



This Place Called Houston

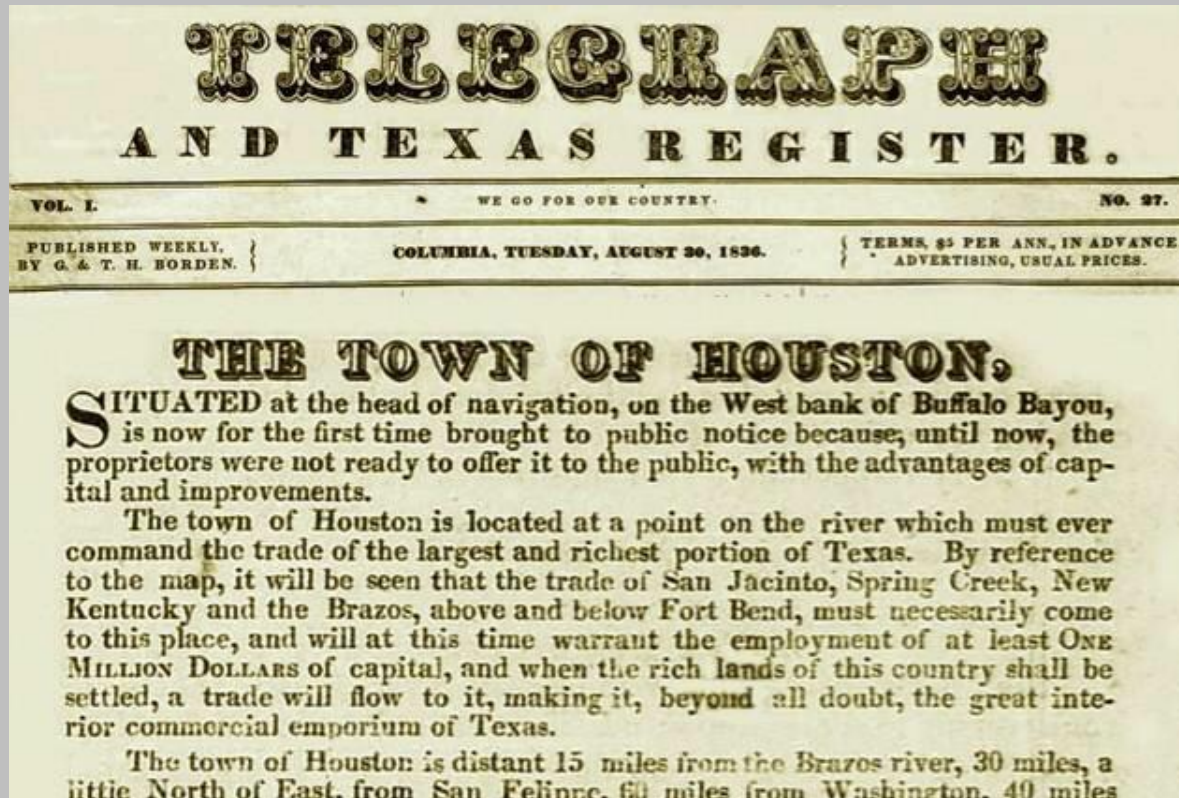
Jim Blackburn
August 28, 2020

Image Isabelle Chapman



RICE UNIVERSITY
OpenRICE
Powered by the Glasscock School

Allen Brothers and Houston, 1836



"with the advantage of capital and improvement." – They'd bought the land only days before the ad first appeared and hadn't yet spent a dollar to develop it. There wasn't a single building on the 8,850 acres.

The ads ran in the United States and Europe. **One showed a drawing of Houston: a pretty little lake, rolling hills and, off in the distance, blue mountains. Mountains?**

**City of Houston Incorporated,
June, 1837**

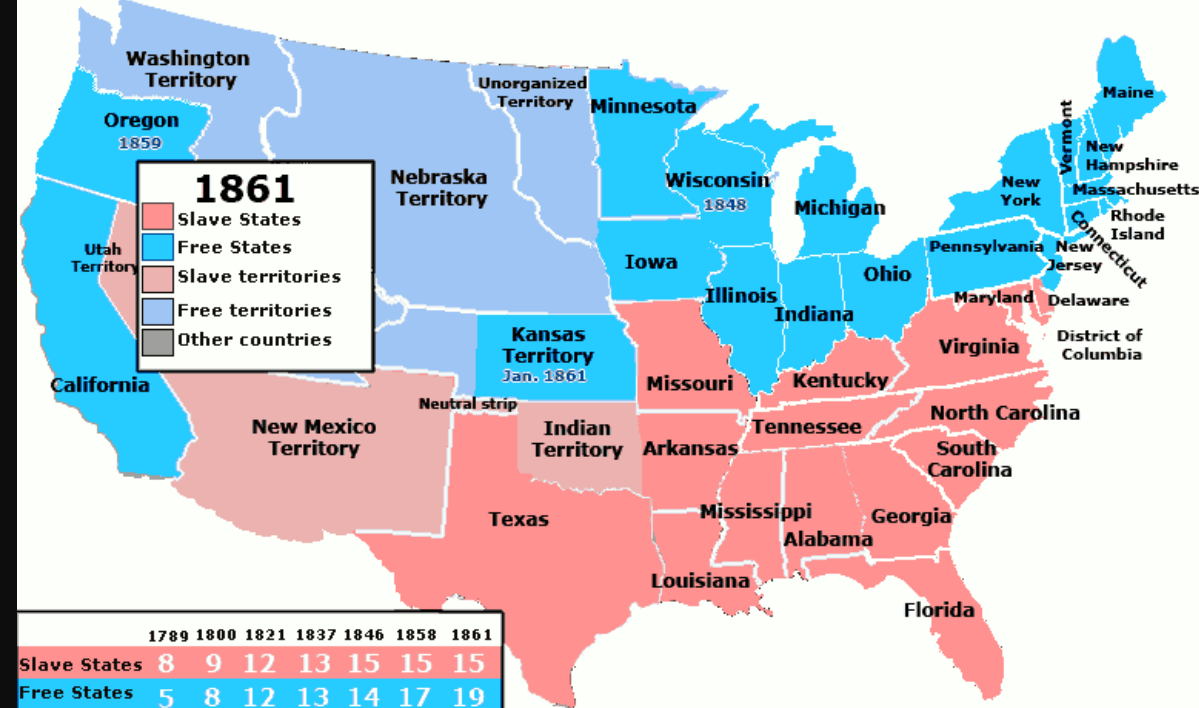
Lisa Gray, Houston Chronicle, 2008

Civil War – 1861-1865

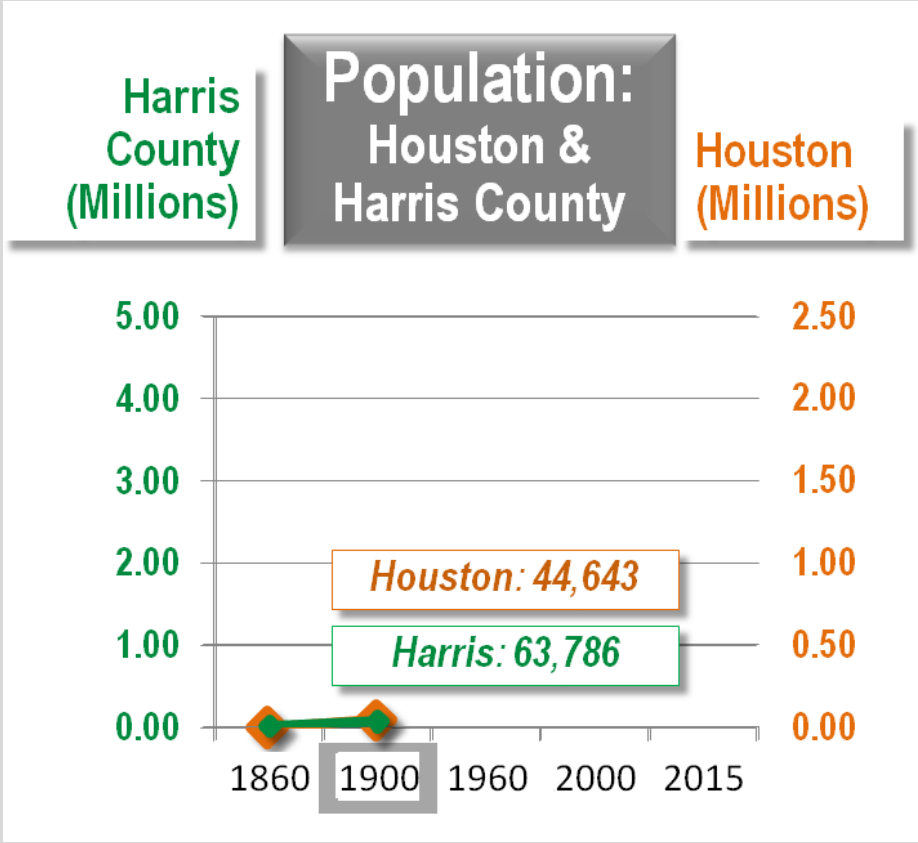
“Juneteenth” – June 19, 1865

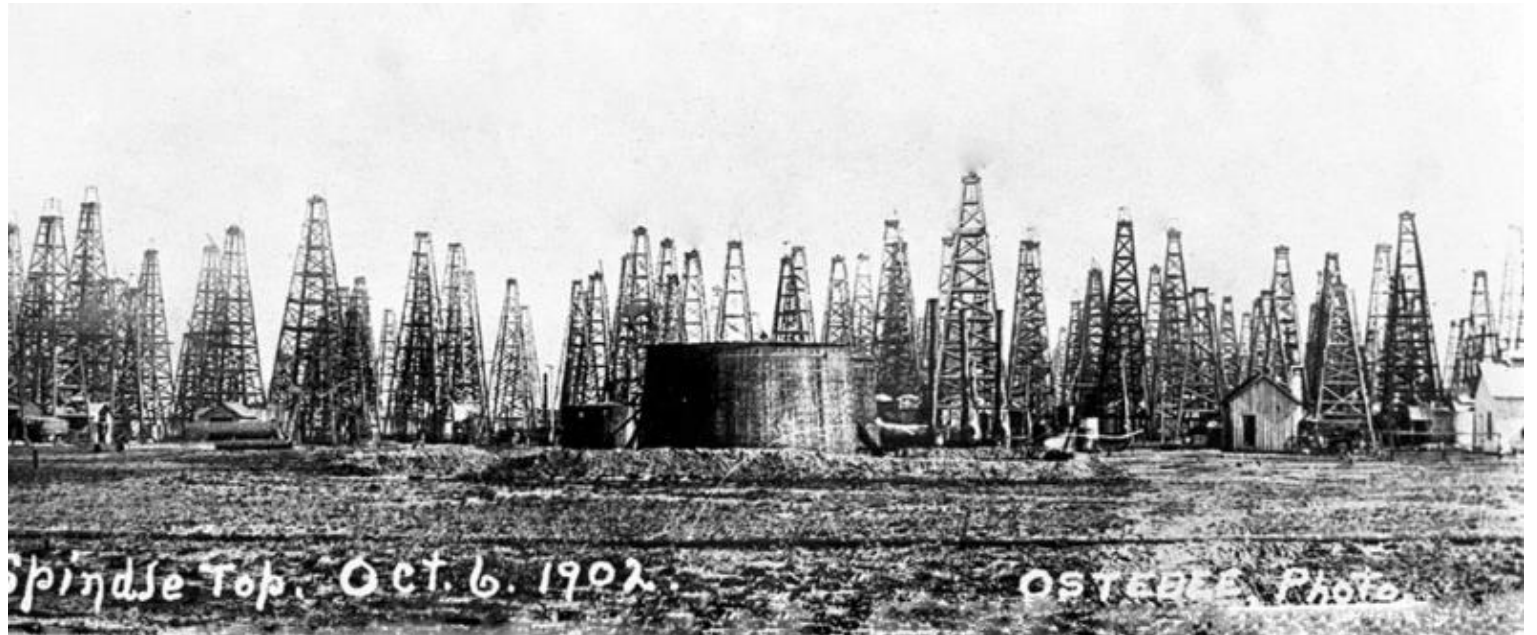
- Ashton Villa, Galveston
General Gordon Granger,
Union Army in Occupation of
Texas, June 19, 1865 –

General Order #3 –
250,000 slaves in Texas
emancipated



Houston 1900





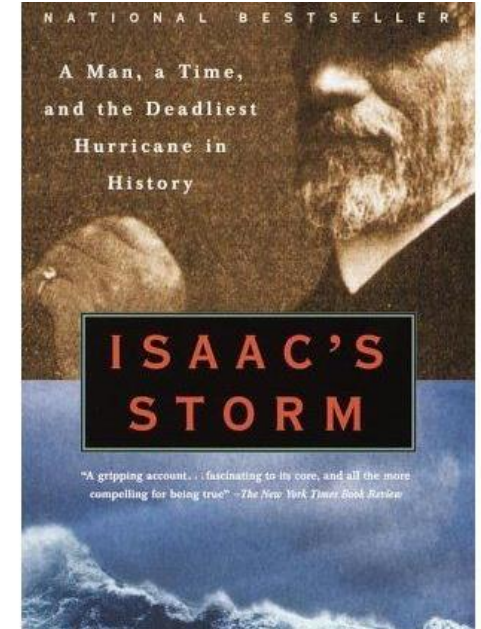
Spindletop, Oct. 6, 1902.

OSTERLEE PHOTO.

Spindletop 1900



Horse and Buggy late 1800s
Automobiles Early 1900s



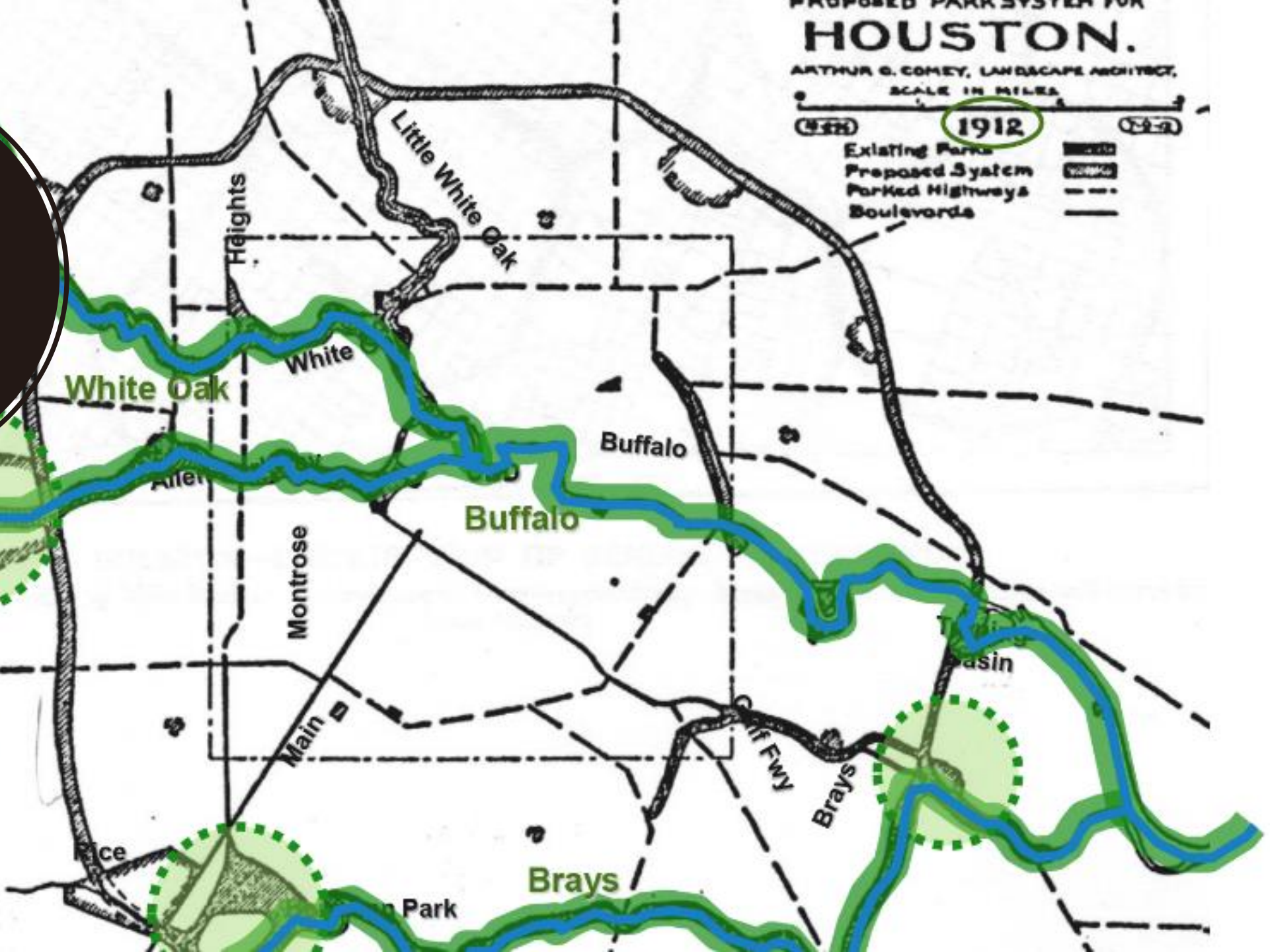
Galveston Hurricane 1900

Houston Benefits From This Storm

PROPOSED PARK SYSTEM FOR
HOUSTON.
ARTHUR G. COMEY, LANDSCAPE ARCHITECT,
SCALE IN MILES

1912
Existing Parks
Proposed System
Parked Highways
Boulevards

Comey Plan
1912



COMEY PLAN

ORIGINAL PROPOSED BAYOU GREENSPACE



Port of Houston and Panama Canal – Both Opened 1914



Jesse Jones 1931

Organized Houston
Banks –

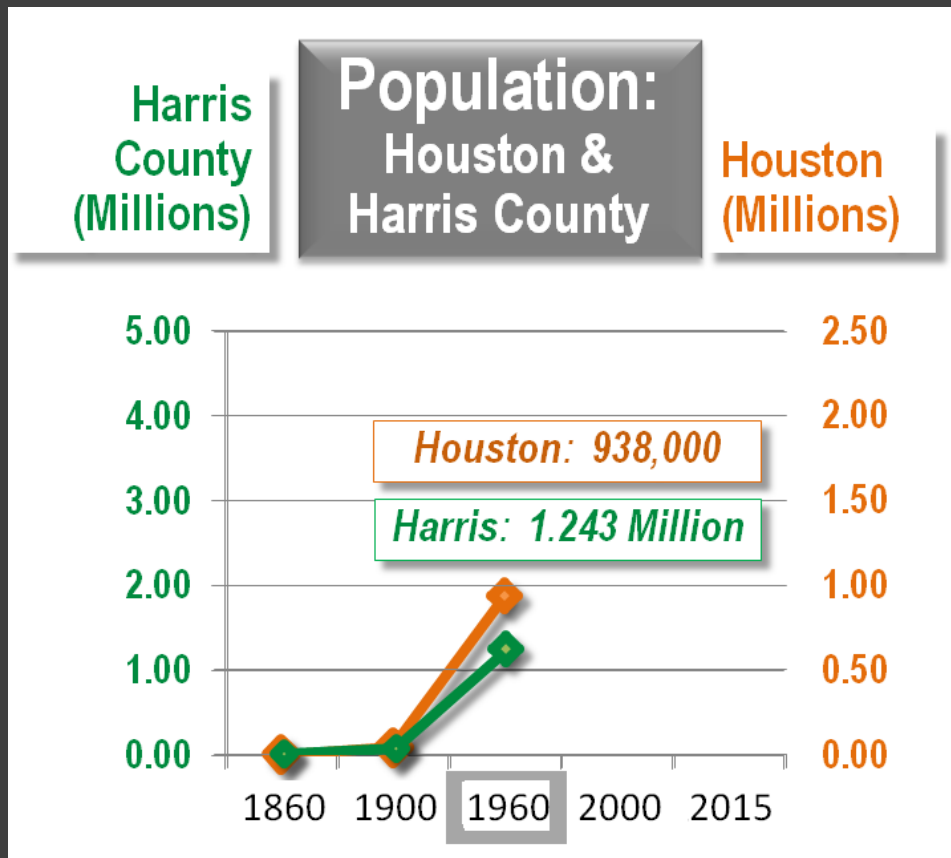
Cajoled Bankers Into
Putting Up Reserves
To Stop Failures

Houston emerges
from depression in
excellent financial
shape



Chemical Industry Post WW II

Foley's Downtown - Lunch Counters Integrated August 1960



To Our Fans - 1965 HIGHLIGHTS OF
SPACE-AGE BASEBALL - INDOORS



**THE ASTROS FIRST YEAR
IN THE ASTRODOME**

Price:
50¢

©1965 BY HOUSTON SPORTS ASSOCIATION, INC. ALL RIGHTS RESERVED

**Astrodome
Opens 1965
8th Wonder
of the World**

Offshore Technology Conference Starts 1969

- Symbol of Houston as global oil and gas center

- Today
- 110 Countries
- Participate

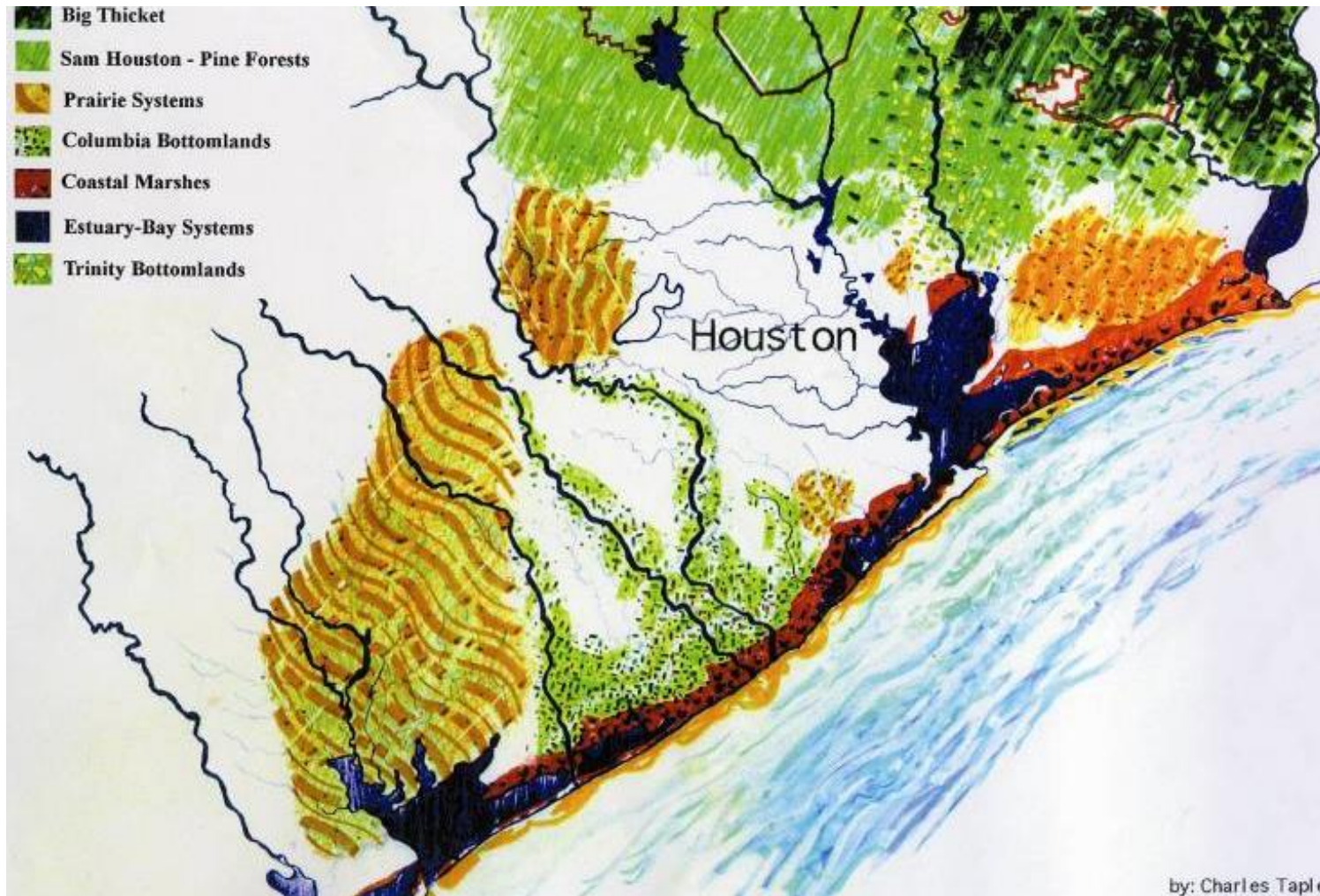


NASA Manned Spacecraft Center Mission Control

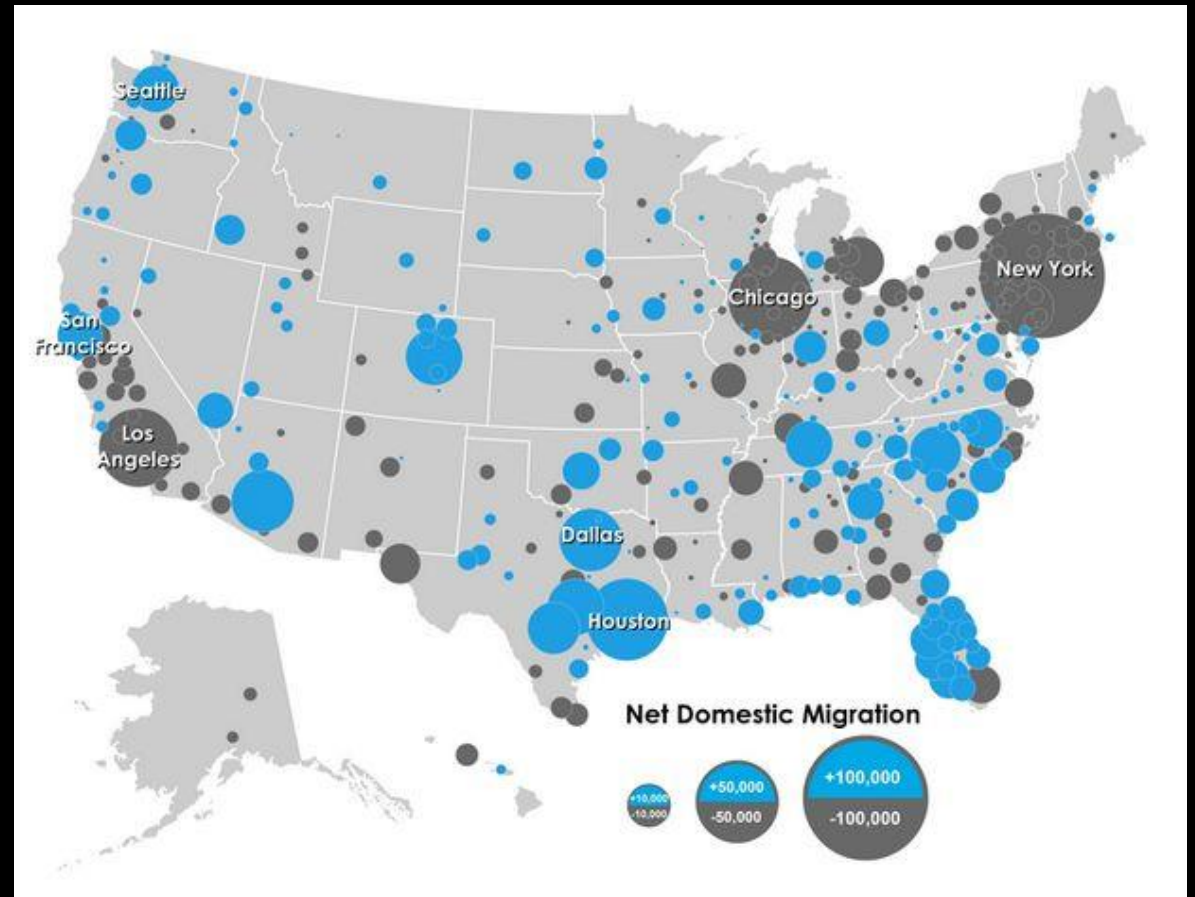
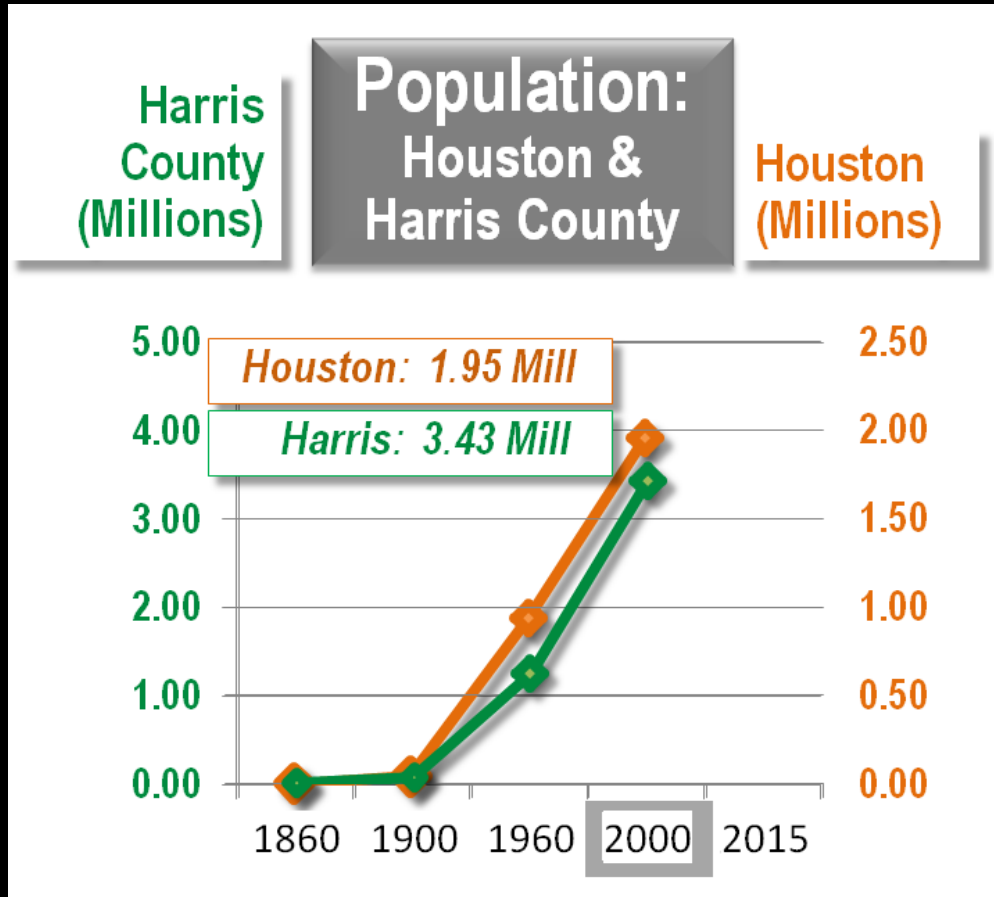
**“Houston, we
have a problem”
April 14, 1970**



Houston Ecological Capital Map, 1995

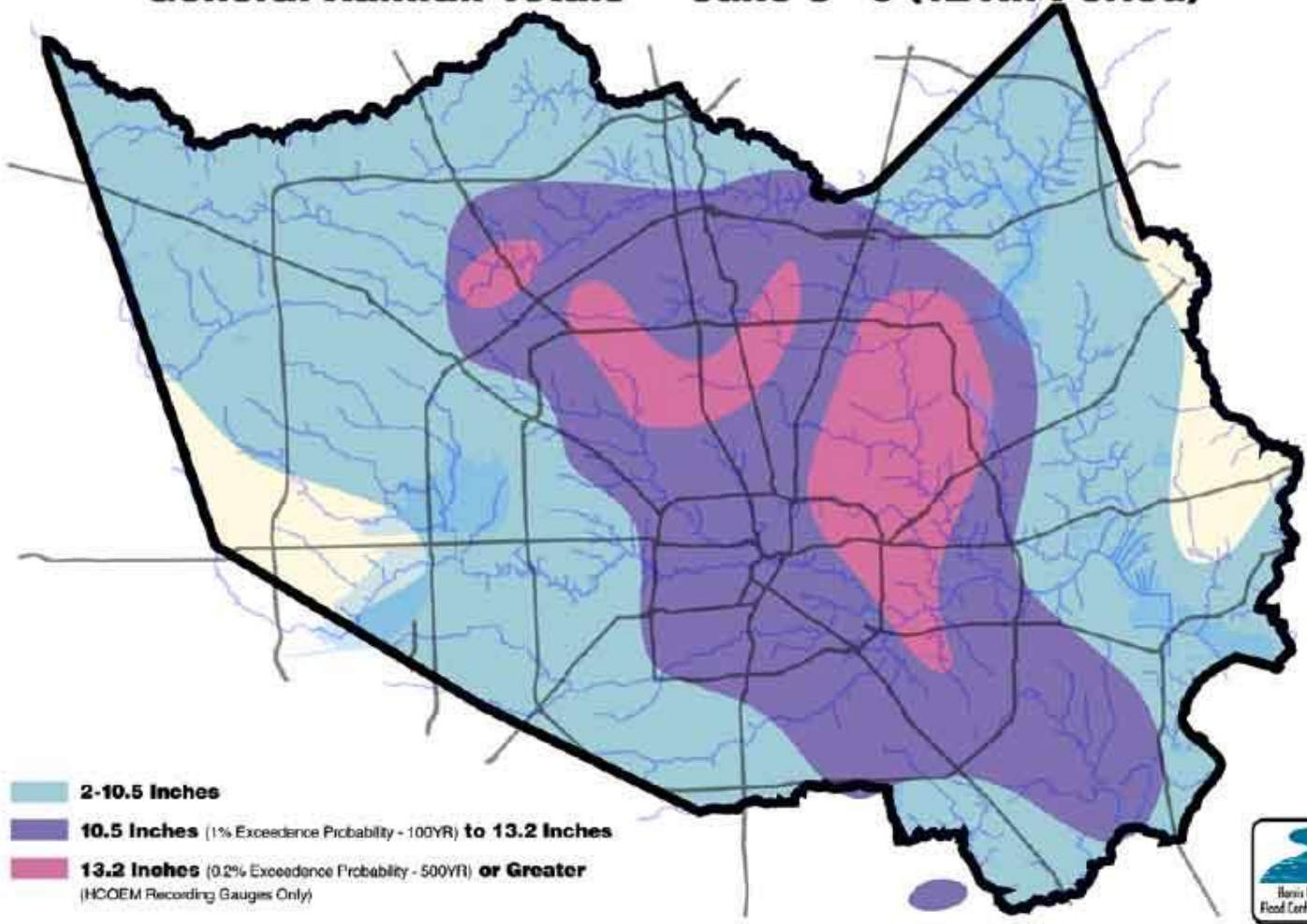


Population, 2000



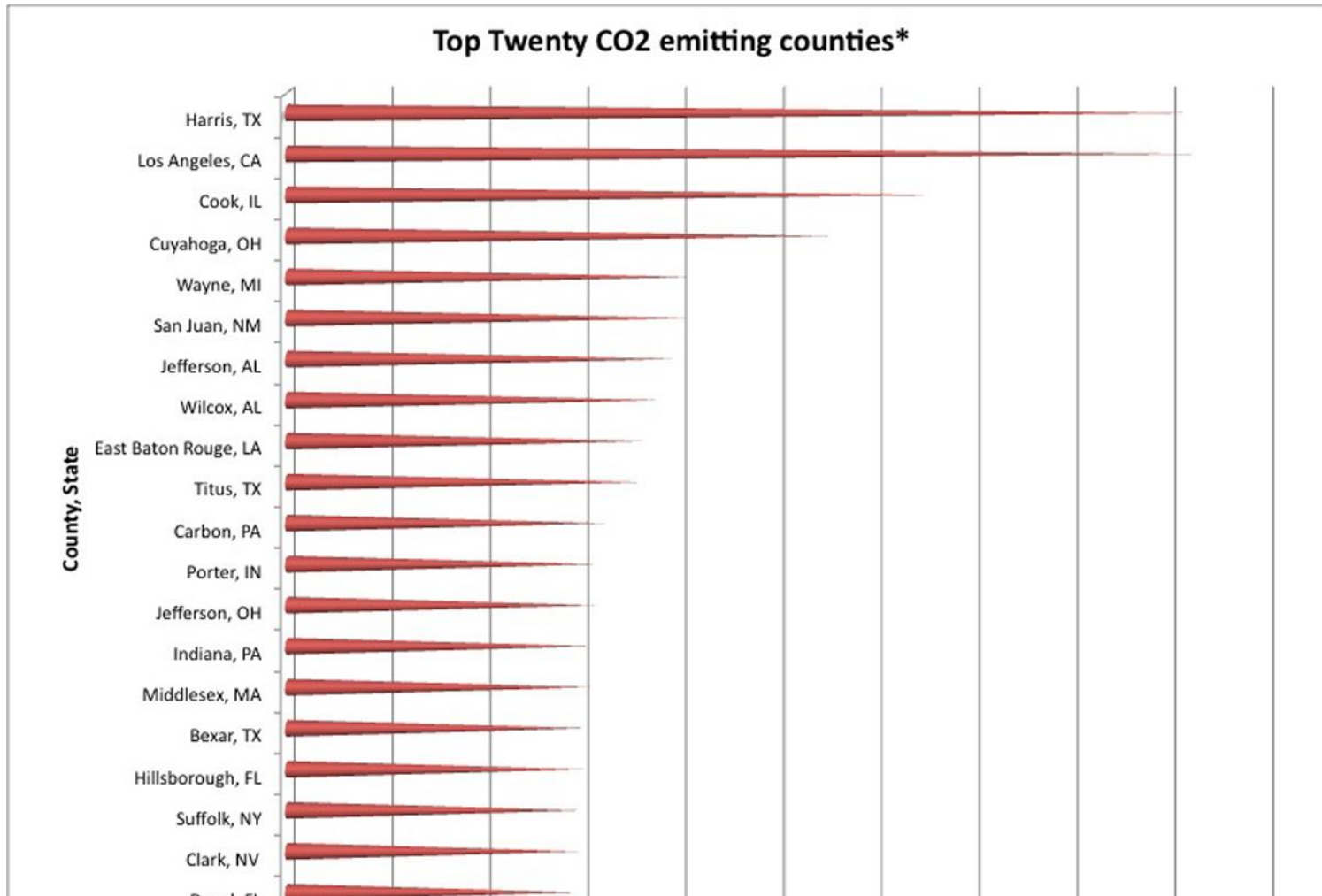
Tropical Storm Allison

General Rainfall Totals June 8 - 9 (12 Hr. Period)



Tropical Storm Allison 2001

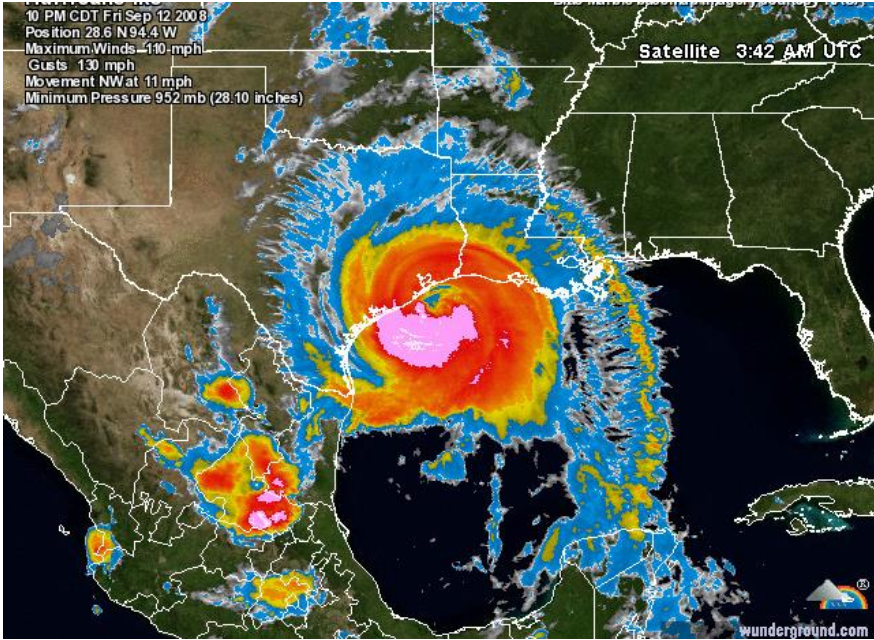
Top Twenty CO2 emitting counties*



Harris
County
Carbon
Emissions
2002 –
We're Also
#1

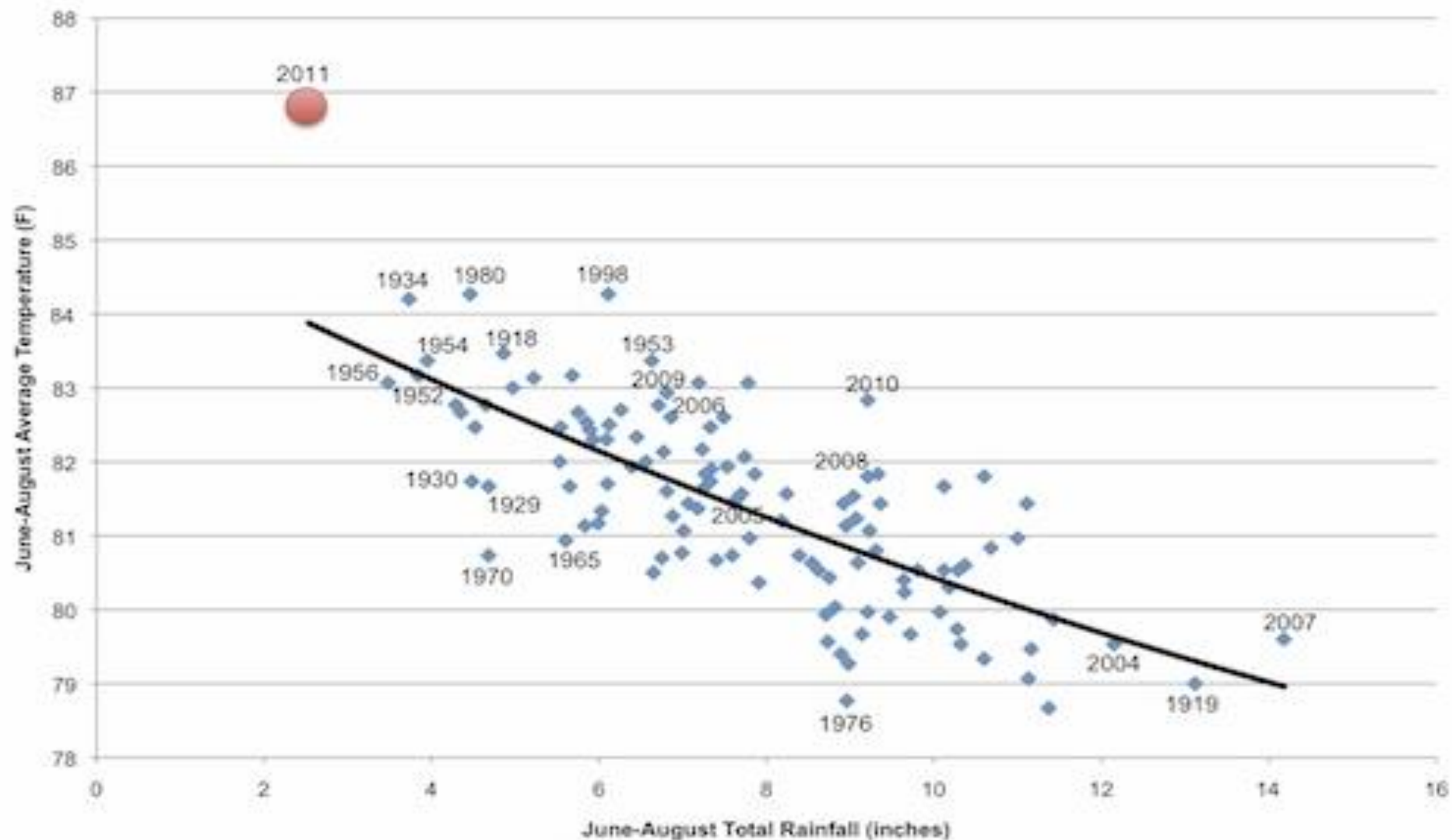
Katrina and Rita - 2005





Hurricane Ike 2008 Missed Us - \$24 Billion in Damages

Texas Summers



In Texas, the summer of 2011 has been both the hottest and driest on record. The drought has cost billions in economic losses, mainly due to agricultural impacts and from wildfires. Credit: John Nielsen-Gammon, Texas State Climatologist.

Country, Corporate, City GDP 2011

The World's Top 100 Economies

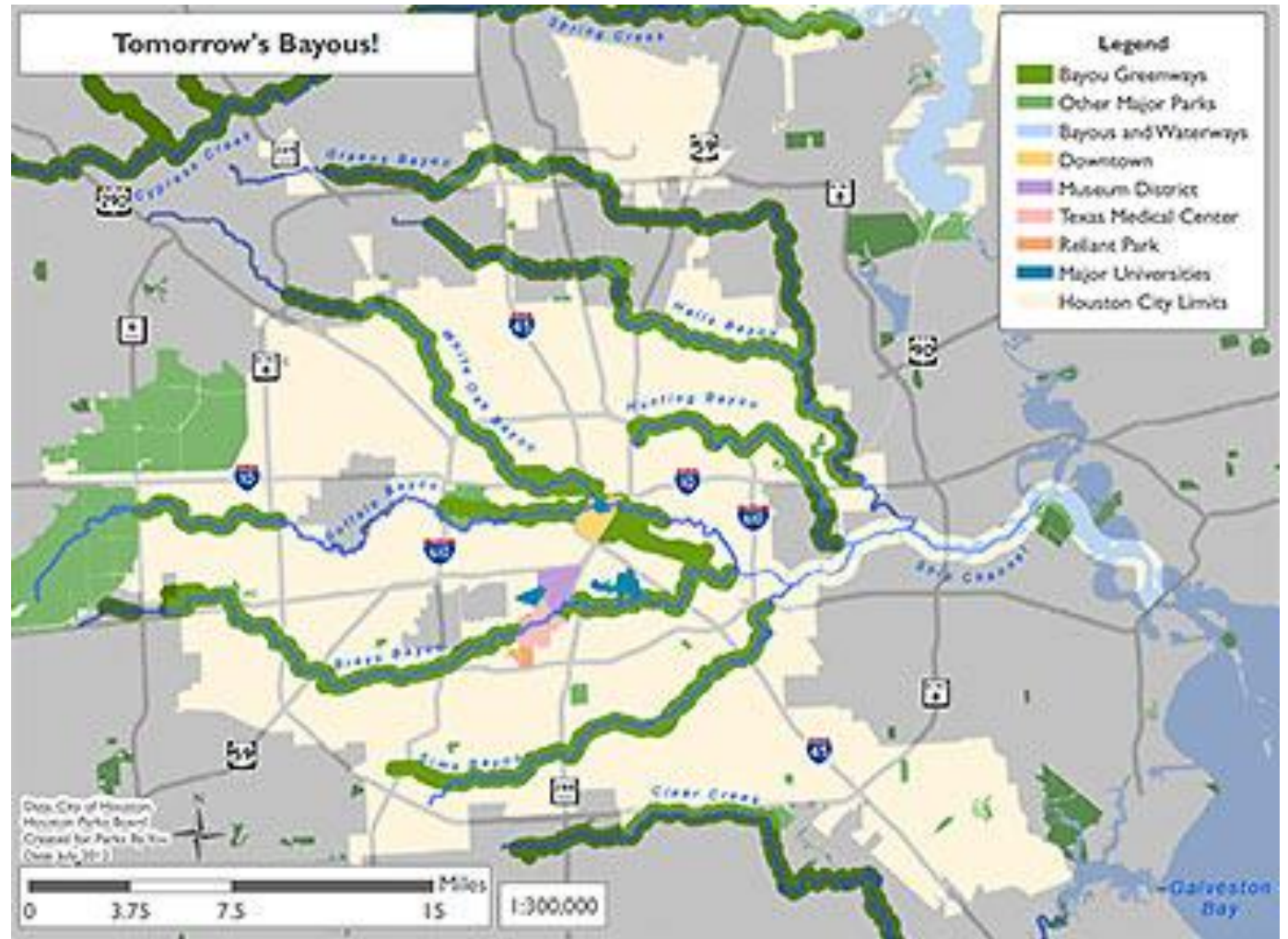
Country/City/Company	GDP/Revenues	Country/City/Company	GDP/Revenues	Country/City/Company	GDP/Revenues
1 United States	14,204	35 ExxonMobil	426	69 Chevron	255
2 China	7,903	36 Osaka/Kobe, Japan	417	70 Toronto, Canada	253
3 Japan	4,354	37 Wal-Mart Stores	406	71 Detroit, USA	253
4 India	3,388	38 Colombia	395	72 Peru	245
5 Germany	2,925	39 Mexico City, Mexico	390	73 Portugal	245
6 Russian Federation	2,288	40 Philadelphia, USA	388	74 Chile	242
7 United Kingdom	2,176	41 Sao Paulo, Brazil	388	75 Vietnam	240
8 France	2,112	42 Malaysia	383	76 Seattle, USA	235
9 Brazil	1,976	43 Washington, DC, USA	375	77 Shanghai, China	233
10 Italy	1,840	44 Belgium	369	78 Madrid, Spain	230
11 Mexico	1,541	45 Boston, USA	363	79 Total	223
12 Tokyo, Japan	1,479	46 Buenos Aires, Argentina	362	80 Singapore, Singapore	215
13 Spain	1,456	47 BP	361	81 Sydney, Australia	213
14 New York, USA	1,406	48 Venezuela	357	82 Bangladesh	213
15 Korea, Republic of	1,358	49 Sweden	344	83 Mumbai, India	209
16 Canada	1,213	50 Dallas/Forth Worth, USA	338	84 Rio de Janeiro, Brazil	201
17 Turkey	1,028	51 Ukraine	336	85 Denmark	201
18 Indonesia	907	52 Greece	329	86 Israel	201
19 Iran, Islamic Rep	839	53 Switzerland	324	87 Ireland	197
20 Los Angeles, USA	792	54 Moscow, Russian Federation	321	88 Hungary	194
21 Australia	762	55 Hong Kong, China	320	89 Finland	188
22 Taiwan	710	56 Austria	318	90 General Electric	183
23 Netherlands	671	57 Philippines	317	91 Kazakhstan	177
24 Poland	671	58 Nigeria	315	92 Volkswagen Group	158
25 Saudi Arabia	589	59 Atlanta, USA	304	93 ENI	158
26 Chicago, USA	574	60 Romania	302	94 AXA Group	157
27 Argentina	571	61 San Francisco/Oakland, USA	301	95 Phoenix, USA	156
28 London, UK	565	62 Houston, USA	297	96 Minneapolis, USA	155
29 Paris, France	564	63 Miami, USA	292	97 Sinopec-China Petroleum	154
30 Thailand	519	64 Seoul, South Korea	291	98 San Diego, USA	153
31 South Africa	492	65 Norway	277	99 HSBC Holdings	142
32 Royal Dutch Shell	458	66 Algeria	276	100 Barcelona, Spain	140
33 Egypt, Arab Rep	441	67 Toyota Motor	263		
34 Pakistan	439	68 Czech Republic	257		

■ Country
 ■ City
 ■ Company
 GDP/Revenues in \$ billions PPP, 2008

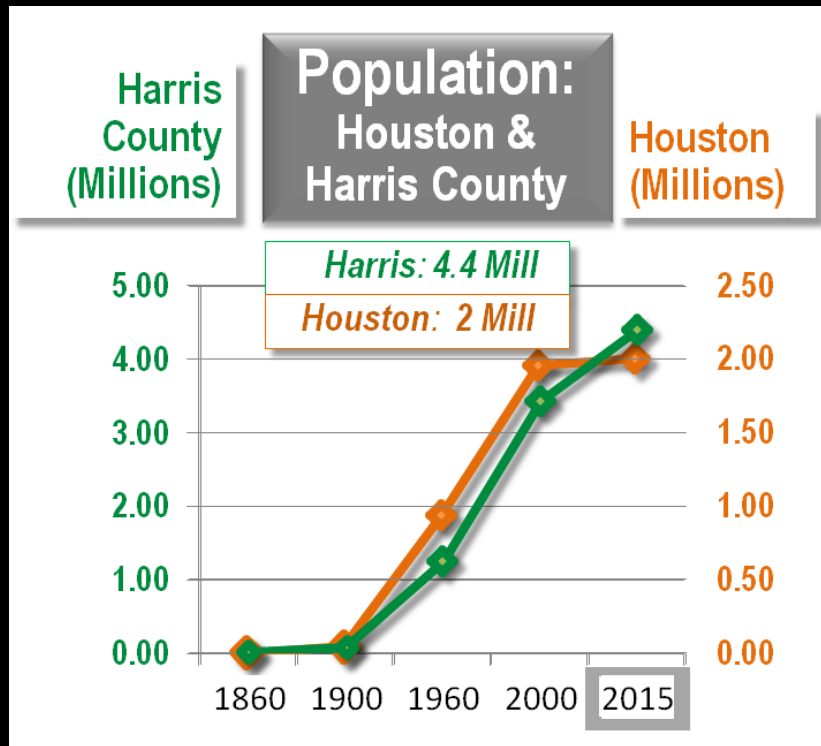
Data sources: Country data: GDP-PPP from the Development Data Platform time series, World Bank; City data: PricewaterhouseCoopers (PwC). 2009. *Which are the largest city economies in the world and how might this change by 2025?* Economic Outlook; Companies: Data retrieved from http://www.forbes.com/lists/2008/18/biz_2000global08_The-Global-2000_Rank.html (accessed November, 2009)

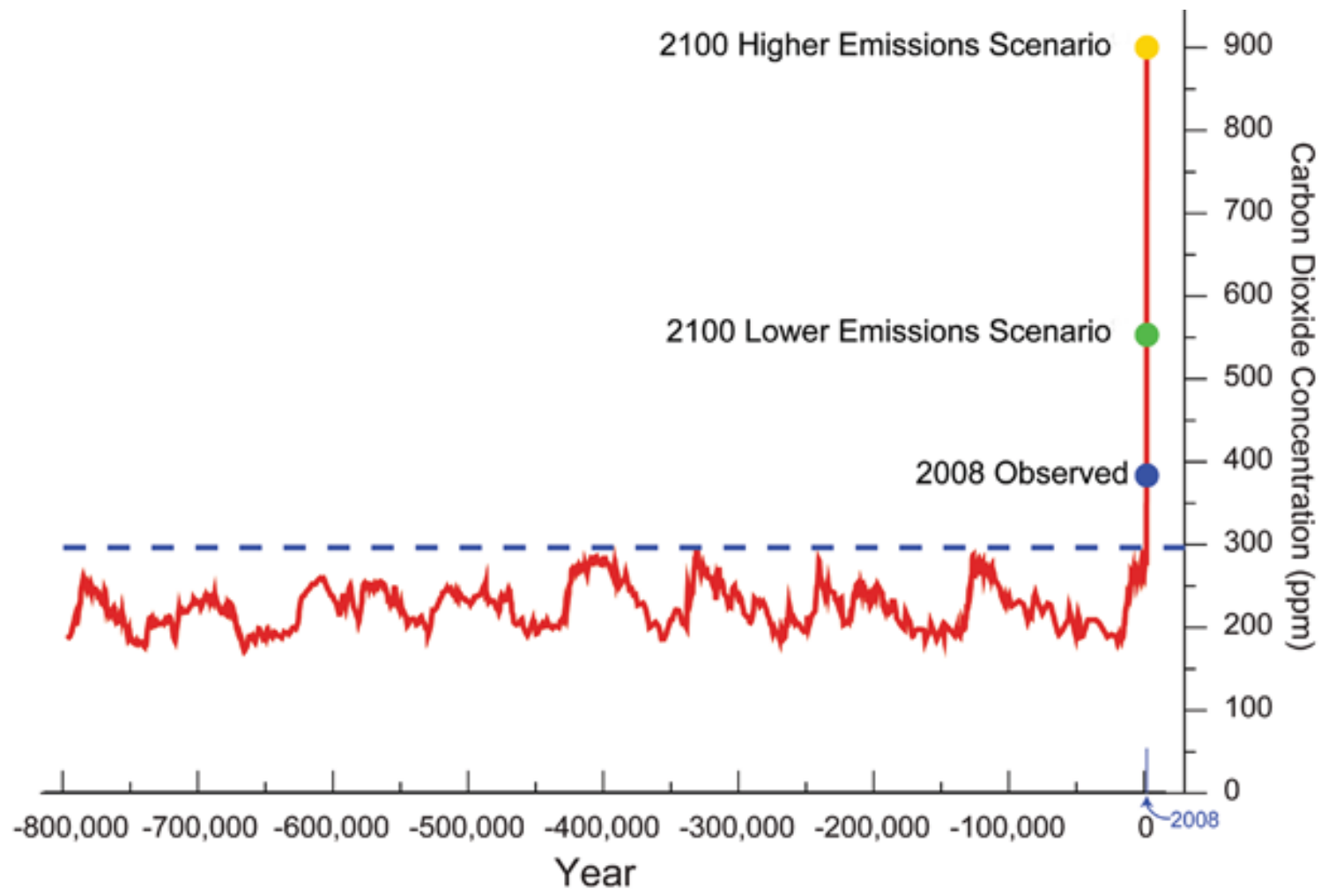
Cite as: Hoorweg, D., P. Bhada, M. Freire, C.L. Trejos Gómez, R. Dave. 2010. *Cities and Climate Change: An Urgent Agenda*. World Bank.

Houston Bayou Greenways Bond Issue \$100 million, Nov 2012



Population, 2015

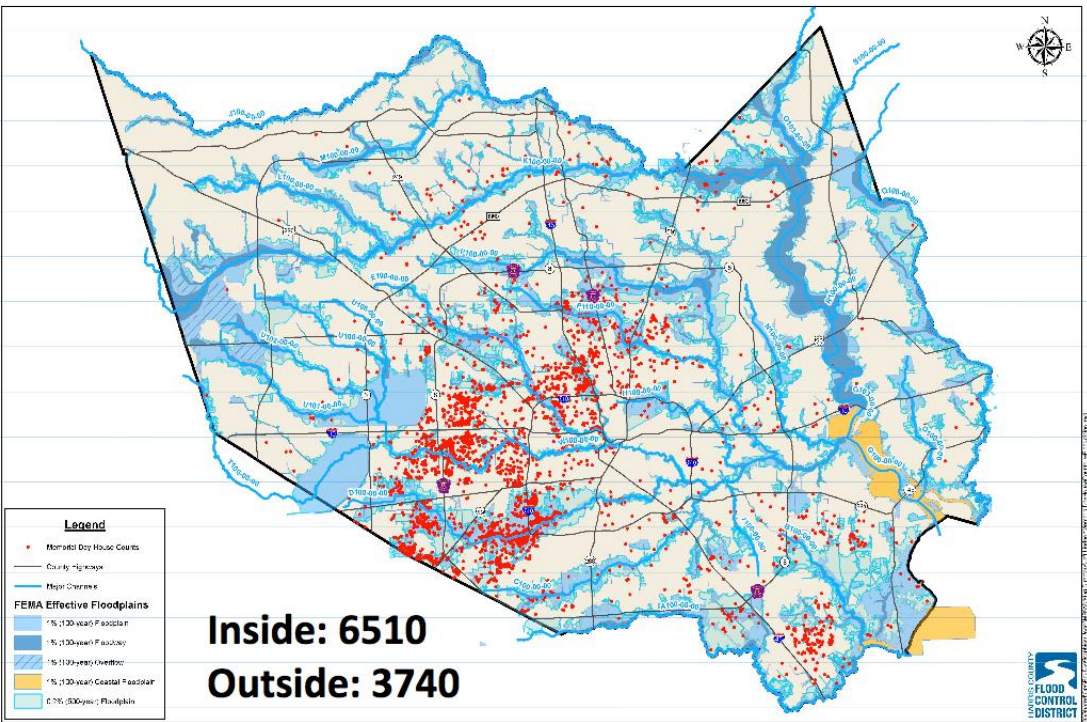




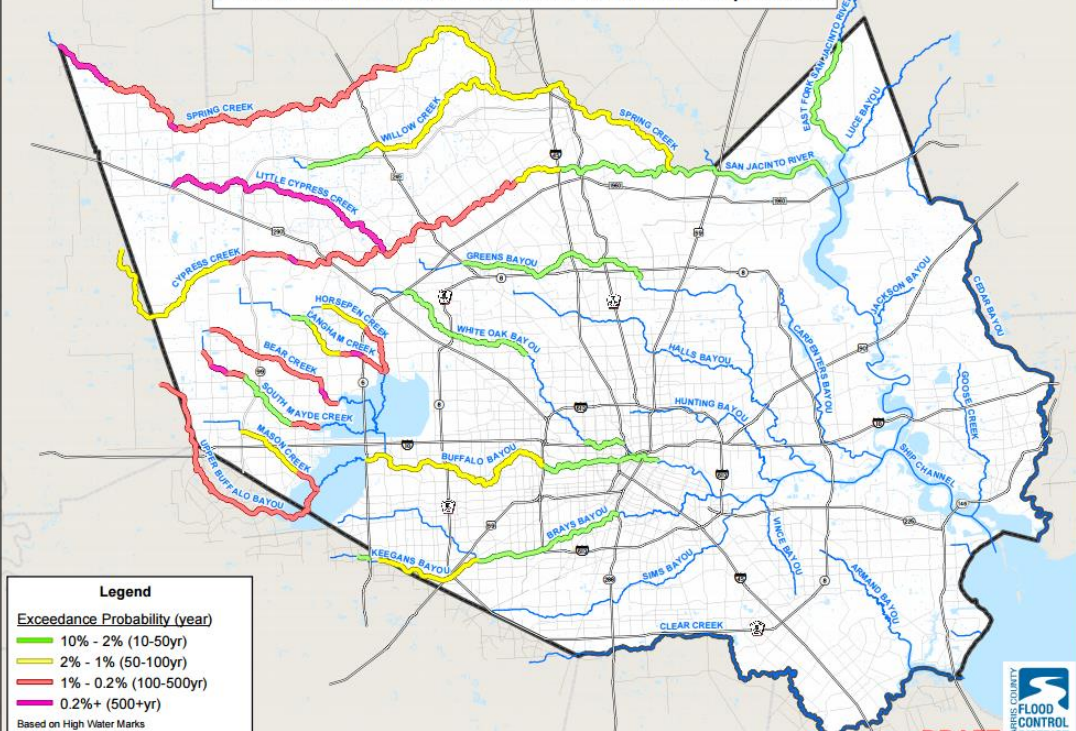
**Carbon
Dioxide
Over
800,000
Years**

Flooding, 2015 and 2016

Floodplains and House Flooding Memorial Day



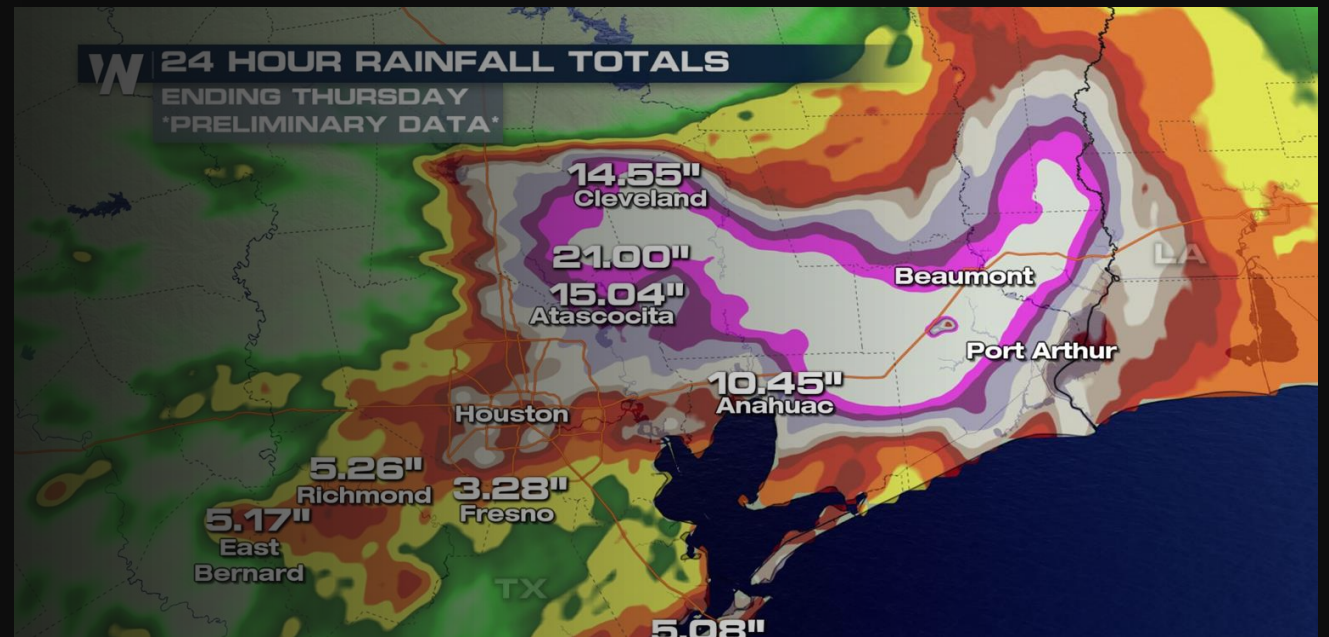
Tax Day Flood, April 17-18, 2016 Peak Channel Water Surface Elevation Frequencies



Harvey 2017



Imelda 2019





Houston In the 21st Century –
Fly or Die? It Depends on “Place”



Houston In the 21st Century

What Kind of
Place
Could/Should
We Be?

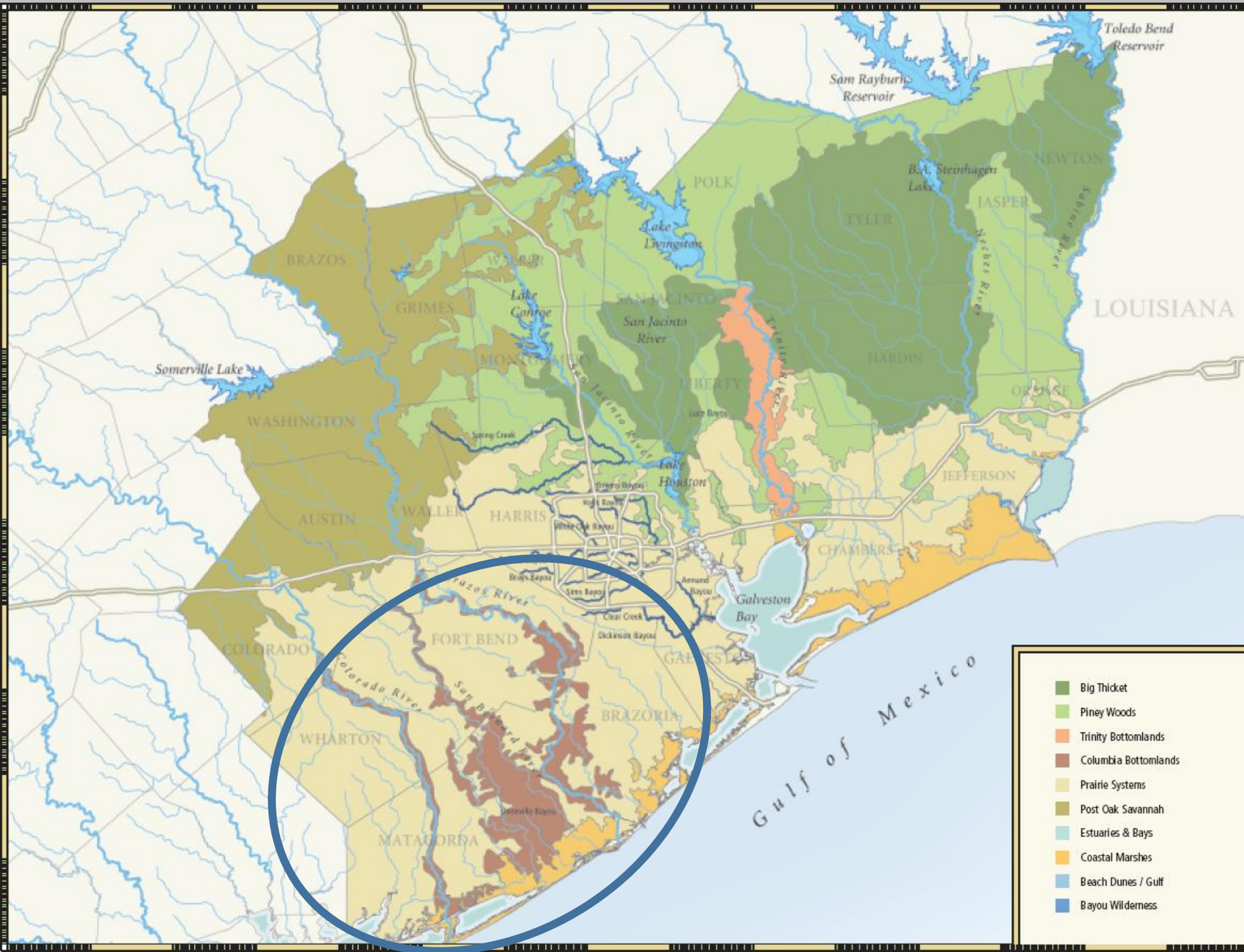
An ecological place –
Houston's best-kept secret

A carbon solution place –
the dark horse

A place that lives with water
– doable

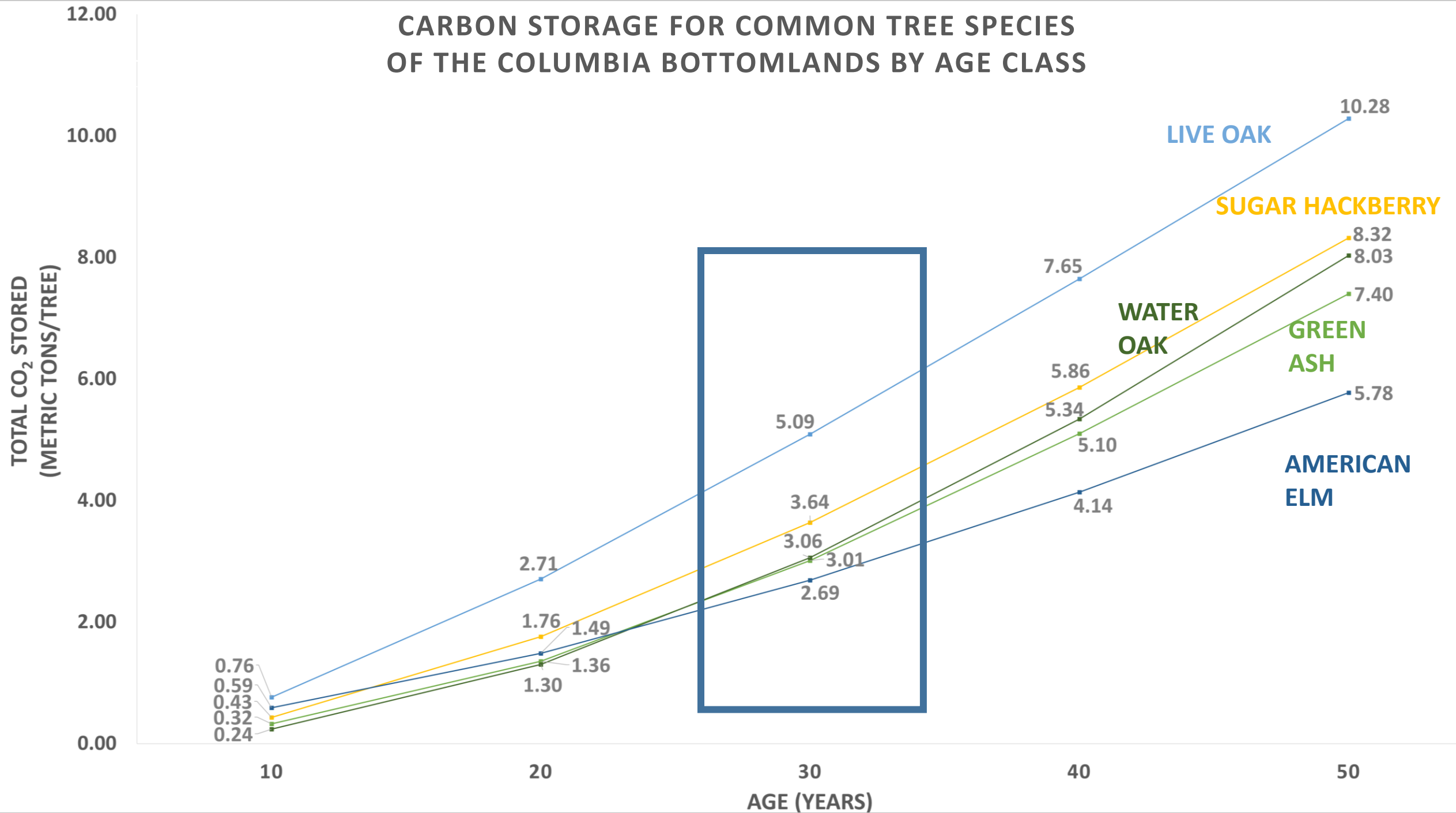
An equitable place – a tough
one but we have begun

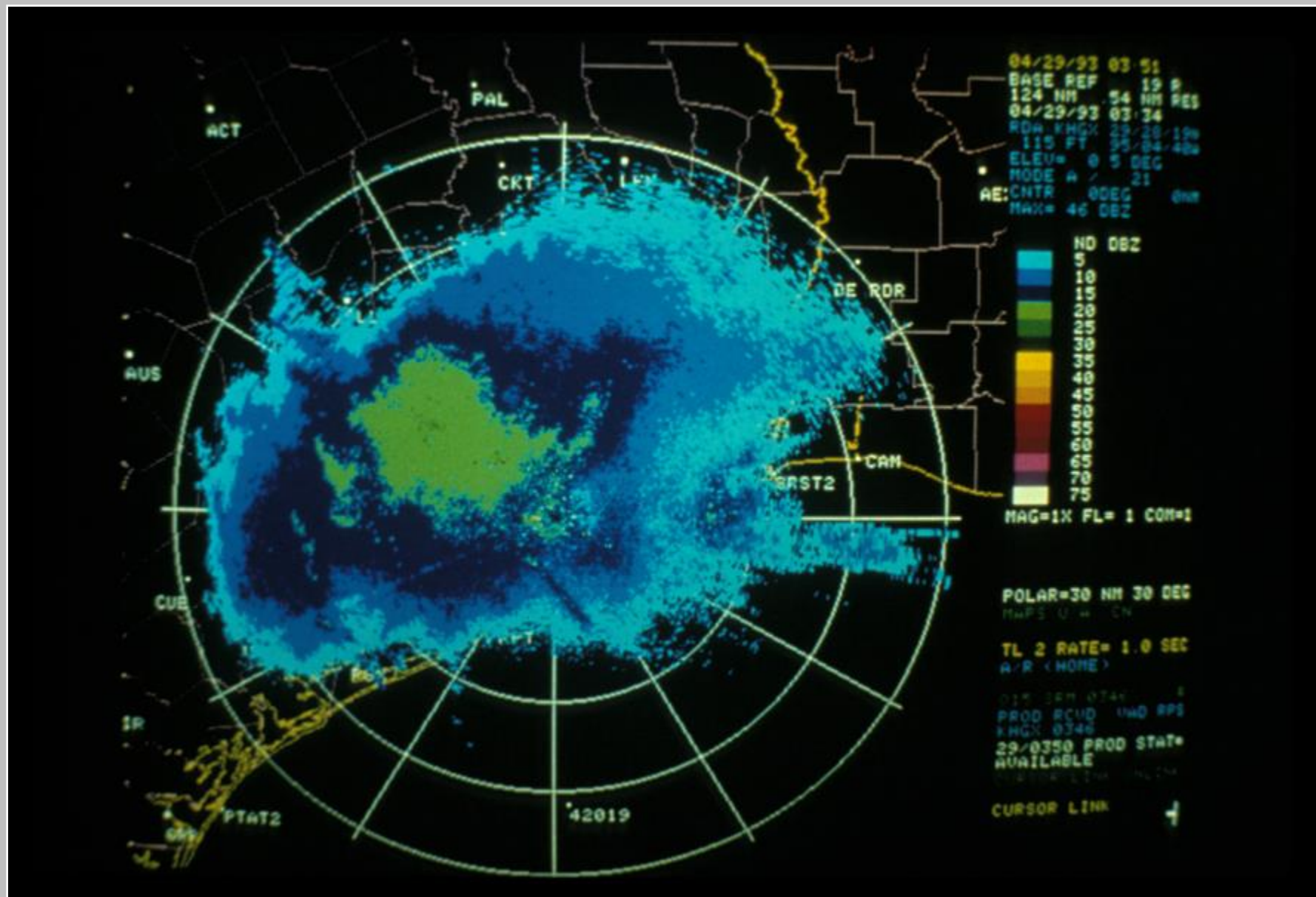
Columbia Bottomlands





CARBON STORAGE FOR COMMON TREE SPECIES OF THE COLUMBIA BOTTOMLANDS BY AGE CLASS



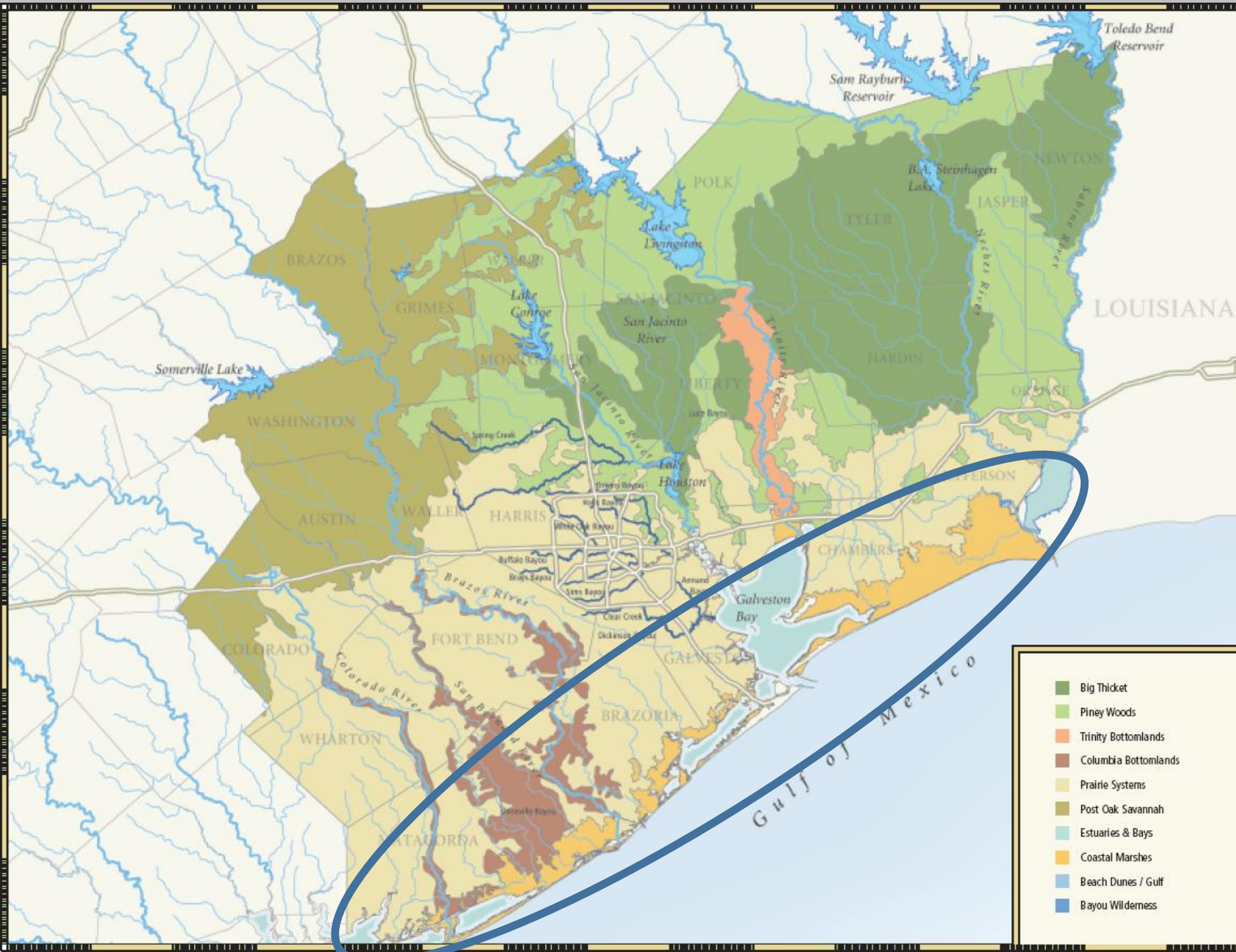




Gray Catbird

A Bird of the
Thickets

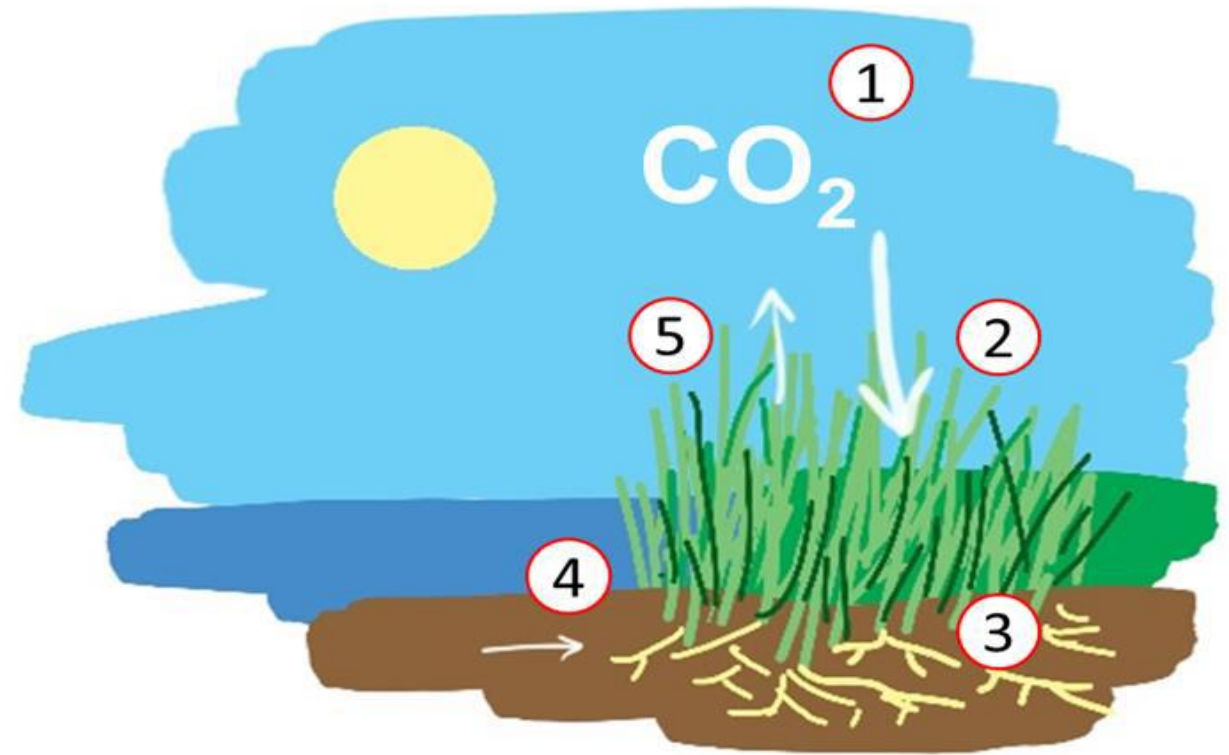
Wetlands







Carbon Dioxide Removal and the Coastal Marsh



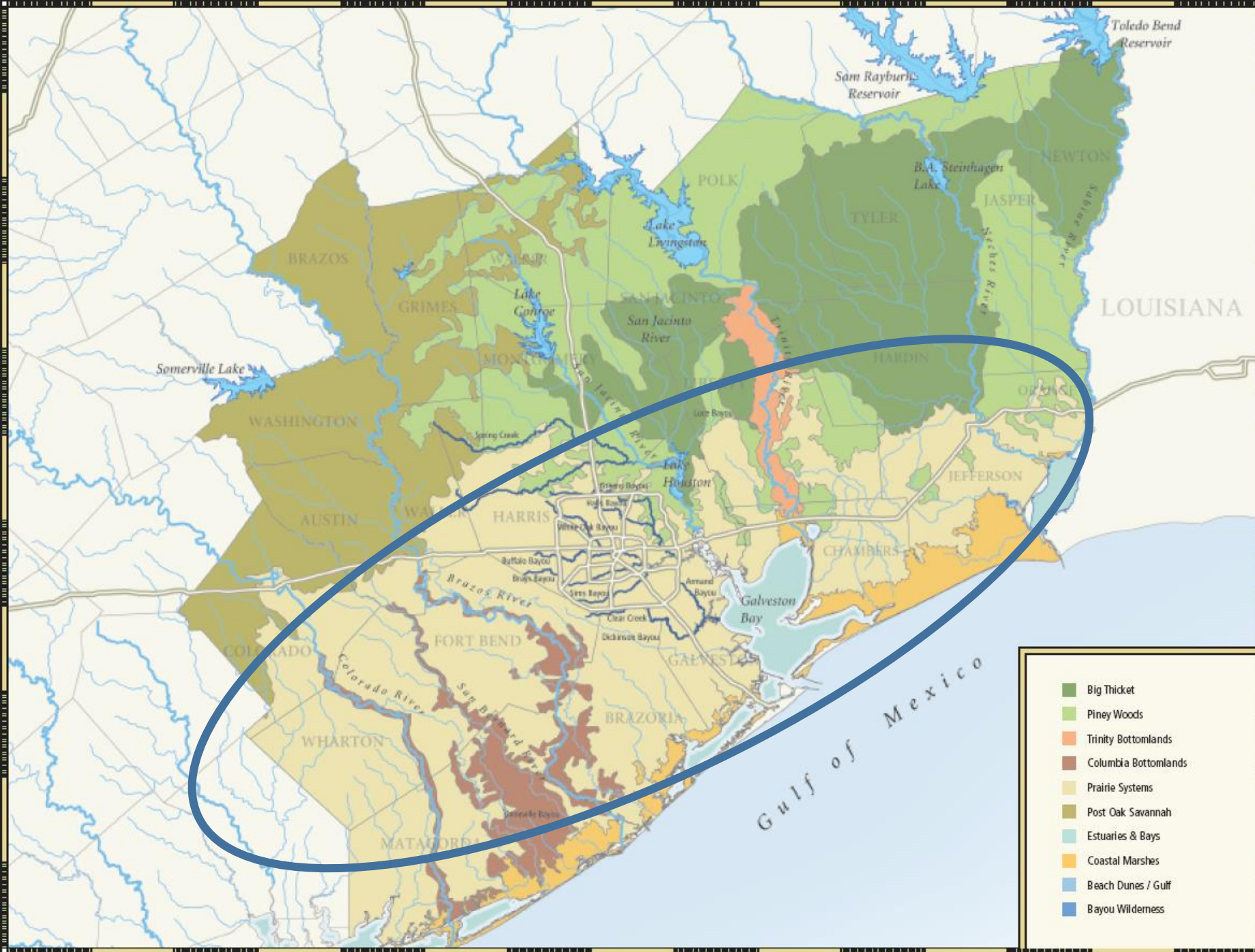
1. CO₂ In Atmosphere
2. Photosynthesis in Marsh Plant
3. Carbohydrate deposited in plant and roots
4. Carbohydrate becomes carbon in soil
5. Some CO₂ back to the atmosphere

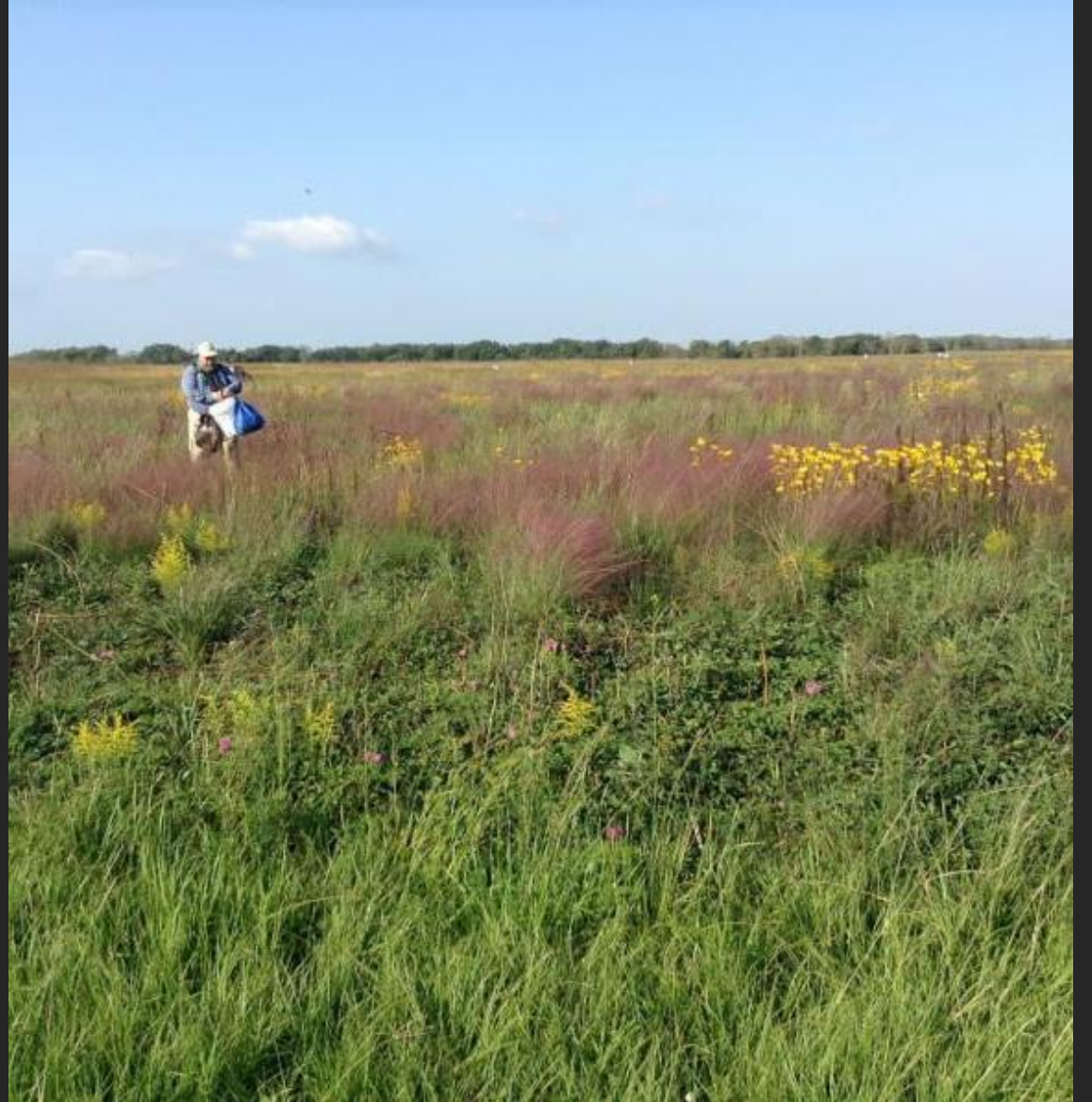


Roseate Spoonbill

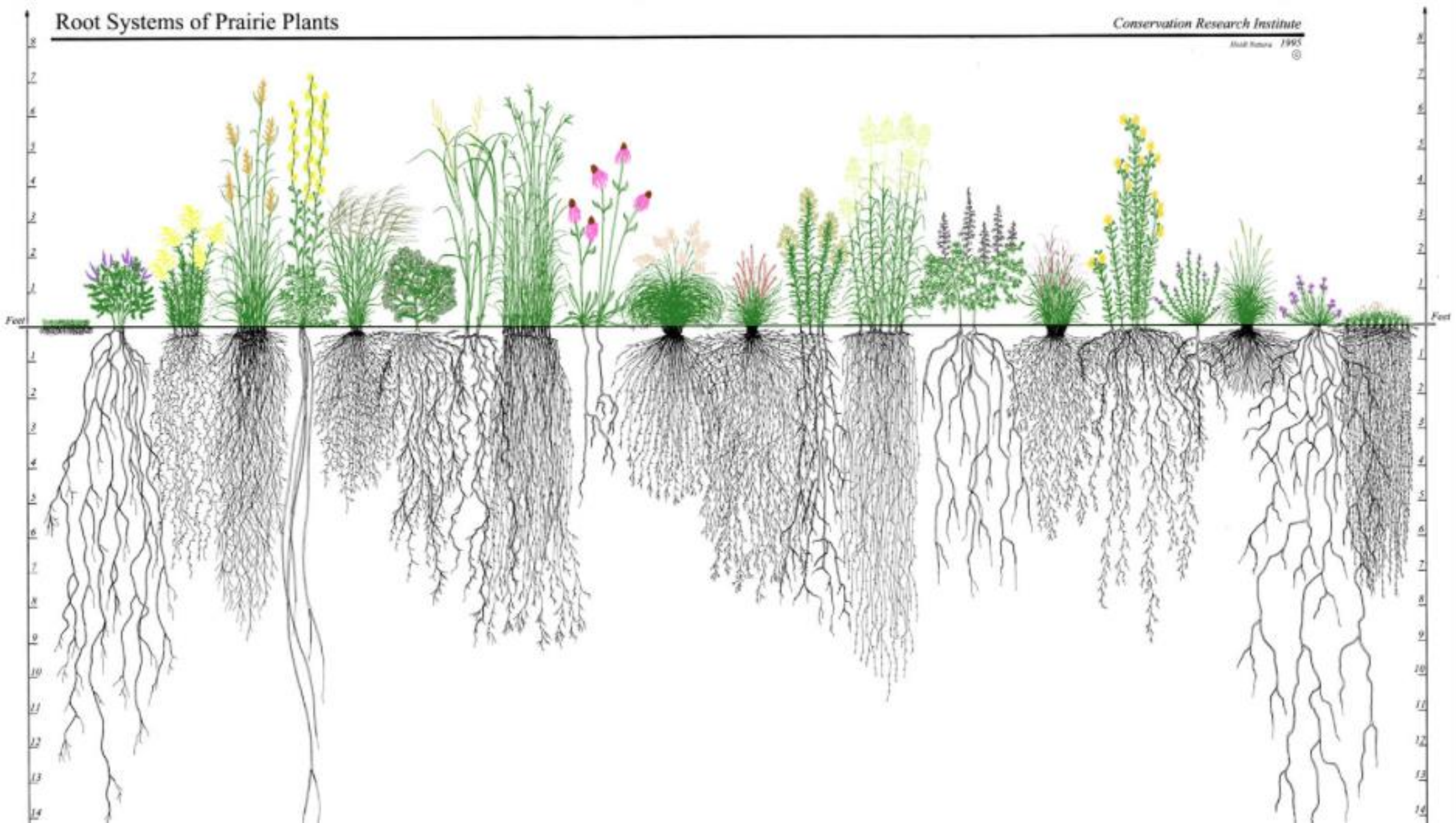
A Bird of the
Coastal Marshes

Prairie





Root Systems of Prairie Plants





The Mottled Duck

A Texas Native of
the Prairie Potholes

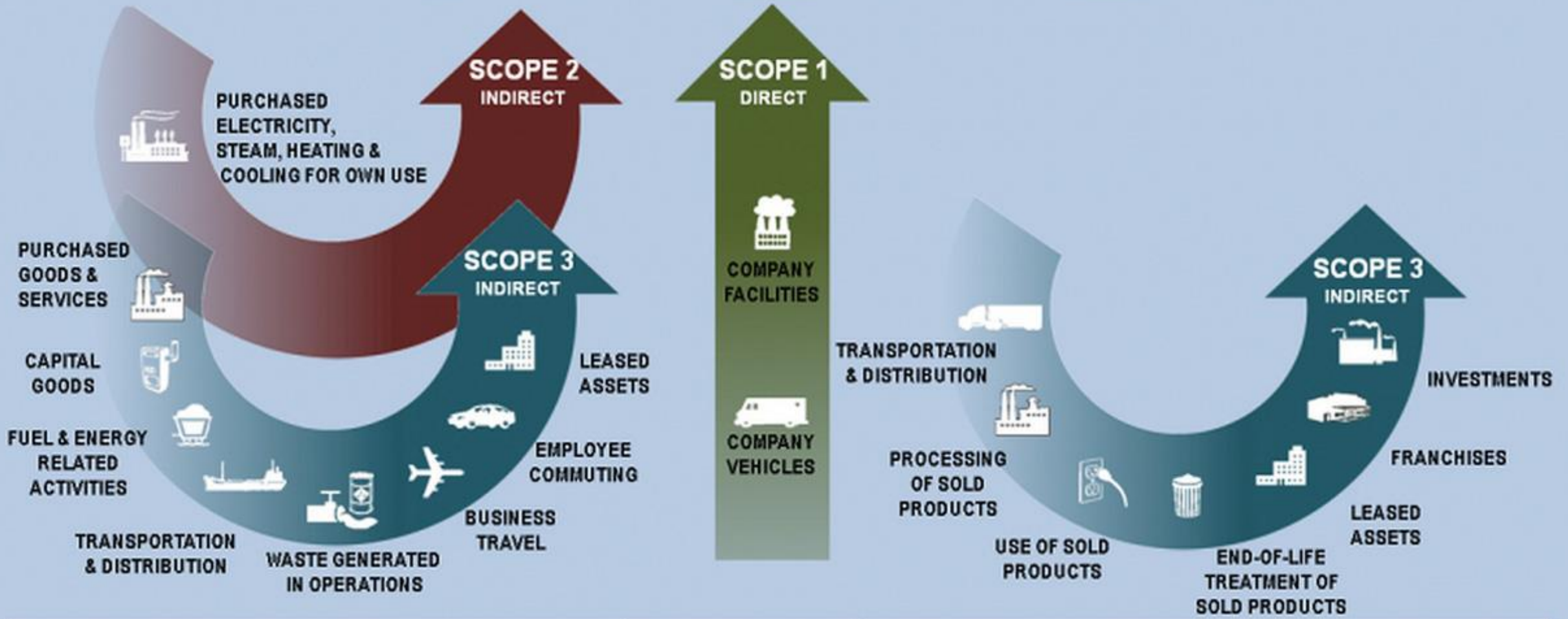


Bobby Tudor's Vision

HOUSTON: LEADING THE ENERGY TRANSITION

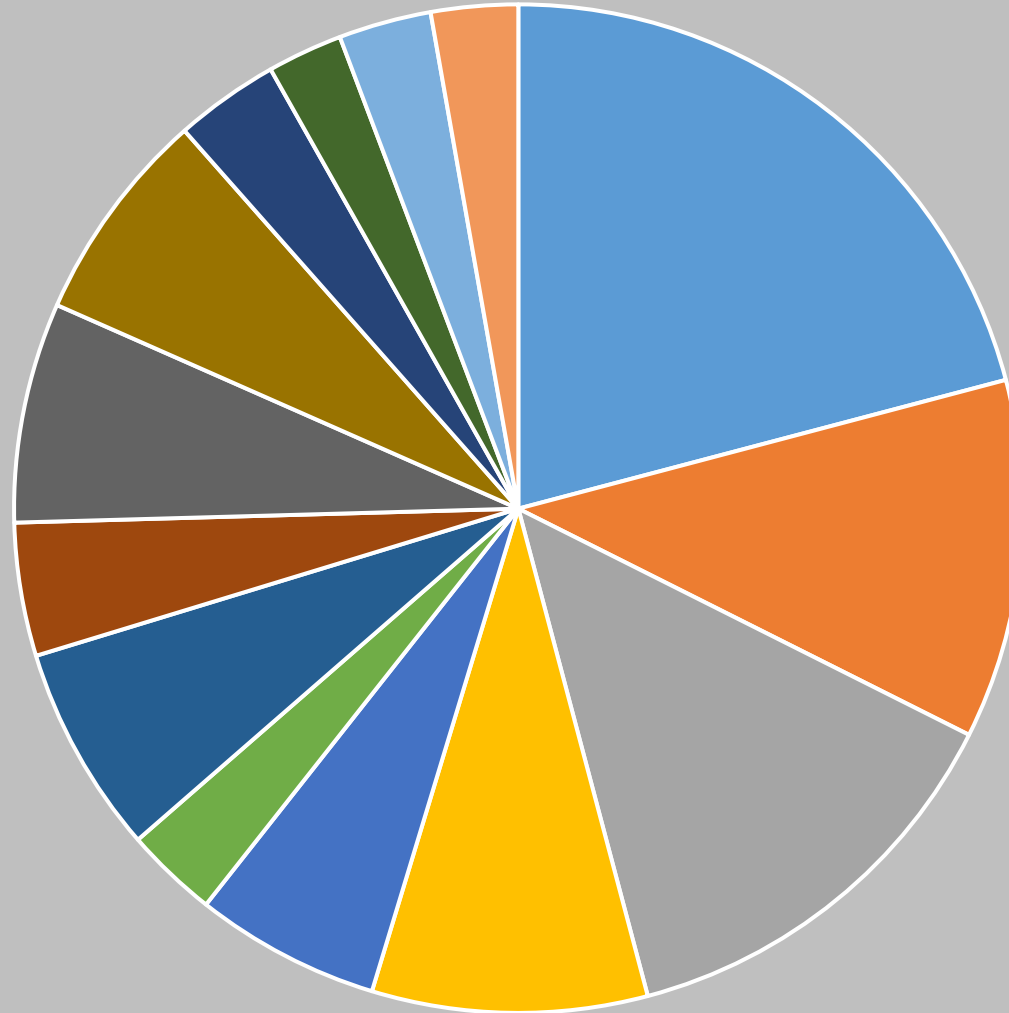
- Commit to lower carbon emissions
- Develop new technologies that address the dual challenge: meeting global energy demand while lowering the world's carbon footprint
- Leverage Houston's strength in natural gas
- Lead development of Carbon Capture, Use, and Storage
- Be leaders in energy efficiency, conservation, and sustainability; smart city technology

CO₂ CH₄ N₂O HFCs PFCs SF₆



Scope 1 and 2 Carbon Emissions

15 Companies With Strong Houston- Region Connections



A B C D E F G H I J K L M N

Total =
538,500,000
metric tons

At 1 t/acre =
538,500,000
acres.

At 2 t/acre =
270,000,000
acres.

At 4 t/acre =
135,000,000
acres.

ExxonMobil

Scopes 1 and 2 vs. 1, 2 and 3

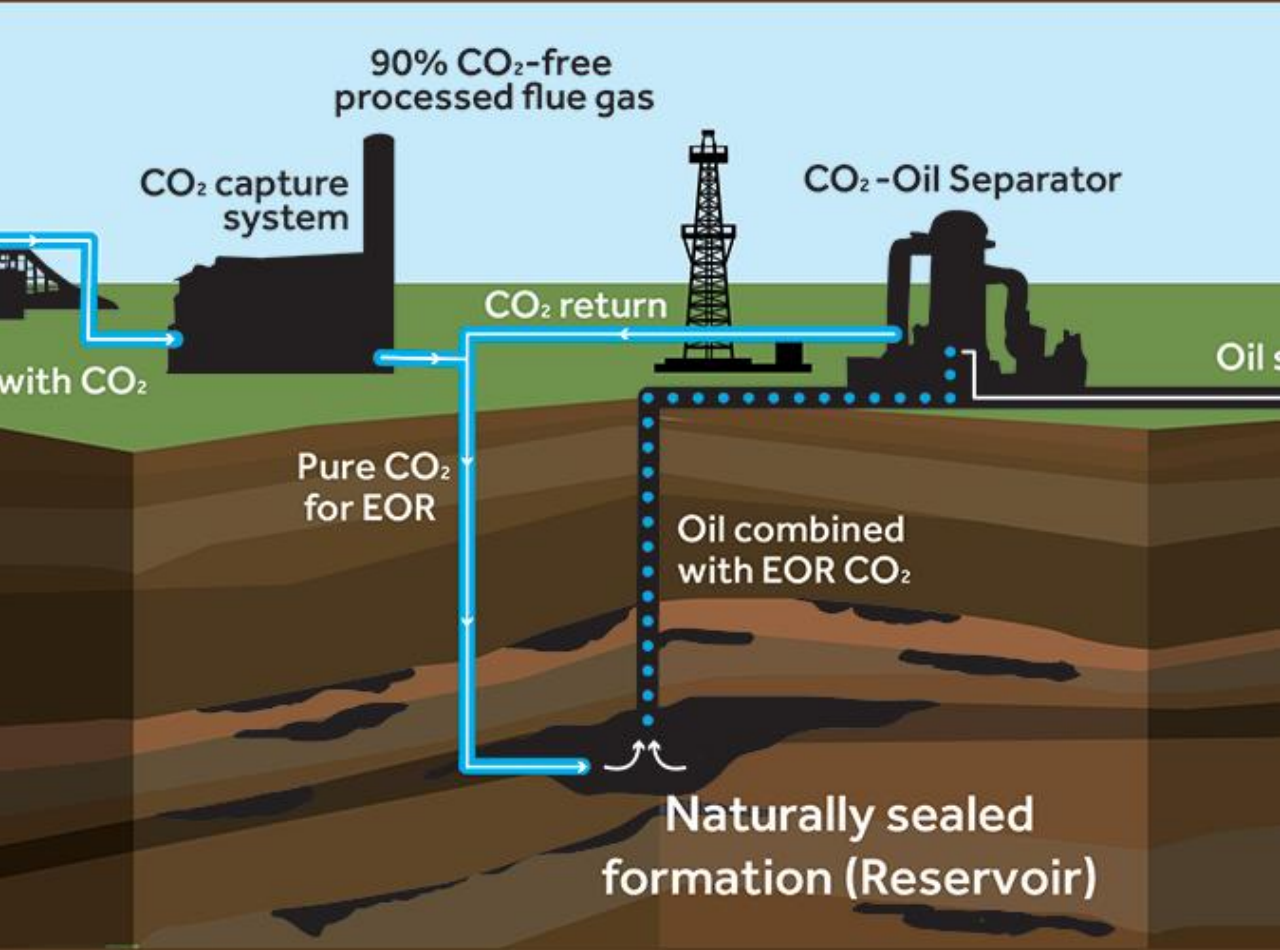
122 MM
t CO₂/yr



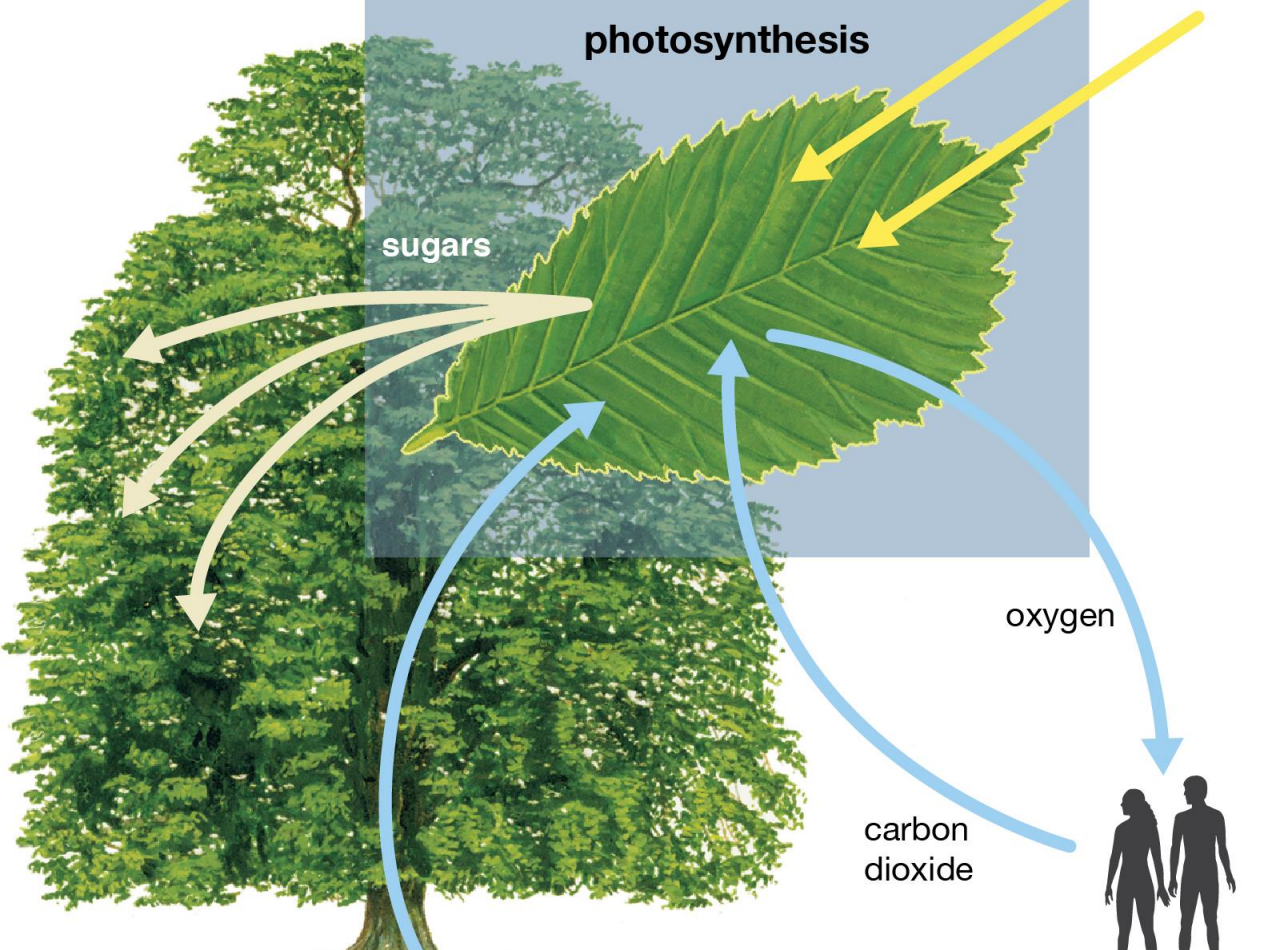
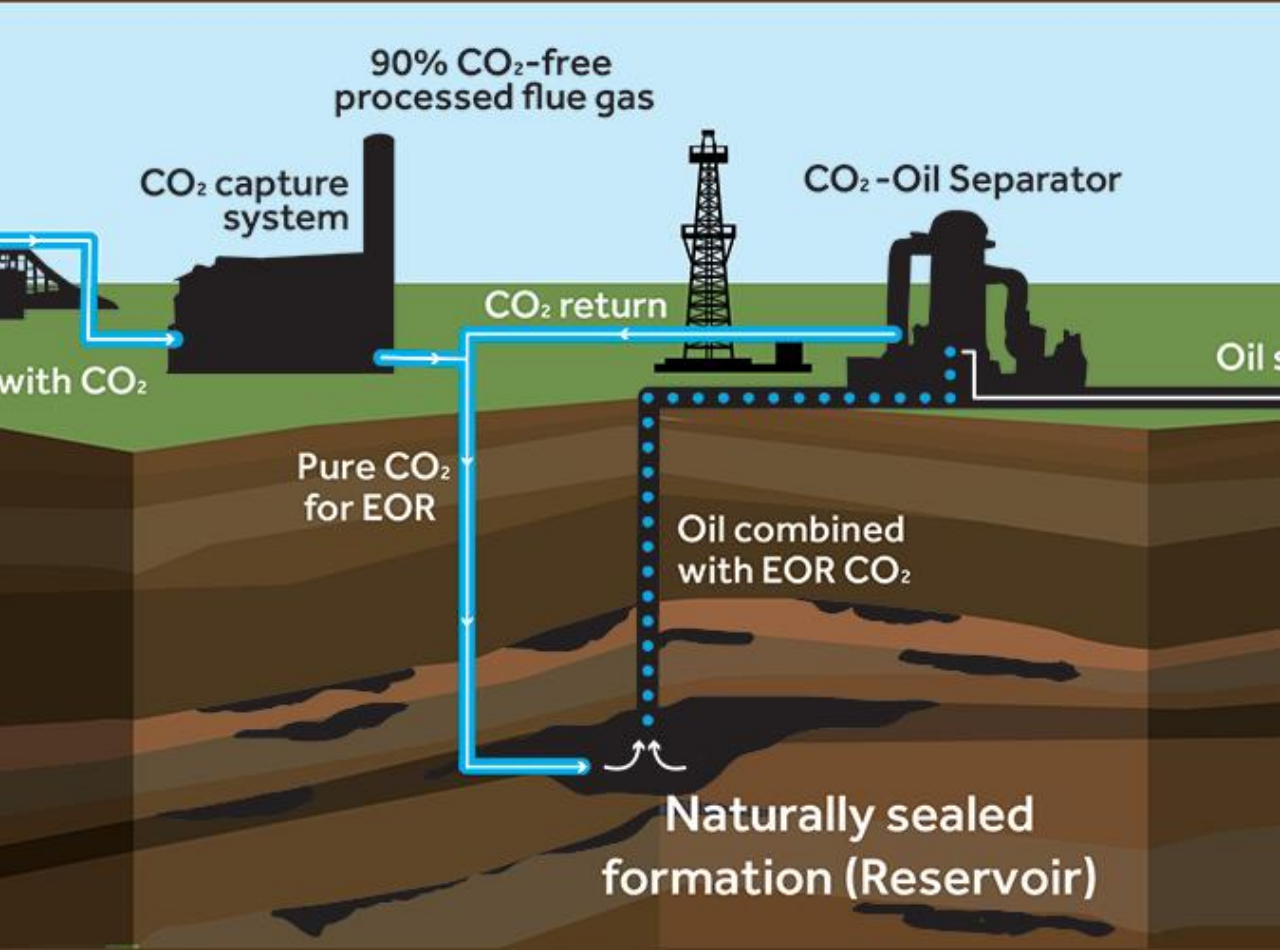
610 MM t CO₂/yr



Compiled from publicly
available information

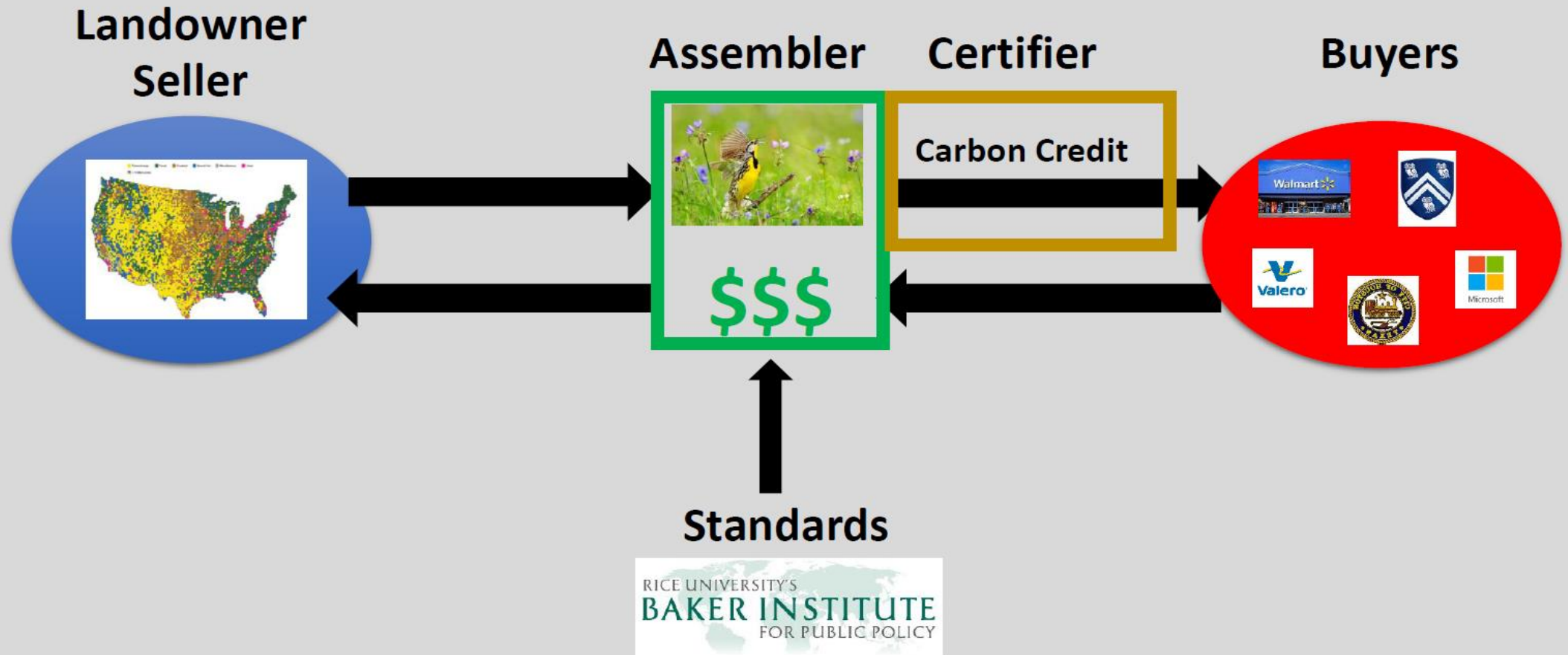


TWO CONCEPTS OF CARBON CAPTURE AND STORAGE



TWO CONCEPTS OF CARBON CAPTURE AND STORAGE

Baker Institute Soil Carbon Storage Standard



Native Systems Protected by Landowners



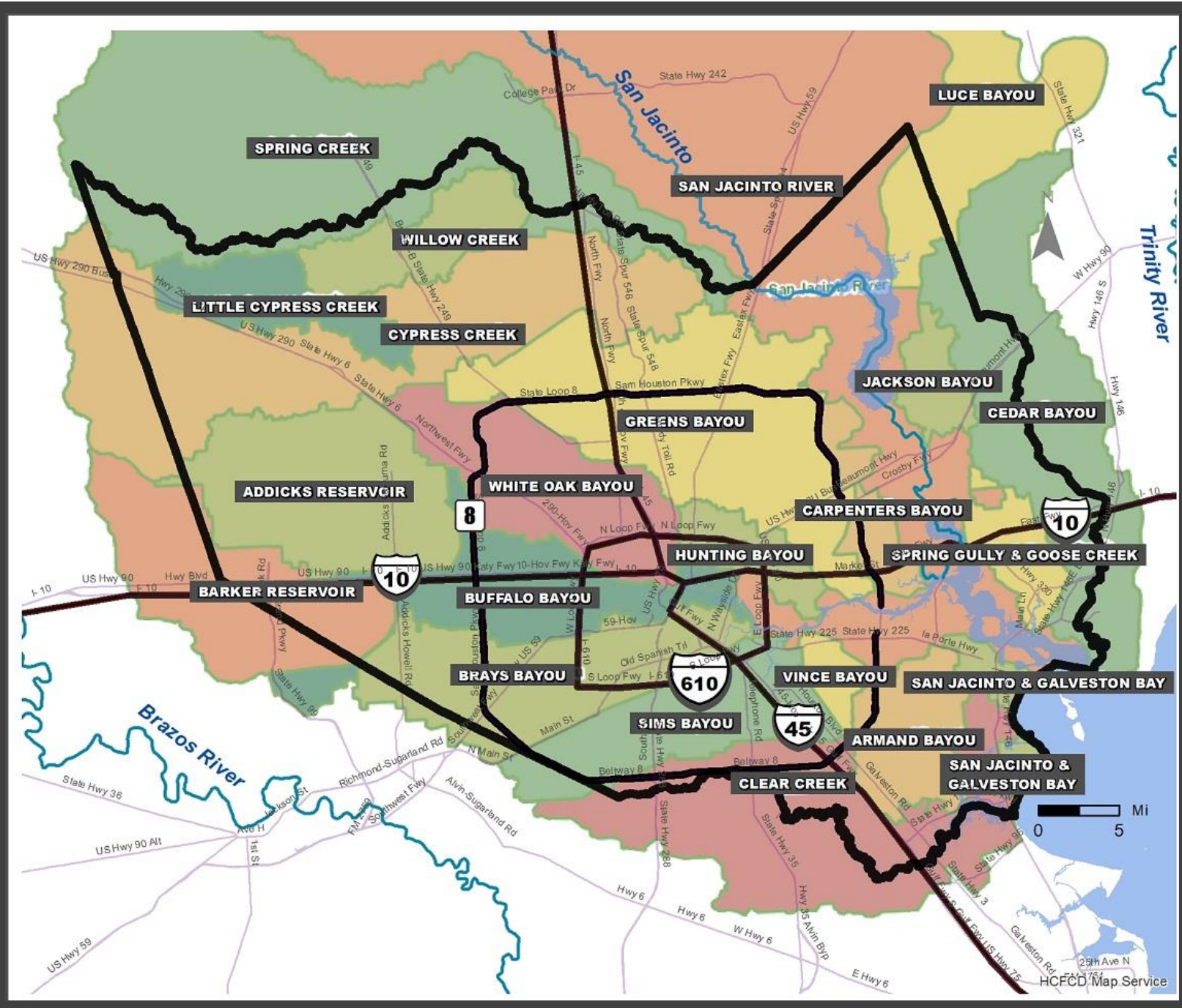


Our Flooding Problem Is Bad and Will Worsen If We Fail To Learn and Ad



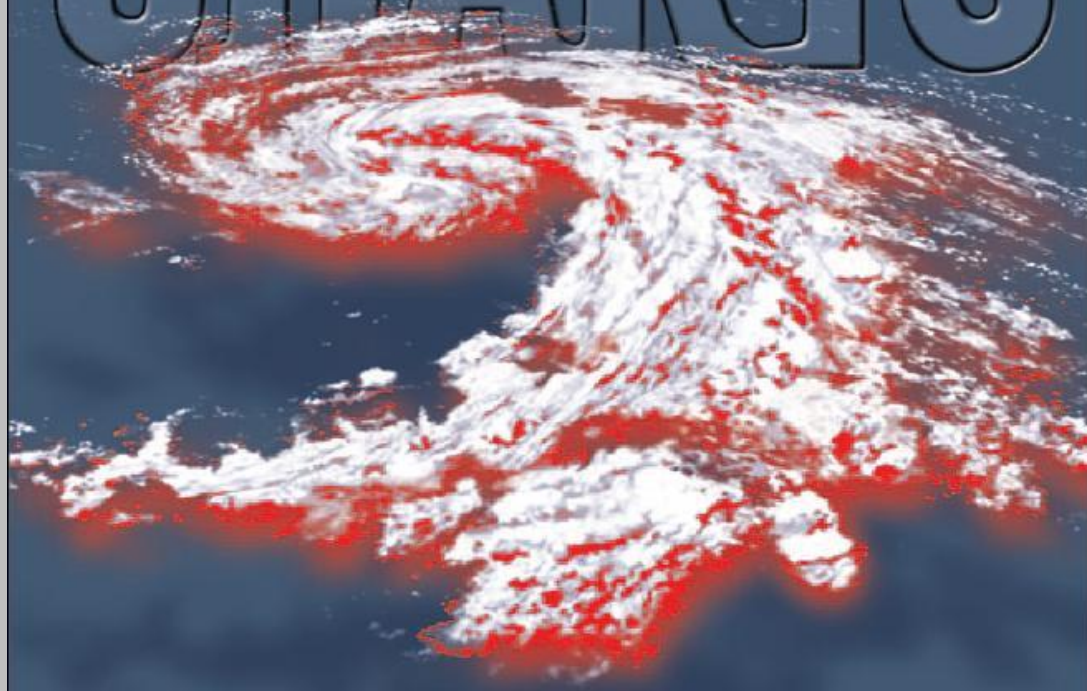
Flood Literacy

Watersheds of Harris County and Houston



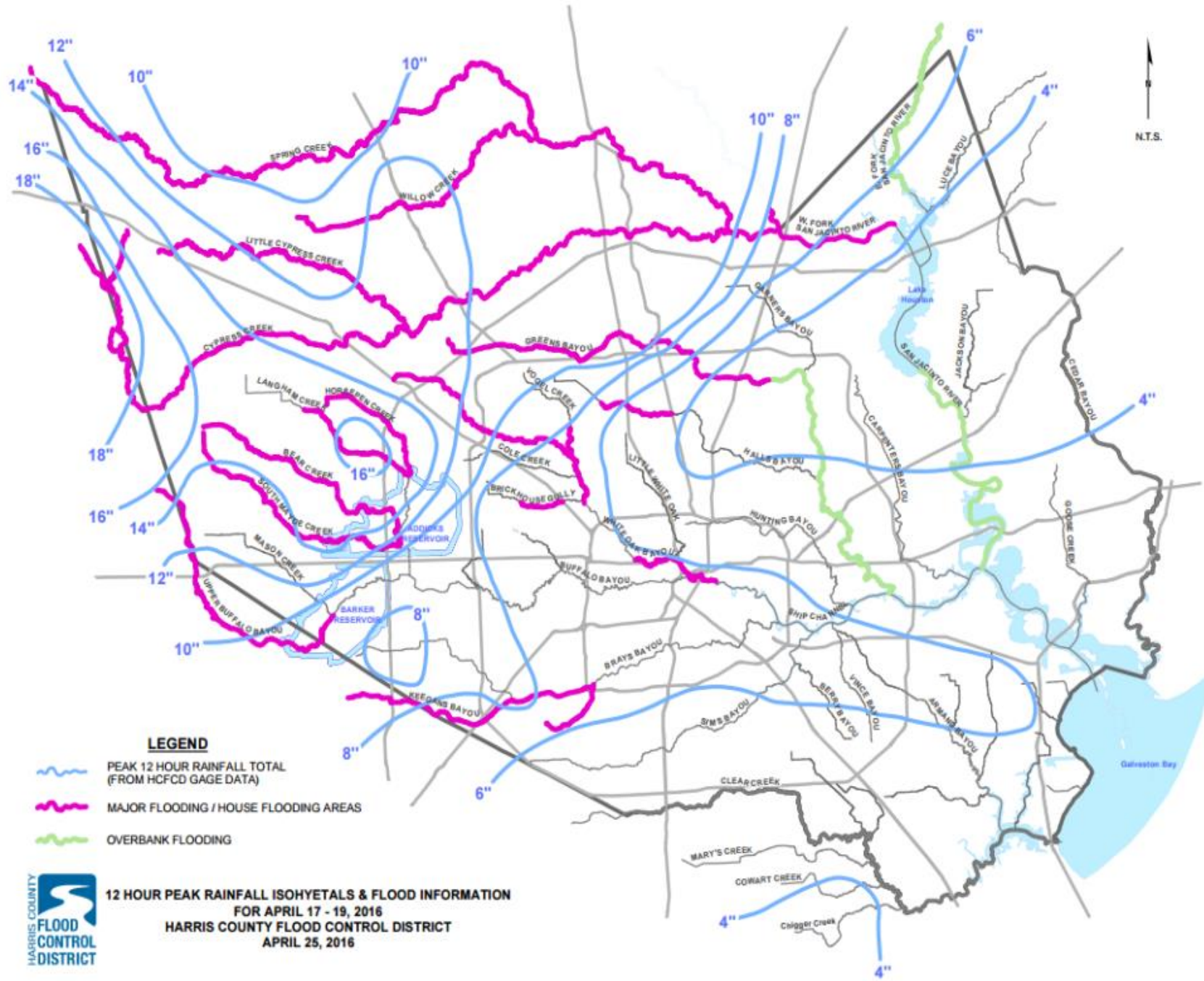
OFF THE CHARTS

TROPICAL STORM **ALLISON** PUBLIC REPORT



UNPRECEDENTED DAMAGE
UNPRECEDENTED RELIEF
UNPRECEDENTED RECOVERY



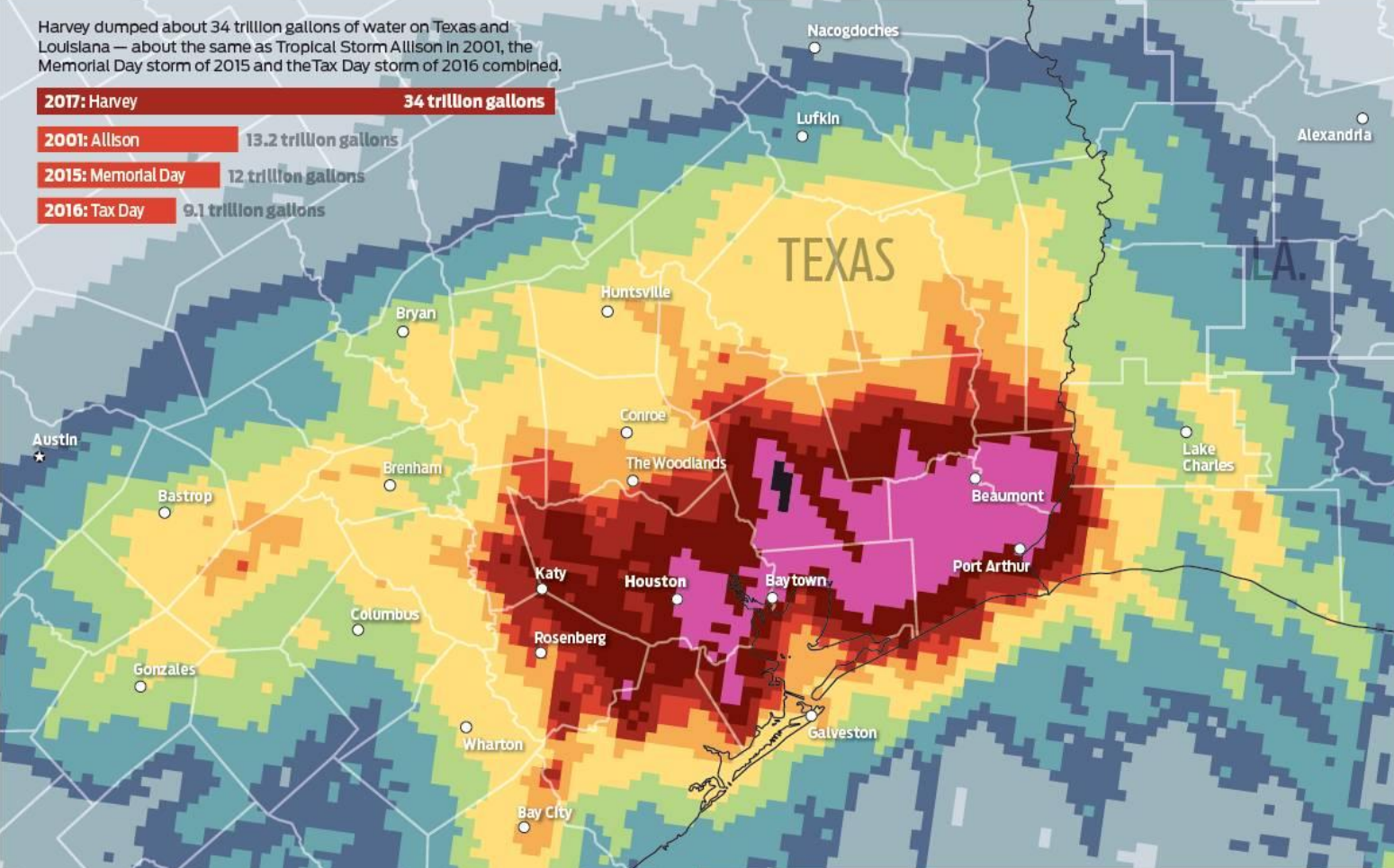


S:\Users\Aly\1\m\2016\April\17-19-2016\Flood E_annot2016_0417-19\april2016_fc.jpg

Tax Day Flood April 2016

Harvey dumped about 34 trillion gallons of water on Texas and Louisiana — about the same as Tropical Storm Allison in 2001, the Memorial Day storm of 2015 and the Tax Day storm of 2016 combined.

- 2017: Harvey** 34 trillion gallons
- 2001: Allison** 13.2 trillion gallons
- 2015: Memorial Day** 12 trillion gallons
- 2016: Tax Day** 9.1 trillion gallons



Harvey 2017

4-day, 500-Year Storm = 21 inches

Harvey – 40+ inches

Record breaking

The rainfall amounts shown in this map consist of both rain gauge data and radar precipitation estimates. Each grid cell represents the average rainfall within the cell area.

RAINFALL OVER THE FIVE-DAY PERIOD FROM AUG. 23 TO AUG. 30

0-4	4.01-8	8.01-10	10.01-14	14.01-18	18.01-24	24.01-28	28.01-30	30.01-34	34.01-40	40.01-50	50.01-54.7
INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES



Sources: Dr. Shane Hubbard, Cooperative Institute for Meteorological Satellite Studies at the University of Wisconsin-Madison and the National Weather Service

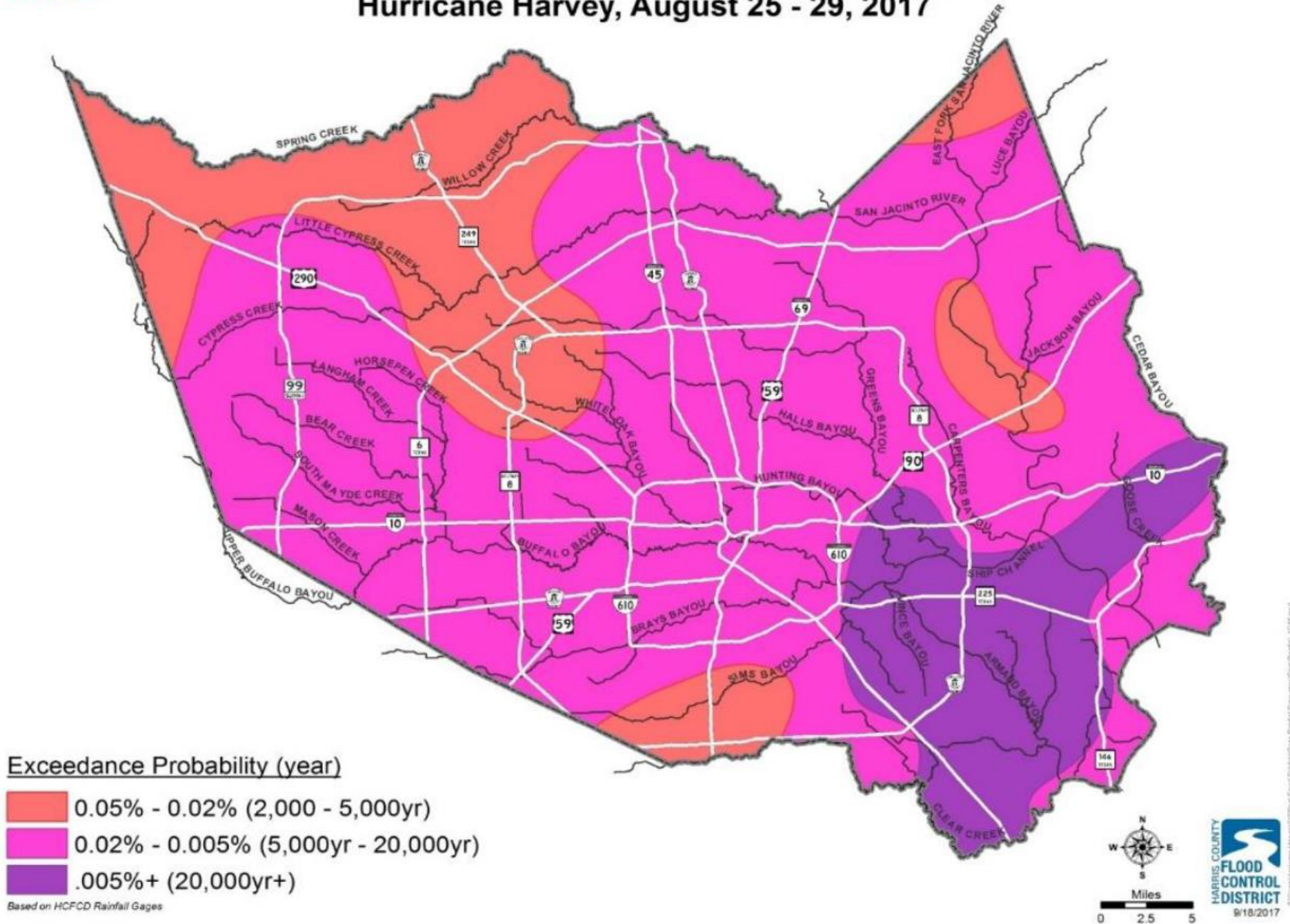
Charles Apple / Houston Chronicle

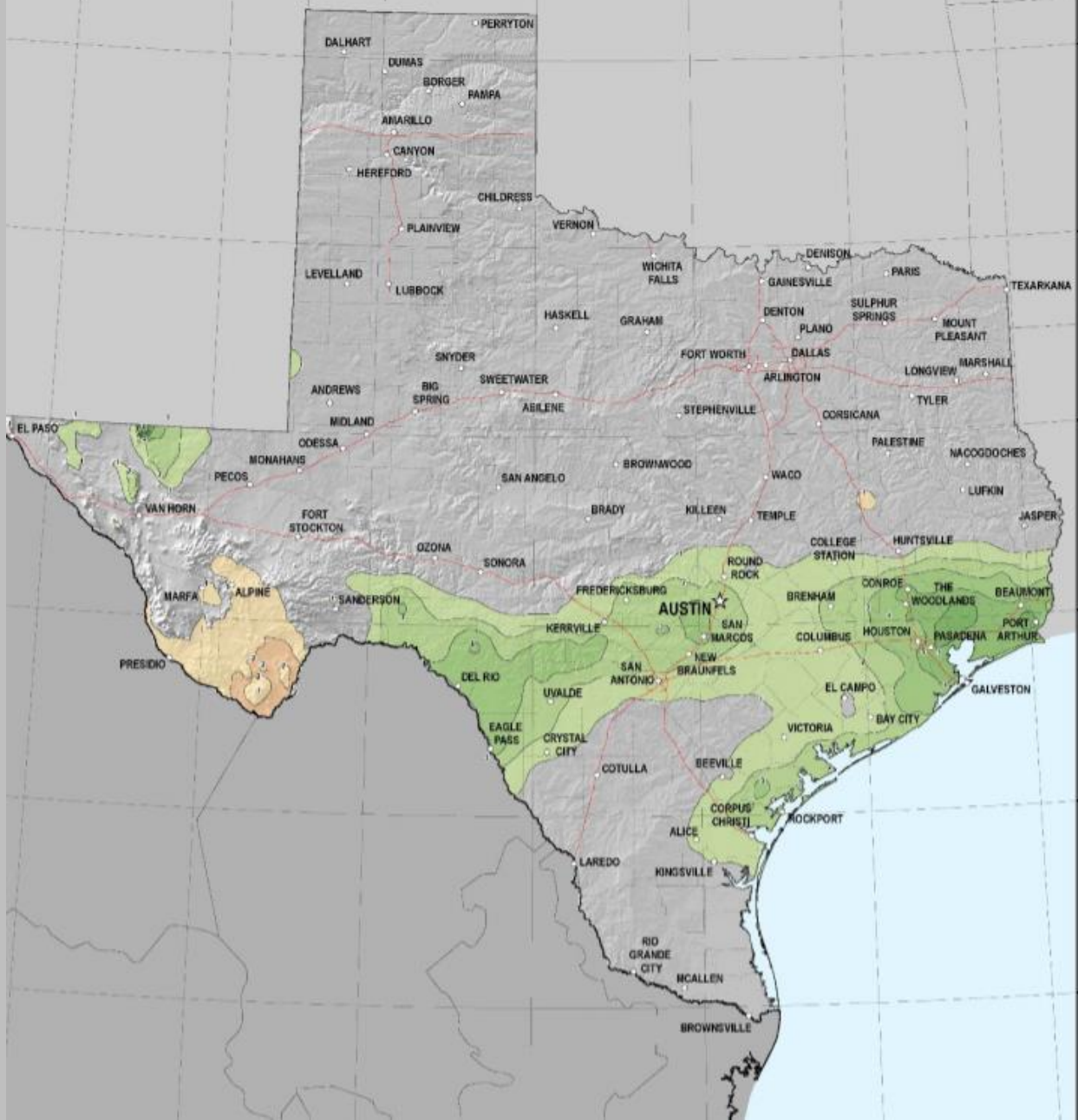
Graphic courtesy of Houston Chronicle

DRAFT

Four Day Peak Rainfall Frequency

Hurricane Harvey, August 25 - 29, 2017





NOAA Atlas 14 2017 Draft Released

Areas With Increased 100 Year Rainfall

1% Annual Chance, 24-Hour Rainfall Depths

14.01"
to
15.00"

15.01"
to
16.00"

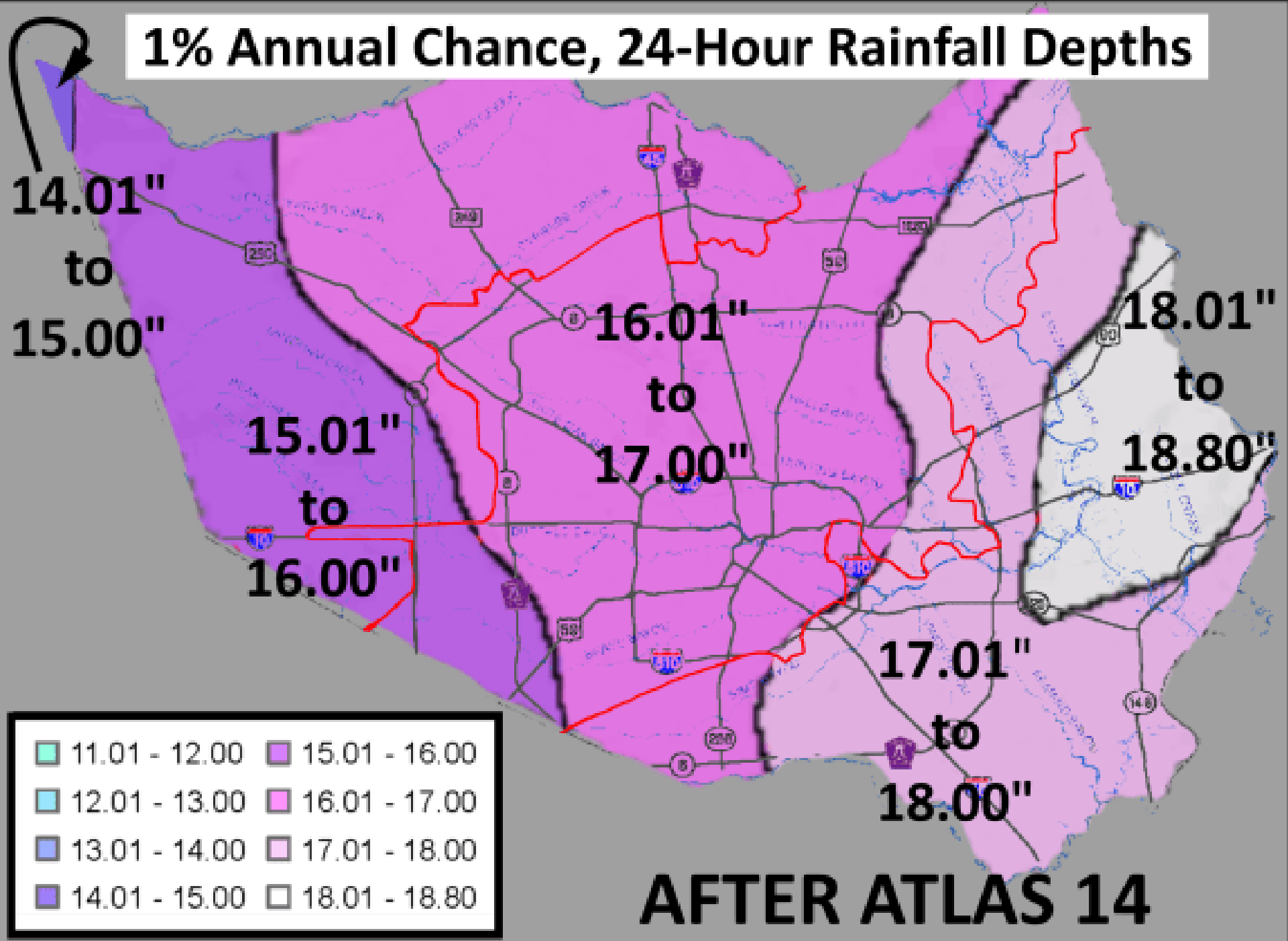
16.01"
to
17.00"

17.01"
to
18.00"

18.01"
to
18.80"

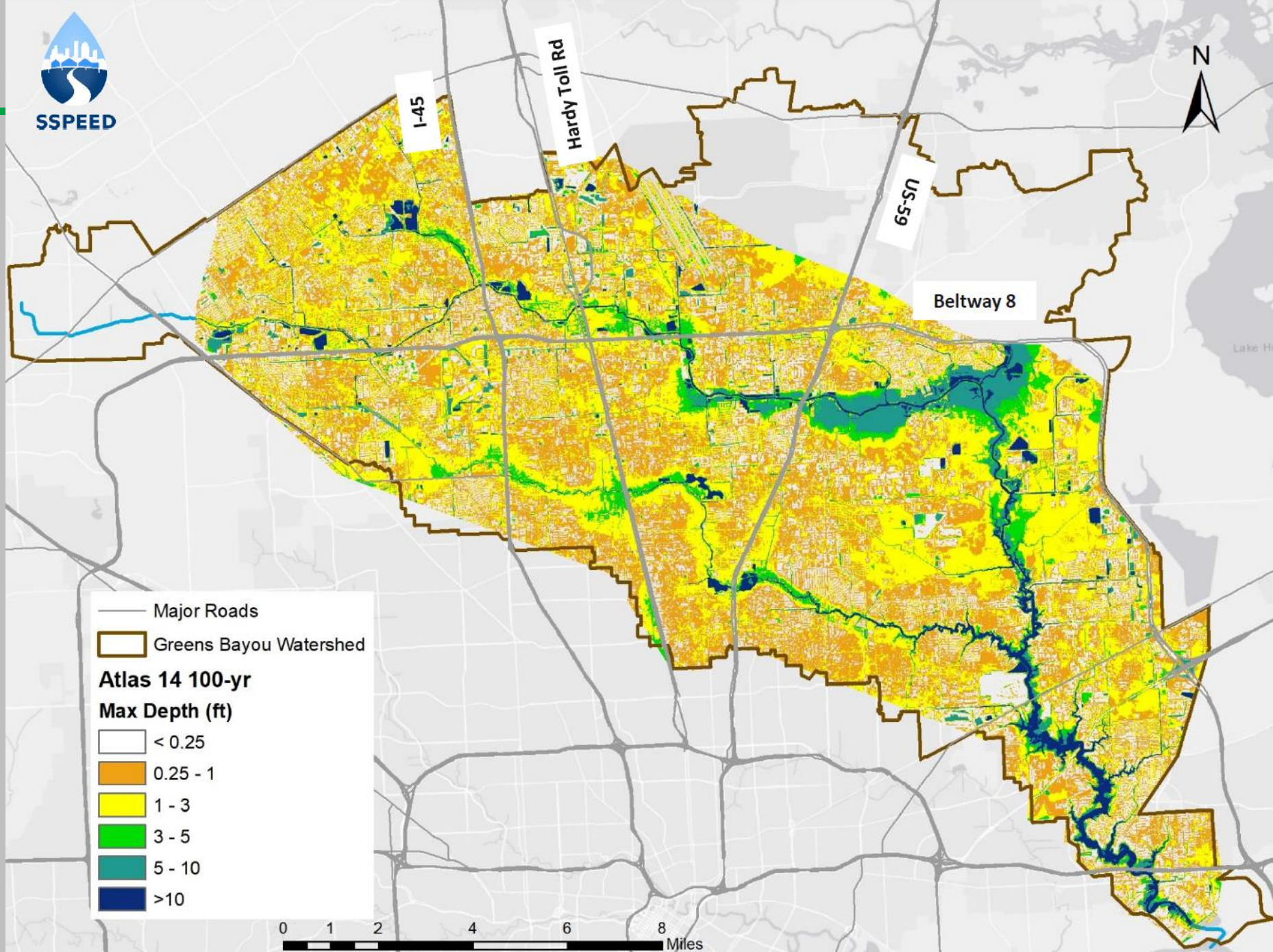
11.01 - 12.00	15.01 - 16.00
12.01 - 13.00	16.01 - 17.00
13.01 - 14.00	17.01 - 18.00
14.01 - 15.00	18.01 - 18.80

AFTER ATLAS 14





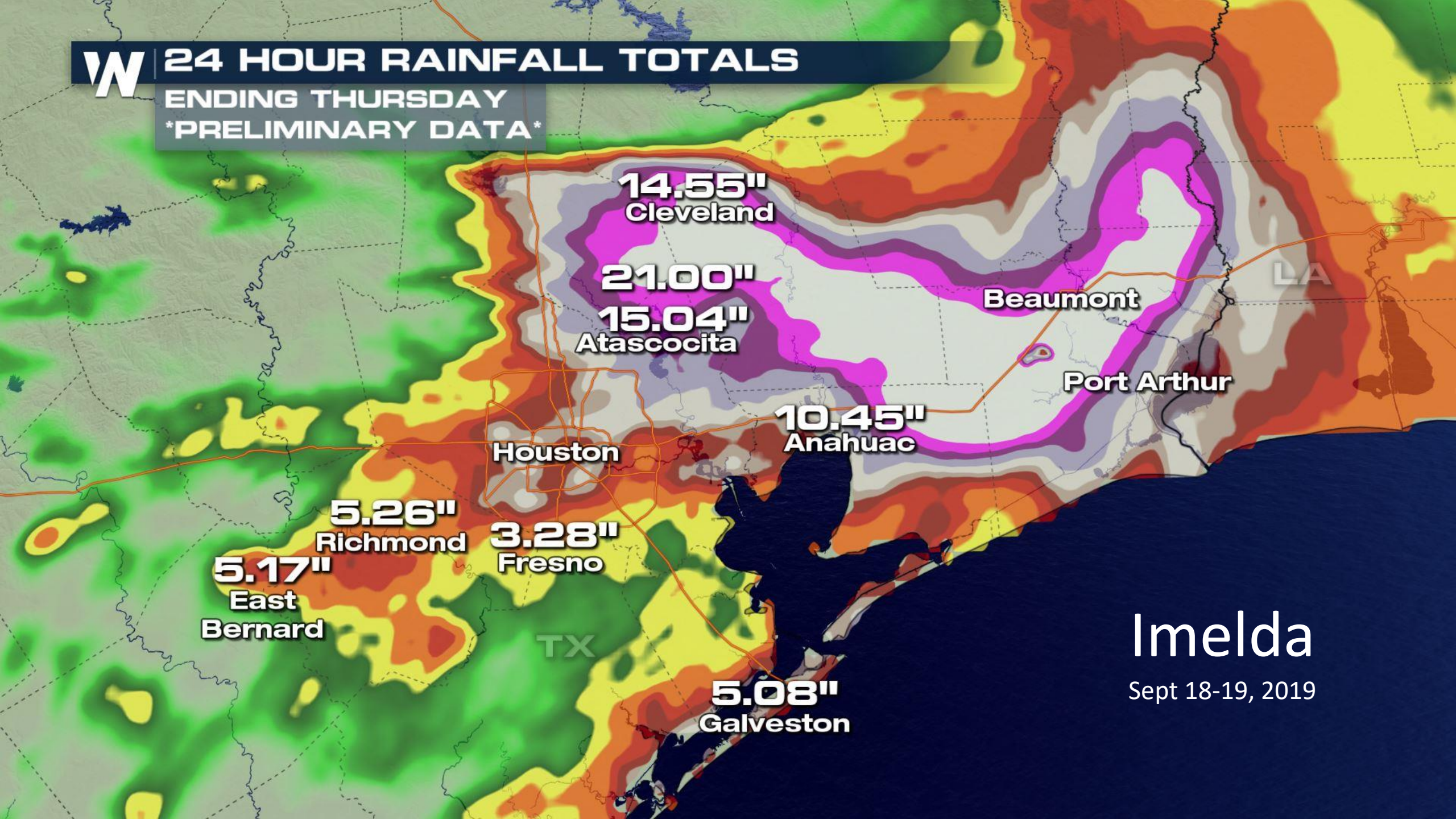
Duration	100 Year Rain Event	500 Year Rain Event	NOAA Atlas 14 100 Year	NOAA Atlas 14 500 Year	Imelda Sept. 2019	Harvey Aug. 2017	Tax Day April 2016	Allison June 2001	October 1994
1-hr	4.3	5.5	4.8	6.4	6.4	6.8	4.7	5.7	3.7
2-hr	5.7	7.6	7.0	9.7	9.2	11.9	7.3	9.9	4.7
3-hr	6.7	9.2	8.6	12.4	10.9	14.8	8.3	13.5	5.3
6-hr	8.9	12.8	11.4	17.0	14.3	18.9	13.9	21.2	7.2
12-hr	10.8	15.5	14.1	21.2	17.9	20.9	16.7	28.3	12.0
24-hr	13.2	18.9	17.0	25.4	21.1	25.6	17.4	28.4	20.9
2 days	14.5	20.0	20.5	29.6	29.1	35.2	17.5	28.5	23.1
4 days	15.9	21.1	23.1	32.5	29.7	47.7	N/A	38.5	28.9



W 24 HOUR RAINFALL TOTALS

ENDING THURSDAY

PRELIMINARY DATA



Imelda

Sept 18-19, 2019

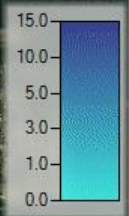
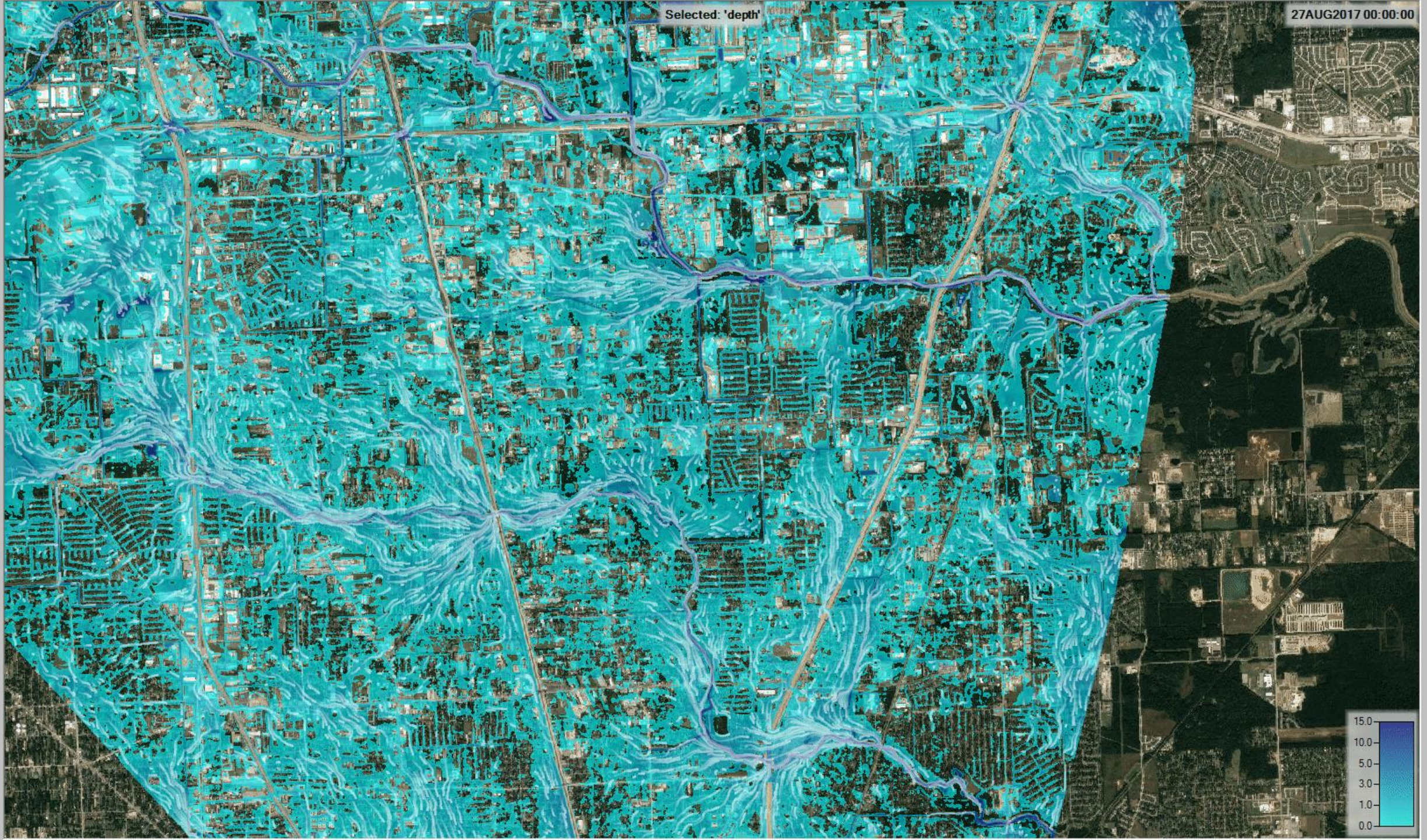


**Would You Drive Using Only
Your Rear-View Mirror?**

- **In our watersheds, we are planning based on 17 to 18 inches in 24 hours but we have seen much more**
- **We are not warning our people about the true risk of larger rainfall events.**

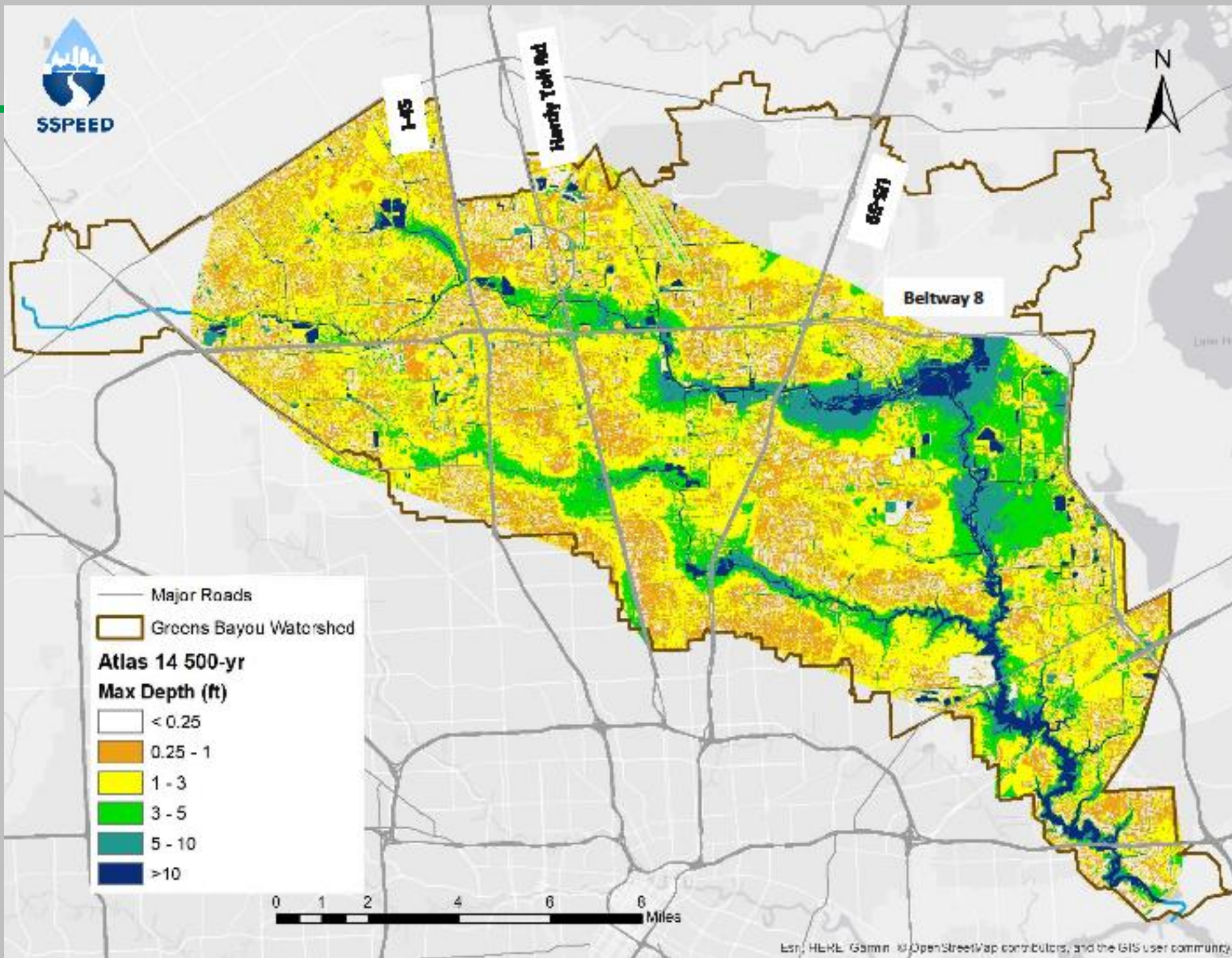
Selected: 'depth'

27AUG2017 00:00:00





SSPEED



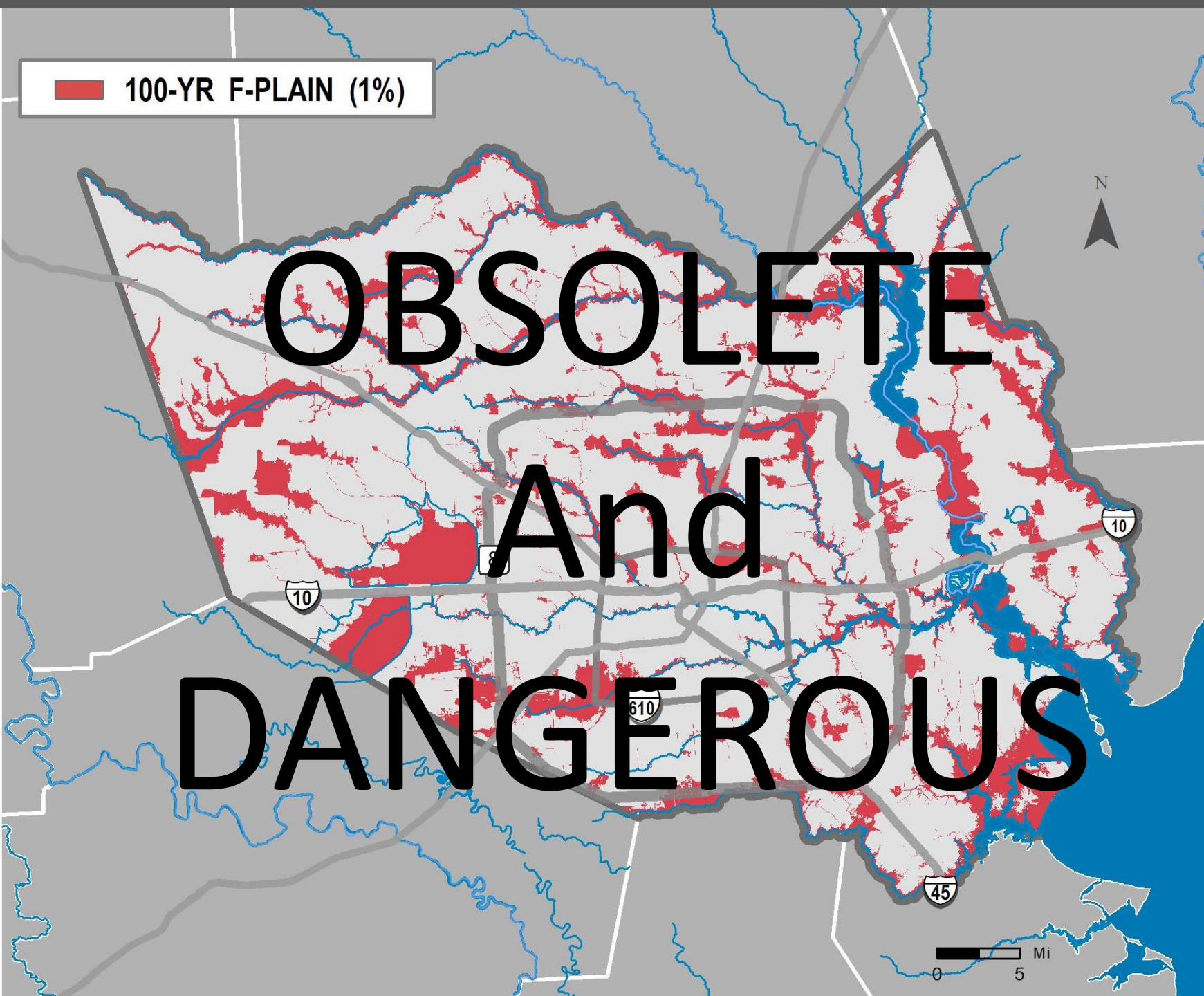
100-YR F-PLAIN (1%)

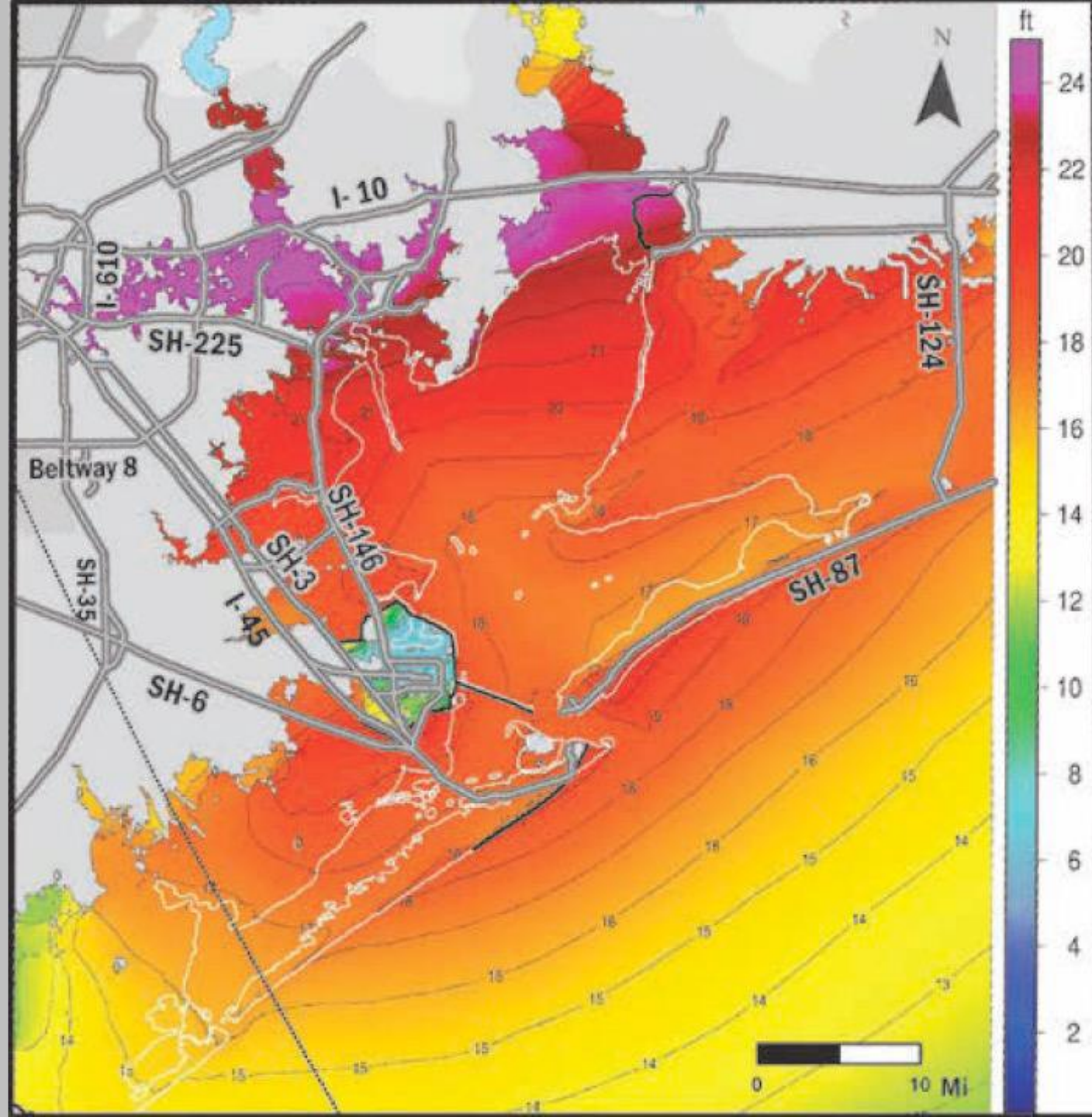
OBSOLETE

And

DANGEROUS

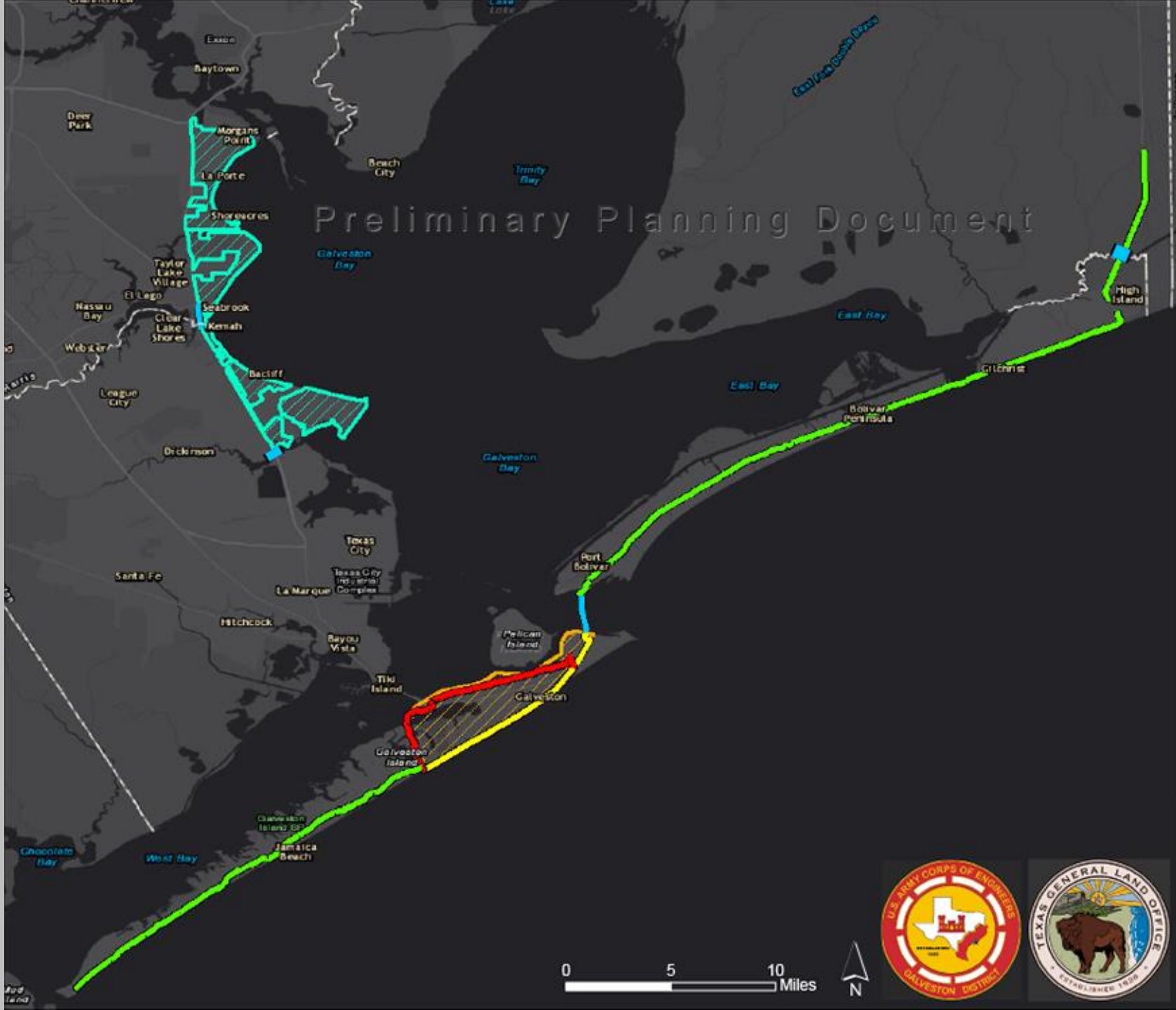
HONESTY



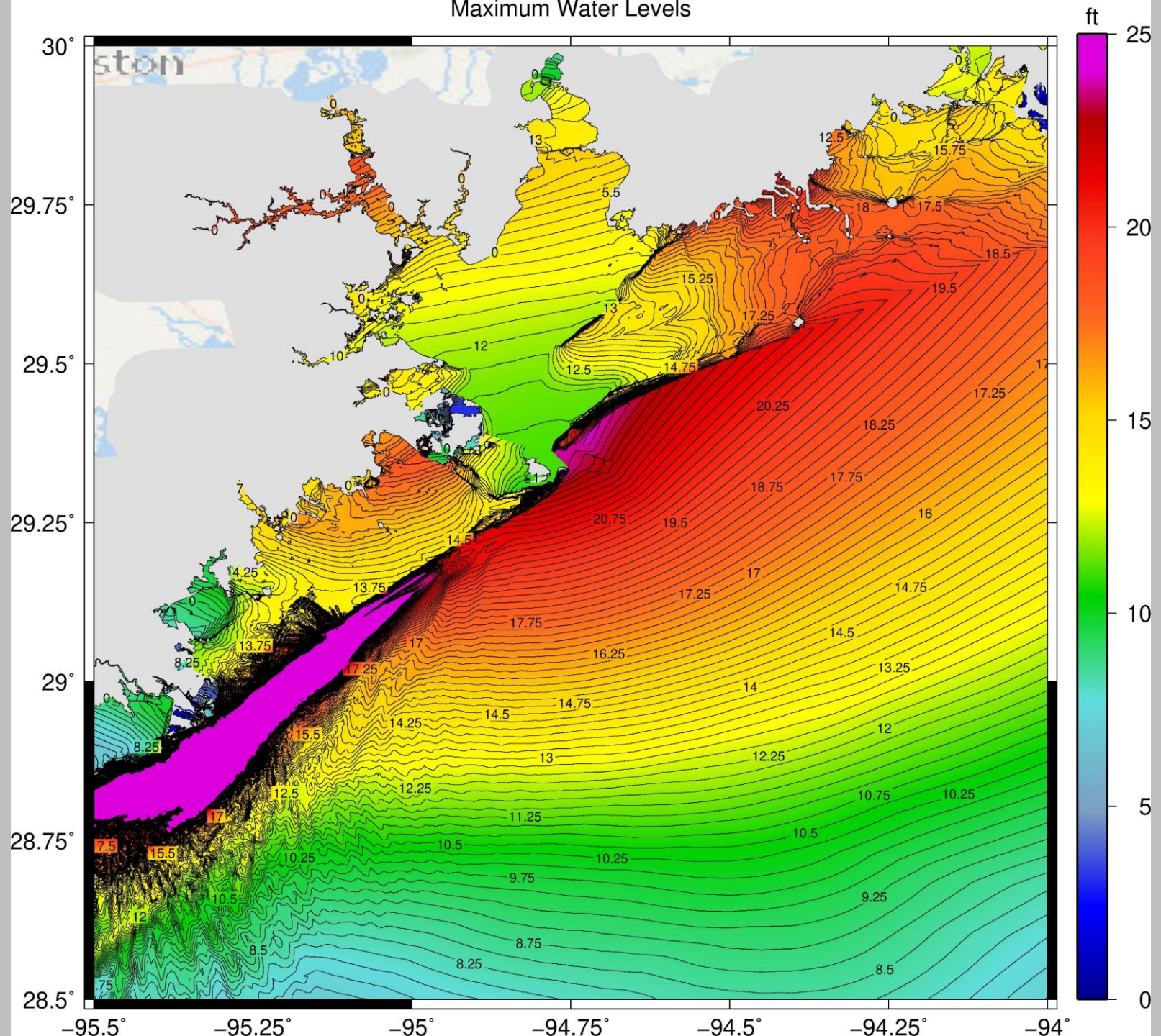


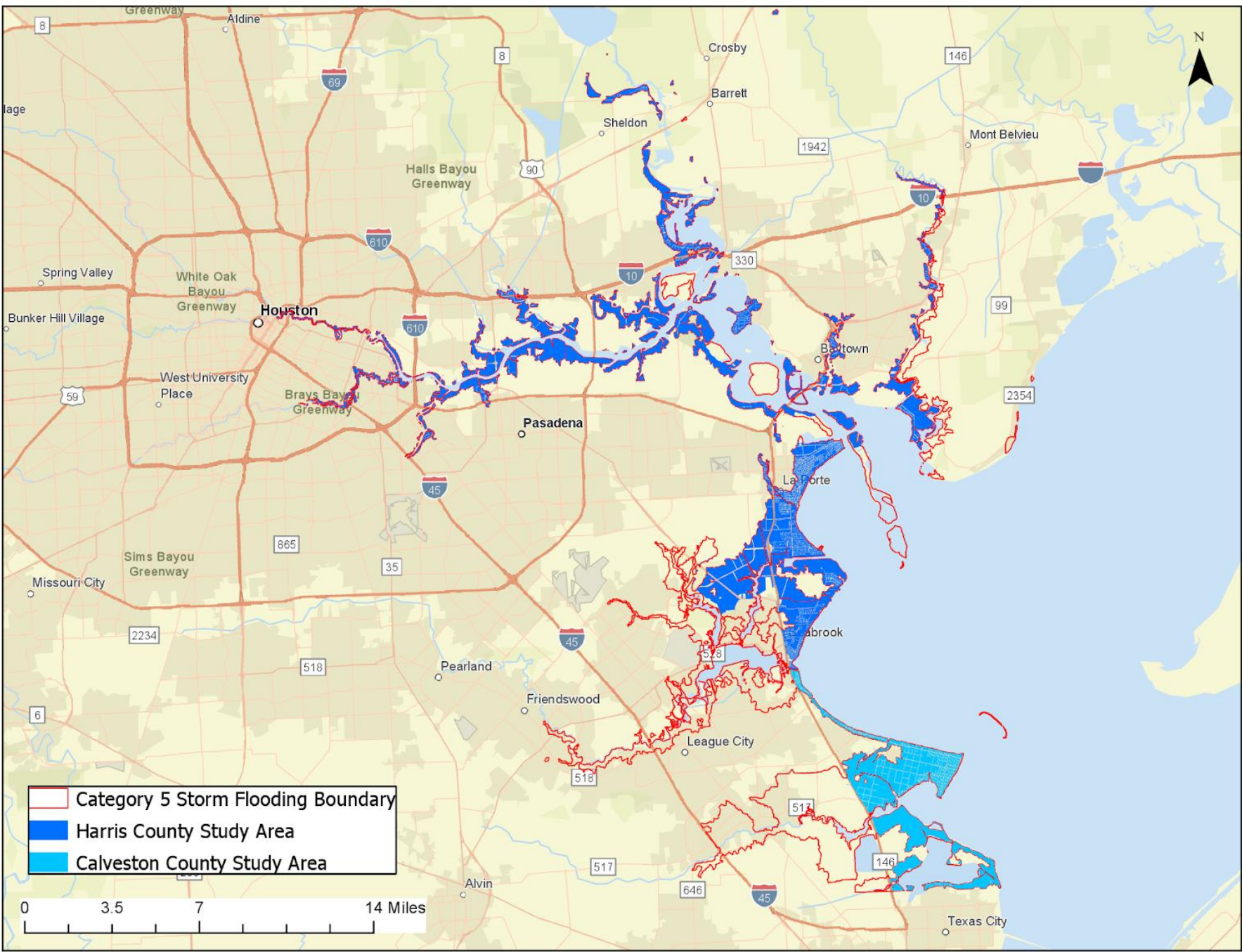
**FEMA Storm 36
Small Cat 4 -
This Event
Would Destroy
Houston's
Economic and
Ecological
Future**

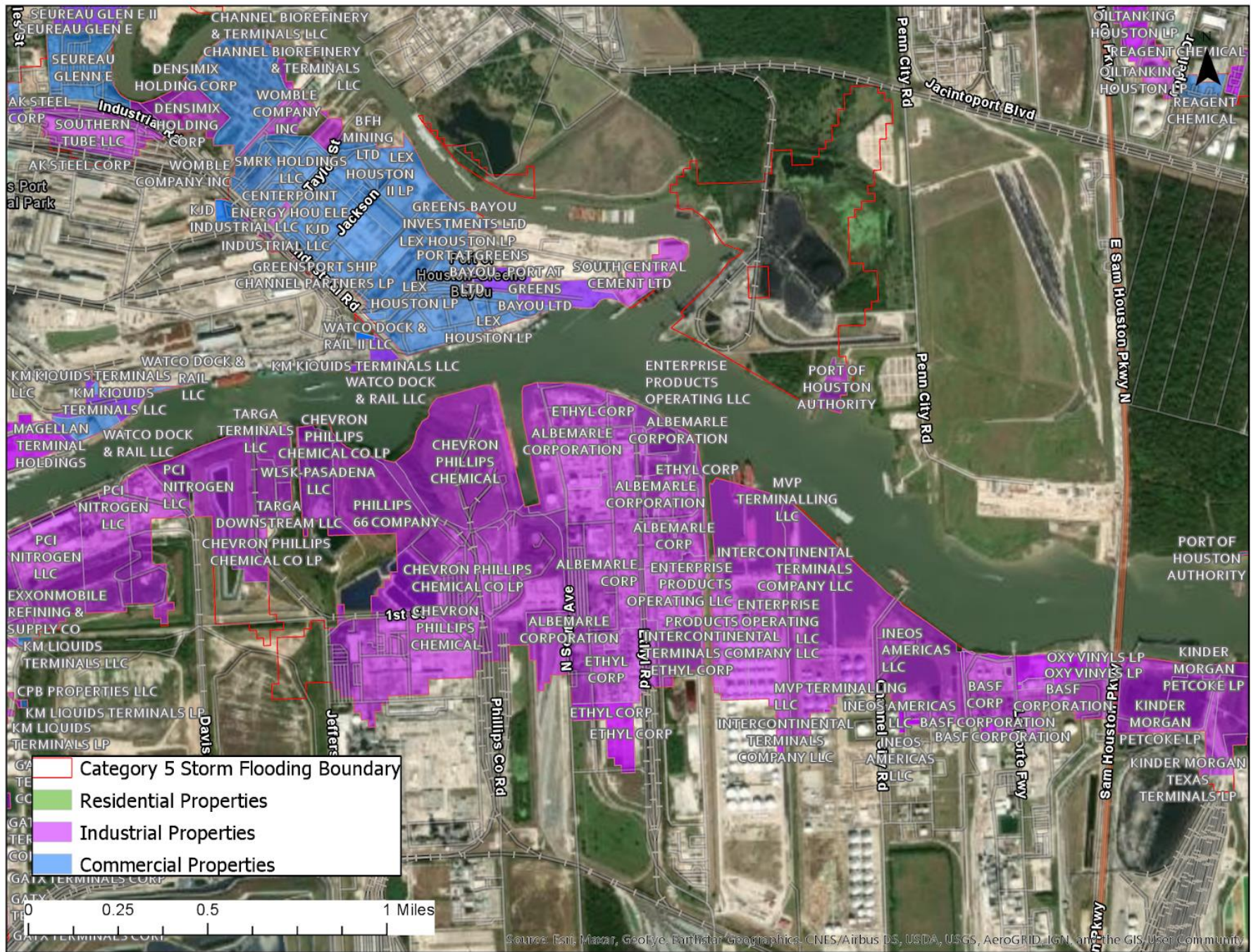
Preliminary Planning Document



Maximum Water Levels









Galveston Bay Park Plan Levee

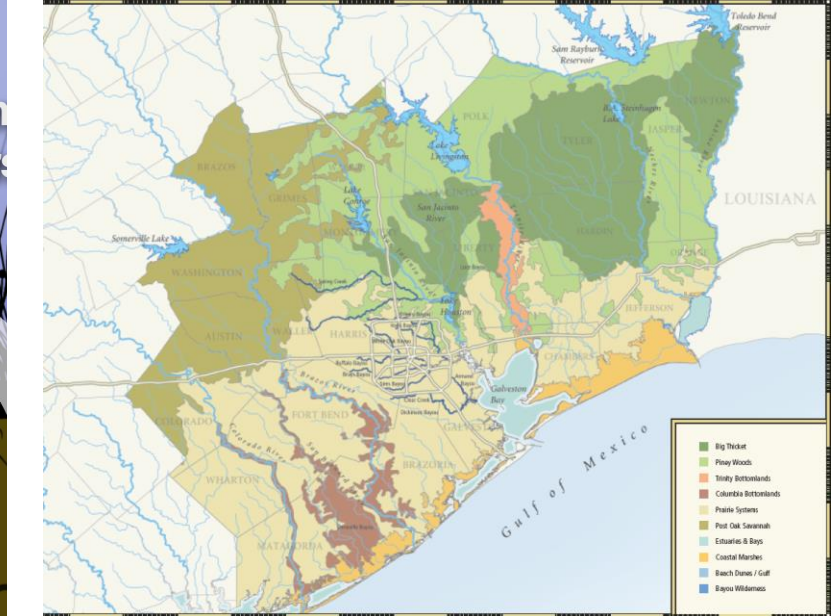
Compatible with
Corps Coastal
Spine

Compatible with
Port Project 11 to
Widen Houston
Ship Channel

Galveston Bay Park Plan Vision



This Place Called Houston – Are We Looking Forward or in the Rear View Mirror?



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