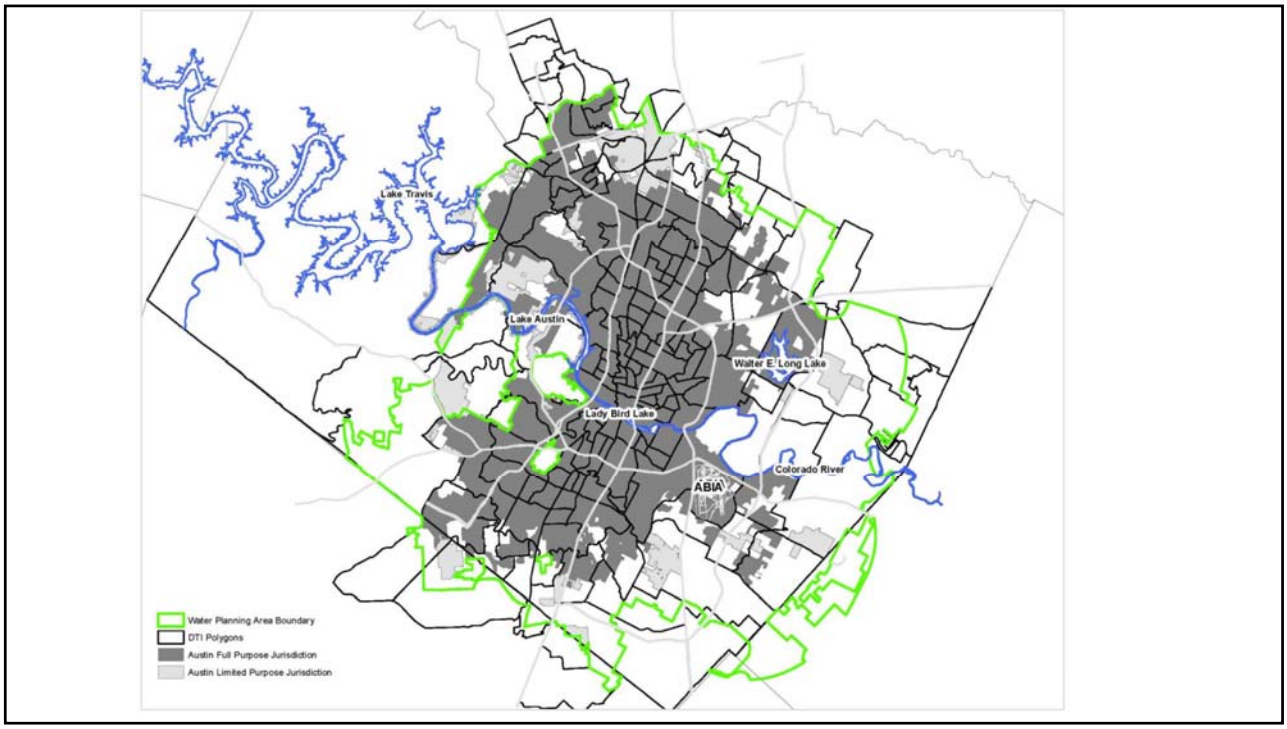
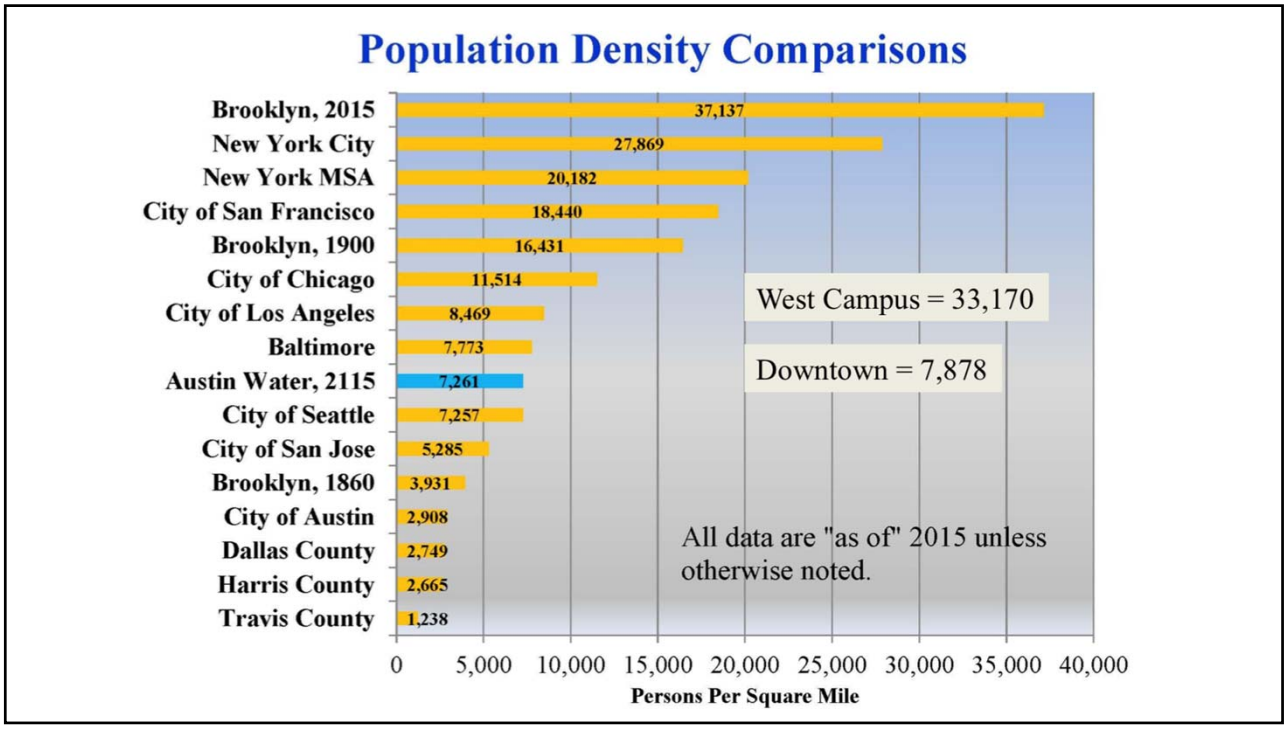
Four million Austinites?



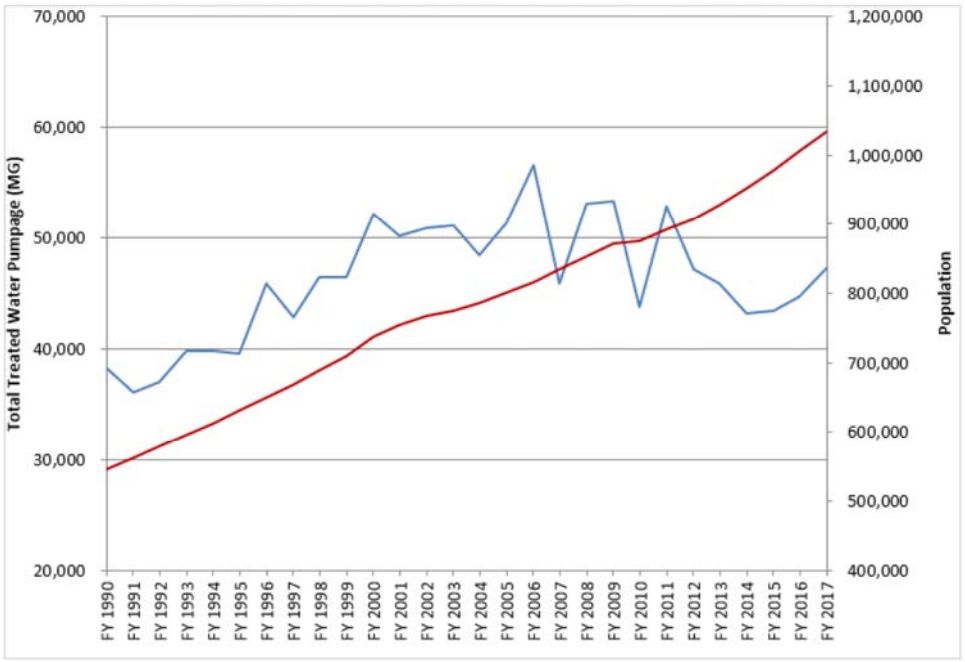
from the City of Austin



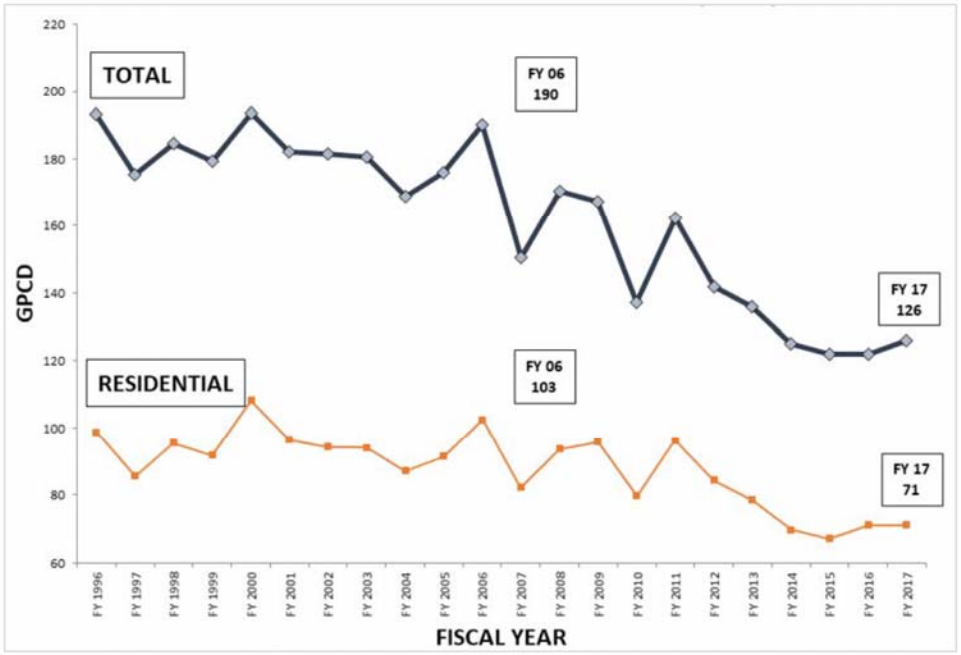

Lake Travis
Lake Austin
Walter E. Long Lake
Lady Bird Lake
Colorado River
ABIA
Water Planning Area Boundary
DTI Polygons
Austin Full Purpose Jurisdiction
Austin Limited Purpose Jurisdiction

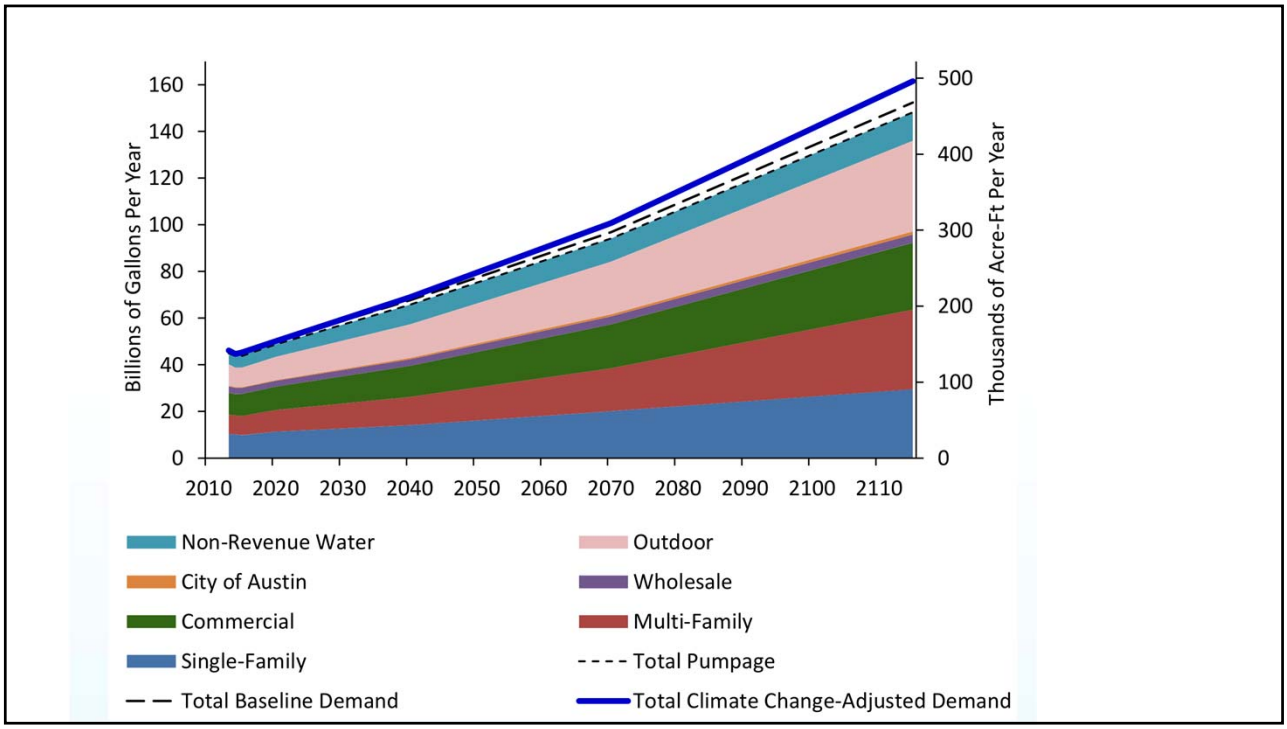

Population Density Comparisons
Brooklyn, 2015
New York City
New York MSA
City of San Francisco
Brooklyn, 1900
City of Chicago
City of Los Angeles
Baltimore
Austin Water, 2115
City of Seattle
City of San Jose
Brooklyn, 1860
City of Austin
Dallas County
Harris County
Travis County
37,137
27,869
20,182
18,440
16,431
11,514
8,469
7,773
7,261
7,257
5,285
3,931
2,908
2,749
2,665
1,238
West Campus = 33,170
Downtown = 7,878
All data are "as of" 2015 unless otherwise noted.
0
5,000
10,000
15,000
20,000
25,000
30,000
35,000
40,000
Persons Per Square Mile

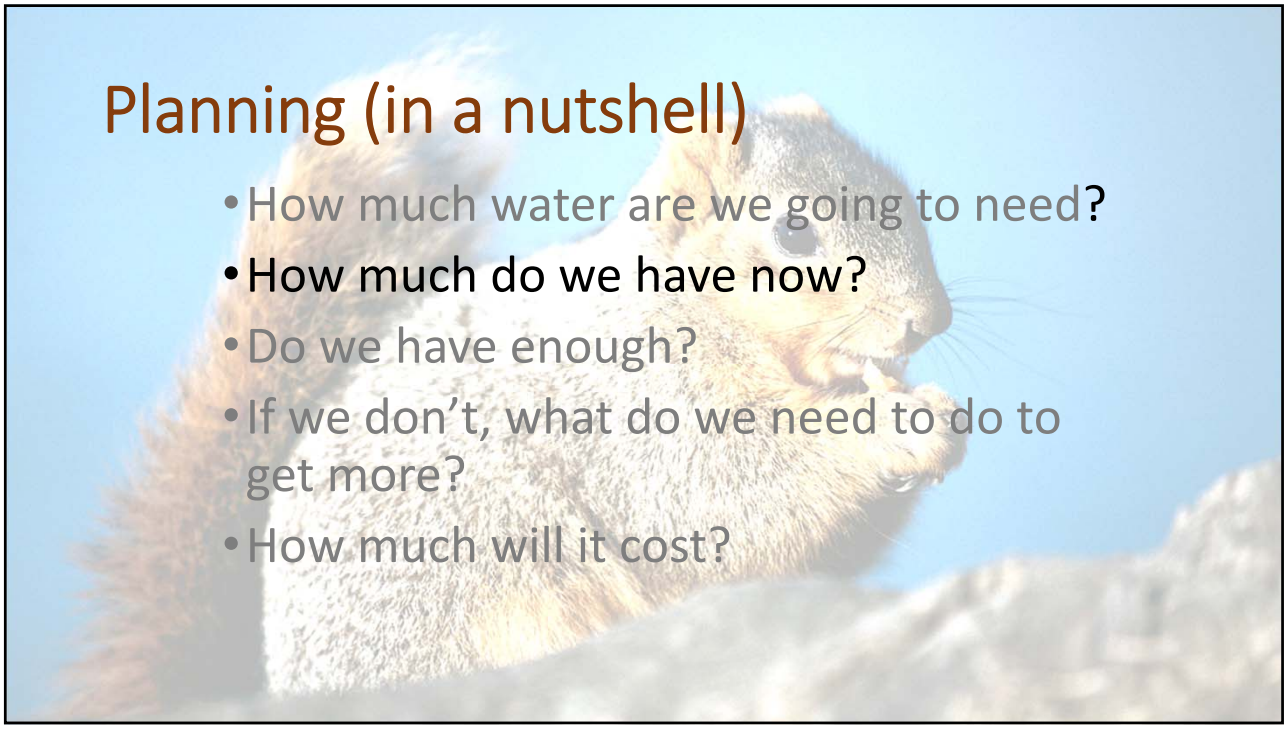
million gallons



gallons per capita daily




Billions of Gallons Per Year
Thousands of Acre-Ft Per Year
160
140
120
100
80
60
40
20
0
500
400
300
200
100
0
2010 2020 2030 2040 2050 2060 2070 2080 2090 2100 2110
Non-Revenue Water
Outdoor
City of Austin
Wholesale
Commercial
Multi-Family
Single-Family
Total Pumpage
Total Baseline Demand
Total Climate Change-Adjusted Demand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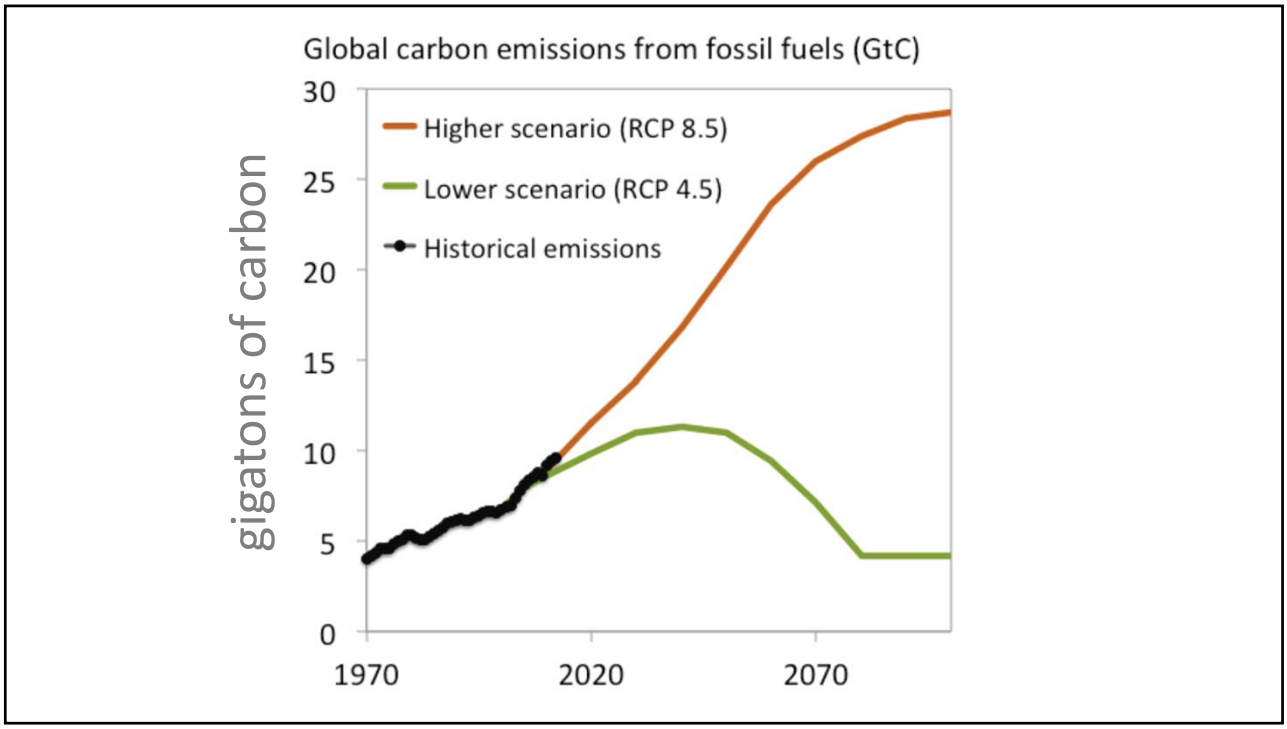
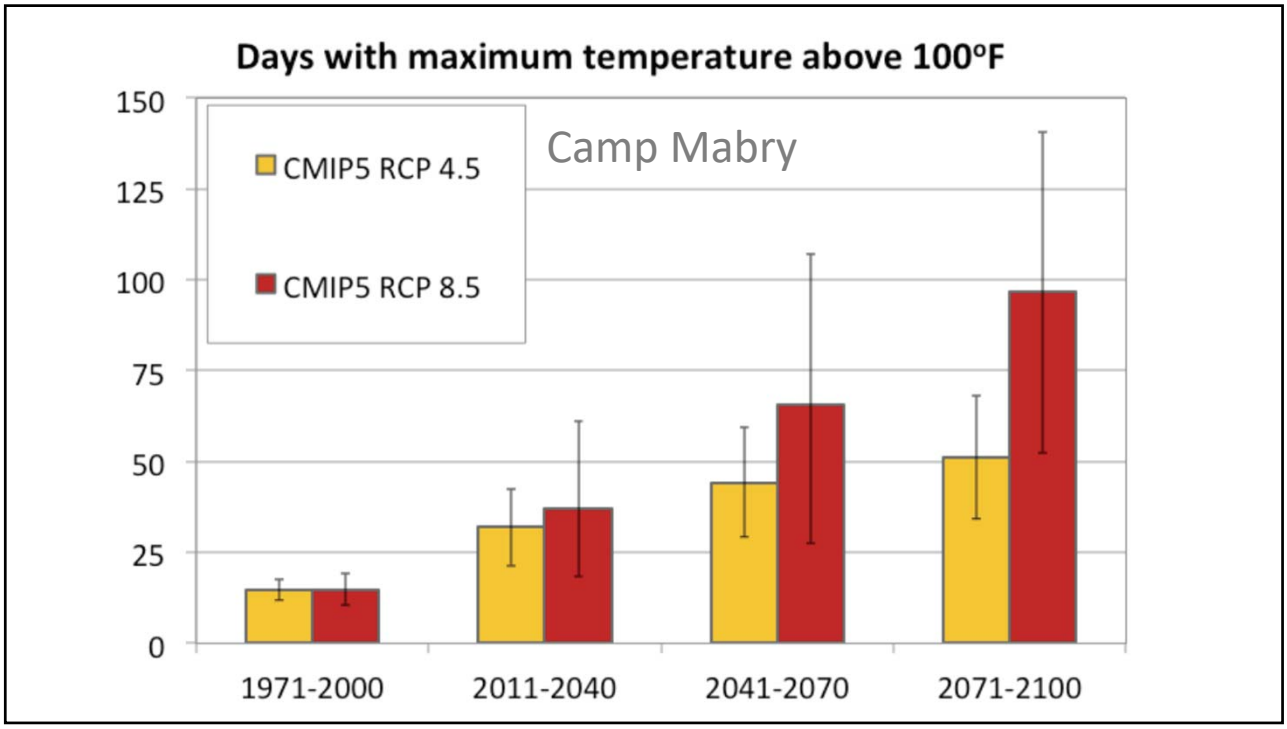
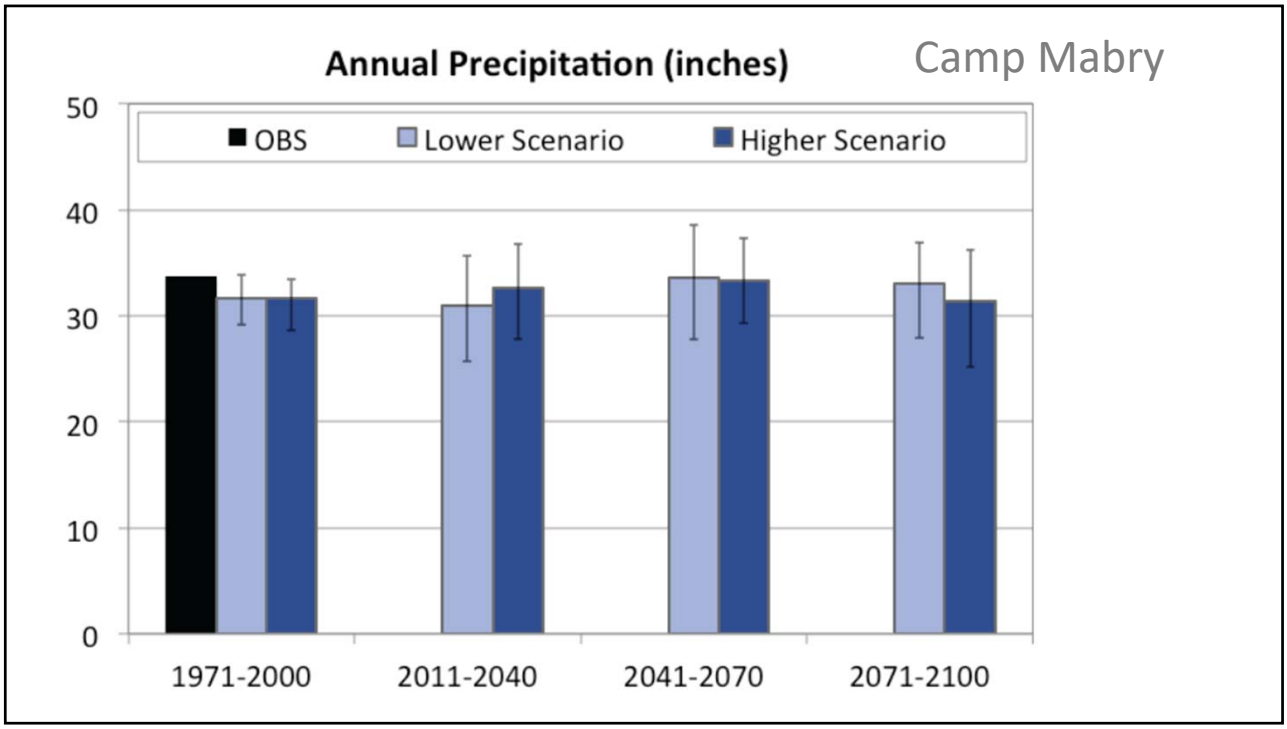
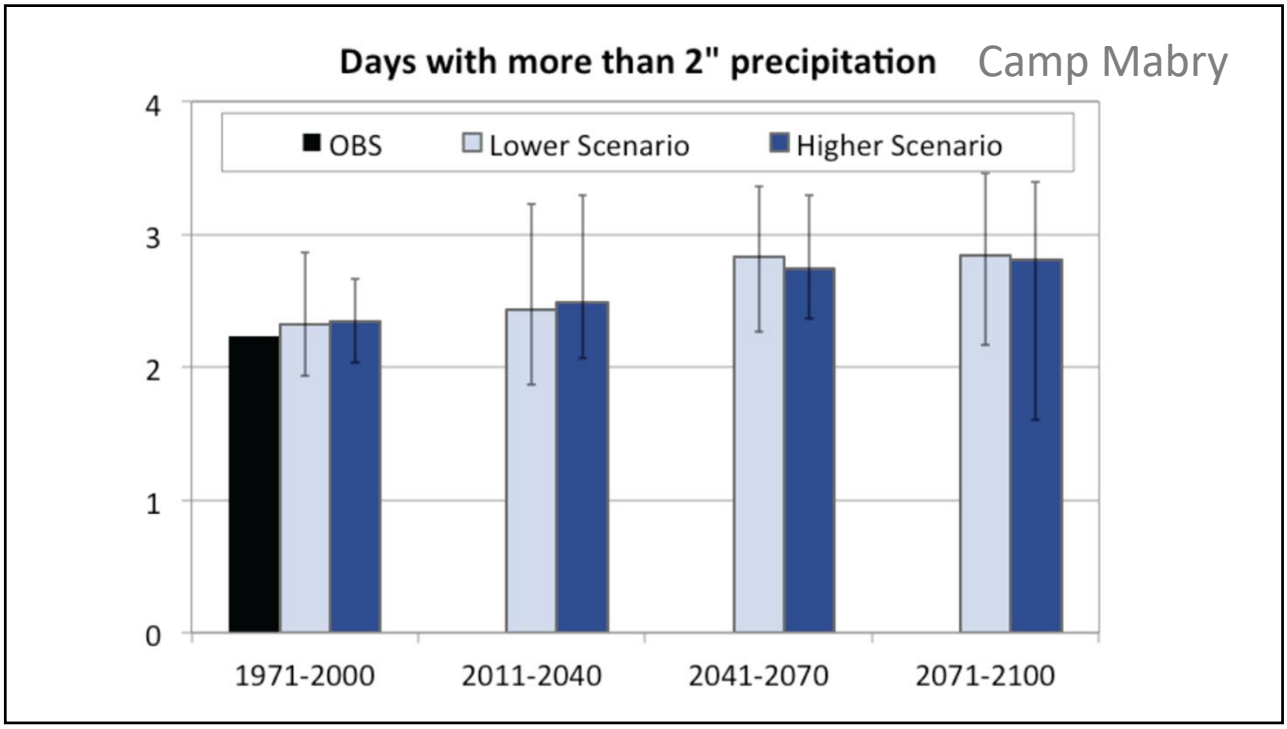
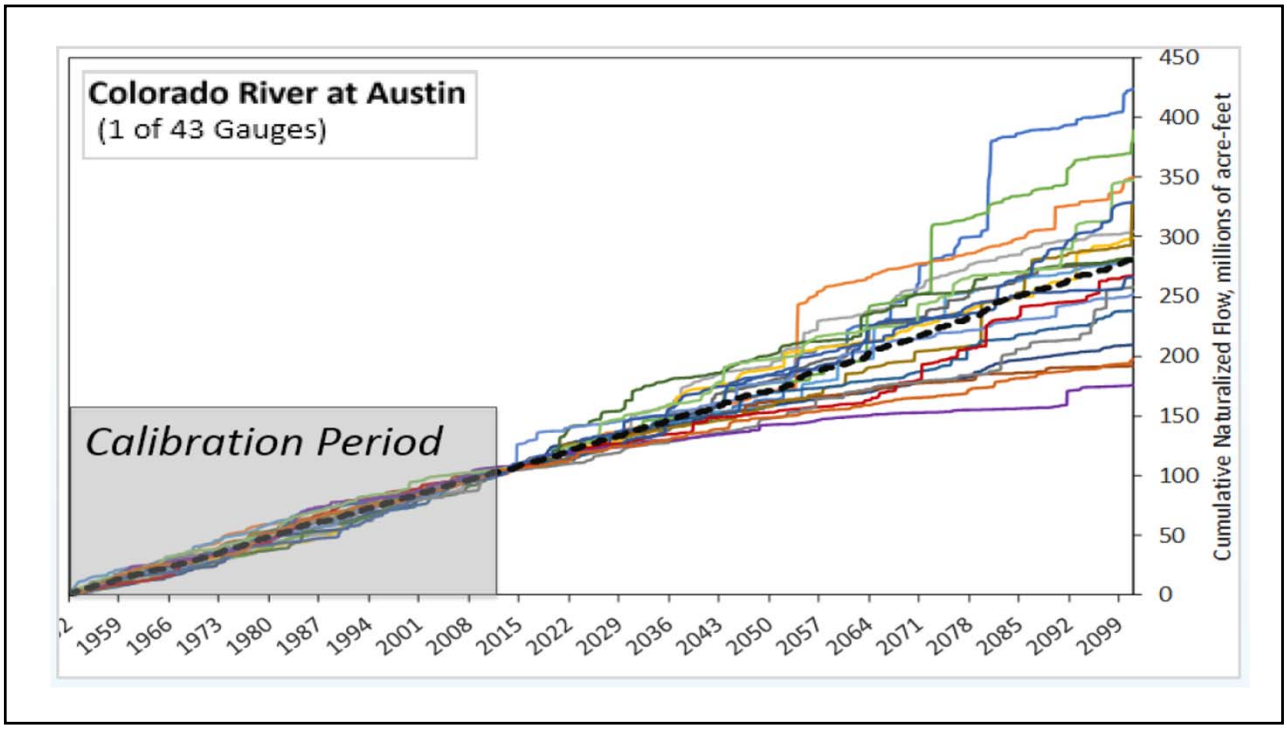
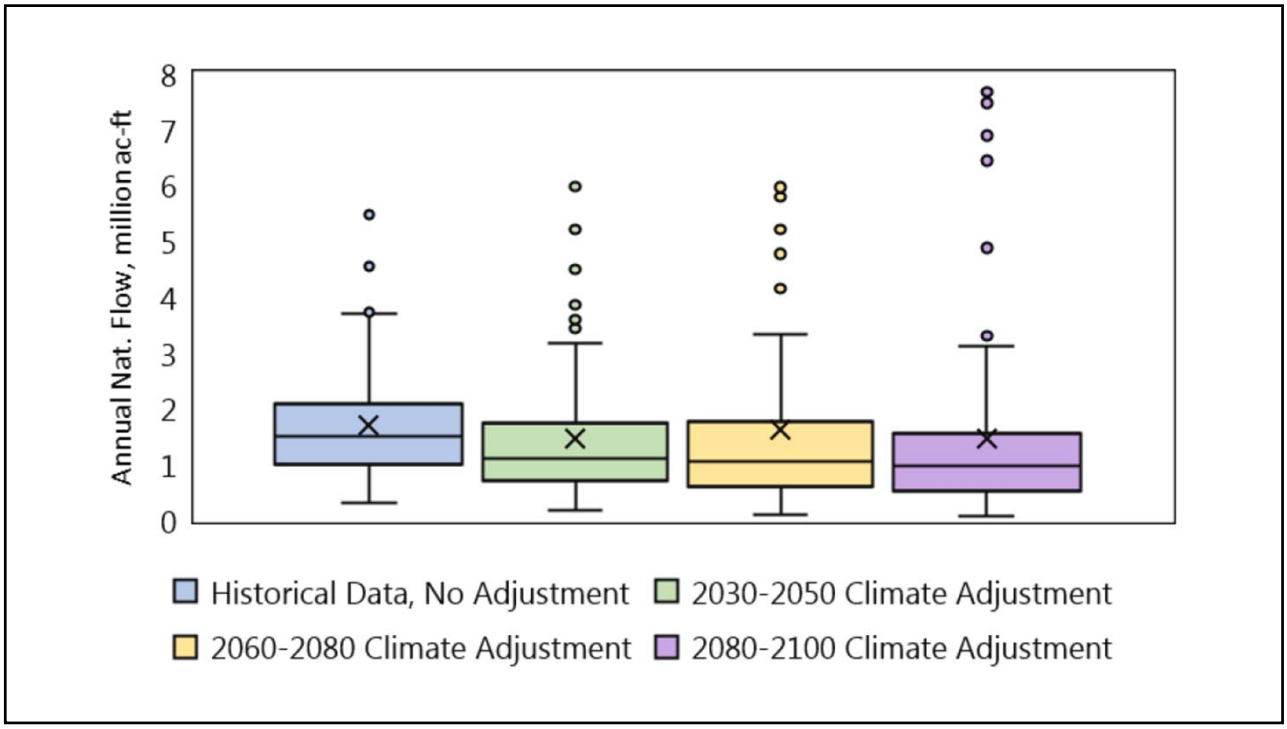

Global carbon emissions from fossil fuels (GtC)
gigatons of carbon
30
25
20
15
10
5
0
1970
2020
2070
Higher scenario (RCP 8.5)
Lower scenario (RCP 4.5)
Historical emissions


Days with maximum temperature above 100°F
150
125
100
75
50
25
0
1971-2000
2011-2040
2041-2070
2071-2100
CMIP5 RCP 4.5
CMIP5 RCP 8.5
Camp Mabry

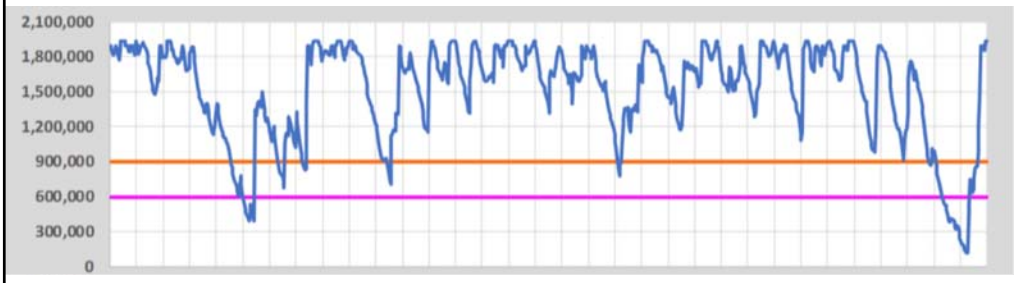

Annual Precipitation (inches)
Camp Mabry
OBS
Lower Scenario
Higher Scenario
50
40
30
20
10
0
1971-2000
2011-2040
2041-2070
2071-2100


Days with more than 2" precipitation
Camp Mabry
OBS
Lower Scenario
Higher Scenario
4
3
2
1
0
1971-2000
2011-2040
2041-2070
2071-2100


Colorado River at Austin
(1 of 43 Gauges)
Calibration Period
Cumulative Naturalized Flow, millions of acre-feet
450
400
350
300
250
200
150
100
50
0
1959
1966
1973
1980
1987
1994
2001
2008
2015
2022
2029
2036
2043
2050
2057
2064
2071
2078
2085
2092
2099

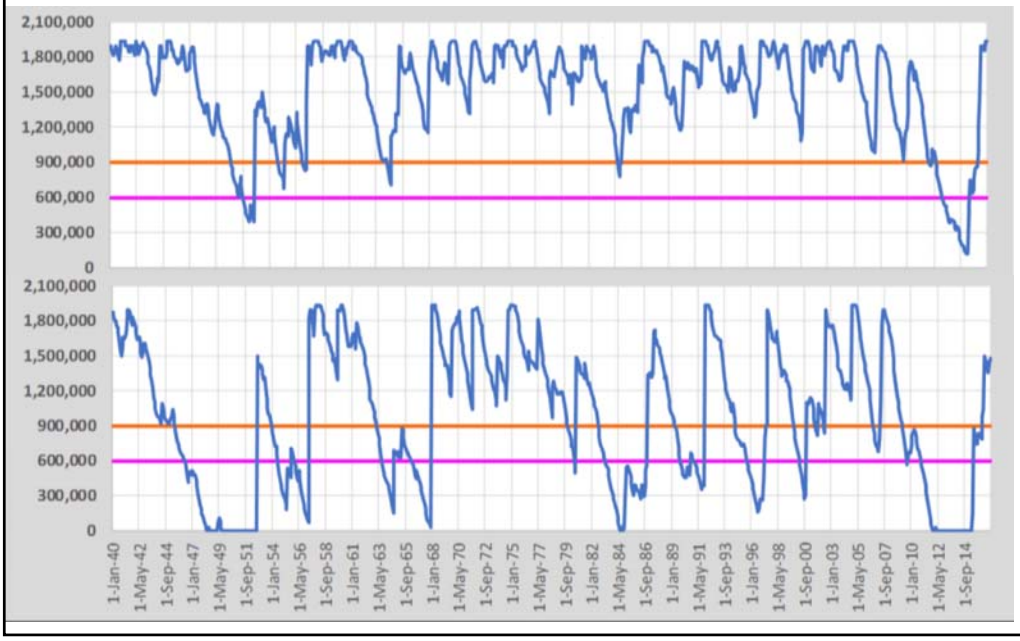

Annual Nat. Flow, million ac-ft
8
7
6
5
4
3
2
1
0
Historical Data, No Adjustment
2030-2050 Climate Adjustment
2060-2080 Climate Adjustment
2080-2100 Climate Adjustment

Modeled Storage in Travis and Buchanan in 2115



no climate change

Modeled Storage in Travis and Buchanan in 2115



no climate change

with climate change

units in acre-feet
from the City of Austin

Planning (in a nutshell)

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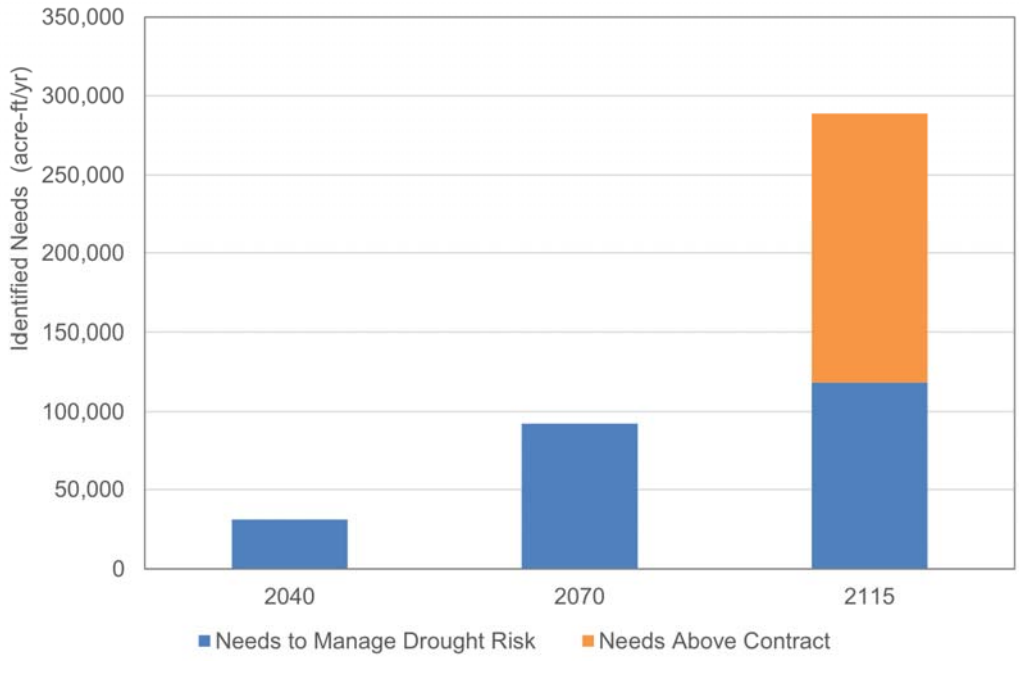

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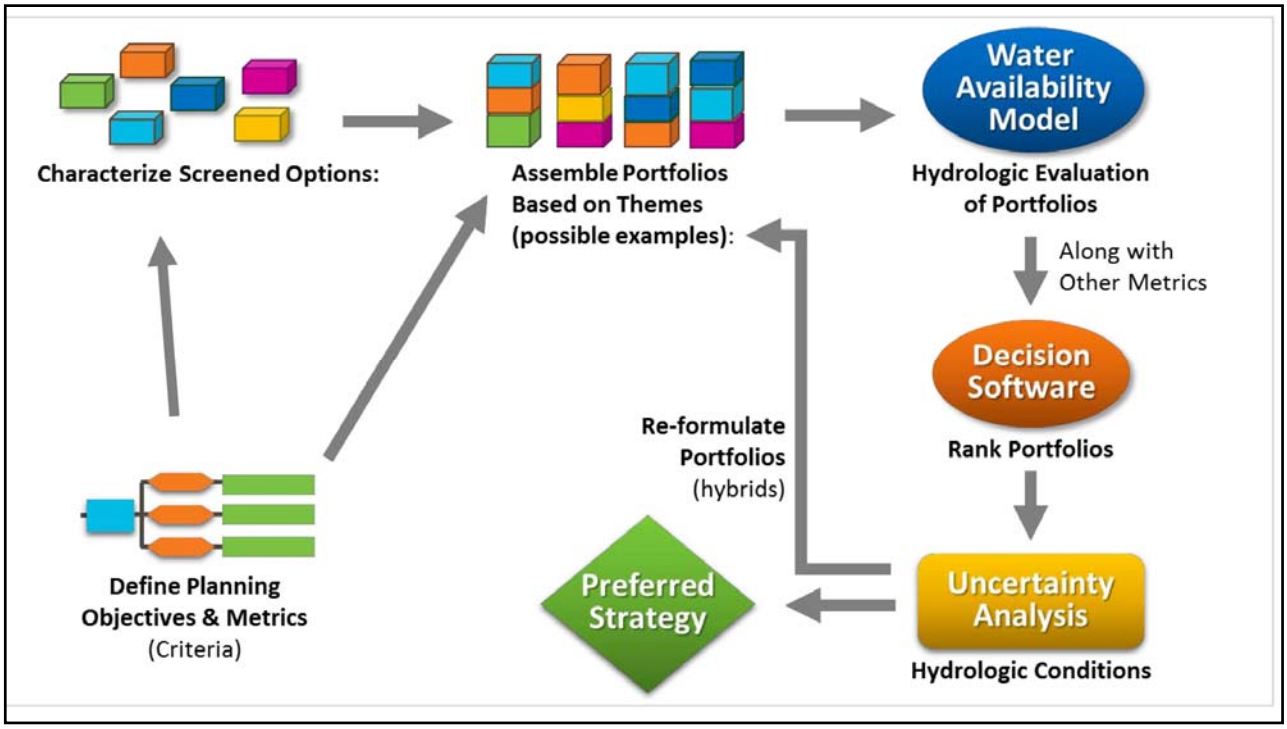


Figure 8-1. Initial Portfolios Centered Around Themes to Push Boundaries and See Trade-Offs

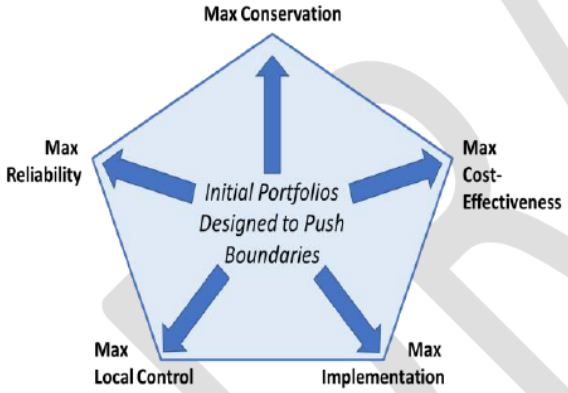
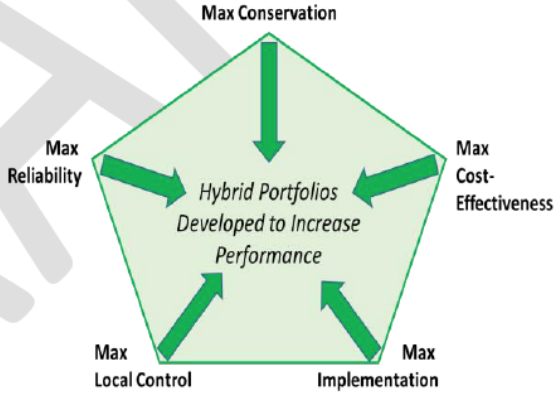


Figure 8-2. Process to Develop Hybrids

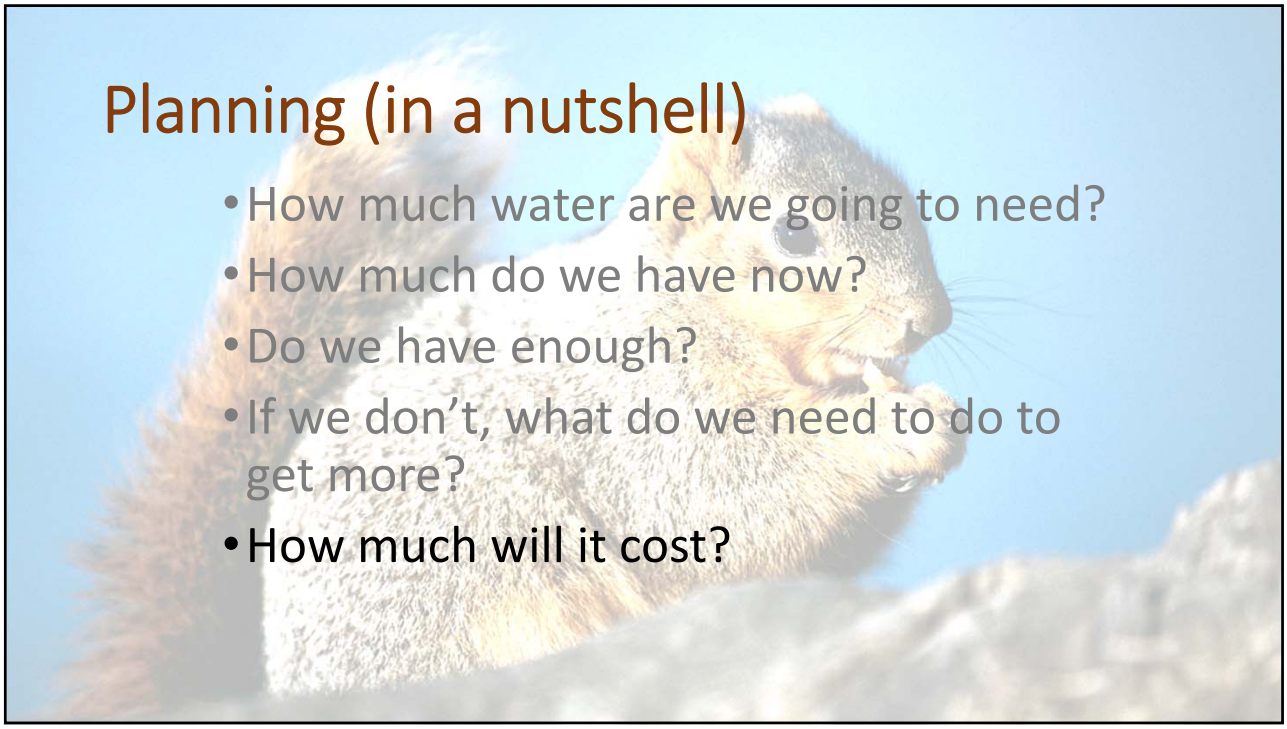


Recommended Options	Average/ Drought	Estimated Yield Capacity (Acre Feet per Year)[1]			
		2020	2040	2070	2115
Demand Management Options					
Advanced Metering Infrastructure (AMI)	Both	596	3,882	5,766	9,371
Water Loss Control	Both	3,108	9,326	10,918	13,064
CII Ordinances	Both	1,063	1,063	1,063	1,063
Benchmarking	Both	-	5,953	11,670	25,228
Landscape Ordinance	Both	-	3,038	7,428	15,050
Landscape Transformation Incentive	Both	-	321	633	929
Irrigation Efficiency Incentive	Both	42	205	427	394
Lot Scale Stormwater Harvesting	Both	-	329	869	2,275
Lot Scale Rainwater Harvesting	Both	-	1,550	4,032	9,251
Greywater Harvesting	Both	-	2,126	5,617	12,667
Building Scale Wastewater Reuse	Both	-	1,323	3,672	7,875
AC Condensate Reuse	Both	100	1,084	2,711	5,150
Demand Management Options Sub-Total	-	4,908	30,202	54,806	102, 317

AFY = acre-feet per year

Recommended Options	Average/ Drought	Estimated Yield Capacity (Acre Feet per Year)[1]			
		2020	2040	2070	2115
Water Supply Options					
Aquifer Storage and Recovery	Drought	-	60,000	60,000	90,000
Brackish Groundwater Desalination	Both	-	-	5,000	16,000
Direct Non-Potable Reuse	Both	500	12,000	25,000	54,600
Indirect Potable Reuse (IPR) through Lady Bird Lake	Drought	-	11,000	20,000	20,000
Capture Local Inflows to Lady Bird Lake (infrastructure also included as part of IPR, above)	Average	-	3,000	3,000	3,000
Off Channel Reservoir	Both	-	-	25,000	25,000
Distributed Wastewater Reuse	Both	-	3,154	14,467	30,049
Sewer Mining	Both	-	1,000	2,211	5,284
Community Stormwater Harvesting	Both	-	158	236	504
Drought Supply Options	-	-	71,000	80,000	110,000
Average/Both Supply Options	-	500	19,312	74,914	134,437
Water Supply Options Sub-Total	-	500	90,312	154,914	244,437
OVERALL TOTAL	-	**5,408**	**120,512**	**209,720**	**346,754**

AFY = acre-feet per year



Options	Total Unit Cost ($/AF)	Capital Unit Cost ($/AF)	O&M Unit Cost ($/AF)
Advanced Metering Infrastructure	$2,800		
Water Loss Control Utility Side	$3,690		
CII Ordinances for Cooling Towers and Steam Boilers	$71		
Water Use Benchmarking and Budgeting	$21		
Landscape Transformation Ordinance	$23		
Landscape Transformation Incentives	$96		
Irrigation Efficiency Incentives	$202		
Stormwater Harvesting (Lot-Scale)	$6,470		
Rainwater Harvesting (Lot-Scale)	$2,864		
Gray water Harvesting (Lot-Scale)	$9,797		
Building Scale Wastewater Reuse (Lot-Scale)	$11,726		
AC Condensate Reuse (Lot-Scale)	$2,702		
Aquifer Storage and Recovery		$1,174	$318
Brackish Groundwater Desalination		$1,883	$807
Direct Non-Potable Reuse (Centralized Reuse – Purple Pipe)	$1,229		
Indirect Potable Reuse with Capture Lady Bird Lake Inflows		$284	$321
Off-Channel Reservoir w/ Lake Evaporation Suppression		$499	$347
Community-Scale Distributed Wastewater Reuse	$2,906		
Community-Scale Wastewater Scalping (Sewer Mining)	$4,261		
Community-Scale Stormwater Harvesting	$11,666		

AF = acre-foot

A couple strategies considered but not used:

Direct potable reuse: $2,204

Seawater desalination: $3,032

in summary…

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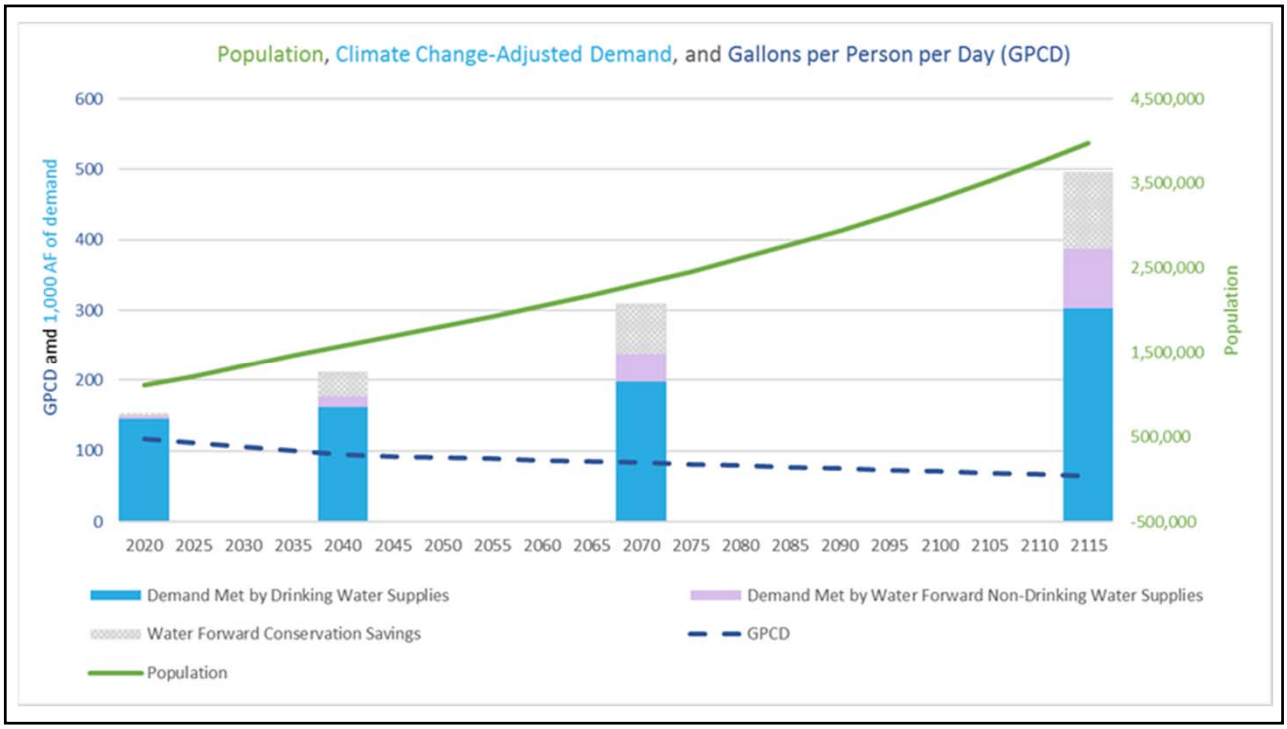

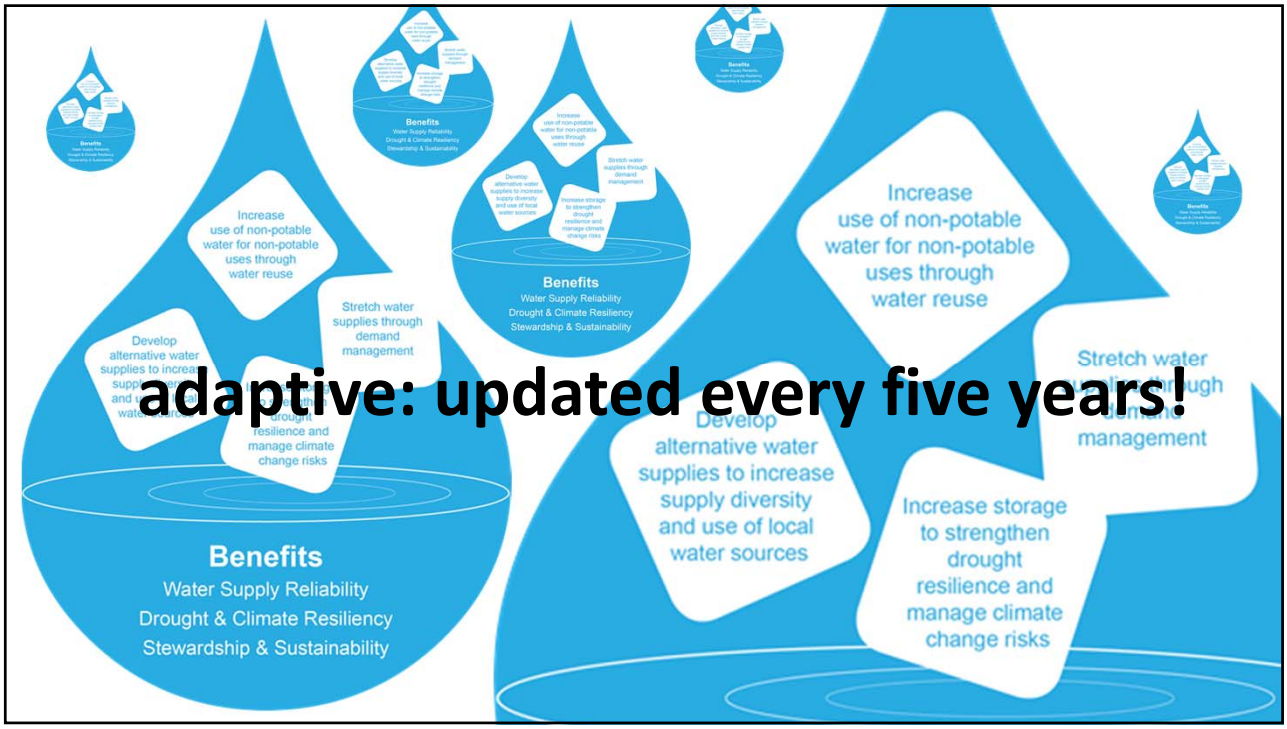

adaptive: updated every five years!

questions?

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presentation available at sosecretoccultandconcealed.com

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resources

- waterdatafortexas.org
- 2014 Austin Water Resource Planning Task Force
- Austin Water Forward
- Austin Water Forward Task Force
- Climate change analysis