

# Upper Llano River Watershed Protection Plan

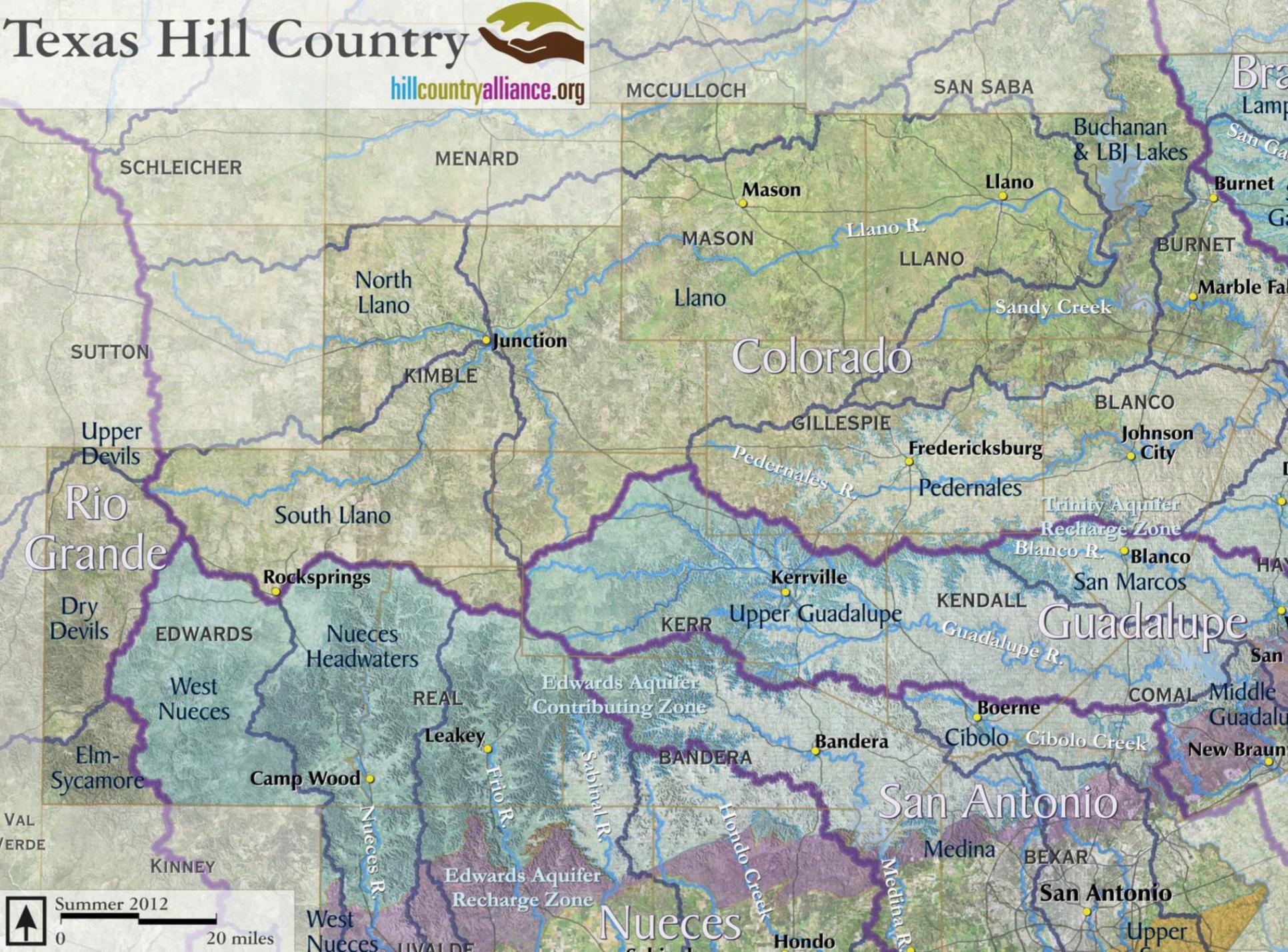
Tyson Broad  
Watershed Coordinator  
Llano River Field Station



# Texas Hill Country



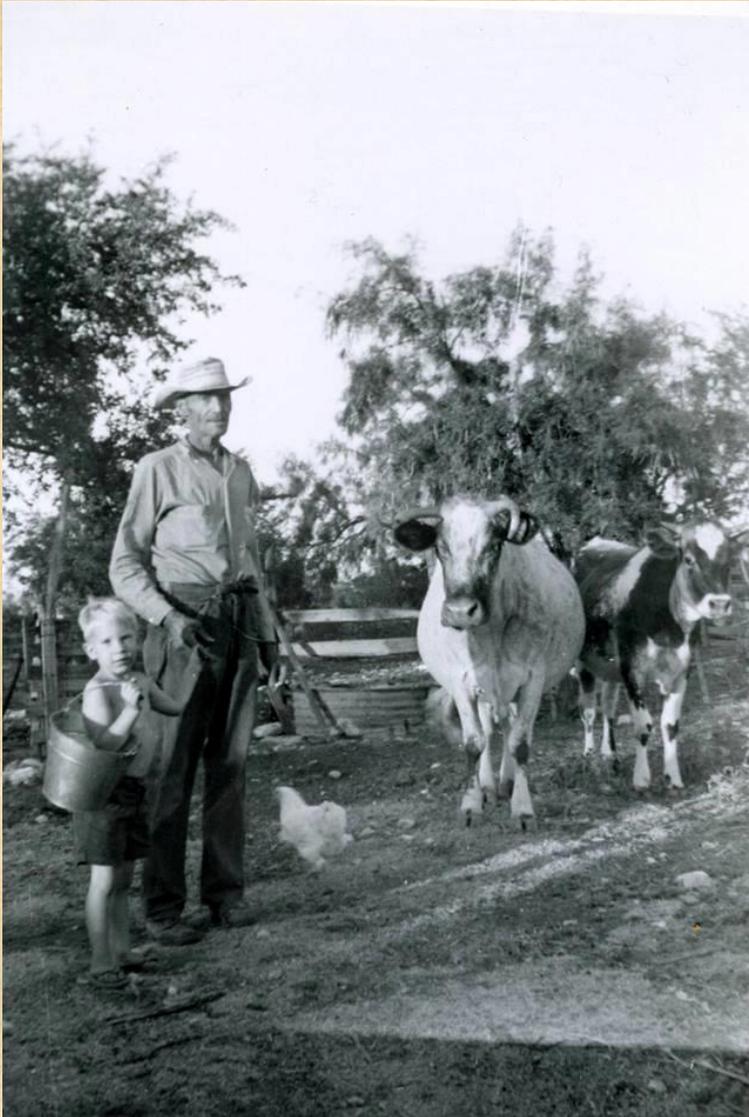
[hillcountryalliance.org](http://hillcountryalliance.org)



Summer 2012

0 20 miles

# Edwards Plateau – Traditional Agriculture



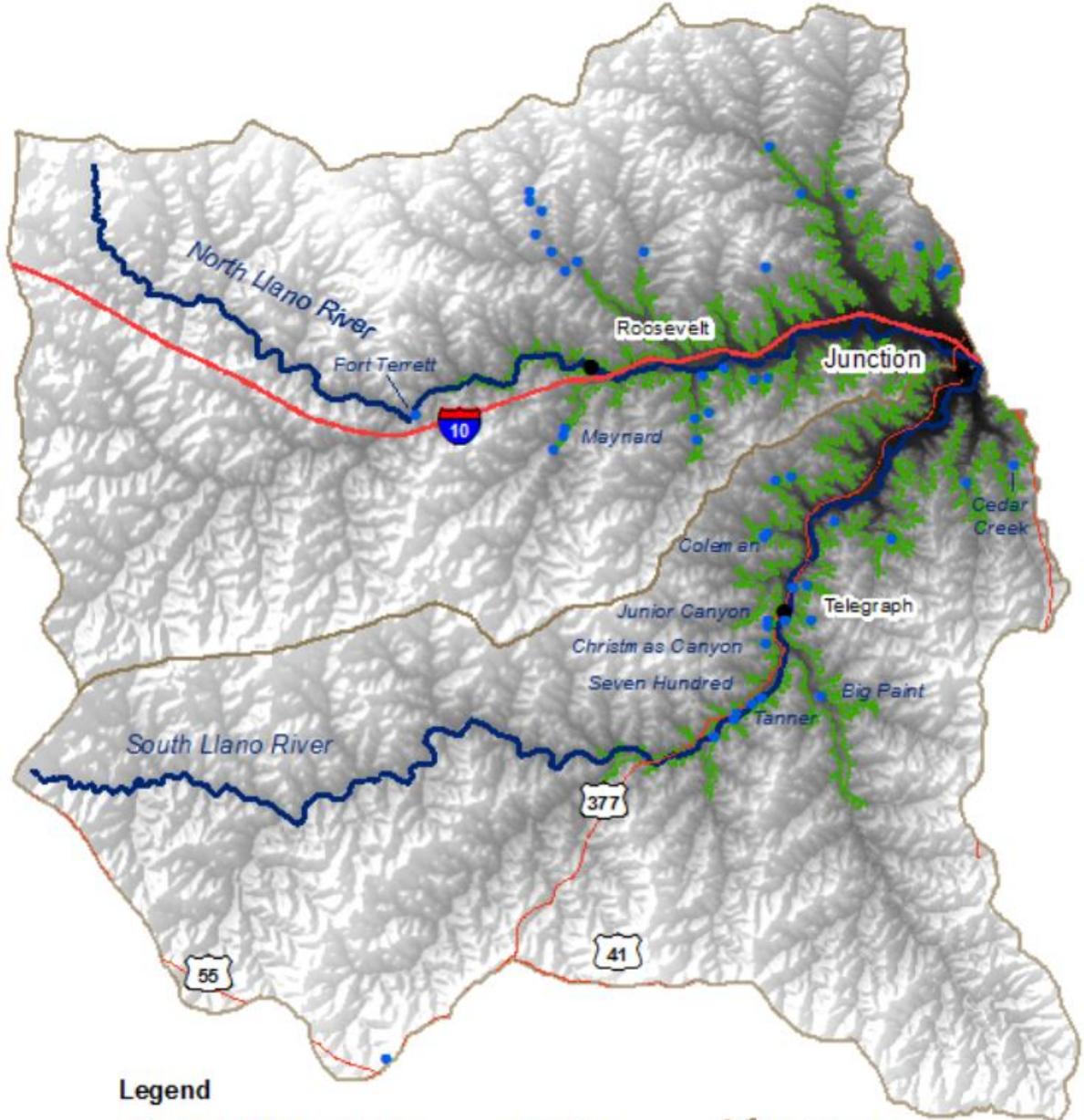
# Edwards Plateau Hunting Leases



# Edwards Plateau-Sparsely Populated



# Upper Llano River Watershed



### Legend

- |                    |              |                 |                |
|--------------------|--------------|-----------------|----------------|
| ● Populated Places | <b>Roads</b> | Rivers          | Basin Boundary |
| ● Springs/Seeps    | <b>Type</b>  | 2000 ft contour |                |
|                    | State Hwy    |                 |                |
|                    | Interstate   |                 |                |
|                    | US Hwy       |                 |                |



**Llano River @ Junction  
began recording October 1,  
1915.**

**Highest recorded flow  
319,00 cfs in 1935**

**Lowest recorded flow is 3.7  
cfs in 1956**

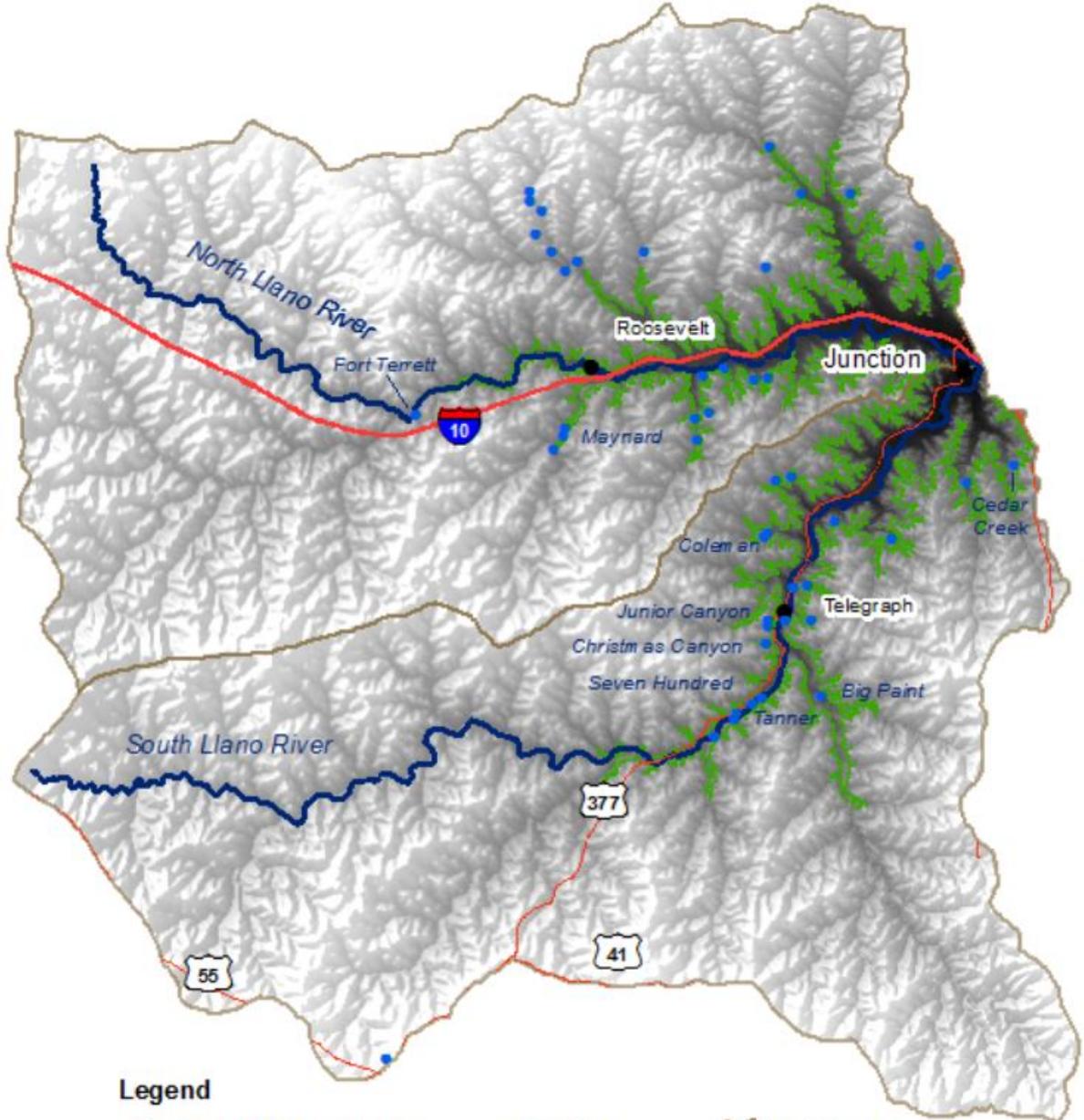
**It's never ceased flowing in  
recorded history**



# Seven Hundred Springs



# Upper Llano River Watershed

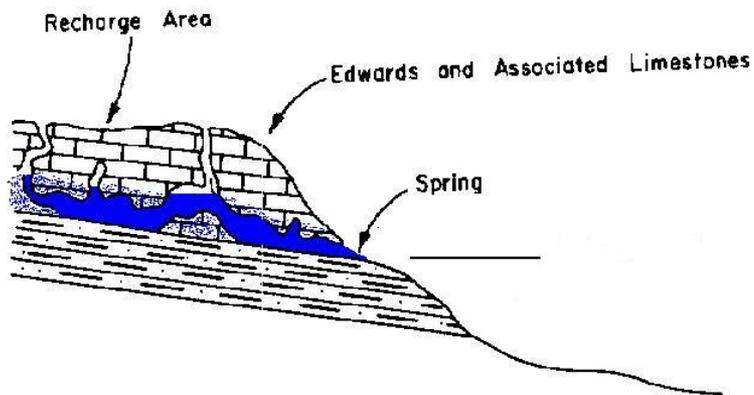


### Legend

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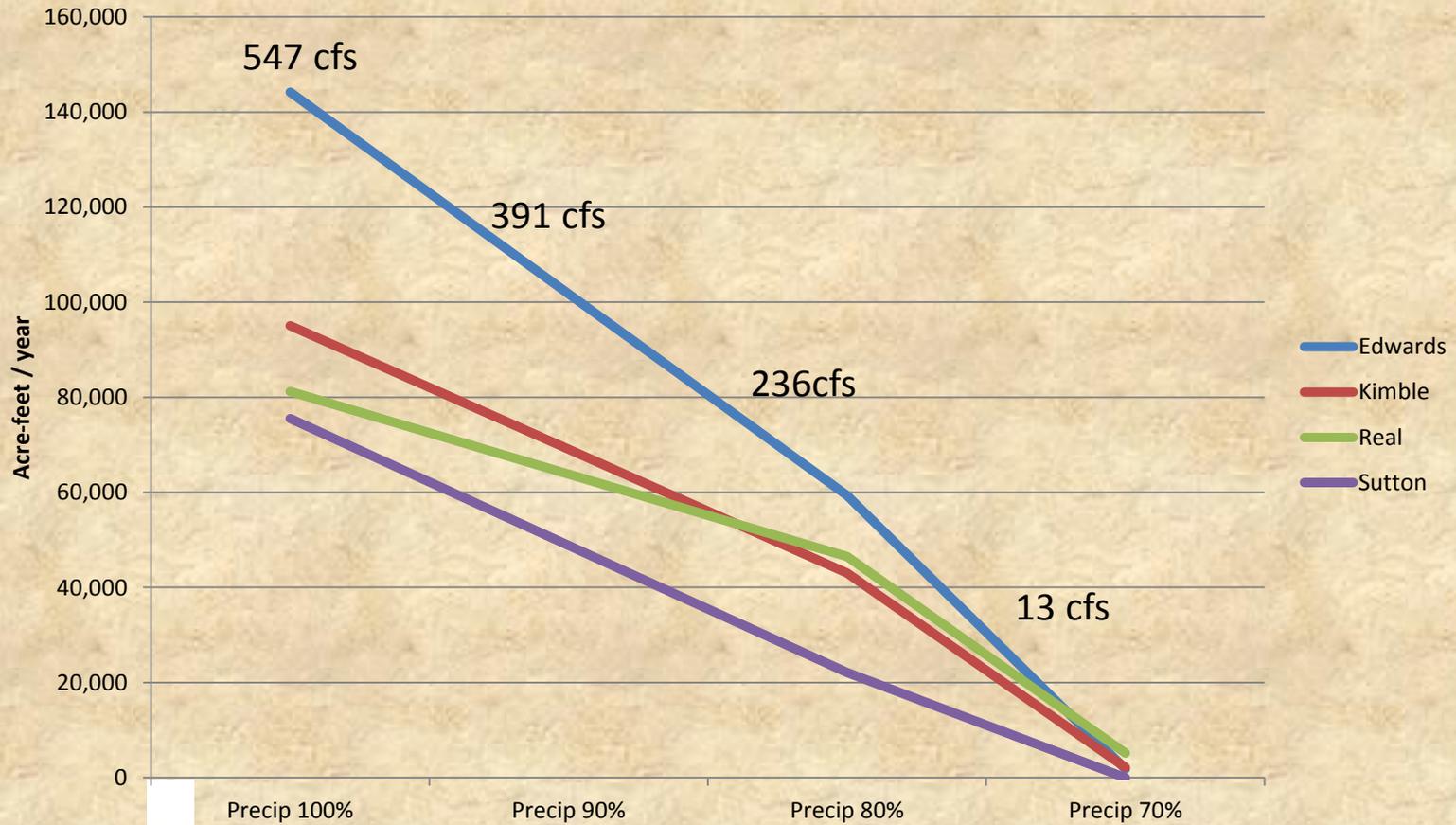
# Source of Springs



b. Edwards—Trinity (Plateau)

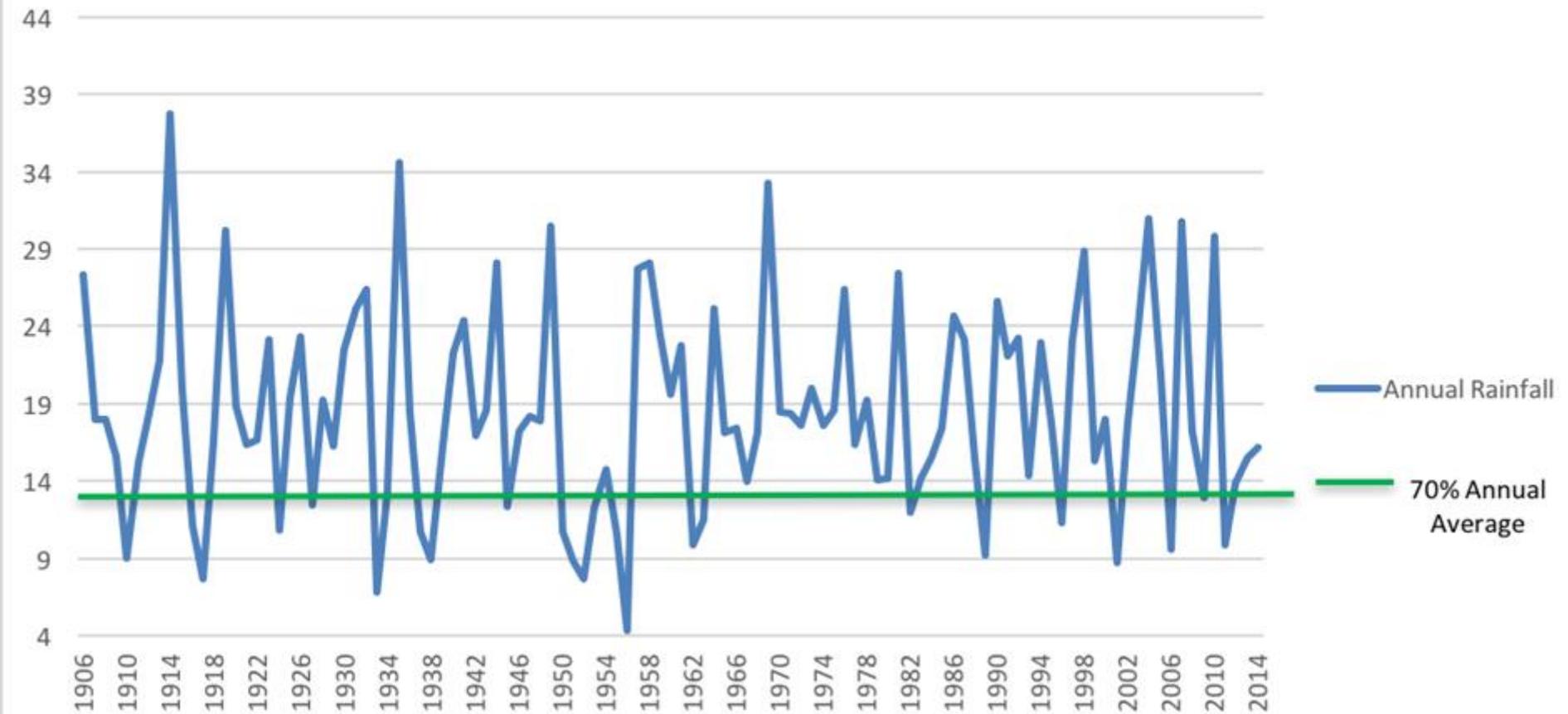


## Annual Recharge v Annual Precipitation (ac-ft)



From Ron Green et al 2010

## Annual Average Rainfall Del Rio, Texas 1906-2015



- 24 out 110 years (22%)
- 6 or 7 years during 50s
- 6 times since 1982
- Zero times 1963-1982

Gonna need a Bigger Sponge!



**Land Stewardship efforts *increase* the *absorption capacity* of the Watershed**

# Upper Llano River Watershed Protection Plan



# Traditional Watershed Protection Plan



# Healthy Watershed Initiative





Locally Driven by Stakeholders

# Stakeholders

- Municipalities
- County Governments
- SWCDs
- GCDs
- NGOs
- State and Federal Agencies
- Local landowners

# Upper Llano River Watershed Protection Plan

*Proactive Local Stakeholder Process  
Address Water Quality and Water Quantity*

<b>Livestock &amp; Wildlife</b>	<b>Land Management</b>	<b>Water Quality &amp; Water Conservation</b>
Grazing Management	Brush Control and Water Supply Enhancement	Septic Systems
Deer and Exotics	Prescribed Burning	Water Conservation
Feral Hogs	Stream Bank & Riparian Buffer Improvement	Urban Stormwater Management

# Bacterial Pollution Feral Hogs



# Feral Hog Taskforce

Share  
information  
and  
resources



# Land Management

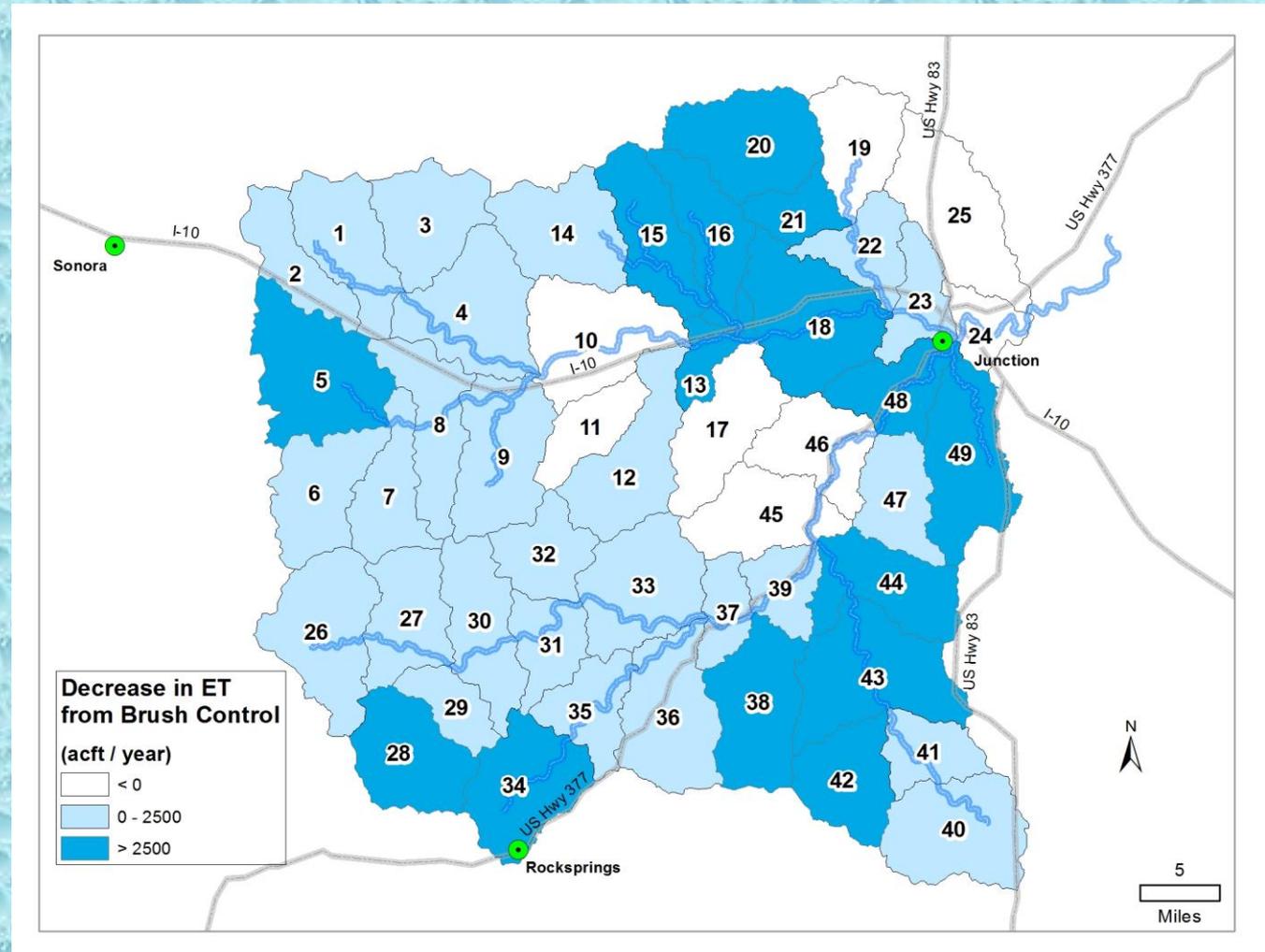
## Upland Land Management

*Over 500,000  
ac. in  
watershed is in  
medium to  
high density  
brush*



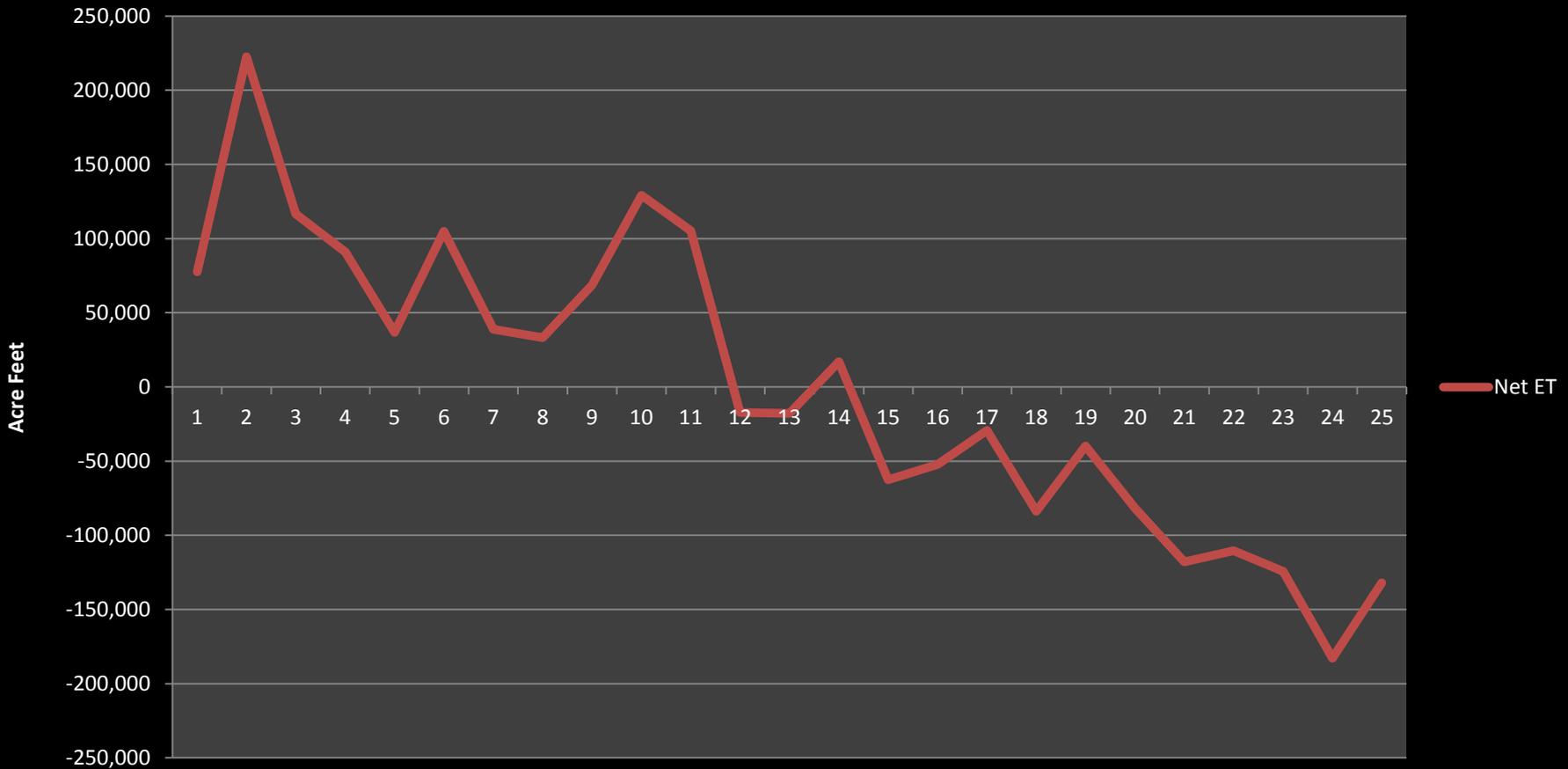
# Brush Control to Enhance Water Supply

Model Output identifies areas with greatest potential for water yield from brush control



# Model Output-Brush Removal

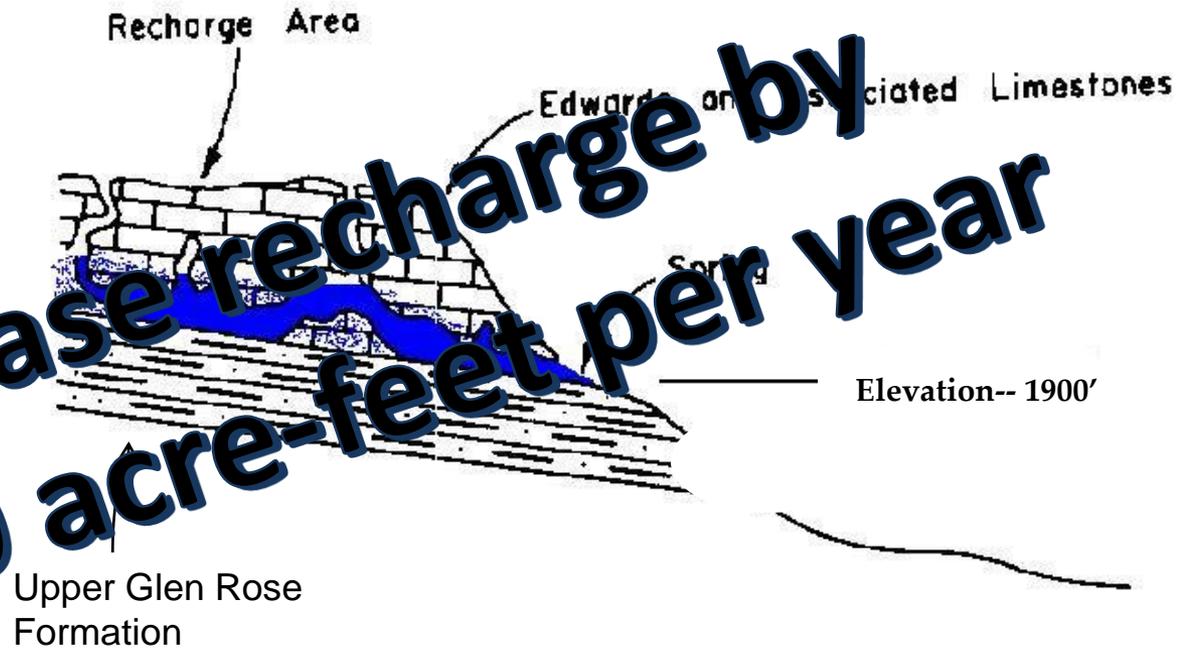
Net ET - Average Year (1958-1982)



# Brush Control to Enhance Water Supply

Unique Paired  
Watershed  
Research  
Opportunity

**Increase recharge by  
75,000 acre-feet per year**



b. Edwards-Trinity (Plateau)

# Riparian Restoration

DANGER  
CAVING BANKS

A photograph of a riparian area. In the foreground, a white wooden sign with red lettering reads "DANGER CAVING BANKS". The sign is supported by two wooden posts. The background shows a river or stream flowing through a wooded area with trees and grasses. The water is calm and reflects the surrounding greenery. The banks are covered in grass and fallen leaves, suggesting a natural, somewhat wild environment.



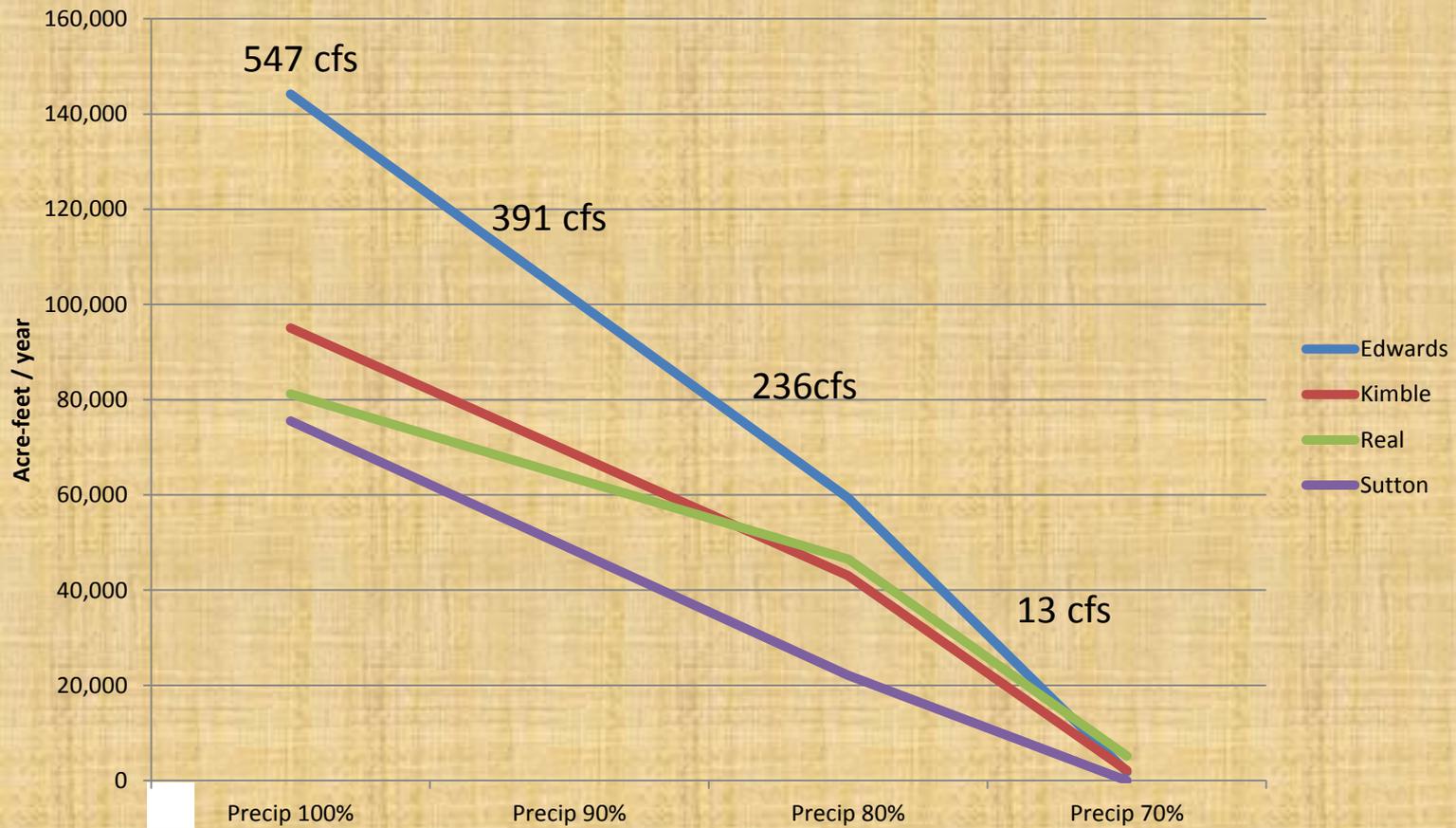
Axis are a big part of the problem







# Annual Recharge v Annual Precipitation (ac-ft)



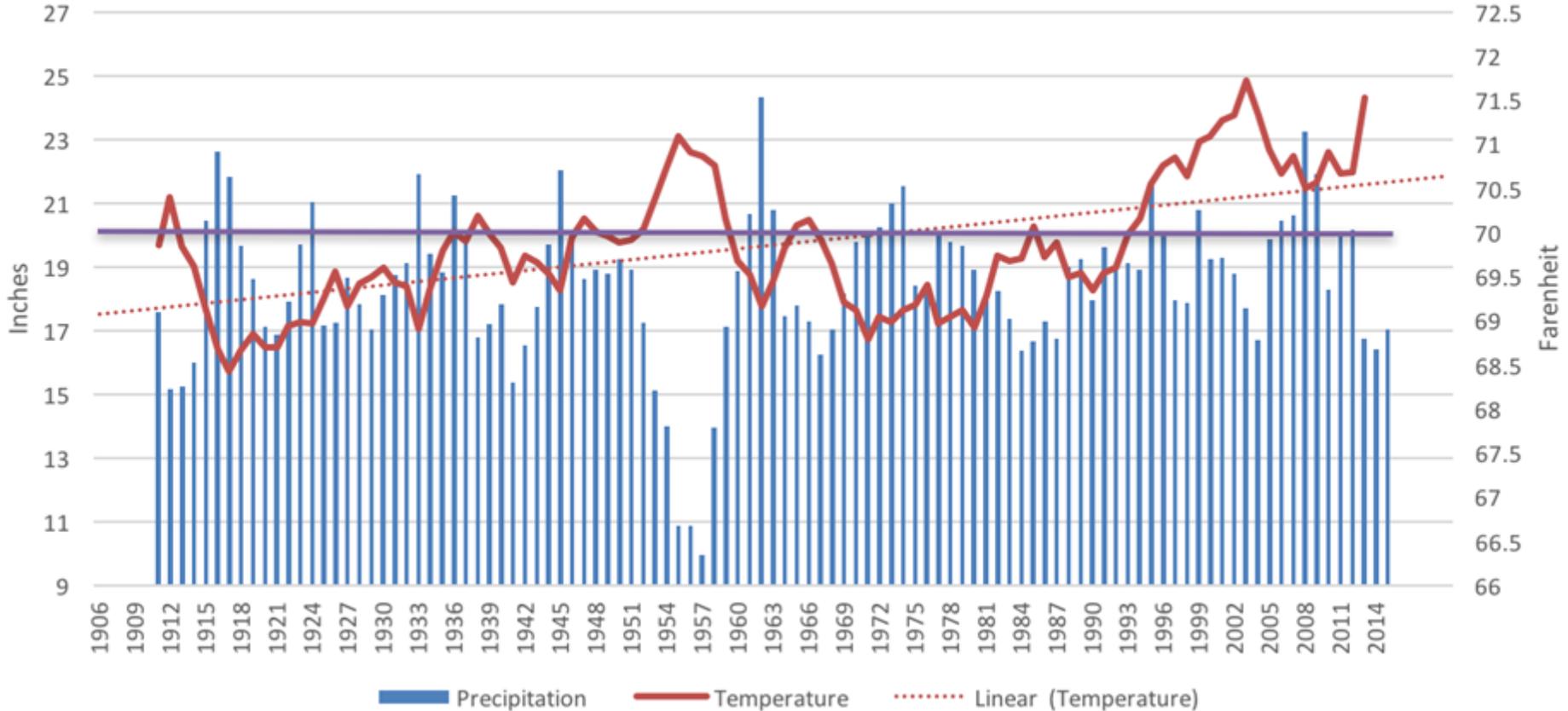
From Ron Green et al 2010

# Elephant in the Room



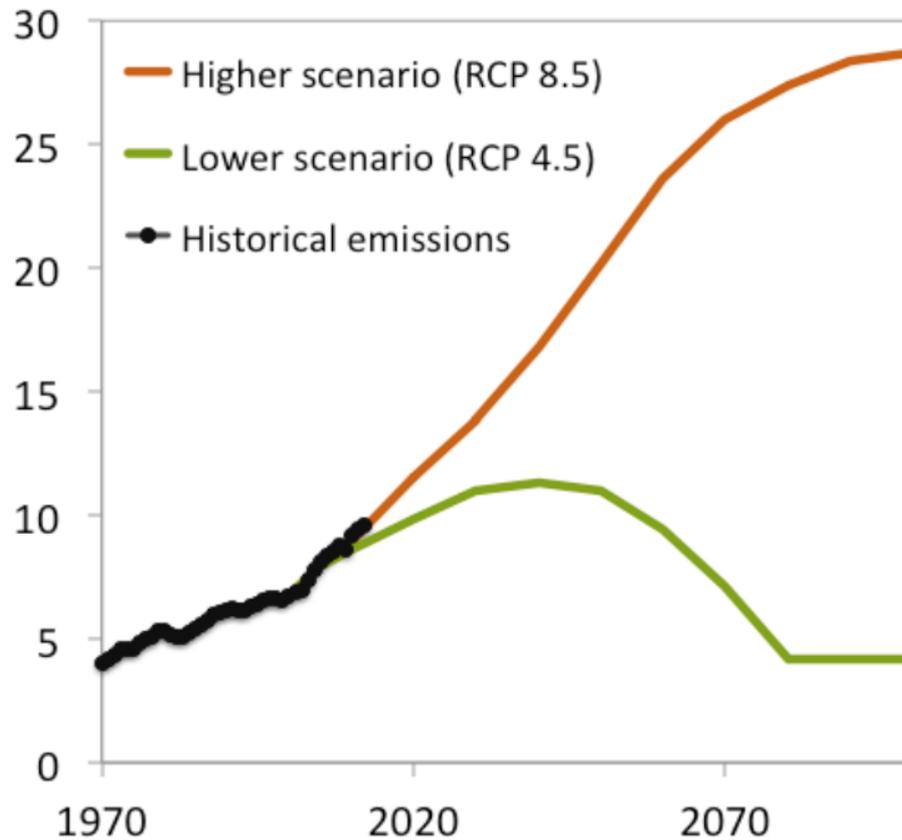
Uh folks...?

## 5 year moving average of average annual precipitation and temperature Del Rio Texas 1906-2015



- Average temperature over 110 year period is 69.9 F
- During drought of 50s above average for 7 years with peak of 71.4
- Above normal 4 of 5 years from 2008-2012 with peak of 73.2
- Annual average temperature has increased 1.7 degrees since 1906

## Global carbon emissions from fossil fuels (GtC)

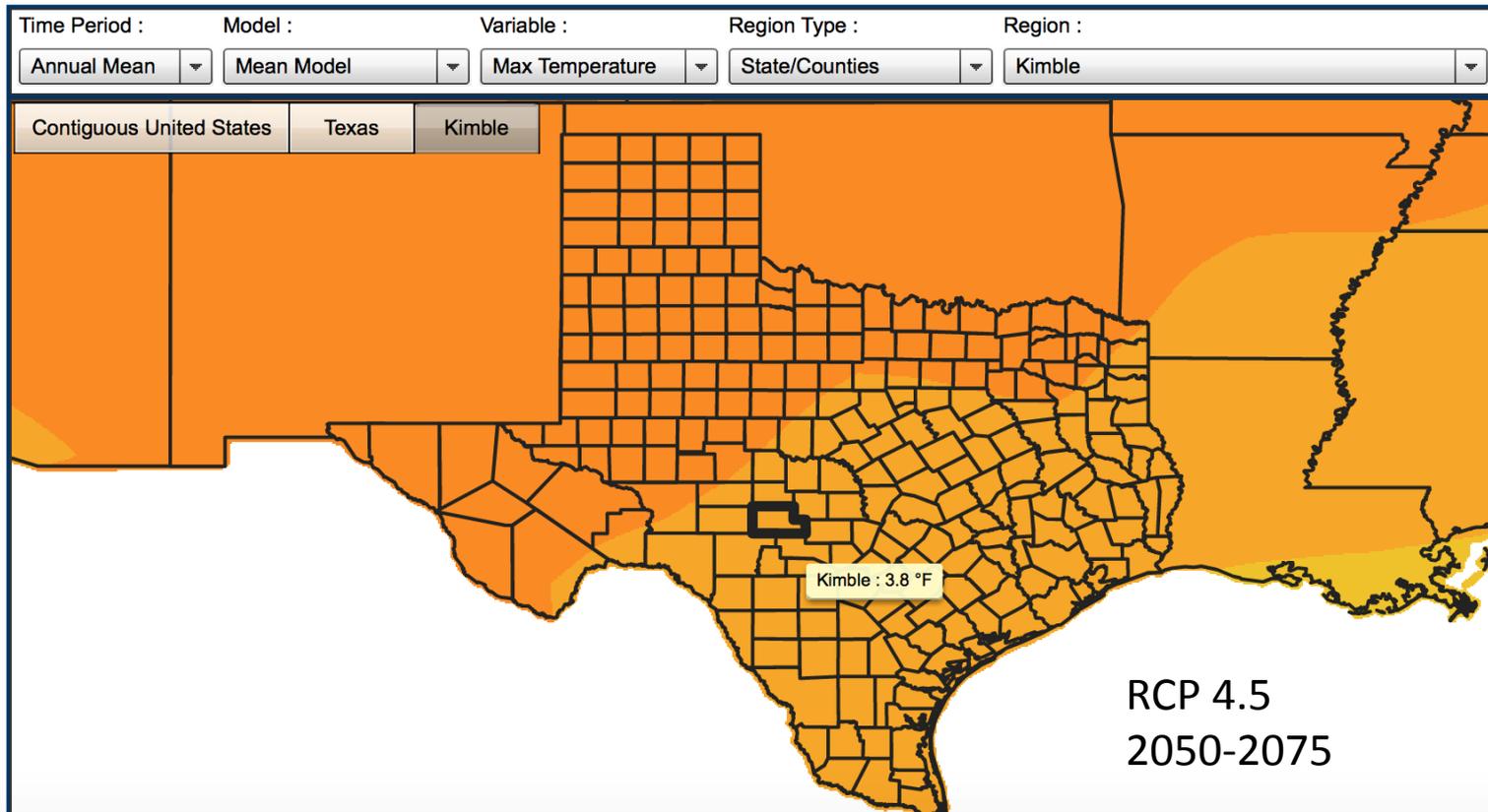


**Figure 1.** Historical carbon emissions (black) continue to increase from one decade to the next. This report examines how Austin's climate might change if the world follows Representative Concentration Pathway (RCP) 8.5, a higher scenario with continued dependence on carbon-intensive fossil fuels (orange) or RCP 4.5, a lower scenario where replacing fossil fuels with zero-carbon alternatives reduces and ultimately stabilizes global carbon emissions (green). Data: CDIAC, IIASA

# National Climate Change Viewer (NCCV)

[Home](#) || [Tutorial \(PDF\)](#) || [Updates](#)

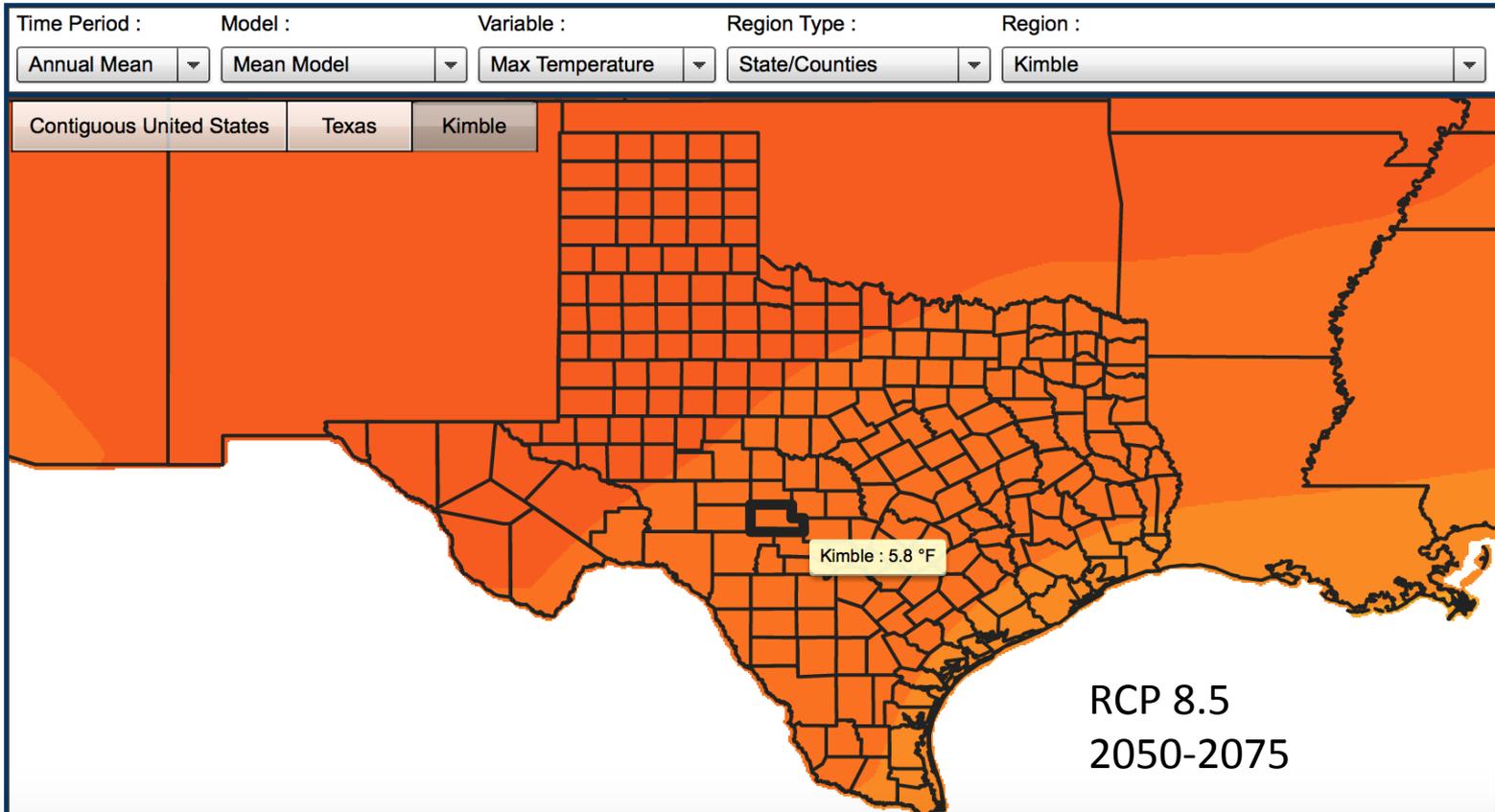
12-09-2016: The National Climate Change Viewer has been updated with all new hydroclimate modeling data.



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Climograph/Histogram

Time Series

Data Table

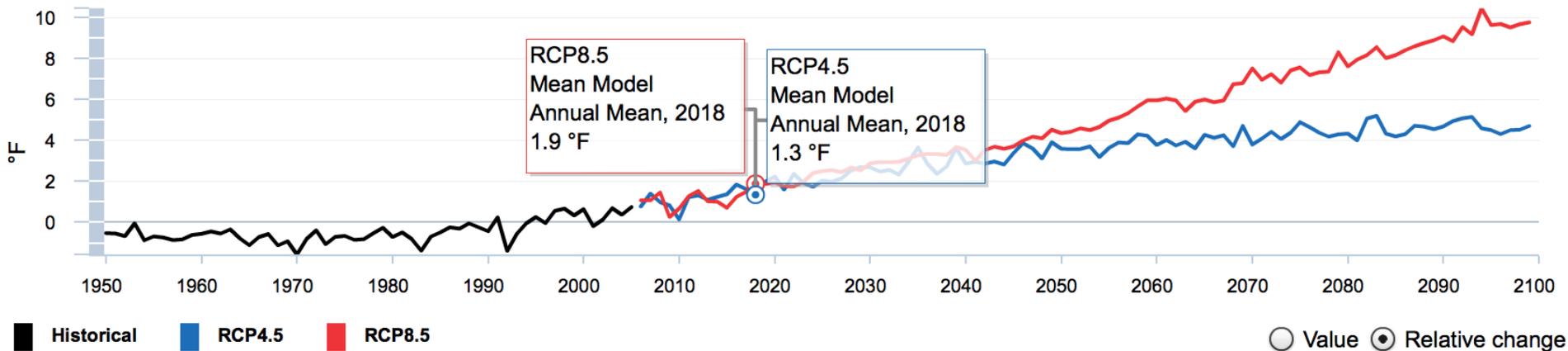
Percentile Table

Model Info

Scenario, Time Period, Units

Download Summary

Annual Mean Max Temperature for Kimble, Texas (Mean Model)



Climograph/Histogram

Time Series

Data Table

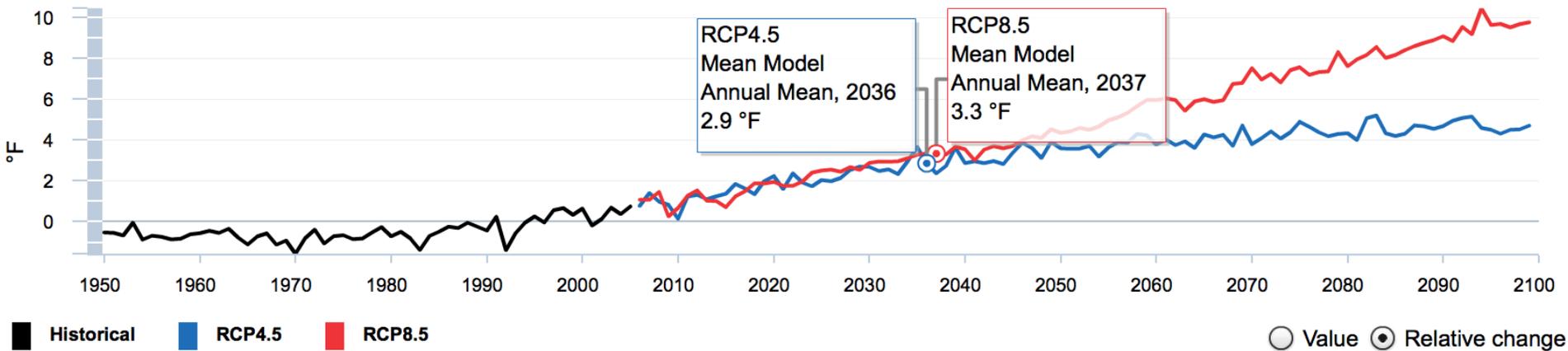
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**Now**  
**more than ever.**

