Austin Integrated Water Resource Planning Community Task Force

February 2, 2016

Overview

- Public Outreach Update
- Consultant Services Procurement: RFQ Update
- Climate Change Impact Analysis Conceptual Roadmap
- Climate and Hydrology Pilot Analysis Briefing – Katherine Hayhoe, Ph. D., ATMOS Research and Consulting
- Zero Net Water Briefing – David Venhuizen, P.E.

Austin WATER

PUBLIC INVOLVEMENT UPDATE

IWRP Task Force
February 2, 2016

Key Goals of Preliminary Outreach

- **Inform and Educate** about Integrated Water Resource Plan
- Gather information on **Community Values and Planning Goals**
- Seek input that reflects Austin's **Diversity**

Inform and Educate

- Web update
  - IWRP web page (target date 3/1)
  - Social media (Facebook, Twitter, Instagram)
- Flyer/handout (target date 3/1)
- Planned Events
  - Zilker Garden Festival
  - Earth Day Festival and events
  - WaterWise Irrigation Professionals Seminar
  - Imagine Austin Speaker Series
  - District Town Hall meetings
  - Austin Energy Customer Assistance Program (CAP) Community Connections events

Community Values and Planning Goals

- Survey update
  - Goals
    - Gather input on community values and goals
    - Seek input that reflects Austin's diversity
  - Progress to date
    - Reviewed other surveys
    - Exploring survey tools
    - Developing survey concepts
  - Projected timeline
    - April 5th - target date to have draft questions for Task Force review
    - May - target for survey launch
    - Mid-June - target for survey close

QUESTIONS, COMMENTS, SUGGESTIONS?

Consultant Services Procurement

RFQ Update

- January 28th Recommendation for Council Action – Main IWRP Consultant Selection
  - Recommended for approval by Water and Wastewater Commission
  - Postponed by Council pending ad hoc Council committee review
  - Discussion planned for February 17th Public Utilities Committee

Austin WATER

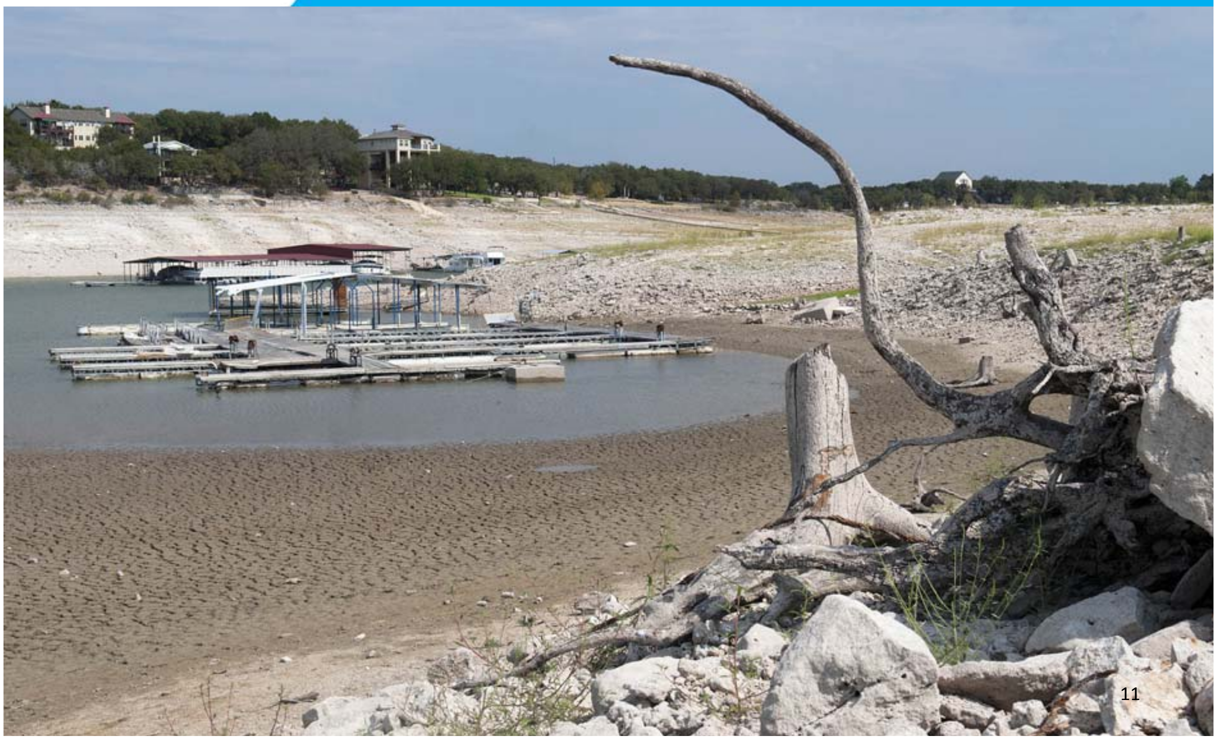
Recap of Information Provided to Task Force on January 12th

- Follow-up information provided includes:
  - Task Force comments on the Evaluation Criteria and staff responses
  - Summary listing of team project experience provided in recommended firm's Statement of Qualifications
  - List of prime firms that attended the pre-response meeting
  - Categorized summary of feedback received from firms as to why they did not submit a Statement of Qualifications (SOQ)

Austin WATER

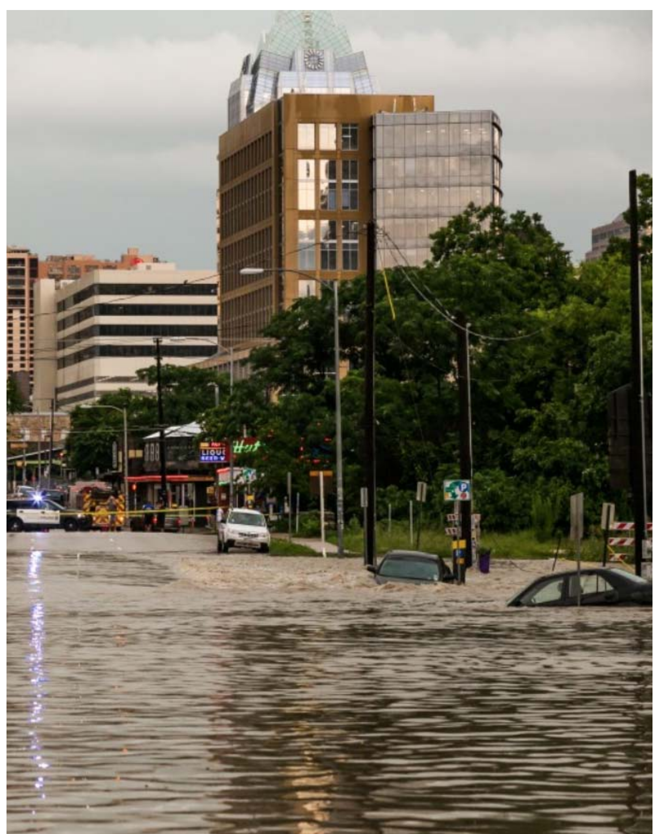
CLIMATE APPROACH AND THE IWRP CLIMATE CHANGE IMPACT ANALYSIS

IWRP Task Force - February 2, 2016



Today's Update

- Climate Change:
  - Water Sector Response
  - AW Climate Program
- Climate Change and the IWRP
- Next Steps
- Questions



Industry Best Practice

EMBRACING UNCERTAINTY

A Case Study Examination of How Climate Change is Shifting Water Utility Planning

WUCA · American Water Works Association · Water Research Foundation · Association of Metropolitan Water Agencies

- Utilities are bringing climate considerations into a variety of their decision processes, now.
- Climate Change projections are not predictions of the future.
- The relationship between the change in climate and the change in water availability is not linear.
- Planning methods and tools need to allow utilities to plan for more than one future
- Public involvement is now a top priority

Austin Water's Climate Program (to date)

MITIGATION:
REDUCE OUR CONTRIBUTION TO CLIMATE CHANGE

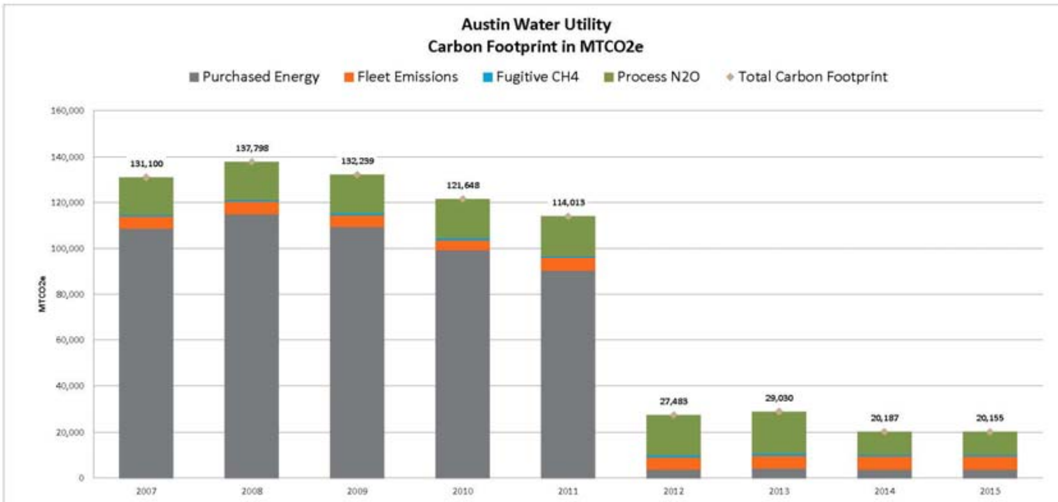
– EMISSIONS: Greenhouse Gas Inventory and Reduction

ADAPTATION:
REDUCE CLIMATE CHANGE'S IMPACT ON OUR ABILITY TO PROVIDE SERVICES

– OPERATIONS: Reduce impacts on operations

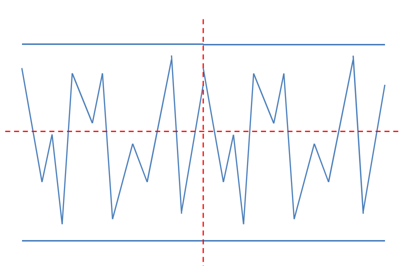
– SUPPLY & DEMAND: Long-term planning to meet future demands under changed climate

MITIGATION: GHG Emissions dramatically reduced since 2012

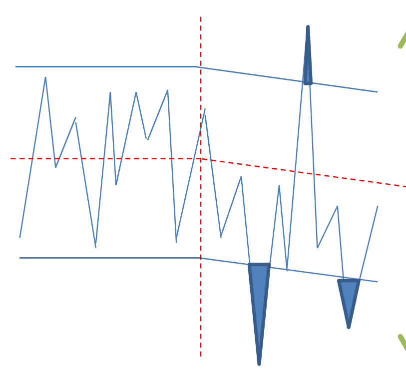


Climate Change Changes the Game

The Past = The Future



Uncertain Future:

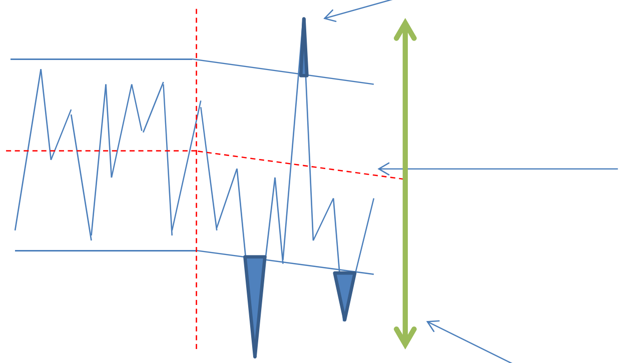


Extreme Events

Changing Trends

Increased Uncertainty

Planning for Trends & Extremes in Water Sector



Addressing Extreme Events:

How intense and how frequent?

- Emergency Response
- Plant Operations

Addressing Trends:

How high / low and how quickly?

- Systems Planning
- Supply changes
- Demand changes

Addressing Uncertainty:

- Scenario Planning
- Building robust / resilient systems

Adaptation Planning Framework

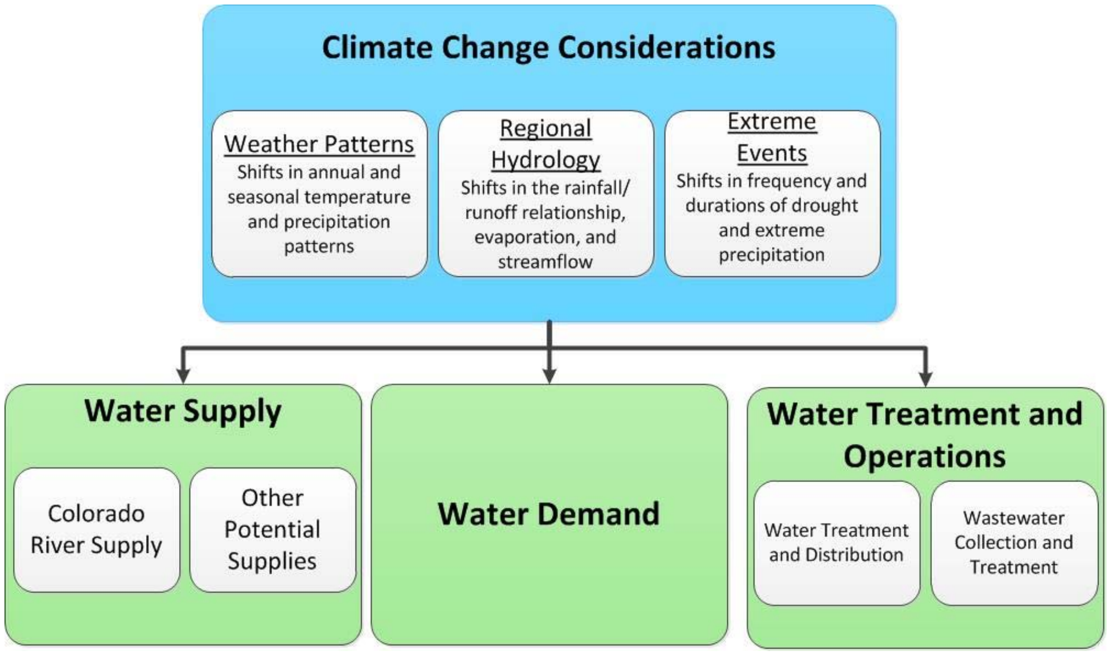
EPA CREAT exercise: Asset-Threat Pairs

ASSET CATEGORY	THREAT
Wildlands	Dry and hot conditions sparked wildfires
	Dry conditions change vegetation
Water supply	Low reservoir levels (drought and heat)
	Increased demand for firm water: LCRA contract trigger
	Watershed: floods threaten dams
Water treatment	Algae blooms and/or flooding result in changes in raw water quality
Distribution System	Water age from reduced demand (water quality)
	Line breaks from shifting soil
Customers & Conservation	Population growth ongoing
	Water demand for outdoor use
Collection System	I&I from flood events
	Line breaks from drought
	Flood damage to lift stations
Wastewater Treatment	Blowers may trip with high temperatures
	Peaking factor with intense rains
	Flood damage to package plants
	High temperature of receiving waters
Reclaimed	Flood damage to package plants that provide reclaimed water
Solids	Dry and windy conditions triggered compost fire
Personnel	High temperatures reduce work times, potential health impacts/overtime
Capital Projects	Projects delayed by budget cutbacks (low revenues)
Facilities	High heat impact on pavement
	Flooding can interrupt access to facilities (for personnel and/or supplies)
	Electricity supply (backup, dual feed) subject to grid dependability

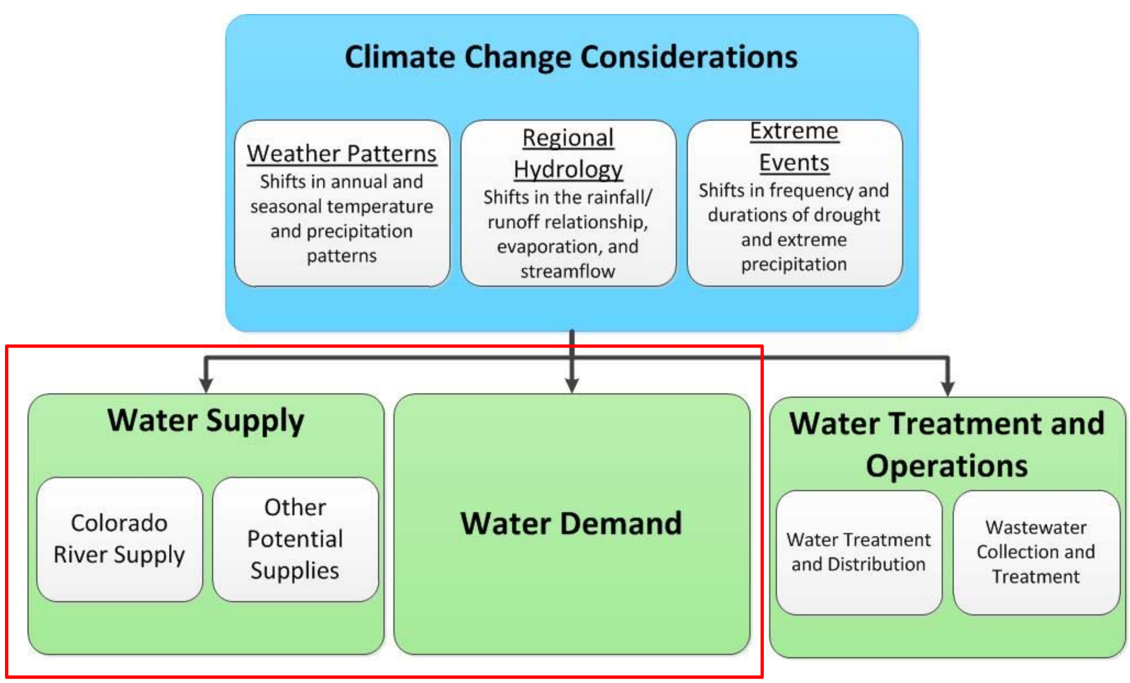
IWRP CLIMATE CHANGE IMPACT ANALYSIS

CLIMATE CHANGE AND THE IWRP

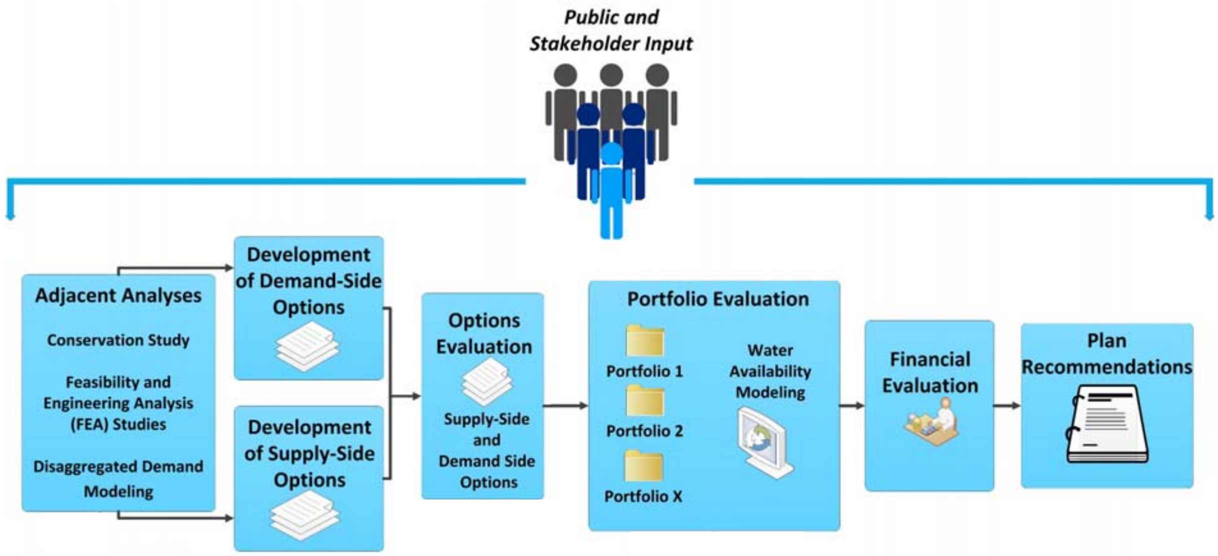
Considerations and Impacts of Climate Change in the IWRP



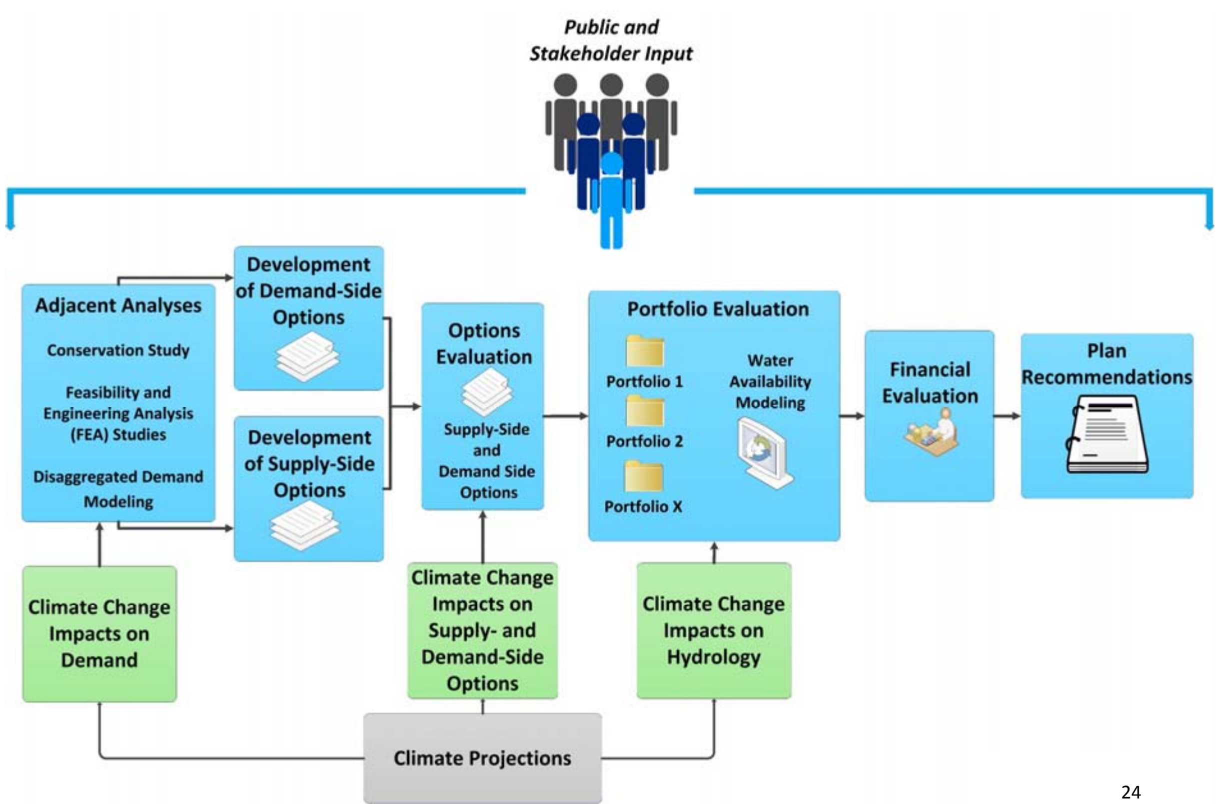
Considerations and Impacts of Climate Change in the IWRP



Integrating Climate Change Impacts into the IWRP



Integrating Climate Change Impacts into the IWRP



Next Steps

- City of Austin staff will continue to develop a comprehensive “Climate Change Impact Analysis” for the IWRP
- Assessment of results of the Climate and Hydrology Pilot Analysis

Questions and Discussion

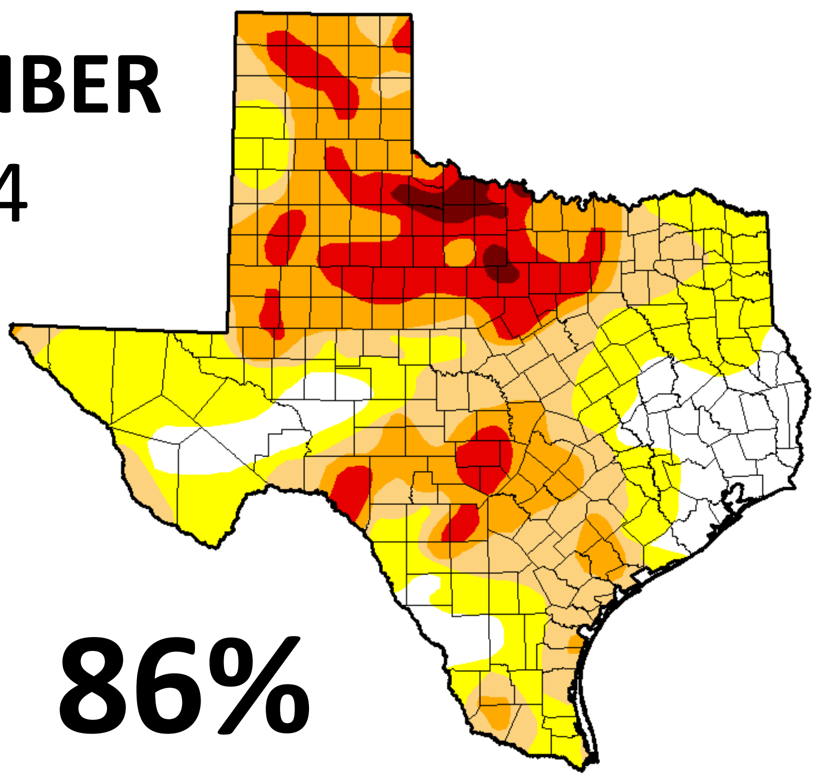
Preparing for a Changing Climate in Austin, Texas

KATHARINE HAYHOE

ATMOS Research & Consulting

SEPTEMBER

2014



86%

We've seen years of dry conditions

dwindling water supplies

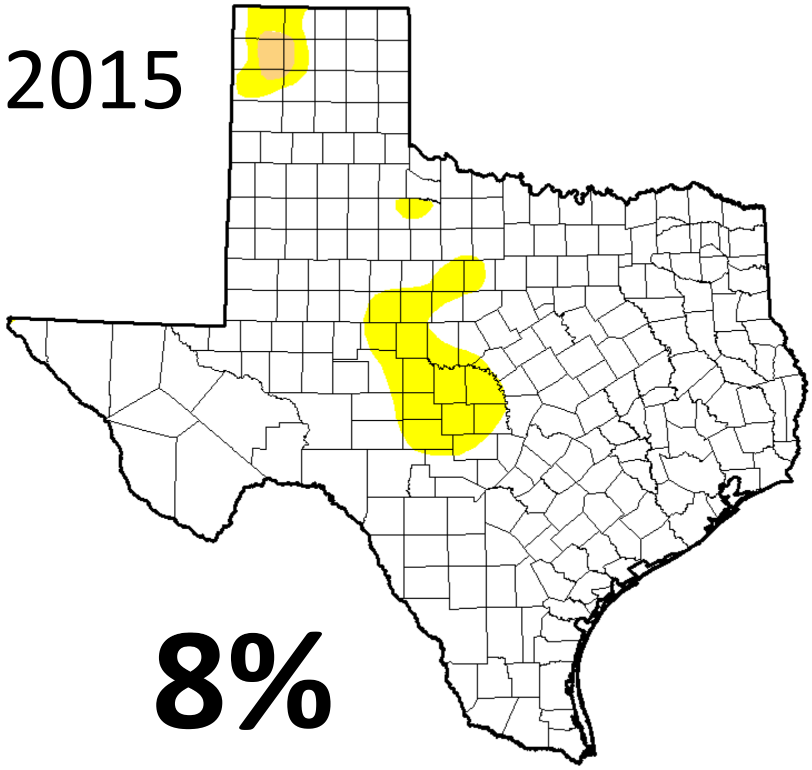
record-breaking fires

dust storms and haboobs

But then came the rains…

… and more rains

MAY 2015

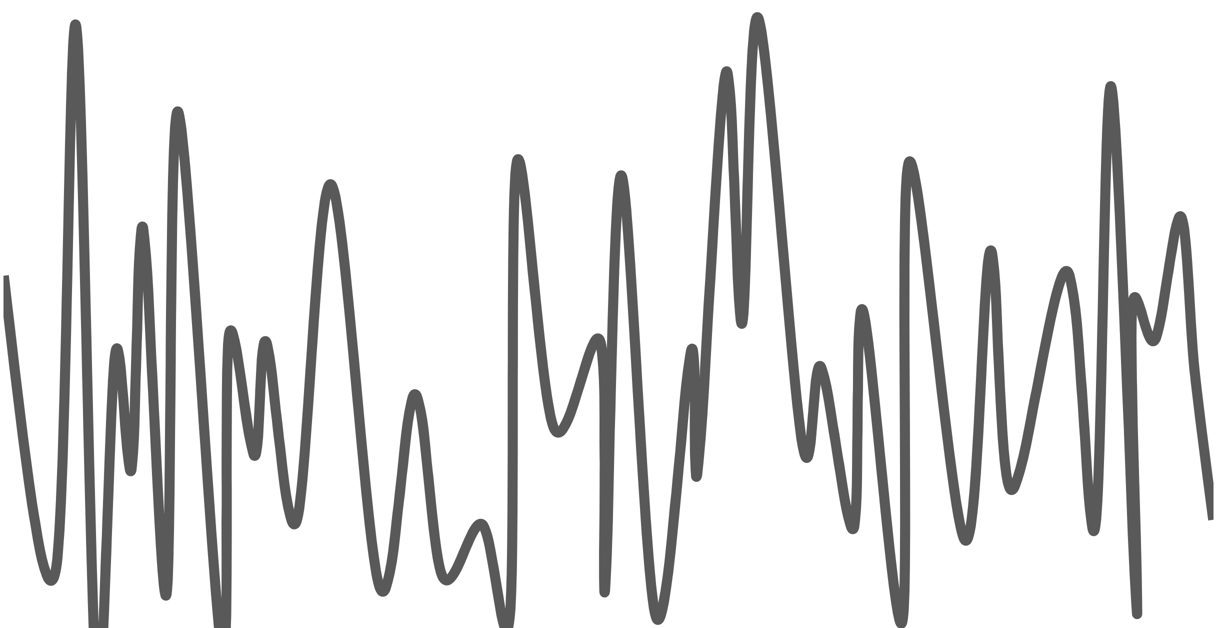


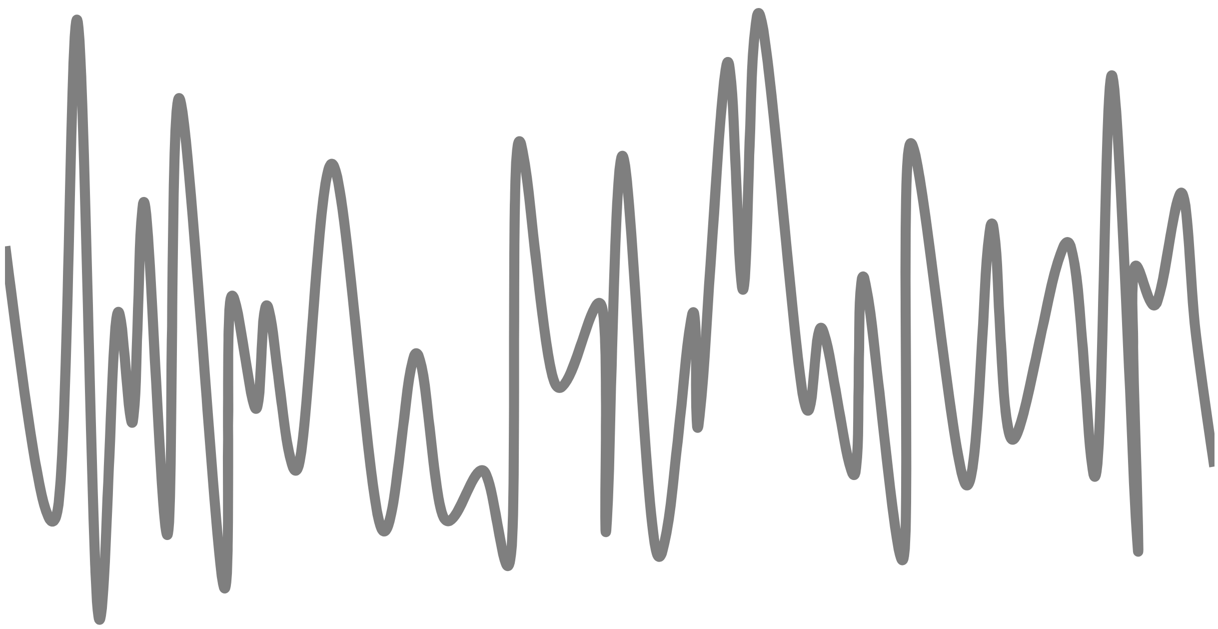
8%

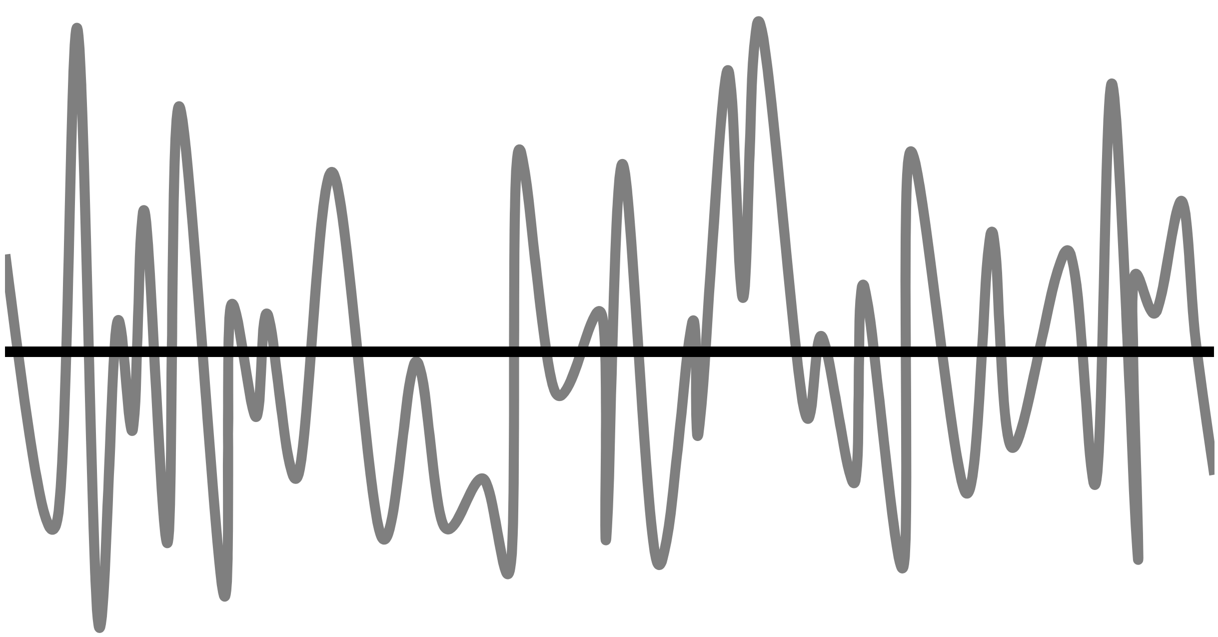
bumper crop yields

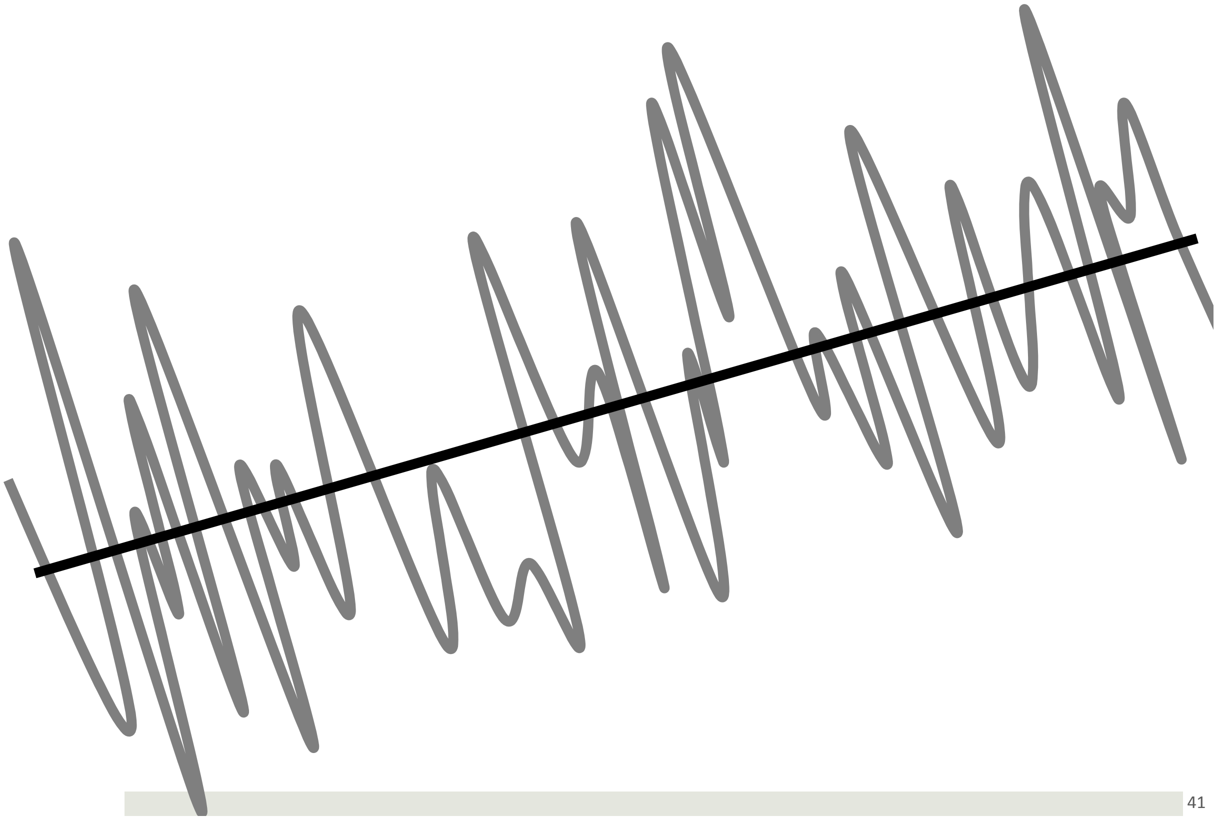
NORMAL CLIMATE

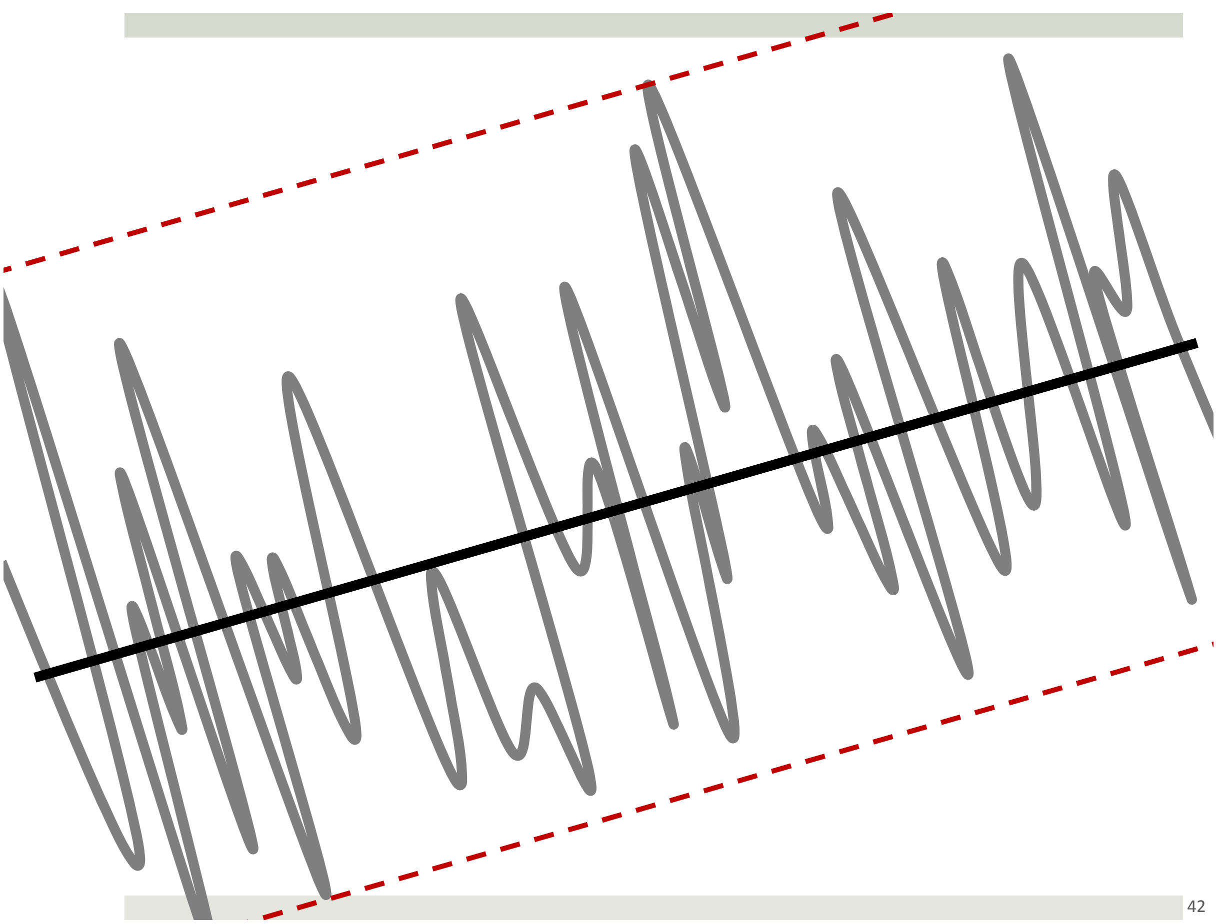
TEXAS CLIMATE

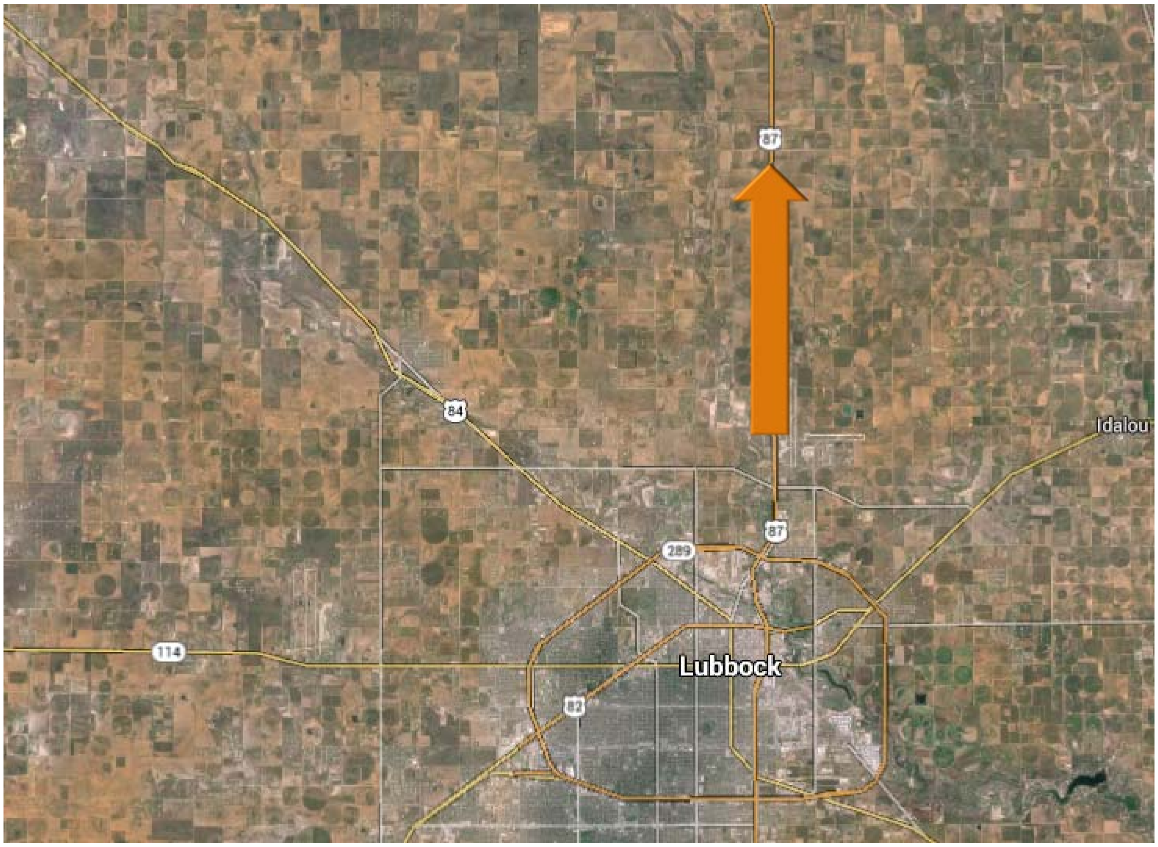










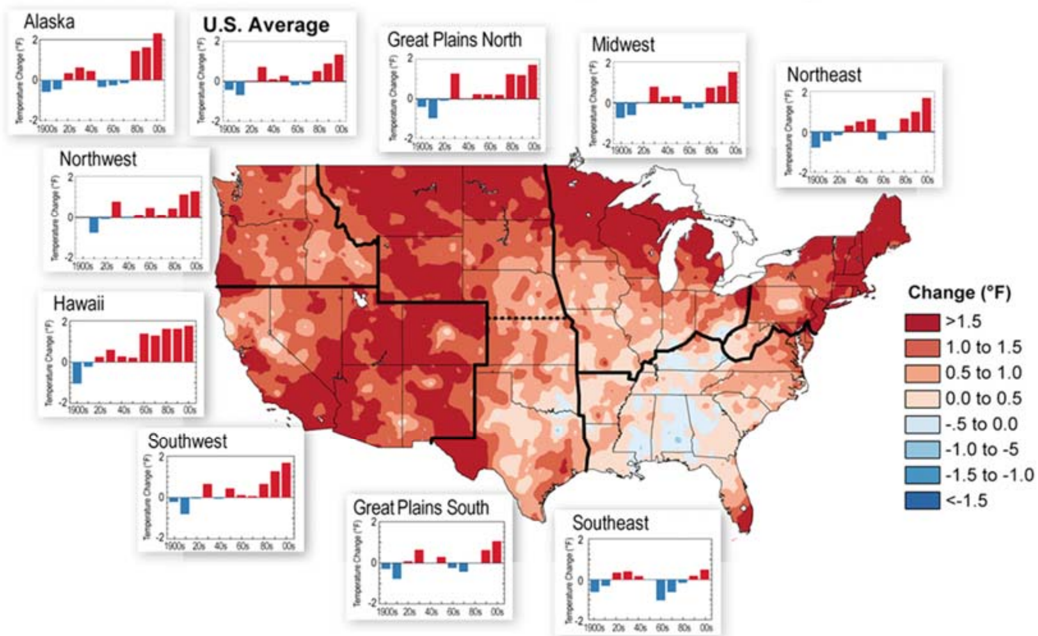

87
84
Idalou
87
289
114
Lubbock
82

Planning for the future
based on the past
is like driving down the road
looking in the rear-view mirror.

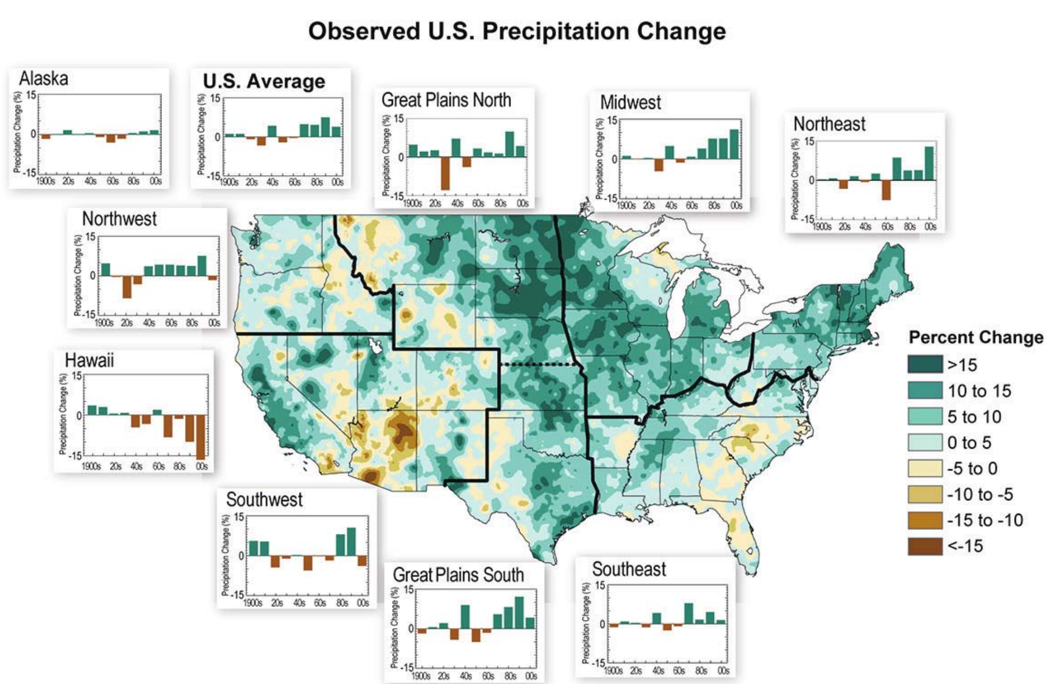
The Past

PART ONE

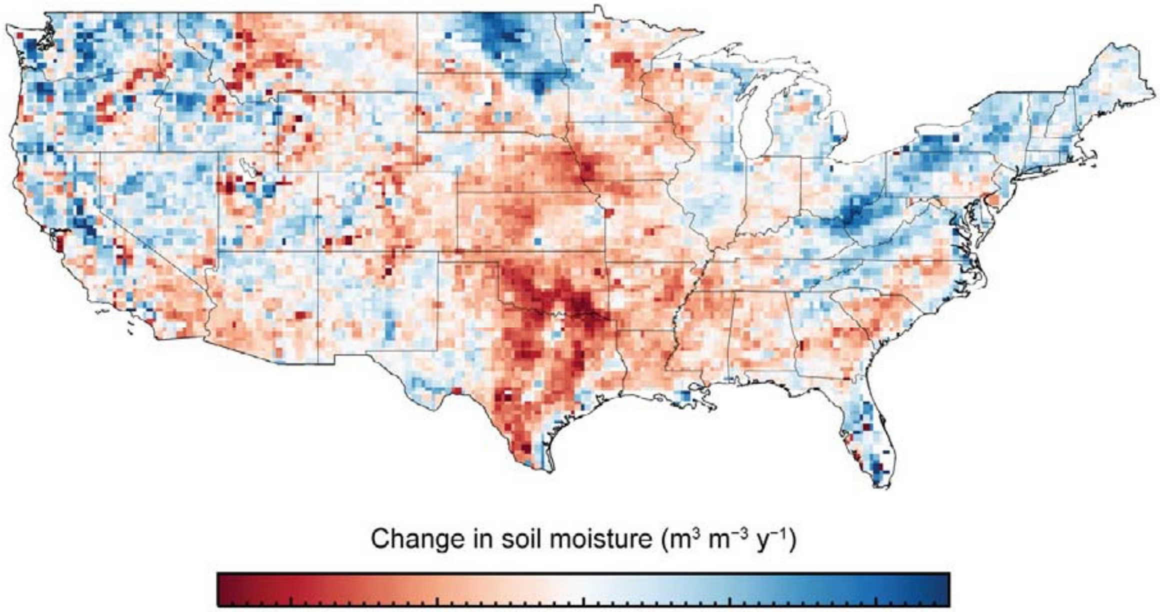
U.S. average temperatures have warmed over the past century



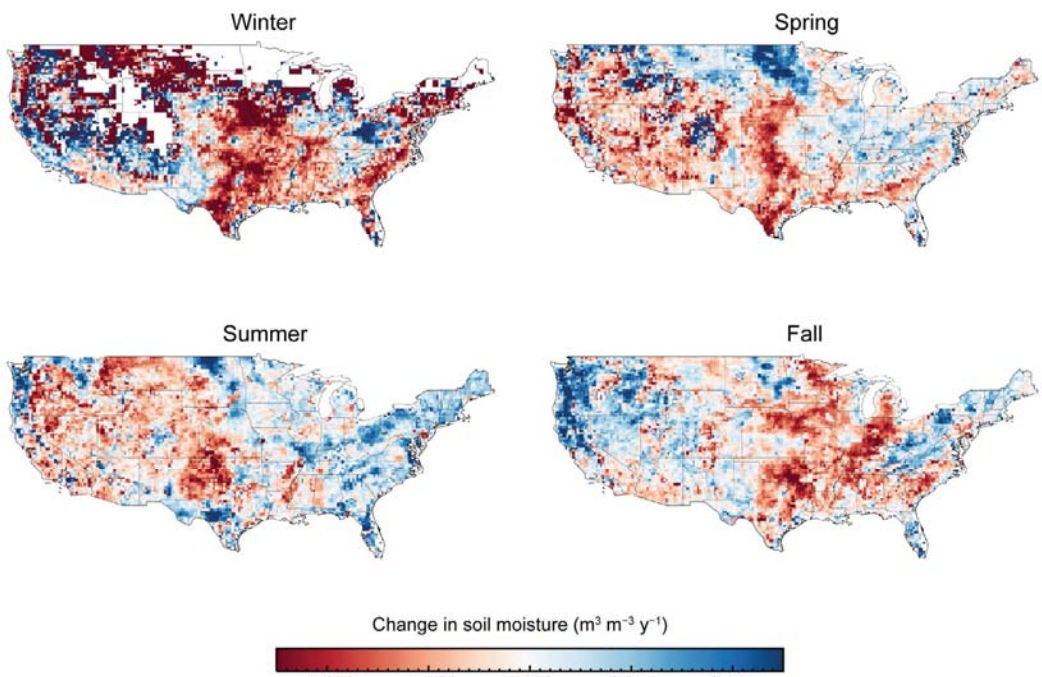
Regional precipitation patterns have shifted



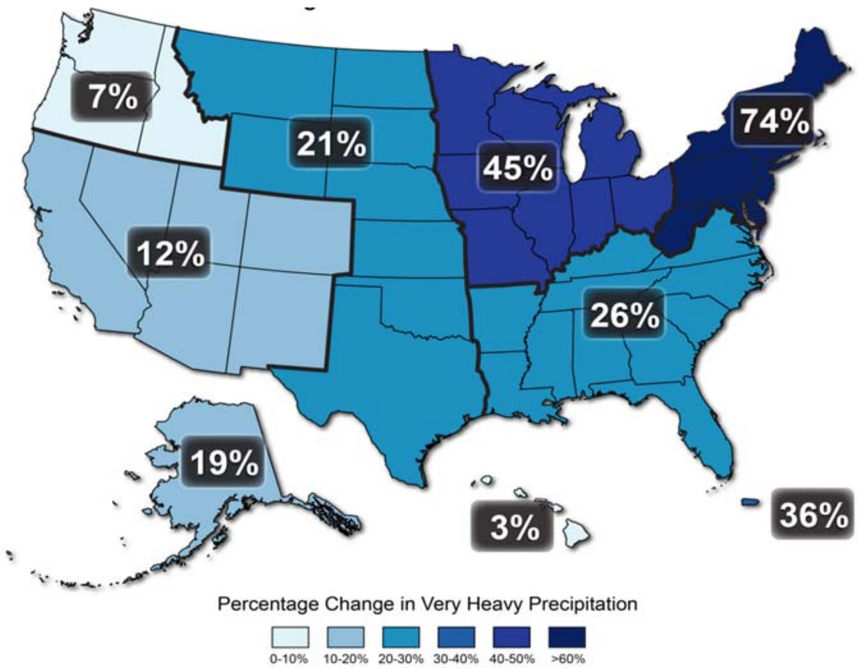
Change in surface moisture 1988-2010



Seasonal trends in soil moisture 1988-2010



Heavy precipitation becoming more frequent



Is Texas climate changing?

- Texas annual temperatures are increasing
- Winter temperatures have warmed the most
- Cold spells are becoming less severe and less frequent

Is Texas climate changing?

- Summer rainfall is shifting into spring and winter
- Extreme rainfall is becoming more common in some locations

For more information…

TEXAS WATER JOURNAL

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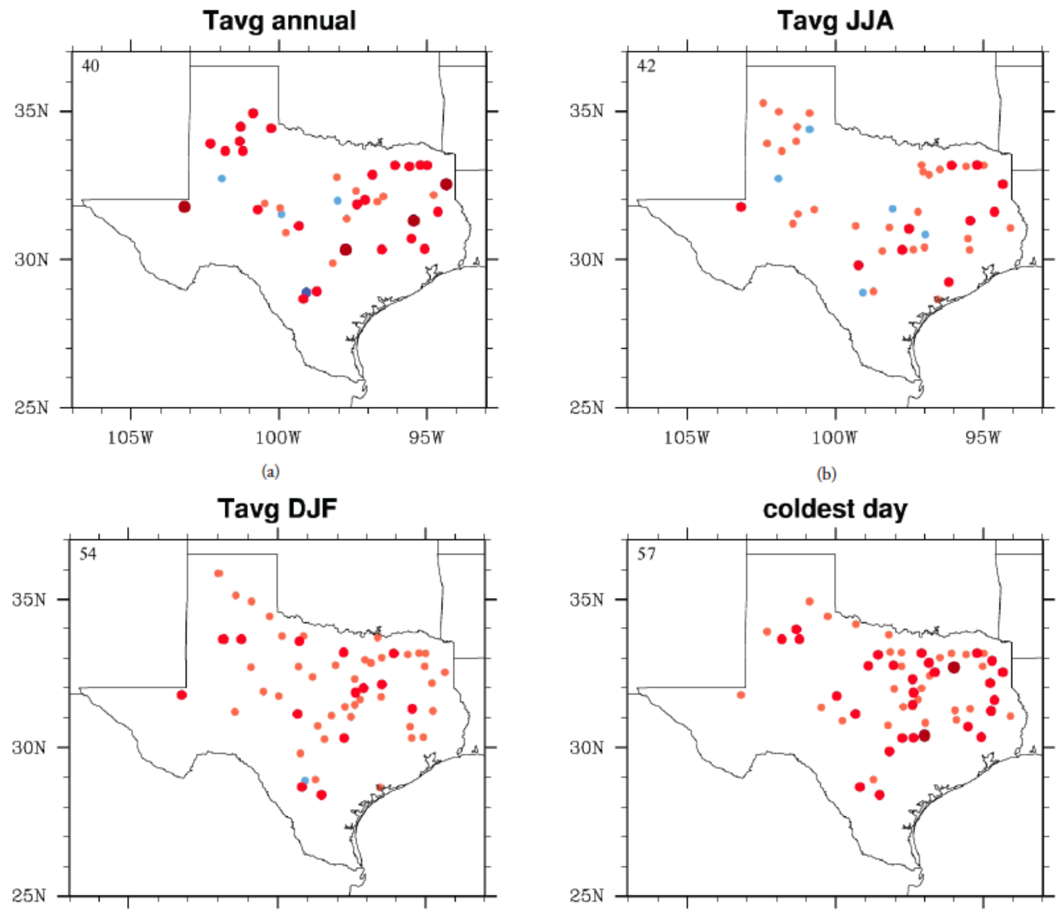
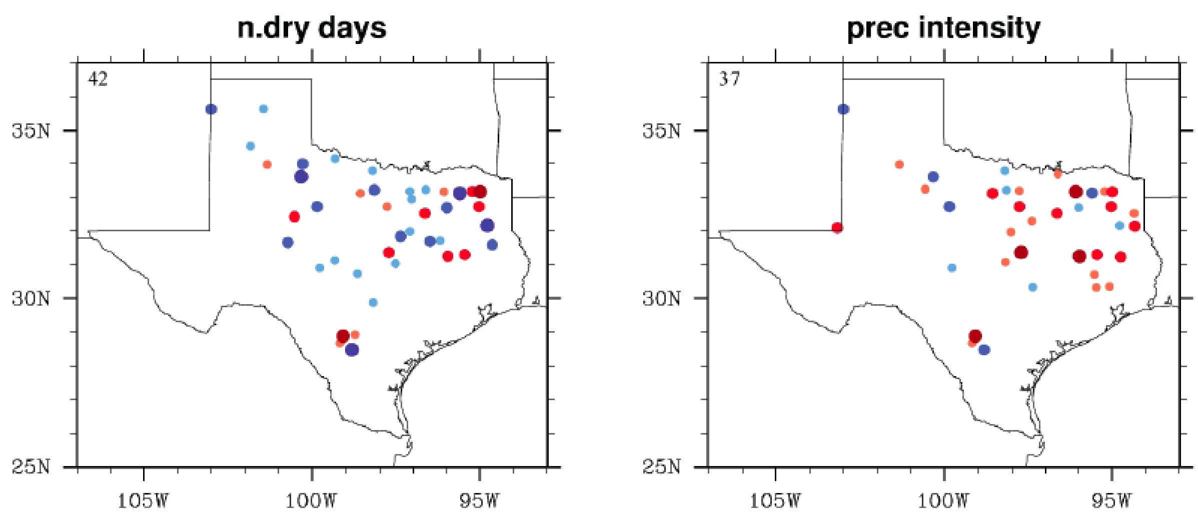
Home > Vol 5, No 1 (2014) > **Gelca**

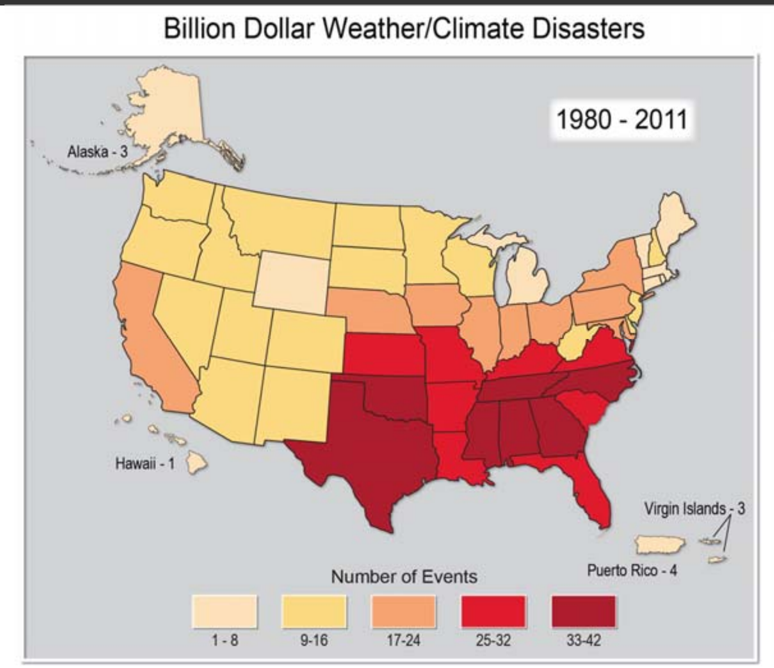
Observed trends in air temperature, precipitation, and water quality for Texas reservoirs: 1960-2010

Rodica Gelca, Katharine Hayhoe, Ian Scott-Fleming


Tavg annual
40
Tavg JJA
42
Tavg DJF
54
coldest day
57
35N
30N
25N
105W
100W
95W
(a)
(b)


n.dry days
42
prec intensity
37
35N
30N
25N
105W
100W
95W

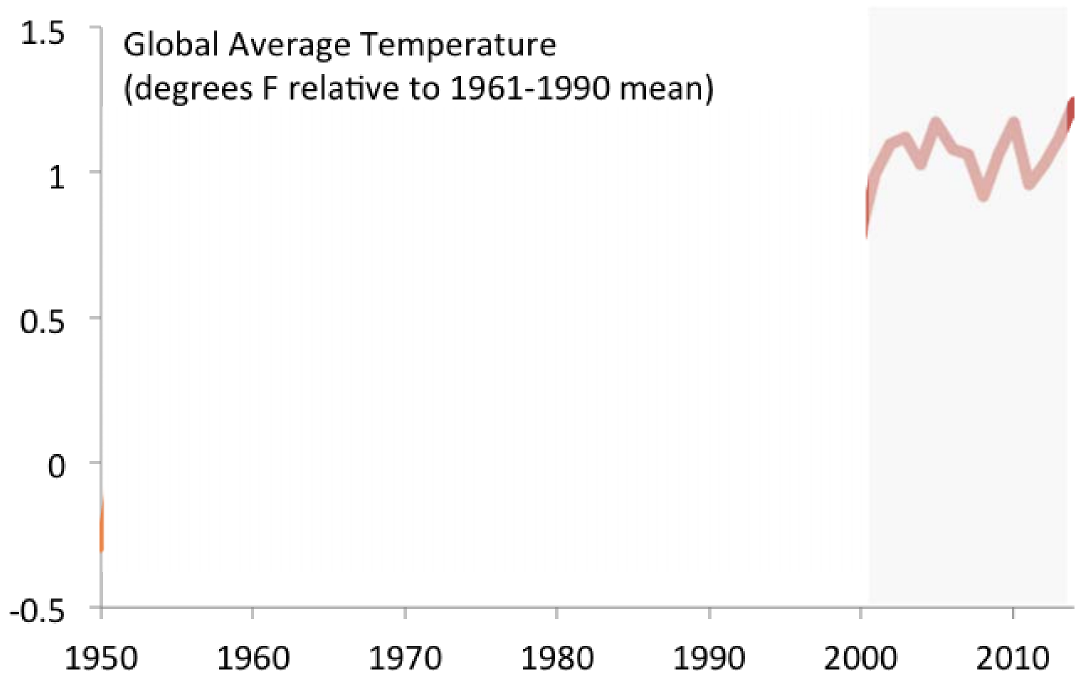
Billion dollar disasters are on the rise



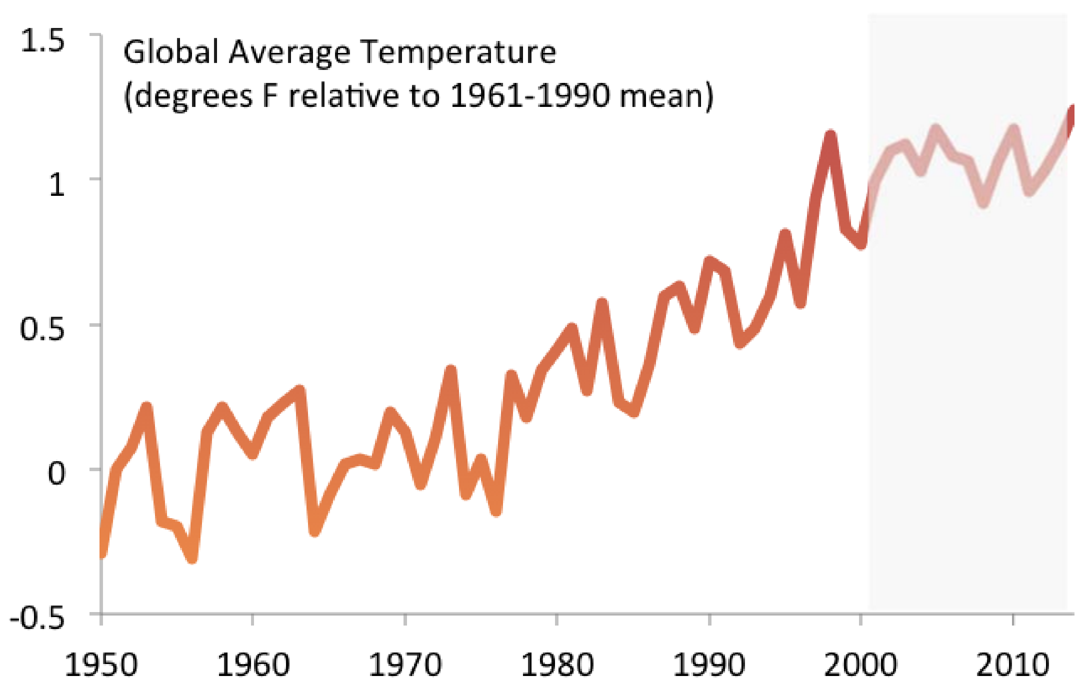
Planning for the Future

PART TWO

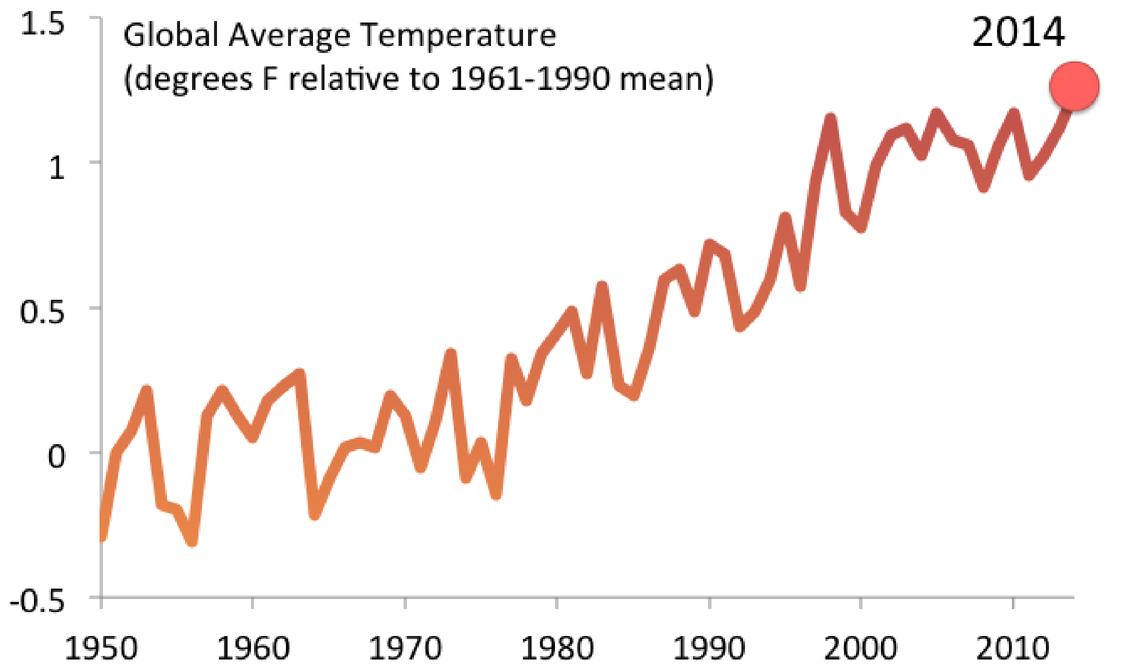
Didn't global warming stop …?



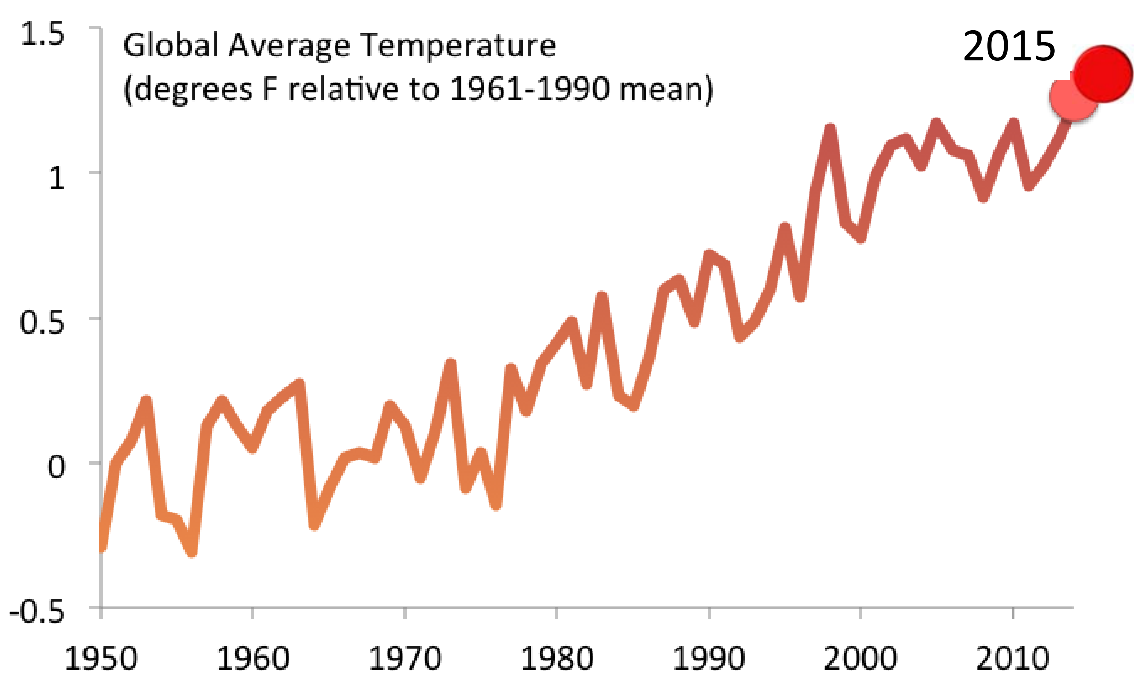
No – the planet IS warming



2014 WAS the warmest year on record



2015 is the new warmest year on record

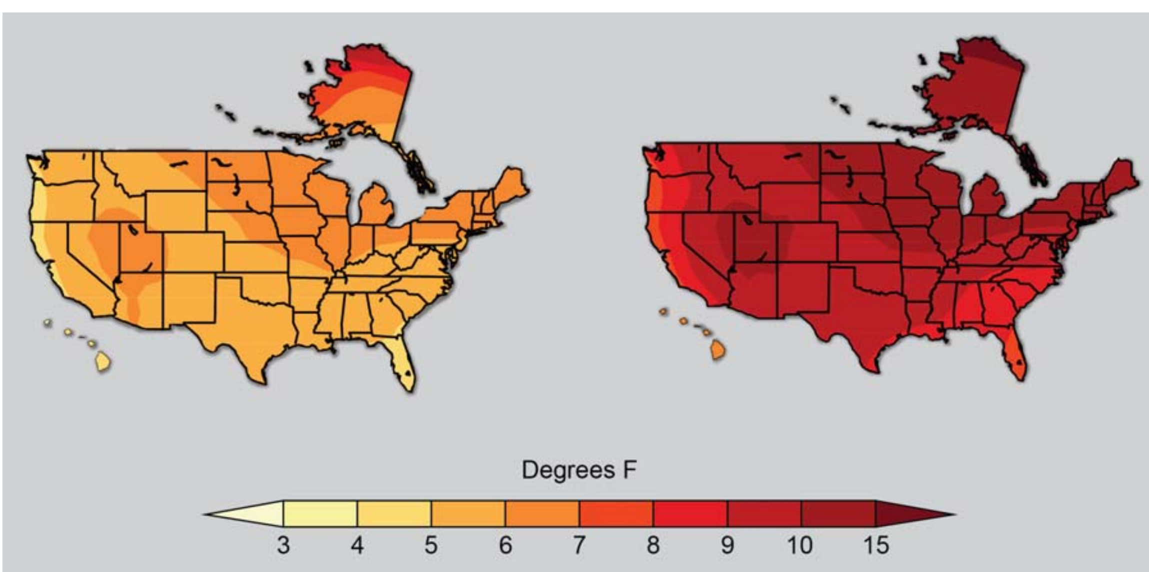


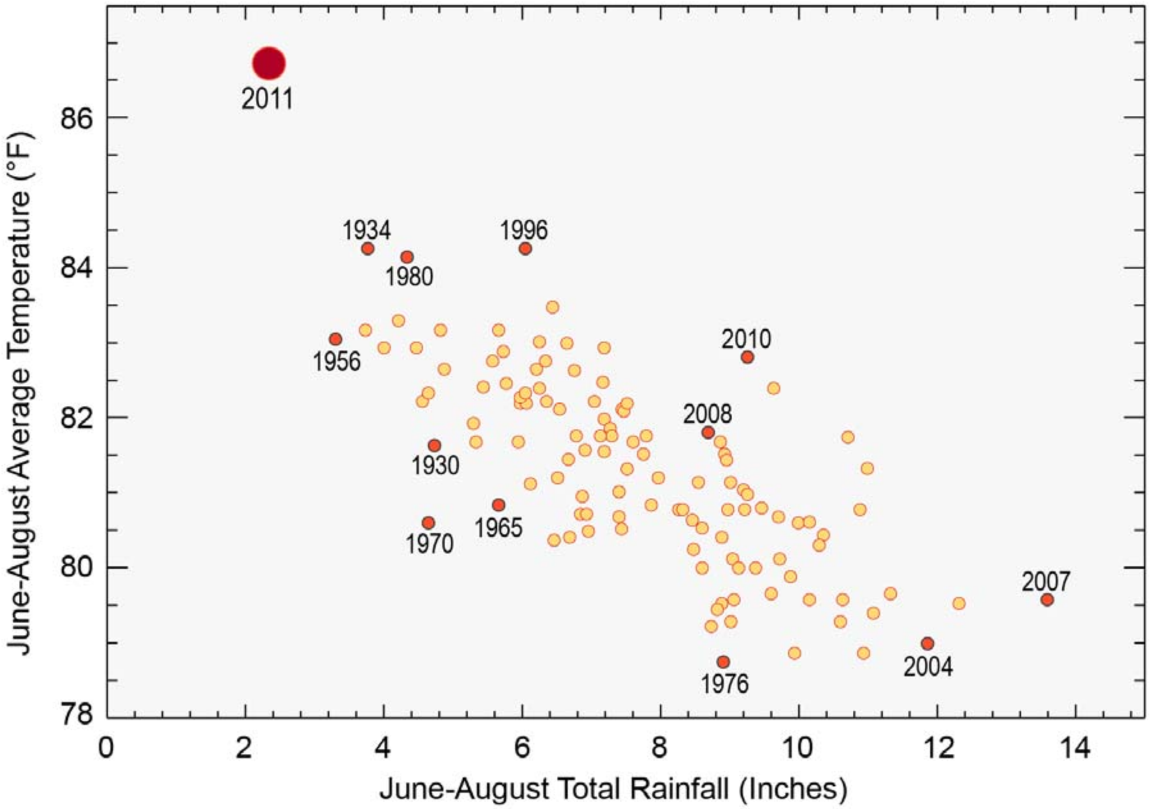
Rising temperatures are leading to increased demand for water and energy.
In parts of the Great Plains region, this will constrain development, stress natural resources, and increase competition for water among communities, agriculture, energy production, and ecological needs.

National Climate Assessment (2014)

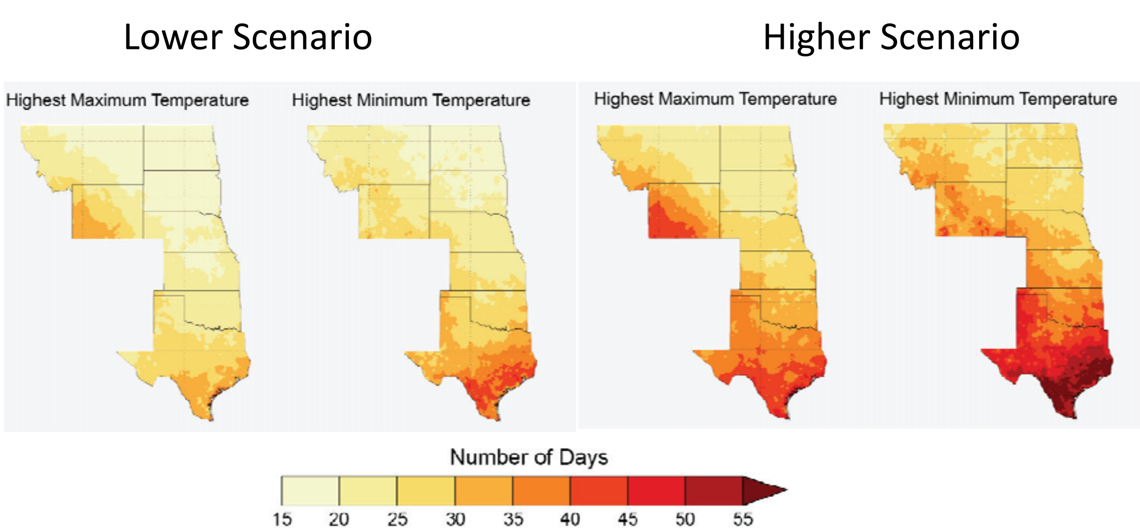
Increasing average temperatures

Lower Scenario   Higher Scenario



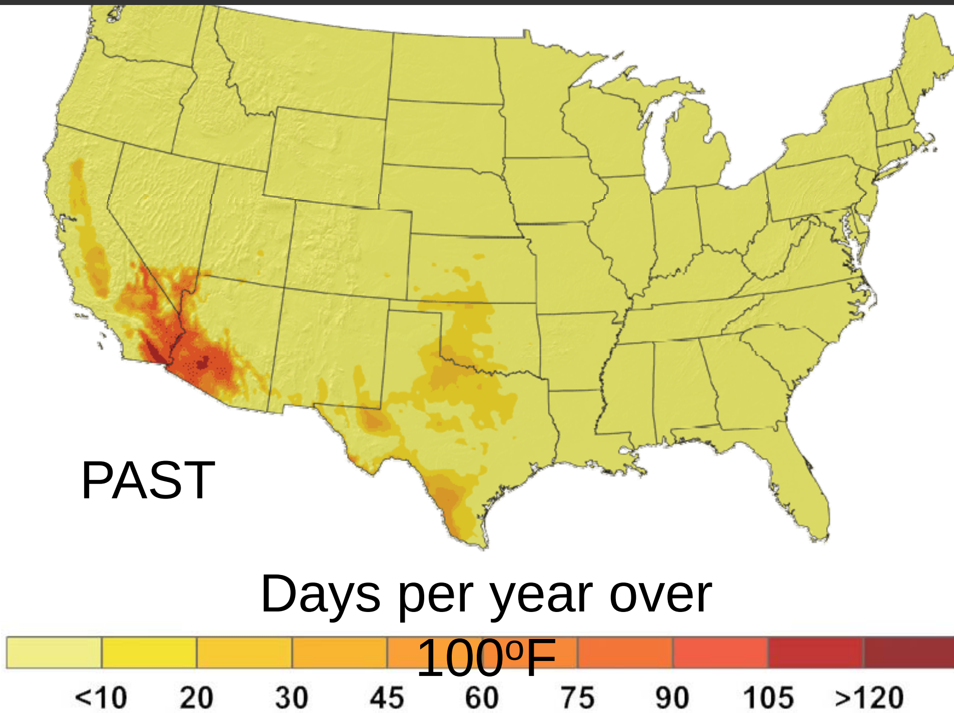


Increasing frequency of extremes

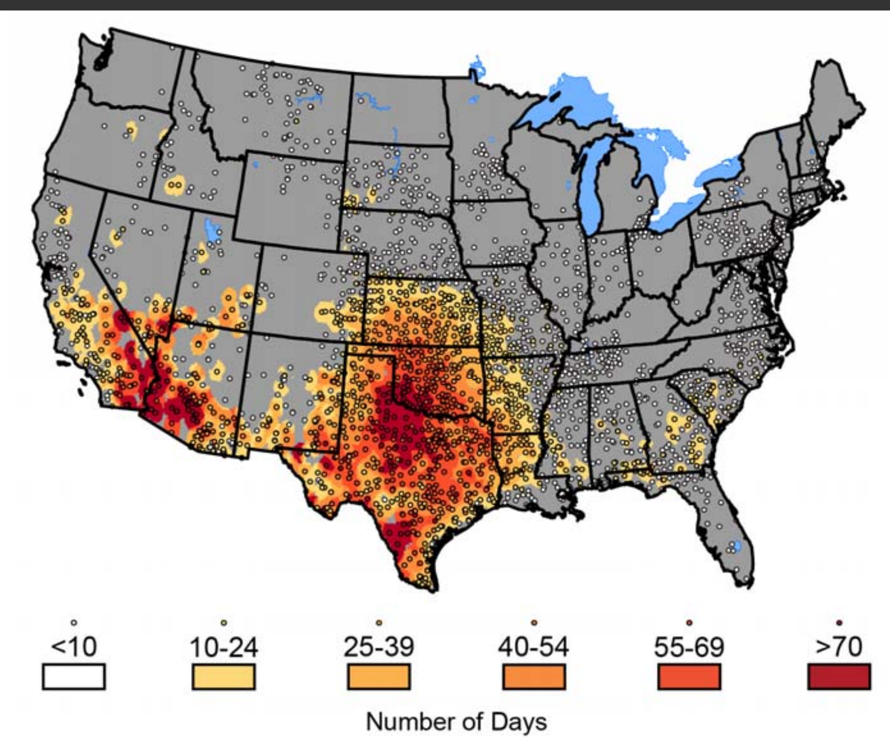


Days per year where 2041-2070 temperature will exceed historical hottest week of the year

… consistent with larger-scale trends.



Summer of 2011



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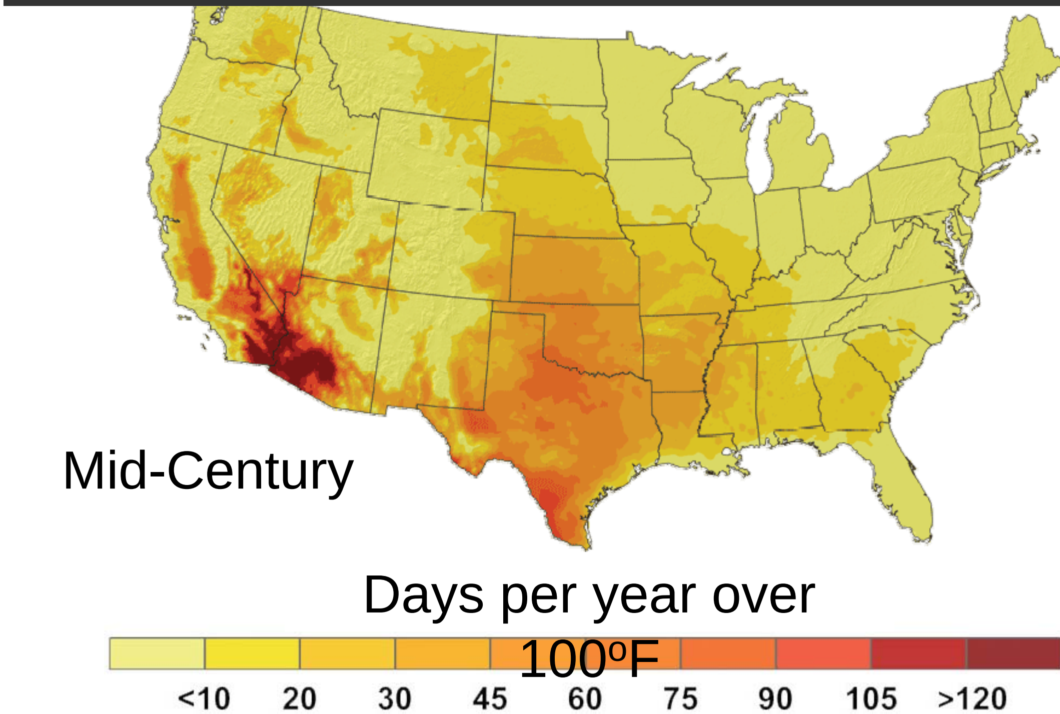

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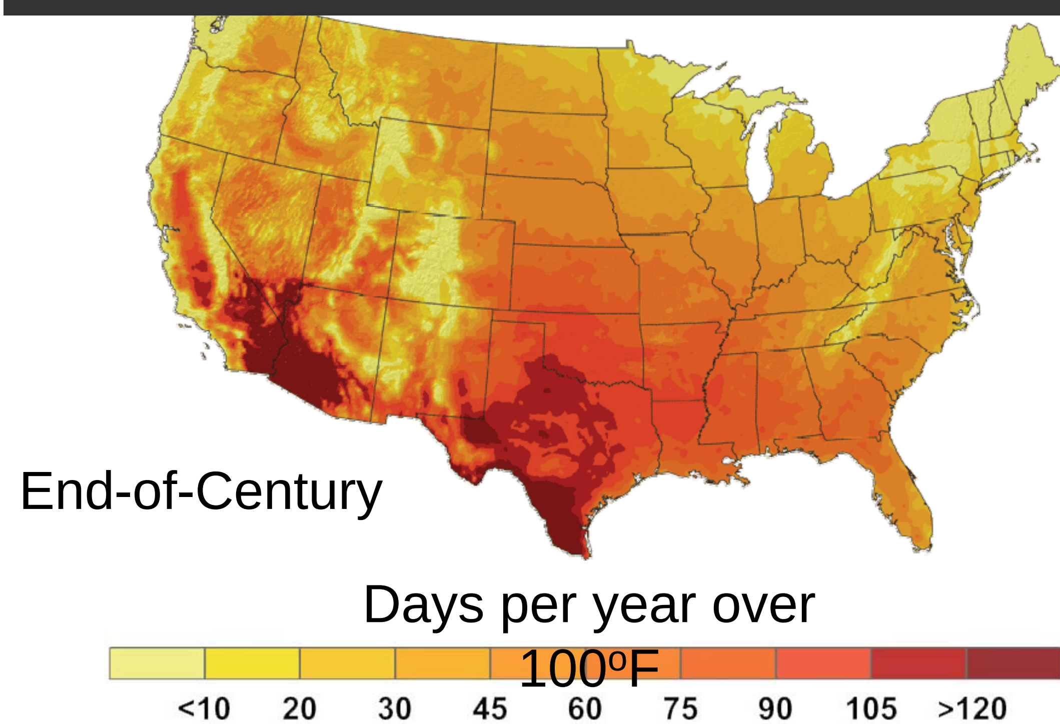
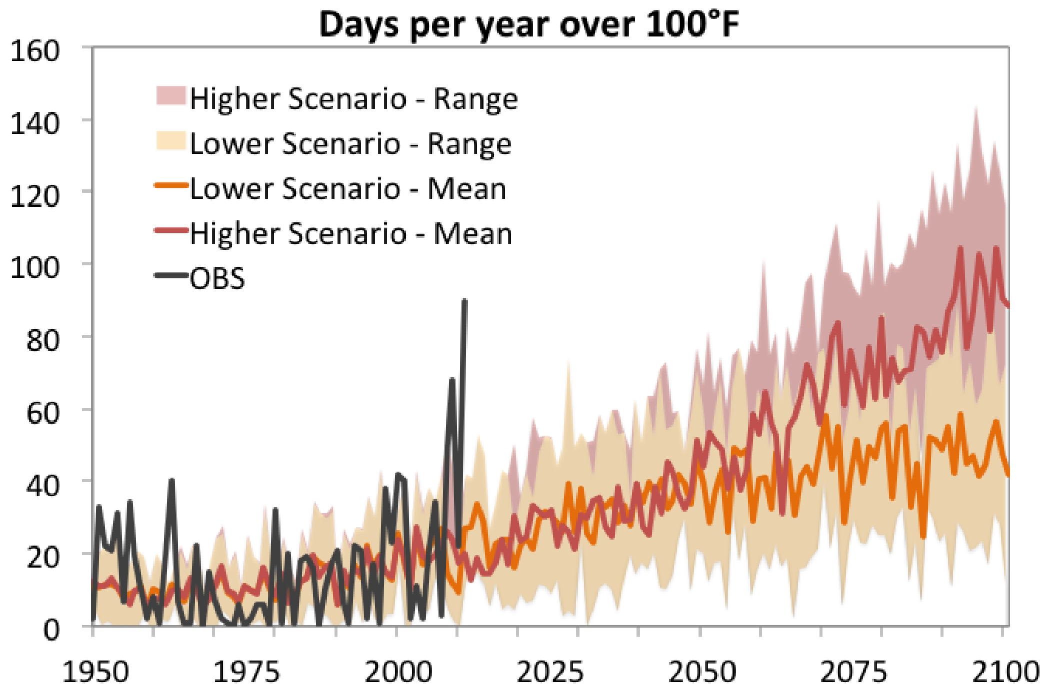


For the Austin area …



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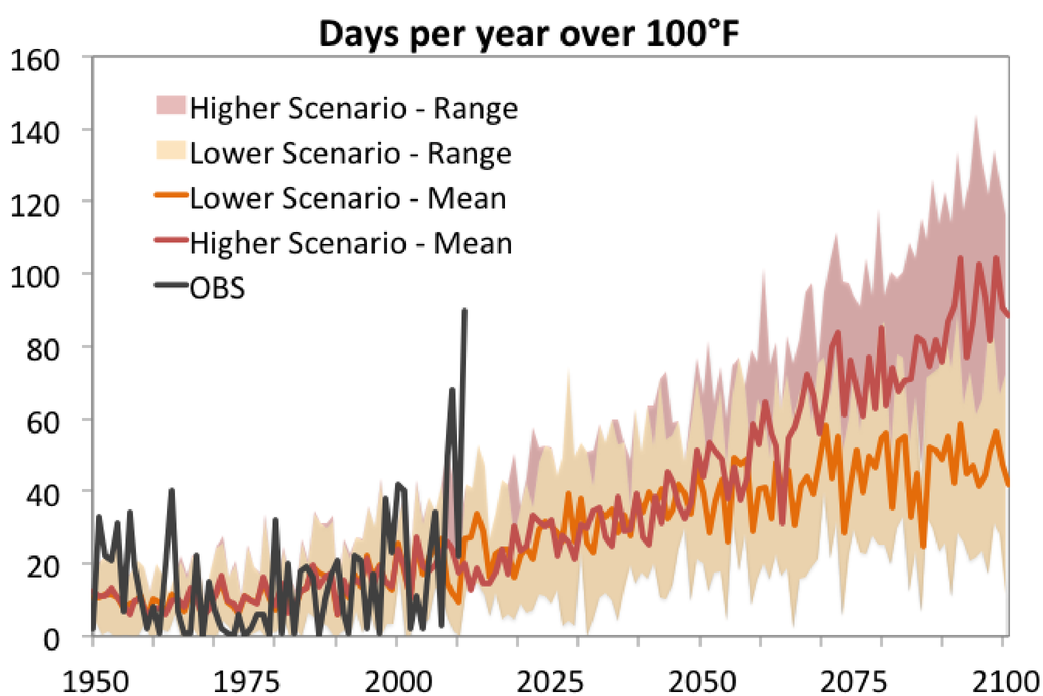


Alterations in the **timing and magnitude of rainfall events** have already been observed.

As these trends continue, they will require new management practices. The Southwest, Great Plains, and Southeast are particularly vulnerable to changes in water supply and demand.

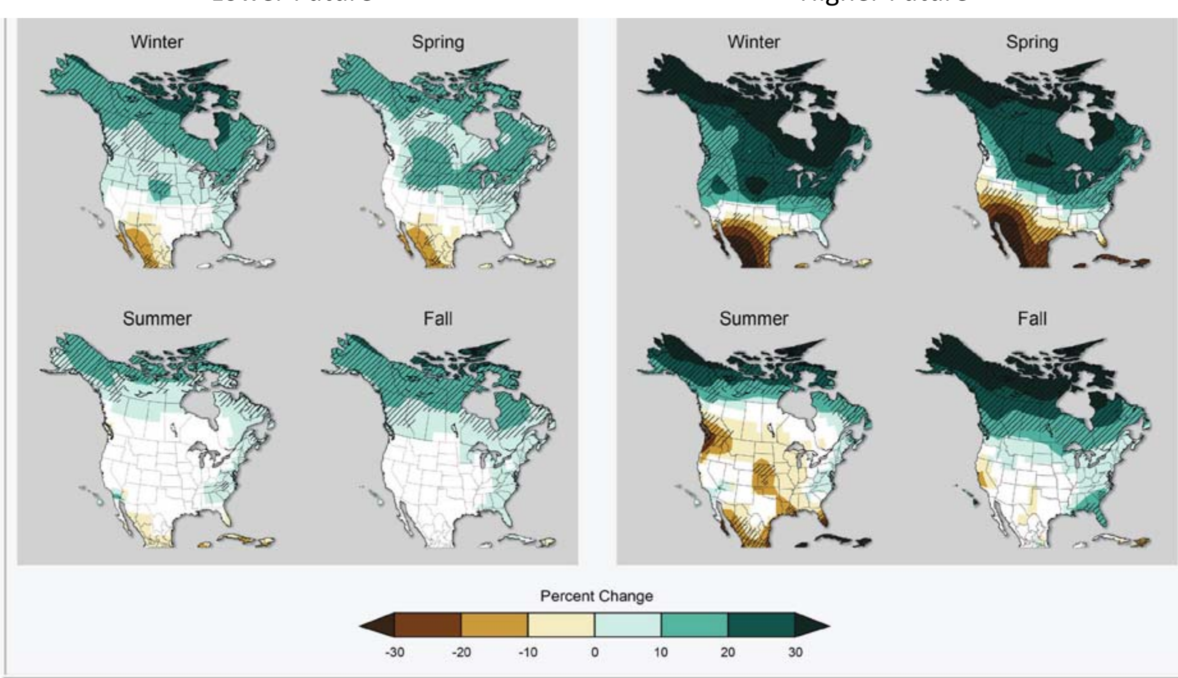
Longer-term droughts are expected to intensify in large areas of the Southwest, southern Great Plains, and Southeast.

National Climate Assessment (2014)

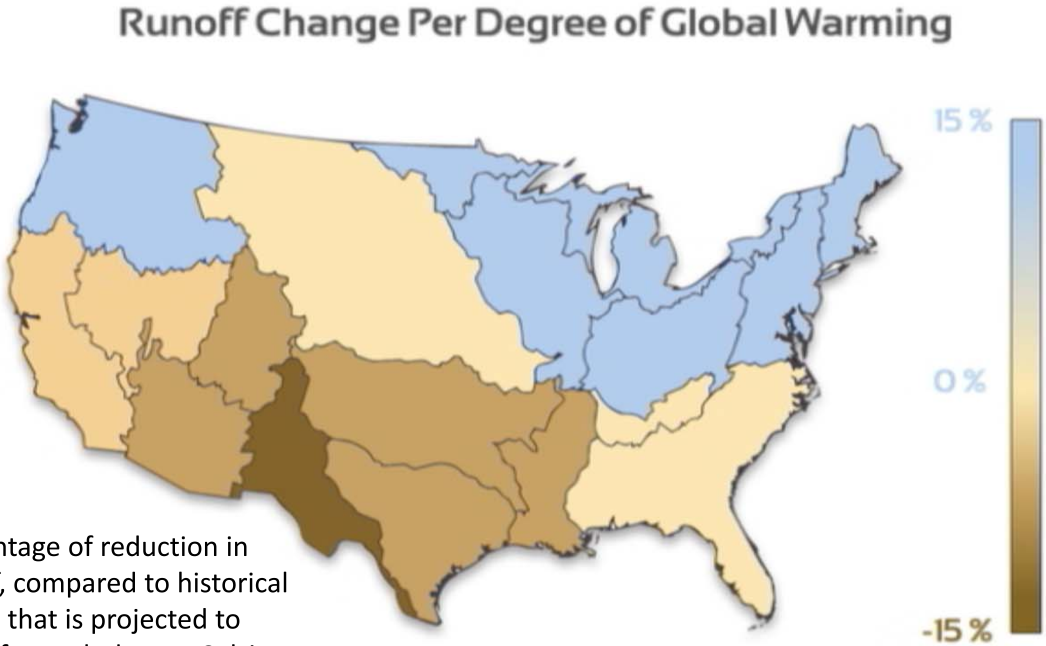
Wet will get wetter; dry areas, drier

Lower Future

Higher Future



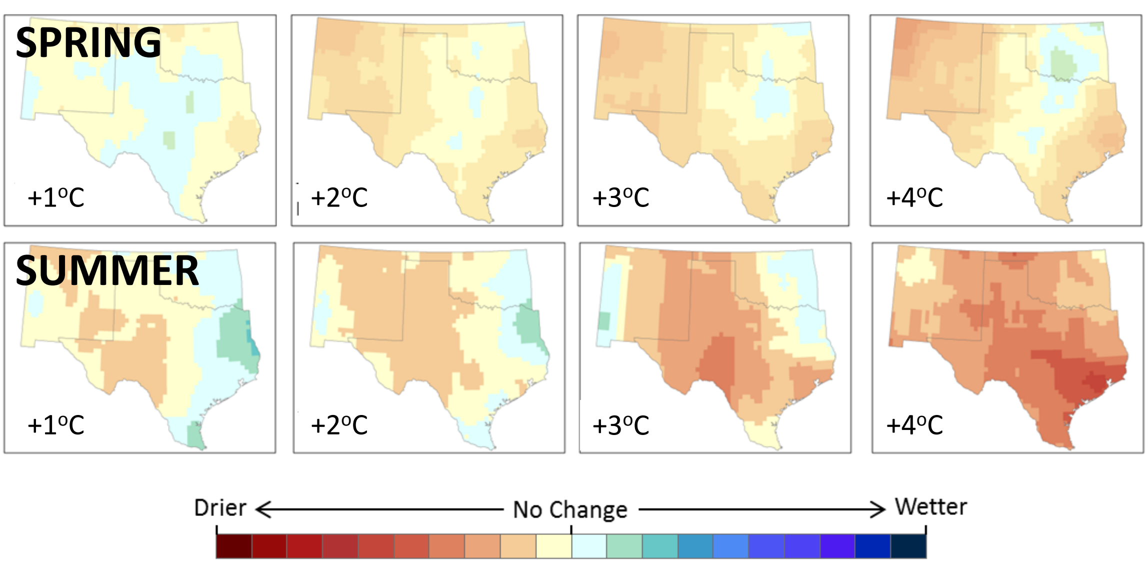
Reductions in surface runoff



Percentage of reduction in runoff, compared to historical levels, that is projected to occur for each degree Celsius that the planet warms.

Based on 2011 National Academy of Sciences

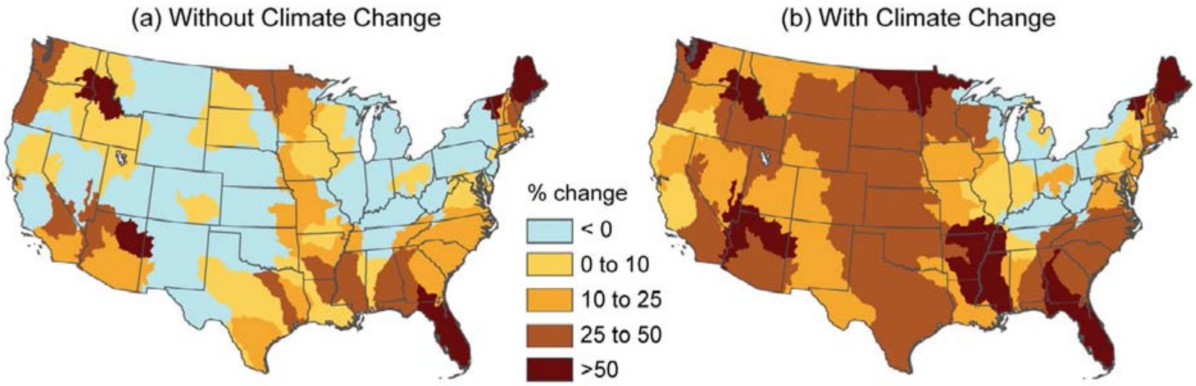
More frequent summer drought conditions



Projected change in Standardized Precipitation Index (the metric used by the National Drought Migitation Center) for each degree Celsius that the planet warms.

From Swain & Hayhoe, Climate Dynamics, 2015

Projected changes in water withdrawals from 2005 to 2060 under a lower scenario



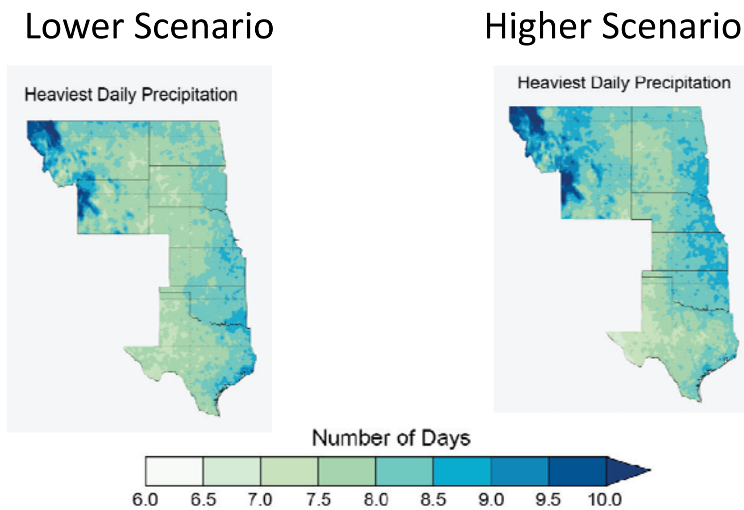
Communities already vulnerable to **weather and climate extremes** will be stressed even further by more frequent extreme events.

The magnitude of expected changes will exceed those experienced in the last century.

Existing adaptation and planning efforts are inadequate to respond to these projected impacts.

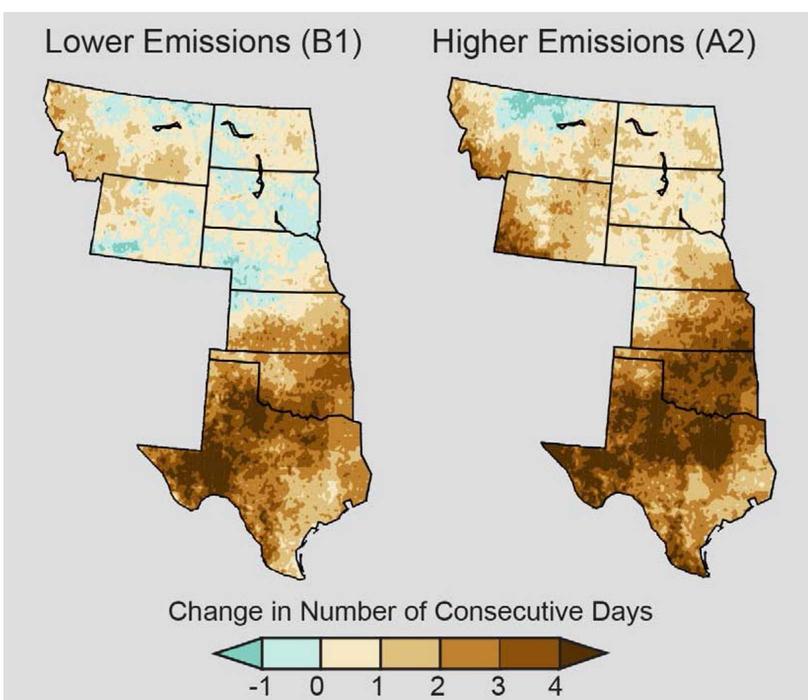
National Climate Assessment (2014)

Increasing frequency of heavy rainfall



Days per year where 2041-2070 precipitation will exceed historical wettest week of the year

And dry days



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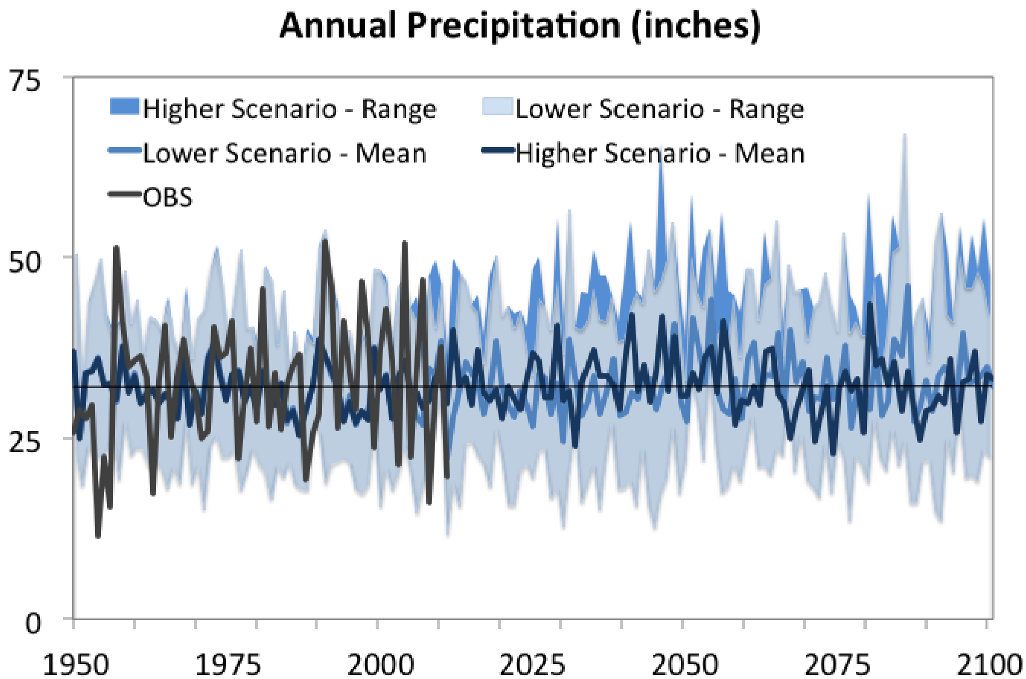

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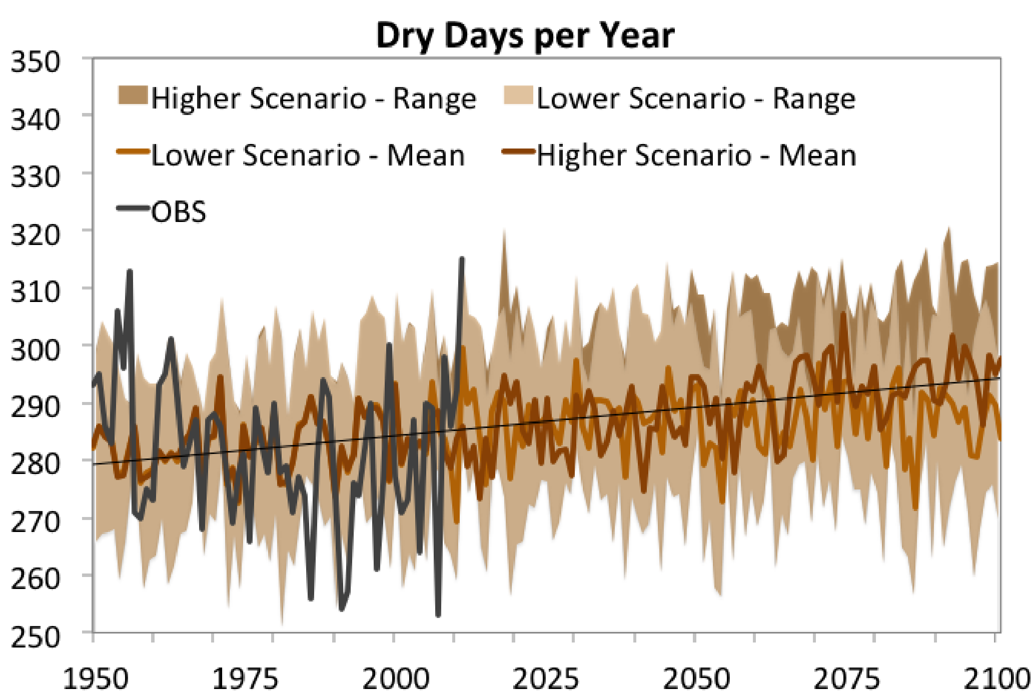

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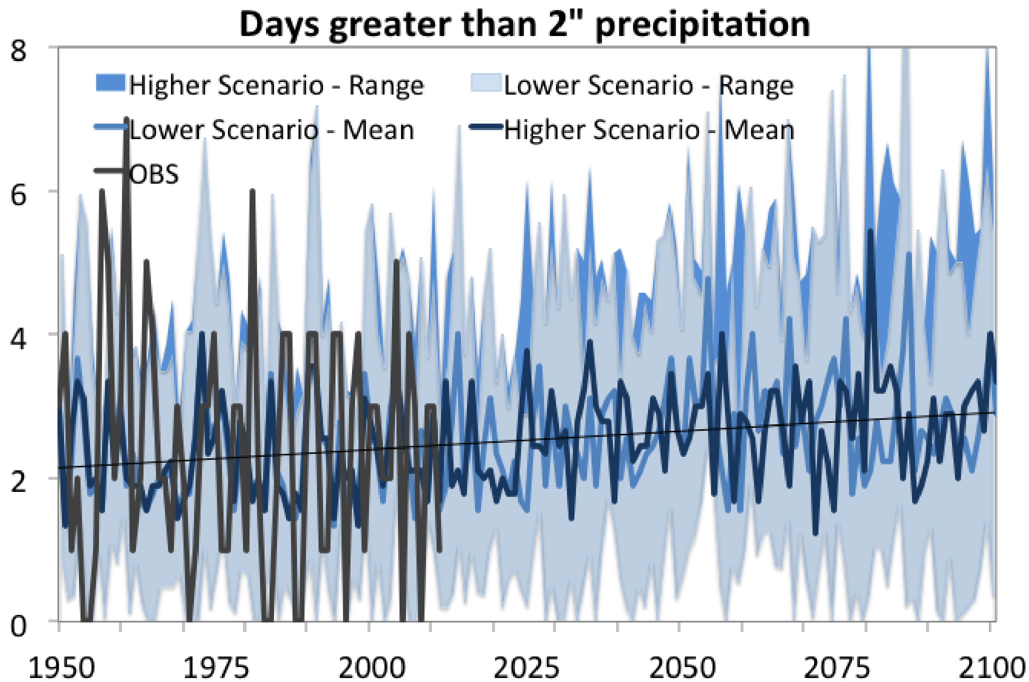


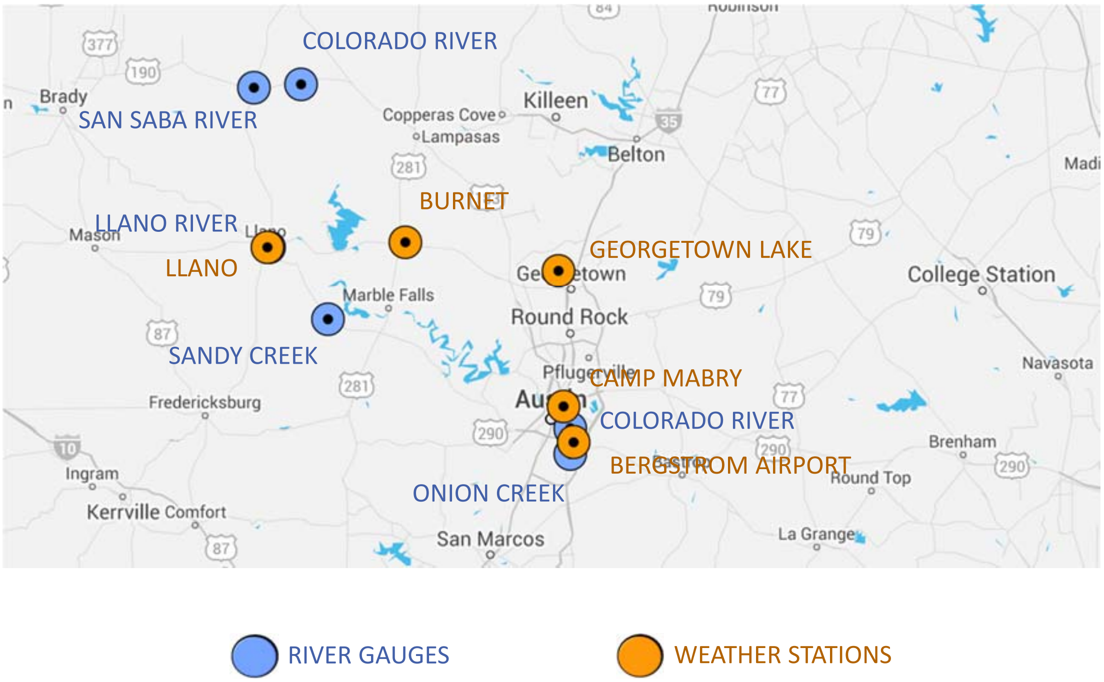
CLIMATE SUMMARY

Our climate is already changing, consistent with larger-scale trends observed across the U.S. and the world

In the future, we expect:

- Increases in annual and seasonal average temperatures to drive increases in evaporation rates
- More frequent high temperature extremes that increase the stress on water supply from shallow rivers and creeks
- Little change in annual average precipitation
- Greater precipitation variability, including both extreme precipitation and drought conditions in summer, making flow rates more uneven

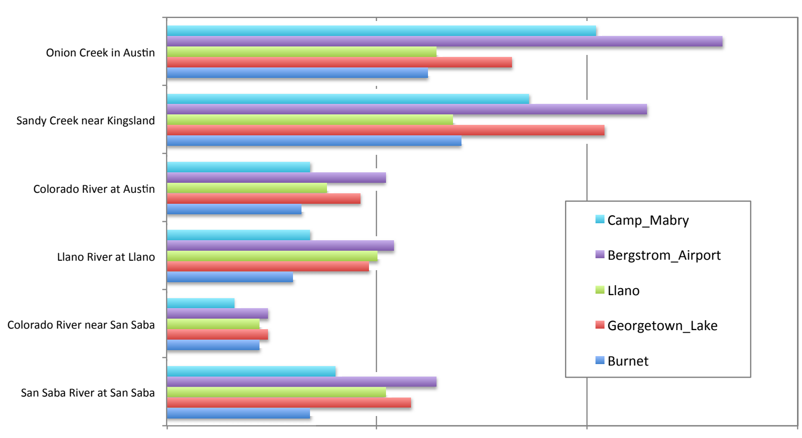
Weather Stations and River Gauges



Streamflow projections for Austin

Using 6 sample gauges and 5 weather stations,

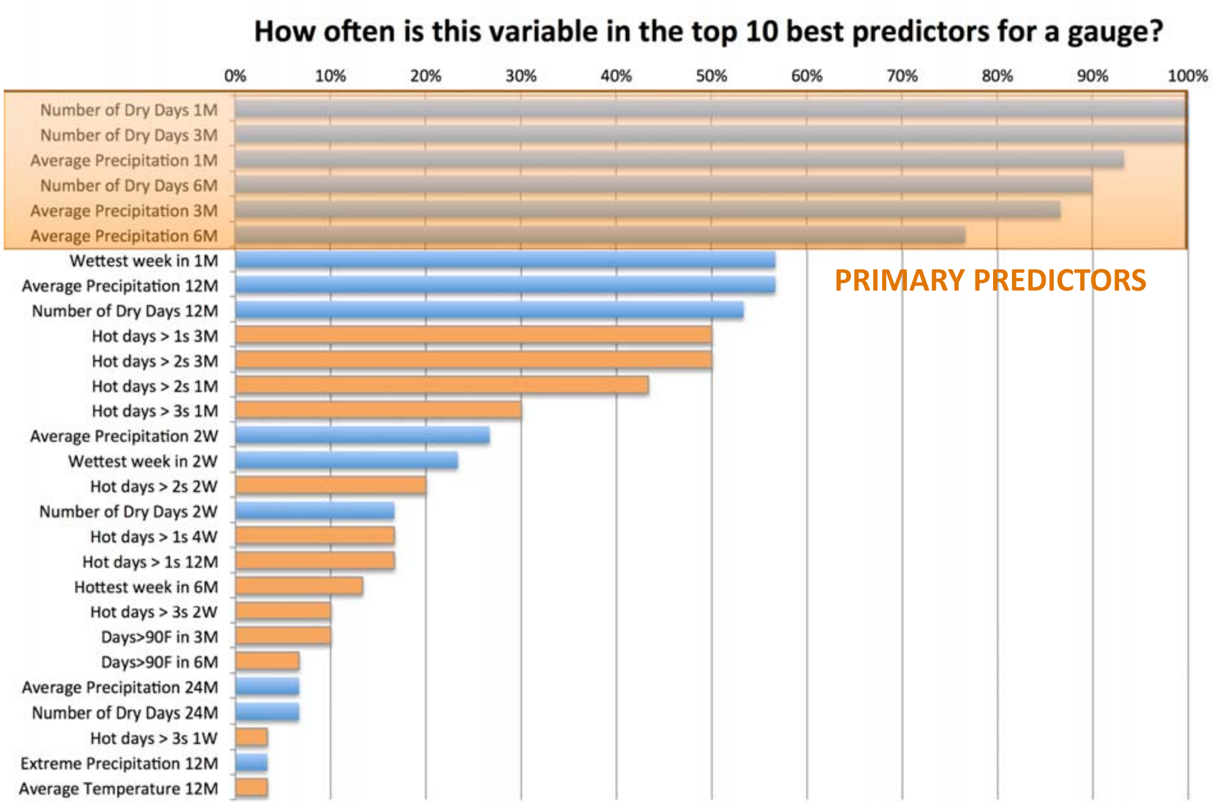
1. Is there a relationship between climate/weather and variability in streamflow?

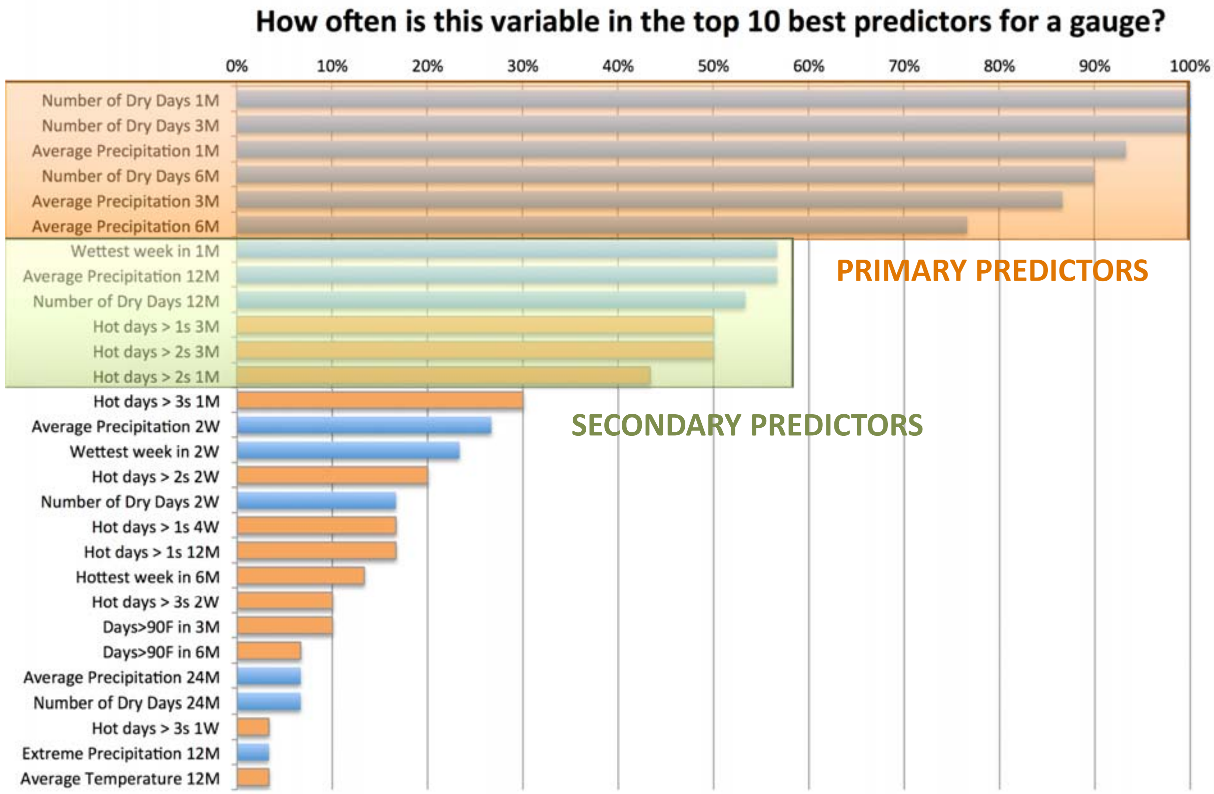


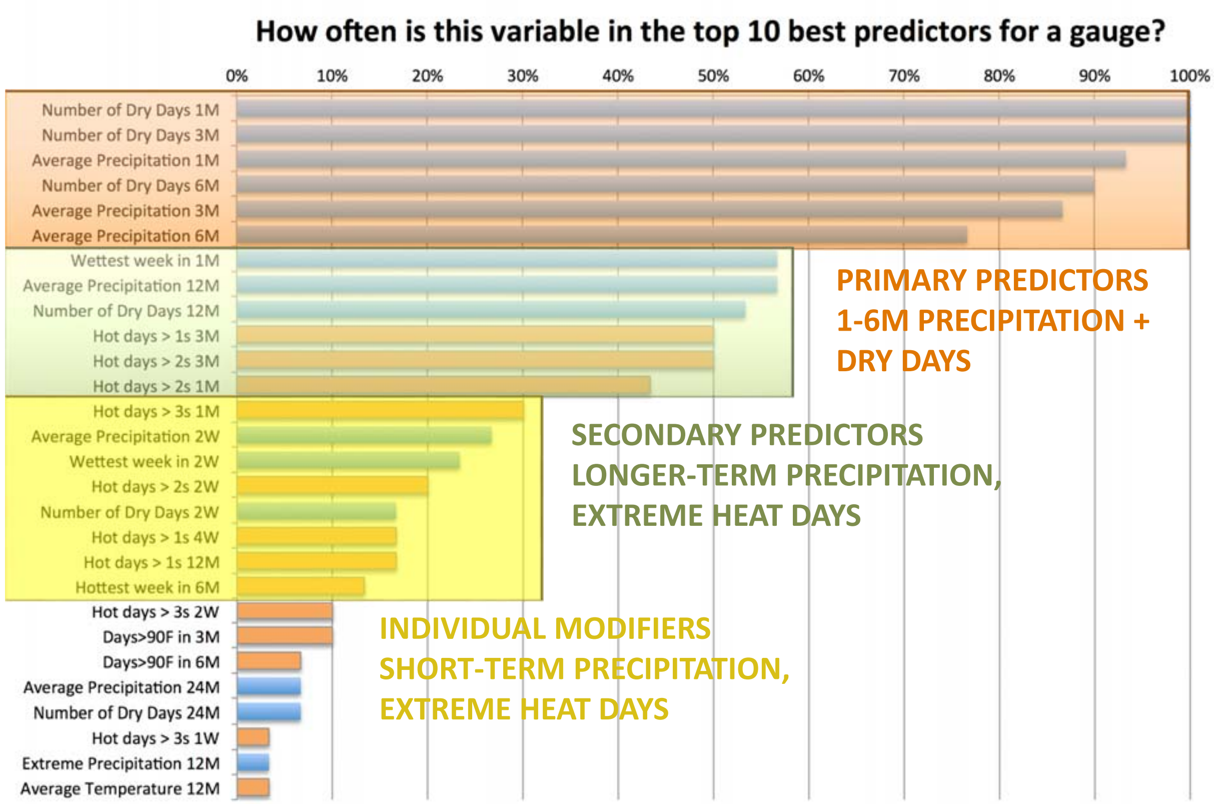
Streamflow projections for Austin

Using 6 sample gauges and 5 weather stations,

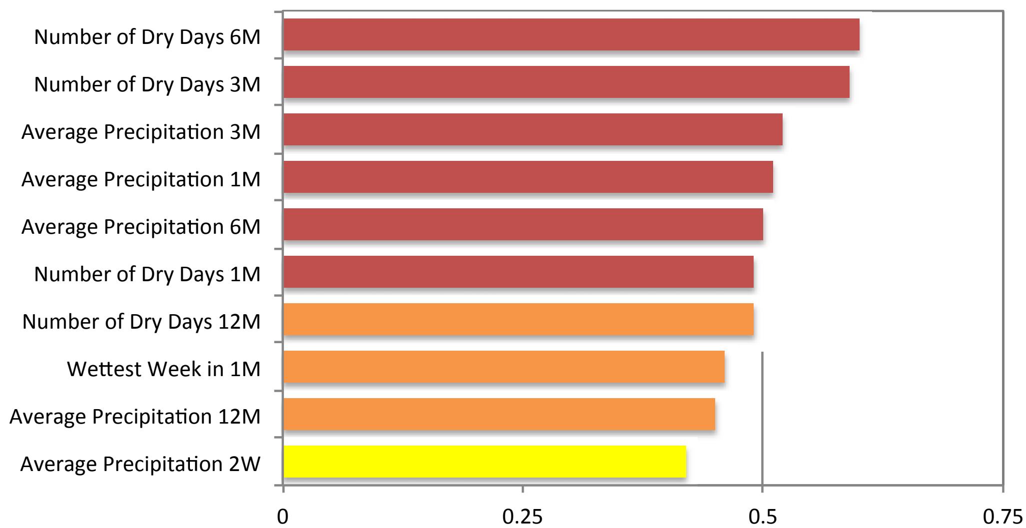
2. Can we identify specific climate indicators to use as predictors of streamflow?




How often is this variable in the top 10 best predictors for a gauge?
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Number of Dry Days 1M
Number of Dry Days 3M
Average Precipitation 1M
Number of Dry Days 6M
Average Precipitation 3M
Average Precipitation 6M
Wettest week in 1M
Average Precipitation 12M
Number of Dry Days 12M
Hot days > 1s 3M
Hot days > 2s 3M
Hot days > 2s 1M
Hot days > 3s 1M
Average Precipitation 2W
Wettest week in 2W
Hot days > 2s 2W
Number of Dry Days 2W
Hot days > 1s 4W
Hot days > 1s 12M
Hottest week in 6M
Hot days > 3s 2W
Days>90F in 3M
Days>90F in 6M
Average Precipitation 24M
Number of Dry Days 24M
Hot days > 3s 1W
Extreme Precipitation 12M
Average Temperature 12M
PRIMARY PREDICTORS
SECONDARY PREDICTORS


How often is this variable in the top 10 best predictors for a gauge?
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Number of Dry Days 1M
Number of Dry Days 3M
Average Precipitation 1M
Number of Dry Days 6M
Average Precipitation 3M
Average Precipitation 6M
Wettest week in 1M
Average Precipitation 12M
Number of Dry Days 12M
Hot days > 1s 3M
Hot days > 2s 3M
Hot days > 2s 1M
Hot days > 3s 1M
Average Precipitation 2W
Wettest week in 2W
Hot days > 2s 2W
Number of Dry Days 2W
Hot days > 1s 4W
Hot days > 1s 12M
Hottest week in 6M
Hot days > 3s 2W
Days>90F in 3M
Days>90F in 6M
Average Precipitation 24M
Number of Dry Days 24M
Hot days > 3s 1W
Extreme Precipitation 12M
Average Temperature 12M
PRIMARY PREDICTORS
1-6M PRECIPITATION +
DRY DAYS
SECONDARY PREDICTORS
LONGER-TERM PRECIPITATION,
EXTREME HEAT DAYS
INDIVIDUAL MODIFIERS
SHORT-TERM PRECIPITATION,
EXTREME HEAT DAYS

Colorado River at Austin

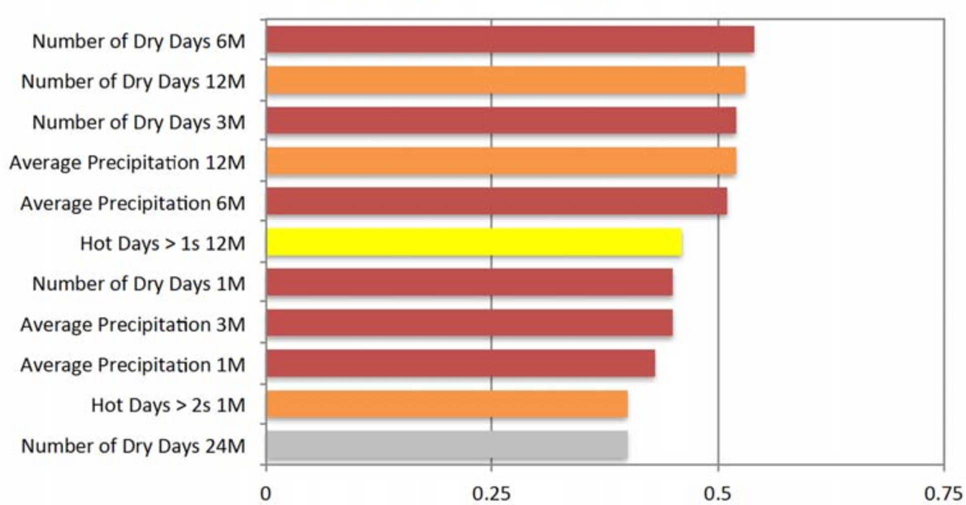


All 6 primary indicators dominate predictability of streamflow

No temperature indicators show up in the top 10

Indicative of a deep river with high flow volume

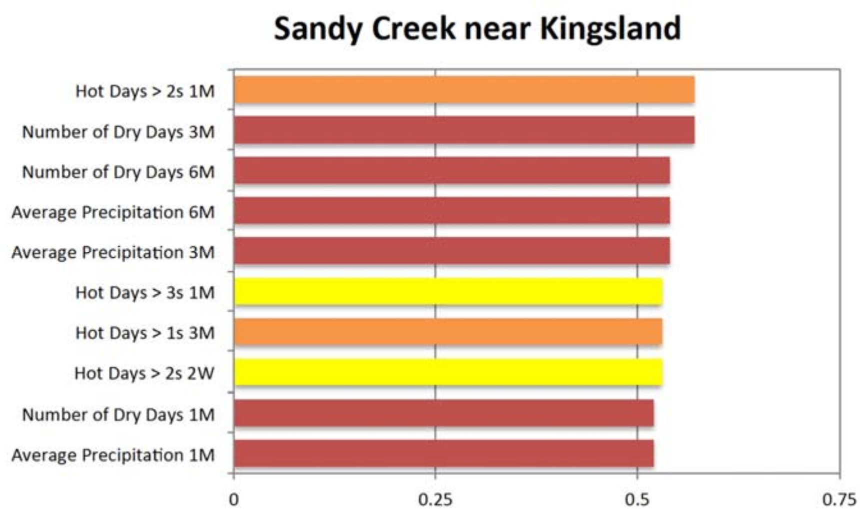
Llano River at Llano



All 6 primary indicators are here, but they are significantly modified by longer-term (12M) indicators

Hot days show up as a consistent secondary predictor

Indicative of a spring-fed river with shallow areas



All 6 primary indicators are here, but their influence is matched by hot temperature days.

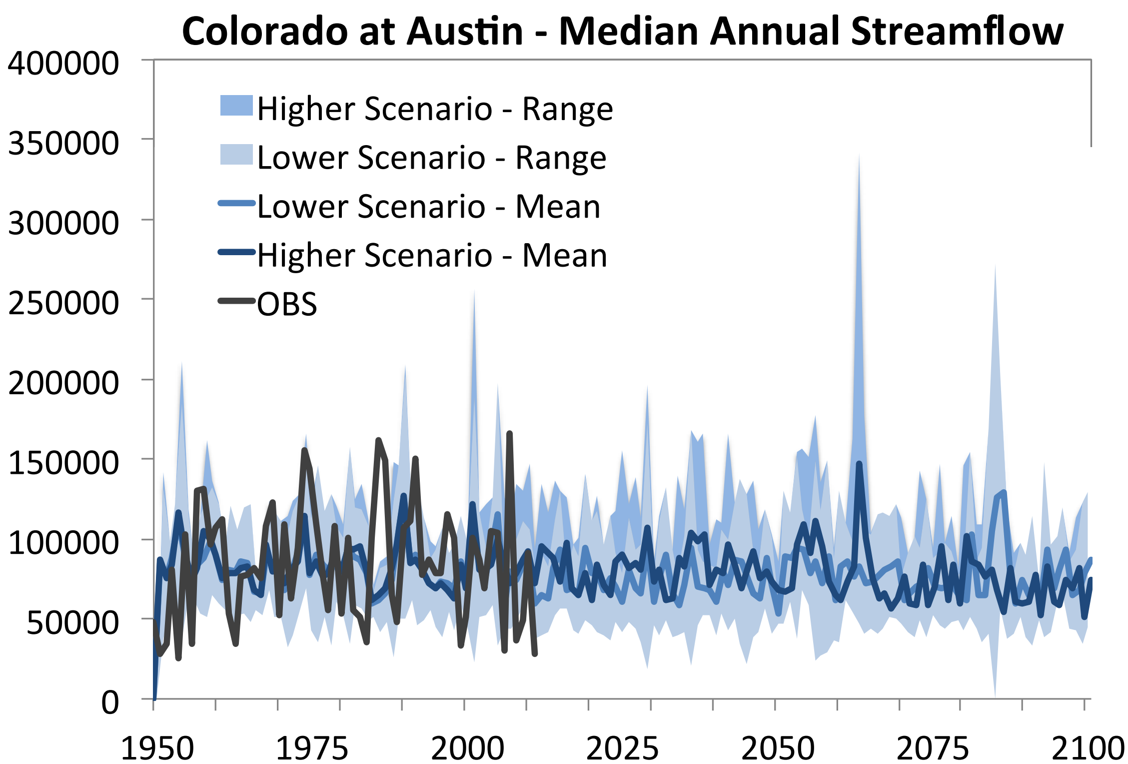
Indicative of a shallow river with significant evaporation

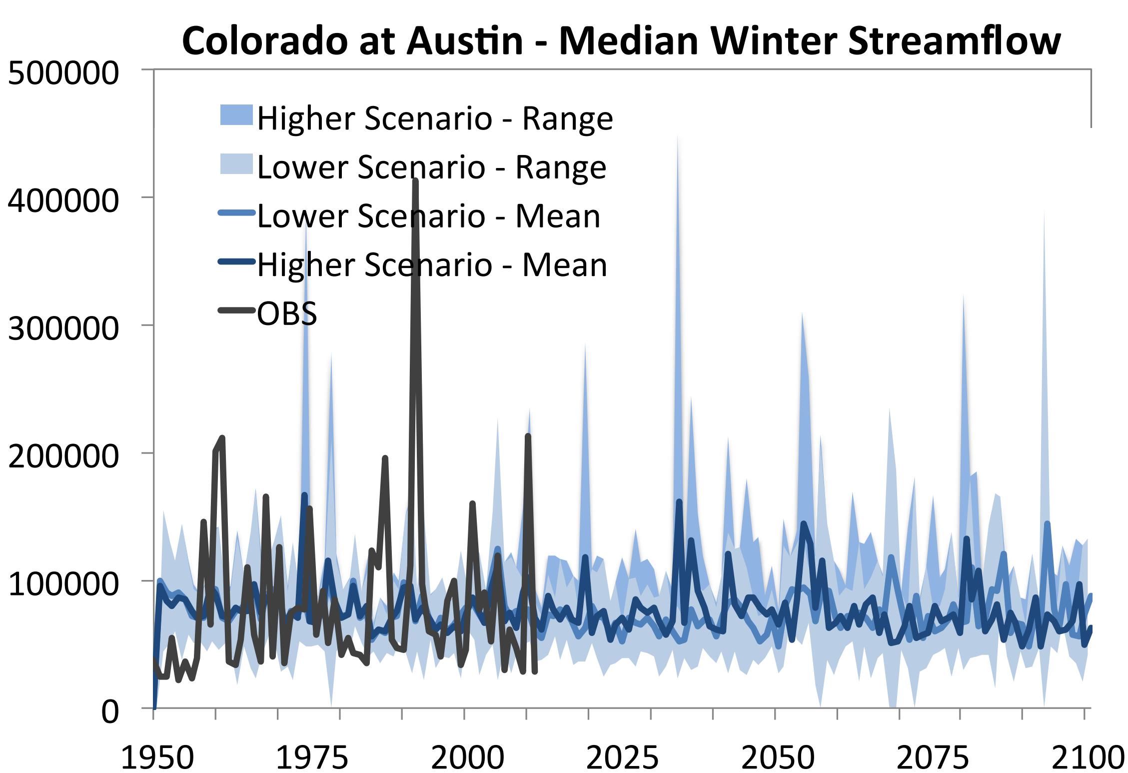
Streamflow projections for Austin

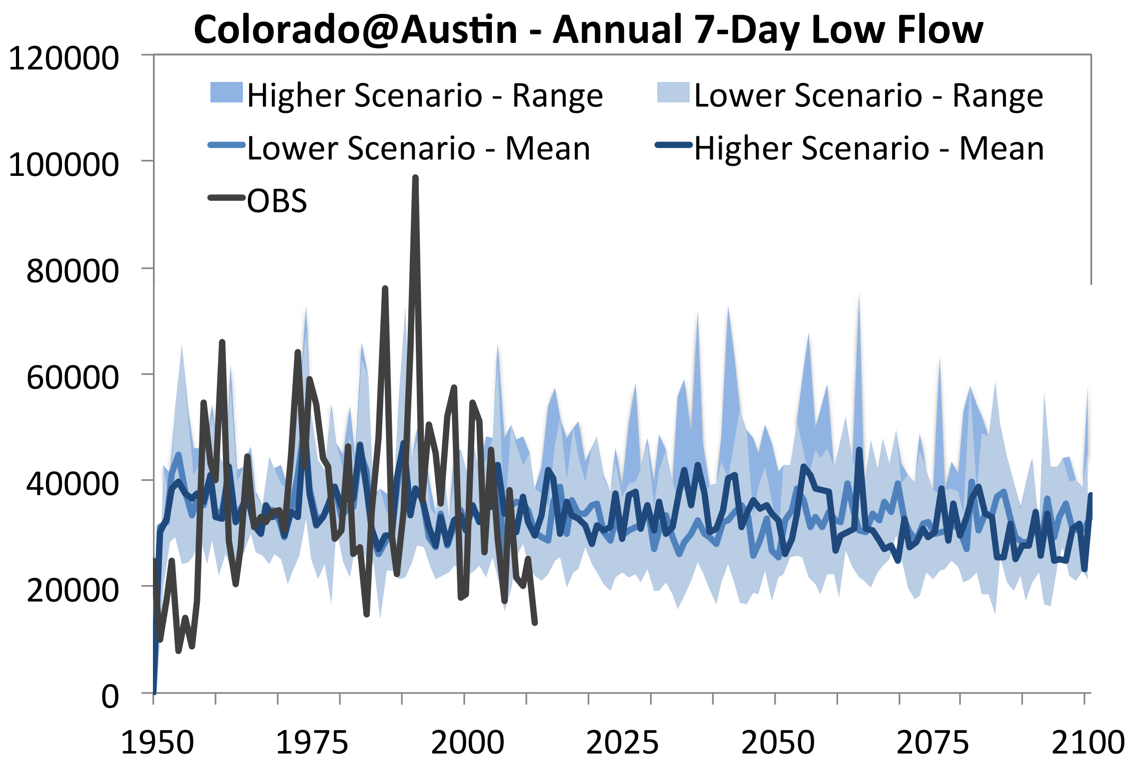
Using 6 sample gauges and 5 weather stations,

3. Can these indicators be used to develop future projections of climate change impacts on streamflow at each gauge?

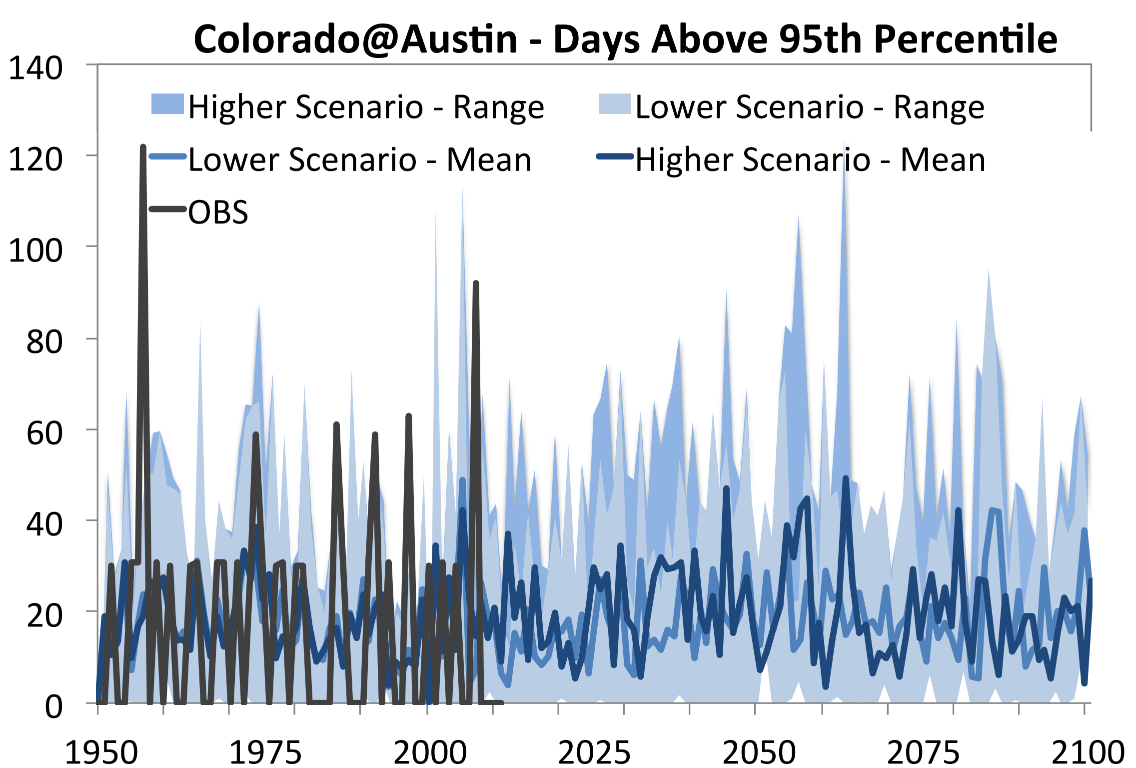
- Built a multivariate predictive streamflow model for each gauge
- Tested the models on a temporally independent dataset
- Developed climate projections for each weather station
- Combined streamflow model with climate projections to estimate projected changes in median streamflow and variability


Colorado at Austin - Median Annual Streamflow
400000
350000
300000
250000
200000
150000
100000
50000
0
1950
1975
2000
2025
2050
2075
2100
Higher Scenario - Range
Lower Scenario - Range
Lower Scenario - Mean
Higher Scenario - Mean
OBS


Colorado at Austin - Median Winter Streamflow
500000
400000
300000
200000
100000
0
1950
1975
2000
2025
2050
2075
2100
Higher Scenario - Range
Lower Scenario - Range
Lower Scenario - Mean
Higher Scenario - Mean
OBS



Colorado@Austin - Annual 7-Day Low Flow
Higher Scenario - Range
Lower Scenario - Range
Lower Scenario - Mean
Higher Scenario - Mean
OBS
120000
100000
80000
60000
40000
20000
0
1950
1975
2000
2025
2050
2075
2100



Colorado@Austin - Days Above 95th Percentile
Higher Scenario - Range
Lower Scenario - Range
Lower Scenario - Mean
Higher Scenario - Mean
OBS
140
120
100
80
60
40
20
0
1950
1975
2000
2025
2050
2075
2100

Regional Approach

- There are 43 Primary Control Points used in the Colorado River Basin Water Availability Model (WAM).
- Generating streamflow and evaporation projections at these locations can facilitate analyzing various climate scenarios in the WAM.
- Rather than relying on historic hydrology, a climate-adjusted hydrologic dataset may offer a way to incorporate climate change considerations into water planning efforts.

The Way Forward

Build our resilience to the risks **we know already exist**

Increase resilience to the risks **we know are getting stronger and/or more frequent**

Incorporate quantitative climate projections into preparing for risks **we know will intensify under greater change**

THANK YOU!

www.katharinehayhoe.com

Zero Net Water

A sustainable water development concept for Central Texas

City of Austin Integrated Water Planning Task Force

"Imagine a water management strategy that would accommodate growth and development without unsustainably pumping down aquifers or incurring the huge expense and societal disruption to build reservoirs or transport water from remote supplies to developing areas."

Welcome to the concept of

Zero Net Water.

The ***Zero Net Water*** Concept

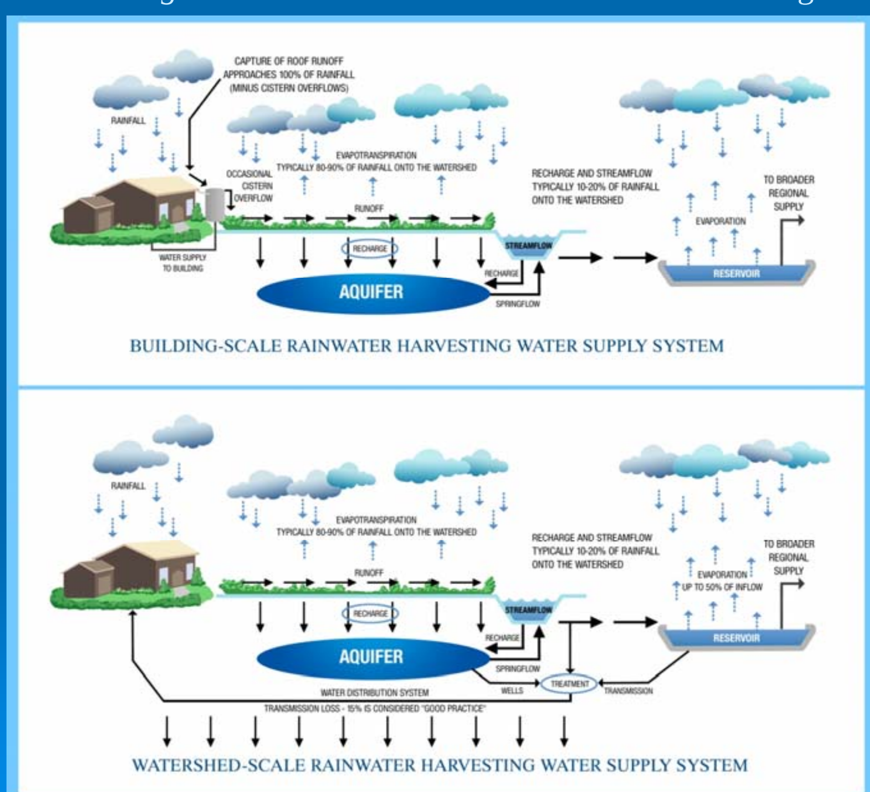
The Result:

Minimal disruption of flows through the watershed, even as water is *harvested at the site scale* to be used – and *reused* there – to support development, creating a

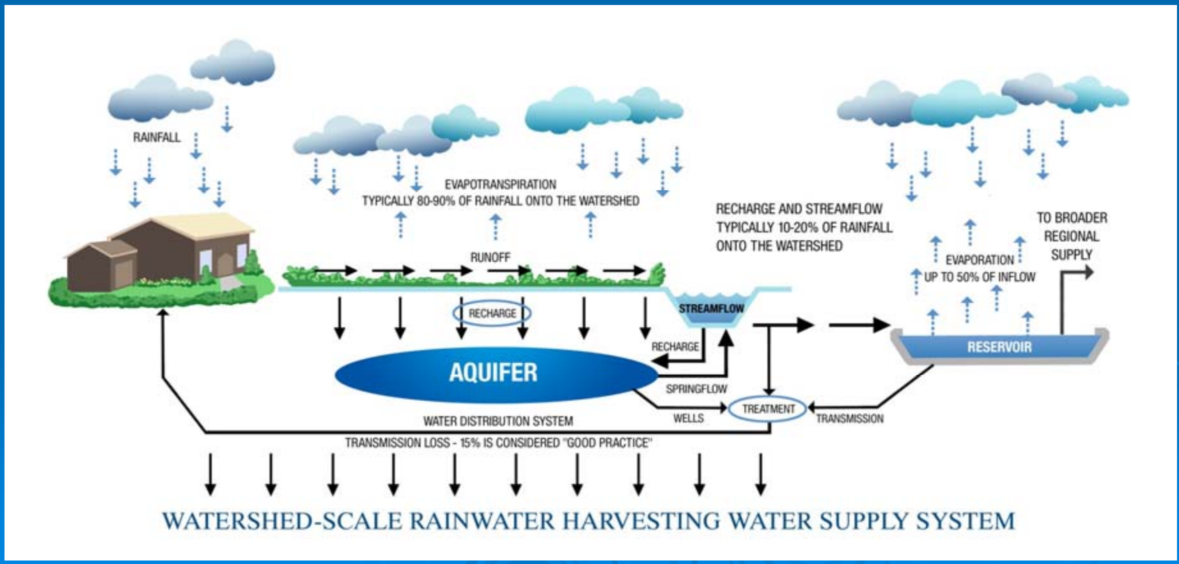
sustainable water

development model

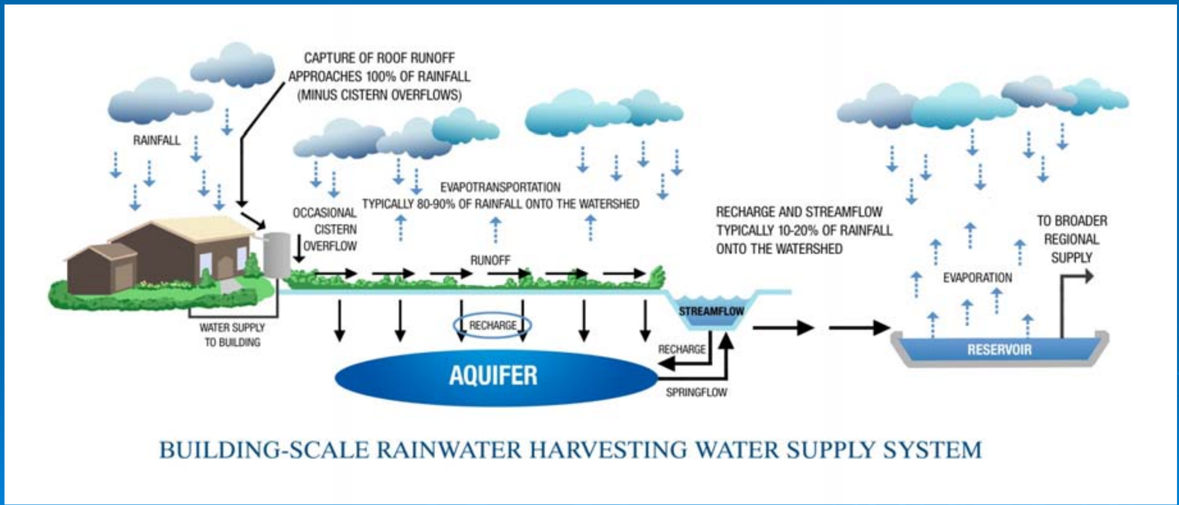
Take advantage of difference in the inherent water capture efficiency of *building-scale* vs. *watershed-scale* rainwater harvesting

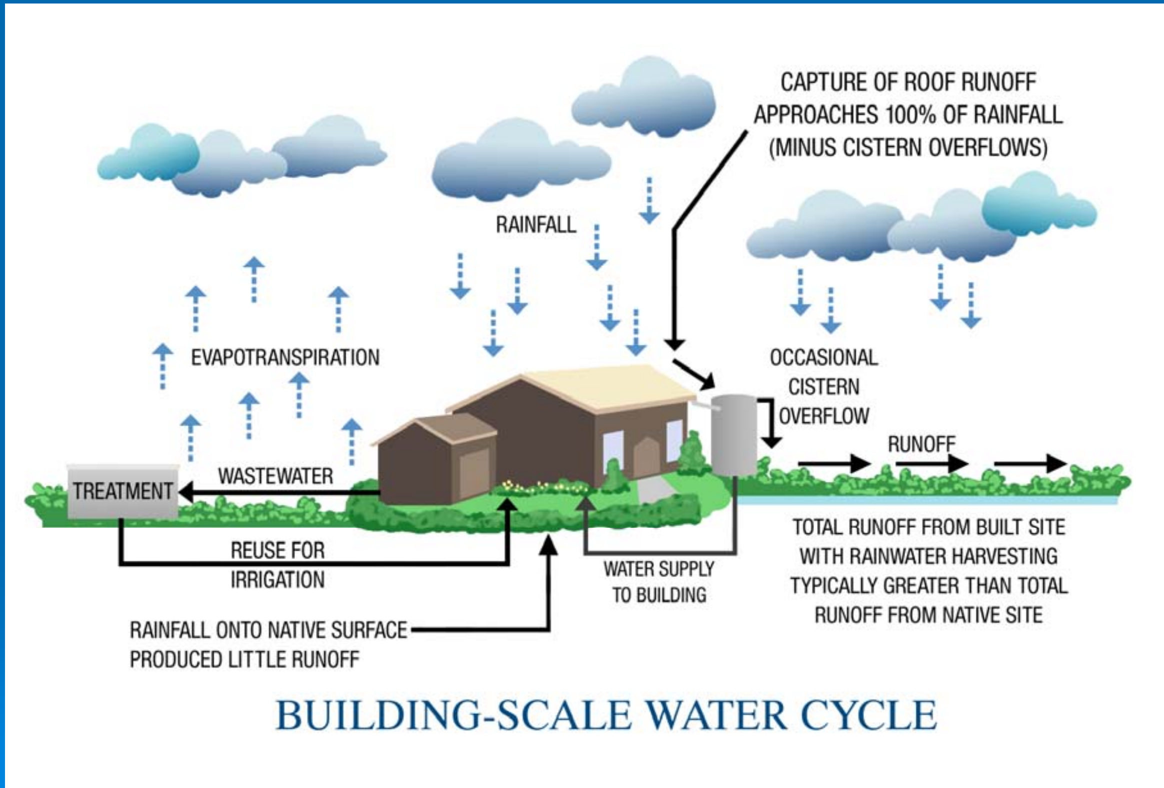


Inefficiencies are inherent in the Watershed-Scale Rainwater Harvesting water supply model



Building-Scale Rainwater Harvesting *blunts all those inefficiencies*





Which model is more sane?

Capture rainfall at extremely *high efficiency*, very *lightly impaired*, over the little parts of the watershed right *where the water is needed* – the buildings – and use it there?

OR

Capture rainfall at very *low efficiency*, with *degraded quality*, over the whole watershed, then *lose a great deal* of it in storage and in moving the same amount of water that fell on a building back to that building? And use a lot of energy doing that?

Building-scale RWH “grows” water supply in direct proportion to increasing demand

- More efficiently transforms rainfall into a water supply usable by humans
  - Creates a *sustainable* water supply system
- More *economically efficient* water supply
  - Supply is built, and paid for, only in response to imminent demand, *one building at a time*.

The caveat to “Zero” …

The building-scale cistern is a "*distributed reservoir*"

- Stores water for future use
- Has a "firm yield" that covers a given water demand profile
- "Right-size" the RWH system – roofprint and cistern capacity – so the "firm yield" covers demands in all but most severe drought periods
- Forego spending a lot to cover last little bit of demand, instead bring in backup supply to cover it

Backup supply would be drawn from the watershed-scale RWH system

- "Right-sizing" would minimize this draw
- Need for backup supply from watershed-scale system occurs just when that system is also most stressed by drought
- "Off-loading" demands on the watershed-scale system most of the time allows it to retain more supply to buffer drought stress
- Watershed-scale system recovers more quickly when rains do come

Austin

Monthly Rainwater Harvesting Model - 1987

Shaded boxes are user inputs

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David Venhuizen, P.E.

System Sizing Parameters			Interior Demand		
Collection area =	4,250	sq. ft.	Occupancy =	4	persons
Total storage =	32,500	gallons	Usage rate =	45	gpcd
Cistern alarm criterion:	-	days	*(Input ZERO to disable alarm function)*		
Cistern alarm level:	-	gallons	*(Cistern volume at which enhanced conservation is practiced -- input zero to disable this function)*		
Enhanced conservation curtailment rate:	1	*(Input 1.0 to curtail irrigation only)*	Wastewater irrigation?	0	*(1=yes, 0=no)*
(Reduces interior demand to this rate times usage rate)			Irrigated area =	0	sq. ft.
			(Input zero to disable irrigation modeling)		

Daily Demand in Each Month			No. of Days	Irrigation Rate		Irrigation Demand	
January	180	gpd	31	0.02	in/week	0	gpd
February	180	gpd	28	0.02	in/week	0	gpd
March	180	gpd	31	0.12	in/week	0	gpd
April	180	gpd	30	0.18	in/week	0	gpd
May	180	gpd	31	0.25	in/week	0	gpd
June	180	gpd	30	0.35	in/week	0	gpd
July	180	gpd	31	0.40	in/week	0	gpd
August	180	gpd	31	0.40	in/week	0	gpd
September	180	gpd	30	0.35	in/week	0	gpd
October	180	gpd	31	0.18	in/week	0	gpd
November	180	gpd	30	0.05	in/week	0	gpd
December	180	gpd	31	0.02	in/week	0	gpd

Month	Austin rainfall (inches)	Gallons collected per s.f.	Total supply (gal.)	Total demand (gal.)	Net change in storage (gal.)	Total gal. in storage	Overflow (gal.)	Total Overflow (gal.)	Make-up water (gal.)	Total Make-up (gal.)
			Initial storage assumed =			16250				
January	1.09	0.654	2737	5,580	-2843	13407	0	0	0	0
February	2.84	1.704	7200	5,040	2160	15567	0	0	0	0
March	1.09	0.654	2737	5,580	-2843	12724	0	0	0	0
April	0.45	0.270	1105	5,400	-4295	8429	0	0	0	0
May	6.74	4.044	17145	5,580	11565	19993	0	0	0	0
June	10.85	6.510	27625	5,400	22225	32500	9718	9718	0	0
July	3.46	2.076	8781	5,580	3201	32500	3201	12919	0	0
August	0.24	0.144	570	5,580	-5011	27490	0	12919	0	0
September	4.65	2.790	11815	5,400	6415	32500	1405	14323	0	0
October	0.31	0.186	748	5,580	-4832	27668	0	14323	0	0
November	2.76	1.656	6996	5,400	1596	29264	0	14323	0	0
December	1.22	0.732	3069	5,580	-2512	26752	0	14323	0	0
TOTALS	35.70	21.420	90,525							

Austin, 1987-2014
"Right-sized" - Interior Usage Only

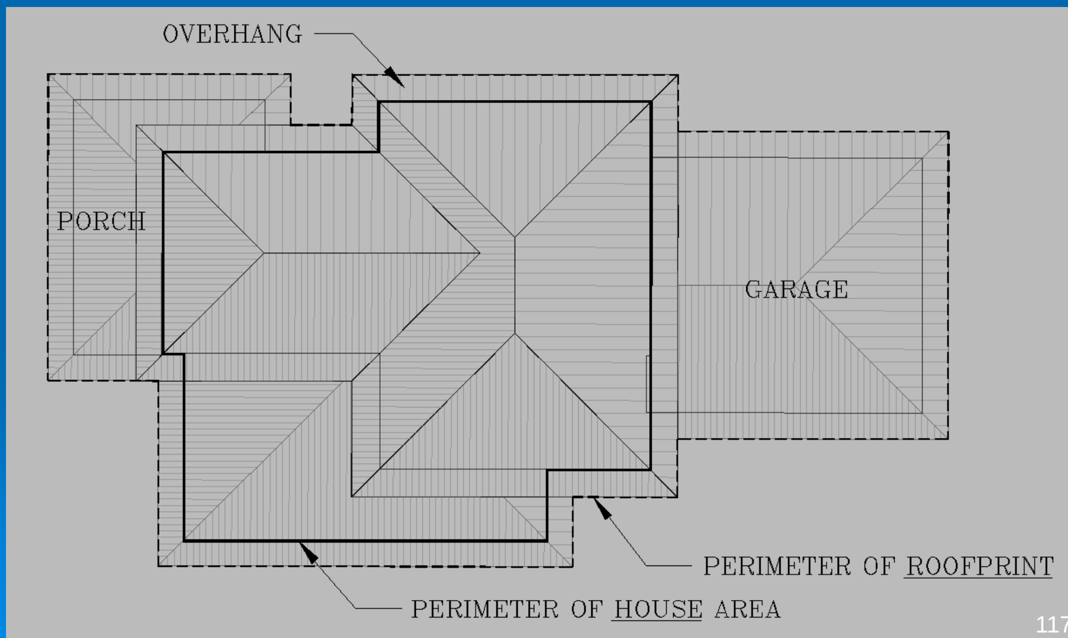
Roofprint	4,250 sq. ft.
Cistern capacity	32,500 gallons
Occupancy	4 persons
Water usage rate	45 gpcd

<u>Backup supply requirements</u>

2008	2,000 gallons
2009	4,000 gallons
2011	18,000 gallons

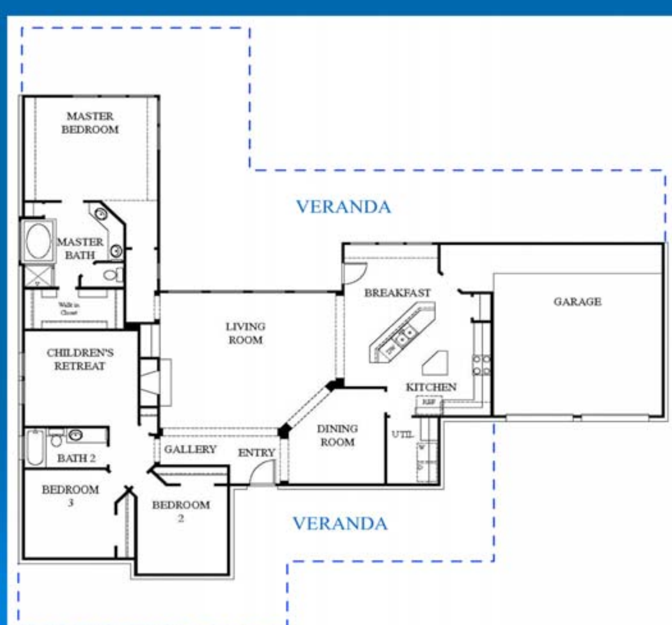
Portion of demand supplied by rainwater in drought period 2008-2014 = 94.8%

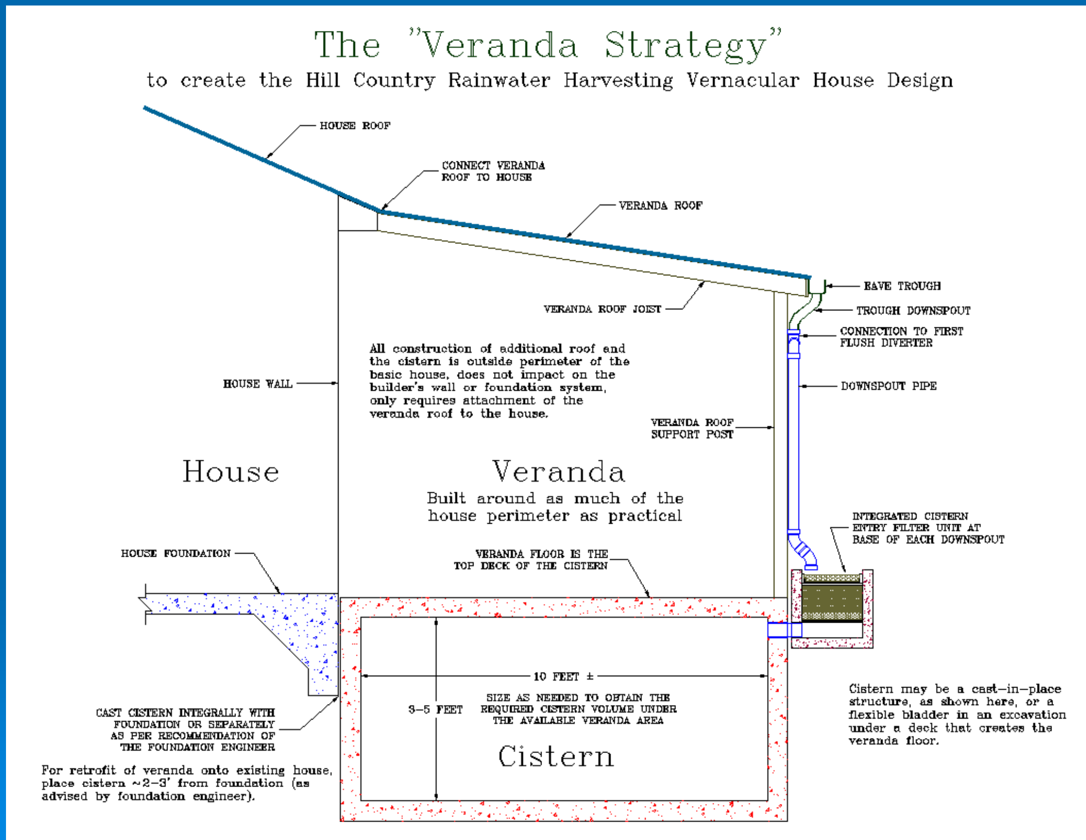
Roofprint is the plan area of the ROOF, all the roof, NOT the house living area



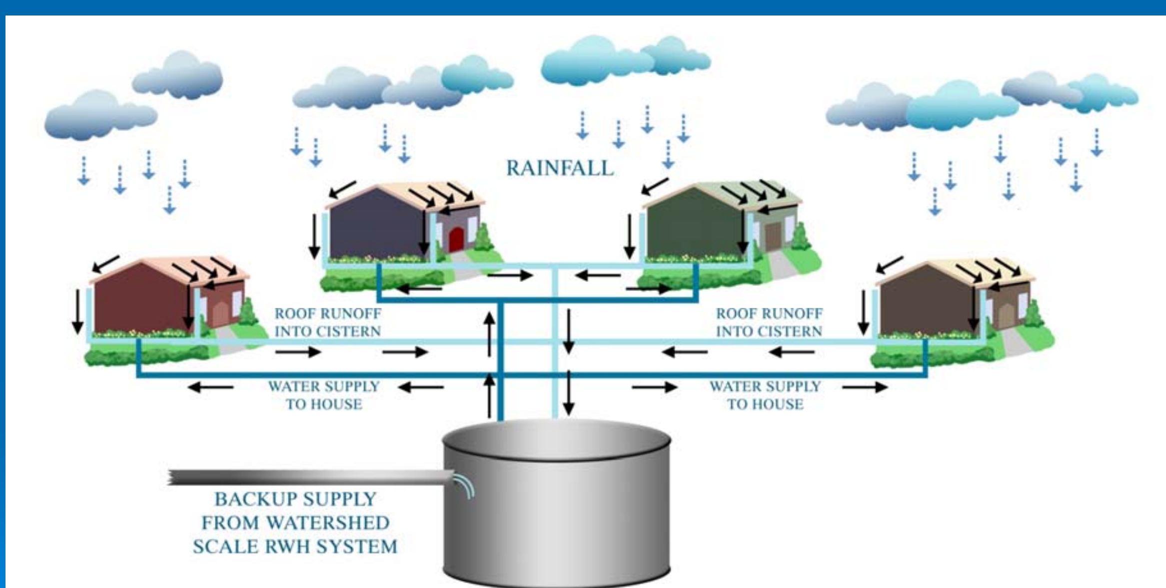
The "Veranda Strategy"

Relatively cost-efficient additional roofprint





Collective Conjunctive-Use System

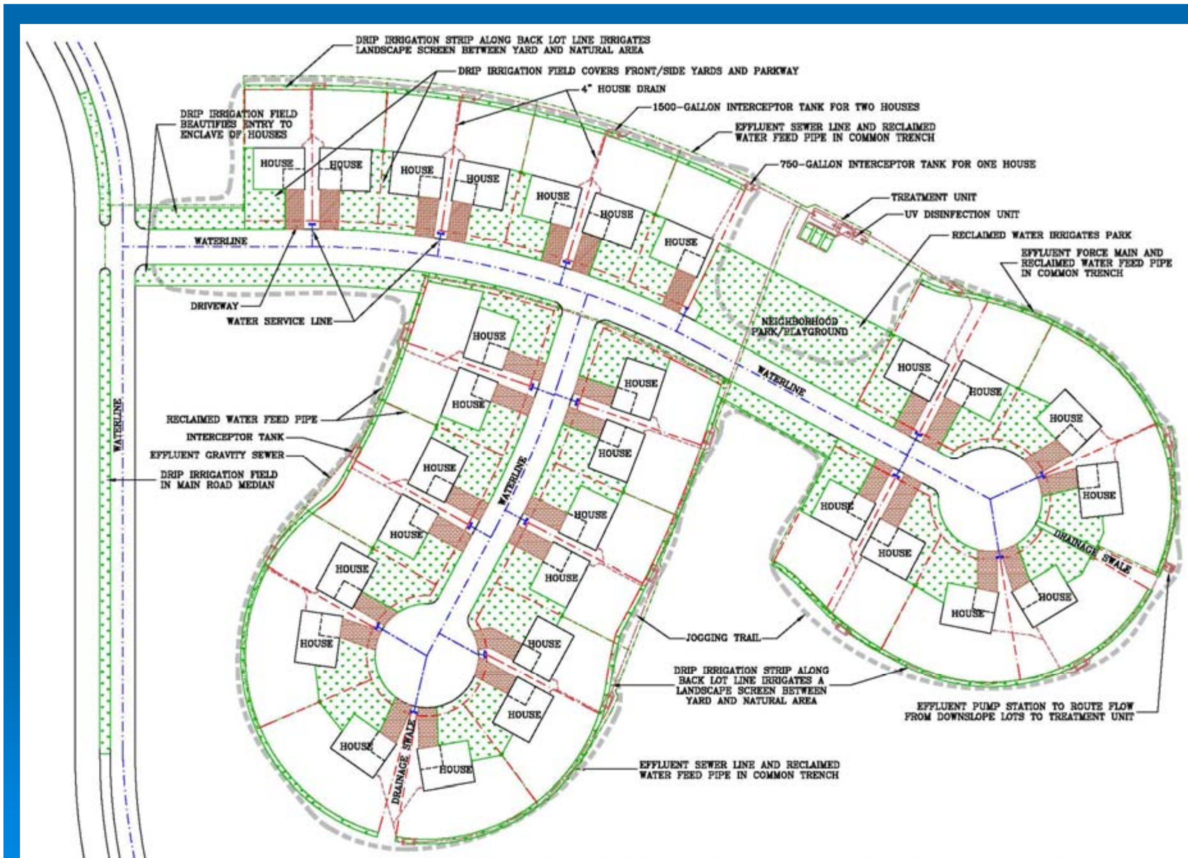


Under ***Zero Net Water***
Irrigation needs would be met mainly by "waste" water reuse

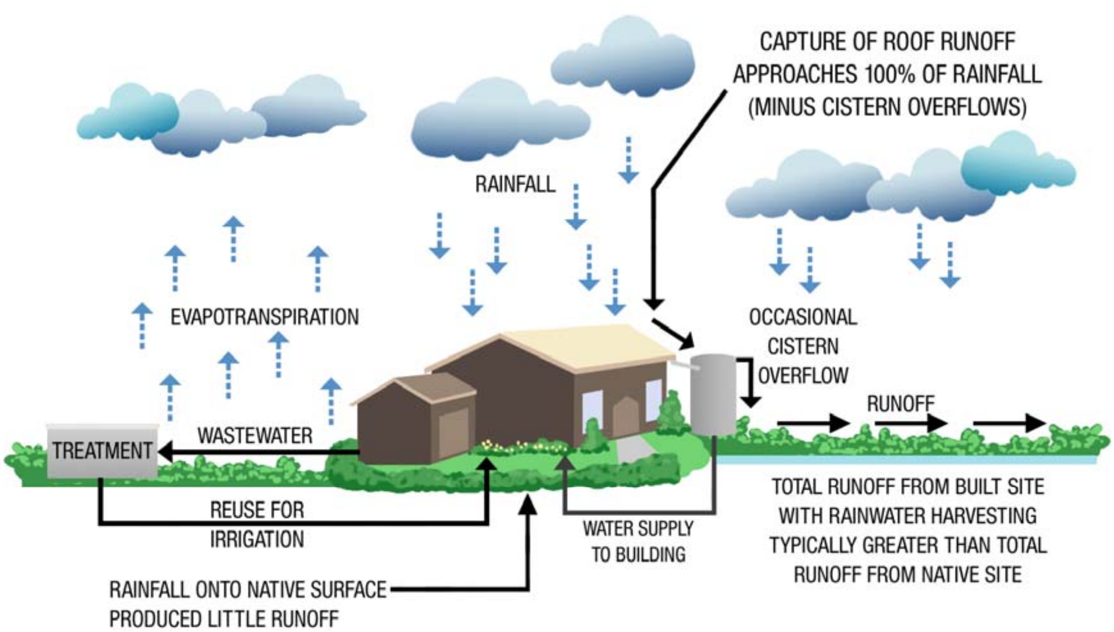
"Waste" water reuse has high value for rainwater harvesters

- "Right-sized" RWH system for interior use only is already "large"
- To provide irrigation supply directly out of the cistern would require a larger system – or *much* more backup
- A flow of water is sitting *right there* we can use for irrigation, that we've *already paid* a hefty price to gather – the "waste" water flowing from water used in the house

Don't lose it – reuse it!



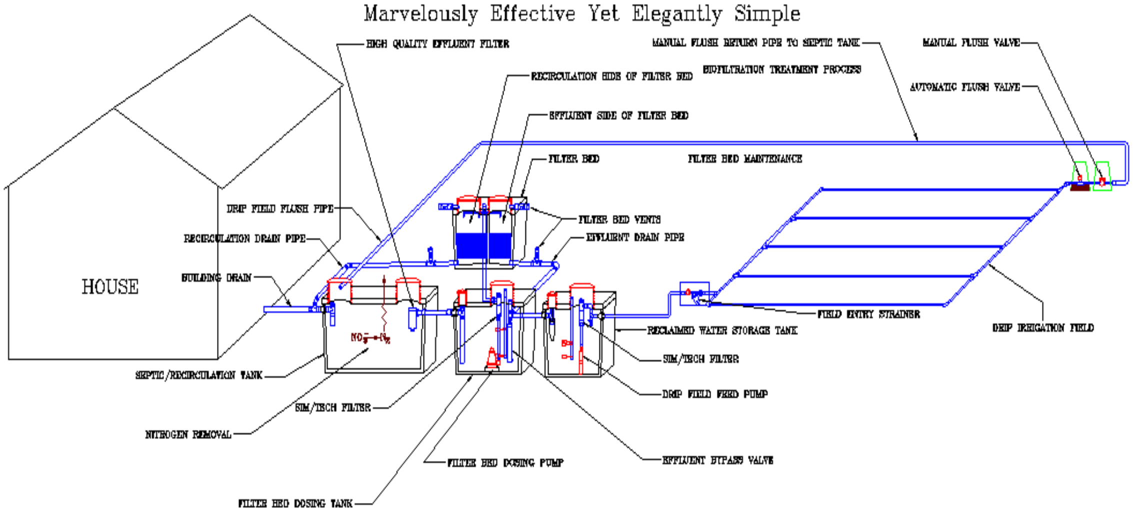
DECENTRALIZED CONCEPT WASTEWATER SERVICE PLAN



BUILDING-SCALE WATER CYCLE

The High Performance Biofiltration/Drip Irrigation System Concept

Marvelously Effective Yet Elegantly Simple



Dripping Springs, 1987-2014
"Right-sized" - Interior Usage Only

Roofprint	4,250 sq. ft.
Cistern capacity	32,500 gallons
Occupancy	4 persons
Water usage rate	45 gpcd

<u>Backup supply requirements</u>

2008	2,000 gallons
2009	10,000 gallons
2011	14,000 gallons

Portion of demand supplied by rainwater in drought period 2008-2014 = 94.3%

Dripping Springs, 1987-2014
Interior + Irrigation Usage
WITHOUT wastewater reuse

Roofprint	4,250 sq. ft.
Cistern capacity	32,500 gallons
Occupancy	4 persons
Water usage rate	45 gpcd
Irrigated area	2,400 sq. ft.

Backup water supply required in 15 years

Max. yr. = 54,000 gallons in 2011

2nd most = 38,000 gallons in 1996

3rd most = 34,000 gallons in 2008

Total over 28 years = 272,000 gallons

Dripping Springs, 1987-2014
Interior + Irrigation Usage
WITHOUT wastewater reuse, larger system

Roofprint	6,750 sq. ft.
Cistern capacity	42,500 gallons
Occupancy	4 persons
Water usage rate	45 gpcd
Irrigated area	2,400 sq. ft.

Backup supply requirements

2009	8,000 gallons
2011	28,000 gallons
Total =	36,000 gallons

Dripping Springs, 1987-2014
Interior + Irrigation Usage
WITH wastewater reuse

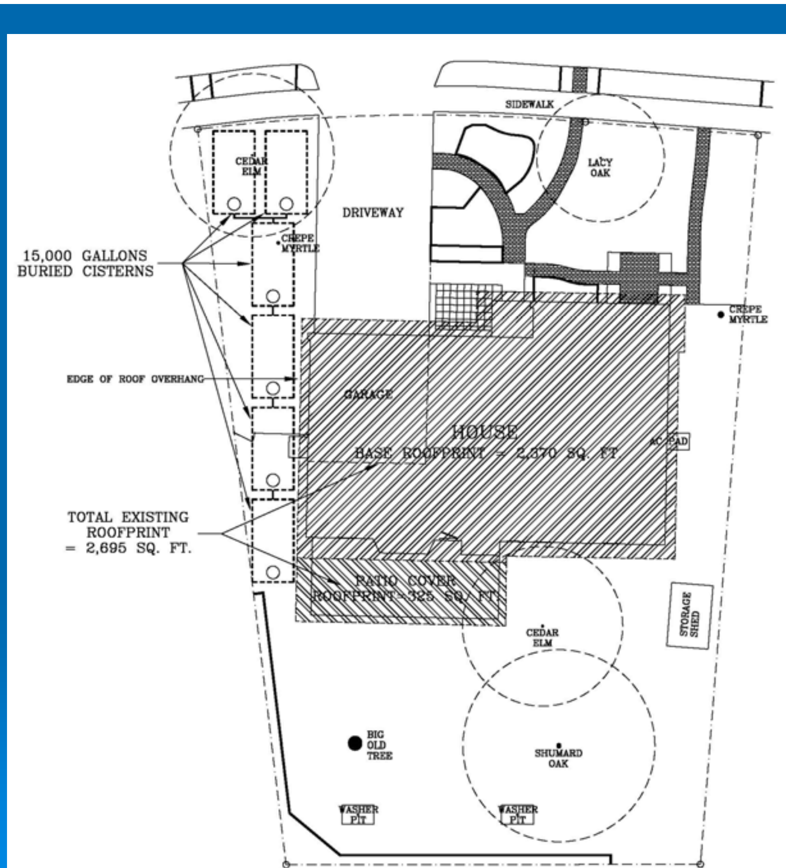
Roofprint	4,250 sq. ft.
Cistern capacity	32,500 gallons
Occupancy	4 persons
Water usage rate	45 gpcd
Irrigated area	2,400 sq. ft.

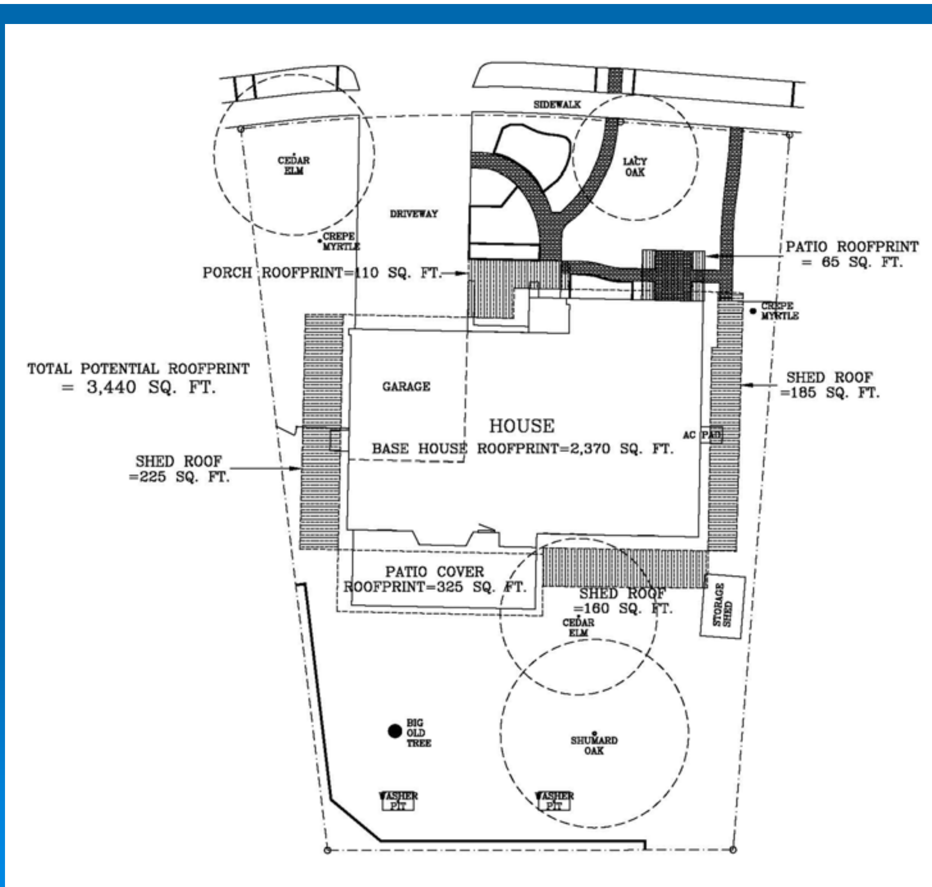
Backup supply requirements

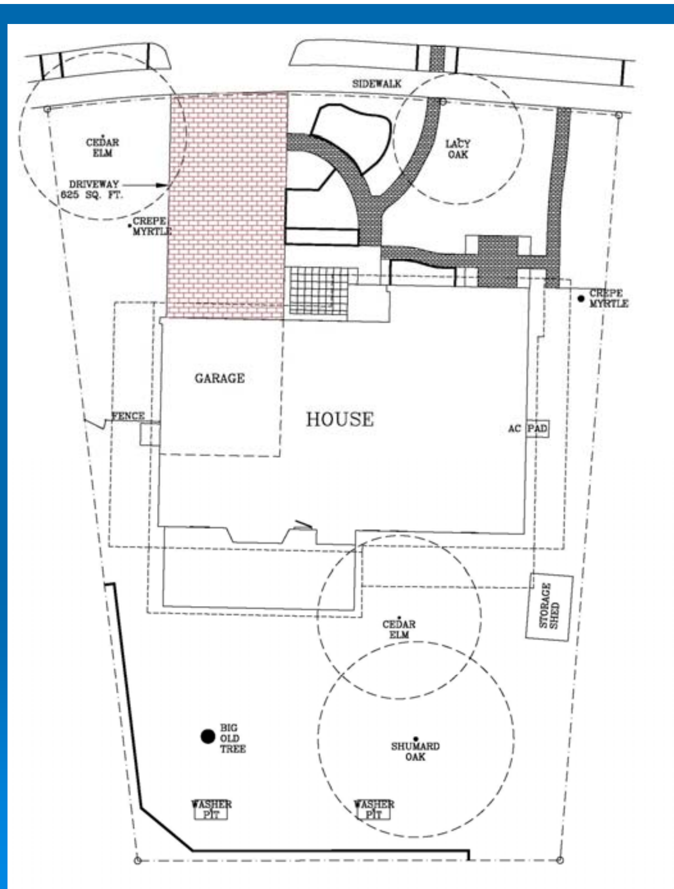
1996	2,000 gallons
2008	2,000 gallons
2009	14,000 gallons
2011	20,000 gallons

Total = 38,000 gallons

vs. 272,000 gallons without reuse


SIDEWALK
LACY OAK
CEDAR ELM
DRIVEWAY
CREPE MYRTLE
15,000 GALLONS BURIED CISTERNS
EDGE OF ROOF OVERHANG
GARAGE
HOUSE
BASE ROOFPRINT = 2,370 SQ. FT.
AC PAD
TOTAL EXISTING ROOFPRINT = 2,695 SQ. FT.
PATIO COVER ROOFPRINT=325 SQ. FT.
STORAGE SHED
CEDAR ELM
BIG OLD TREE
SHUMARD OAK
WASHER PIT
WASHER PIT


SIDEWALK
CEDAR ELM
LACY OAK
DRIVEWAY
CREPE MYRTLE
PATIO ROOFPRINT = 65 SQ. FT.
PORCH ROOFPRINT=110 SQ. FT.
CREPE MYRTLE
TOTAL POTENTIAL ROOFPRINT = 3,440 SQ. FT.
GARAGE
SHED ROOF =185 SQ. FT.
HOUSE
AC PAD
BASE HOUSE ROOFPRINT=2,370 SQ. FT.
SHED ROOF =225 SQ. FT.
PATIO COVER ROOFPRINT=325 SQ. FT.
SHED ROOF =160 SQ. FT.
CEDAR ELM
STORAGE SHED
BIG OLD TREE
SHUMARD OAK
WASHER PIT
WASHER PIT



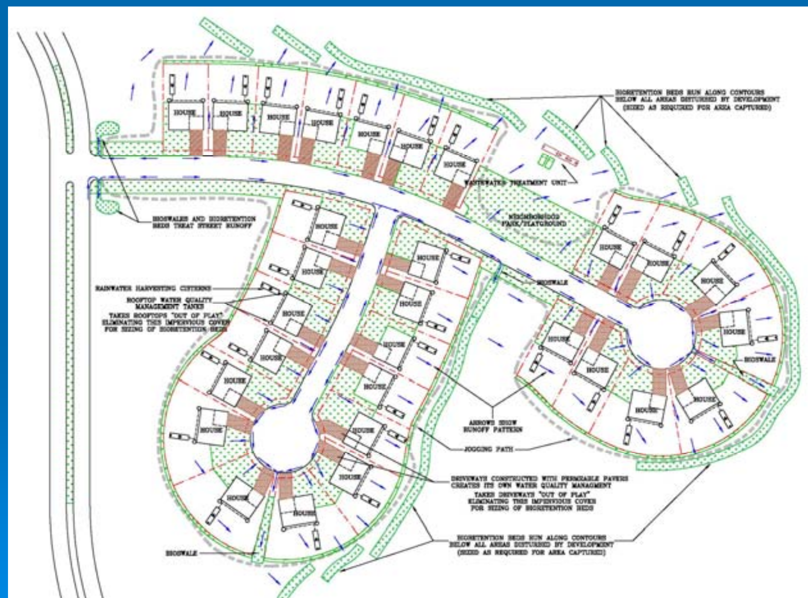
Minimum Net Water

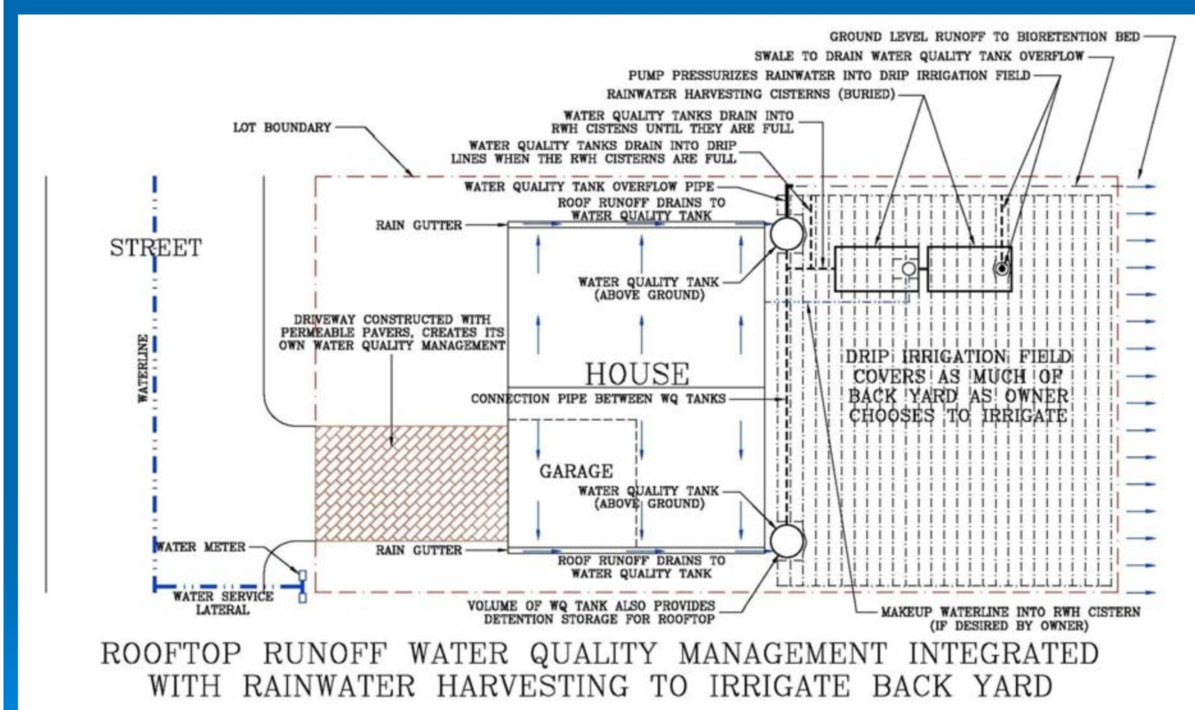
Take irrigation off the potable system

- If water supply will be drawn from the watershed-scale system, can still move irrigation supply to other sources.
- Around here, this will typically reduce annual demand ~40%.
- Will reduce peak demand much more.
- Peak demands drive much of the investment in water systems, so cutting the peak can offer big savings.

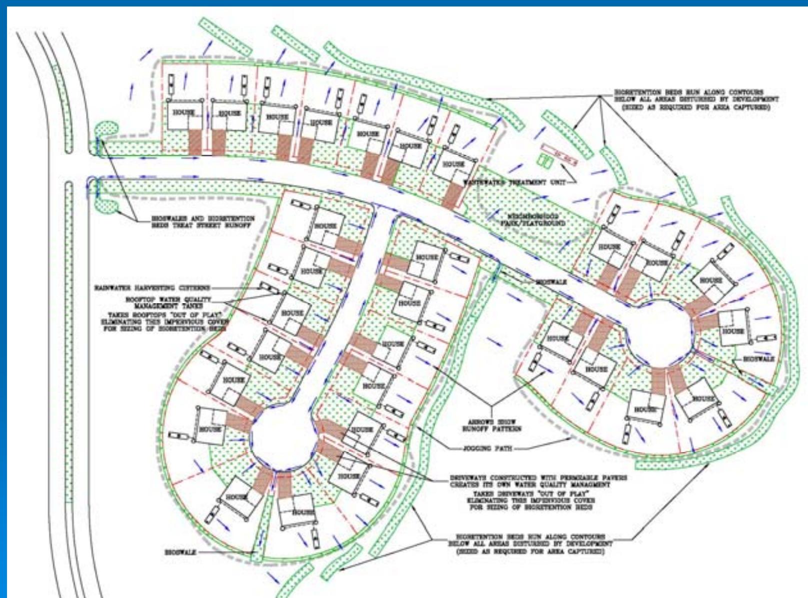
Minimum Net Water

Reclaimed water on “public” areas
Harvested rainwater on “private” areas



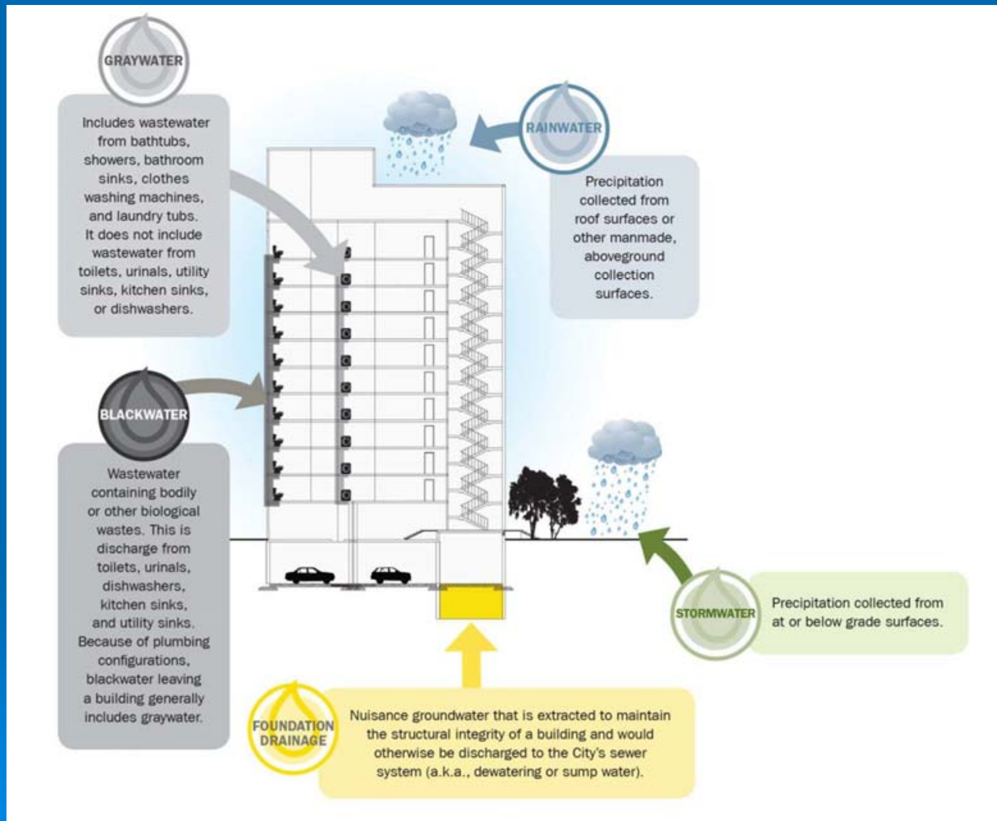


Taking rooftops "out of play" allows downsizing of the rest of the stormwater quality system



Commercial and Institutional Buildings
A MAJOR Opportunity

- Ratio of roofprint to water use profile typically favorable for RWH
- Condensate capture a significant source of water
- Project-scale "waste" water reclamation and reuse to provide irrigation water supply
- LID/green infrastructure stormwater system creates landscape elements that don't need routine irrigation



Water-Independent
Commercial and Institutional Buildings

- Commercial and institutional buildings, or *whole campuses of these buildings*, could readily be water-independent – "off grid", not drawing on the conventional water system at all
- Major savings on conventional water AND wastewater infrastructure

Cost … and VALUE

- By conventional accounting, water from building-scale RWH is very expensive
- On a VALUE basis:
  - Minimizes depletion of local groundwater
  - Blunts "need" to raid remote aquifers or take land to build reservoirs
  - Sustainable over the long term
  - Economically efficient – costs track demand
  - Minimizes public risk

Zero Net Water

City of Austin Integrated Water Planning Task Force

Visit my website and read my blog at

www.waterblogue.com

for more information

Next Meeting

- Consultant Services Procurement: Request for Qualifications (RFQ) Process update
- Public Outreach update
- Other items to be determined
- Continuation of information and discussion items from Meeting #9 as needed