Welcome to the 2025 Annual Groundwater Report Public Hearing

IN-PERSON ATTENDEES

- Please mute all personal devices.
- This boardroom is equipped with microphones that will be recording throughout the entirety of the hearing. Please be mindful of this so as not to disturb the audio for our virtual attendees.
- Public testimony and Q&As will be available at the end of this hearing.

VIRTUAL ATTENDEES

- Virtual attendees will be muted for the entirety of the hearing.
- The webinar will be recorded, including all chat between participants.
- For audio/visual issues, please chat with the organizer.

HARRIS-GALVESTON SUBSIDENCE DISTRICT

2025 Annual Groundwater Report Public Hearing

April 30, 2026

Harris-Galveston Subsidence District

The Harris-Galveston Subsidence District (HGSD) is a special-purpose district created by the Texas Legislature in 1975 to provide the regulation of groundwater withdrawal to end subsidence in Harris and Galveston counties.

GROUNDWATER REGULATION

- Applying a science-based regulatory framework that identifies guidelines for groundwater withdrawals through a well permitting process and an adaptive management strategy that allows for the regulatory plan to be amended based on the best available data.

SCIENCE & RESEARCH

- Improving the understanding of our groundwater system and the impact of groundwater withdrawal through water use, aquifer data, and land surface data collection. Utilizing impactful research to help predict subsidence and ensure the regulatory plan's effectiveness.

WATER CONSERVATION

- Equipping our local communities with water conservation tools and resources to increase water efficiency and reduce reliance on groundwater to prevent further subsidence.

COLLABORATION

- Working with local, state, federal, and international organizations to achieve our mission, share resources, and improve understanding of water resources to maximize sustainable solutions.

Annual Groundwater Reports

Each year, the Harris-Galveston Subsidence District publishes an Annual Groundwater Report to provide the latest information on subsidence in our region. This report encompasses data collected for the previous calendar year and includes the following elements:

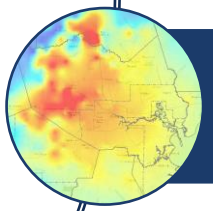
- Climate
- Water Use
- Groundwater Levels
- Subsidence

The results of the Annual Groundwater Report ultimately tell the story about our region's subsidence mitigation efforts and help to better inform local decision-makers with data that can be used to build a more resilient community.

Agenda


Climate


Water Use

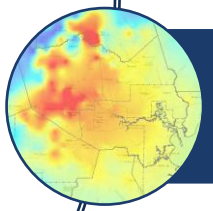

Groundwater Levels


Subsidence

Agenda

Climate

Water Use



Groundwater Levels

Subsidence

Exhibit 1

Location of National Weather Service (NWS) climate stations used for rainfall data for the 2025 calendar year.

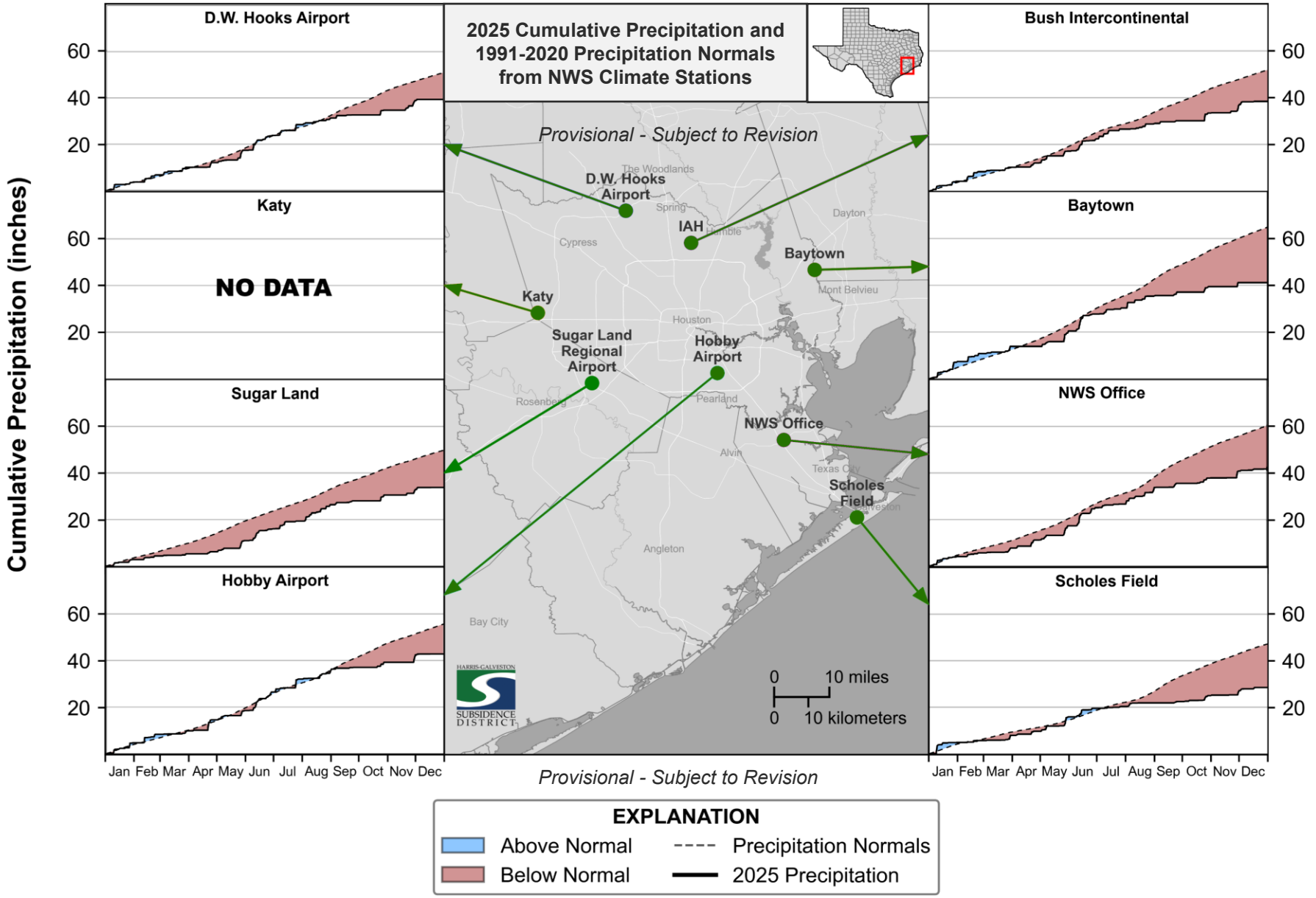
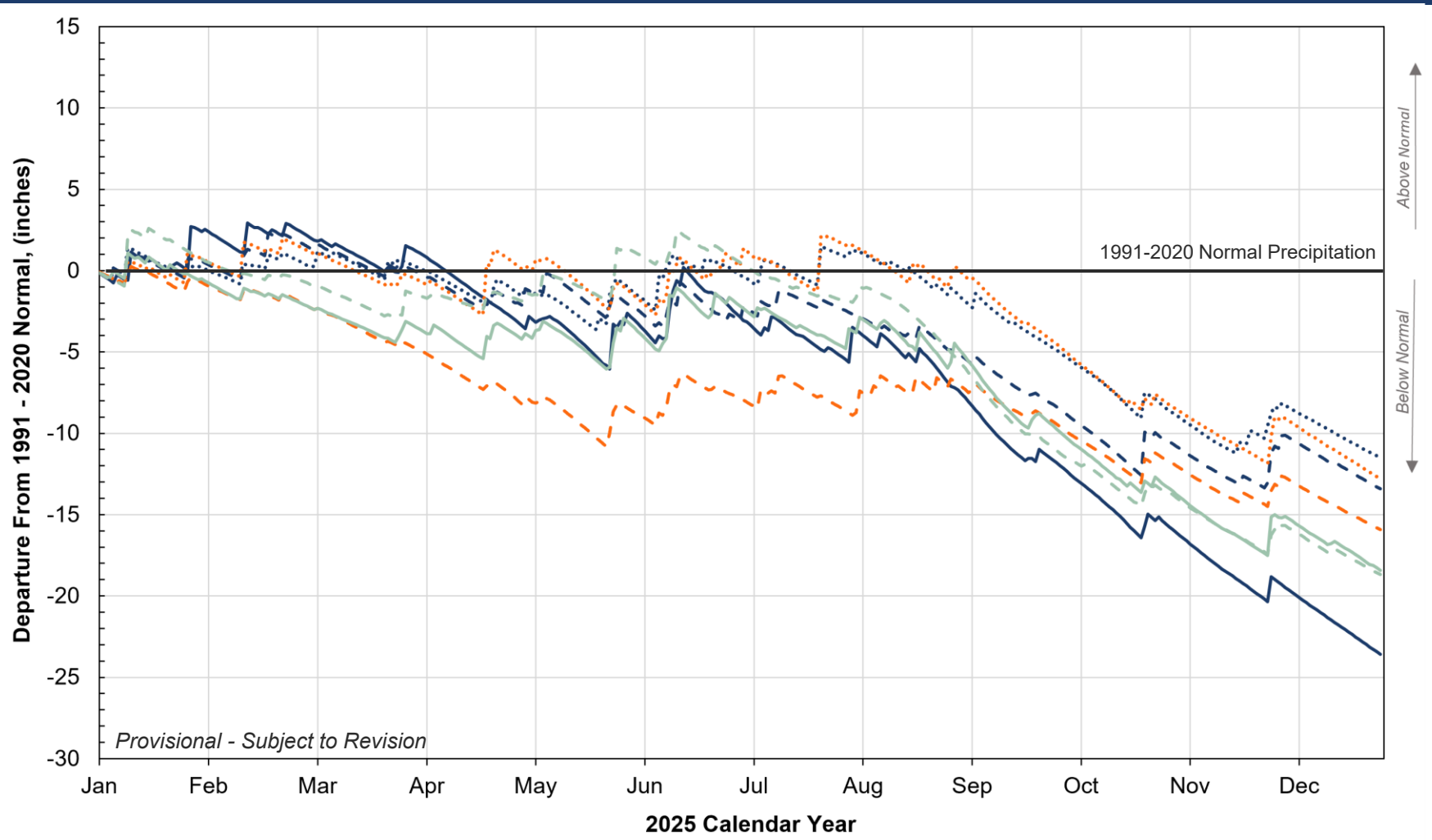


Exhibit 2 | 2025 Precipitation Data



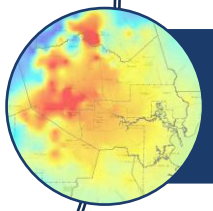
EXPLANATION

- Precipitation Normals
- Baytown
- Bush Intercontinental Airport
- D.W. Hooks Memorial Airport
- Sugar Land Regional Airport
- W.P. Hobby Airport
- NWS Office - League City
- Scholes Field - Galveston

Agenda

Climate

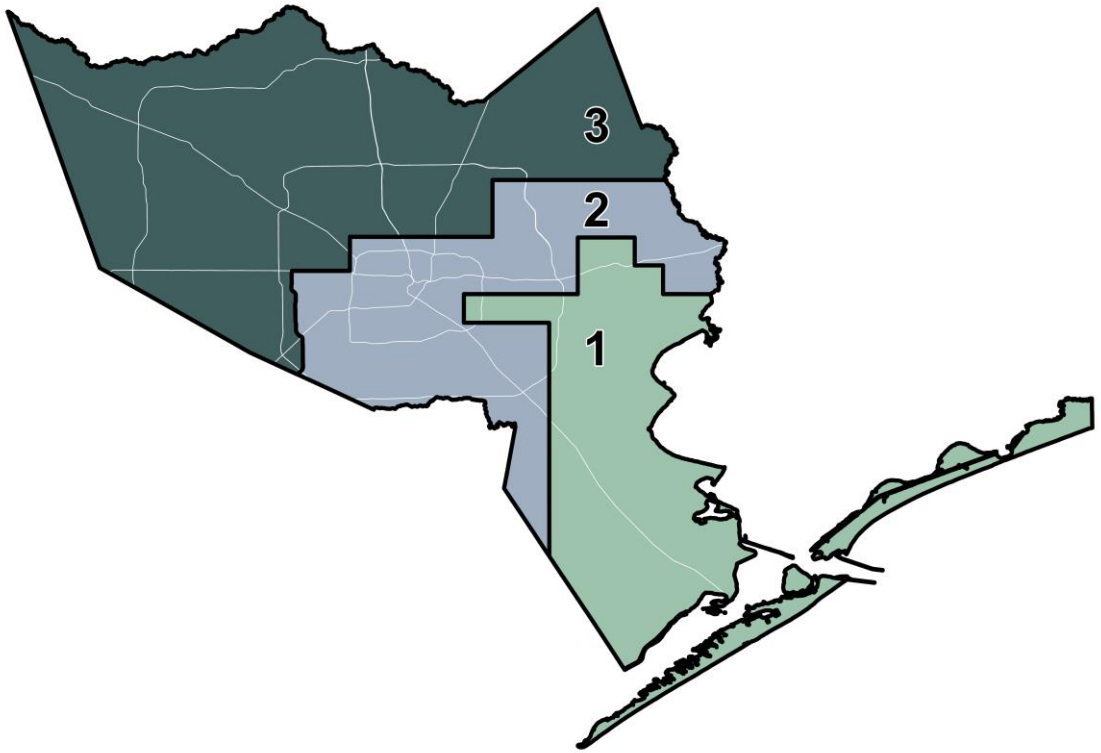
Water Use



Groundwater Levels

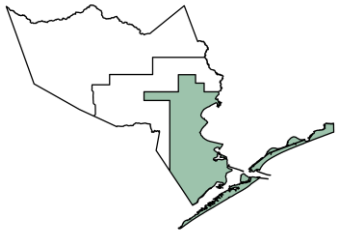
Subsidence

HGSD's Regulatory Areas



- **Area 1:** No more than 10% of Total Water Demand (TWD) may be sourced from groundwater.
- **Area 2:** No more than 20% of TWD may be sourced from groundwater.
  - Groundwater Reduction Plan (GRP) may be approved with conditions.
- **Area 3:** No more than 20% of TWD may be sourced from groundwater.
  - Permittees operating within an approved GRP have the following requirements:
    - 2025 – reduce groundwater use to no more than 40% of TWD
    - 2035 – reduce groundwater use to no more than 20% of TWD

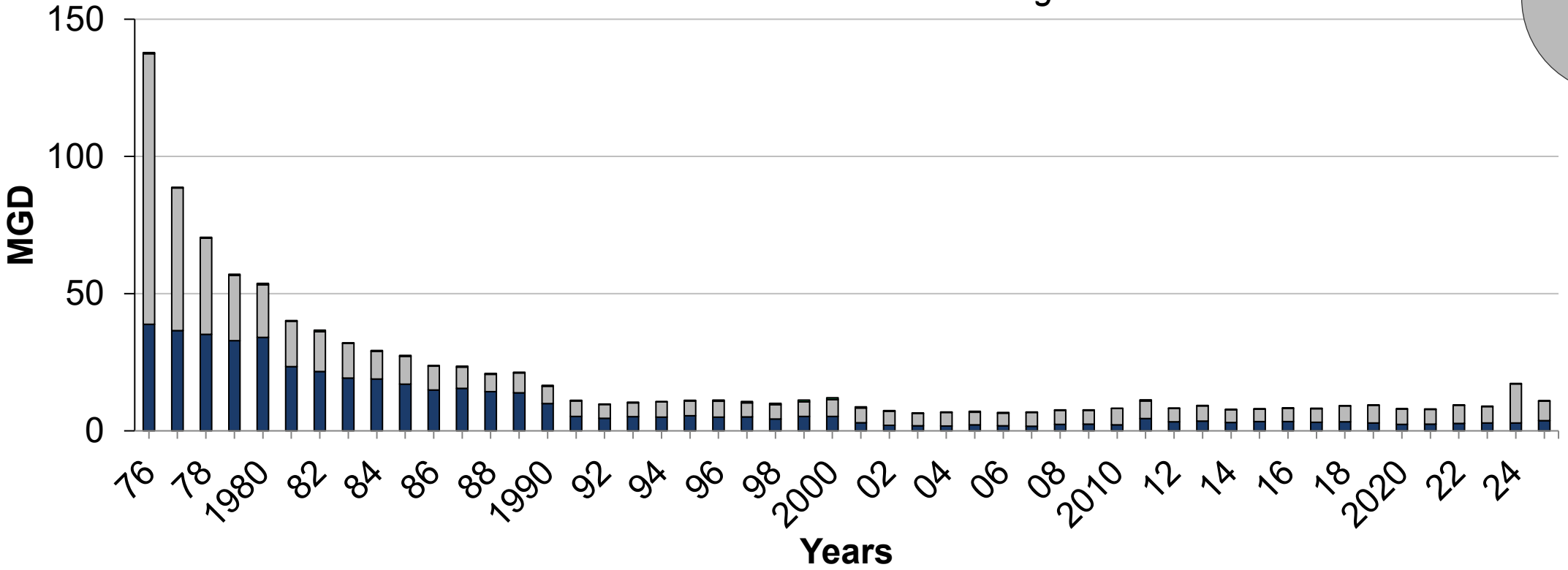
Exhibit 3 | Regulatory Area 1 Groundwater Use



Regulatory Area One

Groundwater Withdrawals Grouped by Use

Public *Industrial* *All Irrigation*



2025: 10.9 MGD

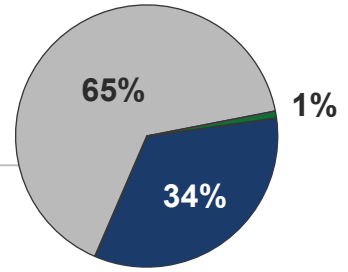
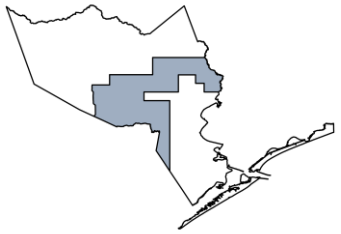


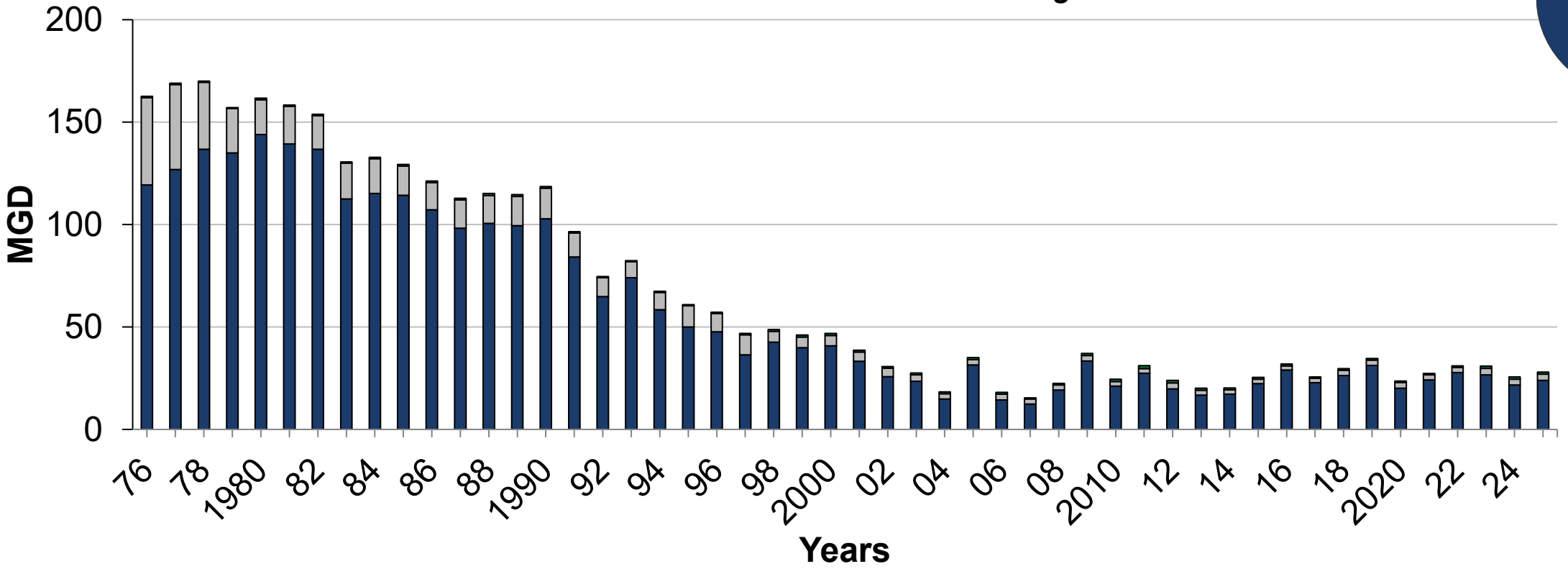
Exhibit 4 | Regulatory Area 2 Groundwater Use



Regulatory Area Two

Groundwater Withdrawals Grouped by Use

Public *Industrial* *All Irrigation*



2025: 28 MGD

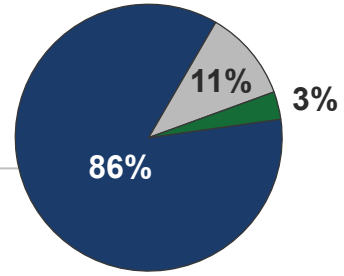
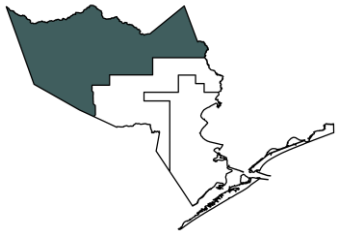
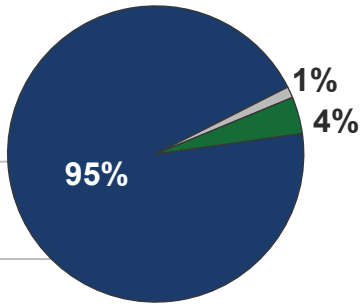


Exhibit 5 | Regulatory Area 3 Groundwater Use





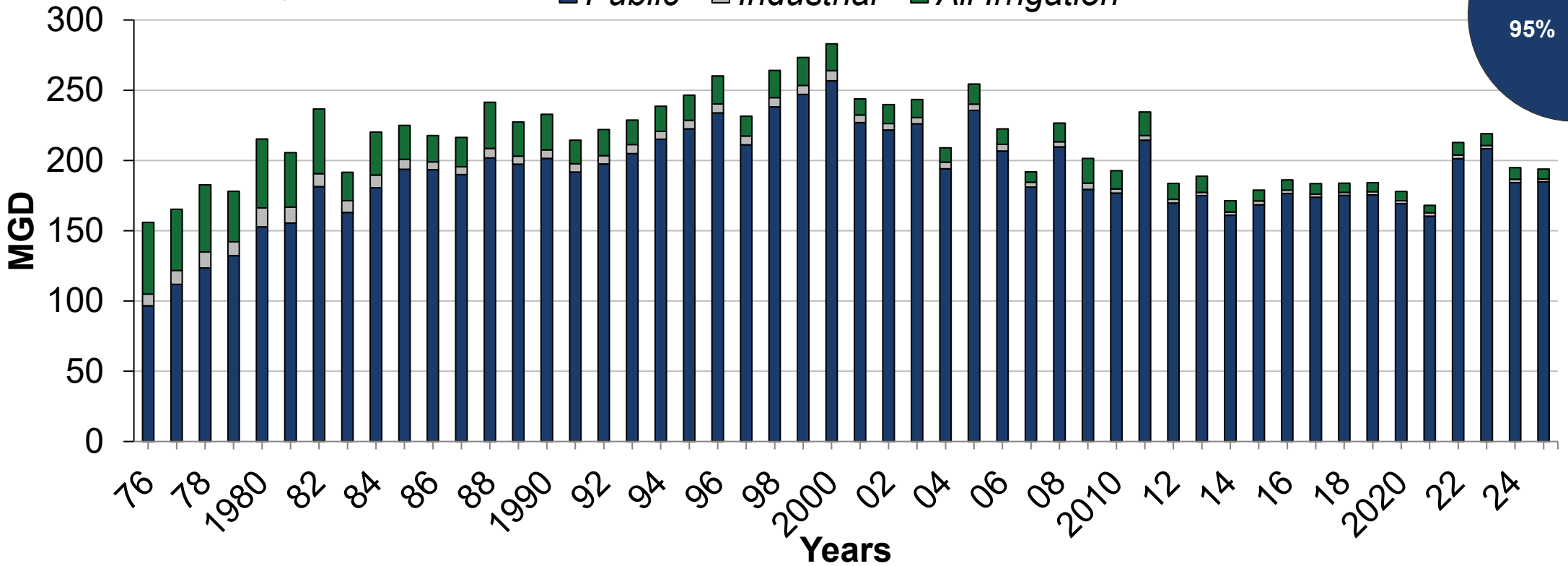
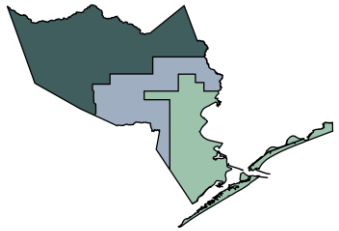


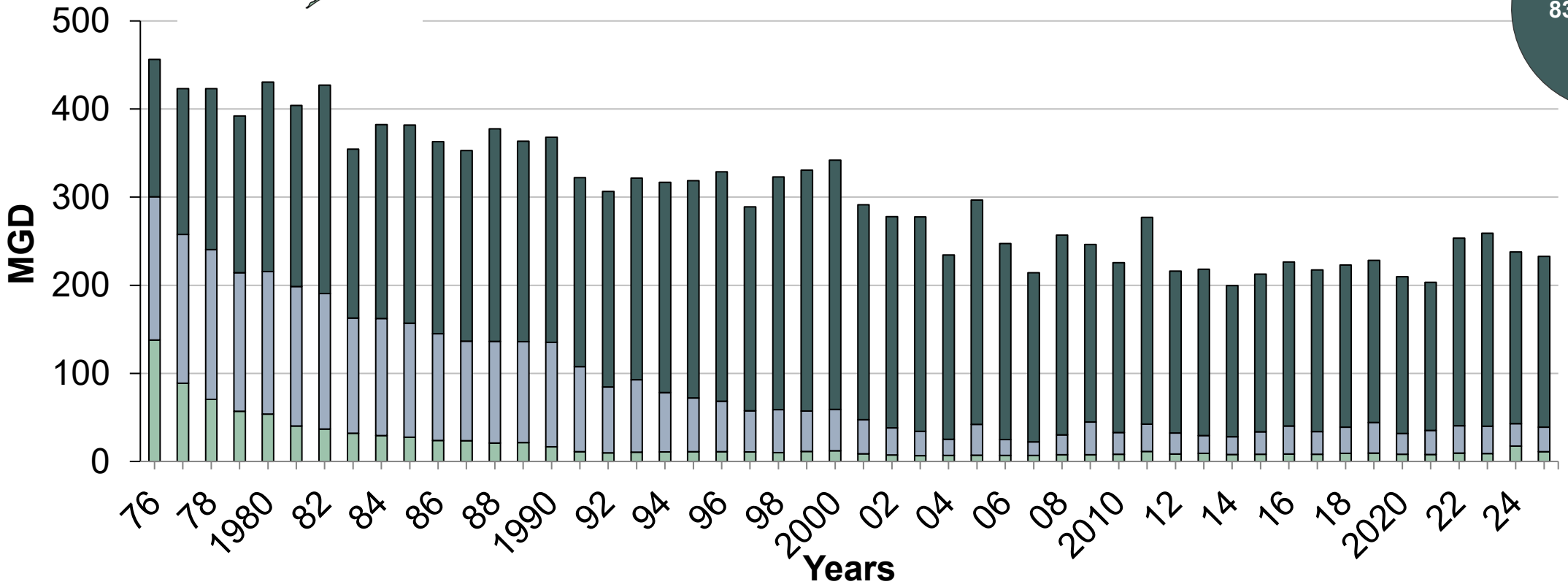
Exhibit 6 | All Regulatory Areas' Groundwater Use



Entire District

Groundwater Withdrawals Grouped by Regulatory Area

Area 1 *Area 2* *Area 3*



2025: 232.8 MGD

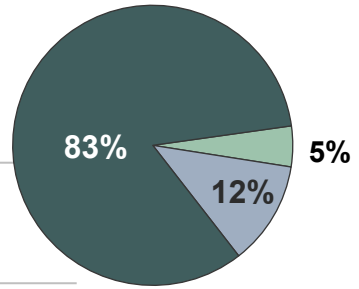
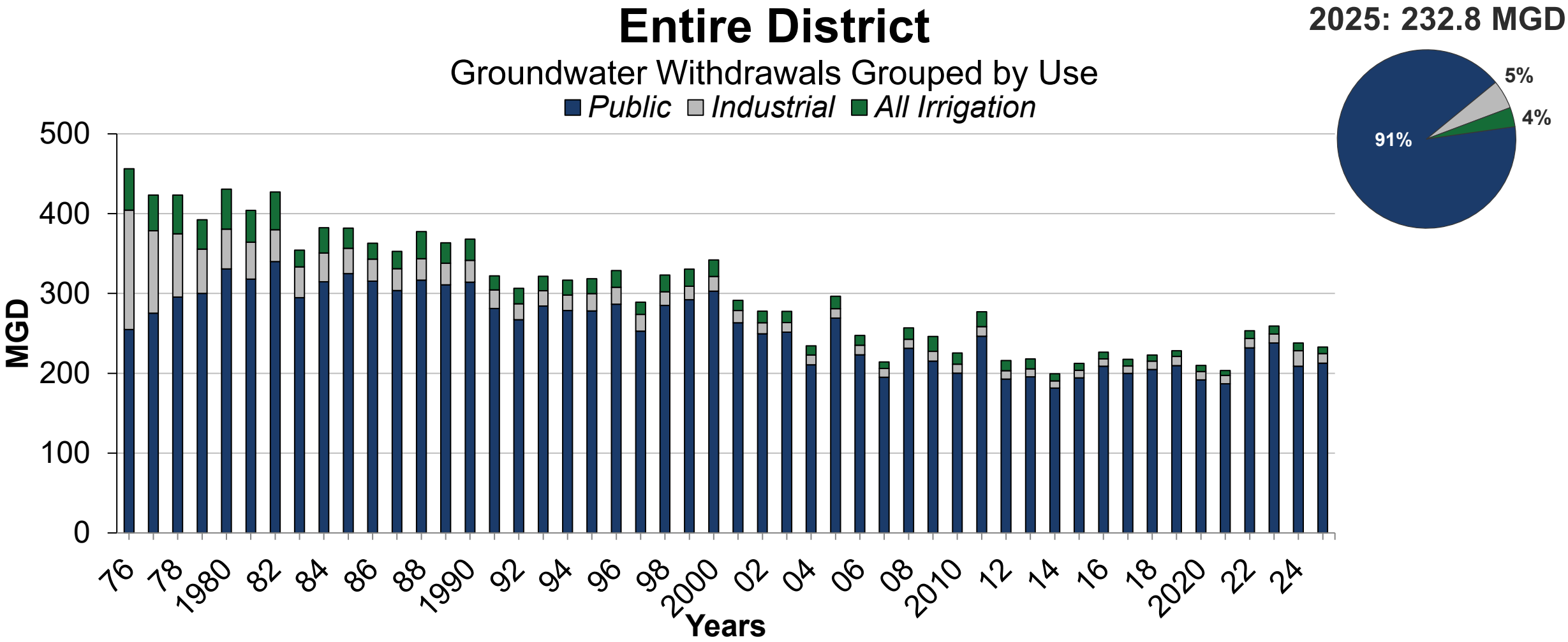
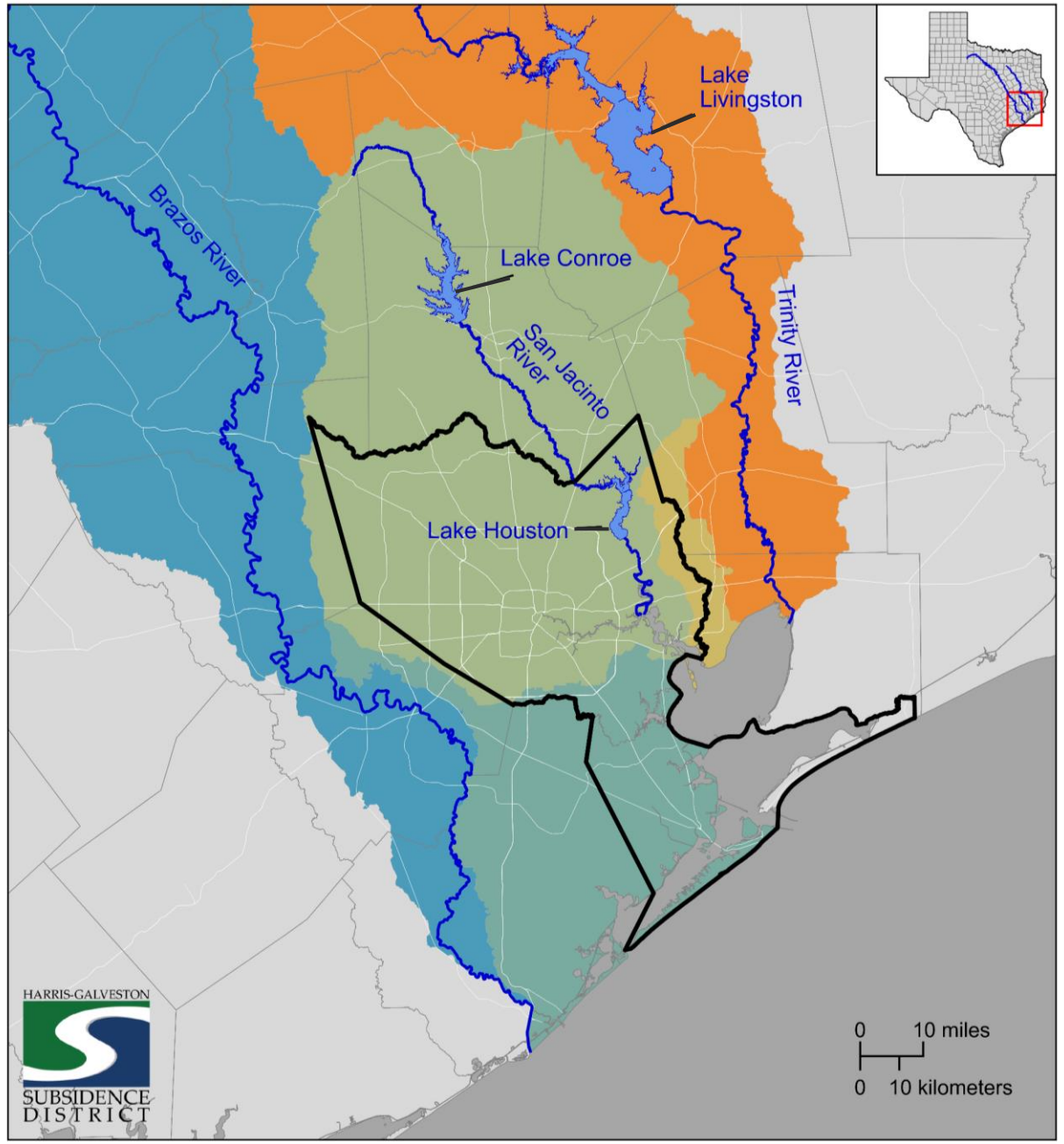


Exhibit 7 | Entire District Groundwater Use Type



Alternative Water Sources

- **Surface Water**
  - Trinity River
  - San Jacinto River
  - Brazos River
- **Reclaimed Water**



EXPLANATION

- HGSD Jurisdiction
- Brazos River Basin
- San Jacinto River Basin
- San Jacinto-Brazos River Basin
- Trinity River Basin
- Trinity-San Jacinto River Basin

Exhibit 8 | Alternative Water Used for Entire District

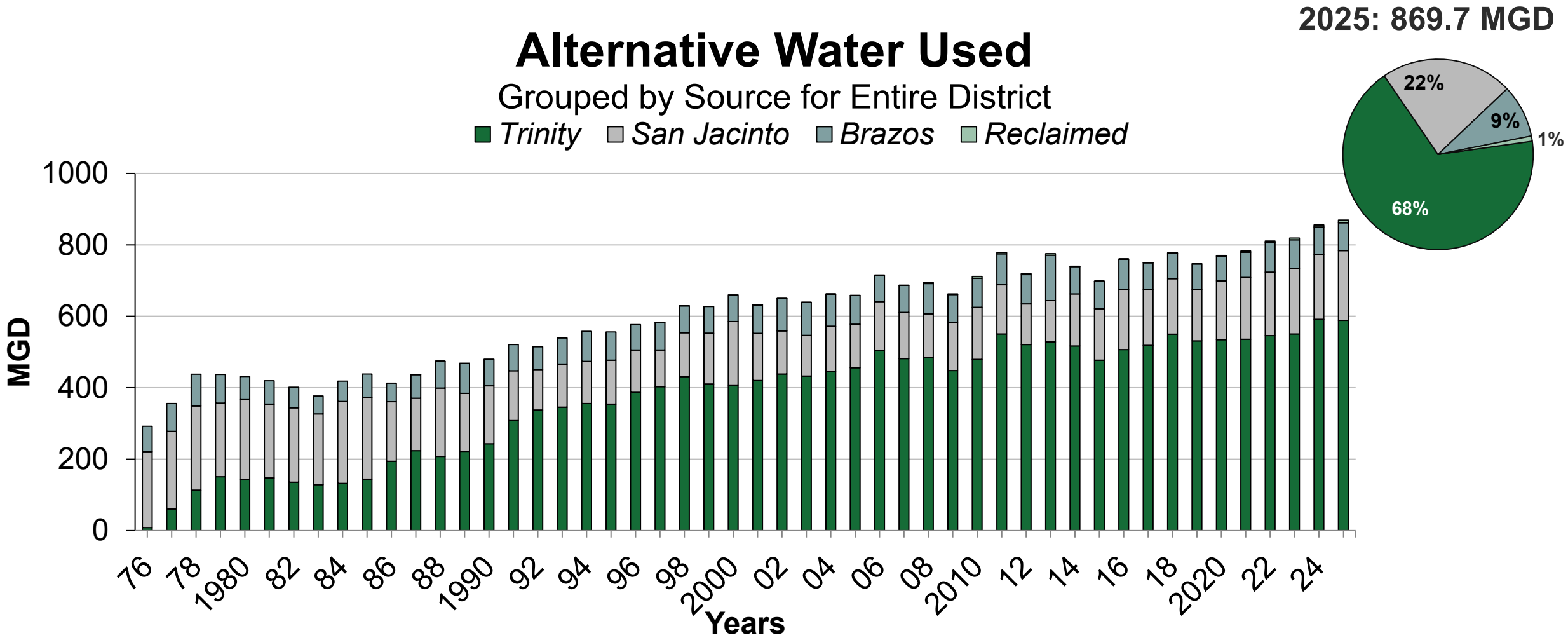
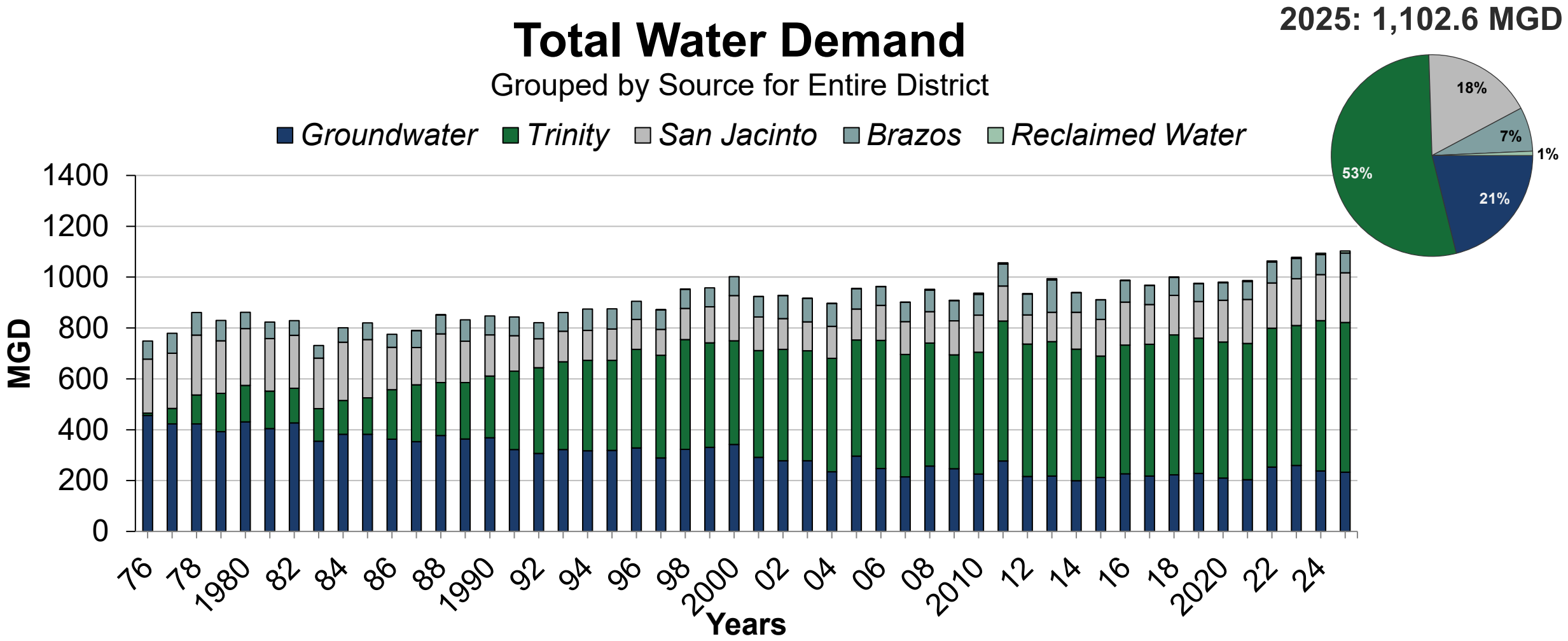


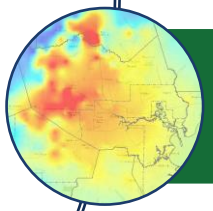
Exhibit 9 | Total Water Demand



Agenda

Climate

Water Use



Groundwater Levels

Subsidence

USGS
science for a changing world

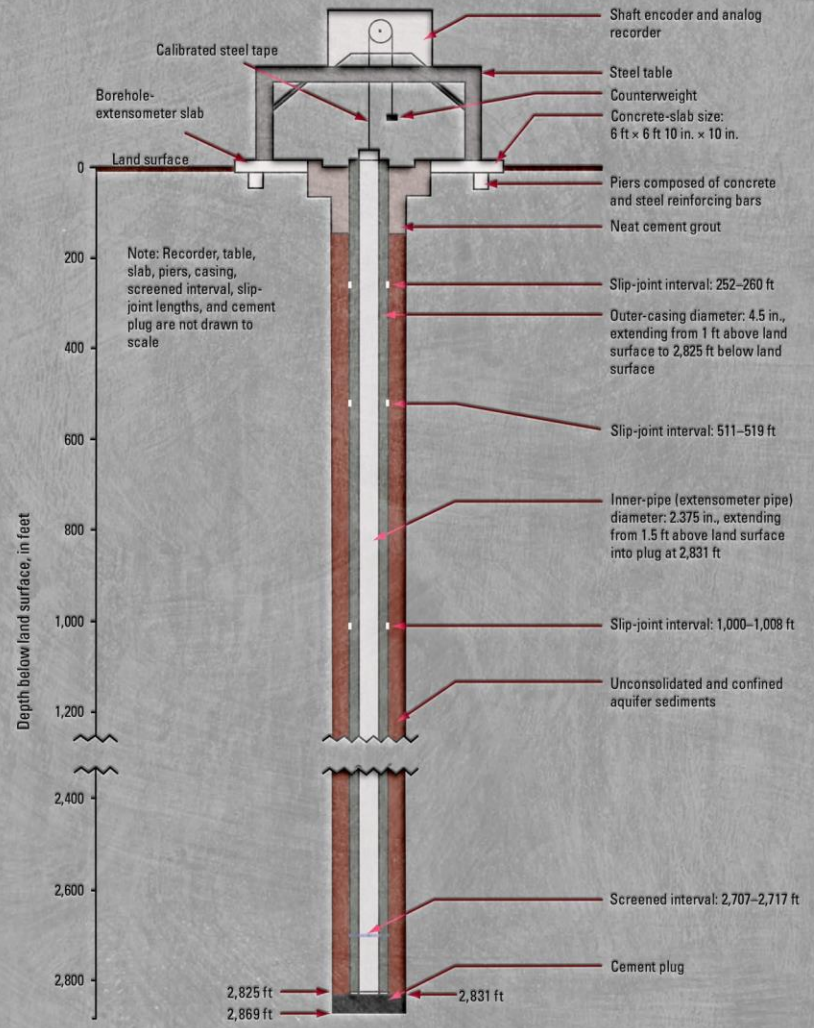


DIAGRAM OF A BOREHOLE EXTENSOMETER

HARRIS-GALVESTON SUBSIDENCE DISTRICT

FORT BEND SUBSIDENCE DISTRICT

Groundwater-level Altitudes, Long-Term Change & Compaction

CHICOT/EVANGELINE AND JASPER AQUIFERS

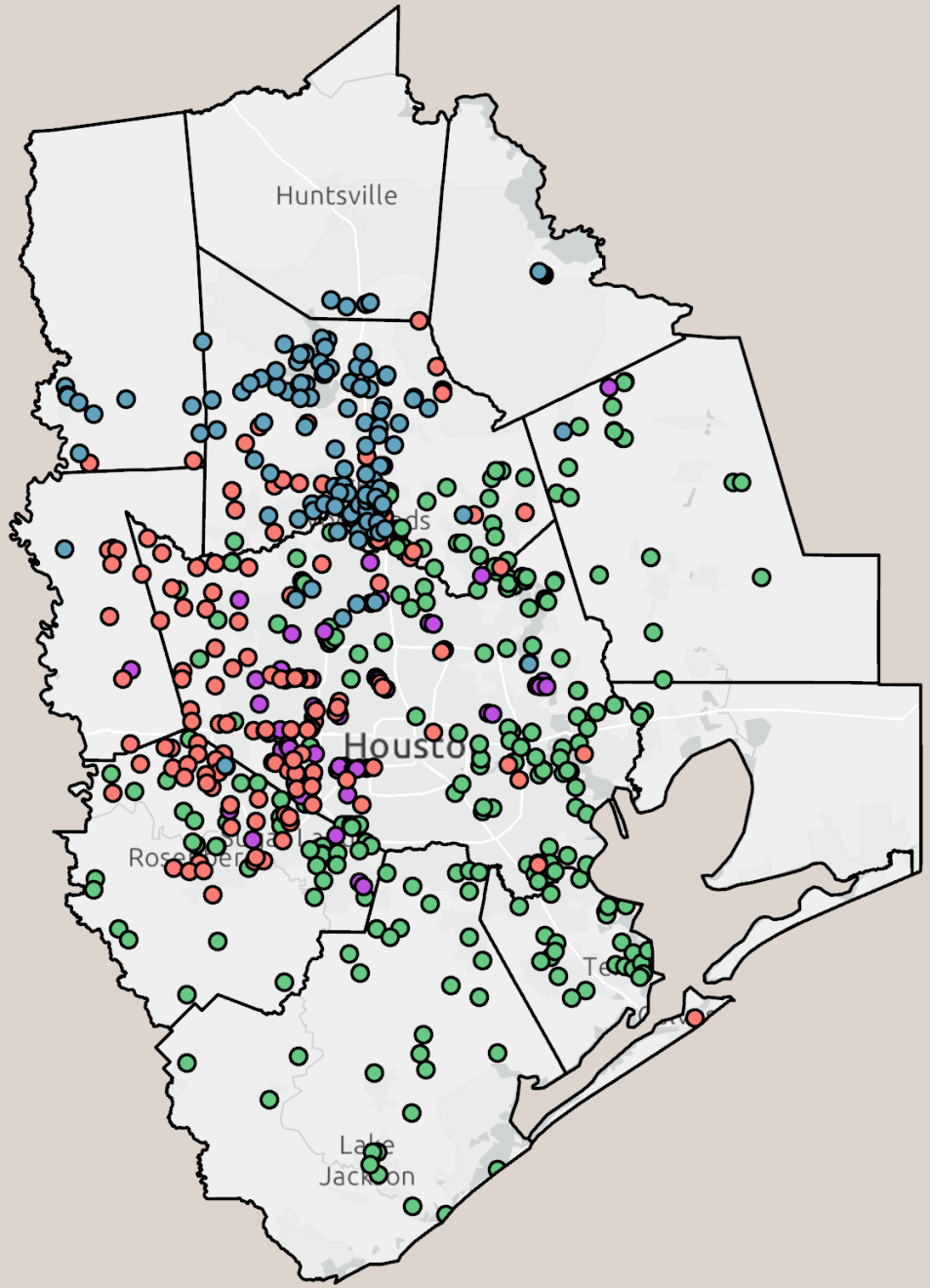
RESEARCH IN COOPERATION WITH THE HARRIS–GALVESTON & FORT BEND SUBSIDENCE DISTRICTS BRAZORIA GROUNDWATER CONSERVATION DISTRICT, THE CITY OF HOUSTON AND LONE STAR GROUNDWATER CONSERVATION DISTRICT

2026 Water-Level Map Series

Chicot and Evangeline Aquifers (undifferentiated)
- 2026 Water-Level Altitude
- 2025 to 2026 Water-Level Change
- 2021 to 2026 Water-Level Change
- 1990 to 2026 Water-Level Change
- 1977 to 2026 Water-Level Change

Jasper Aquifer
- 2026 Water-Level Altitude
- 2025 to 2026 Water-Level Change
- 2021 to 2026 Water-Level Change
- 2000 to 2026 Water-Level Change

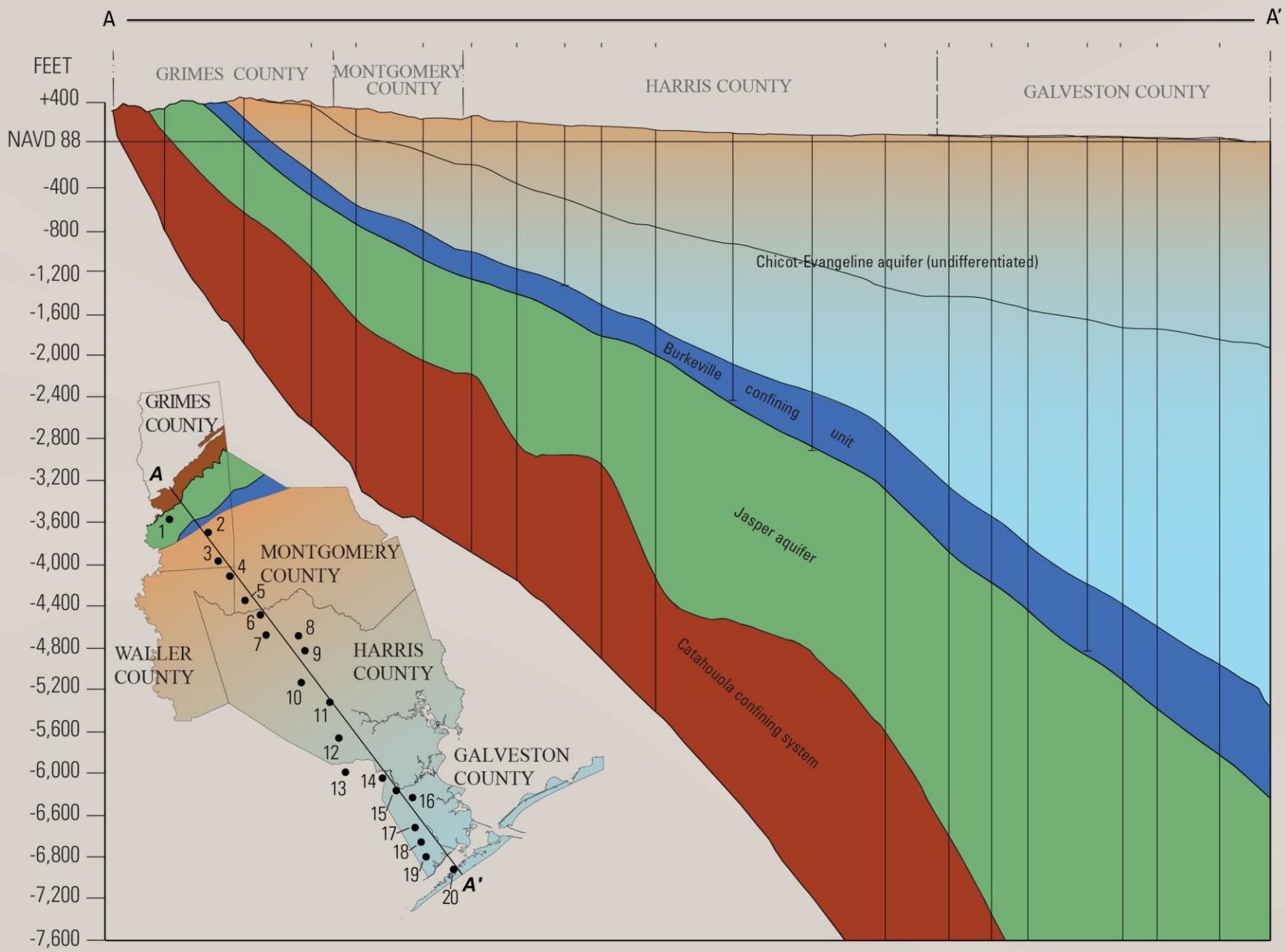
Compaction 1973 to 2025
- Compaction Data from 13 Extensometers



Geology and Hydrology

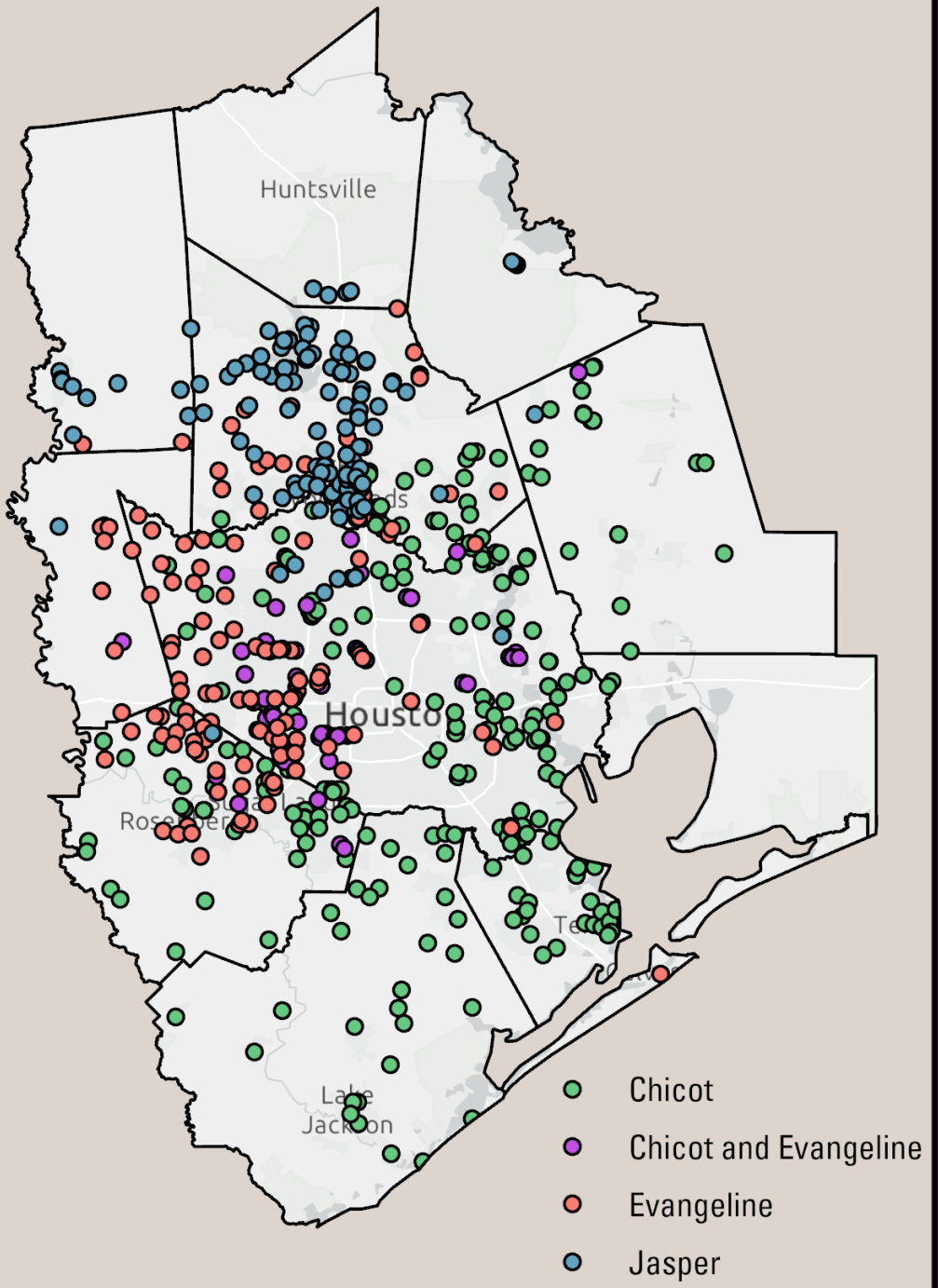
Geologic timescale		Geologic unit[1]		Hydrogeologic unit[1]
System	Series			
Quaternary	Holocene	Alluvium		Chicot and Evangeline aquifers (undifferentiated)
	Pleistocene	Beaumont Formation		
		Lissie Formation	Montgomery Formation	
			Bentley Formation	
		Willis Sand		
Tertiary	Pliocene	Goliad Sand (upper part)		
		Goliad Sand (lower part)		
	Miocene	Lagarto Clay (upper part)		
		Lagarto Clay (middle part)		Burkeville confining unit
		Lagarto Clay (lower part)		Jasper aquifer
		Oakville Sandstone		
	Oligocene	Frio Formation		Catahoula confining unit
		Vicksburg Formation		
Lower Oligocene- and pre-Oligocene sediments				

[1]Modified from Young and others (2012, 2014) and Young and Draper (2020).



Well Network

- Data collected across 11 counties
- Data collection:
  - early December to early March
- Well types:
  - Public Supply, Irrigation, Industrial, Observation
- Number of wells measured
  - 530 - Chicot and Evangeline (undifferentiated)
  - 106 - Jasper
- Number of measurements used to create the altitude maps
  - 502 - Chicot and Evangeline (undifferentiated)
  - 106 - Jasper
- Data were estimated for:
  - 43 wells in the Chicot and Evangeline (undifferentiated)
  - 19 wells in the Jasper



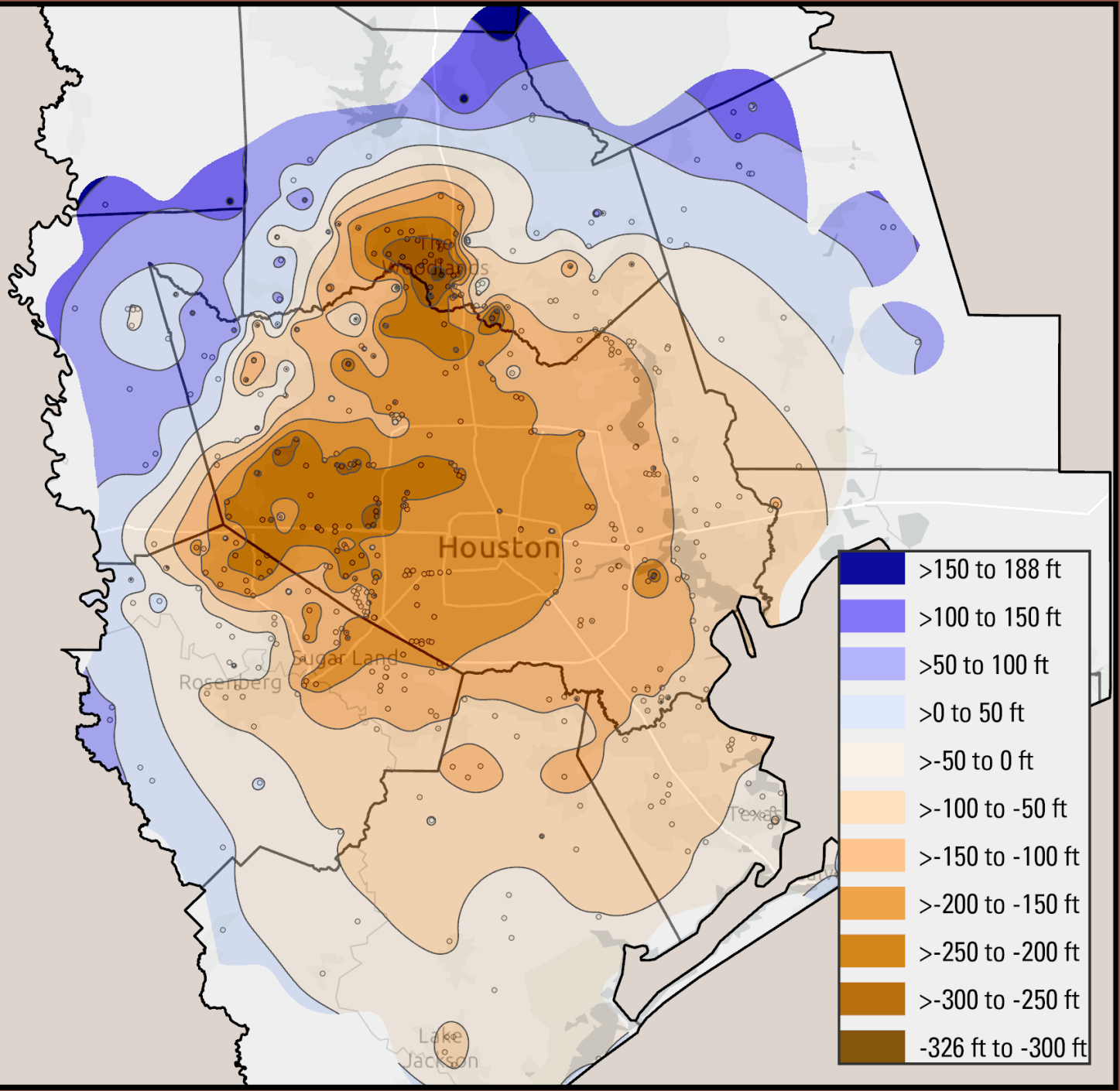
Water-Level Altitude

Chicot and Evangeline (undifferentiated)

Altitudes are referenced from NAVD 88

Lowest altitudes are in portions of southern Montgomery County and west-central Harris County

Highest altitudes are in portions of northern Waller, southern Grimes, northeastern Montgomery, southern San Jacinto and northern Liberty Counties



2025 to 2026 Water-Level Change

Chicot and Evangeline (undifferentiated)

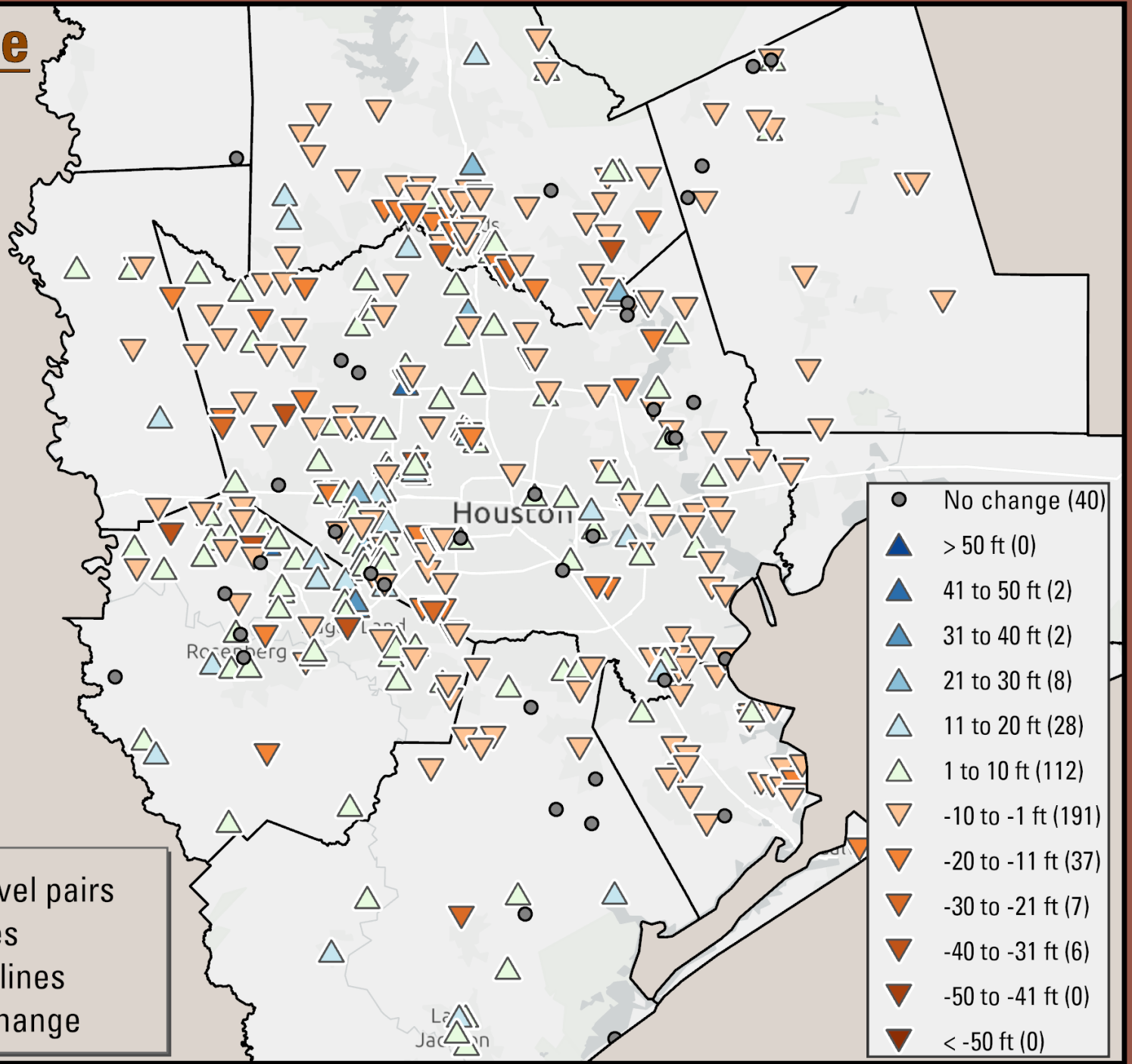
Most of the rises and declines were in the range of 1 to 10 ft of change

Rises concentrated in the southwestern portion of Harris County and central and east-central portion of Fort Bend County

The largest declines were in northern and east-central Fort Bend County, west-central Harris County and south-eastern Montgomery County

The largest rises were in west-central Harris County and Northern Fort Bend County

436 water-level pairs
- 35% Rises
- 56% Declines
- 9% No change



2021 to 2026 Water-Level Change

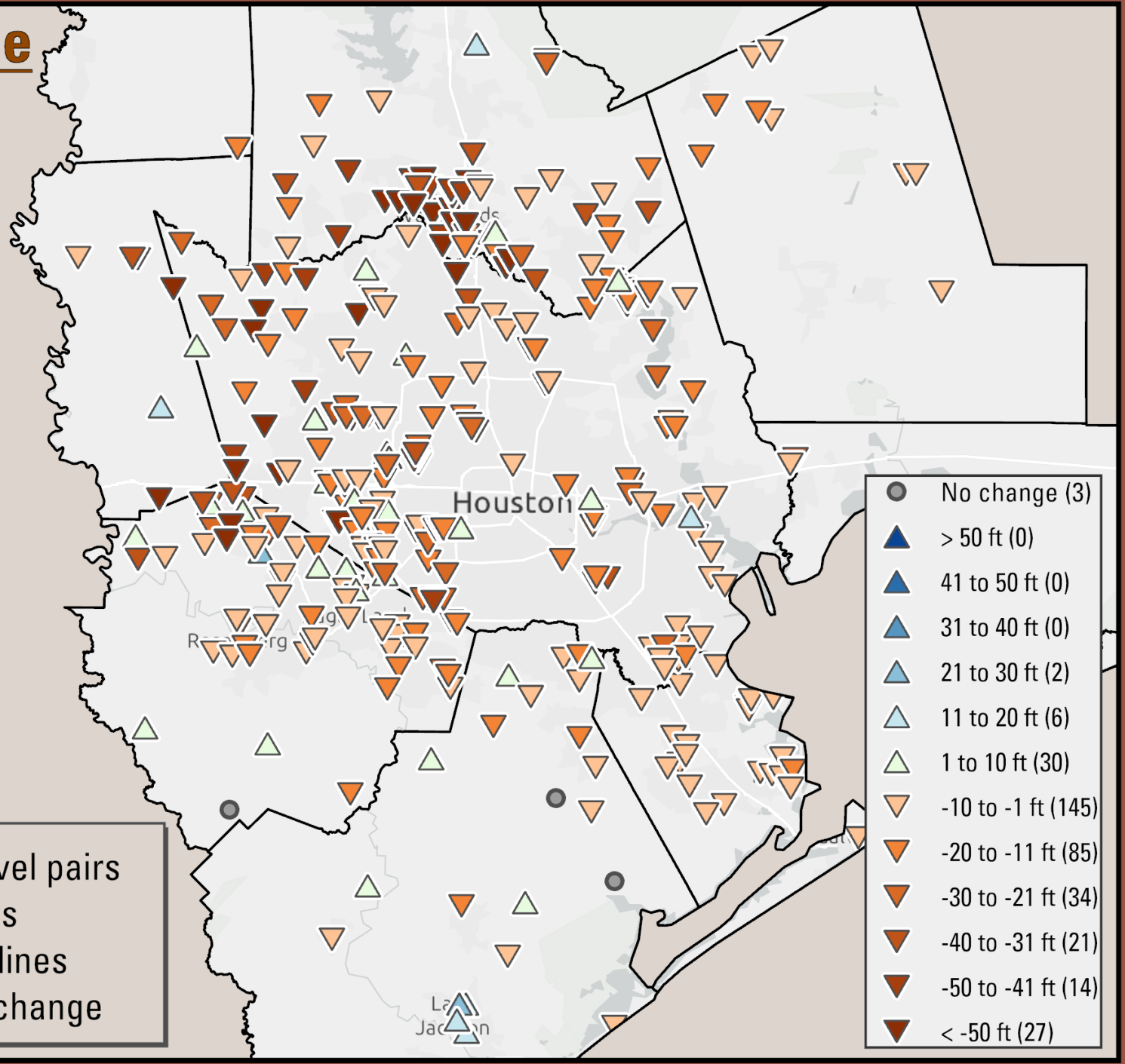
Chicot and Evangeline (undifferentiated)

Most of the rises and declines were in the range of 1 to 10 ft of change

The largest declines were concentrated across portions northern Fort Bend, western Harris, and southern Montgomery counties

Rises were limited with the two largest rises of more than 20 ft occurring at one well in northern Fort Bend County and one well in southern Brazoria County

368 water-level pairs
- 11% Rises
- 89% Declines
- <1% No change



Long Term Change 1977 to 2026

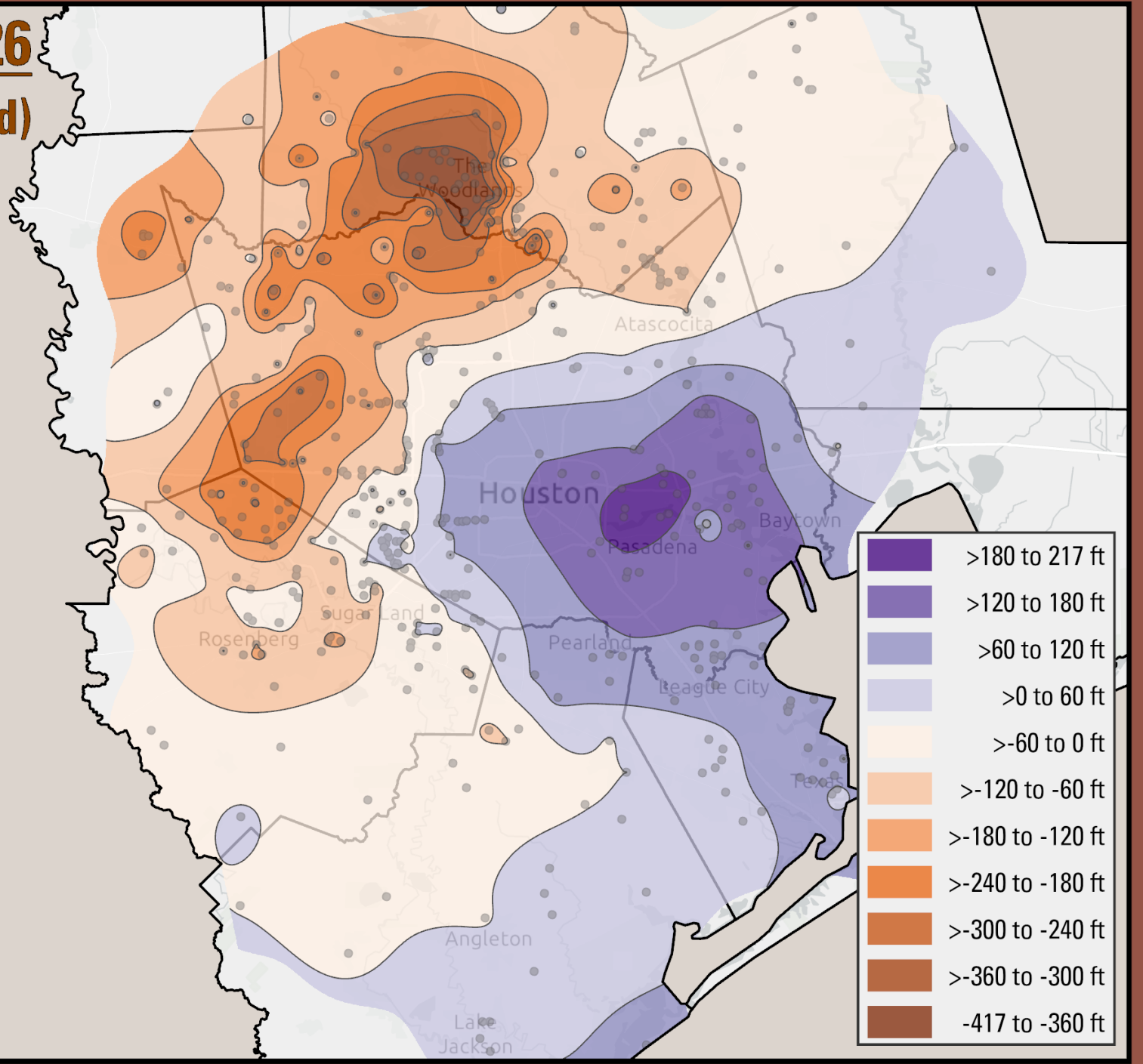
Chicot and Evangeline (undifferentiated)

Water-level rises:

- Most of central and eastern Harris County
- Portions of Liberty, Chambers, Galveston, Brazoria and Fort Bend counties
- Largest rises (>180 ft) in east-central Harris County

Water-level declines:

- Most of the northern and western portions of the greater Houston area
- Largest declines (>= 360 ft) in southern Montgomery County



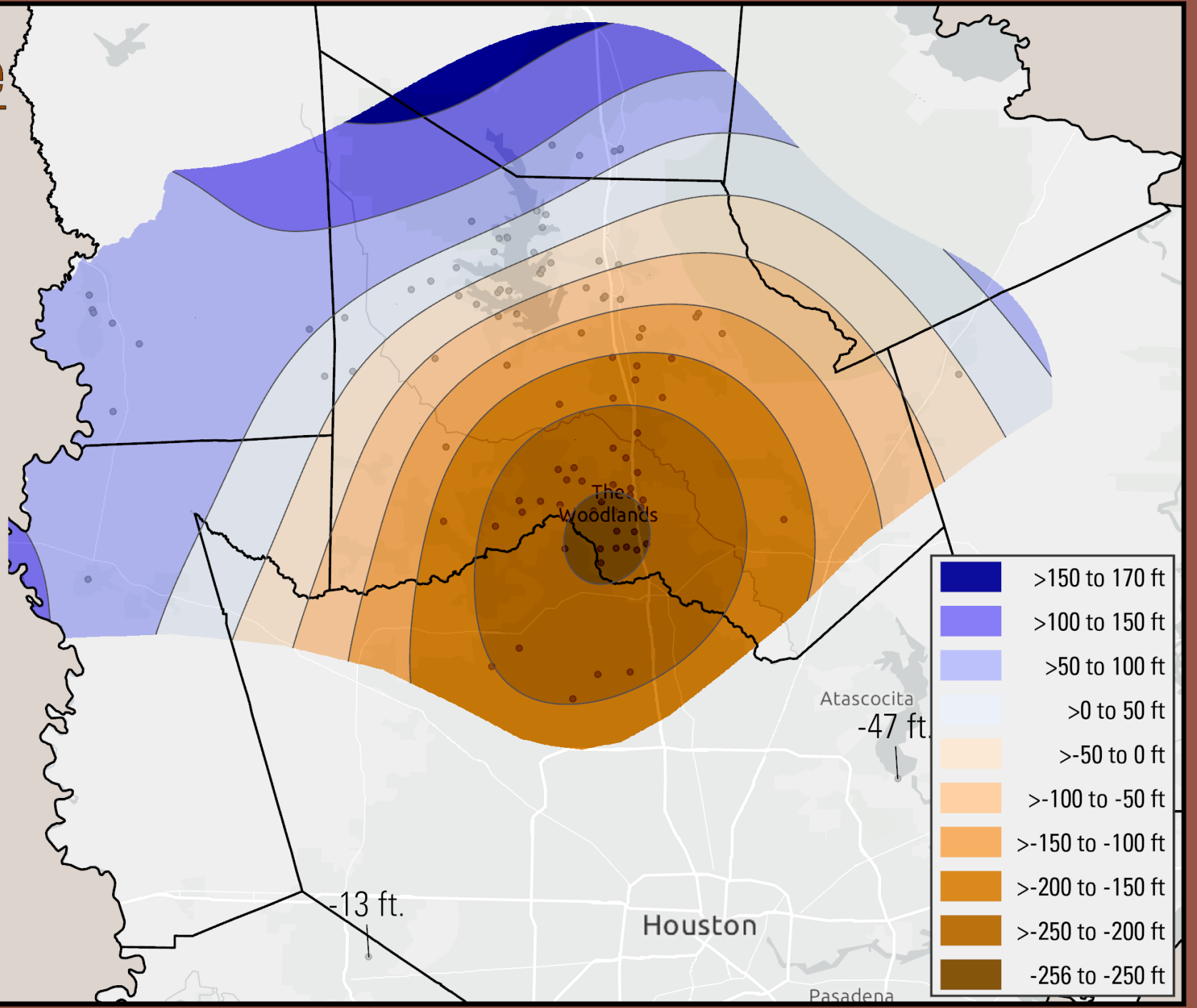
Water-Level Altitude

Jasper

Altitudes are referenced from NAVD 88

Altitudes generally deepen in the down-dip (NW-SE) direction

Lowest altitudes (>250 ft below NAVD 88) in south-central Montgomery County and north-central Harris County



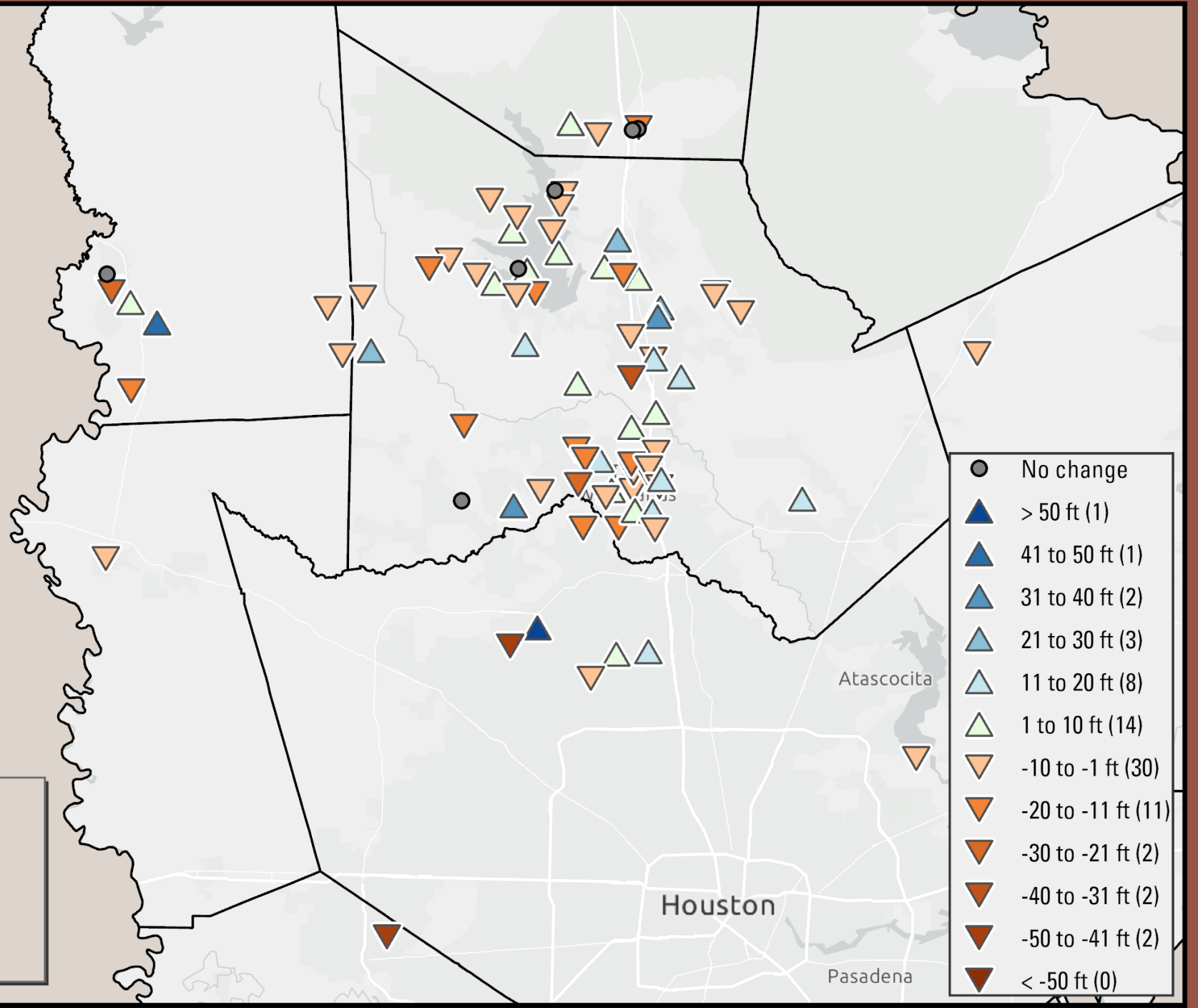
2025 to 2026 Water-Level Change - Jasper Aquifer

Predominantly declines from 1 to 20 feet

Largest declines (> 40 ft) are in west-central Harris County and northern Fort Bend County

Largest rise (> 50 ft) is in west-central Harris County

82 water-level pairs
- 35% Rises
- 58% Declines
- 7% No change



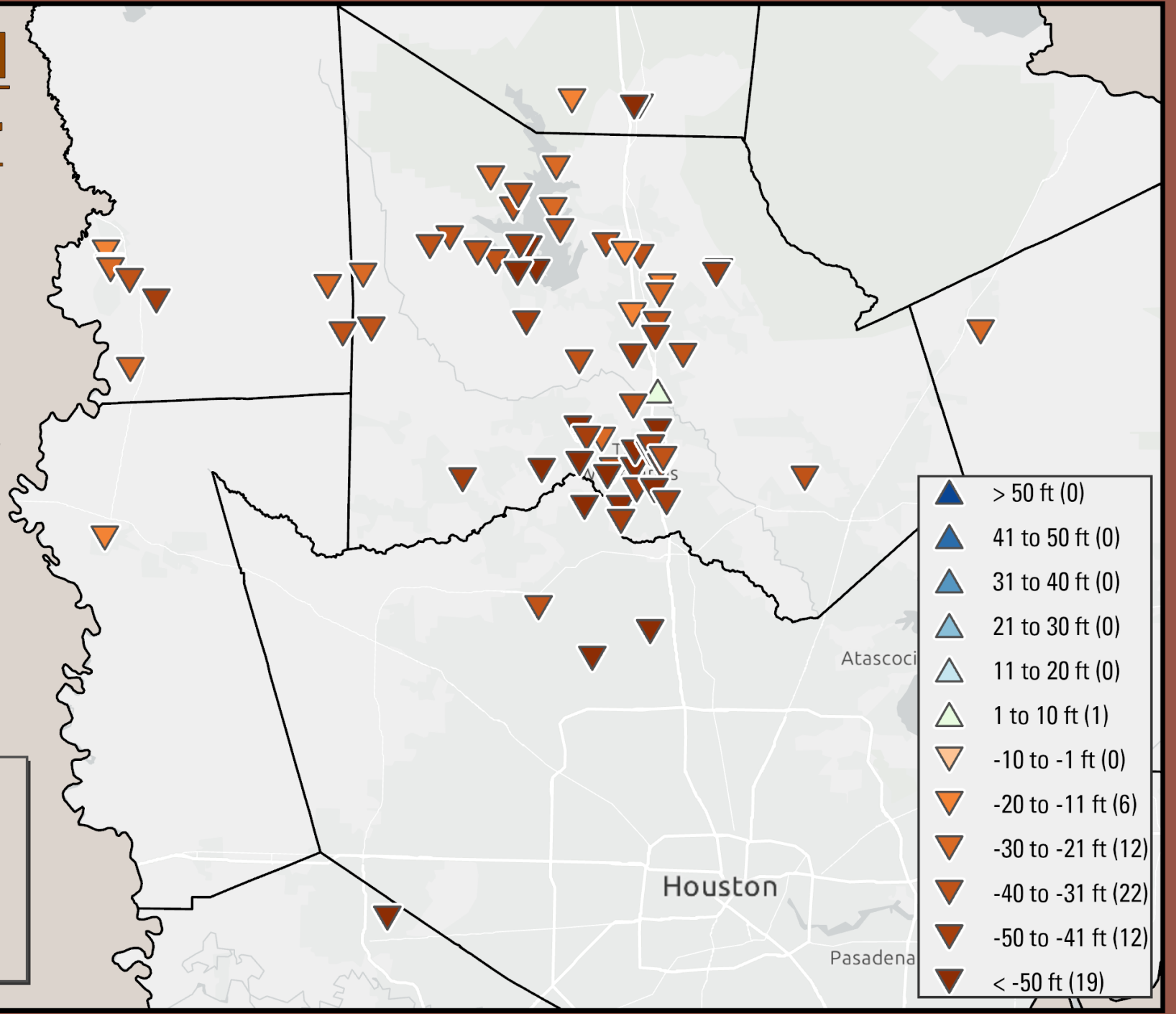
2021 to 2026 Water-Level Change - Jasper Aquifer

Nearly all declines with all of them more than 10 feet.

One slight rise in central-Montgomery County

Declines exceeding 50 ft across most of the study area

72 water-level pairs
- 1% Rises
- 99% Declines
- 0% No change



Long Term Change 2000 to 2026 - Jasper Aquifer

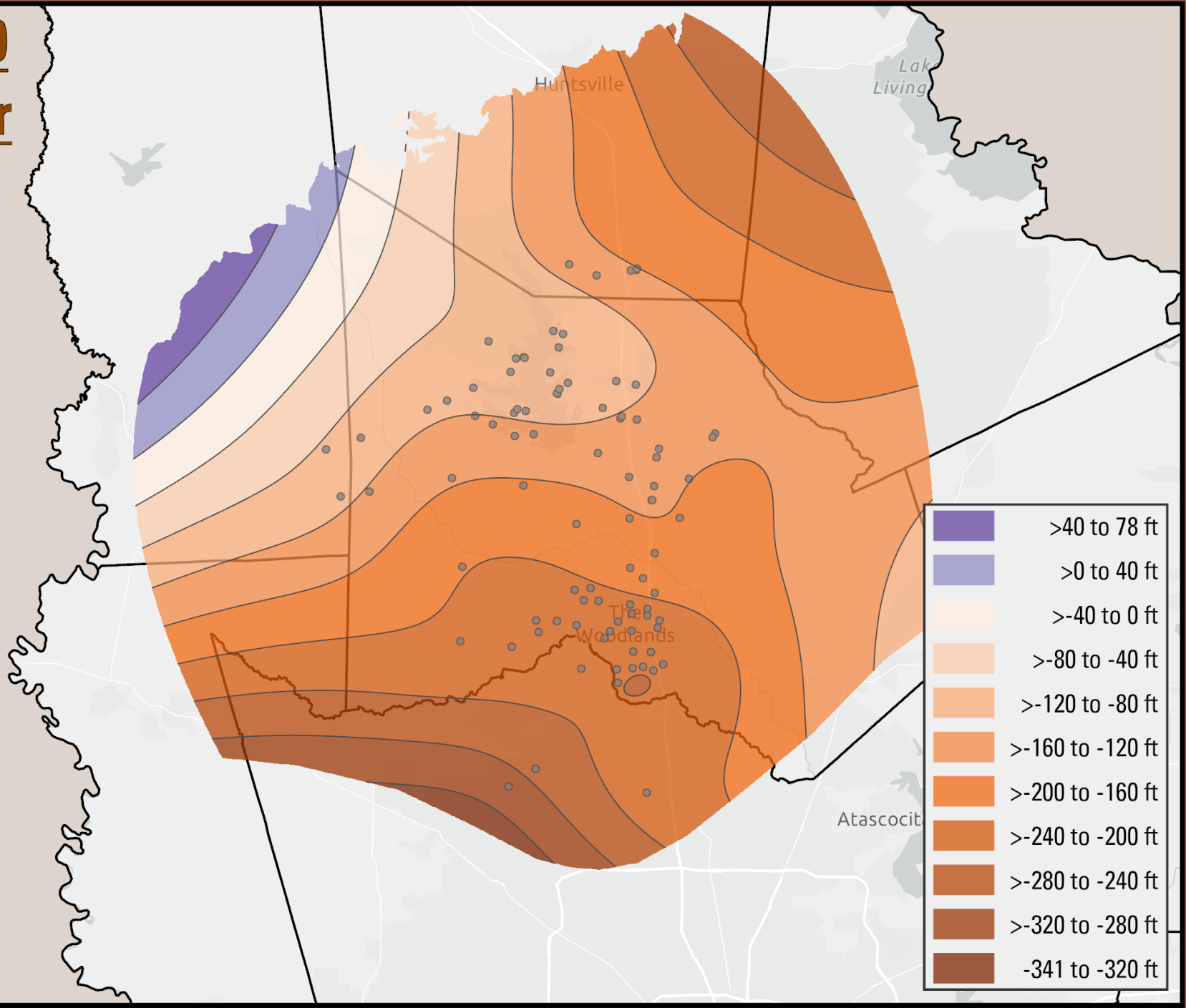
Water-level rises:

- Slight rises in the north-western portion of the Jasper study area, primarily in Grimes County

Water-level declines:

- The majority of the Jasper study area shows declines
- The largest declines are in the west-central portions of Harris County

note: *limitation of well network corresponds to areas of large rises and declines at the extreme edges of the shaded areas*



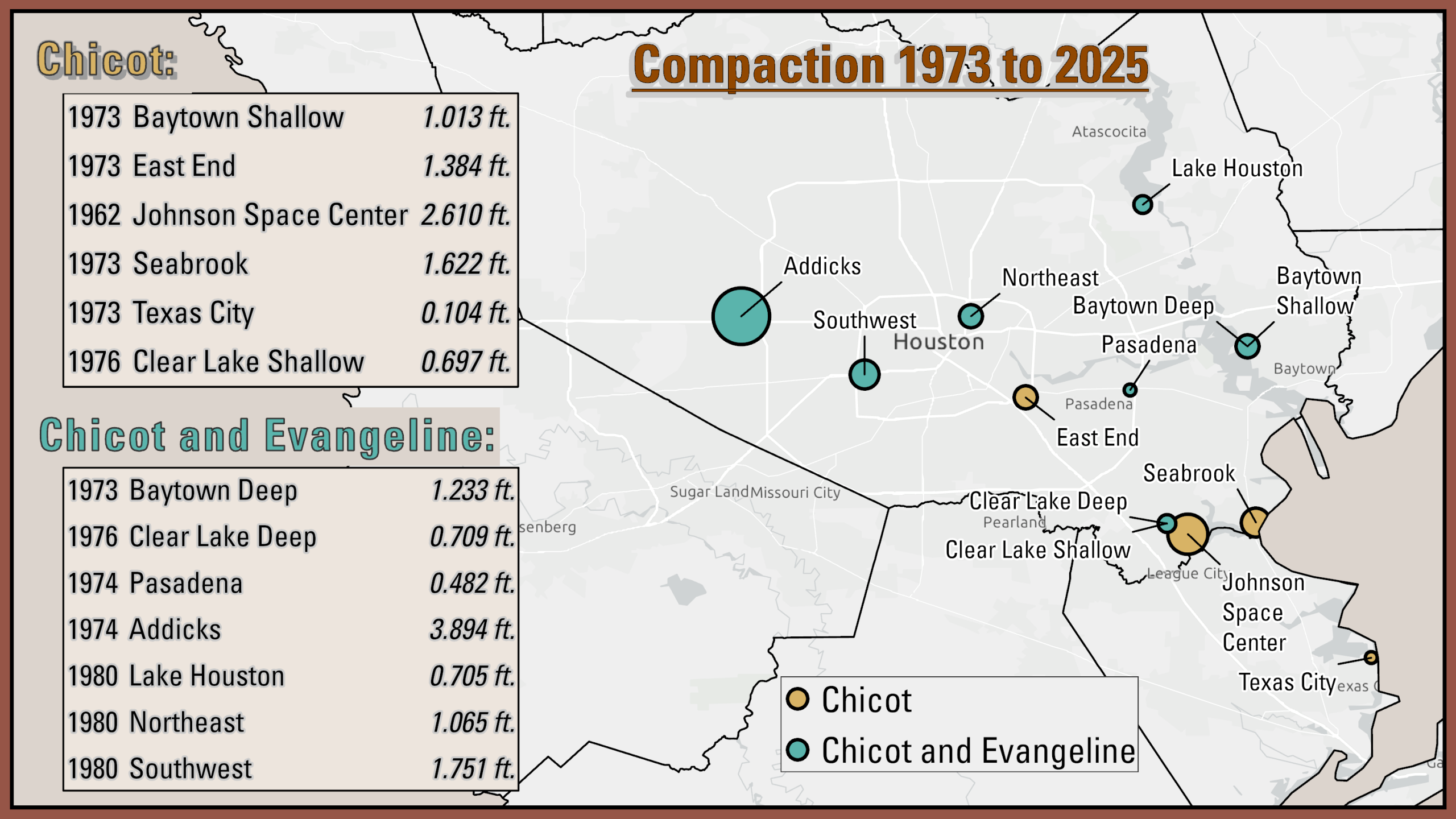
Compaction 1973 to 2025

Chicot:

1973	Baytown Shallow	*1.013 ft.*
1973	East End	*1.384 ft.*
1962	Johnson Space Center	*2.610 ft.*
1973	Seabrook	*1.622 ft.*
1973	Texas City	*0.104 ft.*
1976	Clear Lake Shallow	*0.697 ft.*

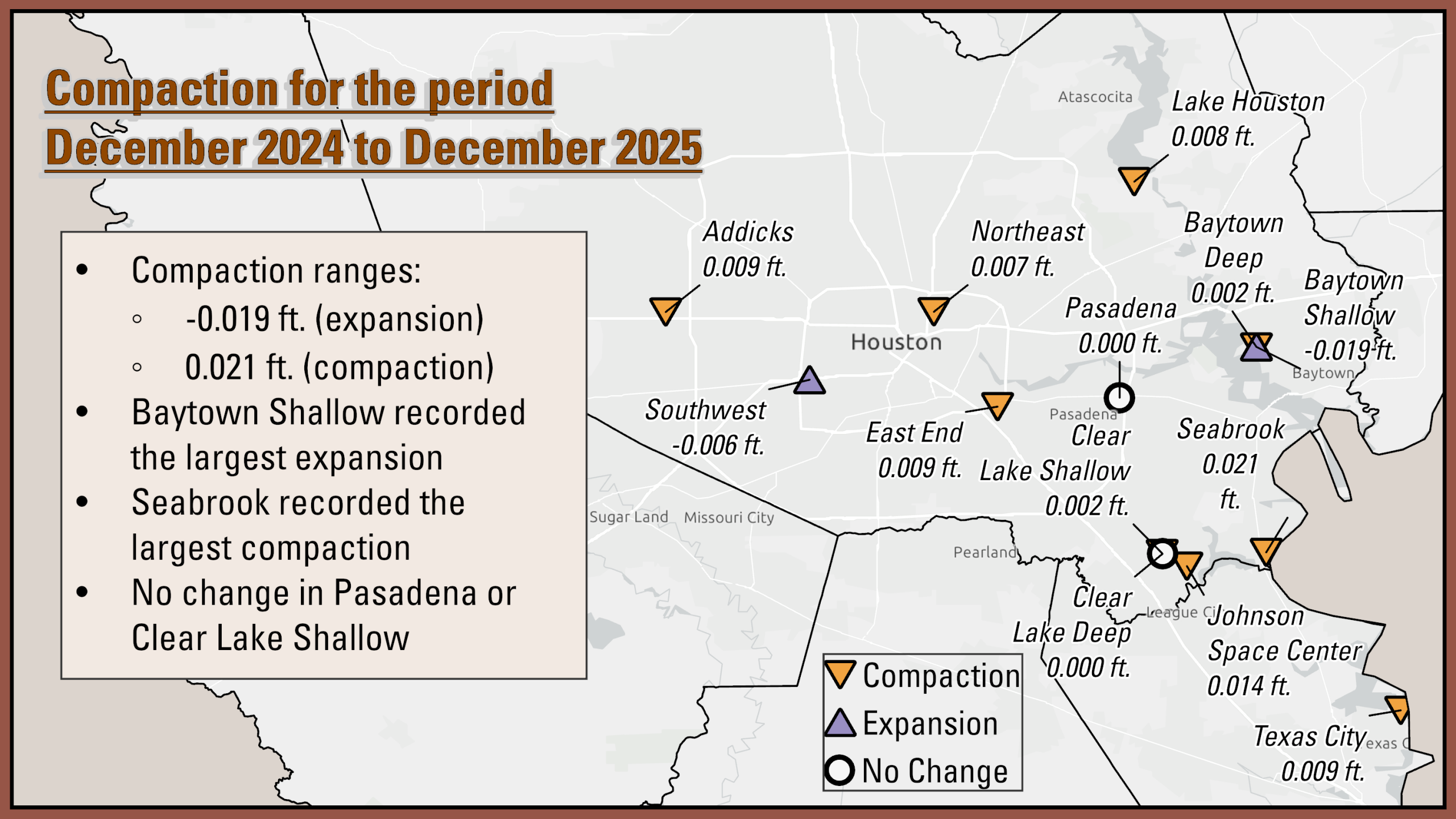
Chicot and Evangeline:

1973	Baytown Deep	*1.233 ft.*
1976	Clear Lake Deep	*0.709 ft.*
1974	Pasadena	*0.482 ft.*
1974	Addicks	*3.894 ft.*
1980	Lake Houston	*0.705 ft.*
1980	Northeast	*1.065 ft.*
1980	Southwest	*1.751 ft.*



Compaction for the period December 2024 to December 2025

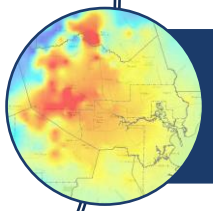
- Compaction ranges:
  - -0.019 ft. (expansion)
  - 0.021 ft. (compaction)
- Baytown Shallow recorded the largest expansion
- Seabrook recorded the largest compaction
- No change in Pasadena or Clear Lake Shallow



Agenda

Climate

Water Use



Groundwater Levels

Subsidence

Subsidence Monitoring

All HGSD-operated global positioning system (GPS) stations are constructed in a custom design.

GPS data are collected for one week every two months (periodic monitoring).

A conversion to continuous monitoring (data collection every day of the year) began in 2023 and will continue through 2027.

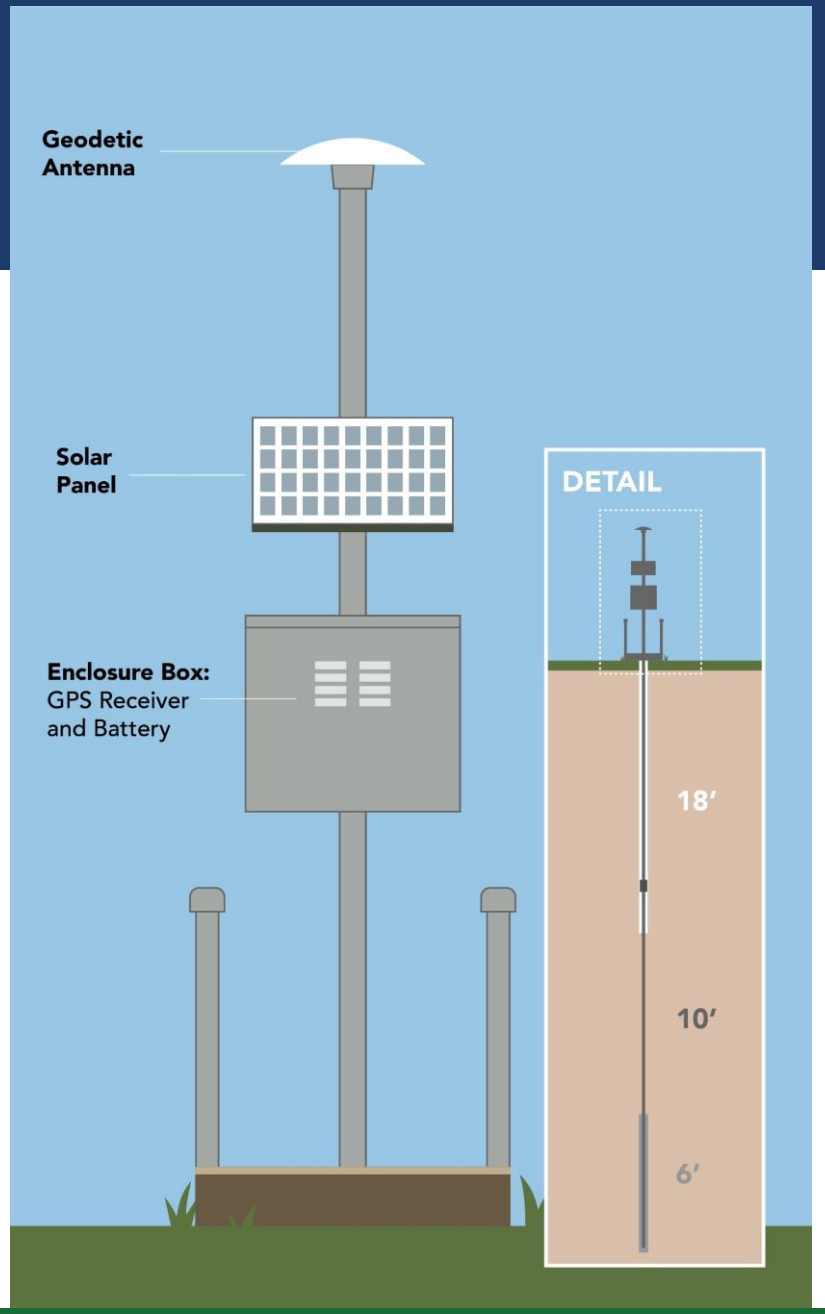
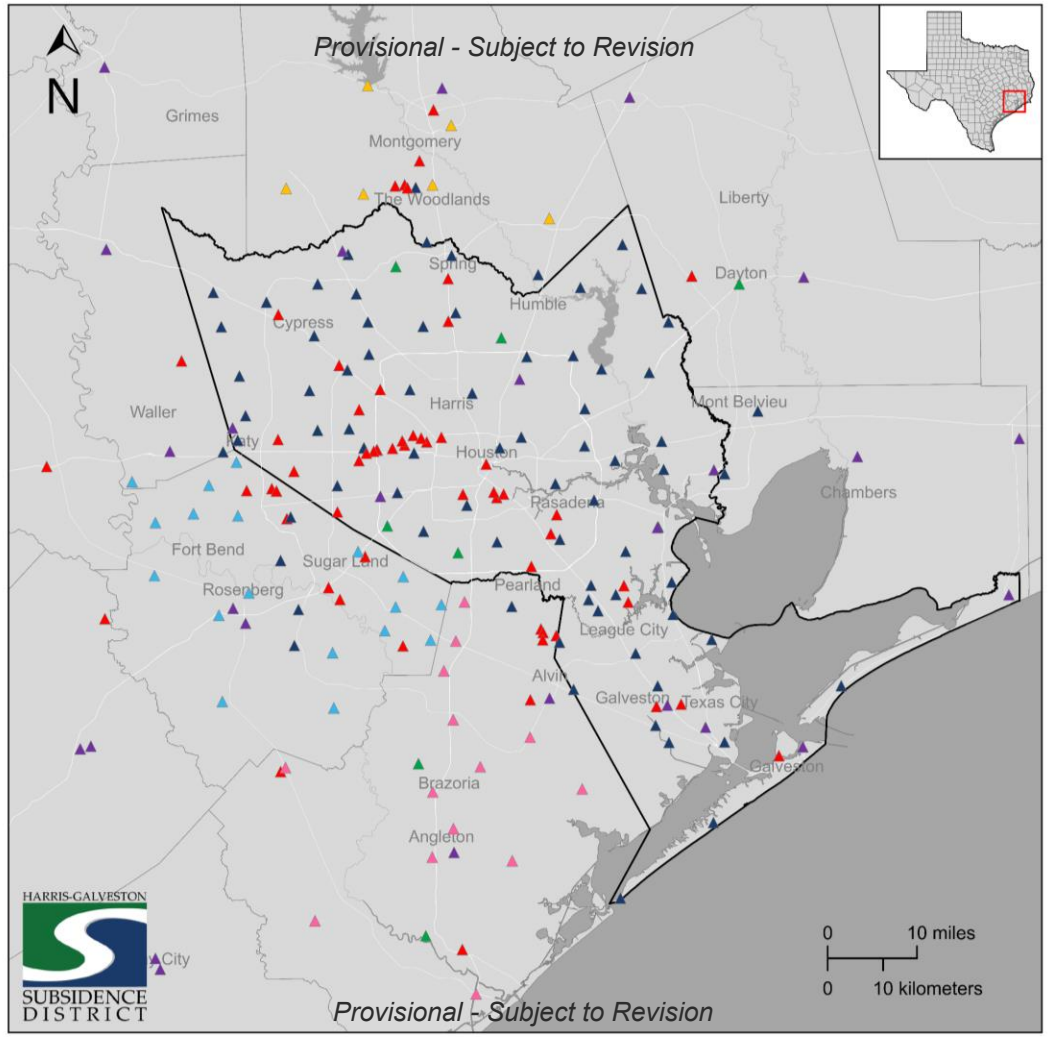


Exhibit 10 | Subsidence Monitoring Network

Location and operator of GPS stations that monitor land surface deformation periodically or continuously within southeast Texas in 2025.

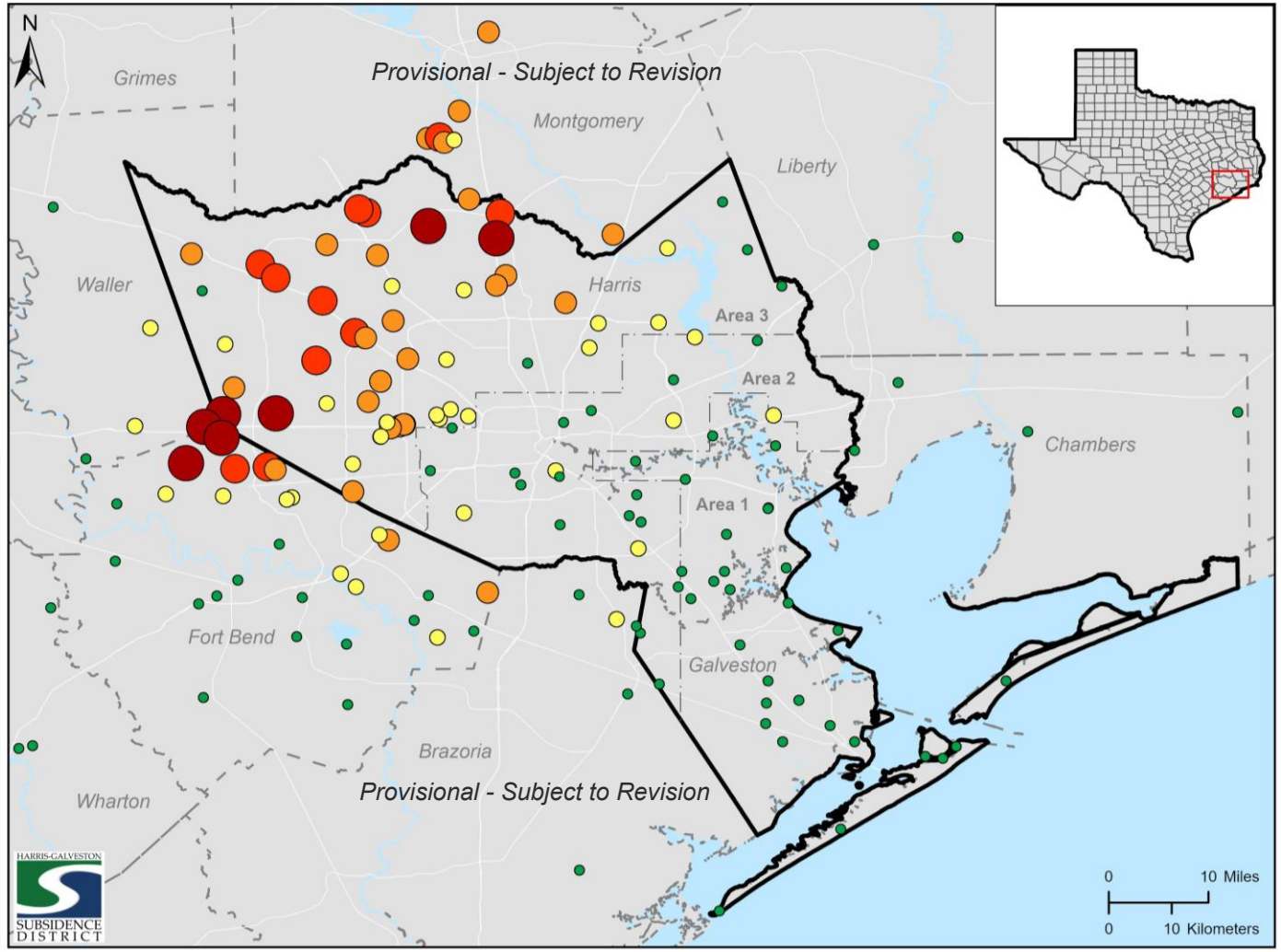


EXPLANATION

- HGSD Jurisdiction
- Harris-Galveston Subsidence District
- Fort Bend Subsidence District
- University of Houston
- Texas Department of Transportation
- Brazoria County Groundwater Conservation District
- Lone Star Groundwater Conservation District
- Other Operators

Exhibit 11 | Subsidence Rates from GPS Stations

Annual subsidence rate, in centimeters per year (cm/yr.), estimated from GPS data collected at active stations with three or more years of data averaged from 2021 to 2025.



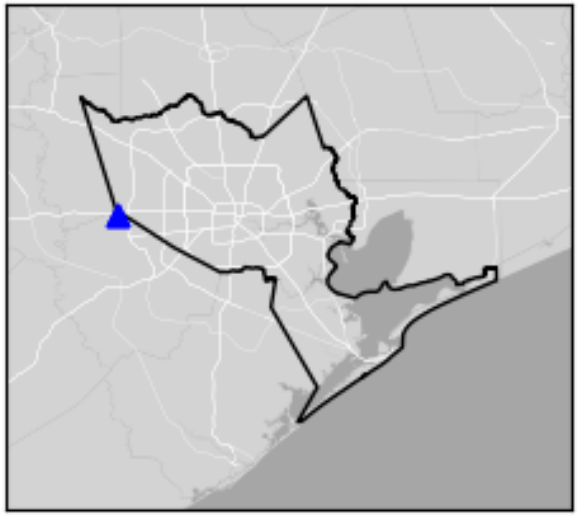
EXPLANATION

Average Annual Subsidence Rate (cm/yr.) Estimated from GPS Data Collected from Active Stations from 2021 to 2025

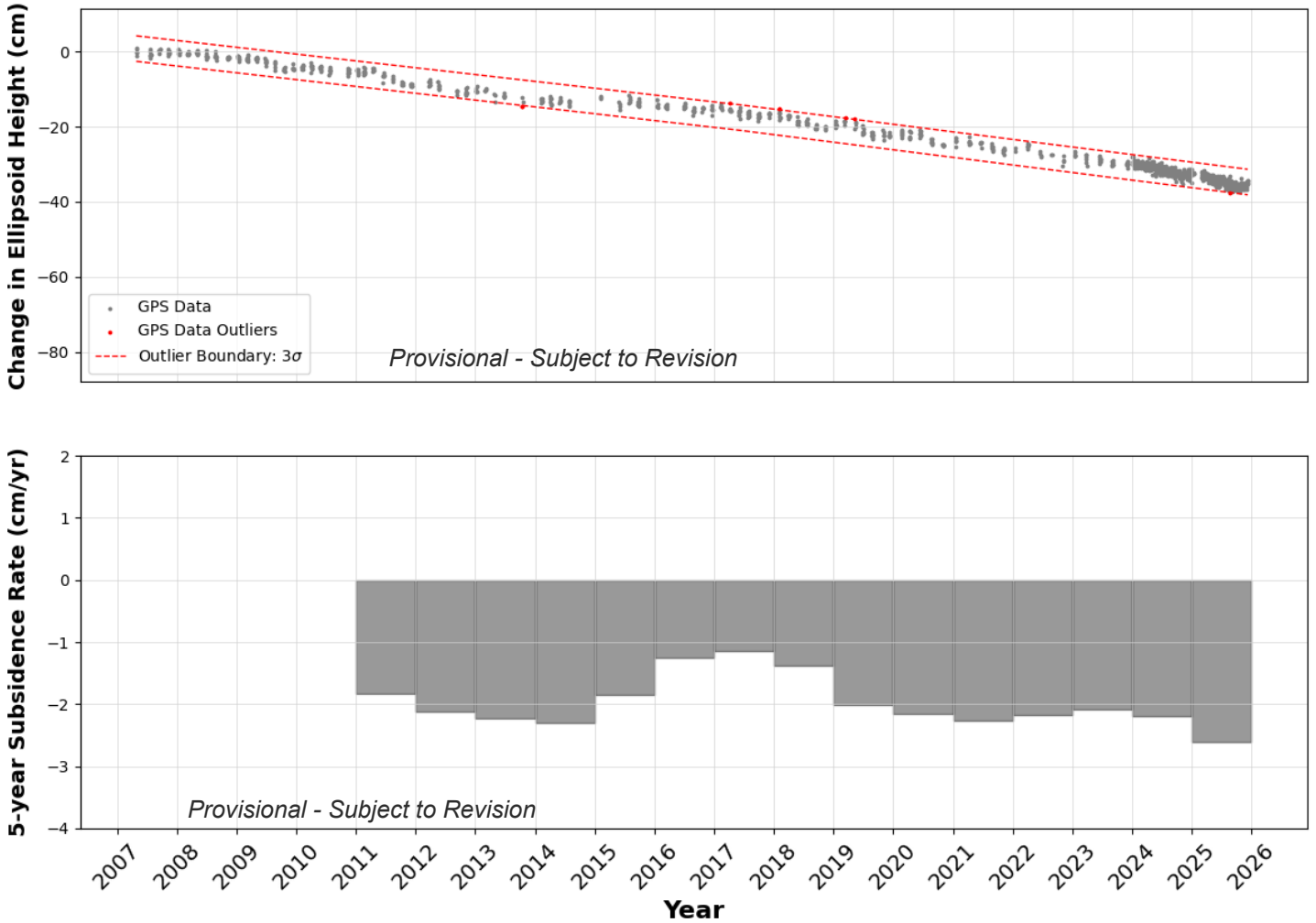
- Greater than 2.0
- 2.0 - 1.5
- 1.5 - 1.0
- 1.0 - 0.5
- Less than 0.5

Exhibit 12 | Greatest Subsidence Rate

GPS station **P029**, located in Katy, has measured a total of 35 cm of subsidence since 2007 with a 2021-2025 average rate of **2.64 cm/yr**.

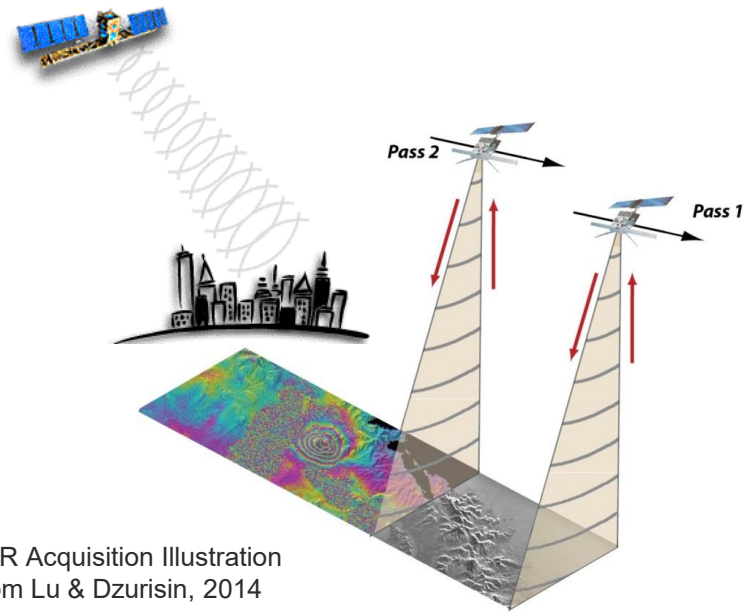


Processed GPS data (source: UH) over period of record. Processed data (grey circles) located inside the outlier boundary (red dashed lines) are used when calculating subsidence rates. Processed GPS data identified as outliers (red circles) are excluded from subsidence rate calculations and are shown for informational purposes only.



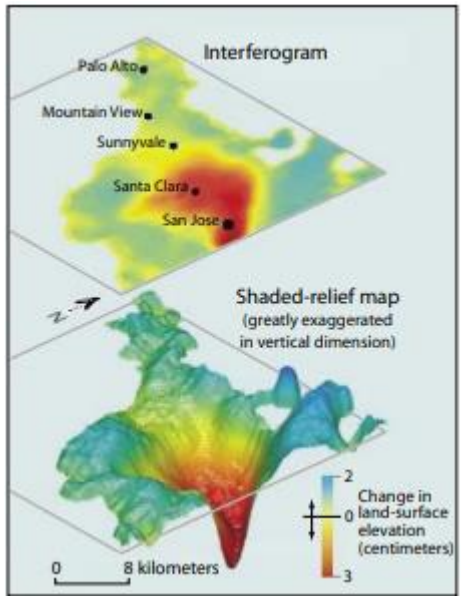
Interferometric Synthetic Aperture Radar (InSAR)

- Synthetic aperture radar (SAR) data are generated by transmitting radio waves from the sensor to the ground and back to the sensor.
- InSAR compares two SAR images of the same area at different times to detect small changes in distances between them. This processed pair of SAR images is the interferogram.
- Processing techniques can be used to achieve an accuracy of millimeters.



InSAR Acquisition Illustration
from Lu & Dzurisin, 2014

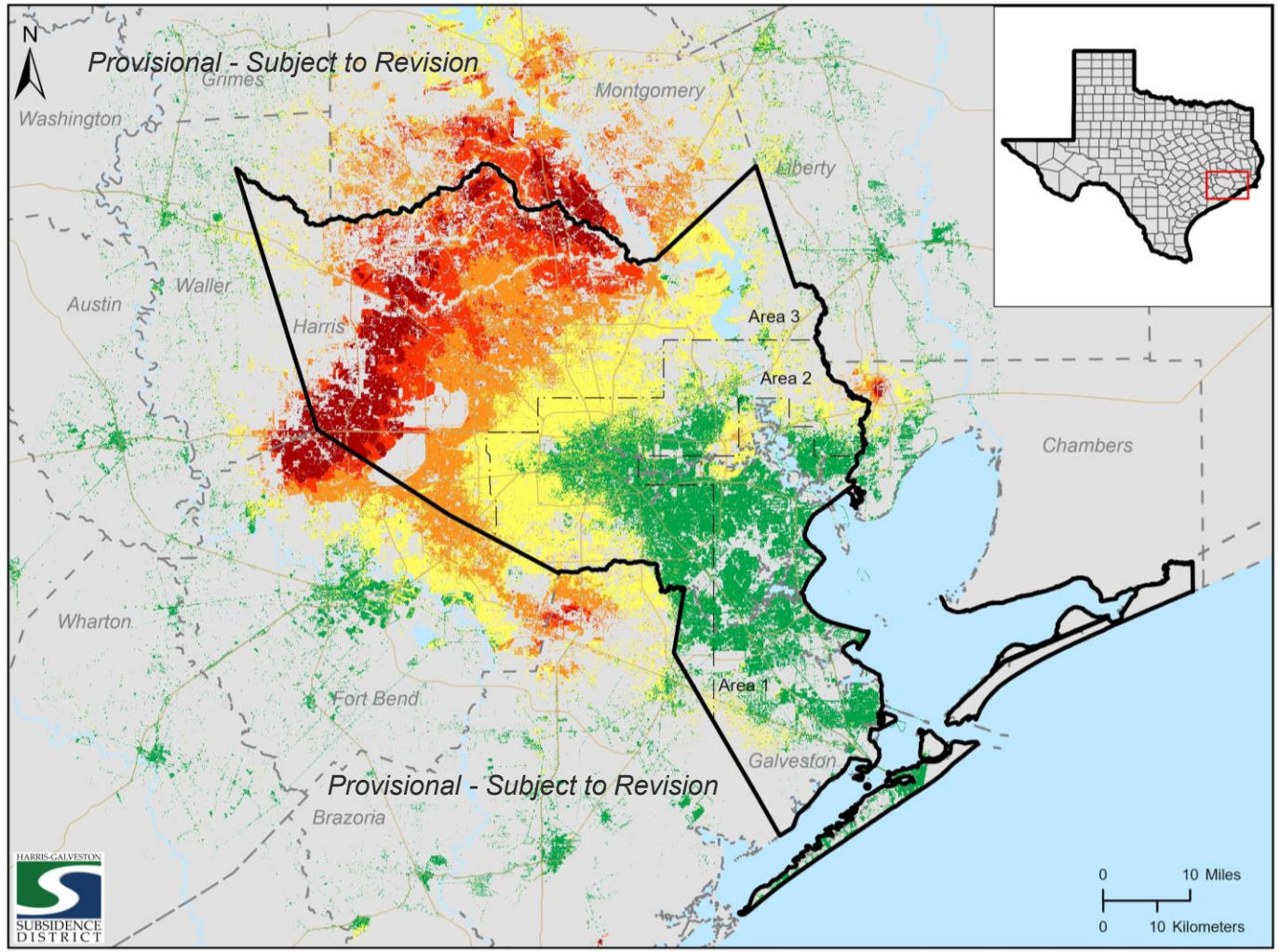
Processing



Interferogram (top) and 3-D topography (bottom)
from USGS Fact Sheet 2005-3025

Exhibit 13 | Subsidence Rates from InSAR

Annual subsidence rate, in centimeters per year (cm/yr.), estimated from Sentinel 1A derived time-series interferograms averaged from 2021 to 2025.



EXPLANATION

Sentinel-1 Derived Average Annual Subsidence Rate (cm/yr.) Processed from 2021 to 2025

- Greater than 2.0
- 2.0 - 1.5
- 1.5 - 1.0
- 1.0 - 0.5
- Less than 0.5

Gray areas show no data as the accuracy of InSAR decreases in rural areas due to tropospheric errors and decorrelation in the vegetated areas.

Testimony and Public Comment

Any person who wishes to appear at the hearing and present testimony, evidence, exhibits, or other information may do so in person, by counsel, via email to **info@subsidence.org**, or any combination of these options.

Thank you for attending the 2025 Annual Groundwater Report Public Hearing

- The record will remain open until **May 8, 2026**. You may provide comments by sending an email to **info@subsidence.org**.

- The 2025 Annual Groundwater Report will be presented to the Harris-Galveston Subsidence District Board of Directors at their next meeting on **May 13, 2026,** for approval.

- Upon Board approval, the 2025 Annual Groundwater Report will be posted on our website, **hgsubsidence.org** - located within the Science and Research section.

Scan the QR code to visit the Annual Groundwater Reports page on our website. →

HARRIS-GALVESTON SUBSIDENCE DISTRICT

HARRIS-GALVESTON SUBSIDENCE DISTRICT

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