



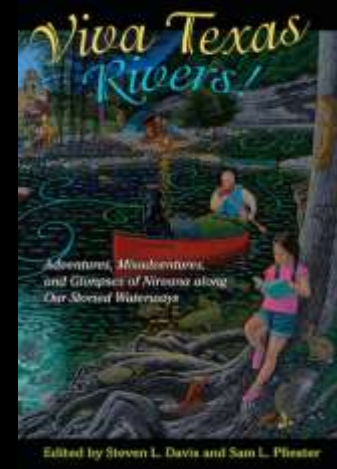
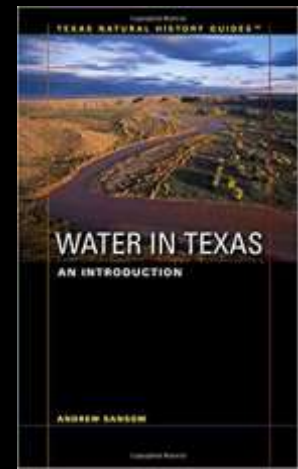
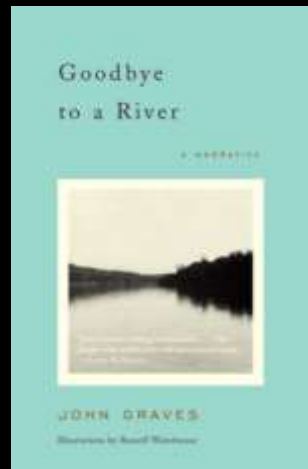
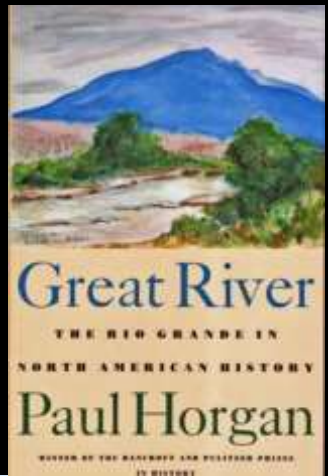
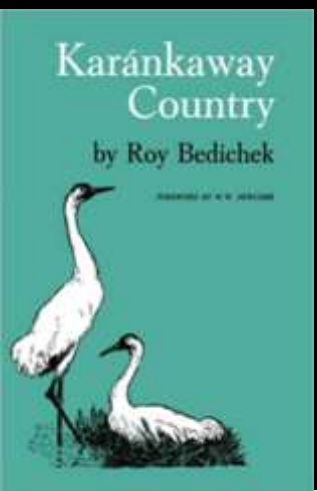
Center for Environmental Research at Hornsby Bend



Waters the Land: Rivers and Water in Texas

Kevin M. Anderson, Ph.D.

Austin Water – Center for Environmental Research



Texas Rivers

- The three best Texas River books
- Texas water management
- Texas water and climate change



We crossed the wild Pecos



We forded the Nueces



We swum the Guadalupe



Red River runs rusty



The Wichita clear



The Trinity's muddy



Now the fair Angelina
Runs glossy and gliding



The crooked Colorado
Runs weaving and winding



The slow San Antonio Courses the plain



But down by the Brazos
I courted my dear



The Geography of Flowing Water in Texas

Water Resource Regions



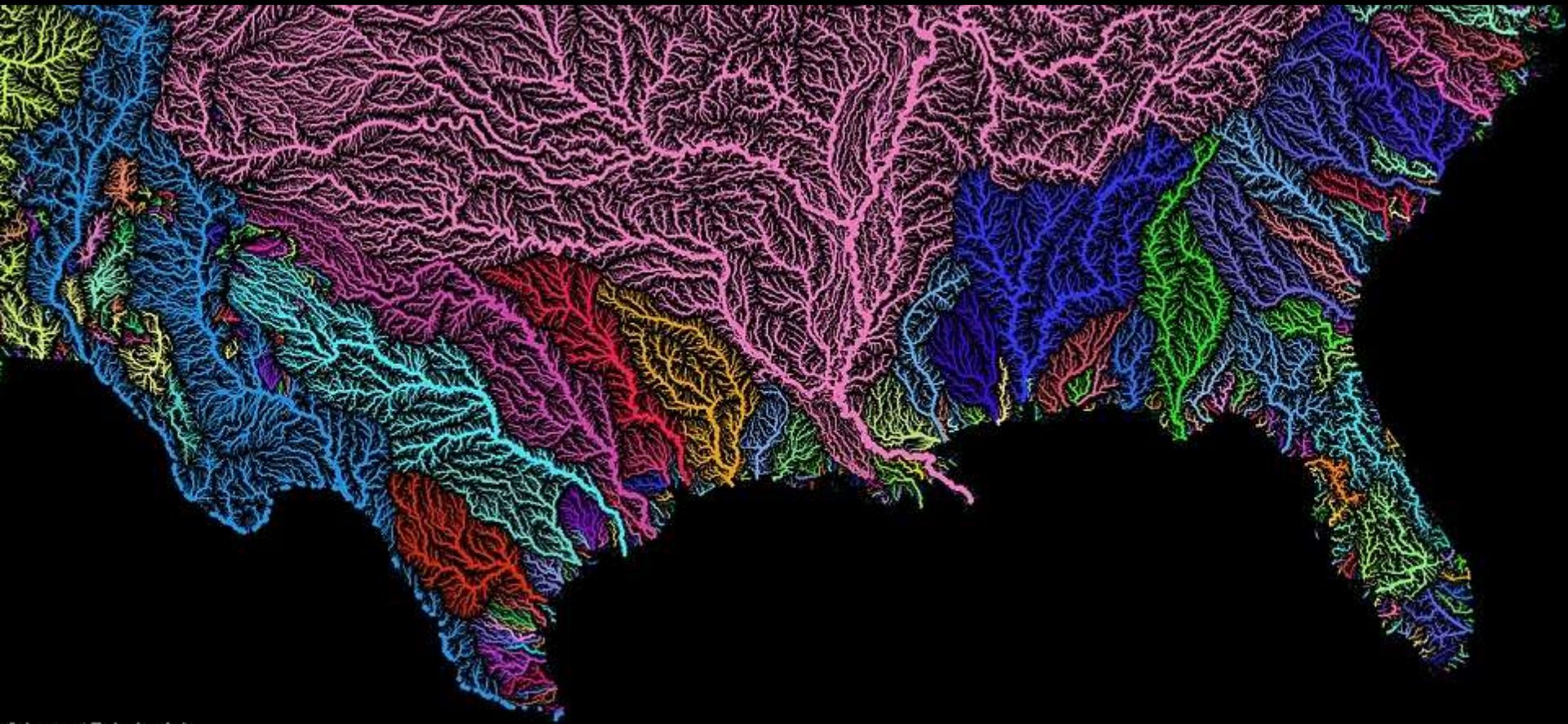


Watersheds of the United States
Where do the U.S. watersheds drain?

Note:
 The Mississippi-Missouri Drainage Basin is the largest in North America.
 — Mississippi-Missouri Drainage Basin

There's many a river, that waters the land

- | | | | | |
|----------------|-----------------|----------------|-----------------------|-------------------|
| Angelina River | Comal River | Little River | Paluxy River | Sabinal River |
| Aransas River | Devils River | Llano River | Pease River | San Antonio River |
| Blanco River | Frio River | Medina River | Pecos River | San Bernard River |
| Bosque River | Guadalupe River | Navidad River | Pedernales River | San Gabriel River |
| Brazos River | James River | Navasota River | Prairie Dog Town Fork | San Jacinto River |
| Colorado River | Lampasas River | Neches River | Red River | San Marcos River |
| Concho River | Lavaca River | Nolan River | Rio Grande | San Saba River |
| Canadian River | Leon River | Nueces River | Sabine River | Sulphur River |
| | | | | Trinity River |



0 200 400
Miles

0 500 1,000
Kilometers

Average Flow in cubic feet per second (cfs):

1,000 2,500 10,000 50,000 250,000 650,000



The Rivers of America Series

- Started in 1937 - 65 volumes were eventually published over 37 years ending in 1974
- "The natural rhythm moving the pioneer life of America forward was the rhythm of flowing water. It is as the story of American rivers that the folk sagas will be told."
Constance Lindsay Skinner creator of the series
- The series traces the history and folkways of the United States through its rivers
- "Literary" histories

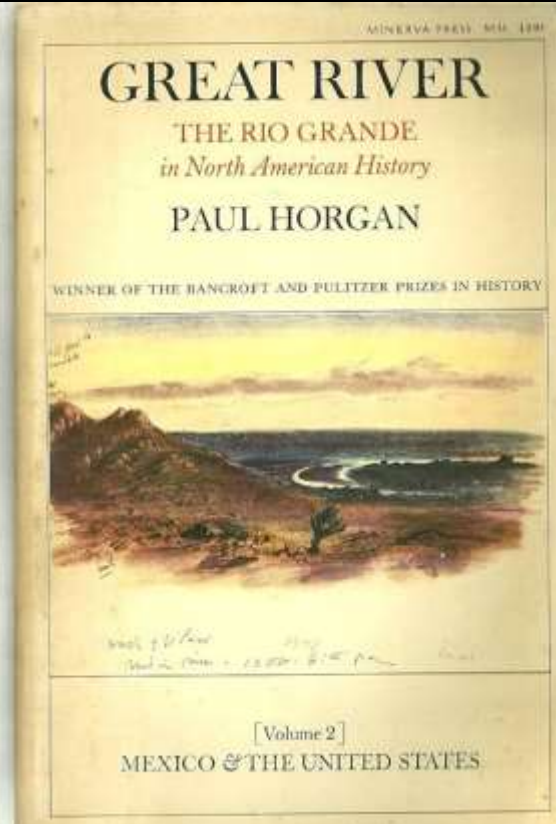
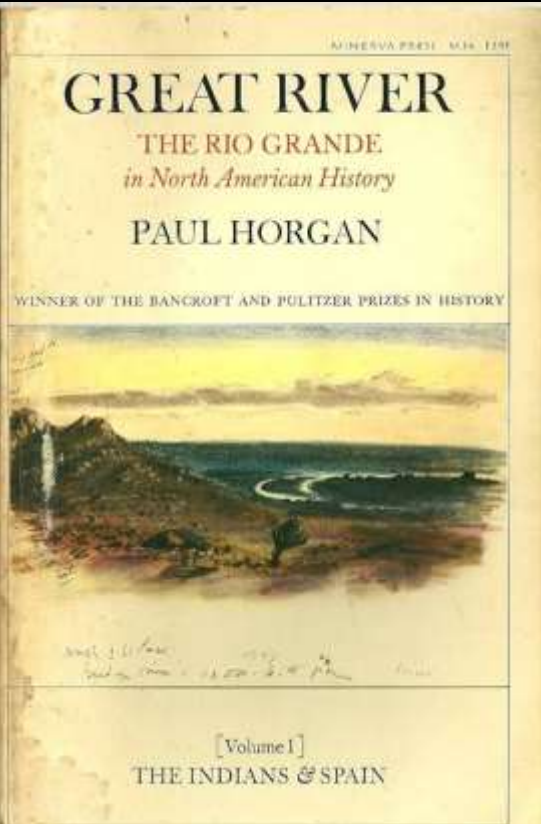


Great River: The Rio Grande in North American History (1954)

Paul Horgan 1903-1995



- Pre-Environmental History
- A Shared River - International and Interstate
- “an epic history of four civilizations—Native American, Spanish, Mexican, and Anglo-American—that people the Southwest through ten centuries” (1000 pages)
- Finalist for National Book Award – Won Bancroft and Pulitzer



The Geography of Flowing Water

Shared Rivers - International and Interstate



The Geography of Flowing Water

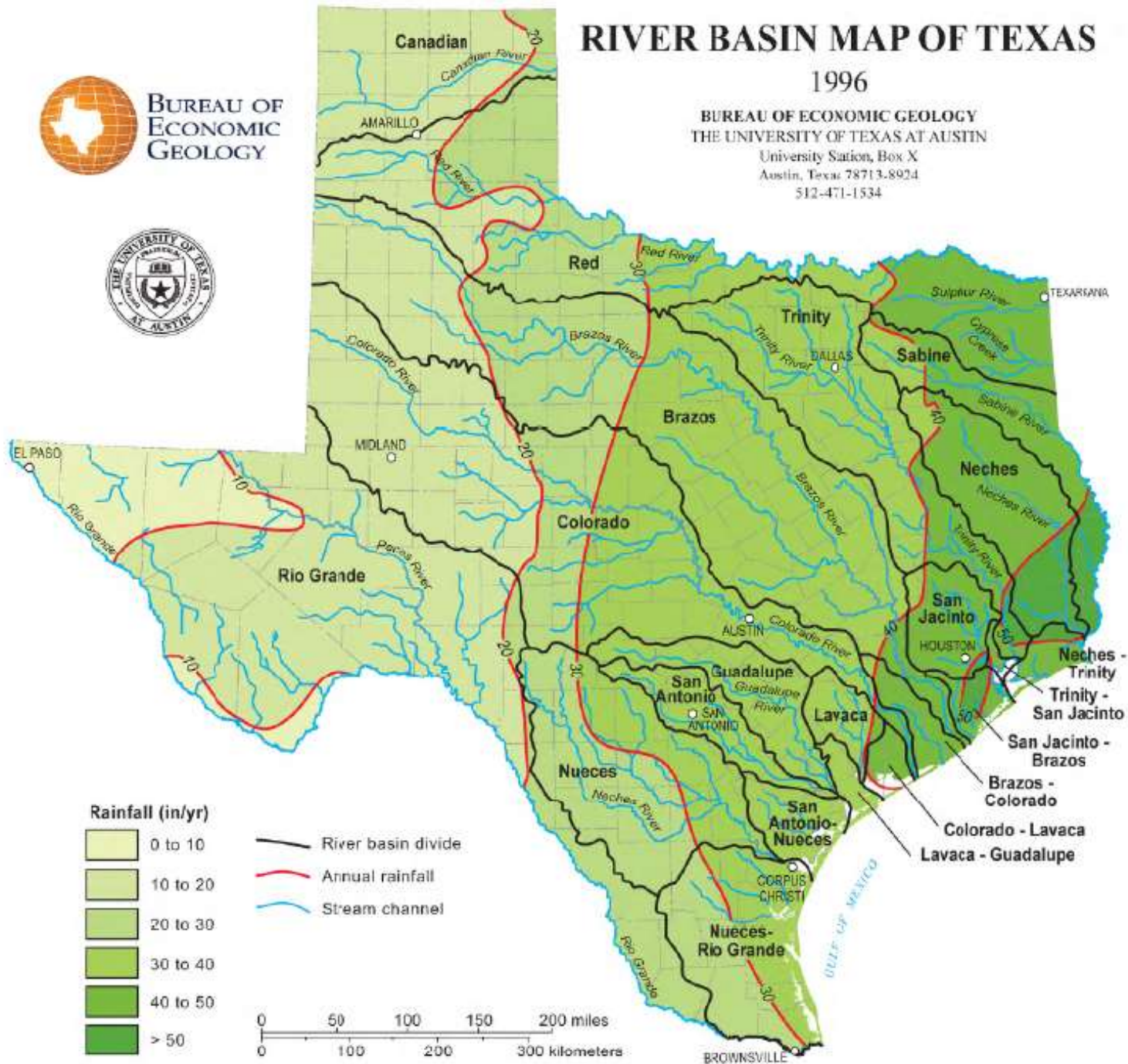
Texas Rainfall Gradient

El Paso 9.7"

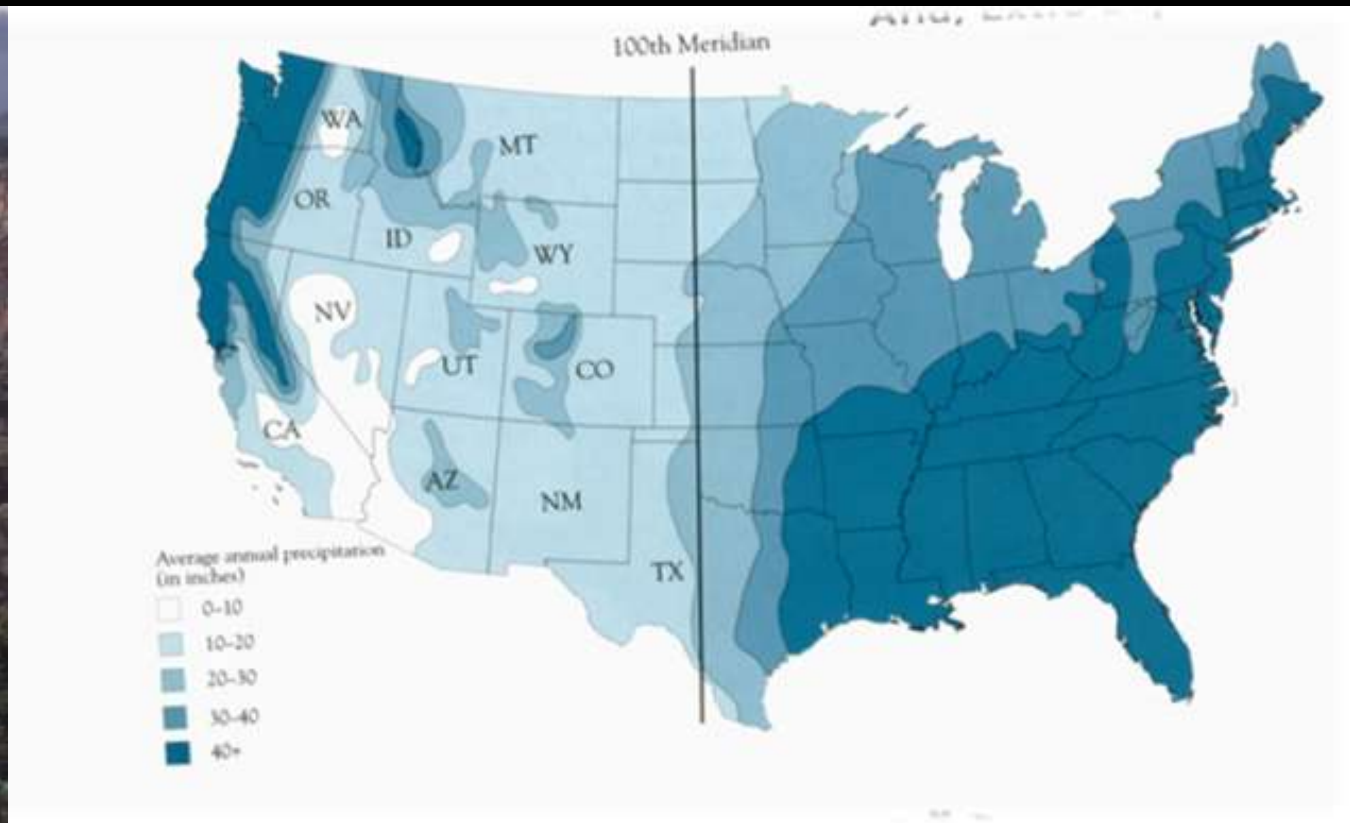
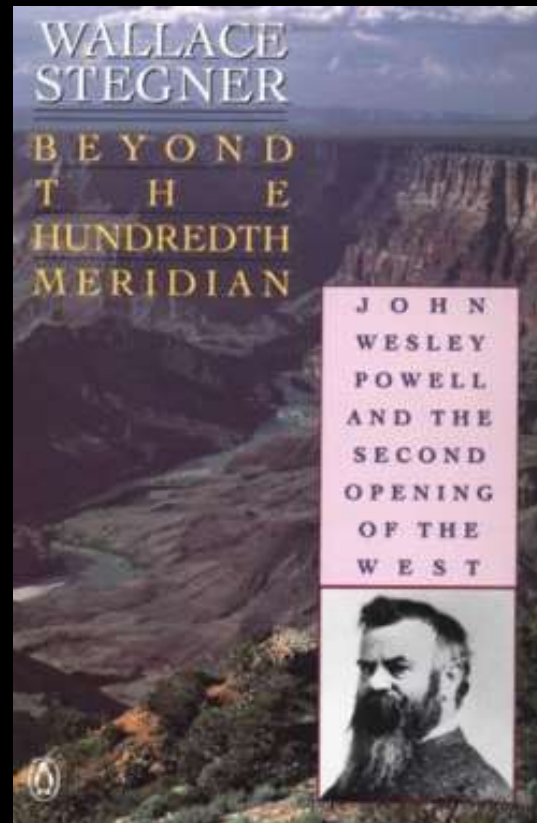
Austin 34"

Houston 45"

Beaumont 60"



Beyond the 100th Meridian and The Great American Desert



Report on the Lands of the Arid Regions of the United States 1878

Arid West was not suitable for agricultural development, except for 2% of the lands near water sources.

Irrigation systems and state boundaries based on watershed areas to avoid “squabbles”.

For the remaining lands, he proposed conservation and low-density, open grazing.

Railroad Empire to Hydraulic Empire - "Rain follows the plow"

Railroad companies owned vast tracts of lands granted in return for building the lines, did not agree with Powell's opinion.

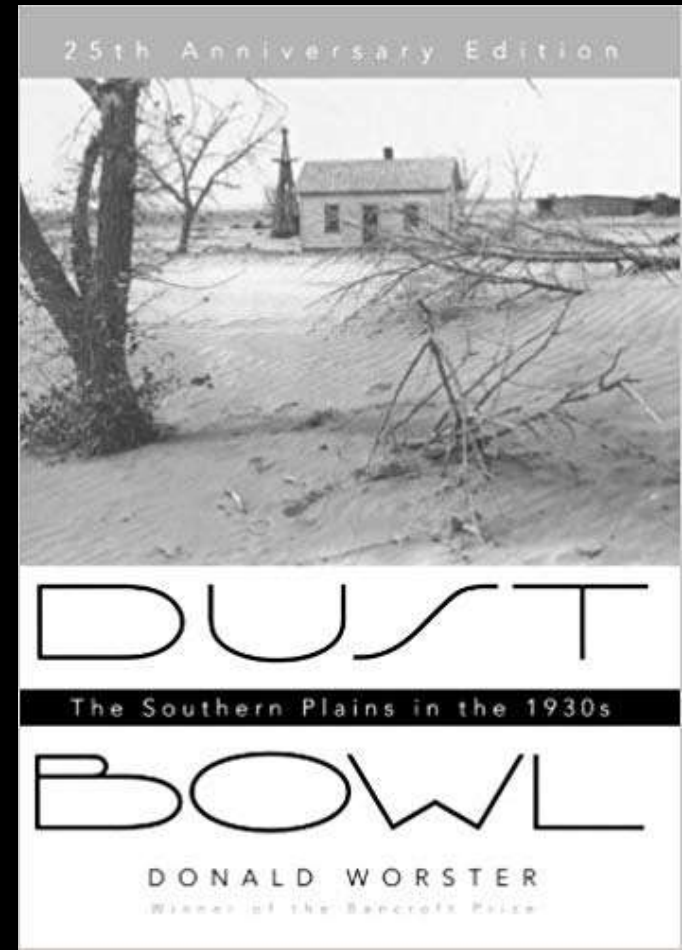
They insisted that agricultural development of land causes arid lands to generate higher amounts of rain - agriculture "is the instrument which separates civilization from savagery; and converts a desert into a farm or garden. ... To be more concise, Rain follows the plow."





DUST STORM - PERRYTON, TEXAS. APRIL 14, 1935
NO. 4
K^oe PERRY STUDIO - PERRYTON, TEXAS

At an 1883 irrigation conference, Powell declares –
"Gentlemen, you are piling up a *heritage of conflict* and litigation over water rights, for there is not sufficient water to supply the land."



The Heritage – 1883-1903

“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.”

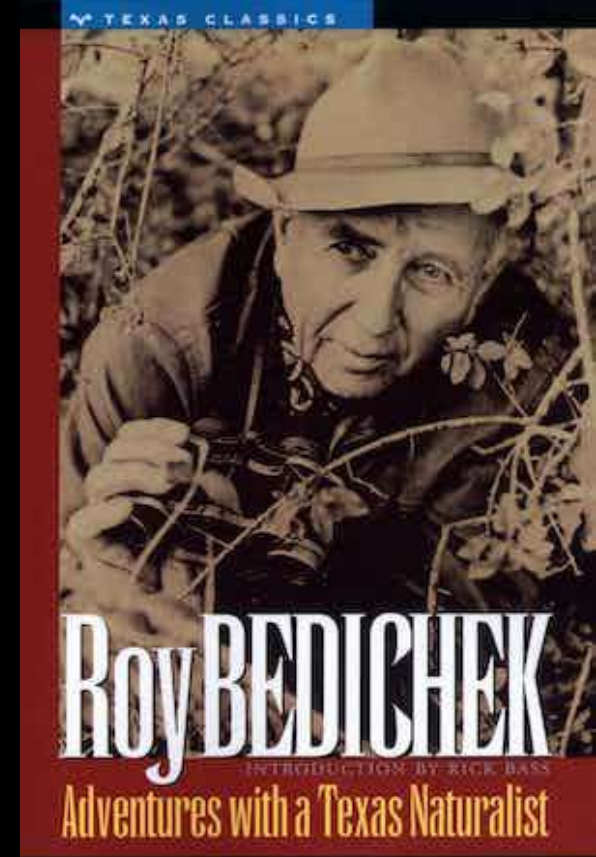
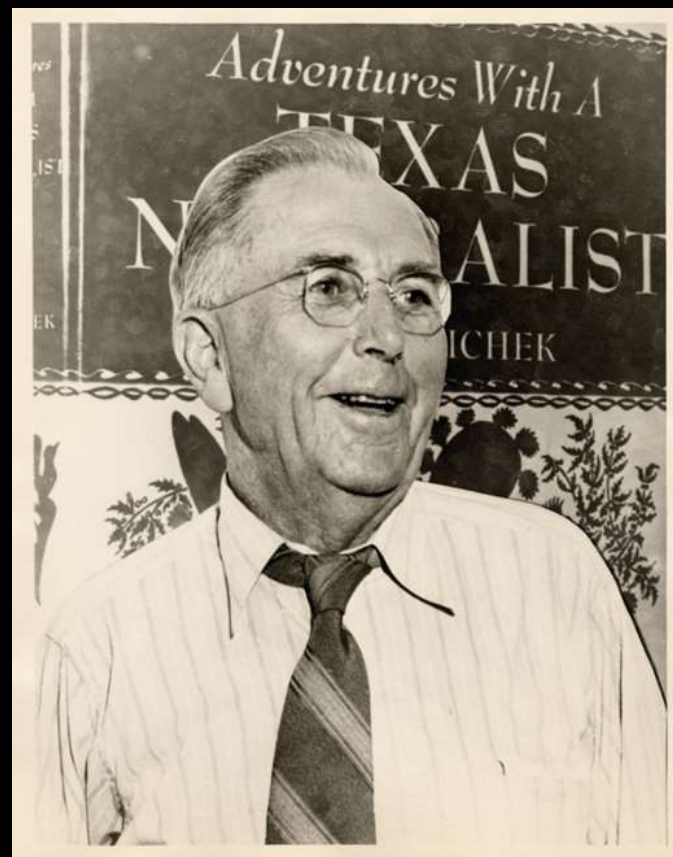
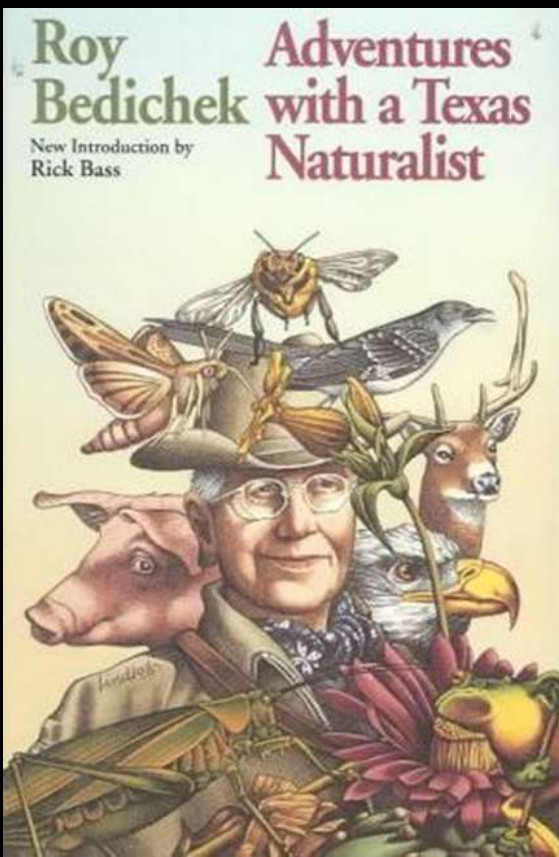


The Prophet of Texas Nature/Ecology

The Best Texas Nature/Ecology Book

Published 1947

(when Bedichek was 69)



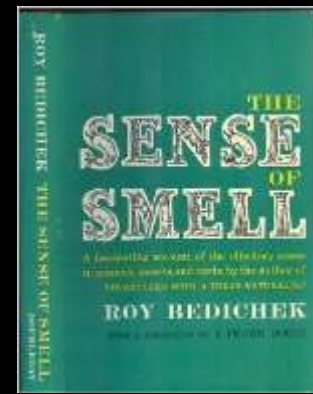
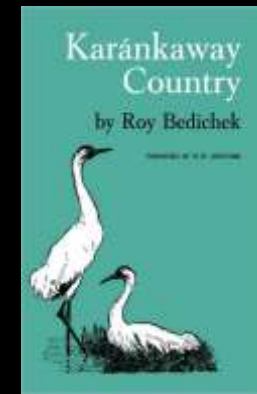
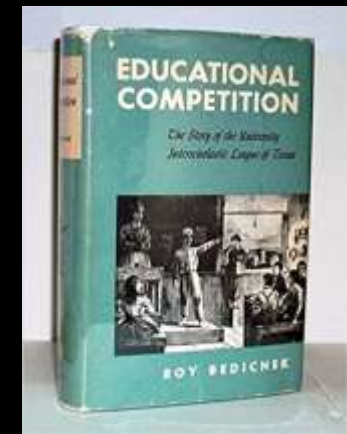
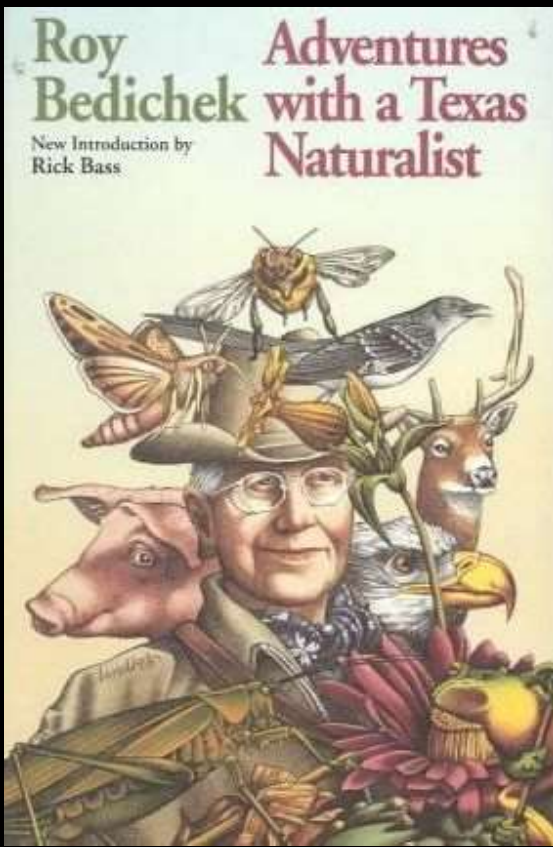
Texas Nature and Roy Bedichek (1878-1959)

Adventures with a Texas Naturalist (1947)

Karankaway Country (1950)

Educational Competition: The Story of the University Interscholastic League of Texas (1956)

The Sense of Smell (posthumous 1960)



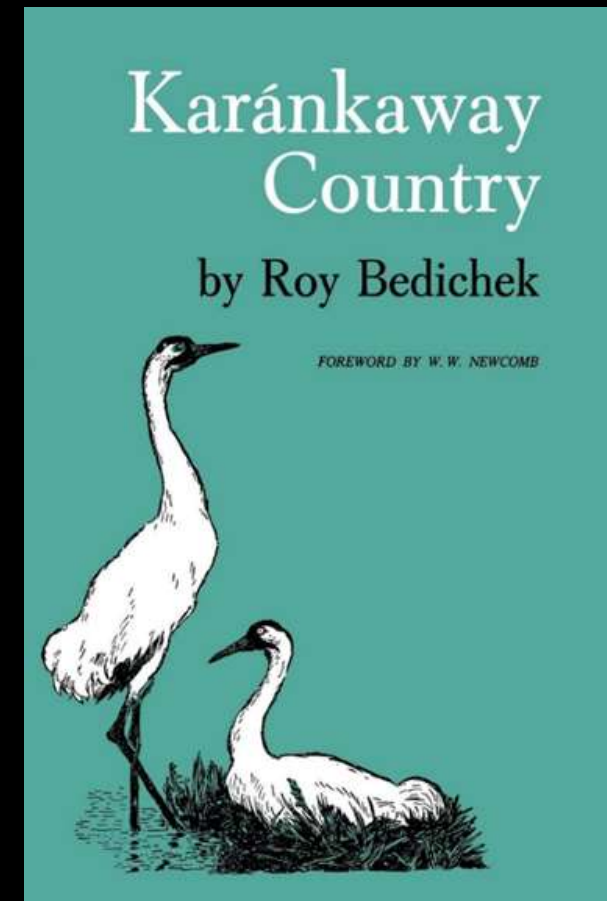
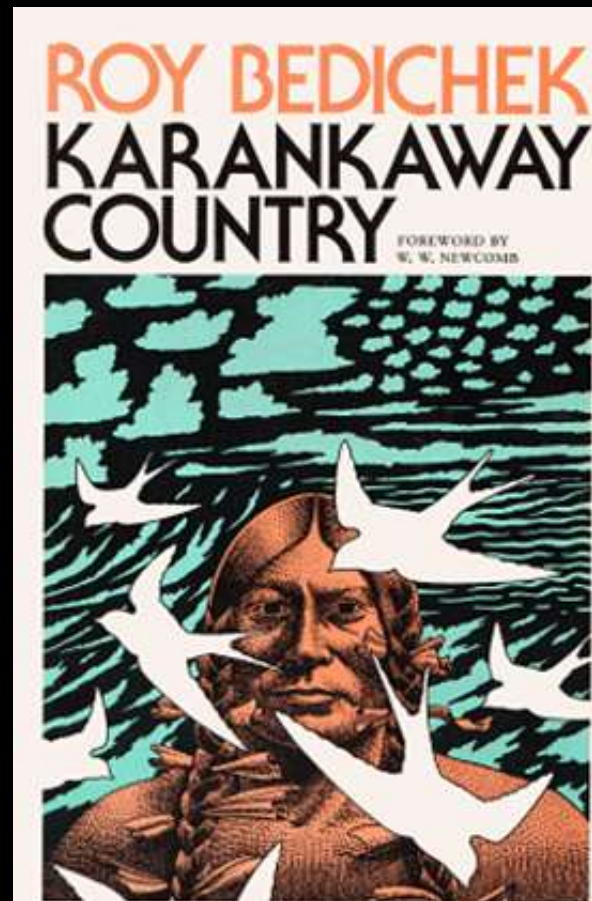
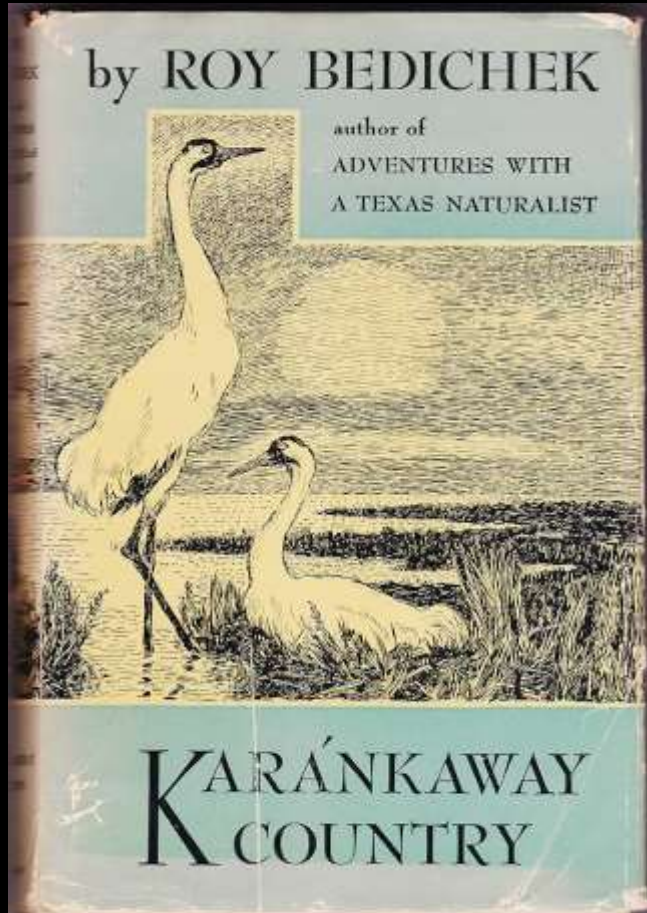
The Best Texas Rivers Book



“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.”

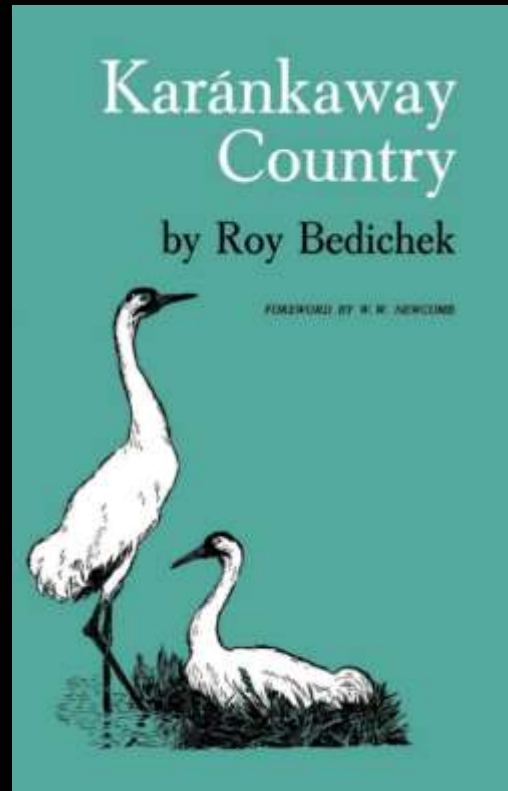
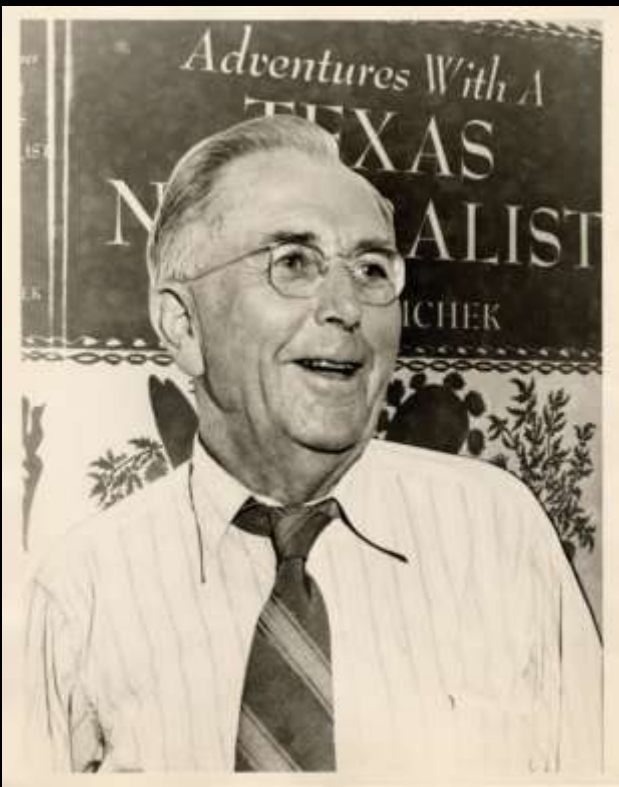
The Texas Institute of Letters Collins Award for the best Texas book of 1950

An “Environmental” Book – Political and Polemical



A Polemic about Texas River/Water Management and Ecology

- “Texas rivers were once truly ‘rivers of life.’”
- “The river is a living organism, or at least it presents characteristics so similar to those of a living organism that to speak of it as such is more than mere metaphor.”
- “A river system is one of Nature’s units, and it must be dealt with as such if it is to be dealt with successfully for serving human needs.”
- “Texas has a river unity which invites unified treatment of Texas rivers”



Bedichek the Polemical Ecologist – The Balance of Nature

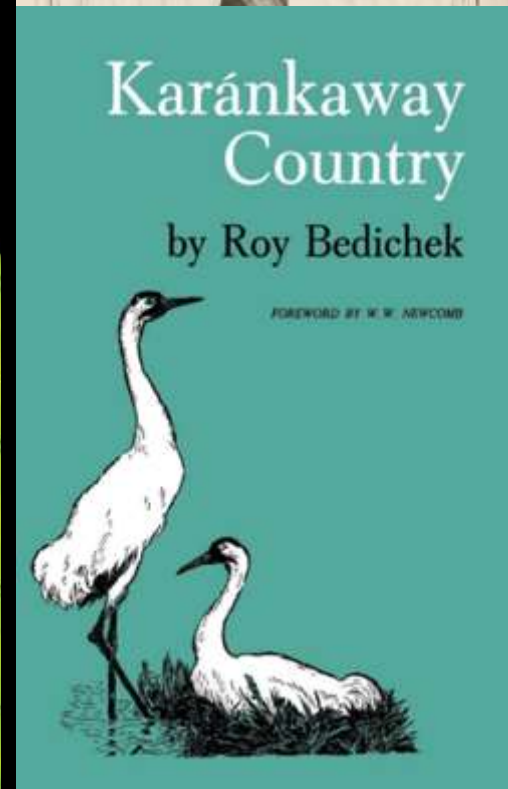
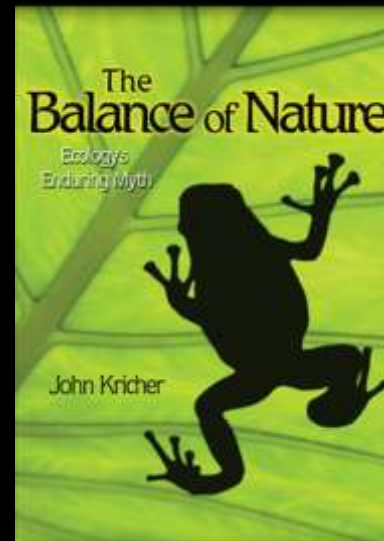
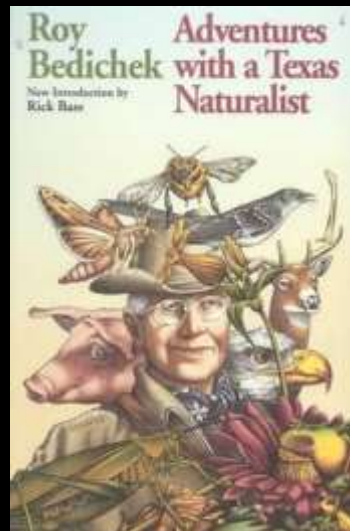
“I found a generous naturalist here who was quite disturbed over trapping, shooting, and otherwise interfering with what he chose to call, with great reverence, ‘the balance of nature’.

The trouble is that the ‘balance of nature’ is *a false figure of speech*, and we find little in reality corresponding to the popular conception of ‘a balance’.

Nature red in tooth and claw, that is, competitive; or Nature at peace, that is co-operative; or Nature in alternating moods, or, at one and the same time, competitive and co-operative (her normal condition), *is only in rare instances in balance for any extended period.*”

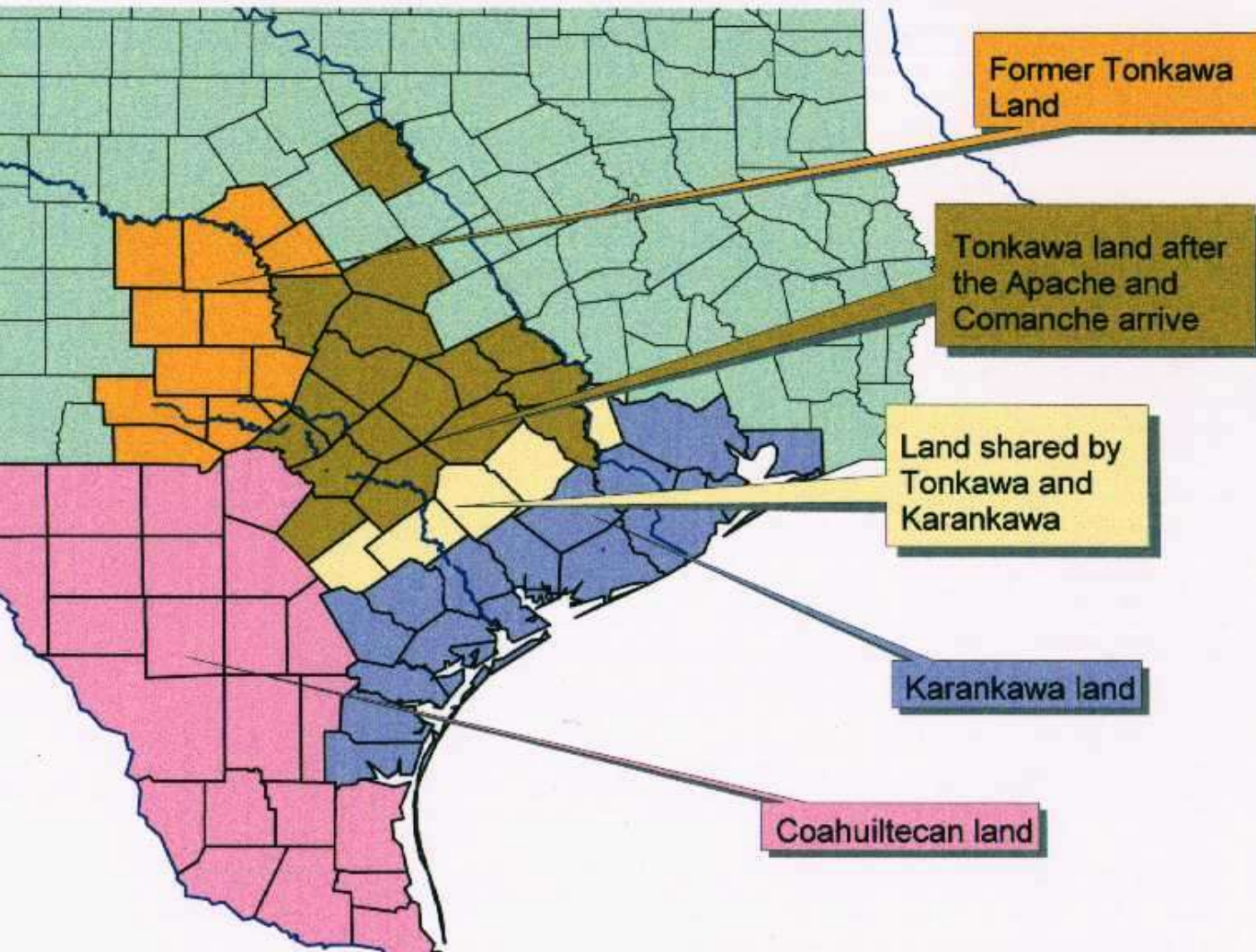
“Once man enters, there is no such thing as letting ‘Nature take her course’.”

“Cooperatives” Chapters in

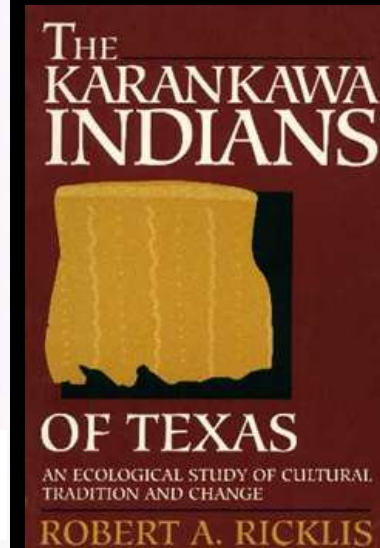
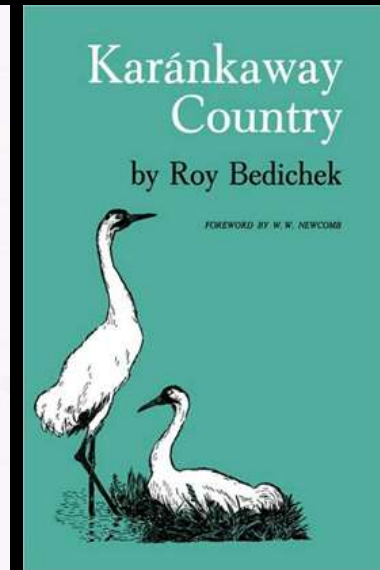


Bedichek the Polemical Anthropologist

“The Karánkaways are gone. Only bitter memories of them remain. In the minds of our people they are eternally damned, largely because they refused a culture we offered..”



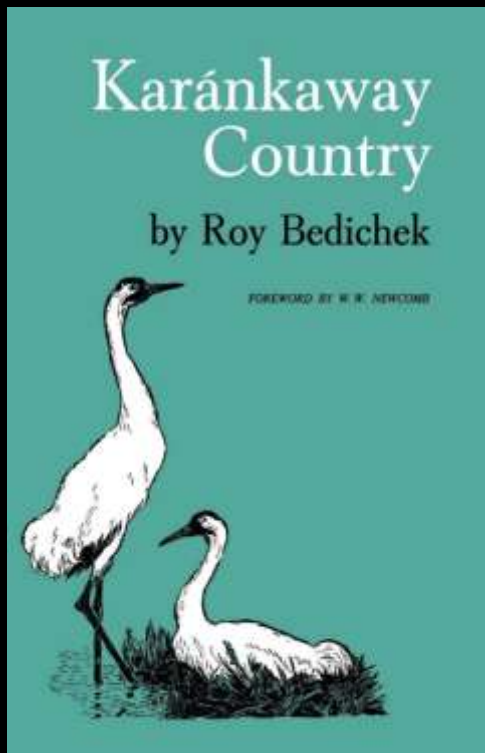
The Karánkawa Country



The Colorado and The Brazos

“The two longest rivers in Texas empty in the Karánkaway Country only fifty miles apart. Their drainage basins spread out to a width of 250 miles to take in the very heart of the state, and finally come again within shouting distance of each other at their sources, six hundred miles as the crow flies from the Gulf.

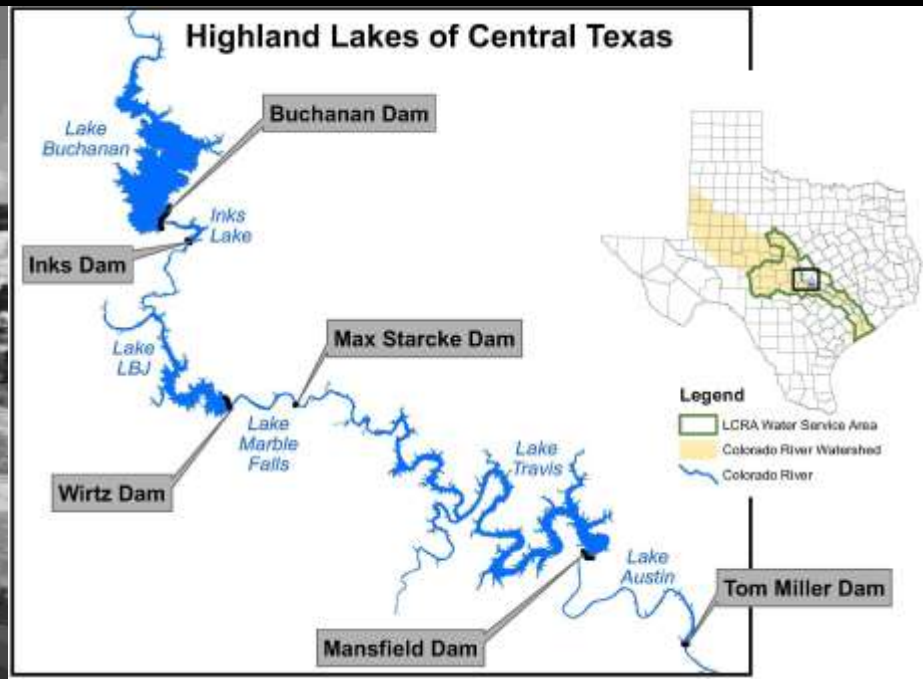
Each delivers an immense burden of silt; and extensive impounding and hydroelectric developments have been completed along their courses, with others in progress, and much more on paper. These are my reasons for selecting this Karánkaway Country for observation...”



Polemical - The Big Waters People - Dams 1930-1950

“It is a mistake to assume that the big dams catching water from eroded and still eroding watersheds store more than was stored in the days when natural forces detained rainfall in the highlands and let it gradually leak away. Compared with the original uses to which rainfall on Texas watersheds was put, big dams merely salvage rather than conserve.

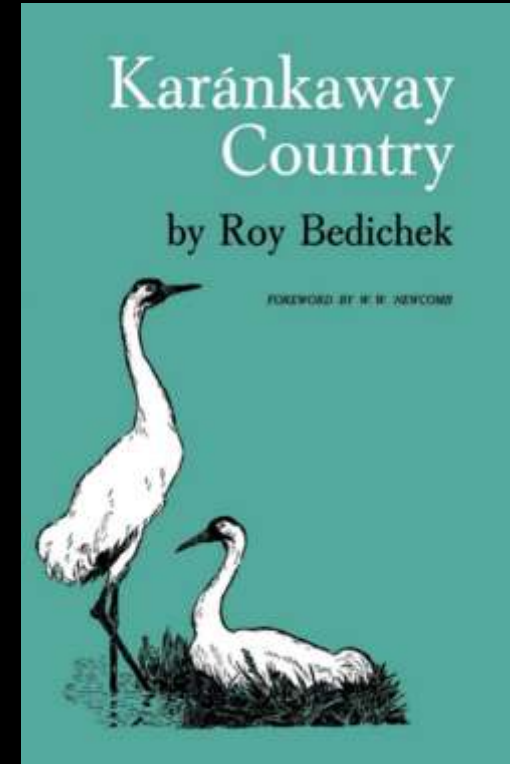
We have relocated the reservoir and changed its character, each for the worse.”



The Watershed as a Reservoir (the Sponge) – the Little Waters

“Under natural conditions, the whole expansive watershed was a giant sponge which was pressed by gravity ever so gently, ever so steadily, to drain its life-giving contents...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..”



Mismanagement – Texas Watersheds and the Brush/Cedar Problem

“I hear landlord and lease holder discussing brush clearance and quoting the learned bulletins of agricultural experimental stations, and when I see them readying the terrific machines for action, I can imagine the debouchment areas of the Nueces and of other Texas rivers *yawning for the gargantuan mouthfuls of soil* which have been detained in their place for the best part of a century by invasion of the despised brush.”



Mismanagement – Ecology and Watersheds

“Ignorance of the conservation function of brush has hung like a pall of smoke over popular thinking since remotest antiquity.

Land stripped of forest or of grass seems to know that nakedness is sin. It hastily grabs up anything within reach with which to cover its shame. (Weeds, invading shrubs, vines)...

Nature abhors an organic vacuum as much as she does an inorganic one.”

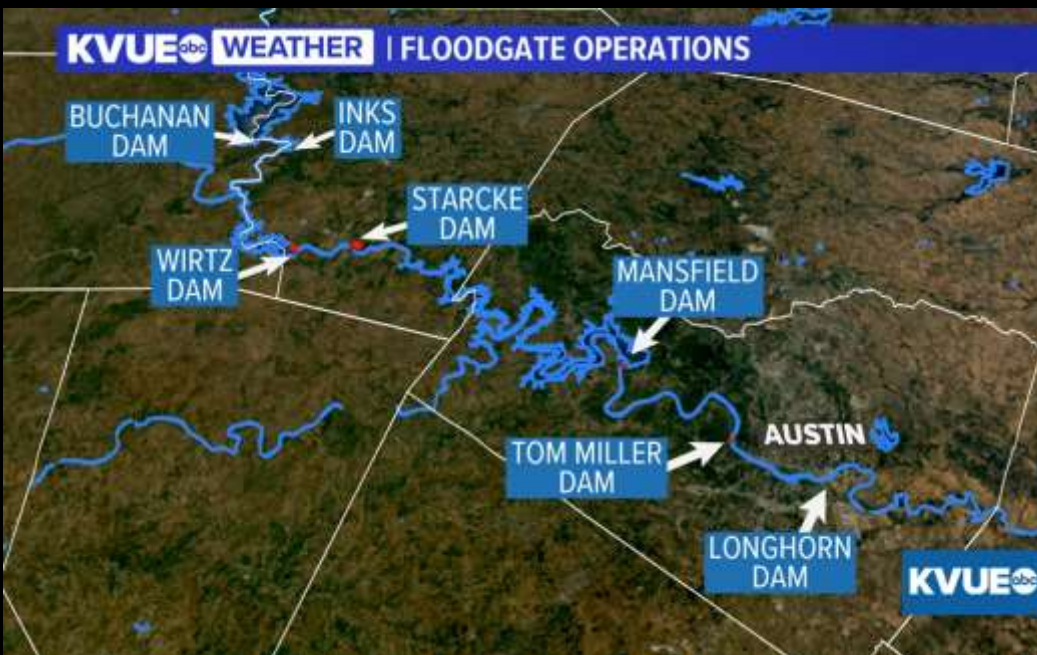


The Little Waters People

“The Little Waters people simply propose to reinstate Nature’s plan in so far as it can now be re-established...

Floods came then as now – ten, fifteen inches of rainfall in a day over limited space – but the soil, well covered, took no pounding, and waterways were lined with vegetation which cushioned the assaults and tamed the rage of plunging waters.”

“The attack upon river systems embodied in some of the ‘conservation’ plans represents the typical attitude of the white man toward his natural environment, hostile and arrogant rather than gentle and cooperative...”



The Hydrological Argument – River Systems as Nature’s Units

“A river system is one of Nature’s units, and it must be dealt with as such if it is to be dealt with successfully for serving human needs.”

“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.”

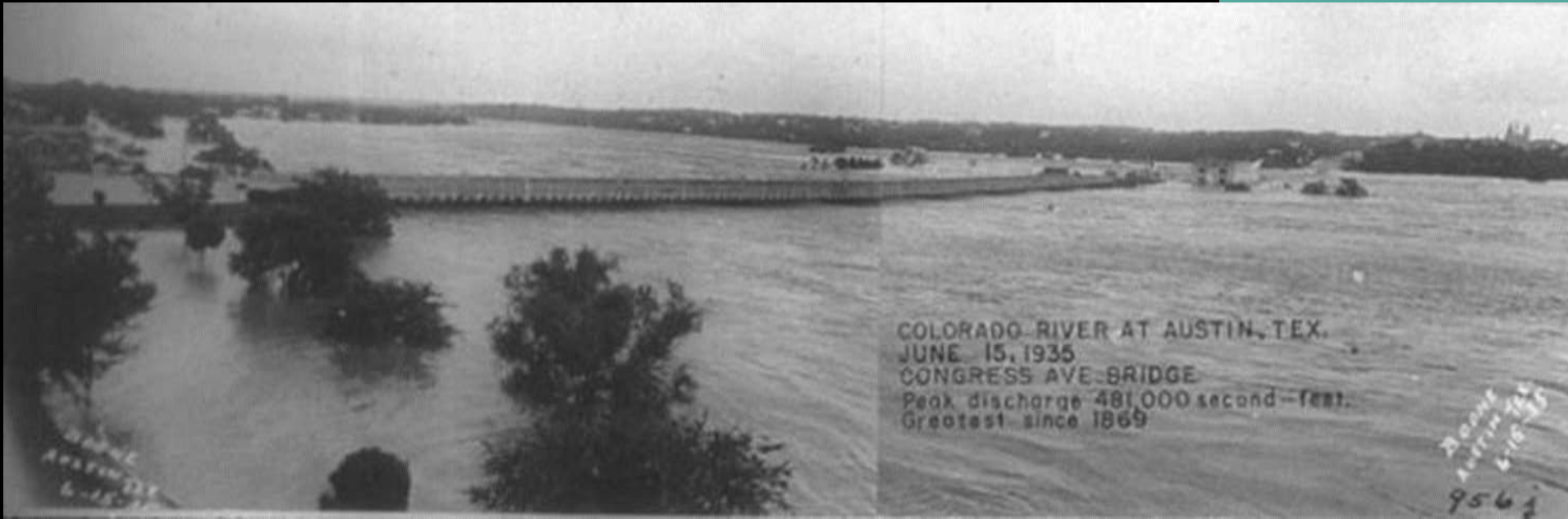
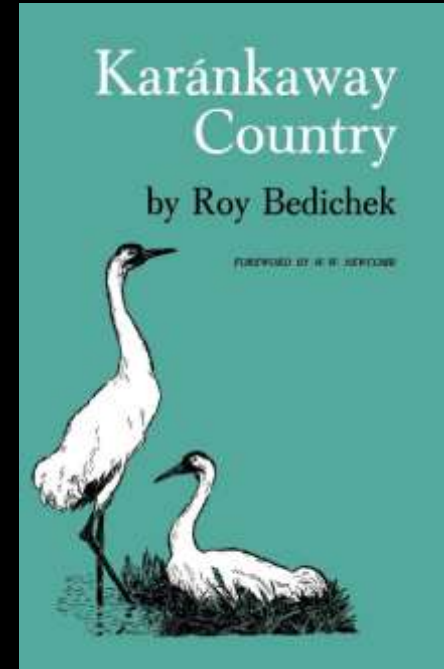


Controlling Texas Rivers - Bedichek's Warning from 1950

“A river is not a colt to be ‘broken,’ trained, stalled, and depended upon thereafter to do the will of his master. It is eccentric, unaccountable, either has no law of behavior or often keeps it secret from human investigators.

Centuries, even, do not delimit its extremes.”

“In spite of its cinema reputation, Texas is not tough, that is, ecologically. It is really a tender land, and cannot stand the buffetings that certain other areas of the world have endured and still support a human population in health and vigor.”



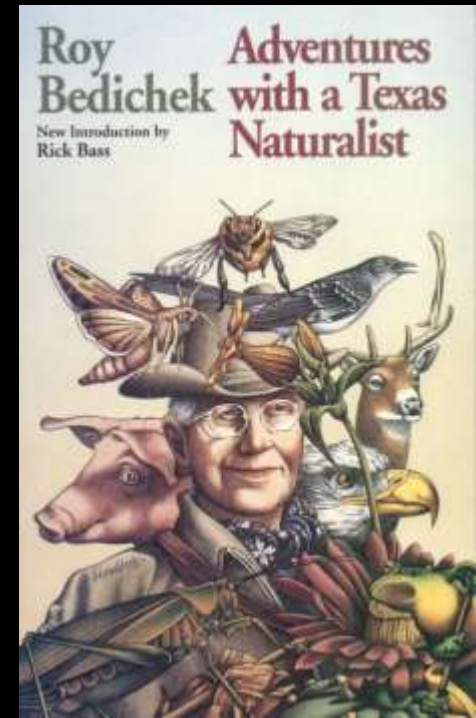
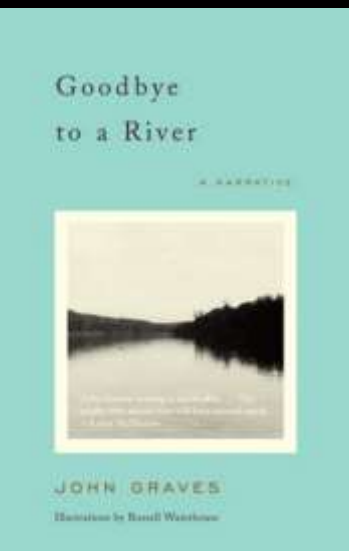
KERA Film *Roy Bedichek's Vanishing Frontier* 2003

Rob Tranchin, Co-Producer/Writer/Director

This documentary is a look at the relationship between people and the natural world.

This modern day road trip guided by the observations of Texas naturalist Roy Bedichek offers an appreciation of the ways people respond to the daily invitation to learn from the natural world around them.

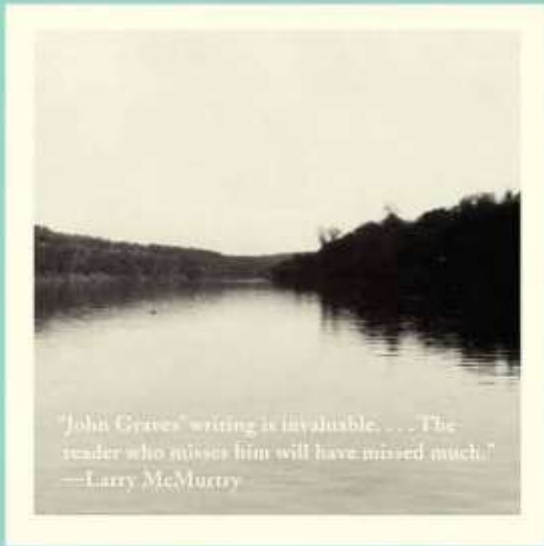
As he revisits the sites that were both points of inspiration and observation for Bedichek, Tranchin crosses paths with noted writer John Graves, author of *Goodbye to a River*



One More Essential Book about a Texas River (and Dams)

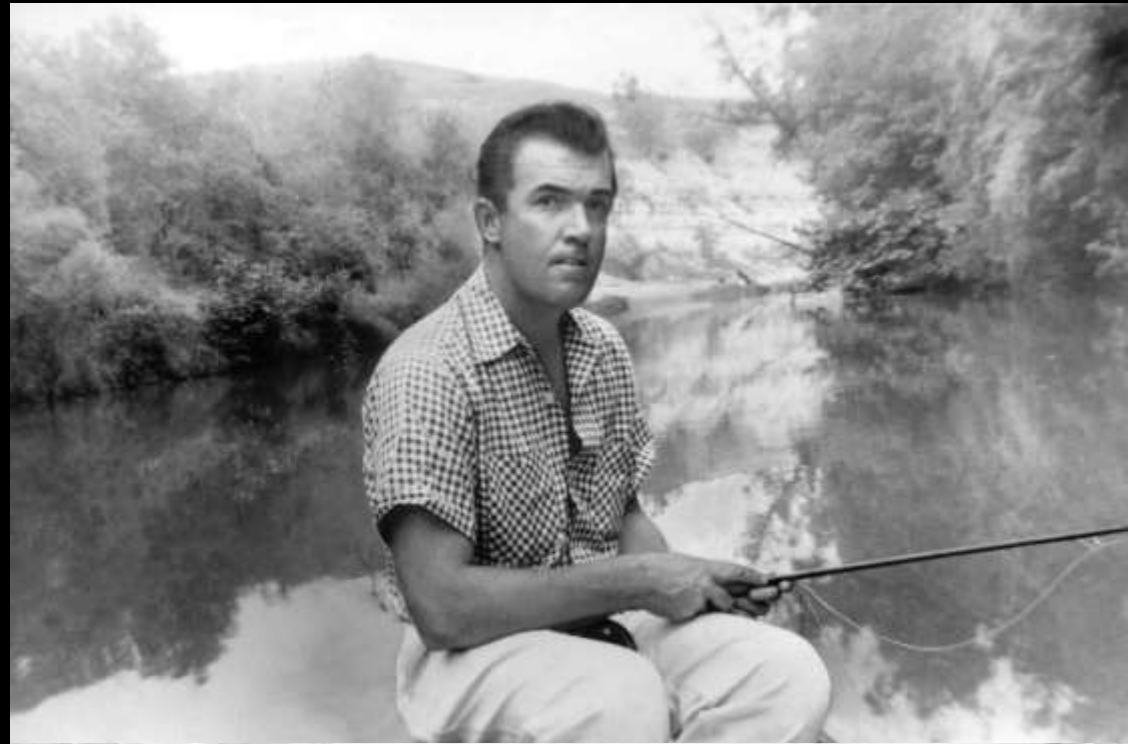
Goodbye to a River

A NARRATIVE



JOHN GRAVES

Illustrations by Russell Waterhouse

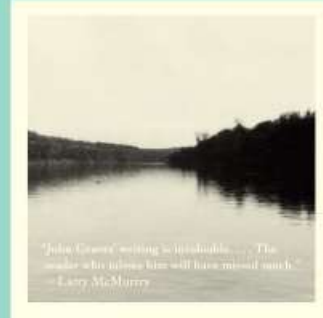




John Graves
1920-2013

Goodbye
to a River

A NARRATIVE



JOHN GRAVES

Illustrations by Russell Waterhouse

Goodbye to a River (1960)

“One river, seen right, may well be all rivers that flow to the sea...”

Won the Collins Award of the Texas Institute of Letters in 1961

Finalist for National Book Award



Other books by John Graves

Hard Scrabble [1974]

From a Limestone Ledge [1980]

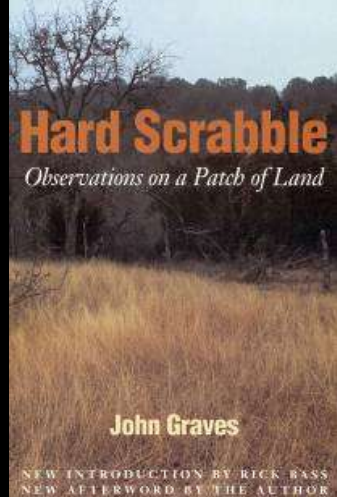
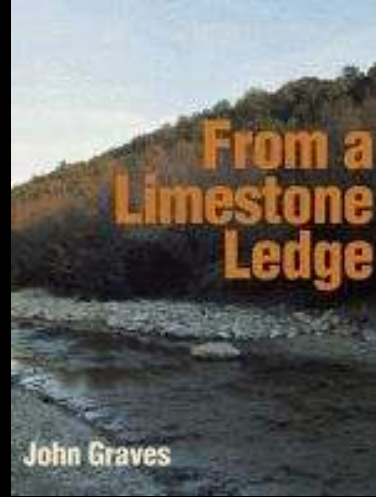
Self Portrait, with Birds [1991]

A John Graves Reader [1996]

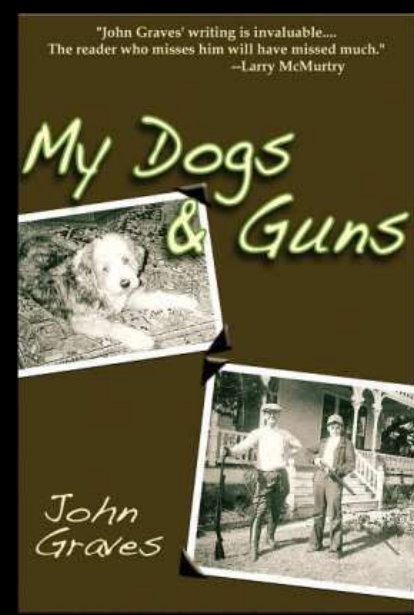
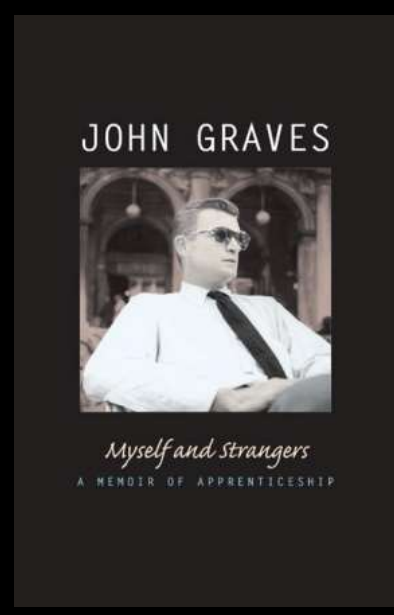
John Graves and the Making of Goodbye to a River: Selected Letters [2002]

Myself and Strangers [2004]

My Dogs and Guns [2007]



...om I admire greatly. I lived
...et him, mainly because I could
...g around and bothering him in
...ght one up. **John Graves**
and the Making of
... a Robert at the Marcouses' the
...-museum fellow. That was quite
...ose of us who tend toward quiet
...ay much to one another. It is
Goodbye to a River:
Selected Letters, 1957-1960
...ok and the samples you send at
...ask that it have fallen into me
...identally, it is I who caused
... "Good-bye." That was my origi
...nd they revised it to "Good-by
...Knopf's editing was extremely
...ry minor head-butting contest
...out most of the changes in punc
...what I'd had in the be inning.
...ne, from one alternative corre
...; but in this case I went on
...because it is in the title. Th
...I think it has to do with the
...th ye." I note that even aft
...ained the inserted hyphen, bu



"John Graves' writing is invaluable....
The reader who misses him will have missed much."
-Larry McMurtry

A Literary Personal History

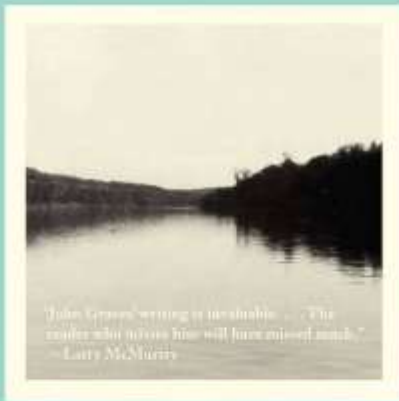
With a dachshund on his lap and a paddle in hand, Graves launched his canoe from just below Possum Kingdom Lake in November 1957.

He wanted to connect with the primitive beauty and frontier history of the Brazos River before proposed dams downstream forever altered the river's natural flow and surroundings.



Goodbye to a River

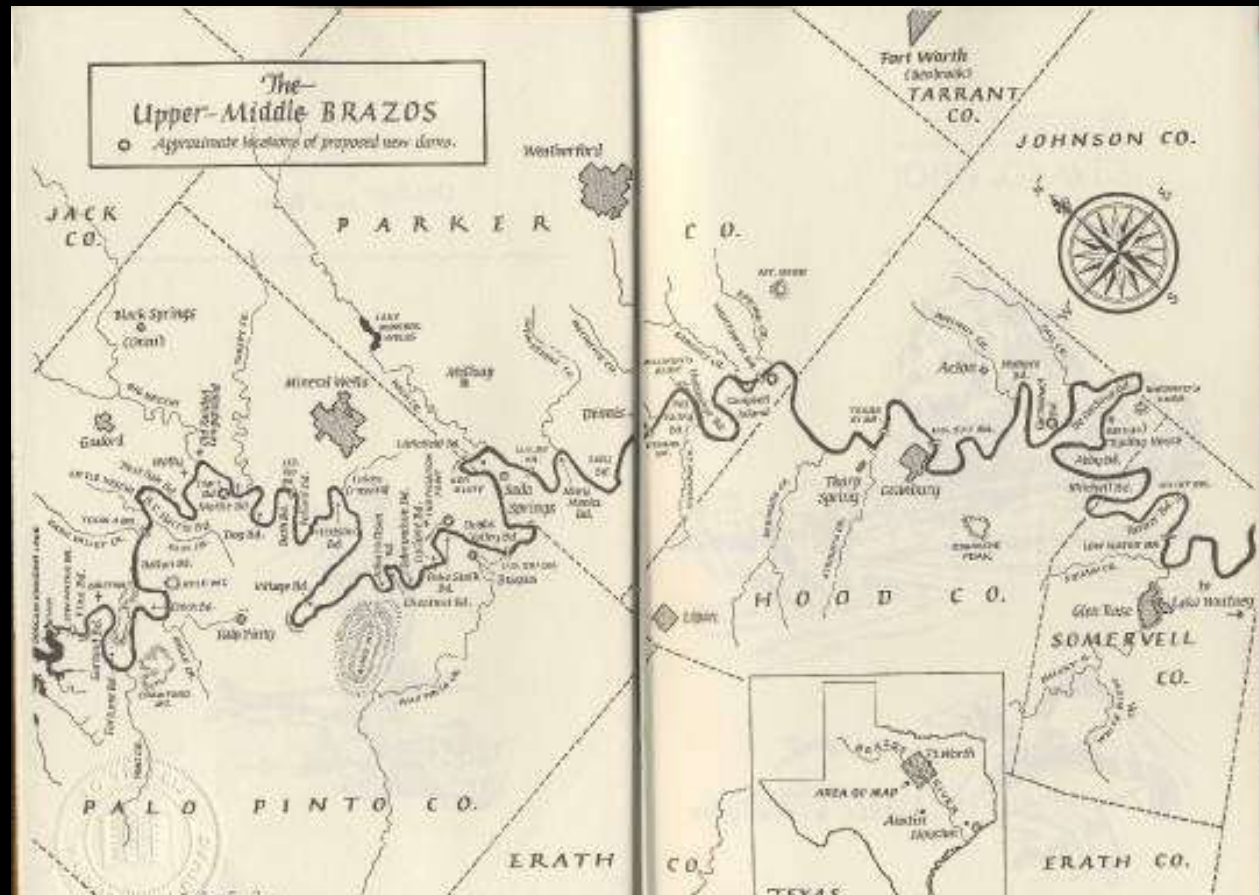
A NARRATIVE



"John Graves' writing is invaluable. . . The reader who picks this up will have missed much."
— Larry McMurry

JOHN GRAVES

Illustrations by Russell Waterhouse



Quest for Self-Understanding: His People – His Texas

“Mankind is one thing; a man’s self is another. What that self is tangles itself knottily with what his people were, and what they came out of.

Mine came out of Texas, as did I...If those were louts, they were my own louts.

They were the cutting edge of a people whetted sharp to go places, to wear things out and move on, to take over and to use and to discard.

The hills are not rich country, not since the old ones cottoned out the flat places and grazed out the slopes, and the topsoil went on down the Brazos, and the cedar moved in thick and sullen, letting nothing grow beneath it. That happened so long ago that a whole, spare, organic way of life has had time to grow up around the cedar itself, and even in the thirties only a few ancients recollected scraps of the brief richer time.”



Goodbye
to a River

A NARRATIVE



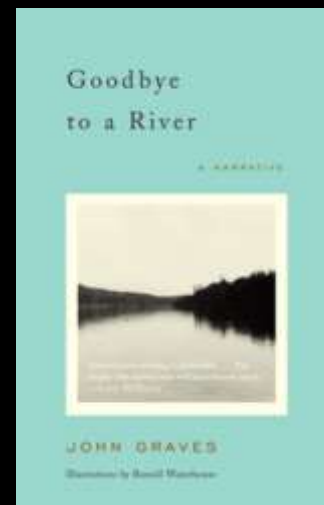
JOHN GRAVES

Illustrations by Russell Westmore

Shadowed Inheritance (Bedichek?)

“Neither a land nor a people ever starts over clean. Country is compact of all its past disasters and strokes of luck—of flood and drouth, of the caprices of glaciers and sea winds, of misuse and disuse and greed and ignorance and wisdom—and though you may doze away the cedar and coax back bluestem and mesquite grass and side-oats grama, you're not going to manhandle it into anything entirely new.

It's limited by what it has been, by what's happened to it. And a people, until that time when it's uprooted and scattered and so mixed with other peoples that it has in fact perished, is much the same in this as land. It inherits.”



The Real Whole River

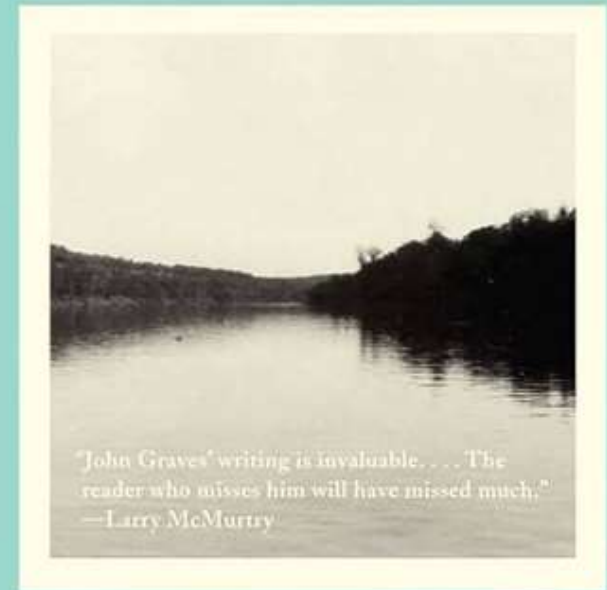
“A whole river is mountain country and hill country and flat country and swamp and delta country, is rock bottom and sand bottom and weed bottom and mud bottom, is blue, green, red, clear, brown, wide, narrow, fast, slow, clean, and filthy water, is all kinds of trees and grasses and all the breeds of animals and birds and men that pertain and have ever pertained to its changing shores, is a thousand differing and not compatible things in-between that point where enough of the highland drainlets have trickled together to form it, and the wide, flat, probably desolate place where it discharges itself into the salt of the sea.

It is also an entity, one of the real wholes, but to feel the whole is hard because to know it is harder still.”

(Bedichek?)

Goodbye to a River

A NARRATIVE



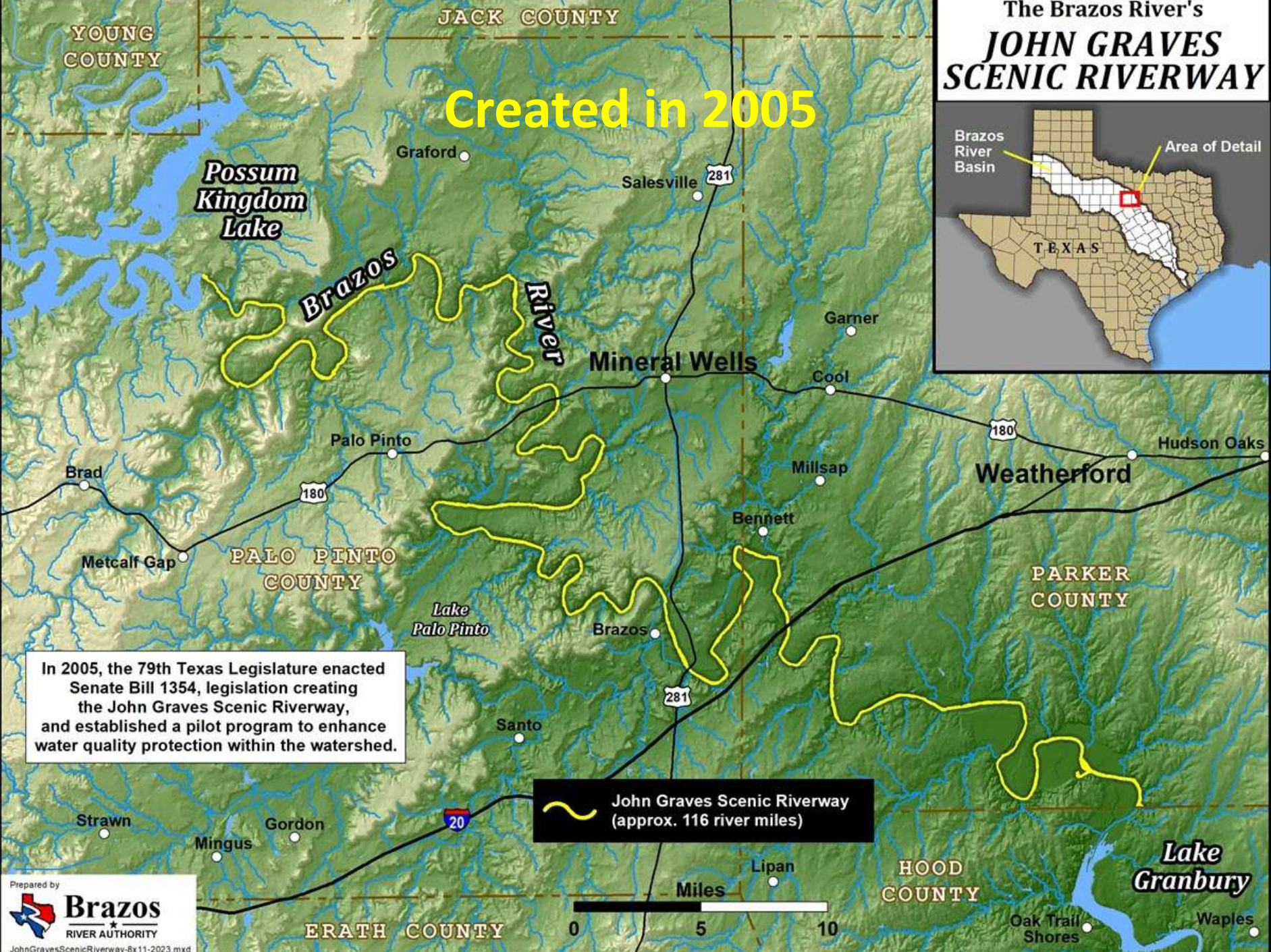
"John Graves' writing is invaluable. . . . The reader who misses him will have missed much."
—Larry McMurtry

JOHN GRAVES


Illustrations by Russell Waterhouse

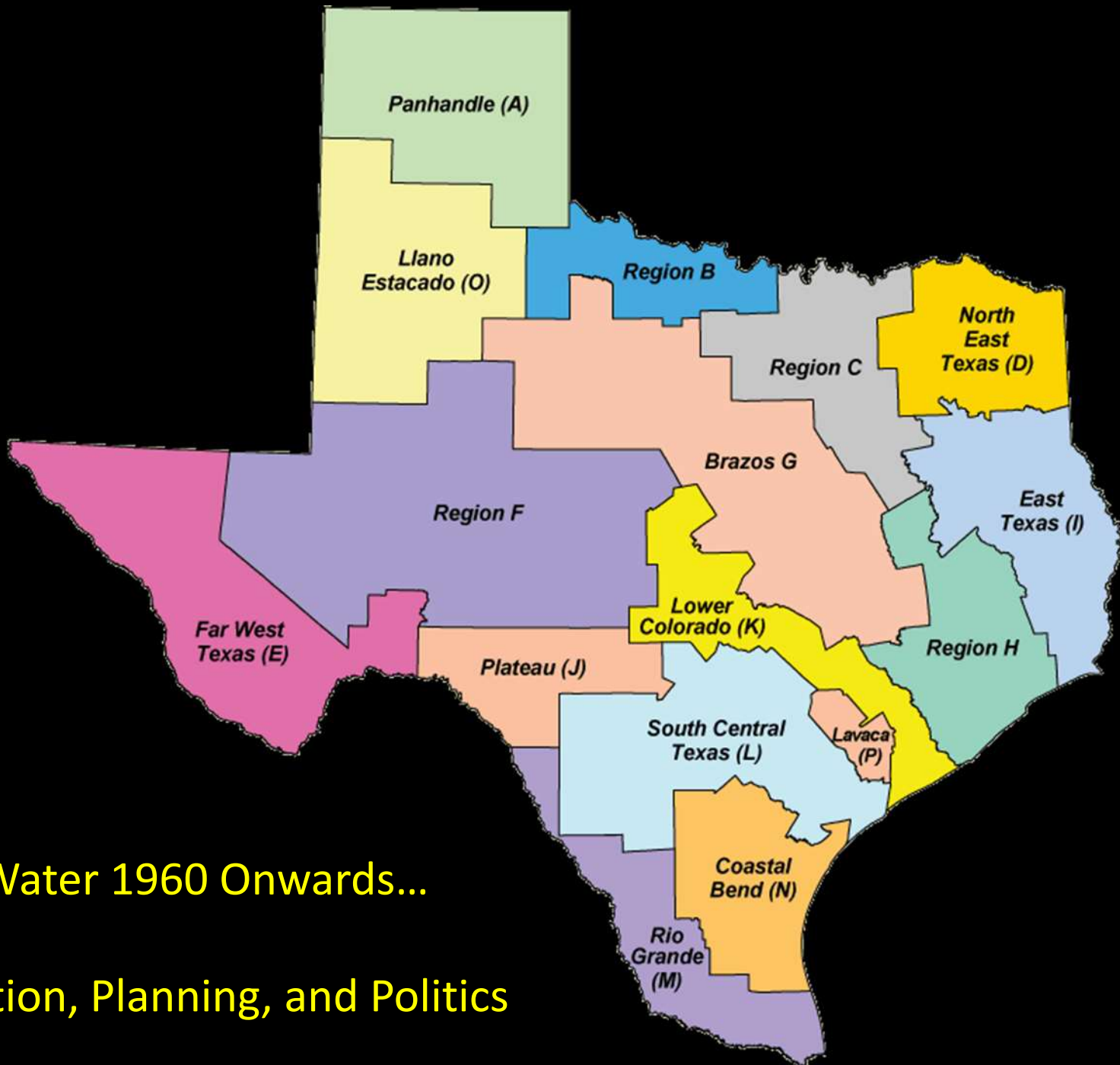
The Brazos River's
**JOHN GRAVES
SCENIC RIVERWAY**

Created in 2005



In 2005, the 79th Texas Legislature enacted Senate Bill 1354, legislation creating the John Graves Scenic Riverway, and established a pilot program to enhance water quality protection within the watershed.

 John Graves Scenic Riverway
(approx. 116 river miles)



Texas Water 1960 Onwards...

Protection, Planning, and Politics

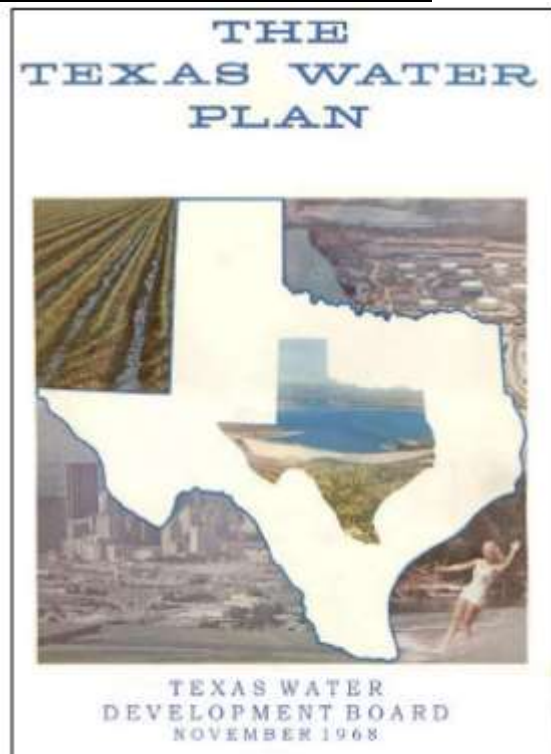
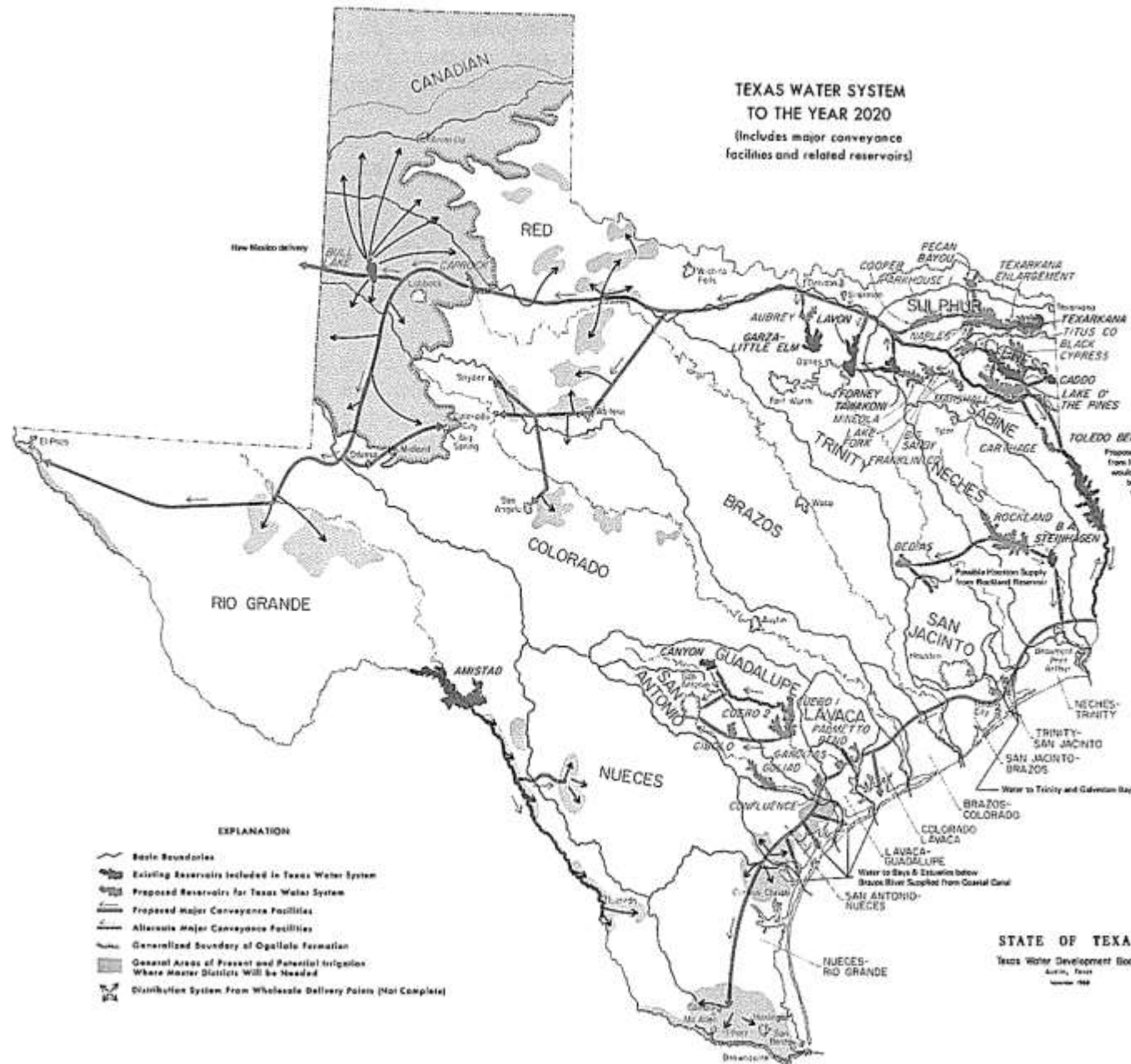
SUMMARY OF FAILED TEXAS RIVER PROTECTION BILLS

Texas 20th Century Failures

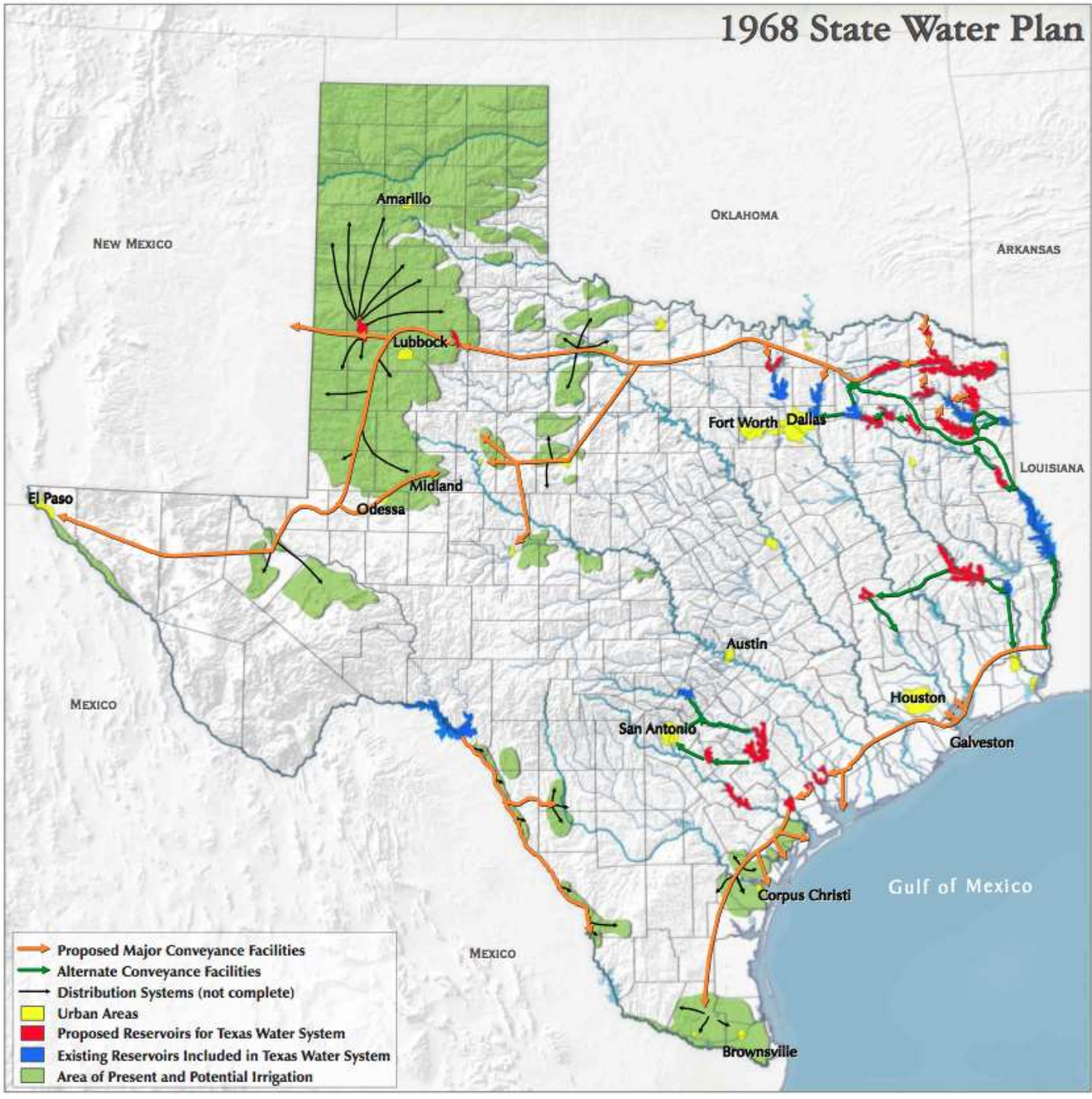
Proposed Legislation	# of River Segments Designated	Classification System	Prohibited Uses of Designated Rivers	Riparian Land Protection Mandated	Riparian Landowner Incentives	Funding Mechanisms
1969 Natural Rivers Act	16	All segments designated as natural river areas	Dams and other projects	Yes	Tax incentives for easements	Donations, appropriations
1971 Natural Rivers Act of Texas	1	All segments designated as natural rivers	Not specified in the legislation	Yes	Tax incentives for easements	Gifts, grants
1973 Natural and Scenic Rivers Act	0	All segments designated as natural and scenic rivers	Channelization, clearing/snagging, reservoirs, channel realignment	Not specifically required, but condemnation authorized	Normal riparian activities not affected- no incentives	Gifts, grants
1973 Texas Public Rivers Act	Generally applicable to all navigable inland waterways	Not specified in the legislation	Construction of navigation barriers	Not specifically required, but condemnation authorized	Landowner rights not affected- no incentives	Not specified
1987 Texas Rivers Conservation Act	13	Segments designated as wild, scenic or recreational	Channelization, clearing/snagging, reservoirs, channel realignment	No	Landowner rights not affected- no incentives	Texas rivers conservation fund, donations, watercraft tag fees
1989 Texas Rivers Protection Act	3 with 4 more potential segments to be studied	All segments designated as protected river segments	Channelization, reservoirs, channel realignment	No	Landowner rights not affected- no incentives	Not addressed
1991 Texas Rivers Protection Act	2	All segments designated as protected river segments	Channelization, reservoirs, channel realignment	No	Landowner rights not affected- no incentives	Grants, donations
1993 San Marcos River Protection Act	1	Not specified in the legislation	Channelization, reservoirs, channel realignment	No	Landowner rights not affected- no incentives	Grants, donations
1995 San Marcos River Protection Act	1	Not specified in the legislation	Large scale channelization	No	Landowner rights not affected- no incentives	Grants, donations

Interbasin Transfers

In 1968 the Texas Water Development Board published the Texas Water Plan to prepare for 2020.



A major obstacle to implementation was a Bureau of Reclamation and the Mississippi River Commission 1973 report, which found that excess water is available from the Mississippi River, but concluded that, "while it is feasible to divert water from the Mississippi River to the High Plains, the cost of moving the water would be very high and the environmental impact to the Gulf of Mexico



- Proposed Major Conveyance Facilities
- Alternate Conveyance Facilities
- Distribution Systems (not complete)
- Urban Areas
- Proposed Reservoirs for Texas Water System
- Existing Reservoirs Included in Texas Water System
- Area of Present and Potential Irrigation

Living with the Trinity – KERA 2009

Rob Tranchin, Co-Producer/Writer/Director

Examines the period from 1965 to 1973 when the Trinity River was nearly transformed into a barge canal running from North Texas to the Gulf of Mexico.

It was to run from Fort Worth to the Gulf of Mexico so that DFW could claim to be an inland port—hundreds of miles from the sea.

It all hinged on a March 13, 1973 bond election 50 years ago – which the citizens rejected.



Texas Water Planning Regions

Texas has a river unity which invites unified treatment of Texas rivers - Bedichek

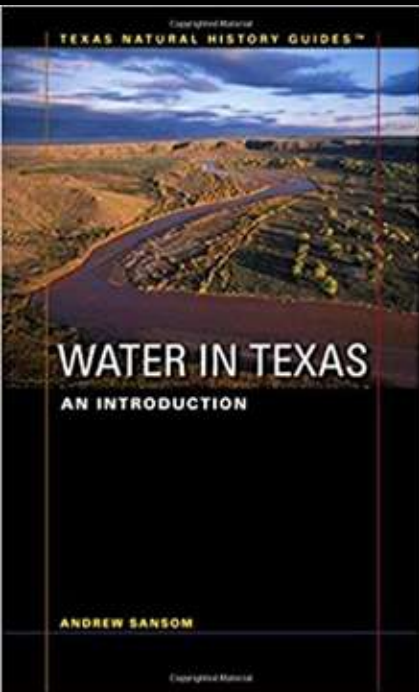


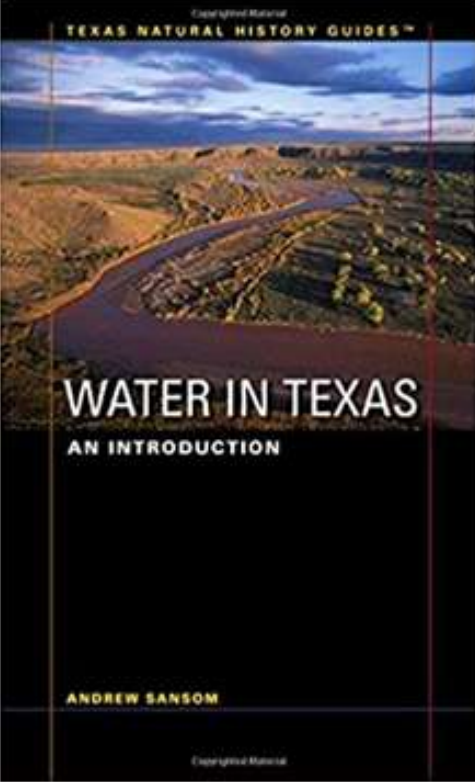
“In fact, some of our rivers are actually overappropriated; that is, if all the water permitted for use from them were withdrawn they would dry up.”

Water in Texas (2008) Andy Sansom

“By law the water in the rivers is considered the property of the people of Texas.

Today most of this water has already been spoken for through the granting of rights to it by the state of Texas.”

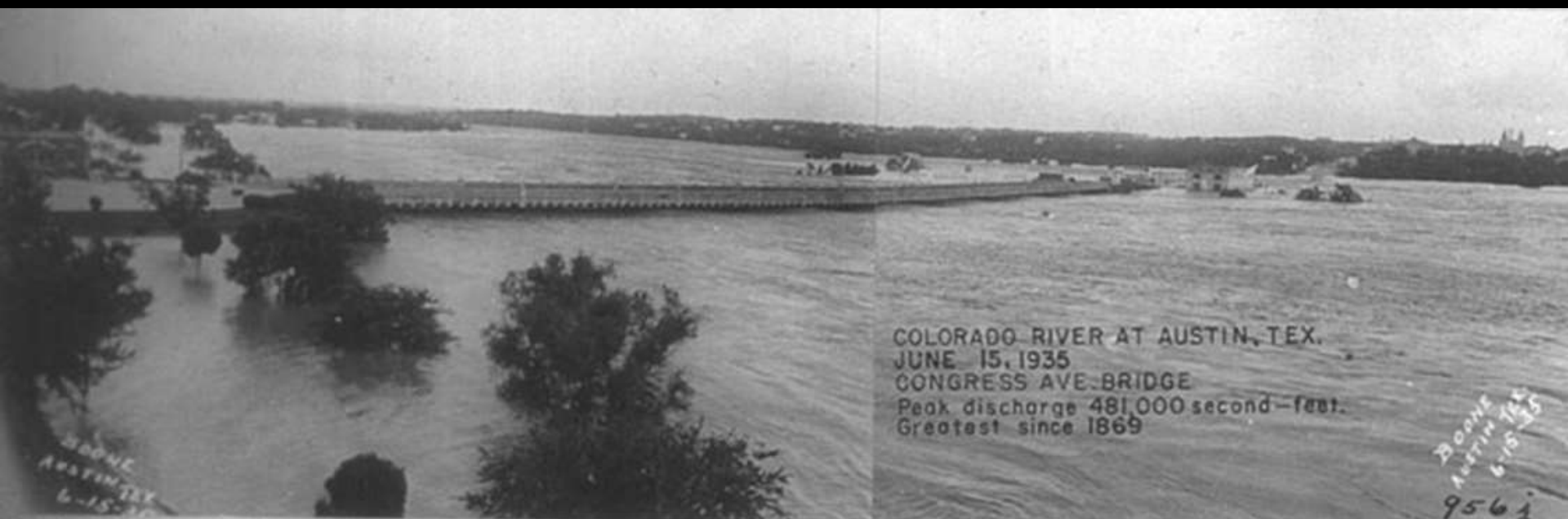




Water in Texas

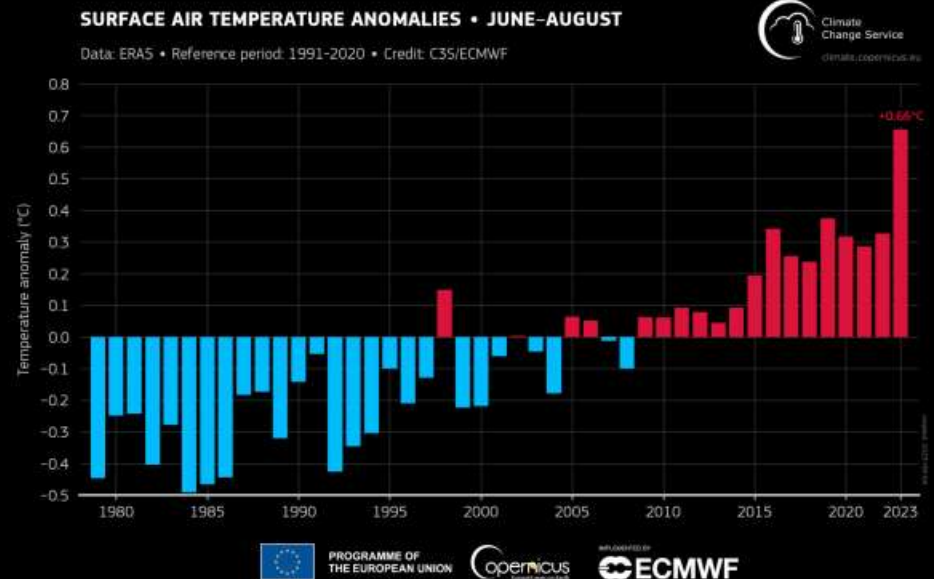
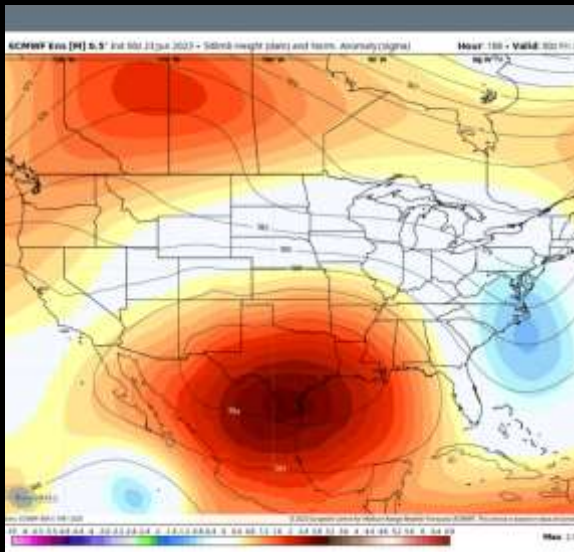
Drought and Flood and Climate Change

"All modern water planning in Texas for the past fifty years has been based on the notion that the drought of the 1950s is as bad as it is going to get."



Global Warming and Texas Heat

- The World Meteorological Organization - *June-August 2023 was the hottest three-month period in recorded history across the Earth.*
- The Office of the Texas State Climatologist - The summer of 2023 will go down as Texas' *second hottest ever*, with an average temperature of 85.3 degrees between June and the end of August, just behind the blistering hot and extremely dry summer of 2011 when the average temperature hit 86.8 degrees.
- The Office of the Texas State Climatologist - 79 of the state's 254 counties had their hottest summer on record, while the July average water temperature in the Gulf of Mexico was the hottest ever recorded. Then, August clocked in as the second hottest month in Texas since 1895 when the state began keeping records.



Climate Change - Austin Heat

- Though Mabry records extend back to 1897, all of Austin’s 10-hottest summers on record have come *since 1998*.
- As the climate warms, Austin’s summer temperatures have warmed by 2.4°F in the last century. *We now average 30 100° days each summer — triple the average 100° day count between 1969 and 1999.*
- For 2023, there were 80 days where the high at Camp Mabry made it to 100° or more. The record book will show that 2023 had *the second most highs 100 and above*, topped by the 90 that baked this area in 2011.
- Austin Camp Mabry recorded temperatures of 105 or more for *11 days in a row* from July 10 to July 20 breaking the city's record set in 1923.

IN-DEPTH HOTTEST SUMMER ON RECORD
JUN. 1- AUG. 31 / AUSTIN-BERGSTROM INTL. AIRPORT

1)	87.1°	2023
2)	86.7°	1954
3)	86.6°	2011

Average: 83.9°



FIRST WARNING WEATHER HOTTEST SUMMER ON RECORD
JUN. 1- AUG. 31 / AUSTIN - CAMP MABRY

1)	89.5°	2011
2)	89.4°	2023
3)	88.8°	2022

Average: 85.0°

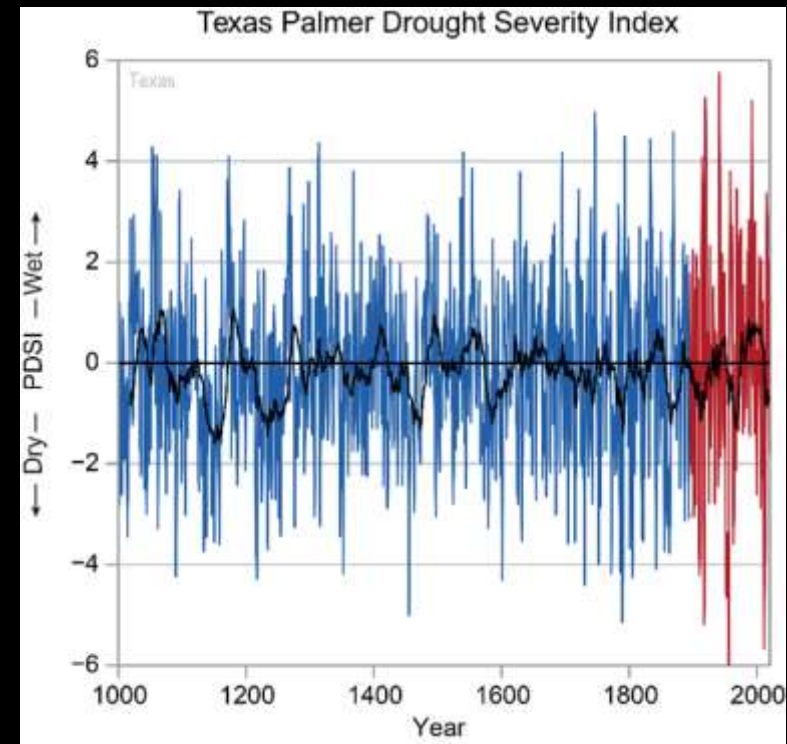
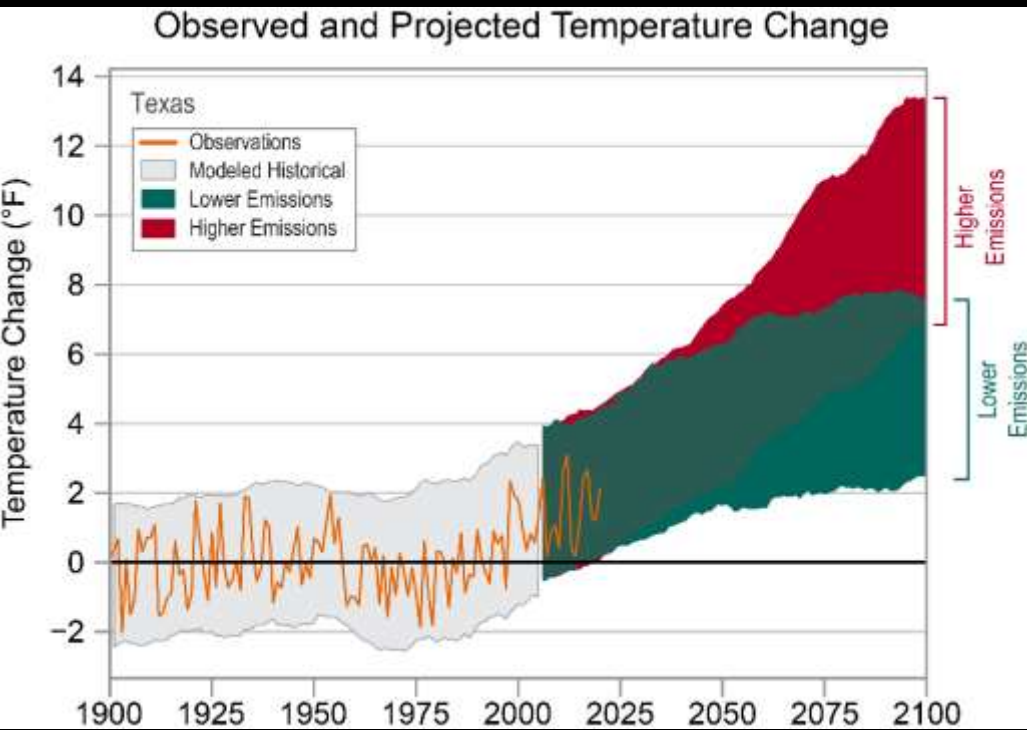


FIRST WARNING WEATHER SEPTEMBER 2023
AUSTIN-CAMP MABRY

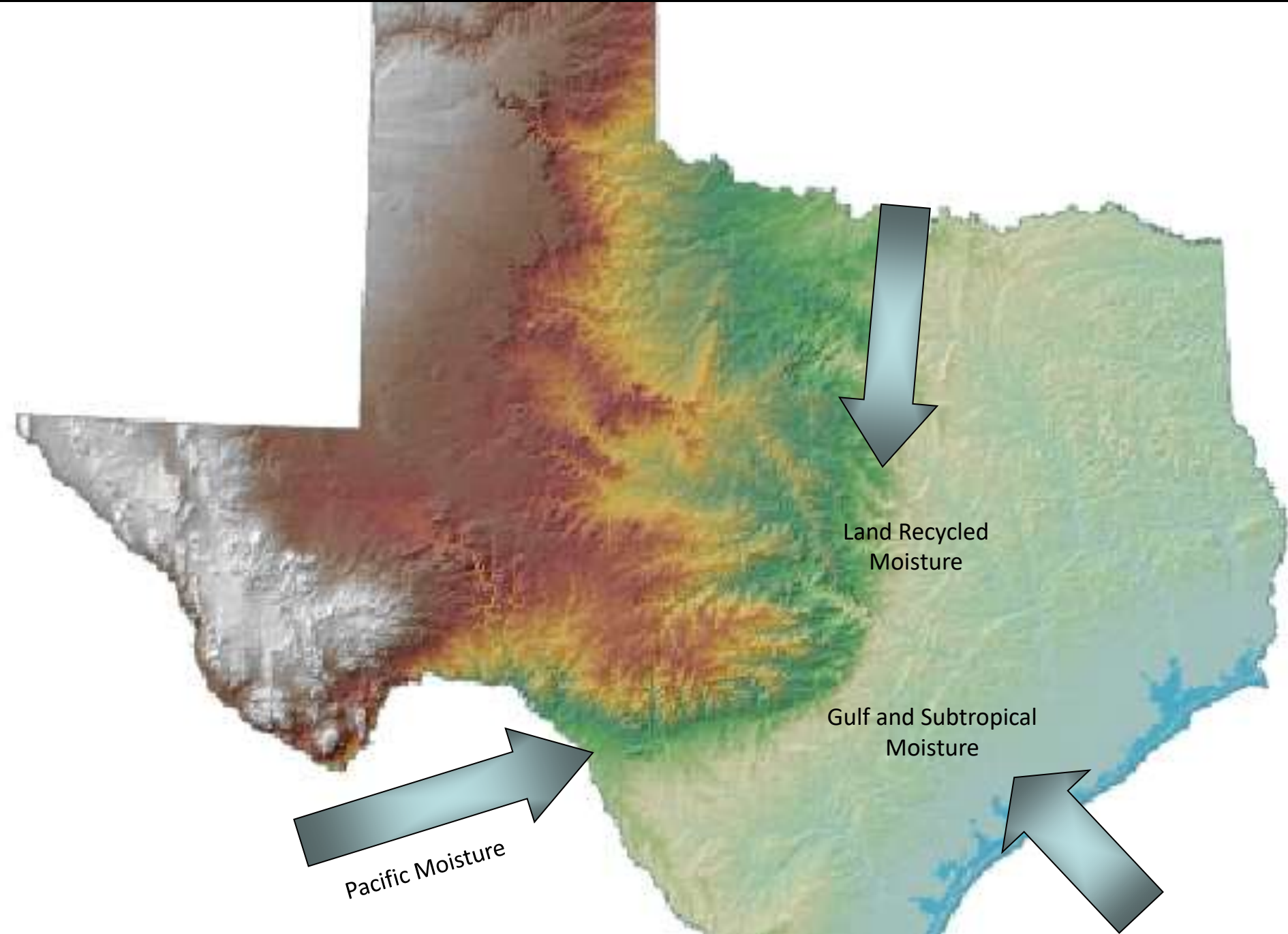
SUN	MON	TUE	WED	THU	FRI	SAT
					1 100°	2 101°
3 102°	4 102°	5 104°	6 103°	7 105°	8 107°	9 104°
10 99°	11 98°	12 94°	13 89°	14 94°	15 89°	16 85°
17 94°	18 96°	19 98°	20 99°	21 97°	22 99°	23 101°
24 103°	25 96°	26 96°	27 96°	28 95°	29 95°	30 95°

NOAA National Center for Environmental Information State Climate Summary 2022 – Heat and Streamflow

- Temperatures in Texas have *risen almost 1.5°F* since 1900
- Under both higher and lower emissions pathways, *historically unprecedented warming* is projected by the end of this century
- Increased drought severity and increased human demand for surface water will cause *changes in streamflow*, with extended reductions of freshwater inflow to Texas bays and estuaries. These changes in streamflow will cause temporary or permanent changes to bay salinity and oxygen content, which will have potentially *major impacts on bay and estuary ecosystems*

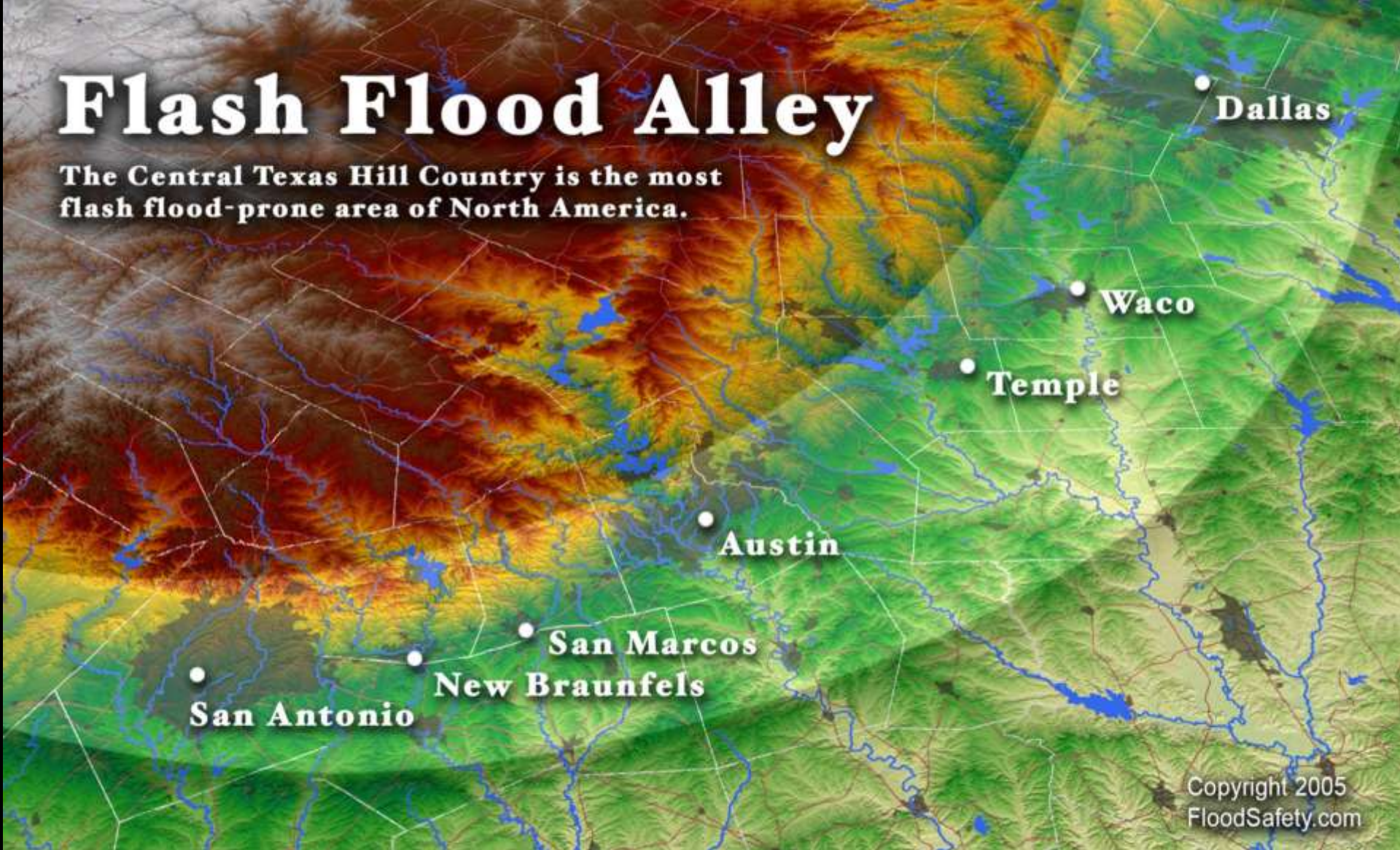


How Texas Droughts End - Floods



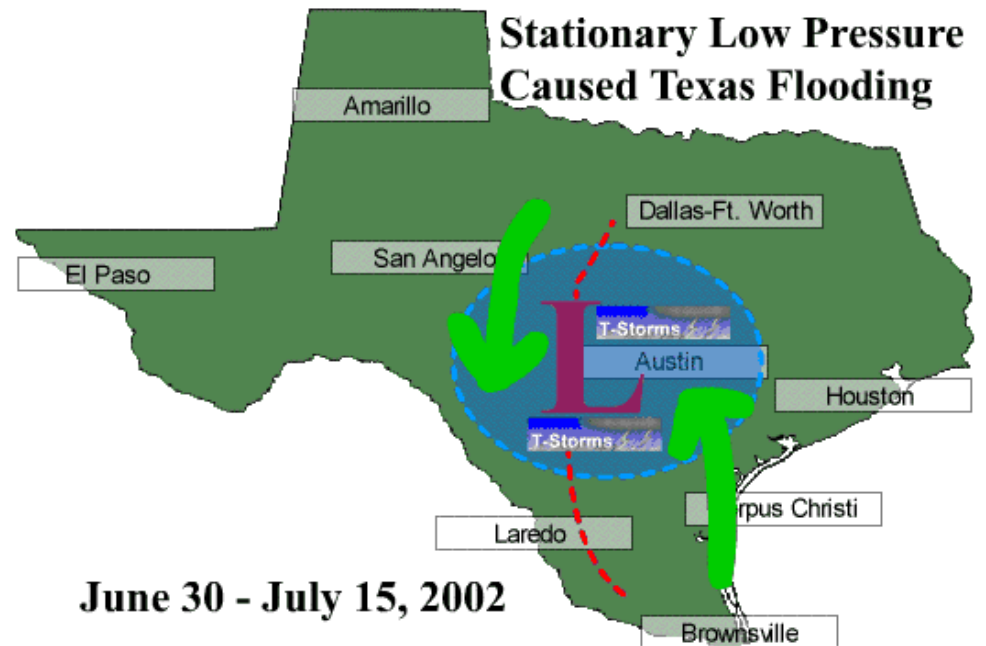
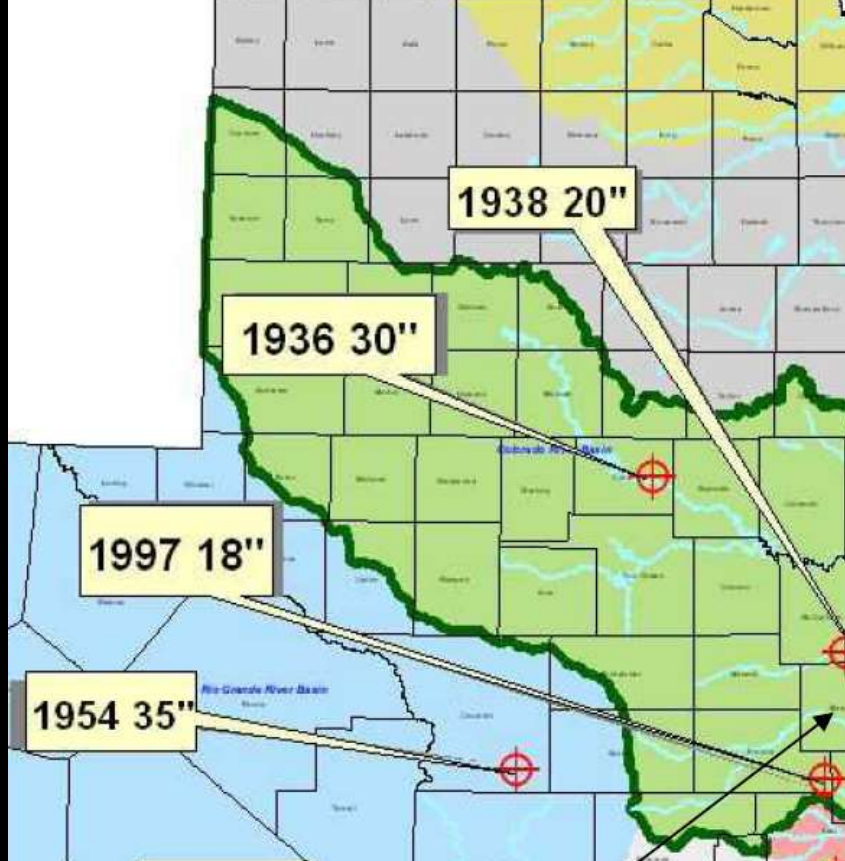
Flash Flood Alley

The Central Texas Hill Country is the most flash flood-prone area of North America.

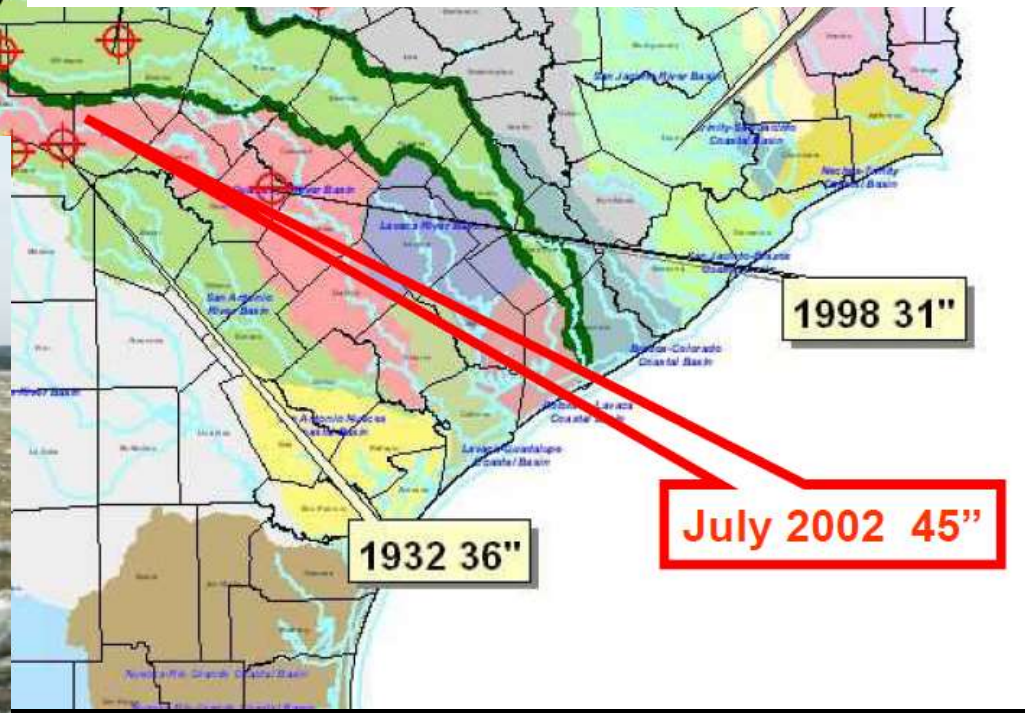


Copyright 2005
FloodSafety.com

NOAA National Center for Environmental Information State Climate Summary 2022
Hurricane intensity and rainfall are projected to increase for Texas as the climate warms.

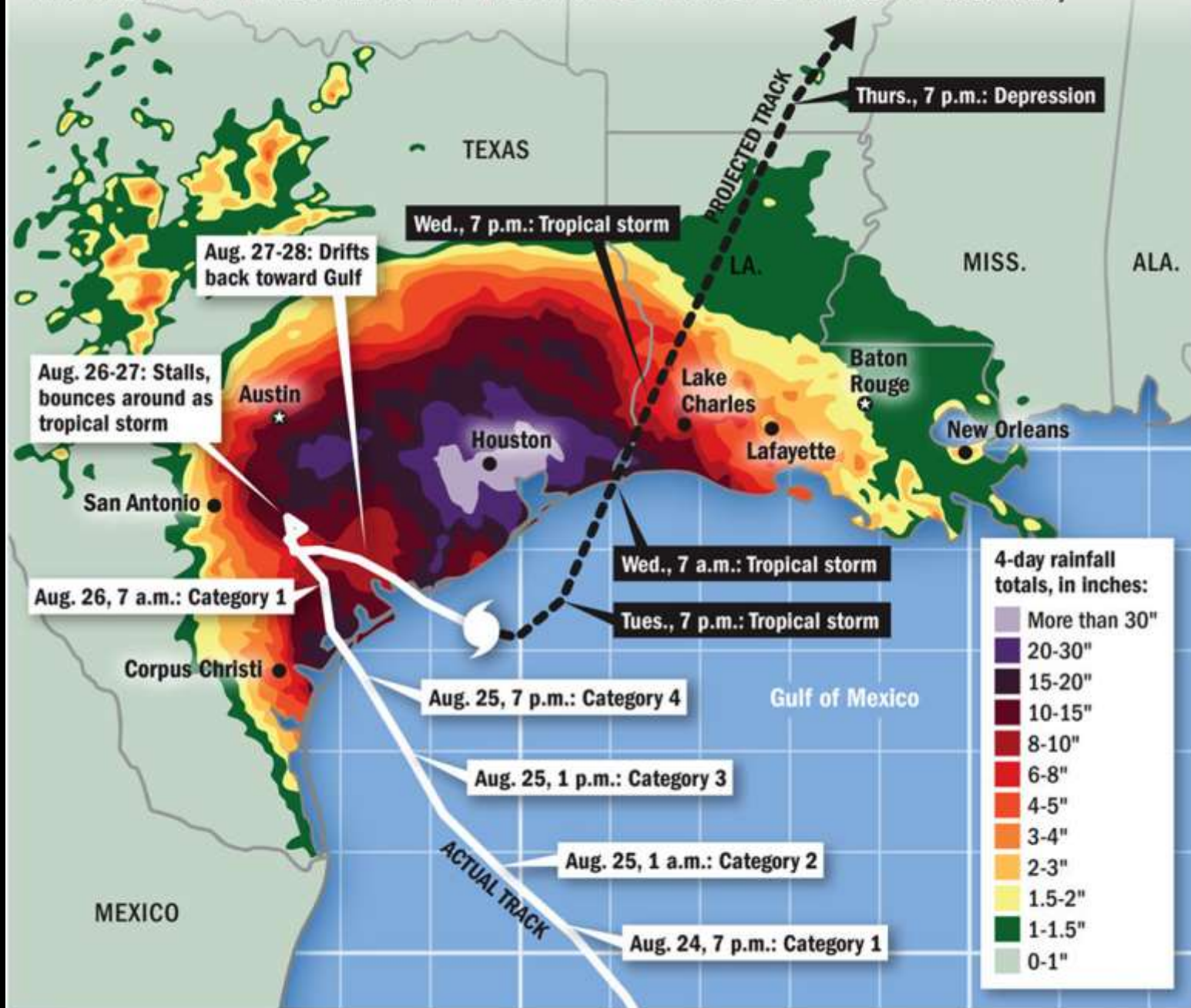


June 30 - July 15, 2002



HARVEY RAINFALL TOTALS AND TRACK

As of Monday



Source: National Weather Service

Advocate graphic by DAN SWENSON

Hurricane
Harvey
August 2017

HARVEY RAINFALL AUGUST 25-30, 2017

Nederland, TX	60.58"
Groves, TX	60.54"
Fannett, TX	49.25"
Beaumont, TX	49.06"
Port Arthur, TX	47.99



HARVEY'S HISTORY

AUGUST 2017



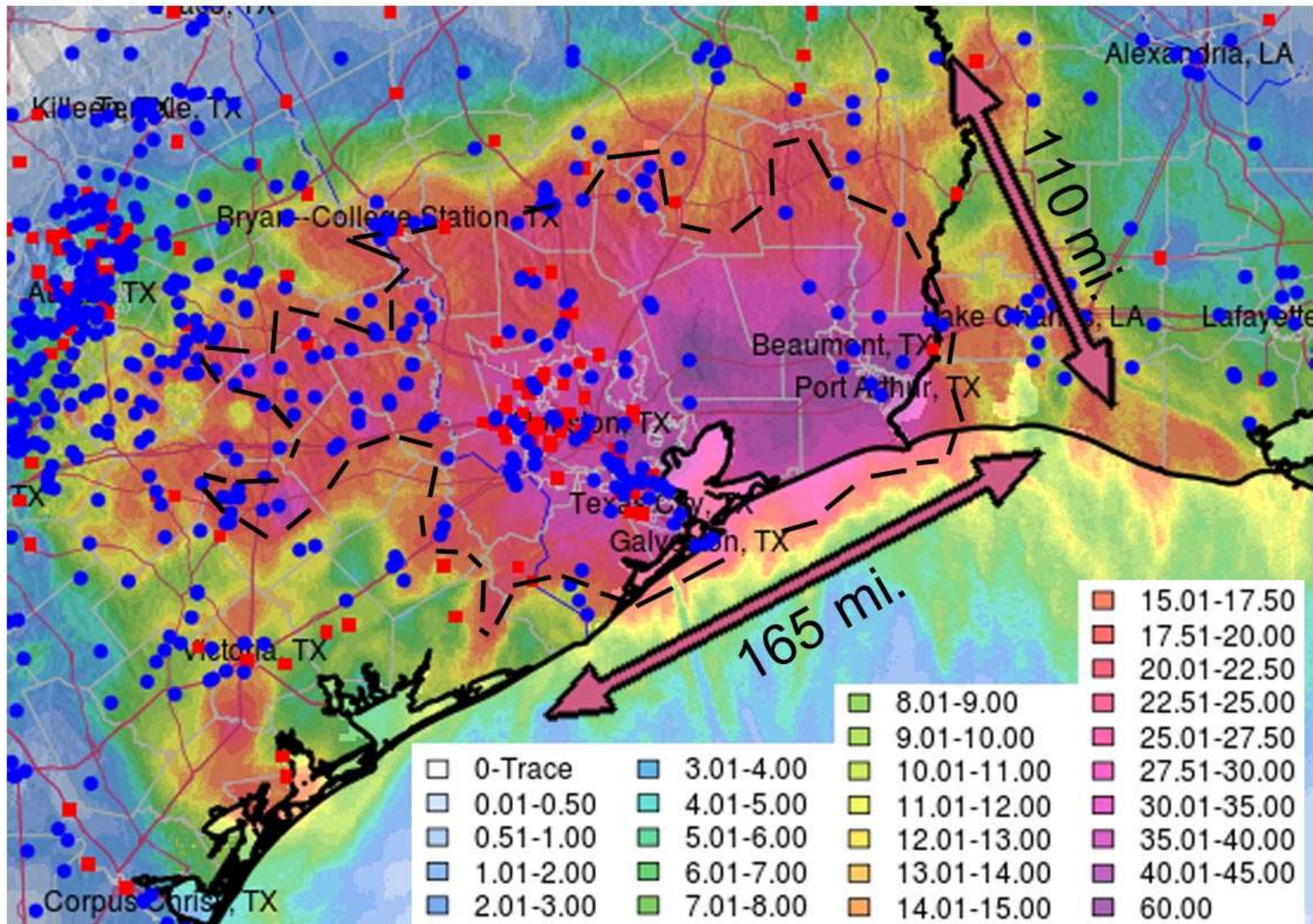
NOAA's Atlas 14: Texas

The 100-year Storm, Now the 25-year Storm

Hurricane Harvey Rainfall

August 25 to August 30, 2017

Dashed line is rainfall in excess of 20 to 27.5 inches



Atlas 14: Texas – The 100-year Storm is Now the 25-year Storm

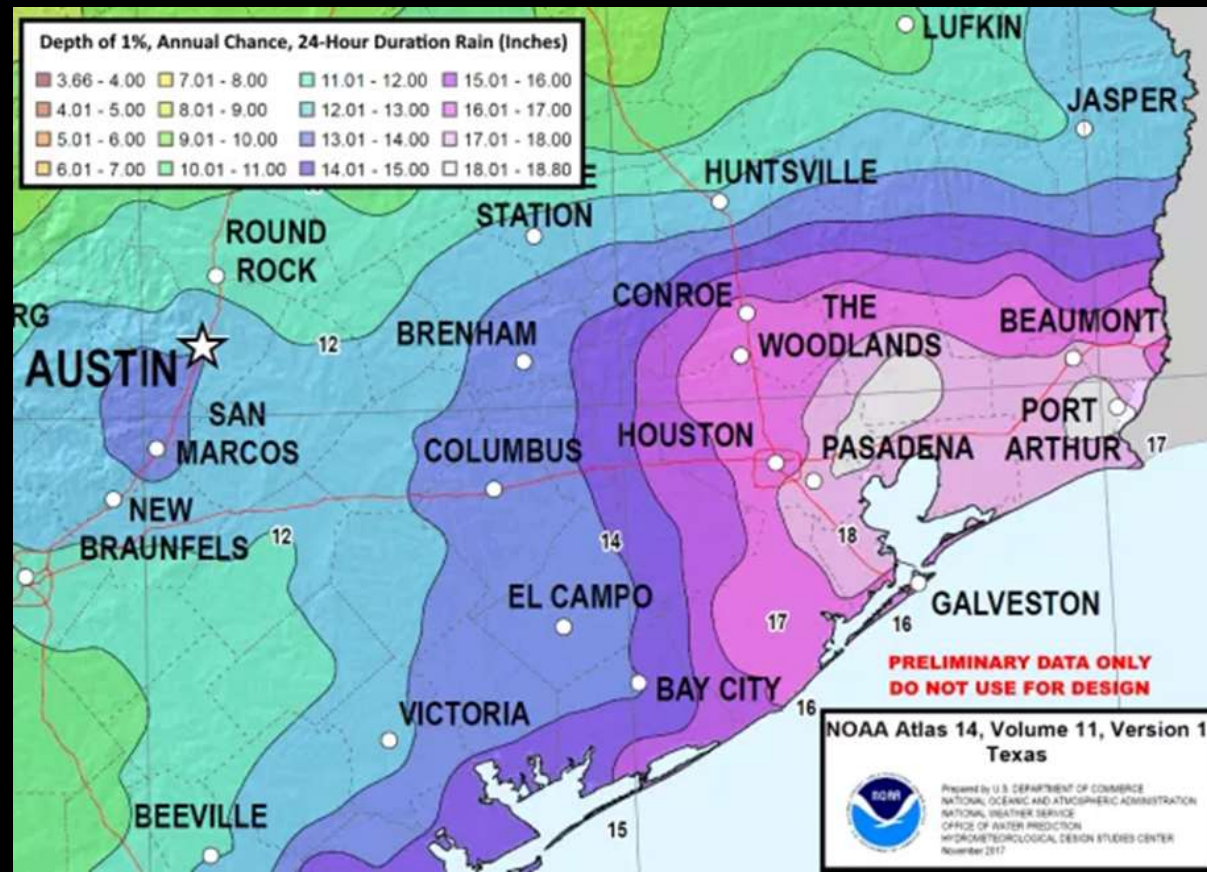
In Houston, the 100-year storm was 12.5 inches in 24 hours.

- The new 25-year storm total is now 12.1 inches.
- The 100-year storm total has increased to 17.9 inches.

In Austin, the 100-year storm was 10 inches in 24 hours.

- The new 100-year storm rainfall amount for 24 hours is 13 inches.
- The Austin 50-year storm is now 10.6 inches and the 25-year storm is 8.86 inches.

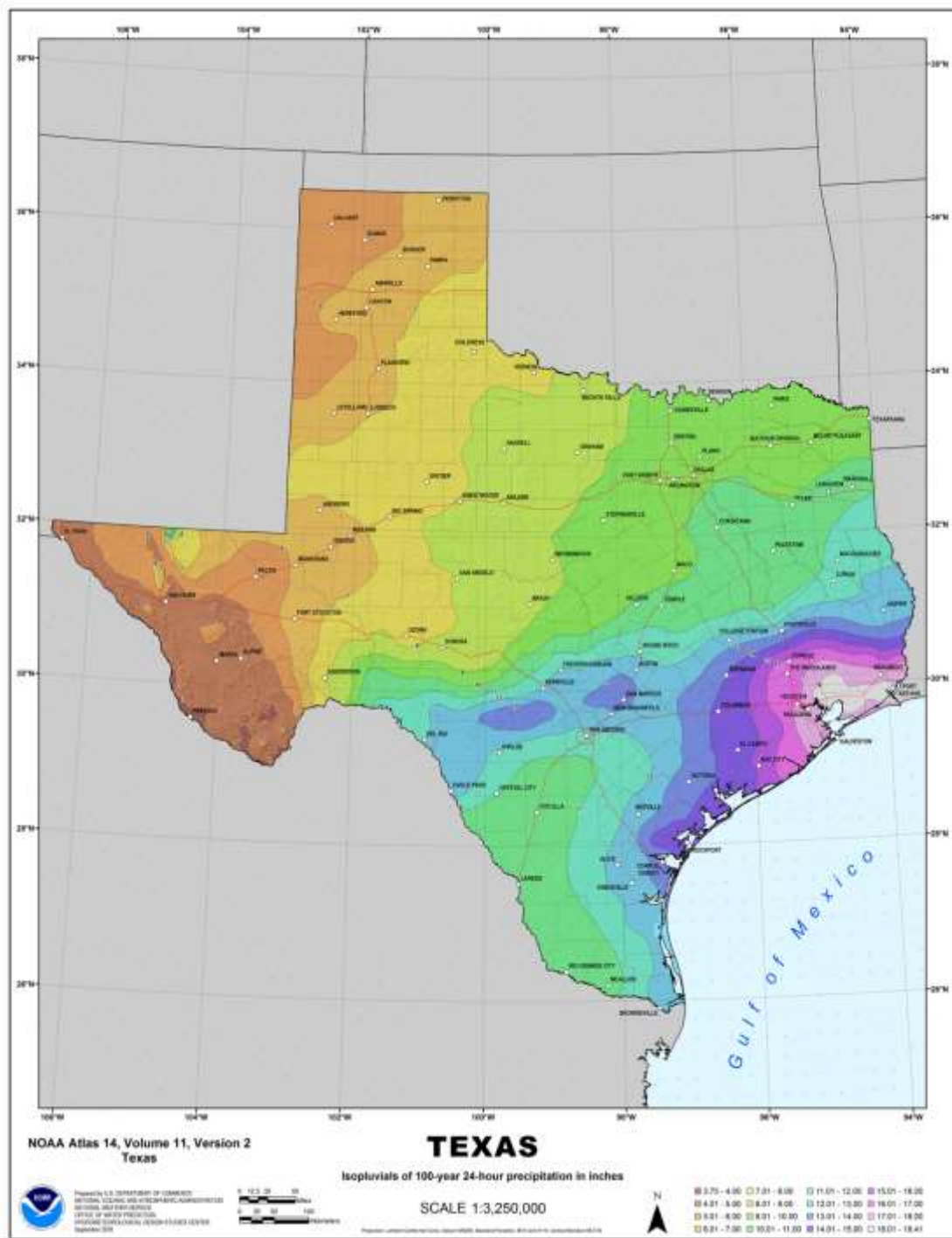
The new values are more accurate than estimates developed 40 to 50 years ago due to decades of additional rainfall data, an increase in the amount of available data, both in the number of stations and their record lengths, and improved methods used in the analysis.



Atlas 14 Impacts

NOAA Atlas 14 rainfall values are used for infrastructure design and planning activities under federal, state and local regulations.

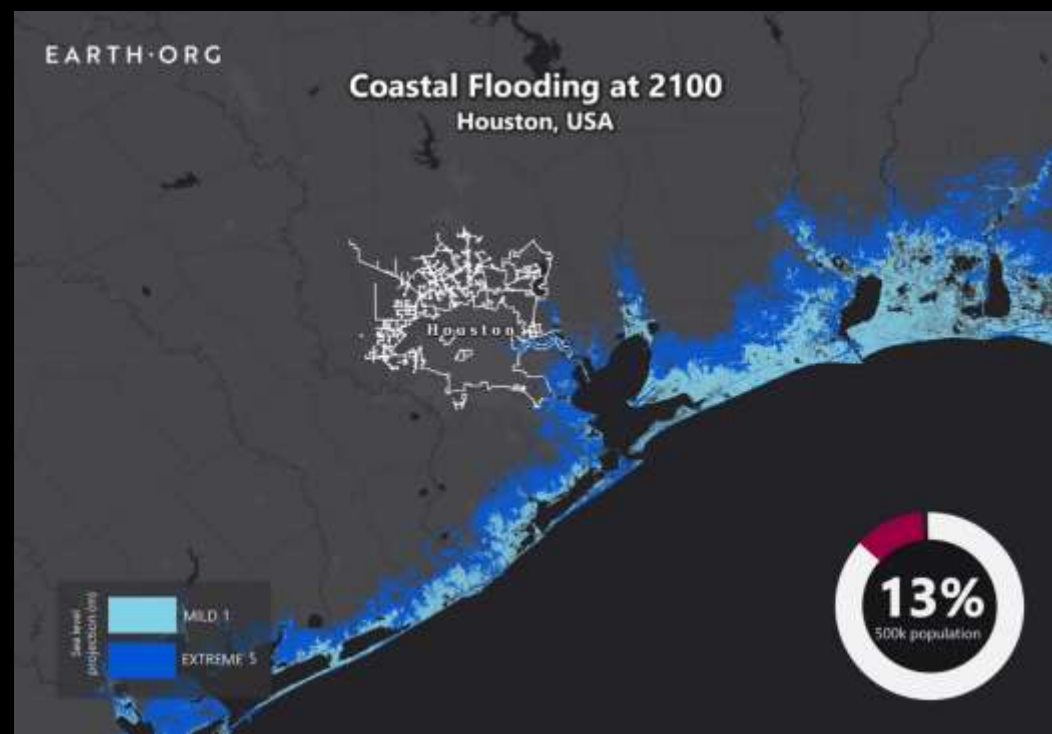
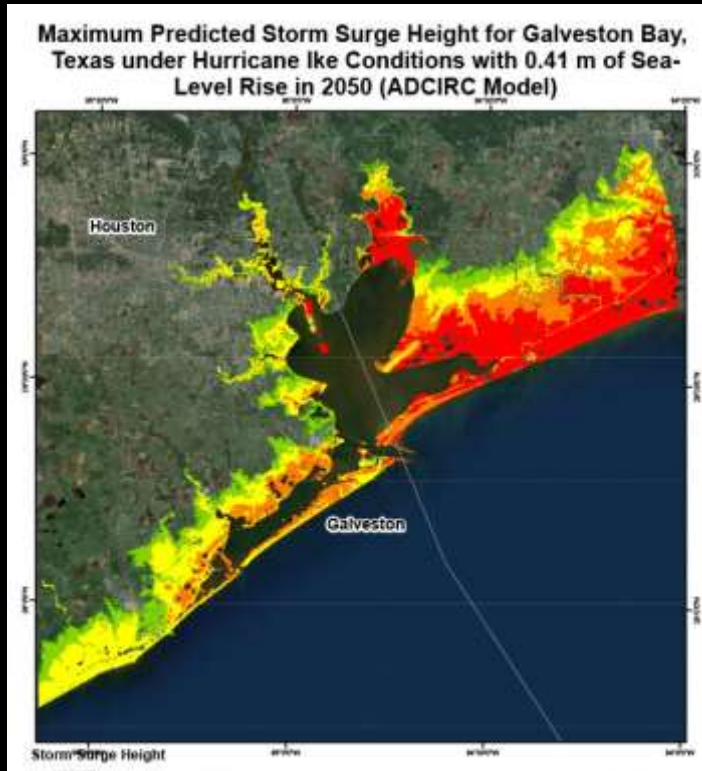
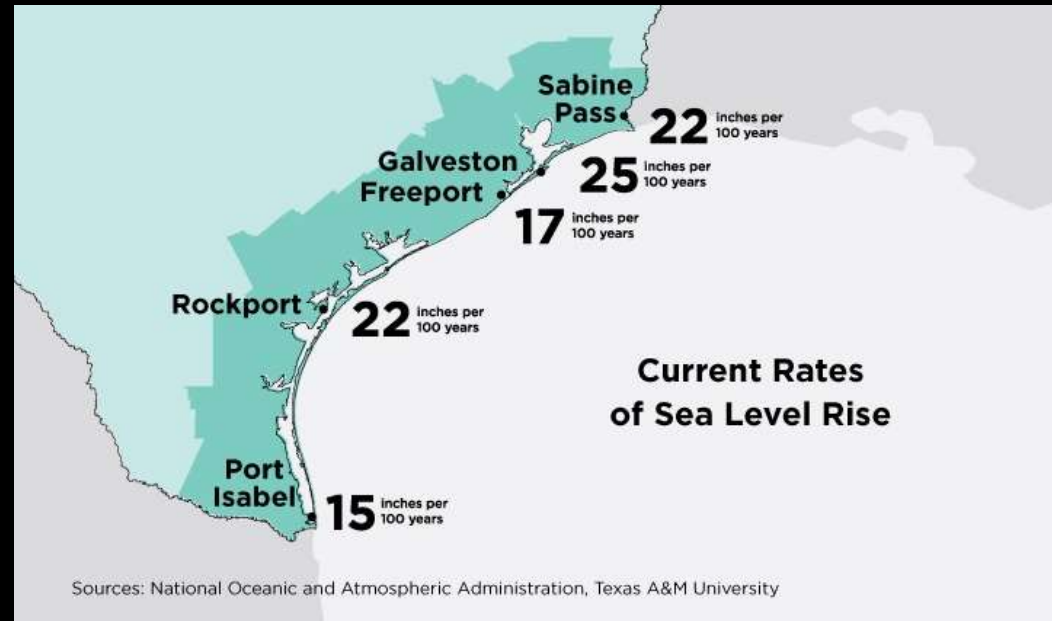
They also help delineate flood risks, manage development in floodplains for FEMA's National Flood Insurance Program and are used to monitor precipitation observations and forecasts that can indicate flooding threats by NOAA's National Weather Service.



Sea Level Rise

Since 1900, global average sea level has risen by about 7–8 inches.

It is projected to rise another 1–8 feet, with a likely range of 1–4 feet, by 2100 as a result of both past and future emissions from human activities



“You could go on forever. You know it.

Your muscles have gone supple-hard and your hands as crusty as dry rawhide, and your head is cleared, and your boat goes precisely, unstrenuously where and how you want it to go, and all your gear falls into its daily use with thoughtless ease.

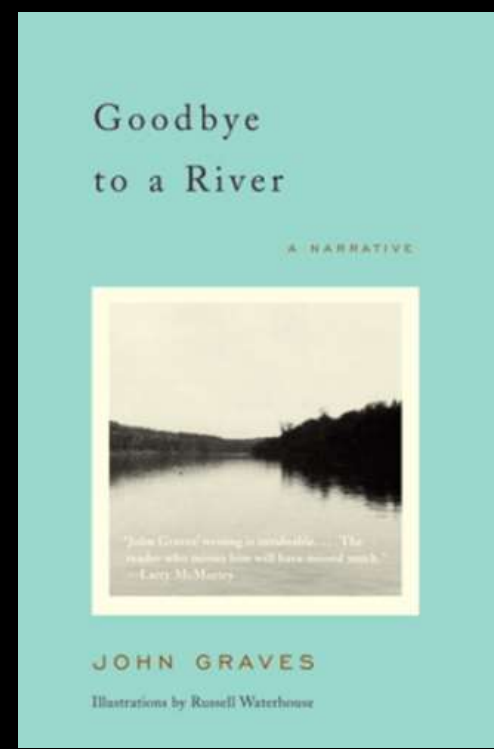
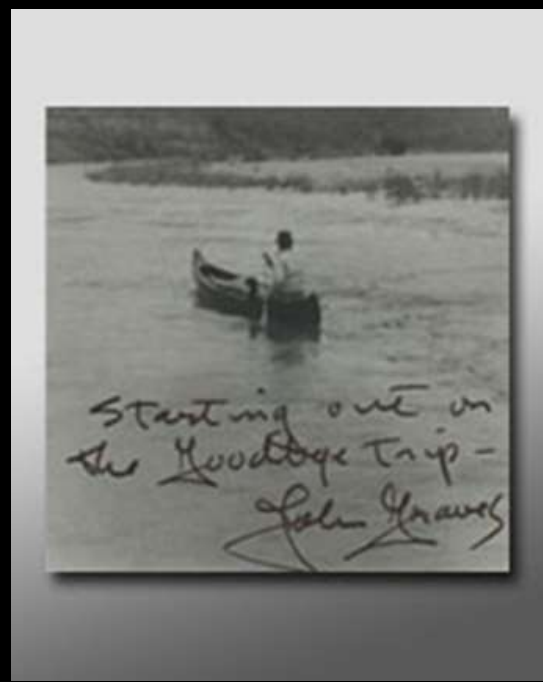
There is merely not enough river, not enough time...

You are spare, bare, and ascetic.

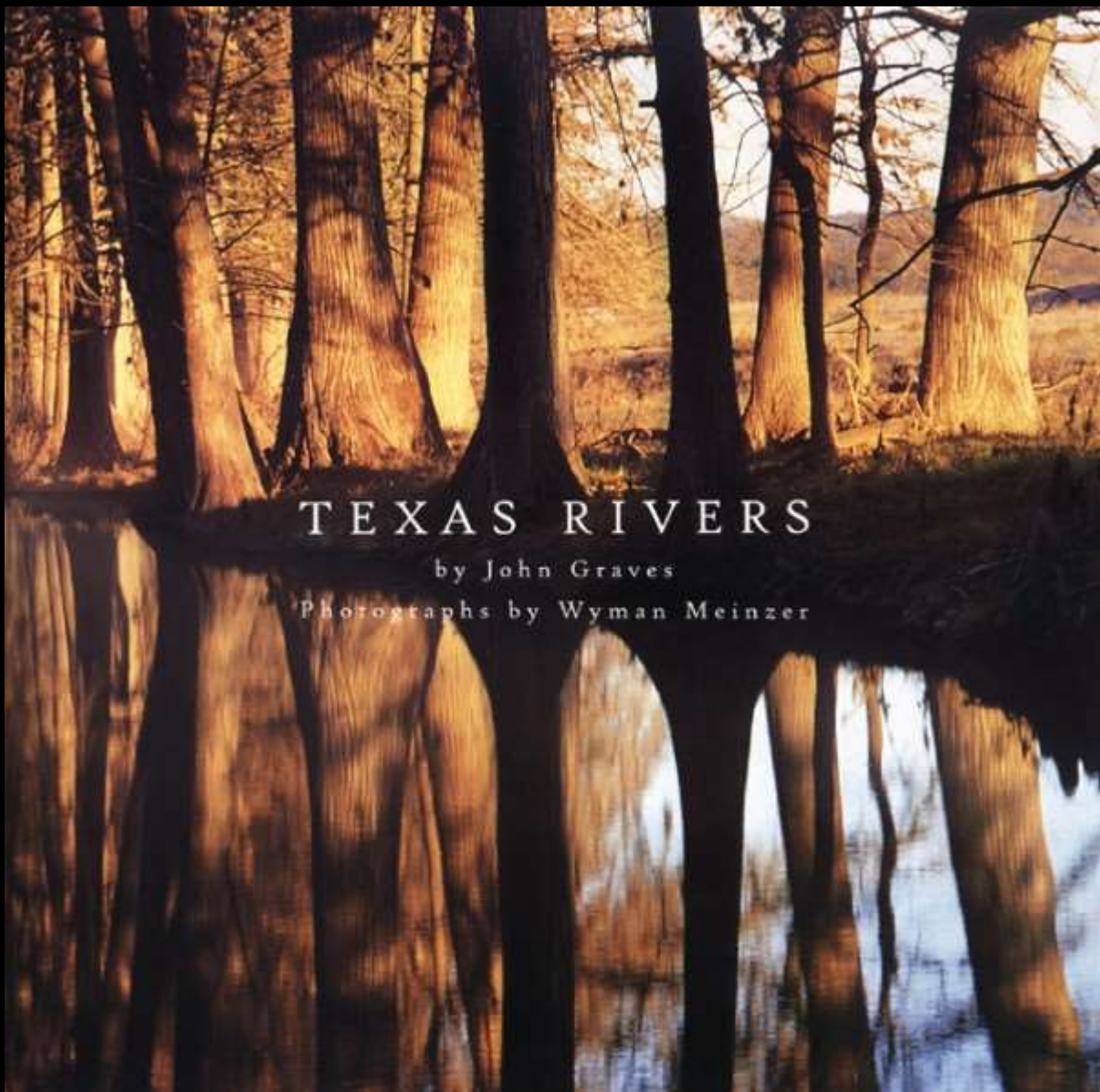
You knew Saint Henry, Yankee moralist though he might be, and knew too all those other old loners who'd ever baked their bread by fires in manless places.

You knew the sovereign pulse of being.

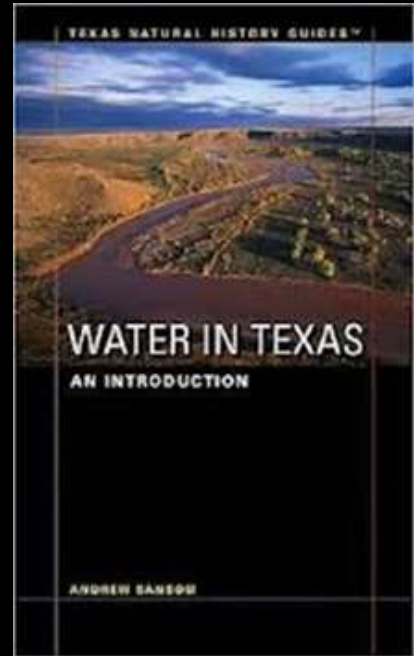
Or you thought you did...”



2002

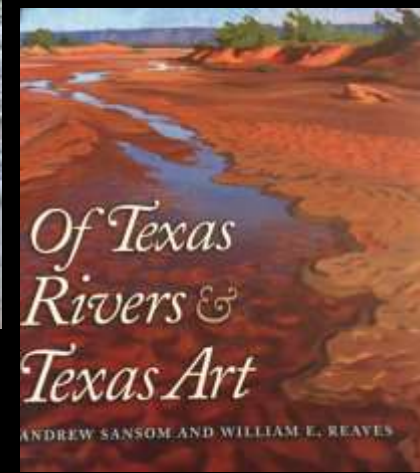
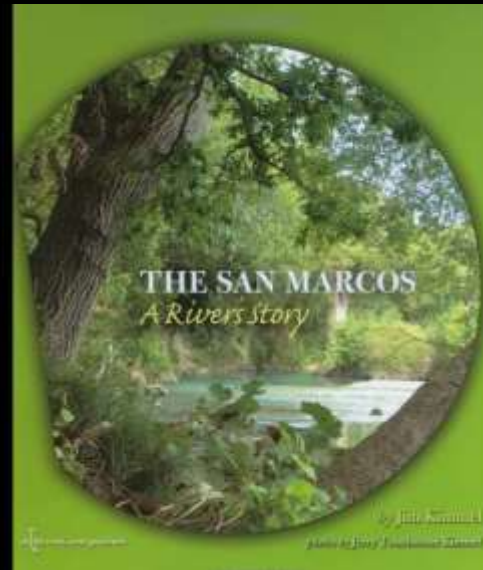
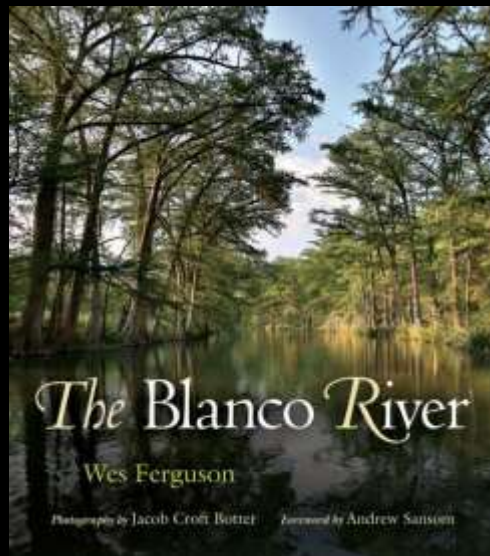
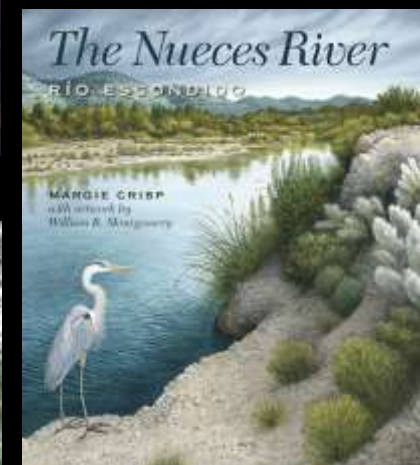
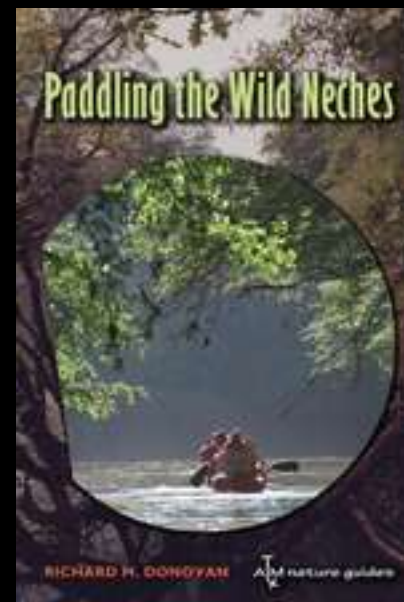
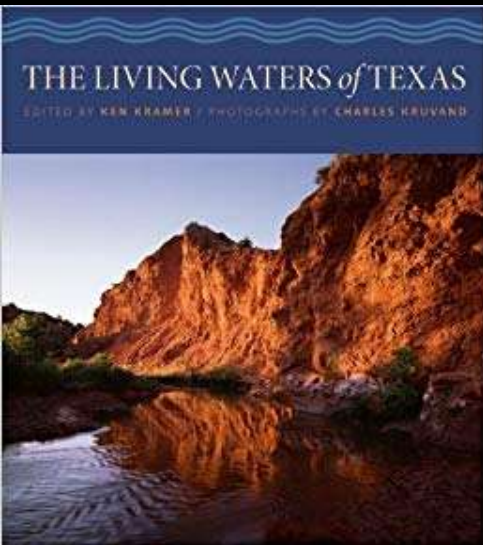


Published by
University of Texas Press

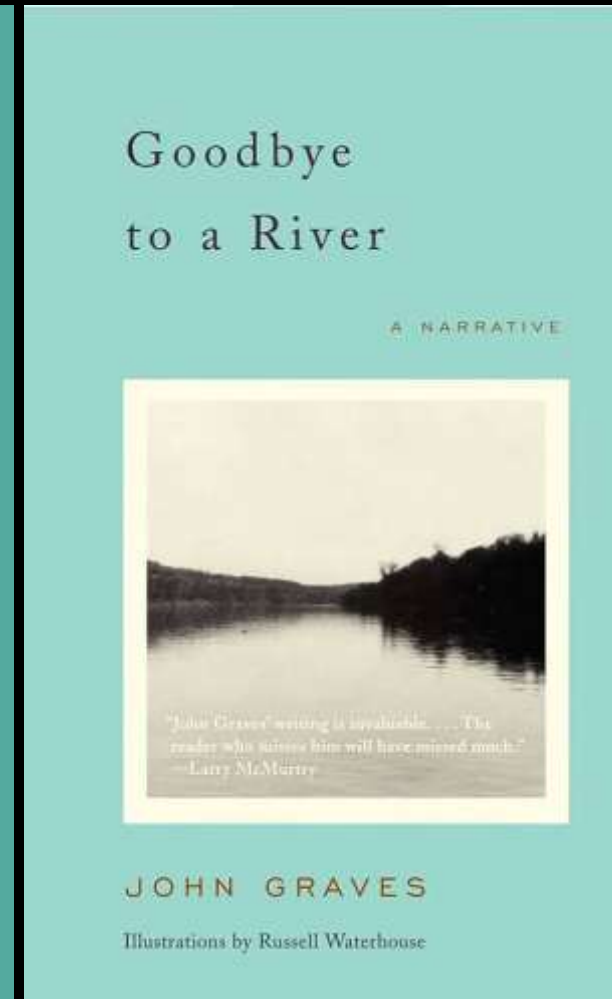
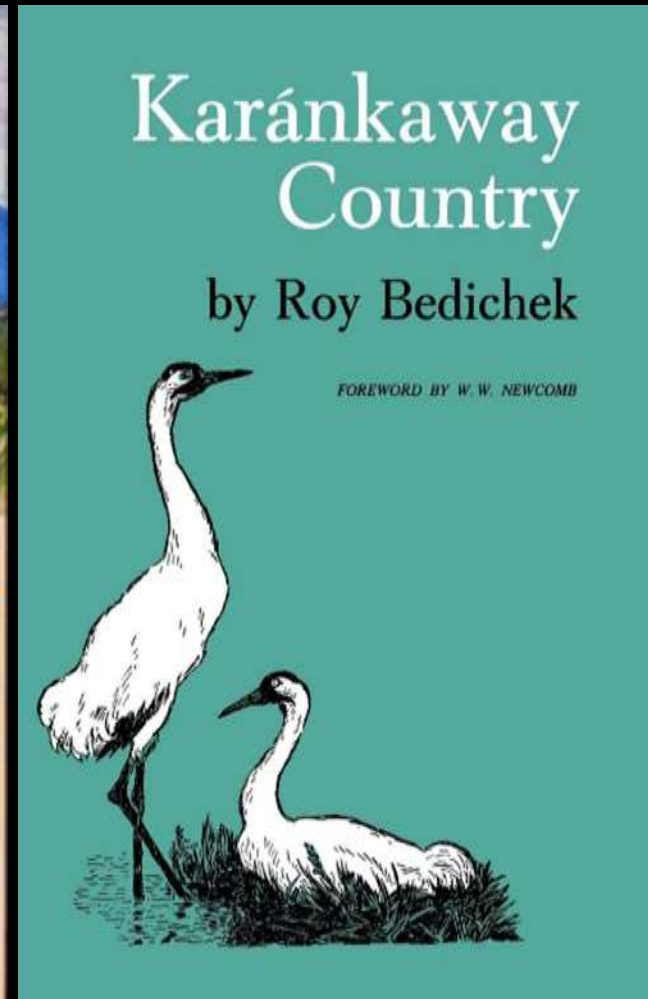
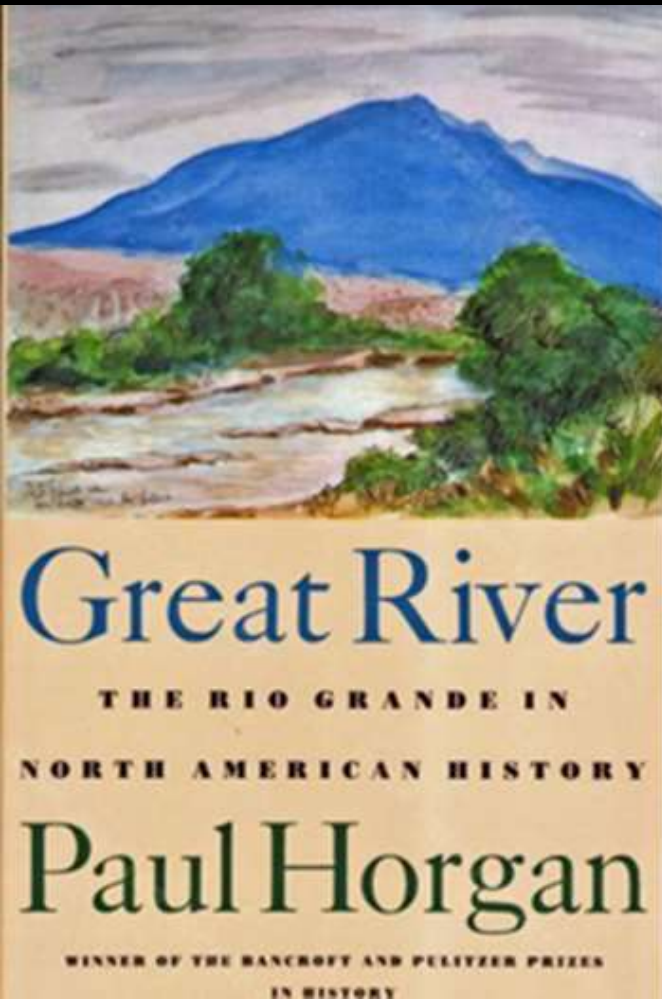


2008

Texas River Books Published by Texas A&M Press



The three best Texas river books



The Cultural Geography of Flowing Water

September - Rivers of Empire: American Environmental History and Waterways

October - Waters the Land: Rivers and Water in Texas

November - Another Colorado: Austin and the River

December – The Urban Stream: Life on Waller Creek

