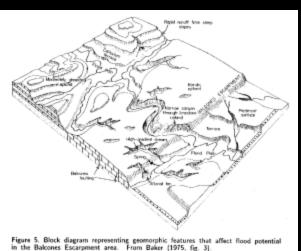
Another Colorado: Rivertown Austin

Kevin M. Anderson Ph. D.

Austin Water Center for Environmental Research









C08484-A Austin History Center, Austin Public Library

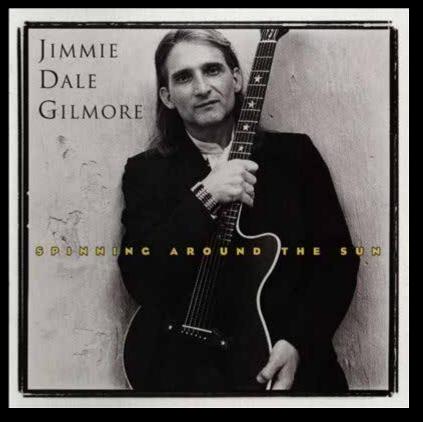




Another Colorado Jimmie Dale Gilmore

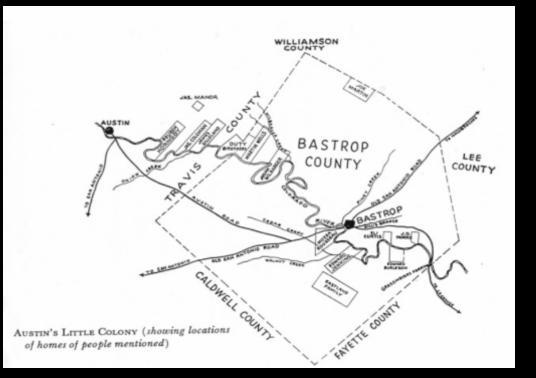
Down by the banks of the Colorado My true love and I one night did lie And we laughed and played and made fun Of the entire world spinning around the sun Down by the banks of the Colorado

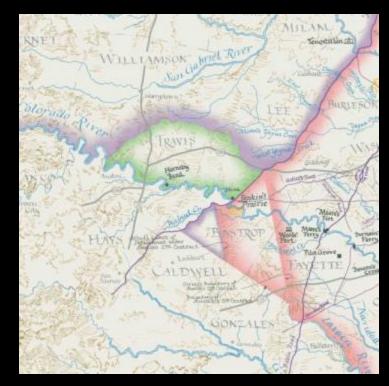
There is another Colorado Wise men have told me, wise women too That I may find sweet El Dorado Down by the banks of one sweet Colorado...





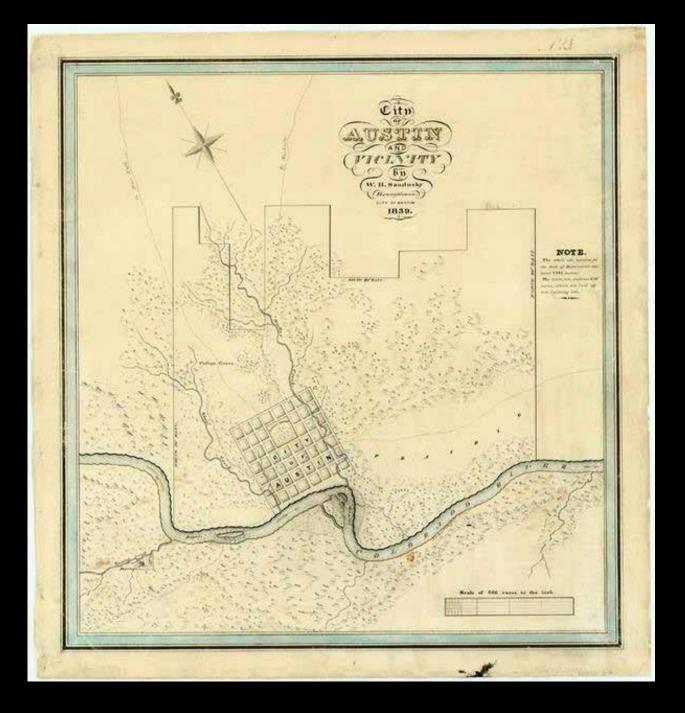
Settlement begins 1820's along river corridor and destroys the bottomland forest



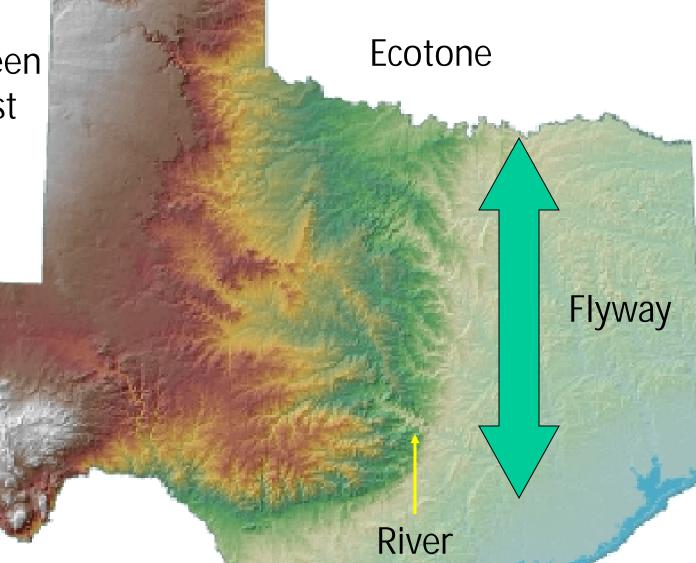


When was the City of Austin founded?

1839



Division between West and East



Uplift

Balcones Escarpment

Mt. Bonnell 780ft

Hornsby Bend 440ft

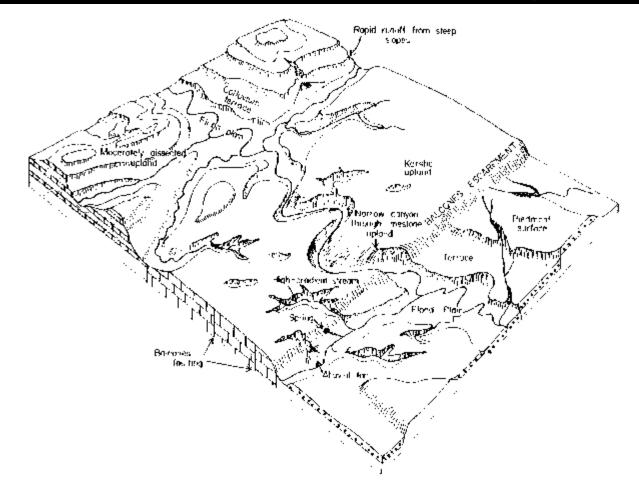
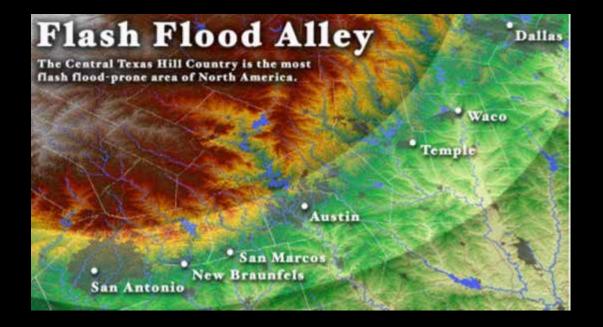
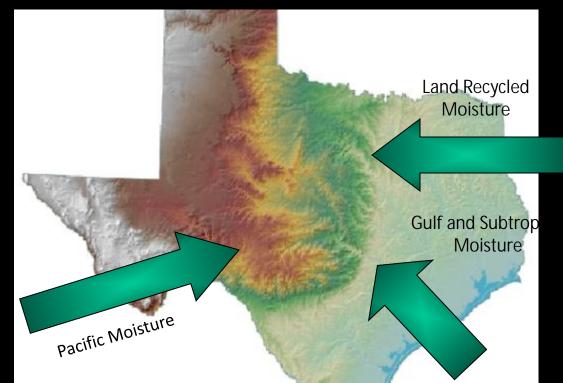
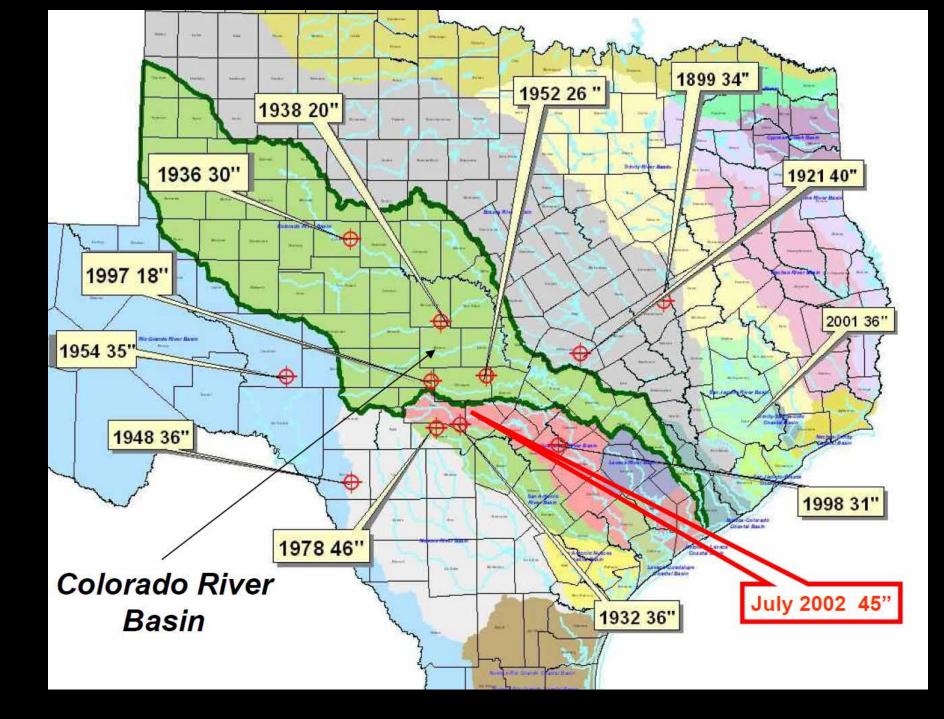


Figure 5. Block diagram representing geomorphic features that affect flood potential in the Balcones Escarpment area. From Baker (1975, fig. 3).







Colorado River Flood History

More than 80 flood events have been recorded in the lower Colorado River basin since the 1800s. These events range from isolated floods that affected local areas to basin-wide floods spawned by unusually heavy rainfalls.

February 1843: In the earliest flood for which there is a written account, floodwaters cause the Colorado River to crest at a stage of 36 feet at Austin.

July 1869: In what is considered to be the worst flood on record, the Colorado crests at 51 feet at Austin and produces record crests of 60.3 feet at Bastrop, 56.7 feet at La Grange, 51.6 feet at Columbus, 51.9 feet at Wharton and 56.1 feet at Bay City. Bastrop and La Grange are inundated.

Reports describe rainfall as incessant for 64 hours, the river at Austin more than 10 miles wide, and floating buffalo carcasses in the river (indicating that some of the floodwaters originated in the High Plains). Damage is estimated at \$3 million.







1900: Flood destroyed the Austin Dam.

1913: Flood merged the mouths of the Colorado and adjacent Brazos rivers, forming a lake 65 miles wide.

1915: Floodwaters from storms in April and September severely damage the second Austin Dam, completed in 1912. The structure will lie unrepaired for more than two decades until it is rebuilt by LCRA in the late 1930s.





 Water Ense

 BIB TE Else

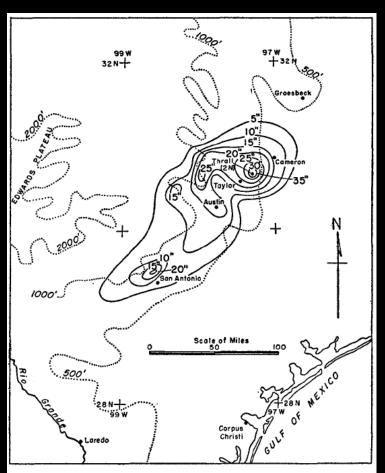


FIGURE 2.—Generalized isohyetal pattern (solid lines, in inches) for the Thrall, Tex., rainstorm, covering the period noon Sept. 8 to noon Sept. 10 (local time), 1921, superimposed on the ground contours (dotted lines, in feet). The intense rain fell in two bursts which traveled from the southwest to the northeast.

1921 Flood

This storm caused the most deadly floods in Texas, with a total of 215 fatalities.

On September 9 and 10, 1921, the remnants of a hurricane moved over Williamson County. The center of the storm became stationary over Thrall, dropping a storm total of 39.7 inches of rain in 36 hours.

The 24-hour rainfall total ending 7 AM on September 10, 1921 (<u>38.2 inches</u>) at a U.S. Weather Bureau station in Thrall.

Eighty-seven people drowned in and near Taylor, and 93 in Williamson County.

Current Record 24 hour total rainfall

On July 25, 1979 Tropical Storm Claudette stalled over Alvin and inundated the region with 45 inches in 42 hours. That total included <u>43 inches in 24 hours</u>, the maximum 24-hour rainfall in US history. **June 1935:** Floodwaters from heavy Hill Country rains cause the Colorado River in Austin to crest at 50 feet, one foot below the 1869 record. The river overwhelms the Congress Avenue Bridge, cutting Austin in half. The Llano River rises to its highest recorded stage of 41½ feet, streamflow 388,000 cfs.

September 1936: The 1936 flood was created by two major storms in summer and early fall totaling 51 inches over the watershed of the Concho River. Floodwaters from heavy rains throughout the basin pour through the Colorado River at Austin for a 20-day period, cresting at 31.4 feet. Earlier, floodwaters from a 30-inch rain on the Concho River had washed away nearly 300 buildings in San Angelo.





July 1938

Twenty inches of rain over 12 counties pour more than 3 million acre-feet of floodwaters into newly completed Lake Buchanan.

Rains of up to 25 inches over a 10-day period at the storm's center near Brady, upstream of the newly completed Buchanan Dam.

LCRA opened 22 of Buchanan's 37 floodgates (still a record) to pass through the floodwaters.

Basinwide damages totaled roughly \$39 million in today's dollars and left more than 4,000 homeless





Harnessing the River – Floods, Flows, and Dams

The Lower Colorado River Authority

a multipurpose public agency instituted by the Texas legislature in 1934 as a conservation and reclamation district with a statutory authority covering ten counties through which the Lower Texas Colorado River flows. These counties extend from San Saba in Central Texas to Matagorda on the Gulf Coast.

Walter E. Long, *Flood to Faucet* (Austin: Steck, 1956)



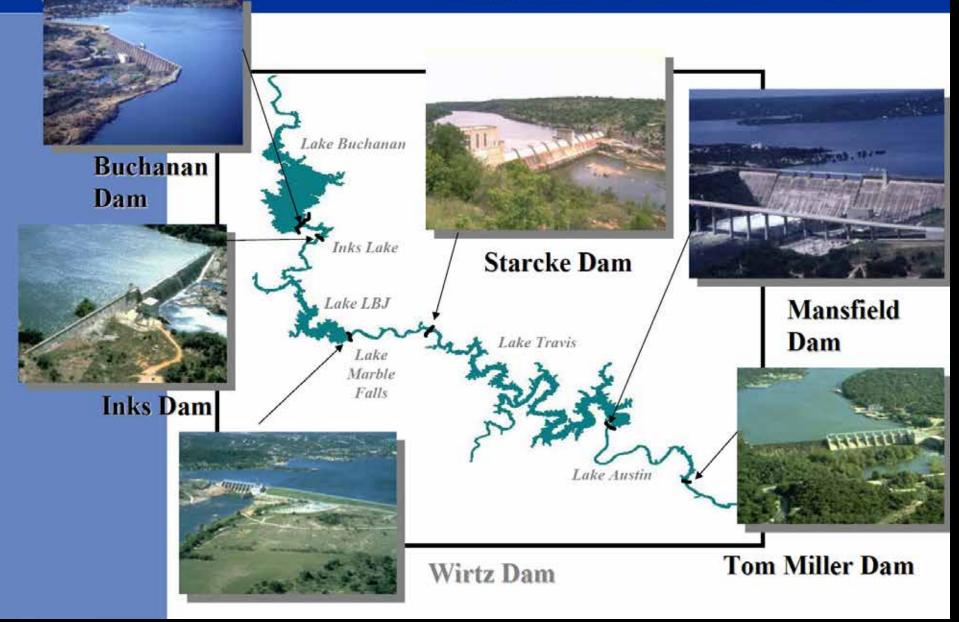








Highland Lake Dams



Chain of Highland Lakes and Dams

Buchanan Dam – Constructed from 1935 – 1937

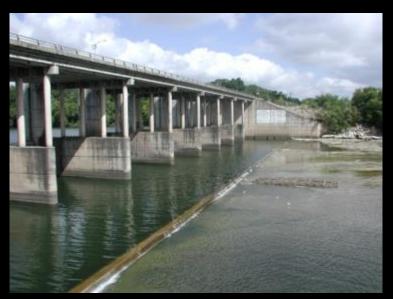
Inks Dam – Constructed from 1936 – 1938

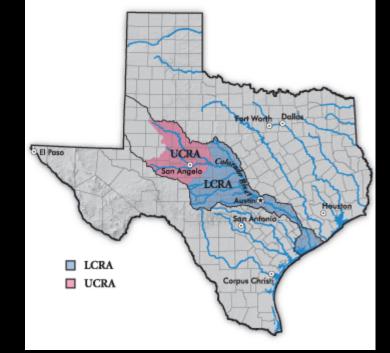
Wirtz Dam – constructed from 1949 to 1950

Starcke Dam – Constructed 1949 – 1951

Mansfield Dam - Constructed from 1937 – 1941

Tom Miller Dam – Constructed from 1938 – 1940

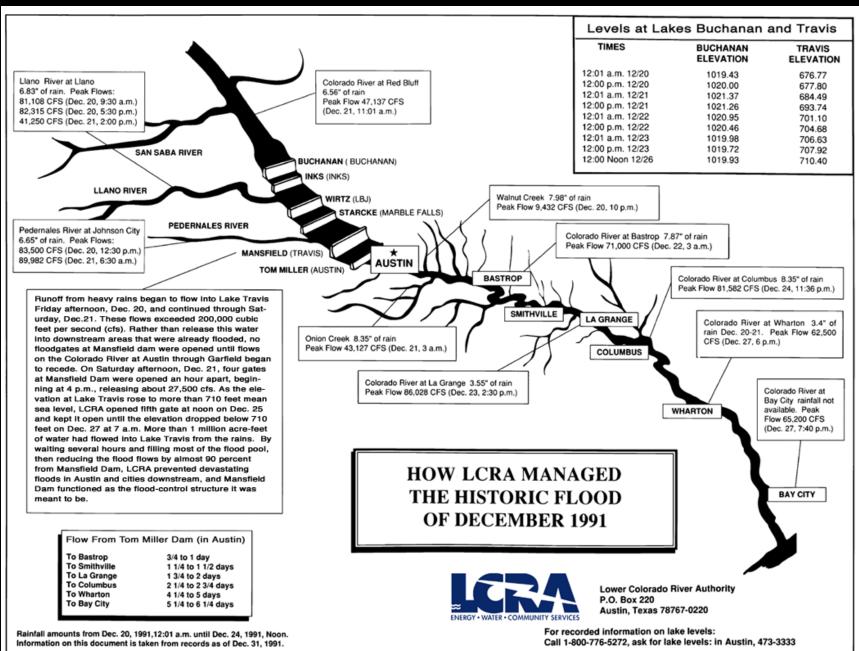






[Longhorn Dam – Constructed 1960 by City of Austin and still operated by Austin Energy]

The "Christmas Flood" of 1991 pushed Lake Travis to its all-time high elevation of 710.4 feet, about 4 feet below the Mansfield Dam spillway.



Floodgate Tom Miller Dam July 2007



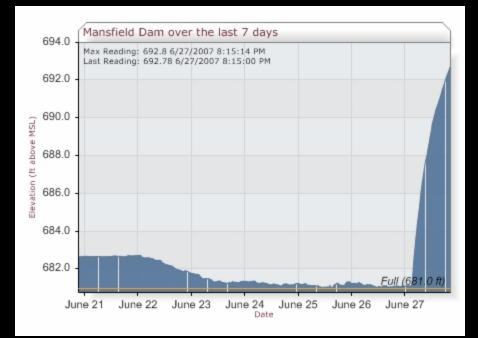
	ABIA Wettest							
	January to Augus							
	Periods							
	1943 T	O 2007						
	2007	41.52						
2.	1991	37.80						
8.	1992	35.28						
! .	2004	33.85						
).	1965	33.08						

JANUARY TO OCTOBER 2008 RAINFALL

OF 15.49 INCHES IS THE 6TH DRIEST JANUARY TO OCTOBER

SINCE 1943

AT AUSTIN BERGSTROM.



Future Floods

The lower Colorado basin has come close in recent years to experiencing floods that would have rivaled those of the 1930s. Massive floods, such as those that devastated communities along the Guadalupe River in 1998 and 2002, could just as easily have occurred in the Colorado River, had the storm's center shifted only 85 miles northwest, into the Hill Country.

A worse impact would have come from a storm like <u>Tropical Storm Allison</u>, which swamped Houston in 2001 with rains of up to 37 inches. An LCRA study estimated that a Hill Country storm like Allison would have forced LCRA to open all 24 of Mansfield Dam's floodgates – something that has never happened. (The most that have been opened at one time was six, during a 1957 flood.)

"The flood that occurred in summer 2007 was triggered by a 19-inch rain in the Marble Falls area," LCRA Chief Meteorologist Bob Rose noted. "If that heavy a rain had fallen over a much wider area of our watershed, it could have resulted in a catastrophic flood approaching those of the 1930s. One day, such a flood will occur, and its impact will be even more devastating to a basin that is much more heavily populated and urbanized than it was seven decades ago."



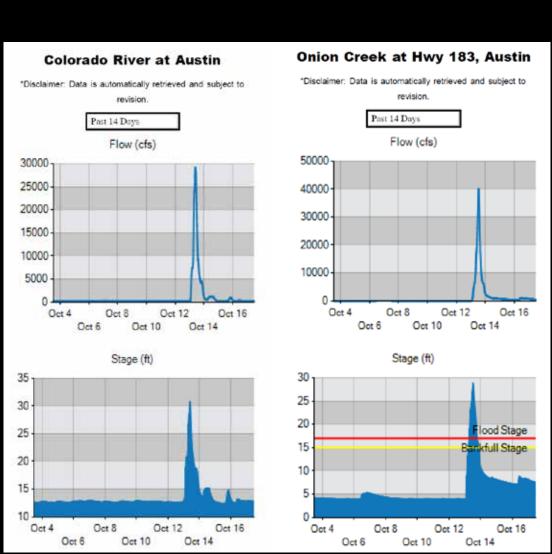
Barton Creek – Austin City Limits Festival Flood Oct 13, 2013

Over a 12-hour period, the Barton Springs Area got <u>12.1 inches</u> of rain and downtown Austin received 10.6 inches.

The deluge in Austin forced Austin City Limits Music Festival organizers to cancel the final day of the two-weekend event.



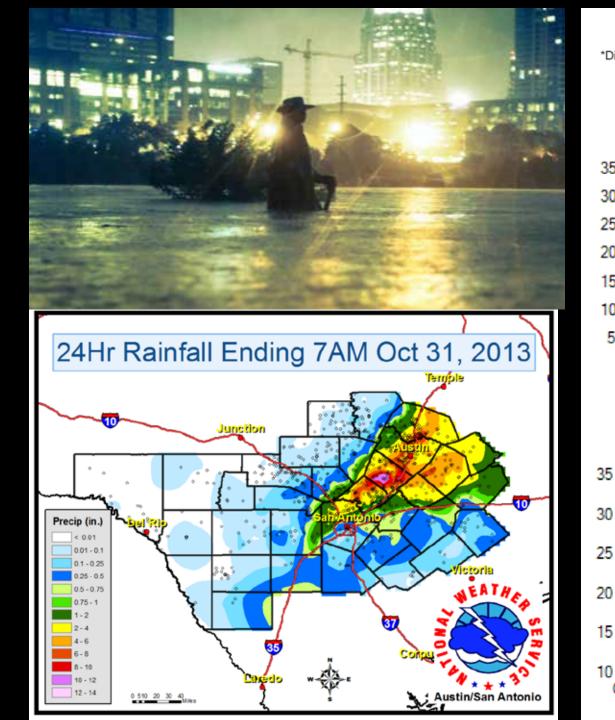




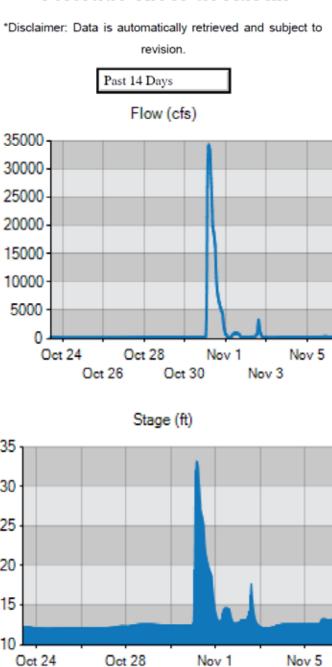
Halloween Flash Flood October 30-31, 2013

A typical, early fall, flood event occurred from the evening of October 30 through late afternoon on October 31, 2013. There was widespread rainfall of 2-4 inches across portions of eight counties; substantial areas of 6-10 inches across Hays, western Comal, and central Travis counties; and a bull's-eye of 12-14+ inches in a narrow swath from Wimberley to Driftwood.





Colorado River at Austin



Oct 28

Oct 30

Oct 26

Nov 1

Nov 3

Record flooding was measured at the USGS stream gage on Onion Creek at Highway 183 in Austin, Texas on Halloween morning around 10 a.m.

The creek level was measured at 40.97 feet; 36 feet higher than normal levels.

The previous highest measurement of 38 feet occurred more than 90 years ago in 1921.



USGS	08159000	2013-10-31 06:15	CDT	10400 P	21.32	Ρ
USGS	08159000	2013-10-31 06:30	CDT	61700 P	32.32	P:I:T
USGS	08159000	2013-10-31 08:43	CDT	126000 P:*	39.43	P:T:*
USGS	08159000	2013-10-31 09:45	CDT	134000 P:*	40.09	P:h:*
USGS	08159000	2013-10-31 10:00	CDT		40.95	P:h:*
USGS	08159000	2013-10-31 10:07	CDT		40.97	P:h:*
USGS	08159000	2013-10-31 10:20	CDT	130000 P:*	39.76	P:T:*
USGS	08159000	2013-10-31 10:25	CDT	127000 P:*	39.54	P:*
USGS	08159000	2013-10-31 11:15	CDT	107000 P	37.65	P:T
USGS	08159000	2013-10-31 11:18	CDT	110000 P:*	37.95	P:*
USGS	08159000	2013-10-31 11:29	CDT	106000 P:*	37.53	P:*
USGS	08159000	2013-10-31 11:30	CDT	97500 P	36.71	P:D
USGS	08159000	2013-10-31 11:40	CDT	101000 P:*	37.08	P:*











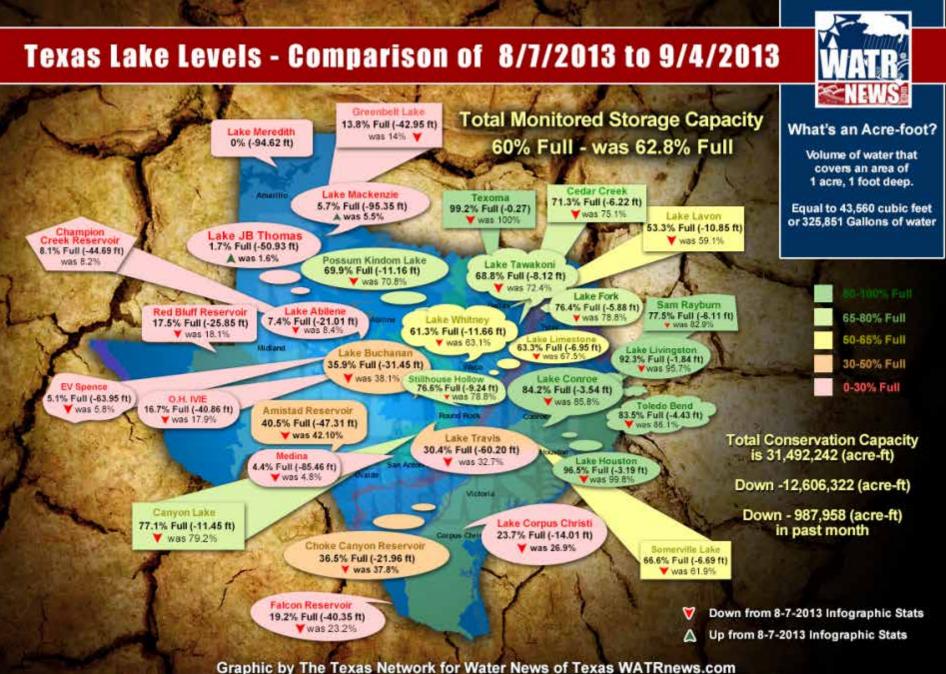
On the other hand...

Drought Here To Stay, Could Last Another 15 Years, Says Texas A&M Expert September 26, 2013

Despite recent rains, the historic Texas drought is still alive and well and about 93 percent of the state remains in drought conditions ranging from dry to exceptionally dry, says a Texas A&M University expert.

John Nielsen-Gammon, professor of atmospheric sciences who also serves as State Climatologist, says, most of Texas is still unusually dry and water levels are below normal.





Reservoir Data provided by TWDB's waterdatafortexas.org - Dry earth by Piotr Krzeslak

In 1918, the whole current of the river plowed a narrow furrow through the silt above the dam, and the channel was so narrow that it was easy to hop across it at one jump. At this time, the whole discharge of the Colorado River was only nine second-feet immediately above the dam.

> University of Texas Bulletin No. 2439: October 15, 1924

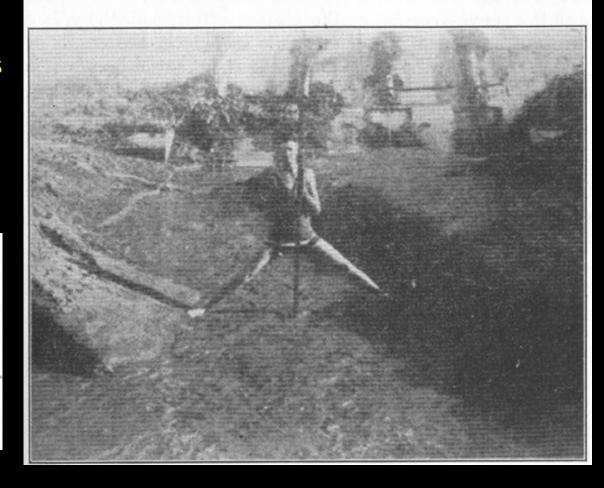
SILTING OF THE LAKE AT AUSTIN, TEXAS

Вy

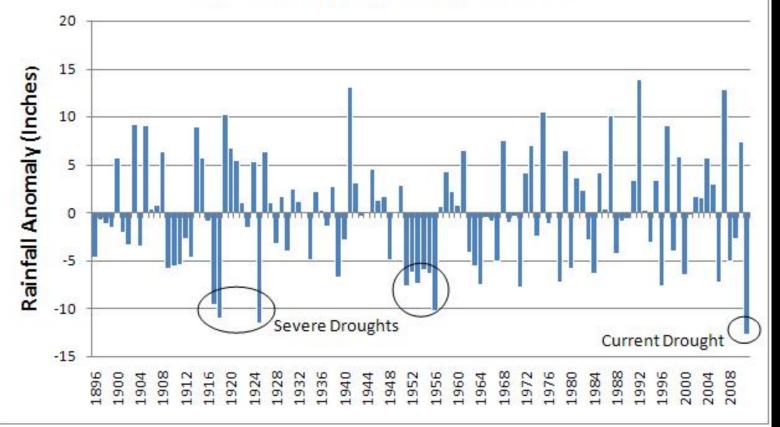
T. U. TAYLOR

Professor of Civil Engineering

illustrates the width of the stream where the man in the bathing suit is astride the whole channel of the river, as it flowed along the narrow furrow that it had cut in the silt. The stream at this point was about four feet wide.



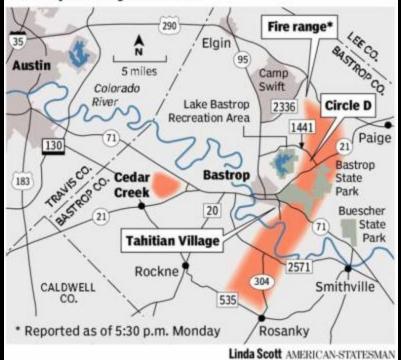
Texas Precipitation, August-July





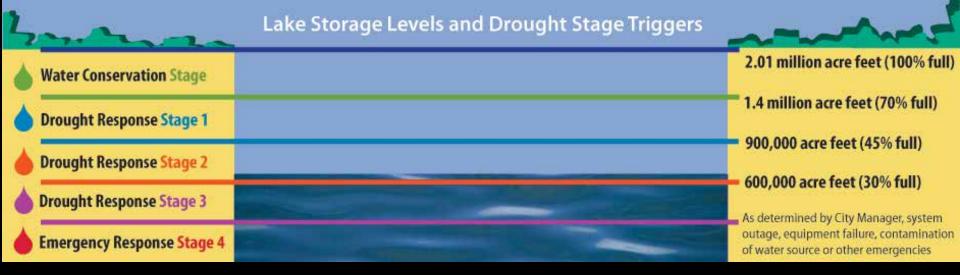


Bastrop County wildfires



September 2011

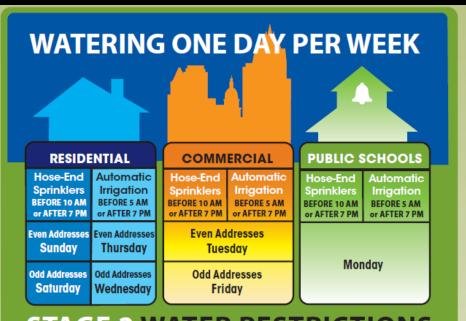


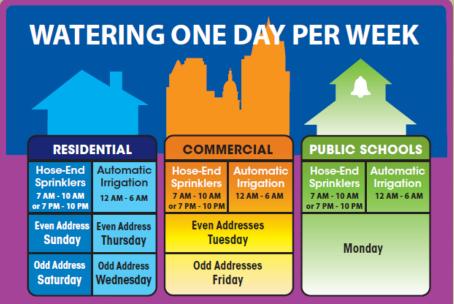


Currently, the combined storage in lakes Buchanan and Travis is at one of the lowest points in the history of the lakes.

Recent rains have pushed back the likelihood of hitting the drought of record until February 2014.

The lowest point ever was 621,221 acre-feet which occurred on September 9, 1952, during the "Drought of Record."



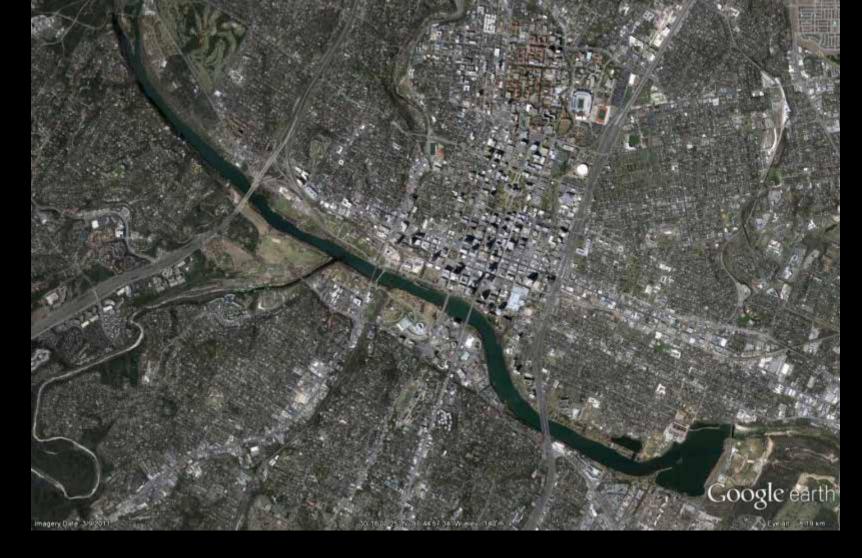


STAGE 3 WATER RESTRICTIONS





EMERGENCY RESPONSE STAGE 4 NO OUTDOOR WATERING



Urbanization and Landscape Ecology Austin, Texas Population - Austin—MSA 1,870,872 (2013)

Austin Area Population Histories and Forecasts

Year	City of Austin Total Area Population	Annualized Growth Rate	City of Austin Full Purpose Population	City of Austin Limited Purpose Population	Travis County	Annualized Growth Rate	Five County MSA(1)	Annualized Growth Rate
1940	87,930				111,053		214,603	
1950	132,459	4.2%			160,980	3.8%	256,645	1.8%
1960	186,545	3.5%			212,136	2.8%	301,261	1.6%
1970	251,808	3.0%			295,516	3.4%	398,938	2.8%
1980	345,890	3.2%			419,573	3.6%	585,051	3.9%
1990	465,622	3.0%			576,407	3.2%	846,227	3.8%
2000	656,562	3.5%	639,185	17,377	812,280	3.5%	1,249,763	4.0%
2001	669,693	2.0%	654,019	15,674	830,150	2.2%	1,314,344	5.2%
2002	680,899	1.7%	667,705	13,194	844,263	1.7%	1,353,122	3.0%
2003	687,708	1.0%	674,382	13,326	856,927	1.5%	1,382,675	2.2%
2004	692,102	0.64%	678,769	13,333	874,065	2.00%	1,419,137	2.6%
2005	700,407	1.20%	687,061	13,346	893,295	2.20%	1,464,563	3.2%
2006	718,912	2.64%	707,952	10,960	920,544	3.05%	1,527,040	4.3%
2007	735,088	2.25%	724,117	10,971	948,160	3.00%	1,592,590	4.3%
2008	750,525	2.10%	739,543	10,982	978,976	3.25%	1,648,331	3.5%
2009	774,037	3.13%	765,957	8,080	1.008,345	3.00%	1,706,022	3.50%
2010	790,390	2.11%	777,953	12,437	1,024,266	1.58%	1,716,289	0.60%
2011	812,025	2.74%	799,578	12,447	1,049,873	2.50%	1,763,487	2.75%
2012	824,205	1.50%	811,746	12,459	1,076,119	2.50%	1,811,983	2.75%
2013	842,750	2.25%	830,278	12,472	1,108,403	3.00%	1,870,872	3.25%
2014	859,605	2.00%	847,121	12,484	1,138,884	2.75%	1,926,998	3.00%
2015	874,648	1.75%	862,151	12,497	1,170,203	2.75%	1,984,808	3.00%
2016	889,954	1.75%	877,445	12,509	1,202,384	2.75%	2,044,353	3.00%
2017	905,529	1.75%	893,007	12,522	1,238,456	3.00%	2,110,794	3.25%
2018	921,375	1.75%	908,841	12,534	1,275,609	3.00%	2,179,395	3.25%
2019	937,499	1.75%	924,953	12,547	1,313,878	3.00%	2,250,225	3.25%
2020	951,562	1.50%	939,002	12,559	1,350,009	2.75%	2,317,732	3.00%
2025	1,025,102	1.50%	1,012,484	12,618	1,546,129	2.75%	2,686,887	3.00%
2030	1,104,326	1.50%	1,091,695	12,631	1,749,304	2.50%	3,077,220	2.75%
2035	1,175,094	1.25%	1,162,450	12,644	1,955,158	2.25%	3,481,592	2.50%
2040	1,235,036	1.00%	1,222,379	12,656	2,158,652	2.00%	3,939,101	2.50%
2045	1,298,035	1.00%	1,285,366	12,669	2,325,481	1.50%	4,349,086	2.00%

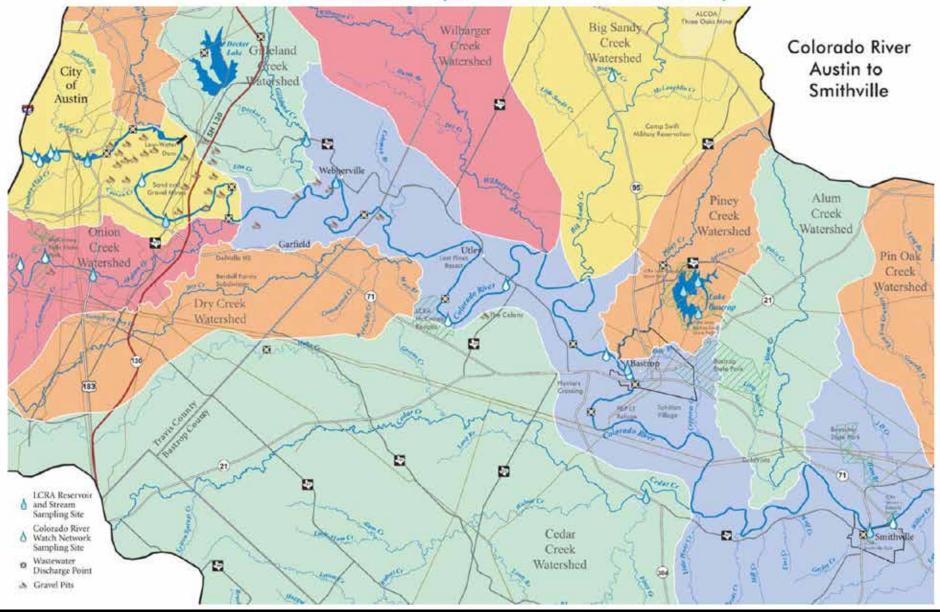
SOURCE: Ryan Robinson, City Demographer, Department of Planning, City of Austin. January 2013.

Rediscovery

Discovering the Colorado A Vision for the Austin-Bastrop River Corridor



The Austin-Bastrop River Corridor Partnership



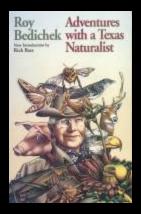
The Colorado River and Bedichek

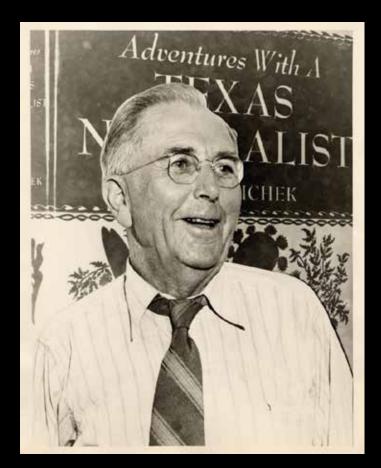
Roy Bedichek

1878-1959

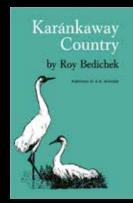
Rivers intrigue me. I can sit on a log and look upon a flowing stream for an hour at a time without feeling those twinges of conscience which come while idling in other environments.







1950

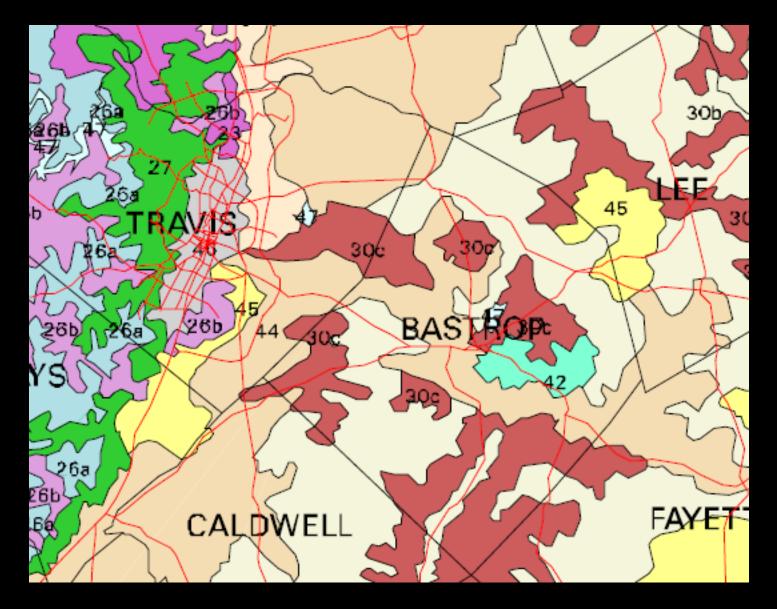


Bedichek – Environmental Transformation

I have seen in my boyhood days the crown and upper slopes of gentle hills, on which the black soil is mixed with fragmented limestone, produce ninety bushels of oats to the acre. Now many of these slopes are all bleached out, pale as death, and really dead in so far as ability to support vegetable life is concerned. Many old-timers have seen bale-to-the-acre land in 1883 abandoned as worthless in 1903.



Karánkaway Country ^{by} Roy Bedichek



44 Crops

Bedichek - The Little Waters

Formerly, timbered bottoms, brushy hillsides, and wide grasslands, thickly sodded, soaked up rain water like a sponge.

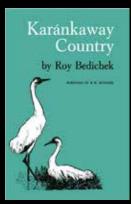
It seeped into the subsoil and eventually filled sandy underground strata from which it found its way by devious paths into bubbling springs at lower levels, trickling off to join other trickles to form [on still lower levels] streamlets whose confluence made streams – all moving unhurried in a widespread network toward the river channel...

Nature was not interested in turning turbines or floating barges, but in producing just as much vigorous, varied, and abundant life as possible, dispersed along the way from plains to sea.

Some think this is a dream. Not so: the overwhelming proof lies in the land richness and life richness which we found here...Under natural conditions, the whole expansive watershed was a <u>giant sponge</u>.









The Colorado River

Forgotten Bottomland Forest

El Monte Grande (del Diablo!) Early Spanish accounts of the Colorado Monte – a sizable almost impenetrable forest – a thicket









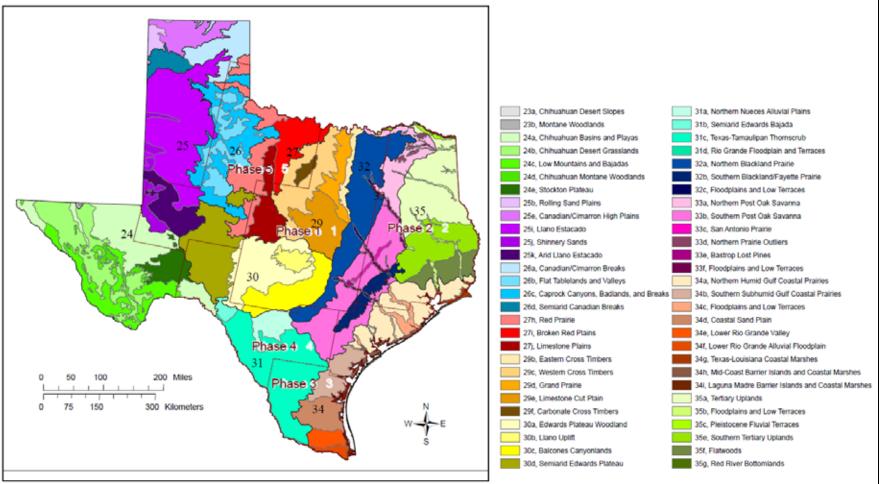


Figure 1. Texas Ecological Systems Mapping project phase map. Outlines of the phases correspond with the footprints of satellite scene data. The project will be completed in the early fall of 2012.

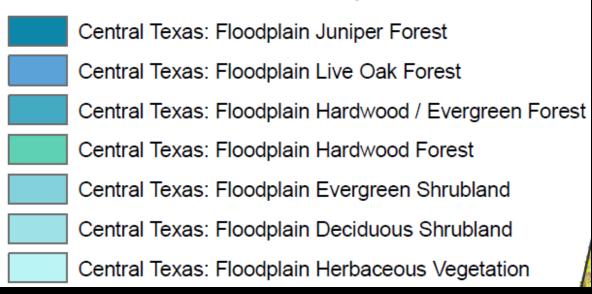
Texas Ecological Systems Project

The Texas Parks and Wildlife Department is cooperating with private, state, and federal partners to produce a new land cover map for Texas, using an expansion and modification of the original NatureServe Ecological System Classification System.

The resulting Mapping Subsystems are essentially land cover types within more broadly-defined ecological systems, which represent groups of related plant communities affected by similar processes, and occurring together within larger landscapes. Human-related cover types such as urban, row crops and native invasive vegetation types are also mapped.



Southeastern Great Plains Floodplain Forest



Alluvial Soils



Austin-Houston Black-Stephen (TX035) Bastsil-Travis-Silstid (TX041) Bergstrom-Smithville-Ships (TX044) Bosque-Frio-Lewisville (TX066) Crockett-Wilson-Gowen (TX121) Edge-Tabor-Gredge (TX161) Heiden-Ferris-Altoga (TX226) Houston Black-Heiden-Altoga (TX235) Padina-Silstid-Chazos (TX390)

STATSGO (State Soil Geographic Database)

The Colorado River Alluvial Aquifer

River

d o

ABRCP Corridor

Bastrop

10

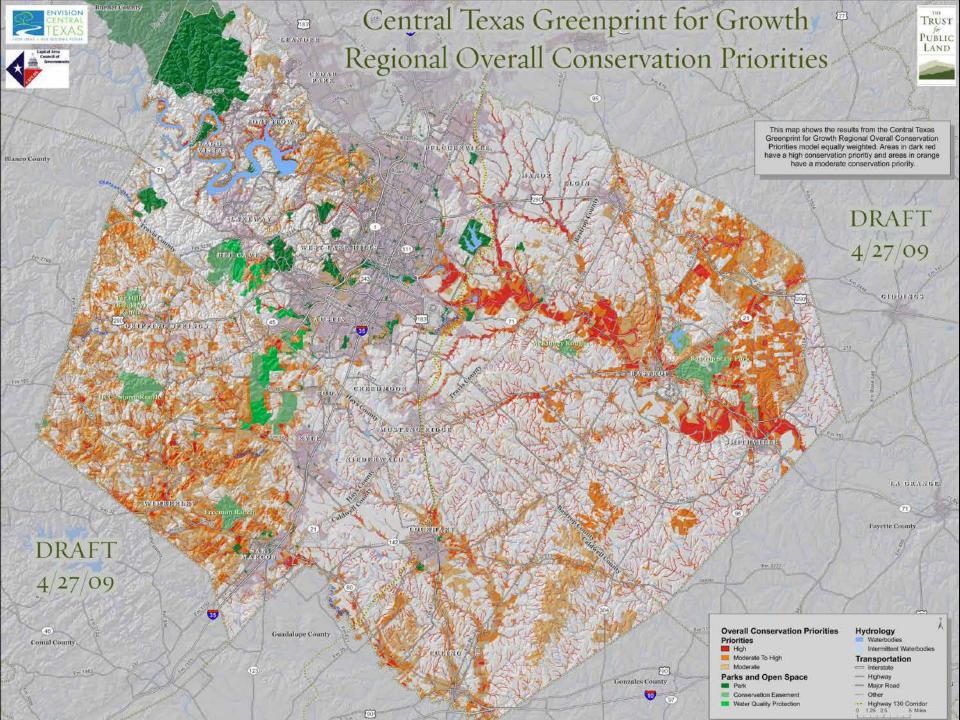
Miles

HWY 71

6

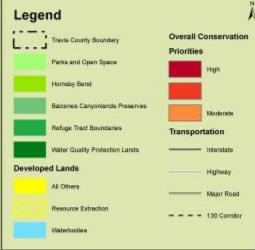
8





Travis County, TX Greenprint Overall Conservation Priorities

This map shows the Travis County, TX Greenprint and the overall conservation priorities. Areas in orange have a moderate conservation priority and areas in dark red have a high conservation priority.



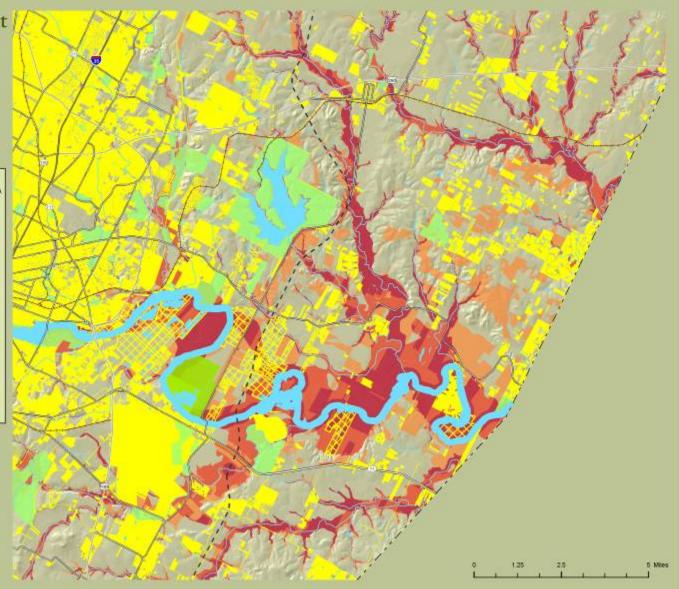
Special thanks to the following data providers: City of Austin, Travis County, University of Texas at Austin, Texas Parks and Wildlife, Texas Historical Commission, CAPCOG, USGS

Map created by The Trust for Public Land on October 4, 2006

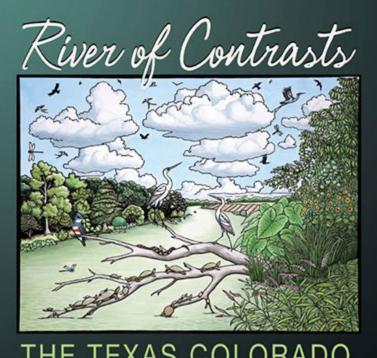


Created in ESRI ArcMap 9.16 Map Projection: NAD 1983 State Plane Texas Central FIPS 4203

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THE TEXAS COLORADO

Another Colorado Jimmie Dale Gilmore

Down by the banks of the Colorado My true love and I one night did lie And we laughed and played and made fun Of the entire world spinning around the sun Down by the banks of the Colorado

There is another Colorado Wise men have told me, wise women too That I may find sweet El Dorado Down by the banks of one sweet Colorado...

