2023

Texas Demographic Conference

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Texas Natural Resources Information System
Texas Water Development Board

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Texas Natural Resources Information System
Texas Water Development Board

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“Making Data Count”

A little history…

TEXAS WATER CODE

§ 11.070. Centralized Data

The staff shall create a centralized data bank incorporating all hydrological data collected by state agencies. (55th Legis., Ch. 425, Sec. 21, subdiv. (j), as amended.)

- Concept of TNRIS came from the drought and floods of the 1950's
- The "*Texas Water Planning Act*" of 1957 mandated a data planning inventory be established.
- In 1967, the Texas Water Code establish the *"Texas Water Oriented Data Bank*".
- 1972, the "*Texas Natural Resources Information System"* was officially established.

TEXAS NATURAL RESOURCES INFORMATION SYSTEM

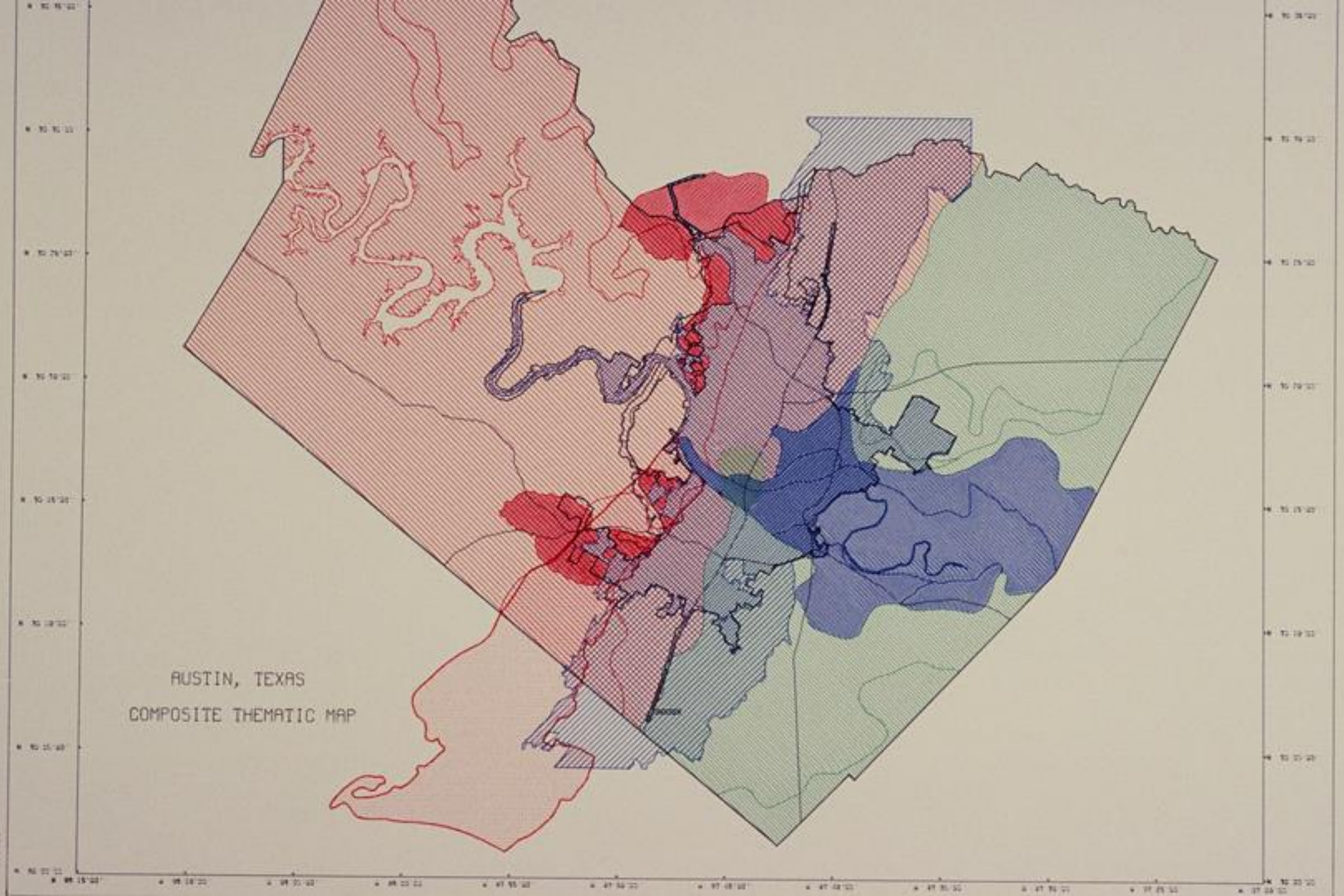
GEOGRAPHIC INFORMATION SYSTEM

User Reference Manual

TEXAS NATURAL RESOURCES INFORMATION SYSTEM

NO SMOKING

SYSTEMS CENTRAL
of LANDSAT Tapes
1:24,000
scaled and registered
printer maps


AUSTIN, TEXAS
COMPOSITE THEMATIC MAP

TNRIS MONITOR
User
Reference
Manual
TEXAS NATURAL RESOURCES INFORMATION SYSTEM
TEXAS NATURAL
INFORMATION
FILE DESCR
TEXAS NATURAL
GEOGRA
INFORMATION SYS
SYSTEM

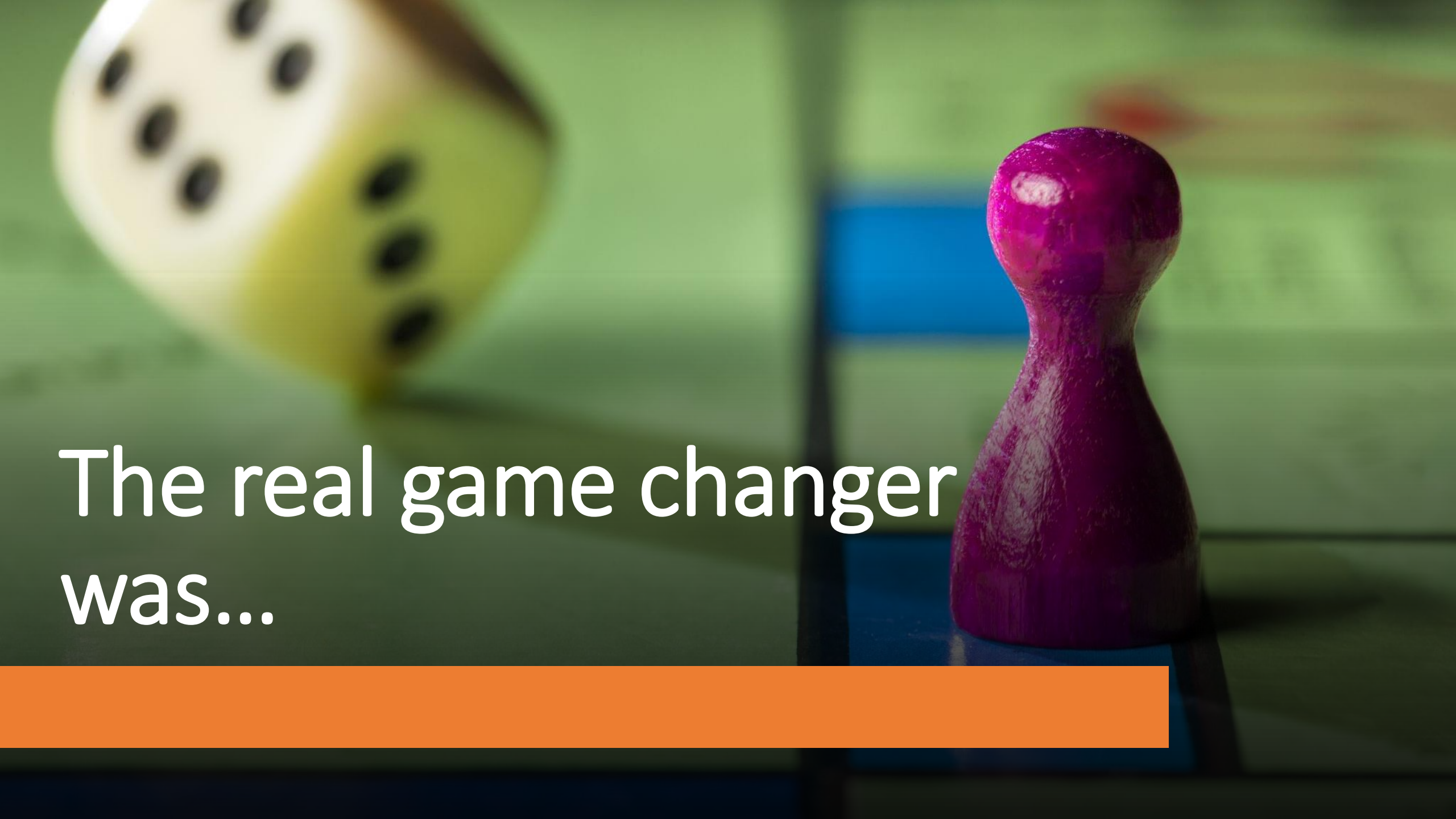
TEXAS CITIES WITH TNRIS MONITOR USERS

TEXAS NATURAL RESOURCES INFORMATION SYSTEM

USE OF THE

TNRIS MONITOR

FOR COMPUTER TERMINAL ACCESS TO NATURAL RESOURCES AND RELATED DATA AND INFORMATION



The real game changer was…

TEXAS NATURAL RESOURCES INFORMATION SYSTEM

CENSUS

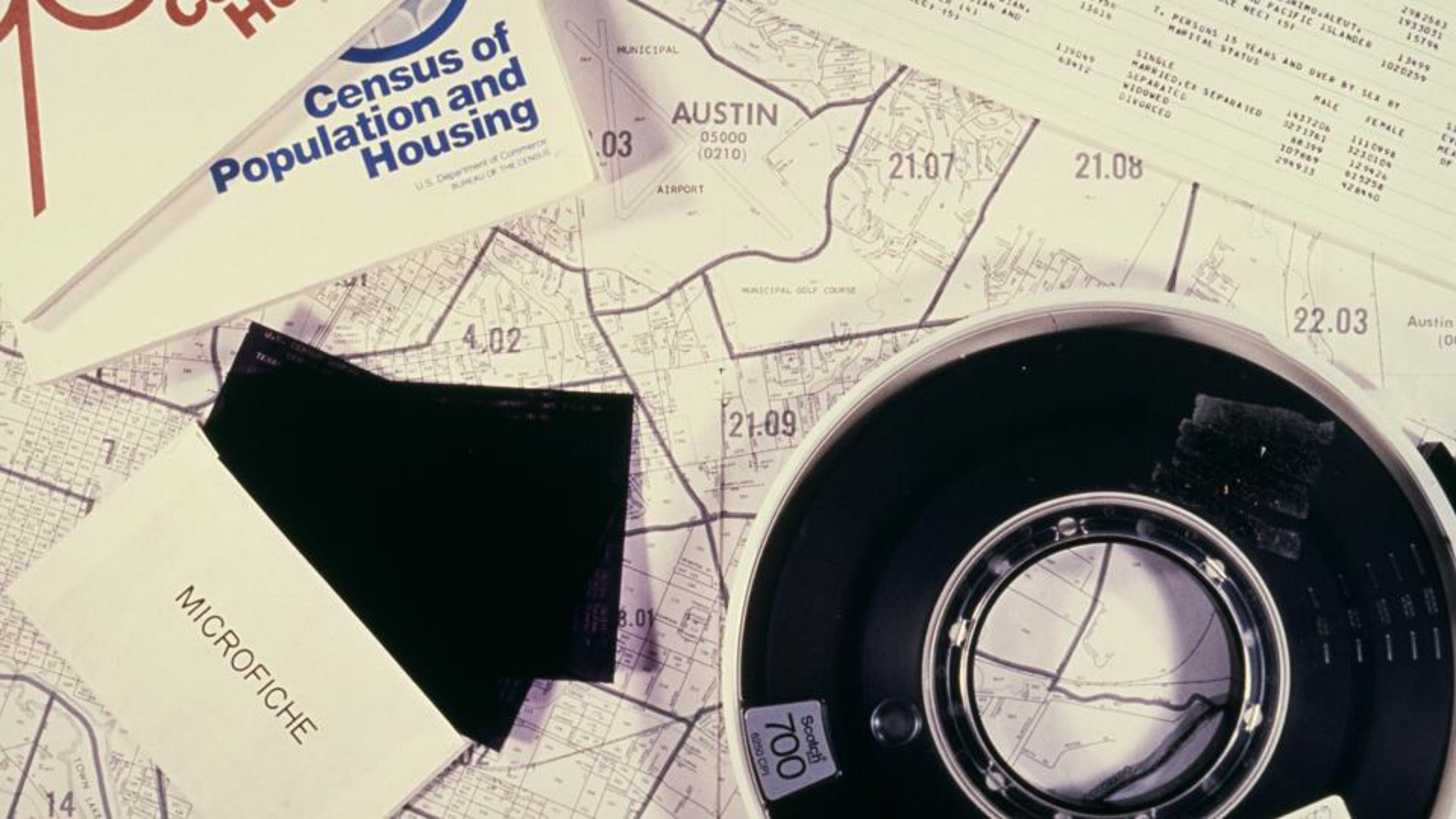
DATA SYSTEM

User

Reference

Manual

TEXAS NATURAL RESOURCES INFORMATION SYSTEM


Census of Population and Housing
U.S. Department of Commerce
BUREAU OF THE CENSUS
MUNICIPAL
AUSTIN
05000
(0210)
AIRPORT
MUNICIPAL GOLF COURSE
21.07
21.08
21.09
22.03
4.02
MICROFICHE
Scotch
700

Dual Independent Map Encoding (DIME)

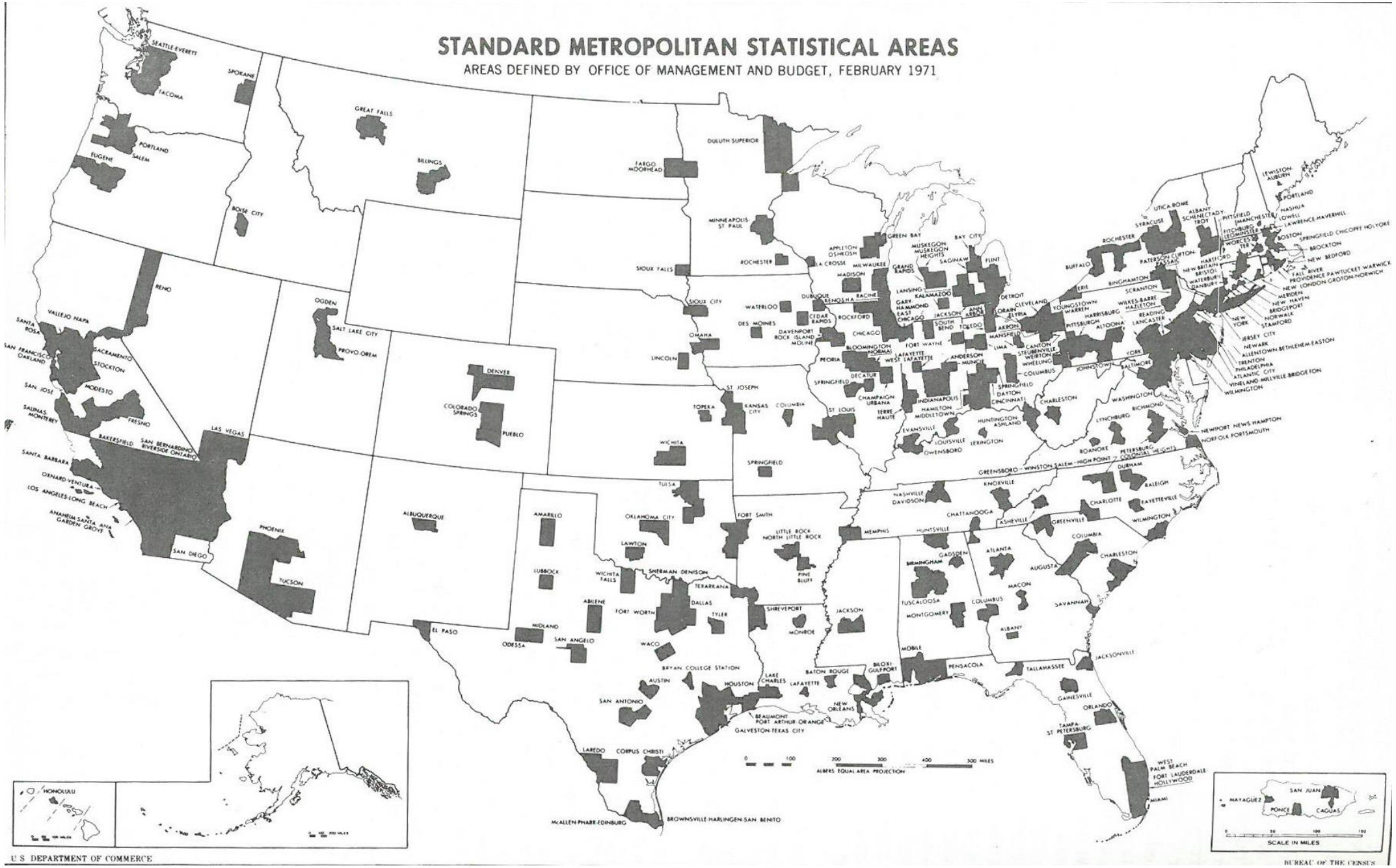
- Developed as a way to link digital map files to the “address coding guide” to support the U.S. Census Bureau with Mail-out and Mail-back procedures for the 1970’s Census.

- Built upon a selection of streets, railroads, administrative boundaries, and hydrological features digitized from the Census Bureau’s Metropolitan Map Series (MMS) program.

- MMS map source files were the USGS 7.5 minute quads.

STANDARD METROPOLITAN STATISTICAL AREAS

AREAS DEFINED BY OFFICE OF MANAGEMENT AND BUDGET, FEBRUARY 1971

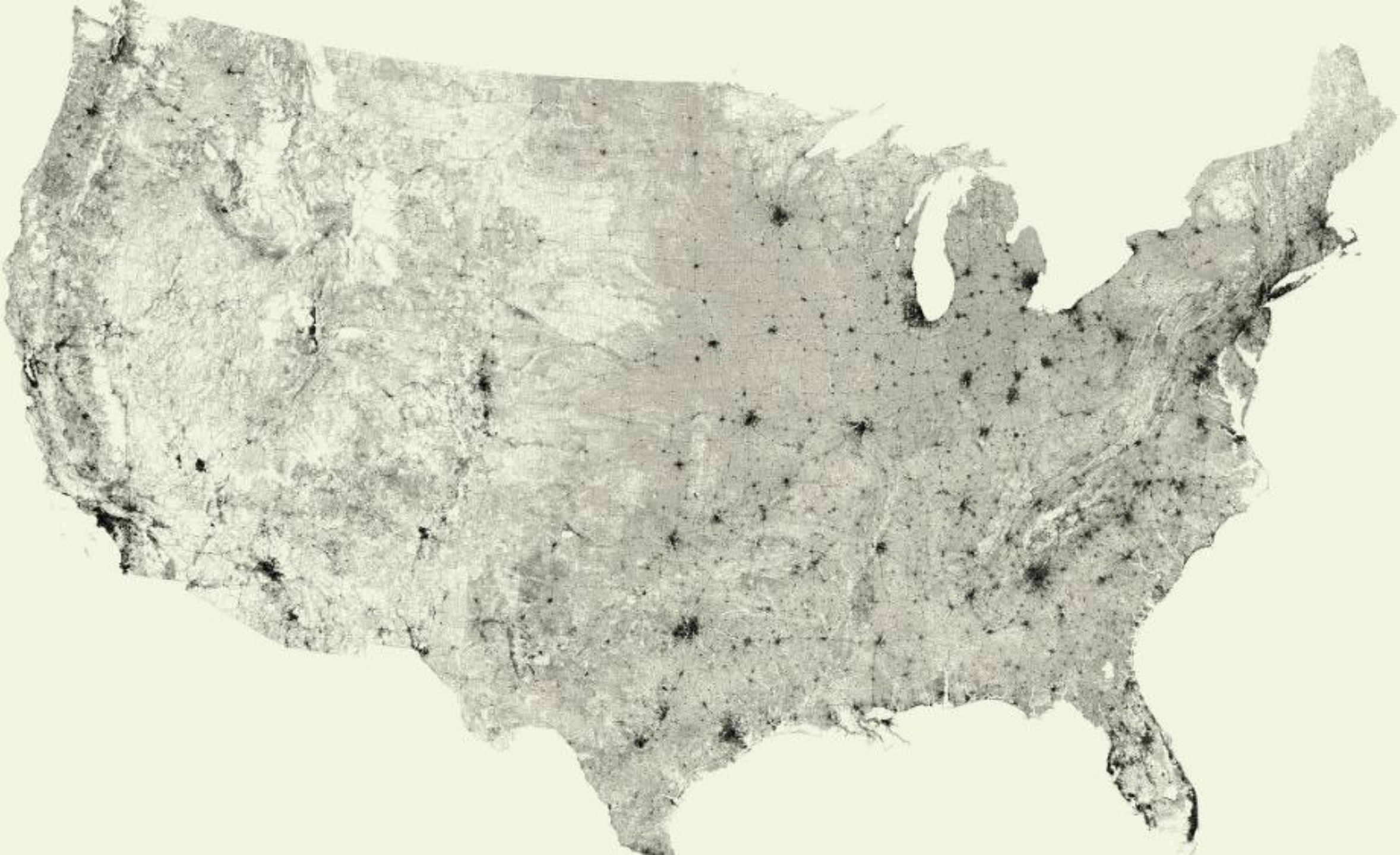


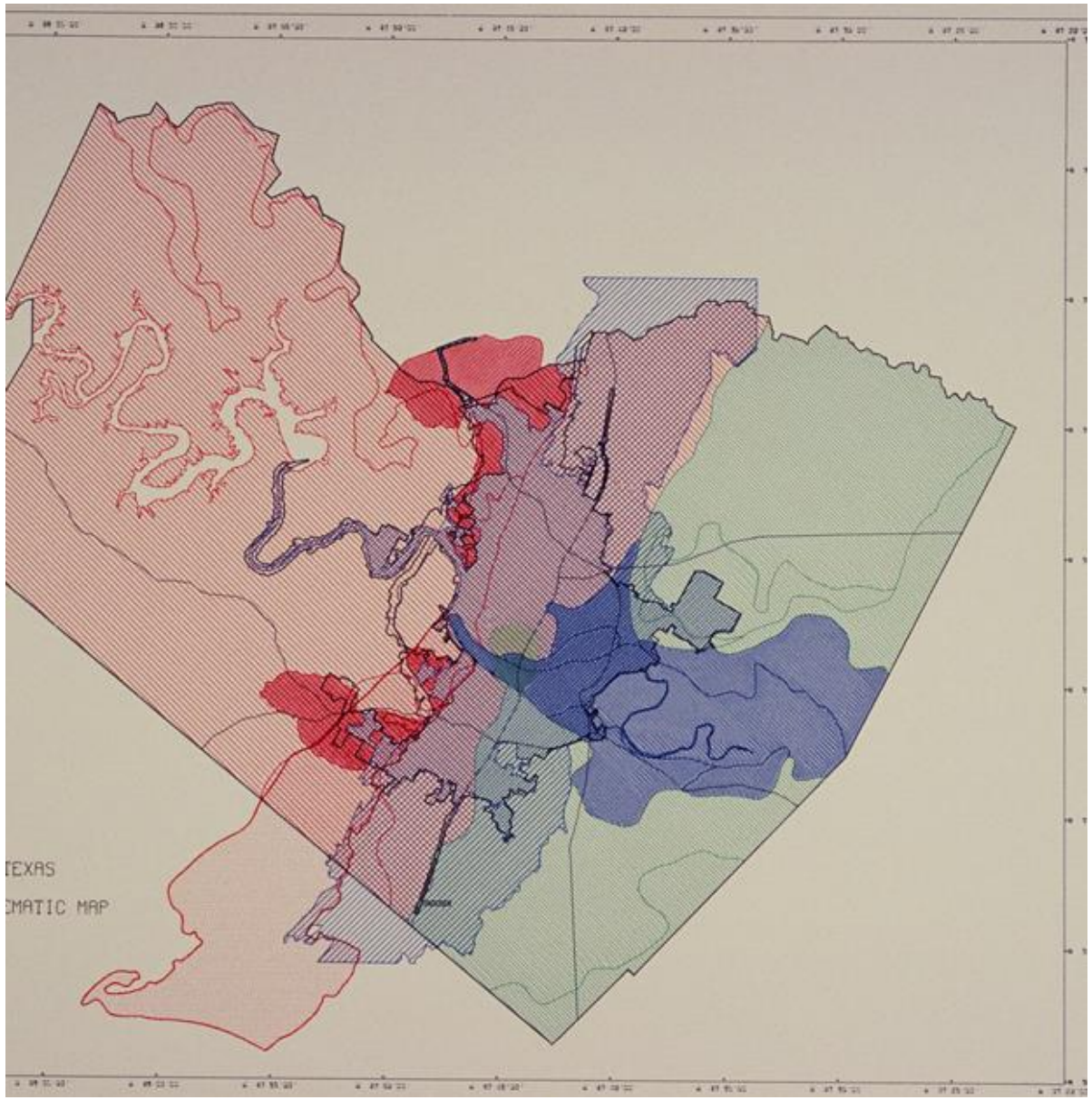
U S DEPARTMENT OF COMMERCE

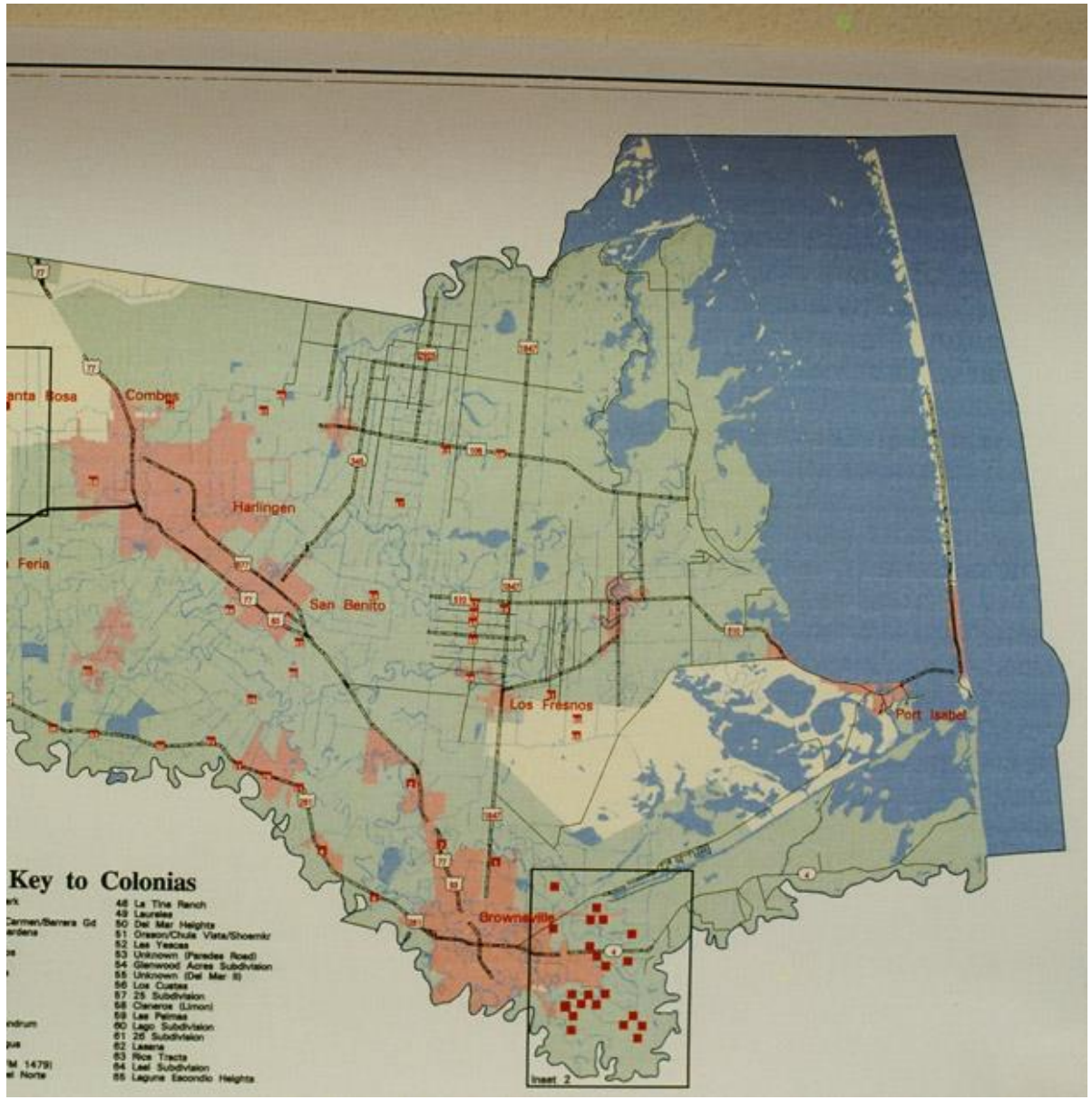
BUREAU OF THE CENSUS

Topologically Integrated Geographic Encoding and Referencing (TIGER) Database

- A Collaborative effort between the Census Bureau and the U.S. Geological Survey (USGS) for the 1990 Census
- The TIGER database contained a latitude/longitude-coordinate for more than 30 million feature intersections and end points and nearly 145 million feature “shape” points that defined the more than 42 million feature segments that outlined more than 12 million polygons.
- National Coverage




TEXAS
CMATIC MAP


Combes
Harlingen
San Benito
Los Fresnos
Port Isabel
Brownsville
Key to Colonias
46 La Tina Ranch
48 Laureles
50 Del Mar Heights
51 Orason/Chula Vista/Shoemkr
52 Las Yescas
53 Unknown (Paredes Road)
54 Glenwood Acres Subdivision
55 Unknown (Del Mar II)
56 Los Cuatas
57 25 Subdivision
58 Cameron (Limon)
59 Las Palmas
60 Lago Subdivision
61 26 Subdivision
62 Lasara
63 Rice Tracts
64 Leal Subdivision
65 Laguna Escondido Heights
Inset 2

Geographic Data for Texas

Why It Is Important

StratMap

Data Layers

Shape Texas

StratMap - Strategic Mapping Program

StratMap Contracts

- Address Points
- Land Parcels
- Aerial imagery – Current, Historic
- Land Cover
- Elevation – Lidar, Bathymetry, Buildings
- Hydrography
- Future additions...

TNRIS StratMap Strategic Mapping Program

Texas Water Development Board

Address Points

Land Parcels

2023 Statewide Address Points and Land Parcels: ***Available July***

data.tnris.org

Aerial Imagery - Current

2022/23 Statewide Aerial Imagery: ***Available Fall*** **tnris.org/texas-imagery-service**

Statewide High-Resolution Imagery for All!

Major Cost Savings per Partner!

35

Contributing Partners

State Agency Tier 1 $375,000

Texas Department of Transportation

State Agency Tier 2 $125,000

Commission on State Emergency Communications
Texas Commission on Environmental Quality
Texas General Land Office
Texas Parks and Wildlife Department
Texas Water Development Board

State Agency Tier 5 $15,625

Texas Department of Criminal Justice
Texas Department of Insurance
Public Utility Commission of Texas
Your agency here!

University $15,625

Texas A&M Forest Service
University Lands
Your university here!

Regional Agency $15,000

Brazos River Authority
Lower Colorado River Authority
Lower Rio Grande Valley Development Council
North Texas Municipal Water District
Tarrant Regional Water District
Capital Area Council of Governments
Your agency here!

Local Agency $6,000

Austin County Emergency Communications District
City of Abilene
City of Carrollton
City of Fair Oaks Ranch
City of San Antonio
City of Temple
City of Universal City
City of Waco
City of Wolfforth
Collin County
Dallas Area Rapid Transit
El Paso County 911 District
El Paso Water Utilities/Public Service Board
Hays County
Houston Parks Board
Lavaca Navidad River Authority
Port of Corpus Christi Authority
VIA Metropolitan Transit Authority
Your agency here!

TNRIS StratMap Strategic Mapping Program

Texas Water Development Board

State Agencies

Level	Service Requests*	Annual Subscription Fee**
Power	>=20,000,000	$375,000
Advanced	1,250,000 - 19,999,999	$125,000
High	500,000 - 1,249,999	$62,500
Moderate	100,000 - 499,999	$31,250
Minimum	<100,000	$15,625

State Universities

Department - Annual flat fee $15,625**

University Wide - Annual flat fee $125,000**

Regional Agency

Annual flat fee $15,000**

Local Agency

Annual flat fee $6,000**

* State Agency cost is calculated based on an annual metric of service web requests. A web request is every **new** click, pan, scroll, load or zoom per user in your organization.

** Cost does not include DIR Fee

Previous years: ***Available Now***

Texas **Imagery** Service

Request a Free Trial Today

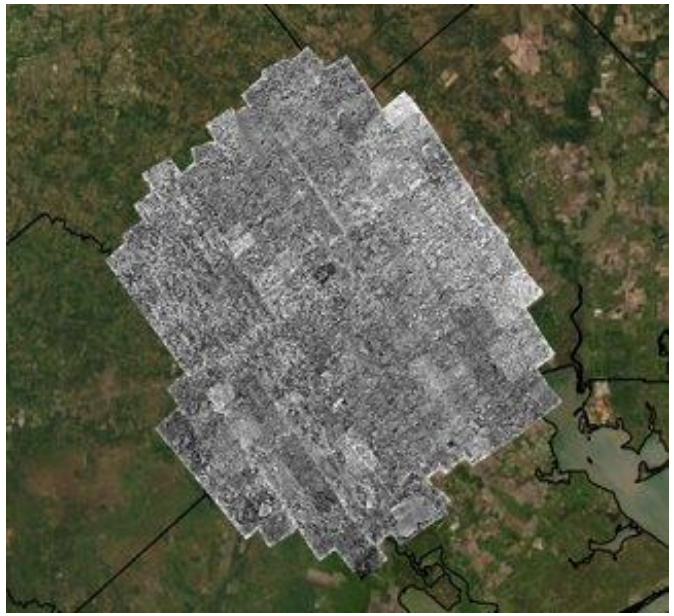
https://www.tnris.org/tis-request/

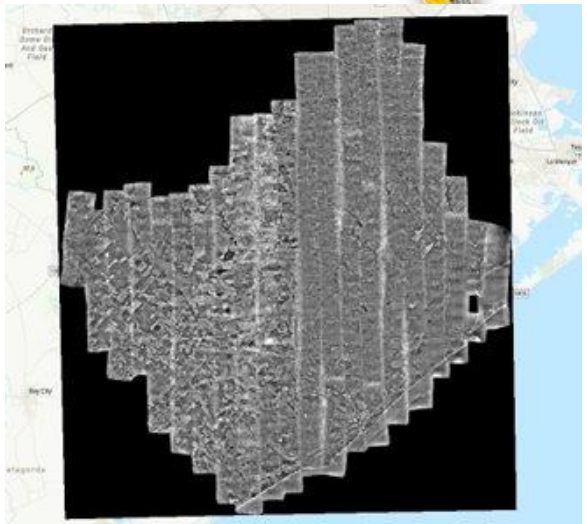
2022/23 Statewide Aerial Imagery: ***Available Fall***

TNRIS StratMap Strategic Mapping Program

Texas Water Development Board

Aerial Imagery - Historic





Statewide Aerial Imagery: ***Available Now, Georeferenced Imagery In Process***

data.tnris.org

TNRIS StratMap Strategic Mapping Program

Texas Water Development Board

MRLC Celebrating 20+ years of Partnership
Multi-Resolution Land Characteristics Consortium

Land Cover

Houston example

Specs

- 30-meter
- 16 classes

NLCD 2019 Land Cover

Key to Land Cover Types

- Open Water
- Perennial Snow/Ice
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Herbaceous
- Hay/Pasture
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

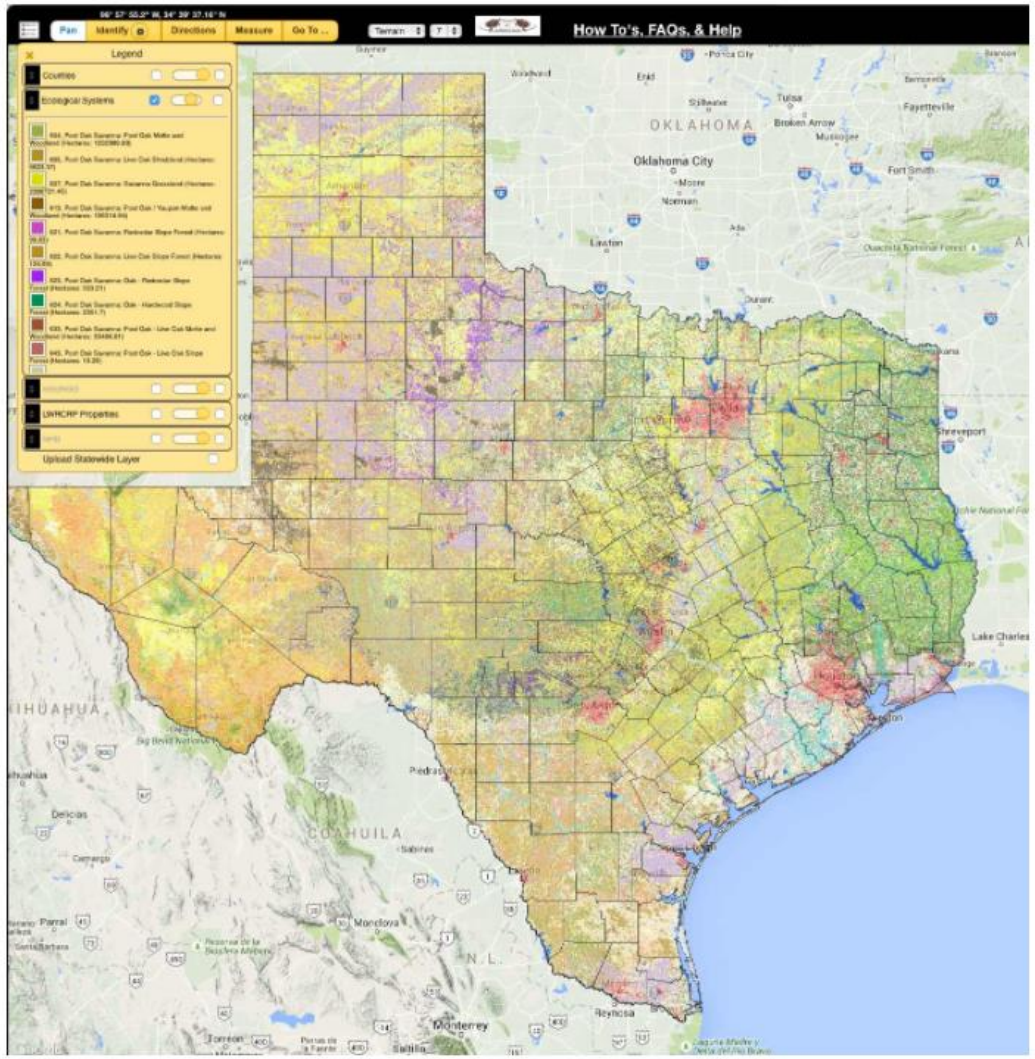
Statewide: ***Available Now***

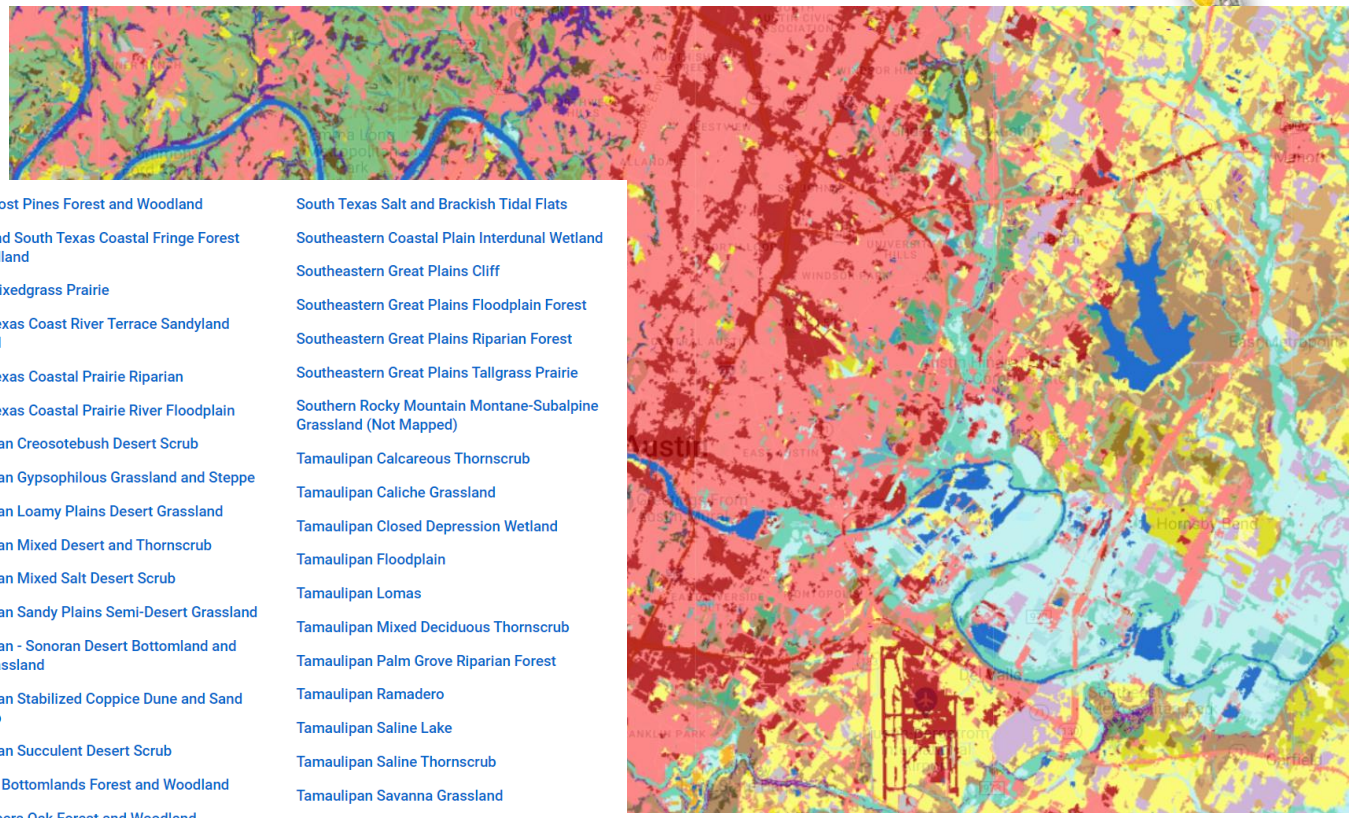
data.tnris.org

TNRIS StratMap Strategic Mapping Program

Texas Water Development Board

Texas Ecological Mapping Systems, Texas Parks & Wildlife





Bastrop Lost Pines Forest and Woodland

Central and South Texas Coastal Fringe Forest and Woodland

Central Mixedgrass Prairie

Central Texas Coast River Terrace Sandyland Grassland

Central Texas Coastal Prairie Riparian

Central Texas Coastal Prairie River Floodplain

Chihuahuan Creosotebush Desert Scrub

Chihuahuan Gypsophilous Grassland and Steppe

Chihuahuan Loamy Plains Desert Grassland

Chihuahuan Mixed Desert and Thornscrub

Chihuahuan Mixed Salt Desert Scrub

Chihuahuan Sandy Plains Semi-Desert Grassland

Chihuahuan - Sonoran Desert Bottomland and Swale Grassland

Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub

Chihuahuan Succulent Desert Scrub

Columbia Bottomlands Forest and Woodland

Crosstimbers Oak Forest and Woodland

East-Central Texas Plains Post Oak Savanna and Woodland

East-Central Texas Plains Xeric Sandyland

Edwards Plateau Carbonate Glades and Barrens (Not Mapped)

Edwards Plateau Cliff

South Texas Salt and Brackish Tidal Flats

Southeastern Coastal Plain Interdunal Wetland

Southeastern Great Plains Cliff

Southeastern Great Plains Floodplain Forest

Southeastern Great Plains Riparian Forest

Southeastern Great Plains Tallgrass Prairie

Southern Rocky Mountain Montane-Subalpine Grassland (Not Mapped)

Tamaulipan Calcareous Thornscrub

Tamaulipan Caliche Grassland

Tamaulipan Closed Depression Wetland

Tamaulipan Floodplain

Tamaulipan Lomas

Tamaulipan Mixed Deciduous Thornscrub

Tamaulipan Palm Grove Riparian Forest

Tamaulipan Ramadero

Tamaulipan Saline Lake

Tamaulipan Saline Thornscrub

Tamaulipan Savanna Grassland

Texas Blackland Tallgrass Prairie

Texas Coast Dune and Coastal Grassland

Texas Coast Fresh and Oligohaline Tidal Marsh

Texas Coast Salt and Brackish Tidal Marsh

Texas Coastal Beach

Texas-Louisiana Coastal Prairie

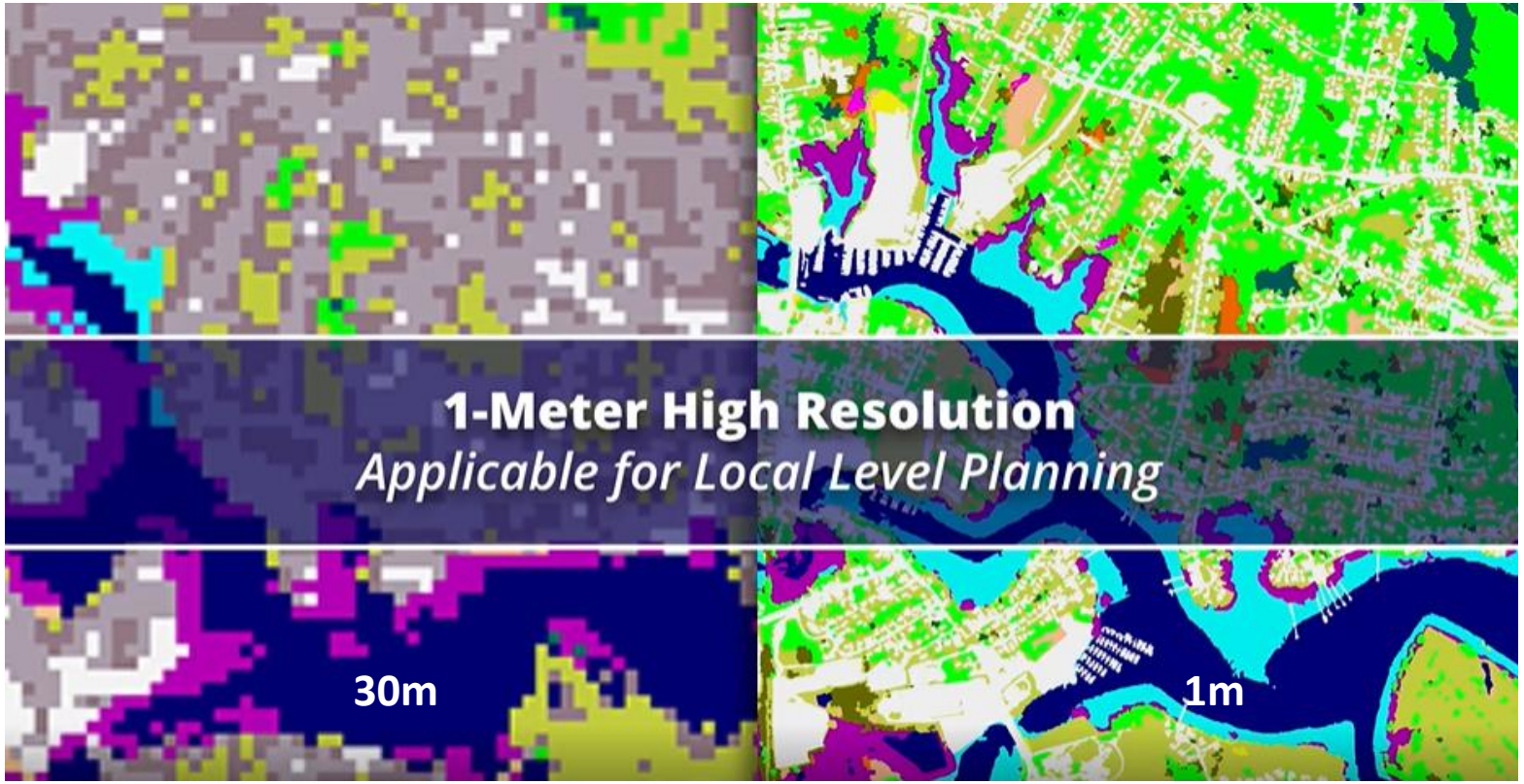
Many more classes!

NOAA C-CAP Land Cover

Specs

- 1-meter
- 25 classes
- Status: *In process*

Land Cover



Houston-Galveston area: ***Available July***

data.tnris.org

Land Cover

USE CASES

COMMUNITY PLANNING AND DEVELOPMENT

- Impervious cover and growth monitoring
- Land use planning and parcel analysis
- Building footprints and access locations
- Open space planning and assessment
- Urban forestry and street trees

FLOODING IMPACTS

- Infrastructure exposure assessment
- Future risk management
- Community Rating System credits
- Hydrodynamic modeling

WATER QUALITY AND STORMWATER MANAGEMENT

- Modeling and assessment
- Planning and mitigation
- Green infrastructure and design

WETLANDS MANAGEMENT

- Marsh condition and trends
- Habitat assessment and connectivity
- Conservation and restoration planning
- Resilience assessment

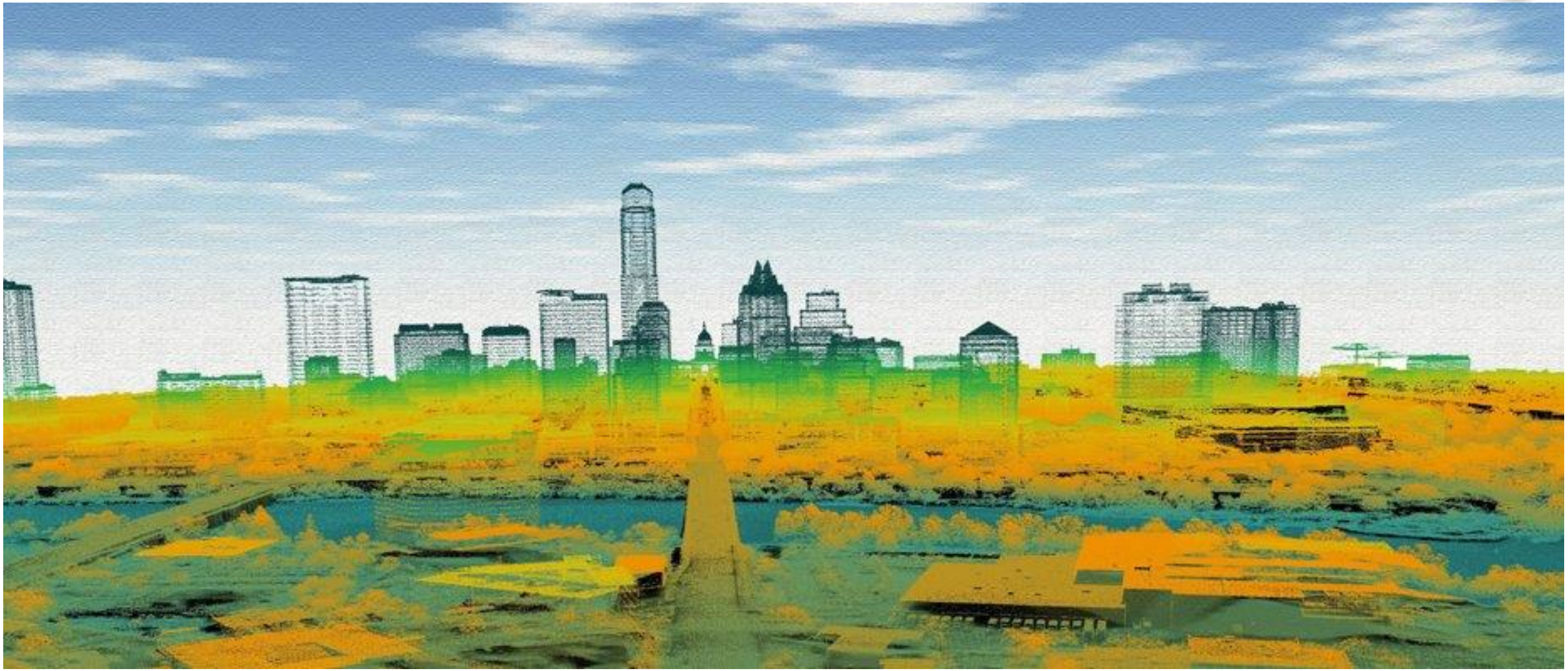
CARBON ACCOUNTING

- Sequestration and storage estimates
- Carbon credits

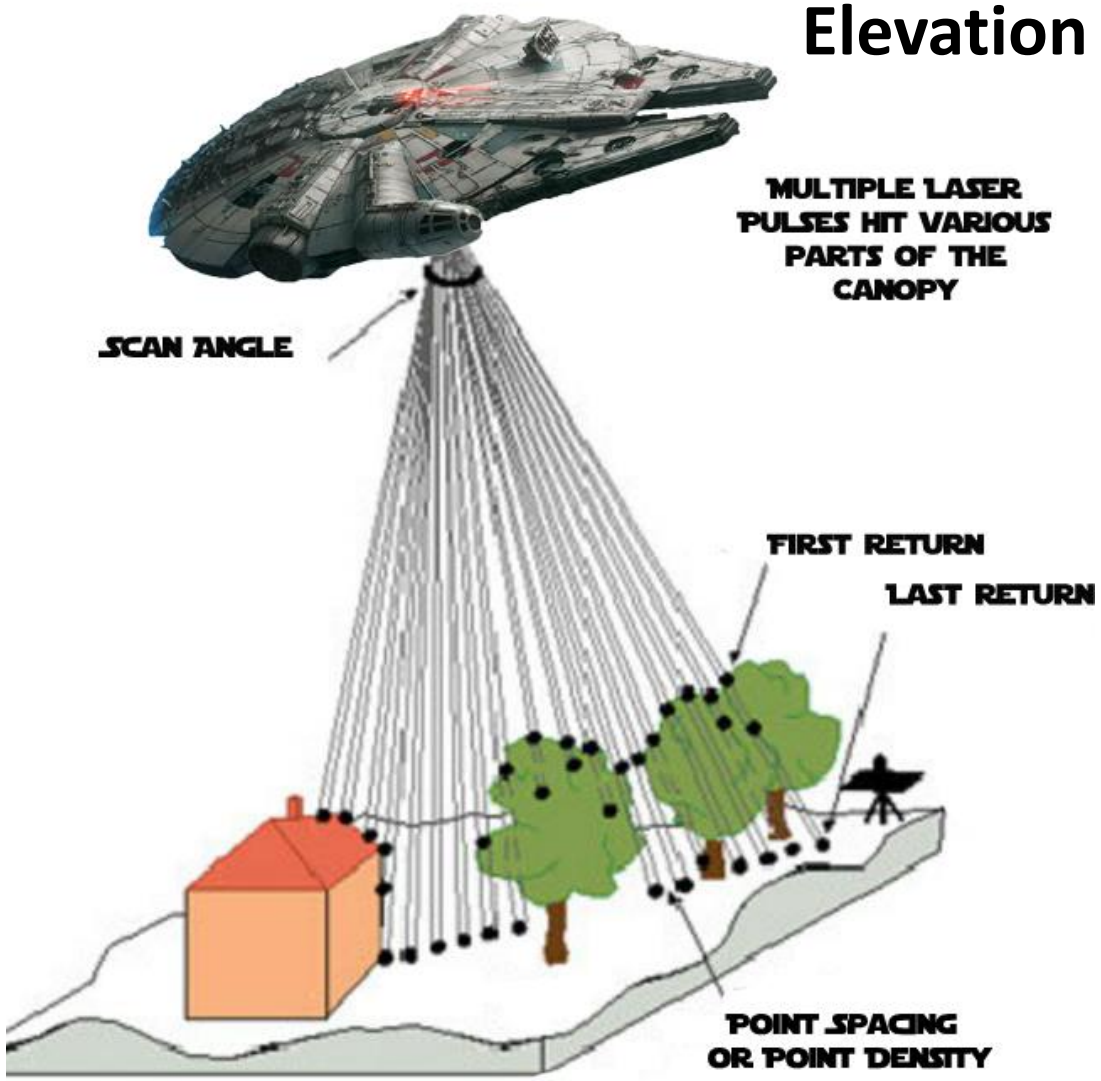
High Resolution Land Cover other uses

Conservation characterization
Elevation derived hydrography
Lidar classification
Change detection

Elevation - Lidar



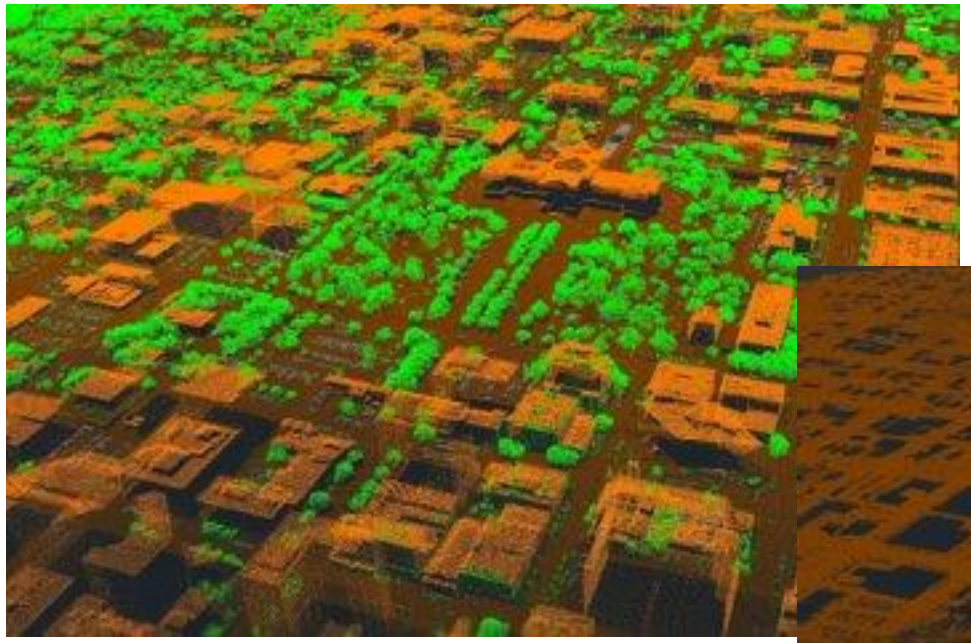
Elevation - Lidar

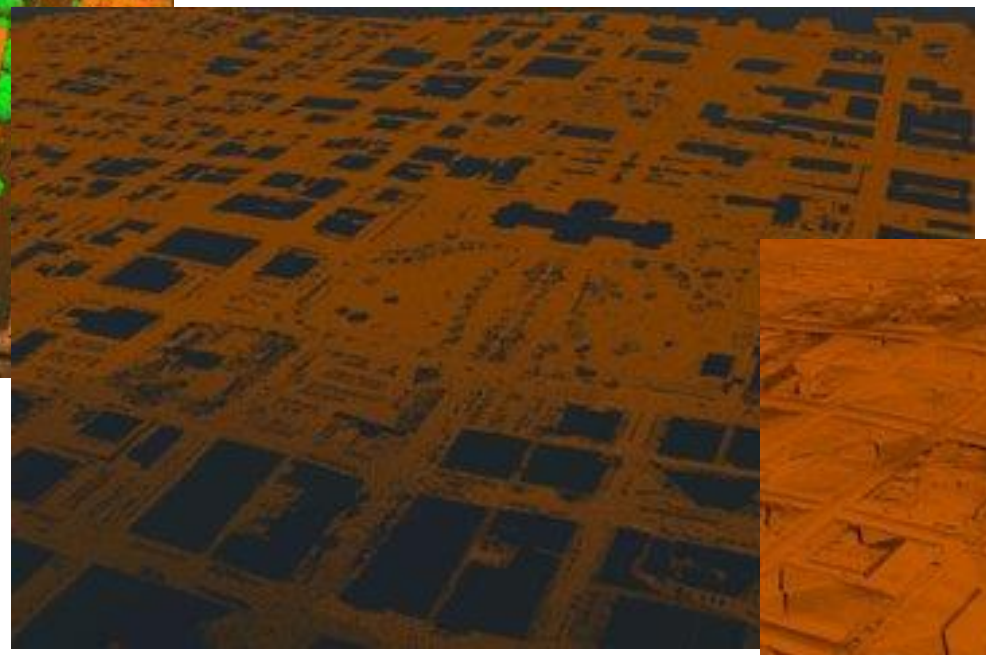


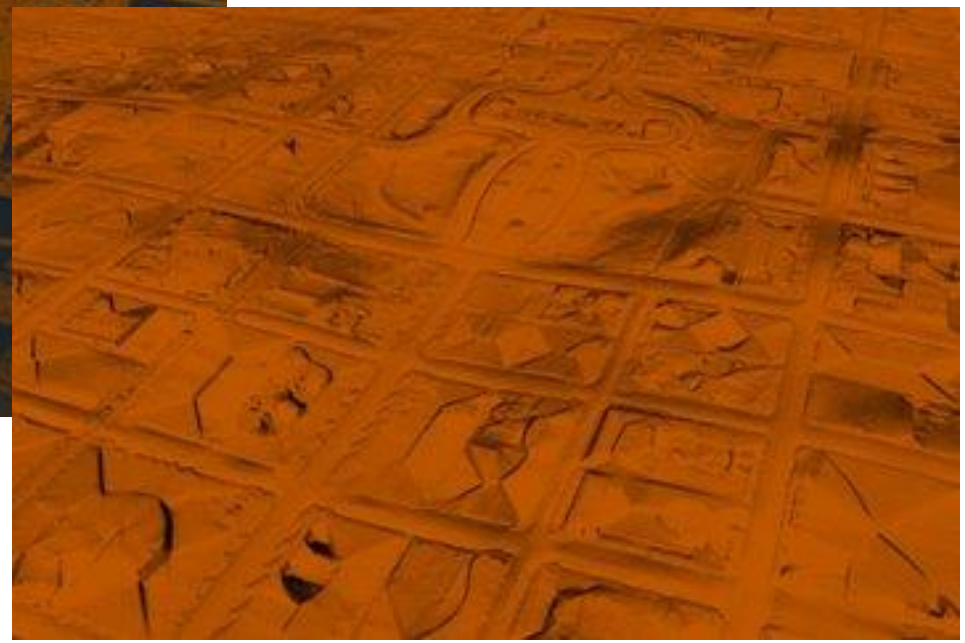
Light Detection And Ranging

- Airborne platform houses laser and sensor
- Lasers are typically pulsed at varied rates in the hundreds of thousands cycles per second(higher pulse rate equals higher density data).
- All reflected pulses are collected by the sensor
- Location and elevation is calculated across the return time of the pulses and GPS located in the plane and on the ground.
- Collected pulses from different swaths are aggregated with points typically being classified based on the surface they reflected from.

Elevation - Lidar







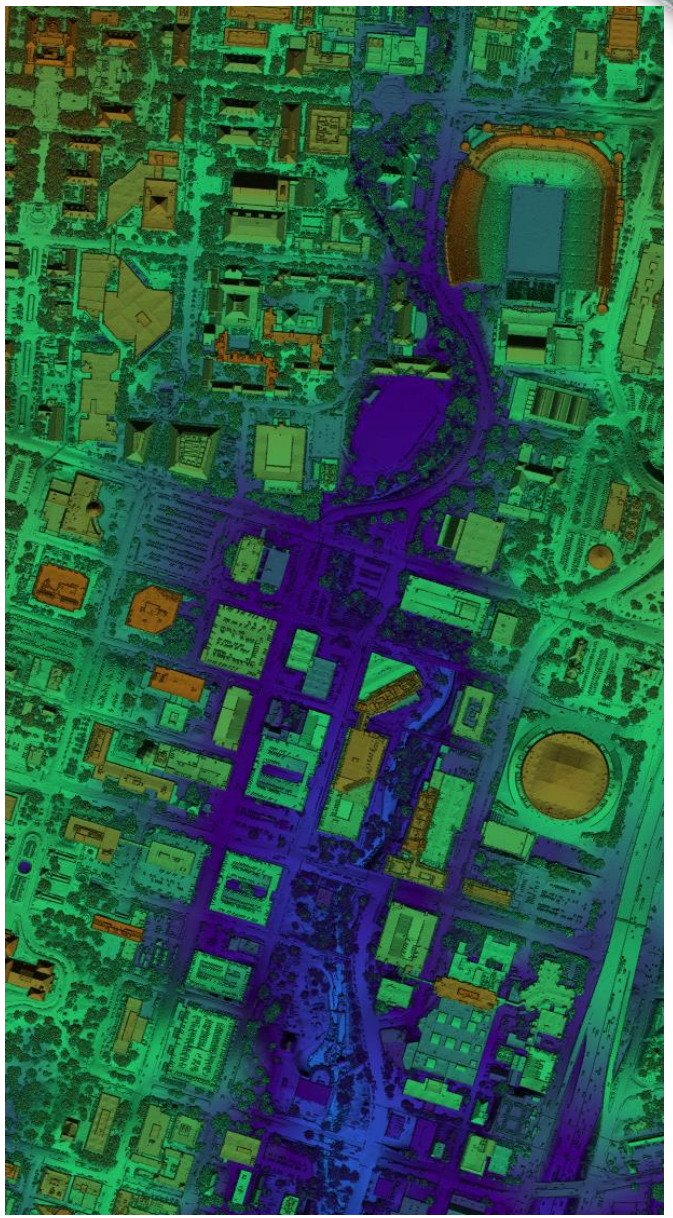
Statewide Lidar: ***Available Now,***
Areas refreshed every 8 years or less

data.tnris.org

Elevation - Lidar

Applications

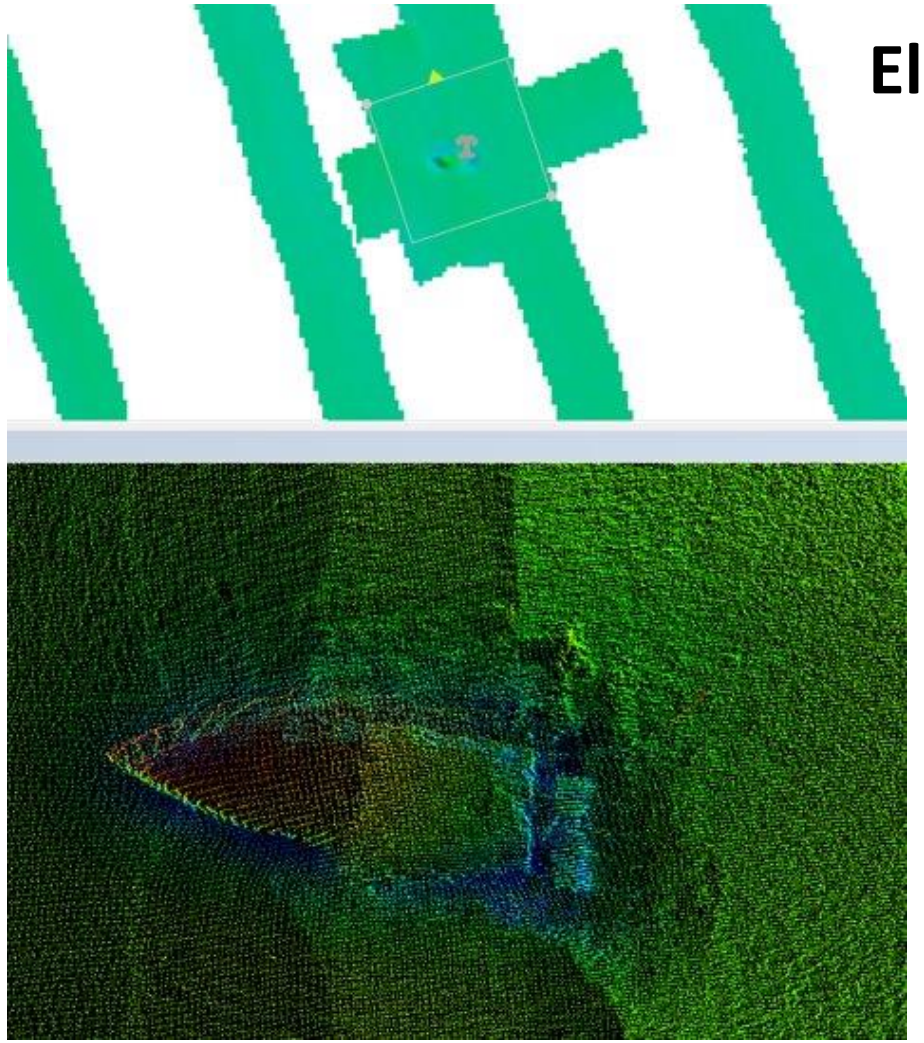
- Autonomous systems to see their surroundings
- Agricultural analysis of crops or irrigation drainage
- Water related modeling to support morphology studies, flood plain studies, surface water mapping
- Archeology to identify structures or ground patterns for inaccessible or remote areas.
- General regional mapping support for land cover or change detection
- Utility infrastructure maintenance and mapping
- Habitat identification and research
- In phones for AR applications
- …and much more

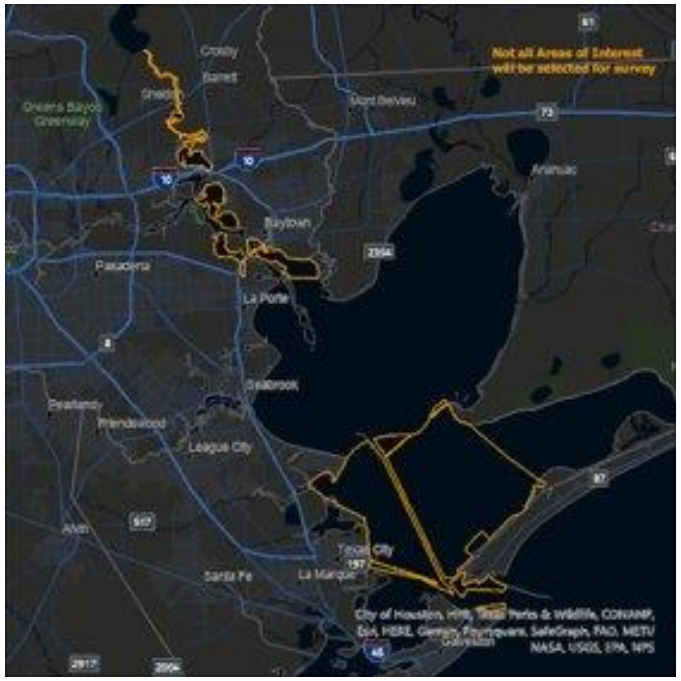


Statewide Lidar: ***Available Now,*** **data.tnris.org**

Areas refreshed every 8 years or less

Elevation - Bathymetry

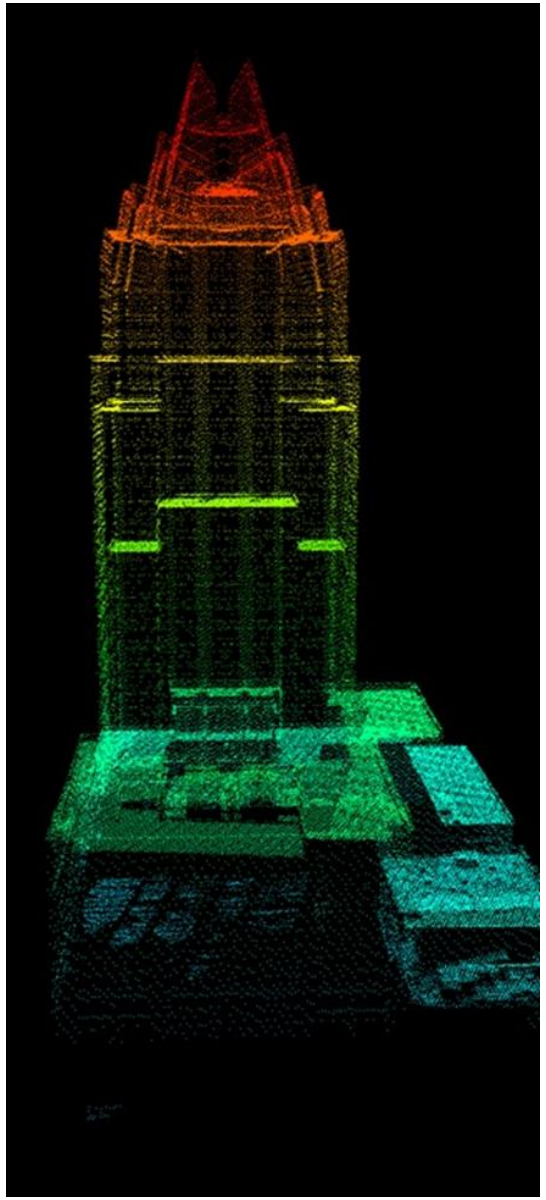




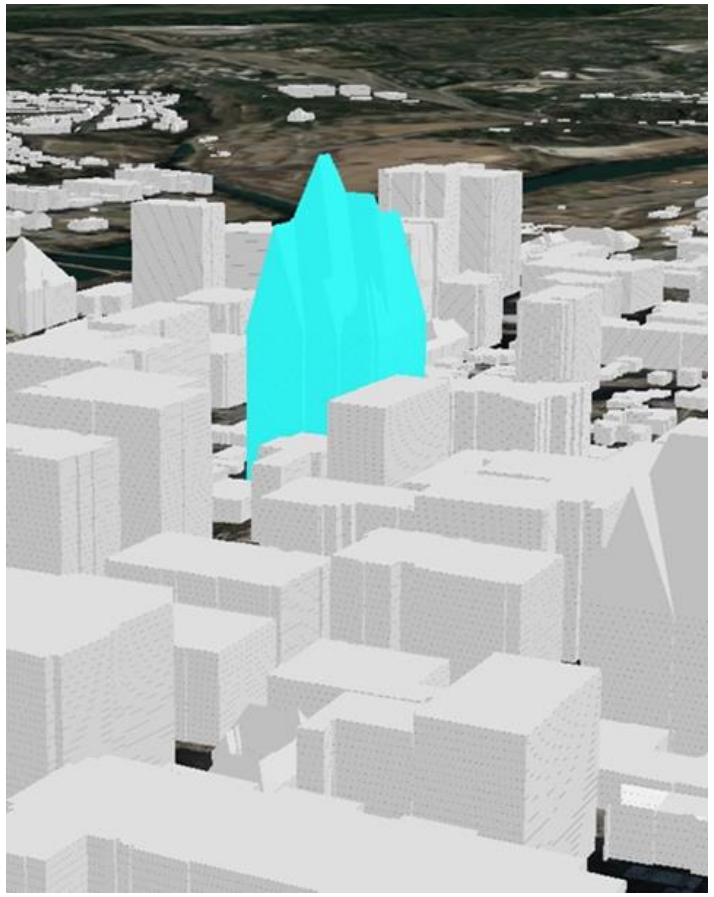
Some coastal and some riverine bathymetry:

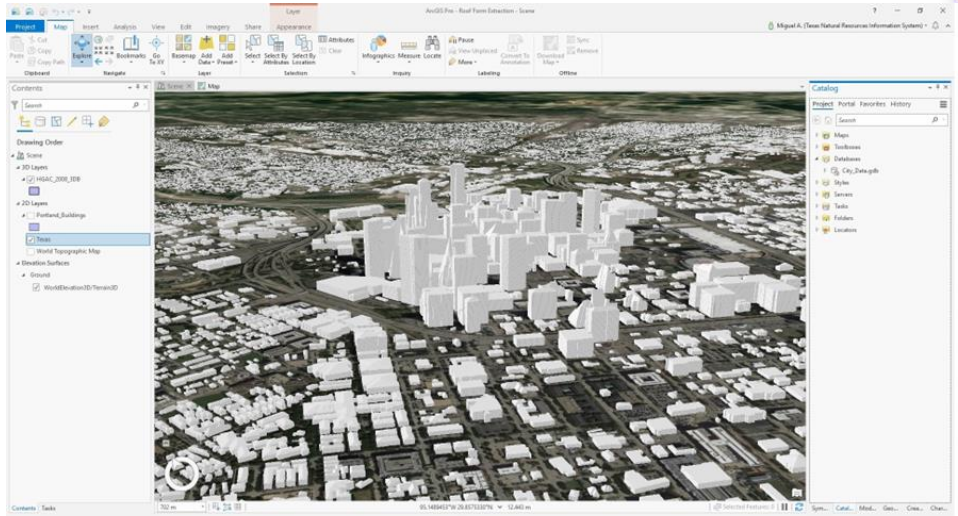
Available Now, more in progress

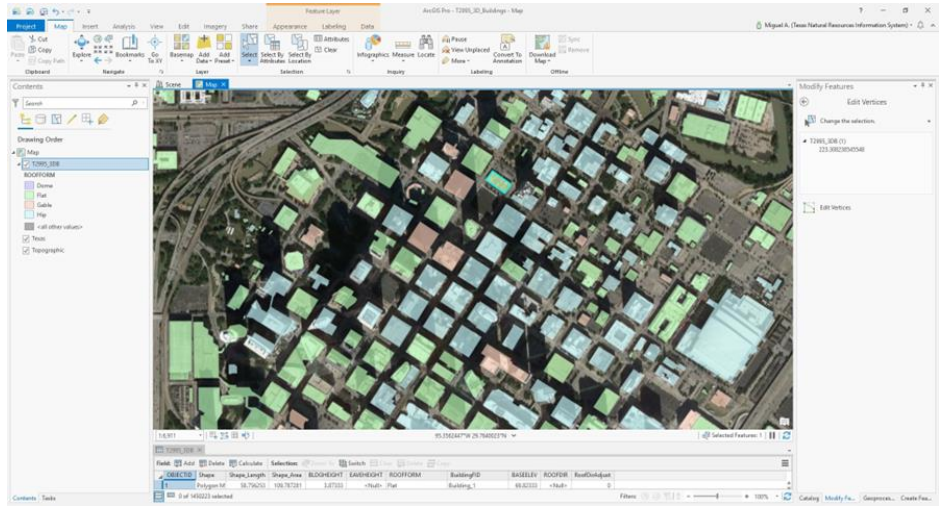
data.tnris.org



Elevation – Buildings





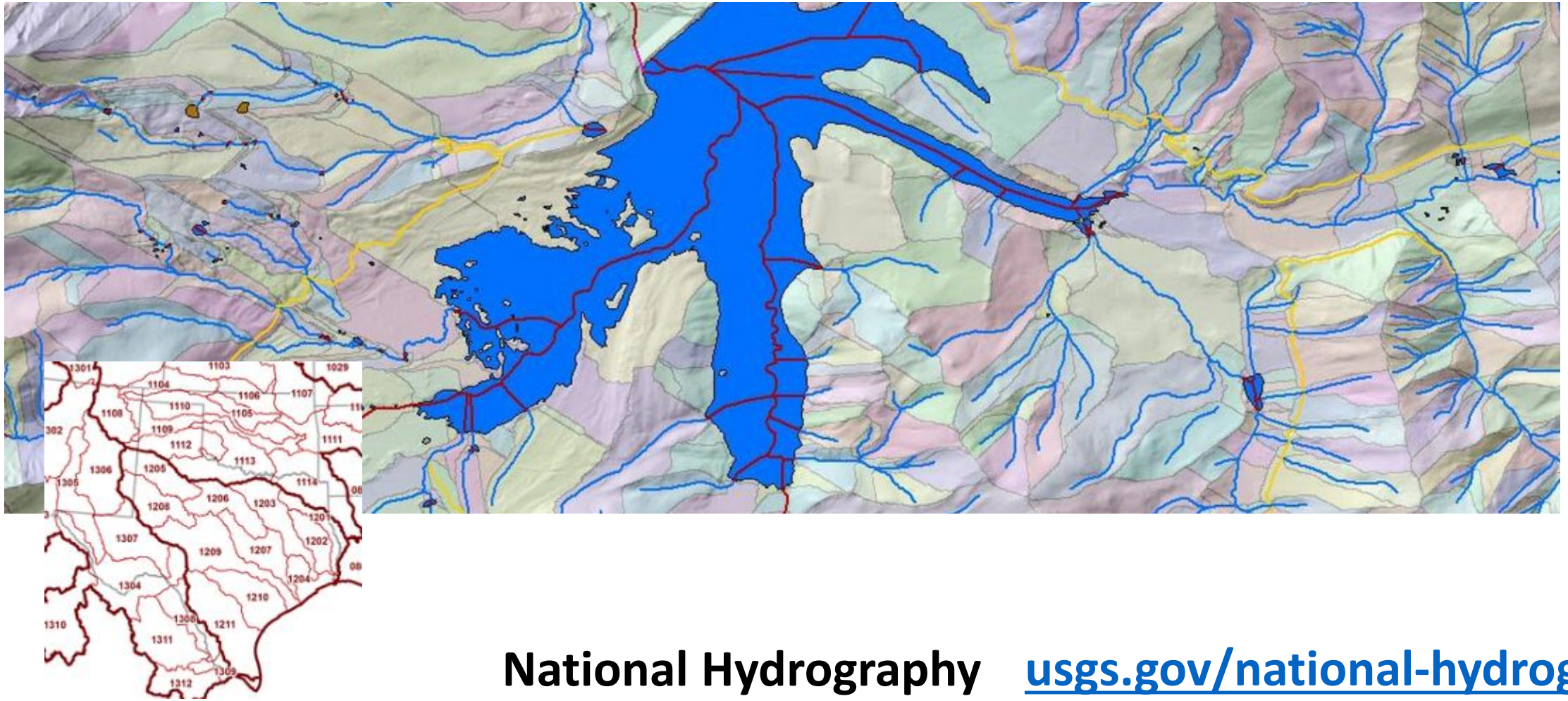


Some 2D & 3D Buildings:

Available Now, more in progress

data.tnris.org

Hydrography

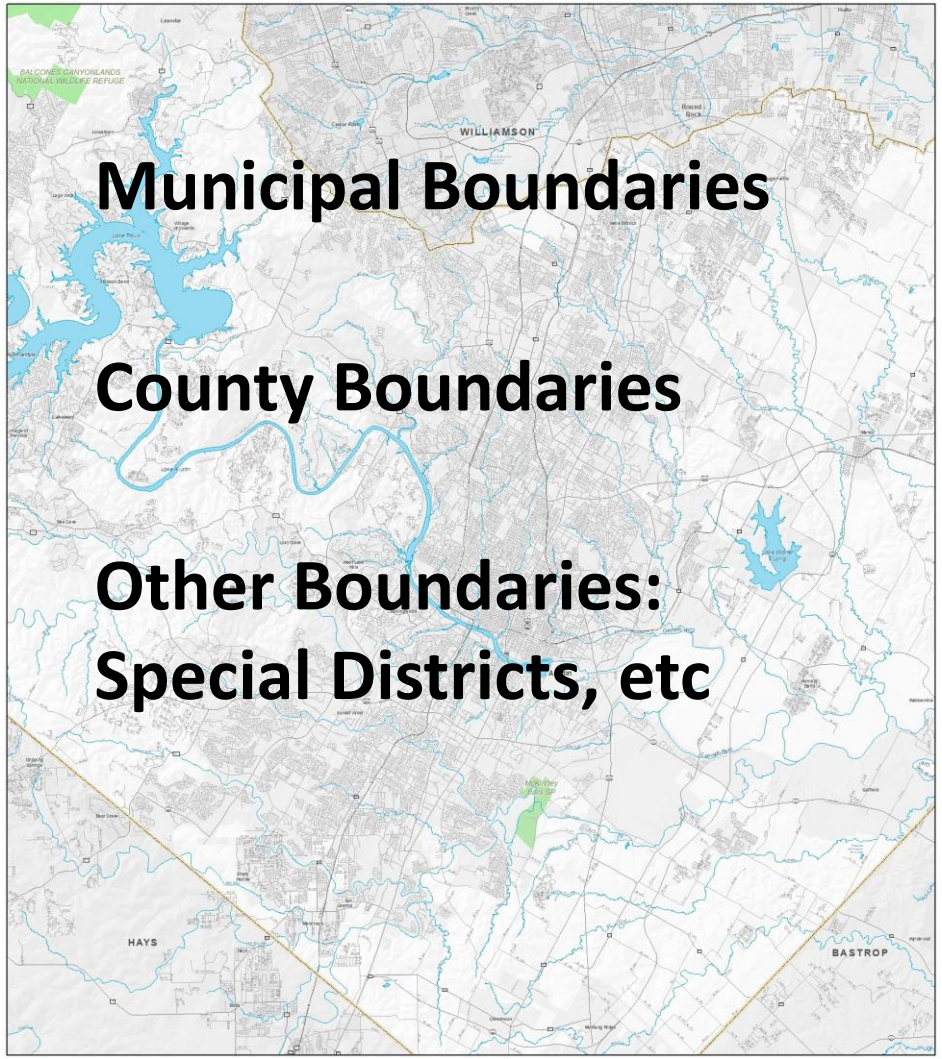


National Hydrography usgs.gov/national-hydrography

Statewide: *Available Now*

Watershed boundaries data.tnris.org

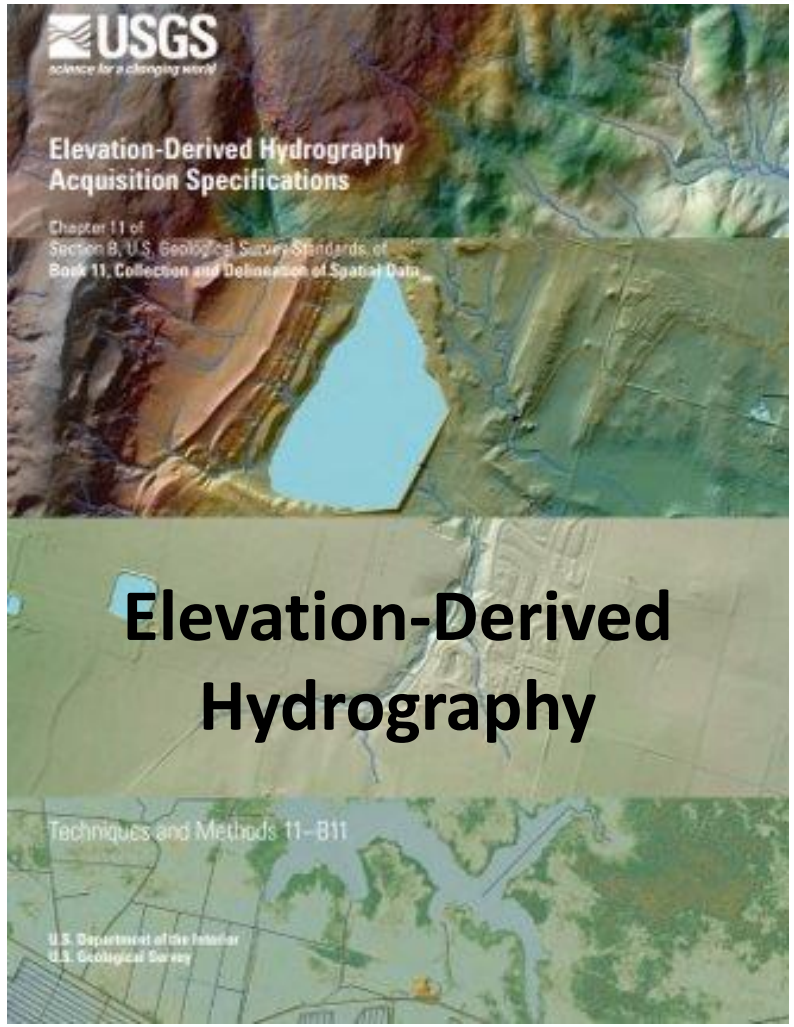
Future additions planned....



Municipal Boundaries

County Boundaries

Other Boundaries:
Special Districts, etc



Elevation-Derived Hydrography

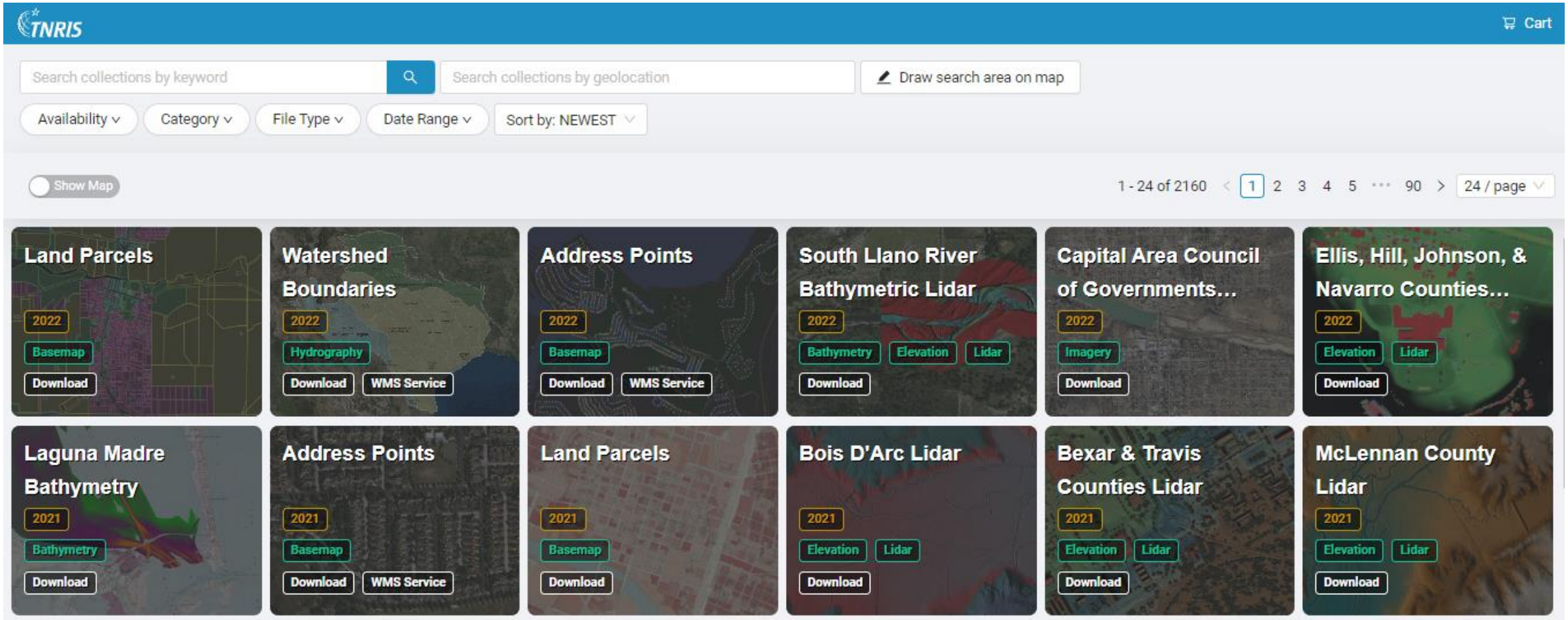
Digital Twin

Future additions planned....

DATA ACCESS

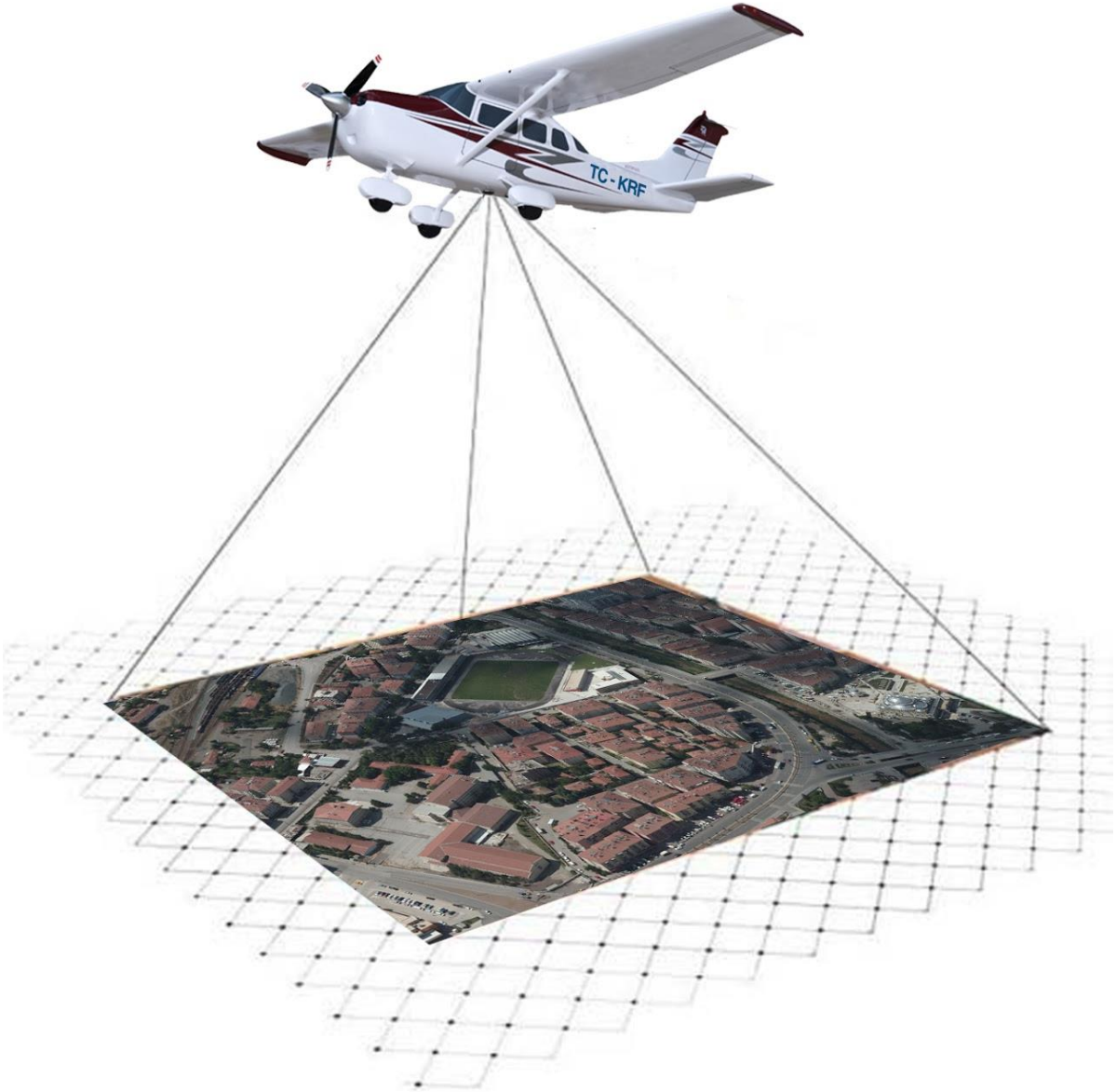
TNRIS Data Hub

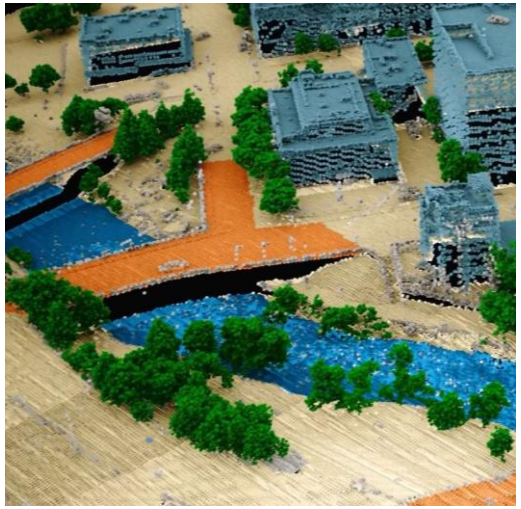
Data.tnris.org



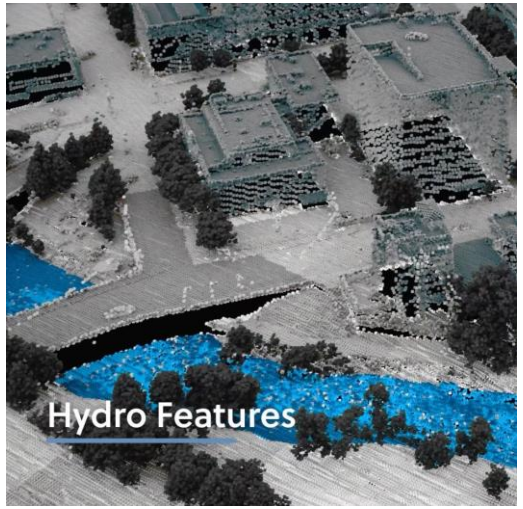
The Future of Data
Development of “Proactive” Data

- Rethinking Data Structure and Access.
- Introduction to Artificial Intelligence and Machine Learning
- Modeling the Earth as a “Digital Twin”

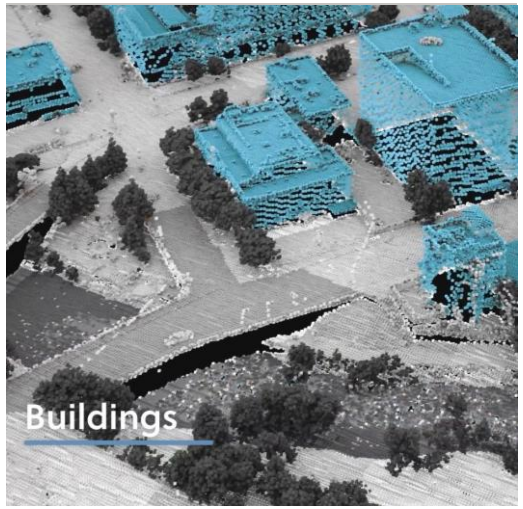

TC-KRF



Classified lidar

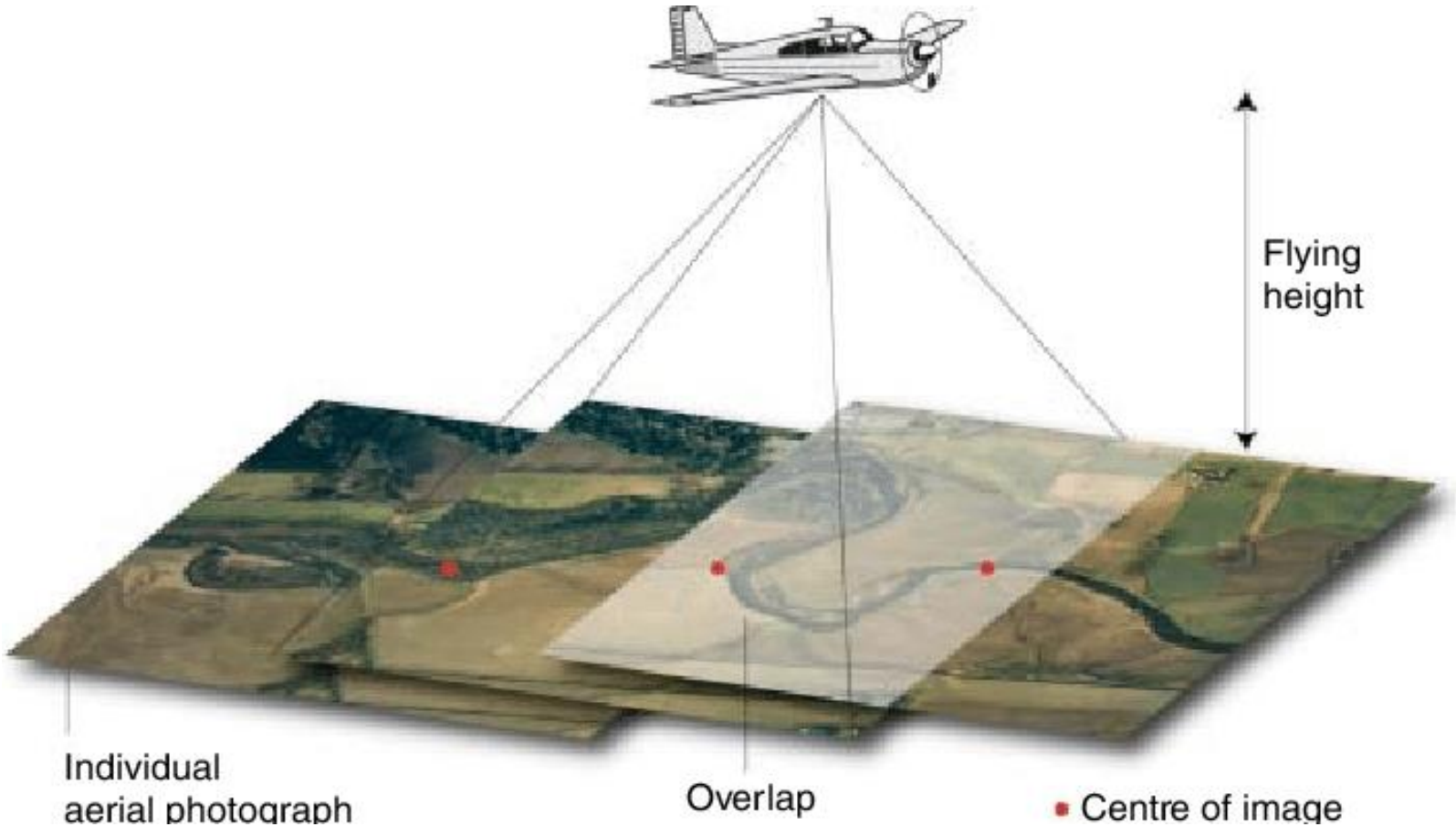


Added hydro features
- Culverts

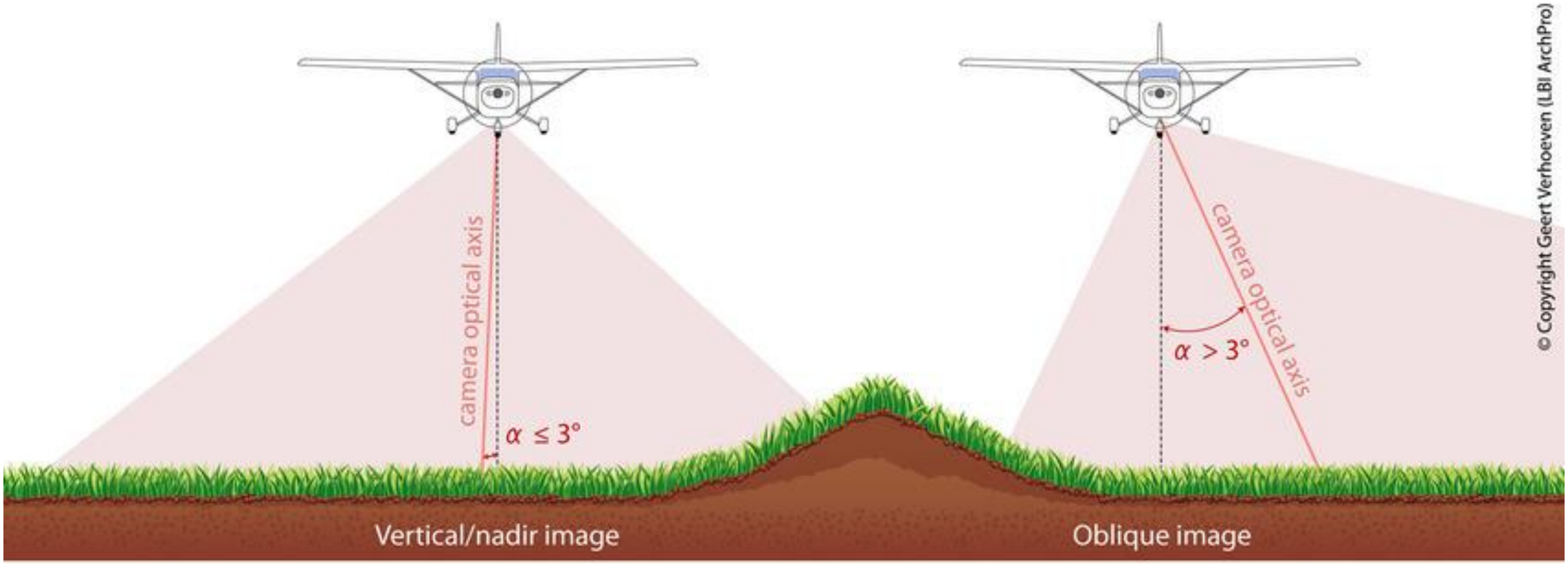


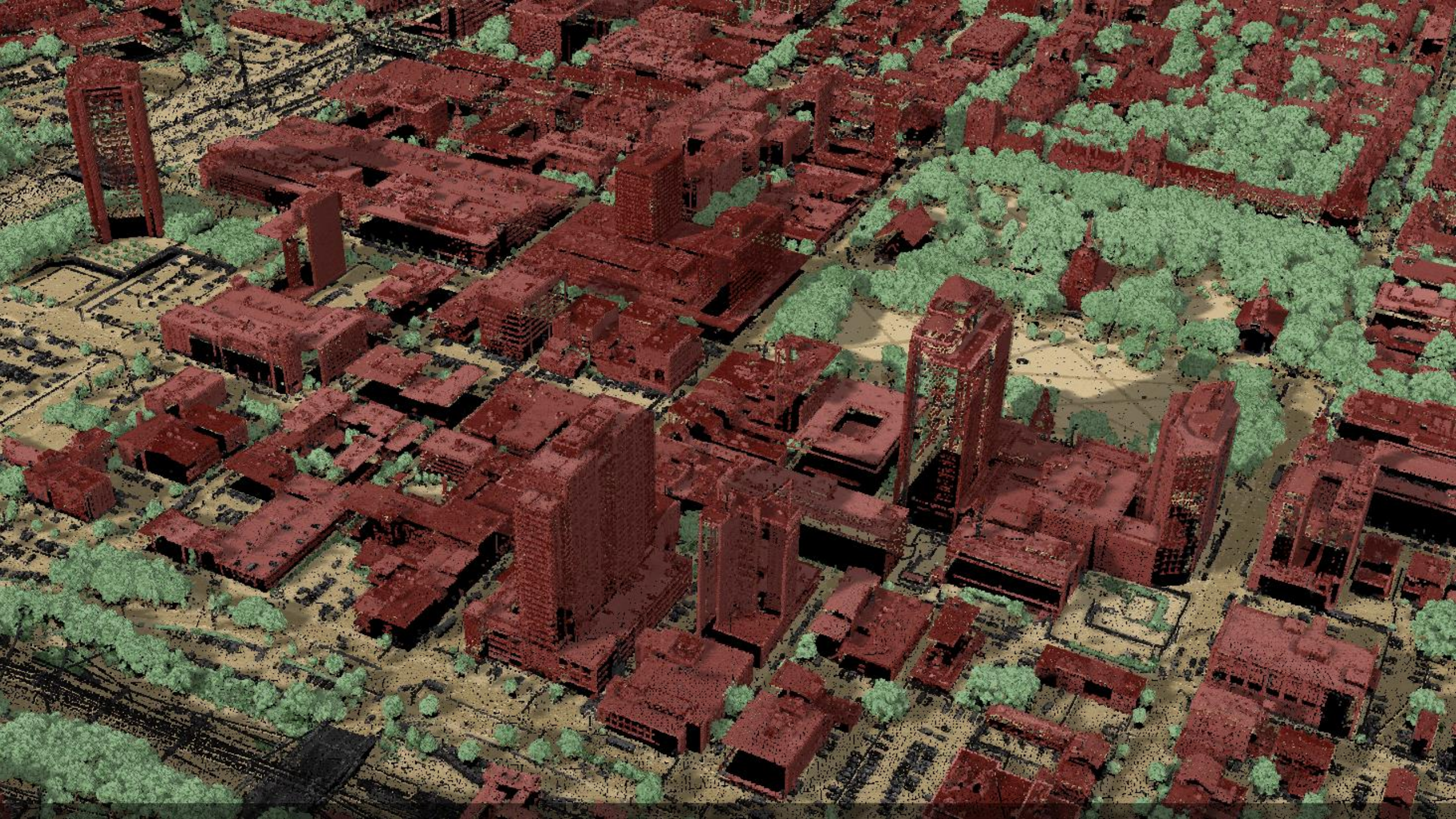
Added buildings

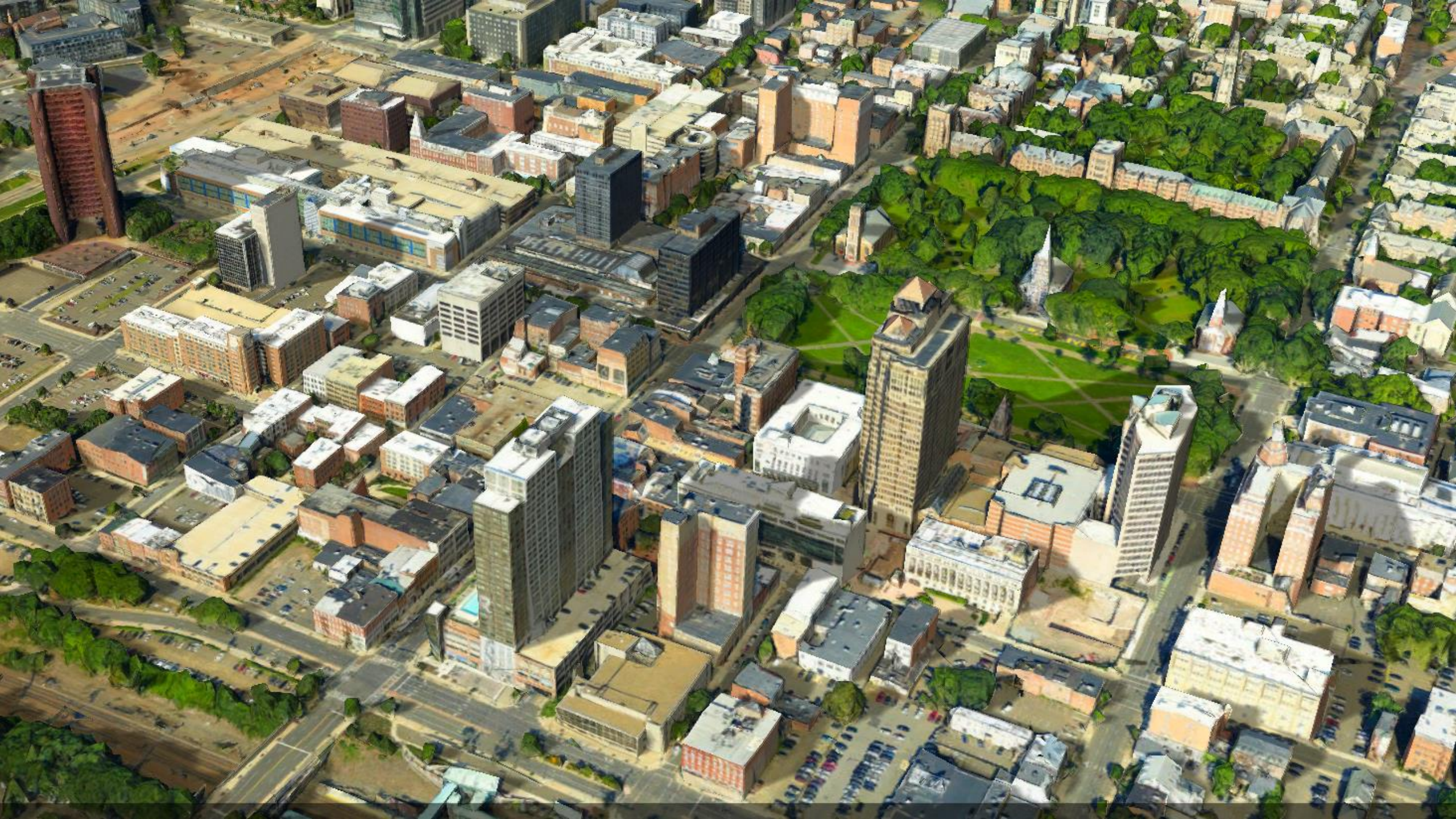
Added vegetation

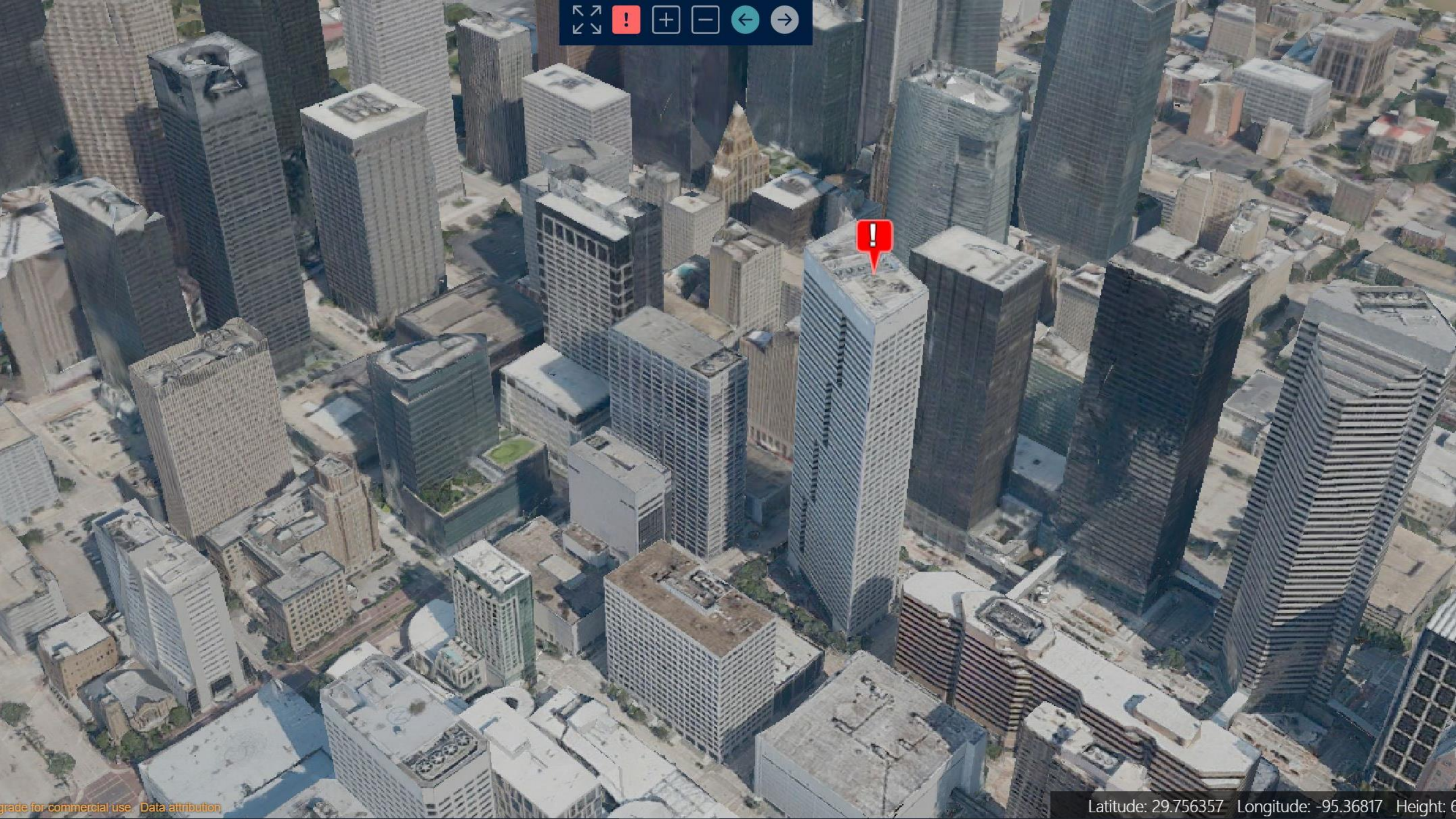


New aerial imagery and elevation collection methods

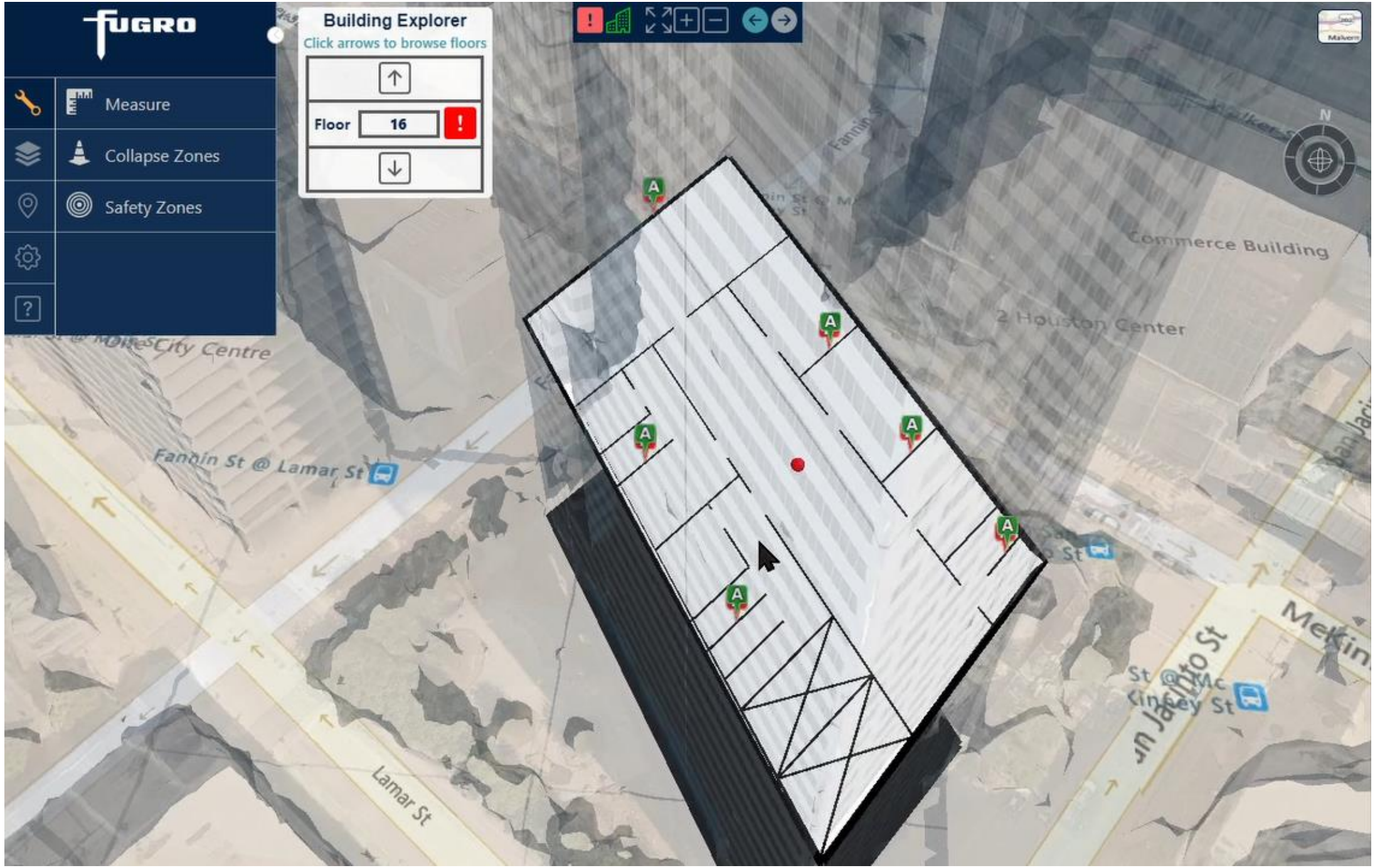

camera optical axis
α ≤ 3°
Vertical/nadir image
camera optical axis
α > 3°
Oblique image
© Copyright Geert Verhoeven (LBI ArchPro)



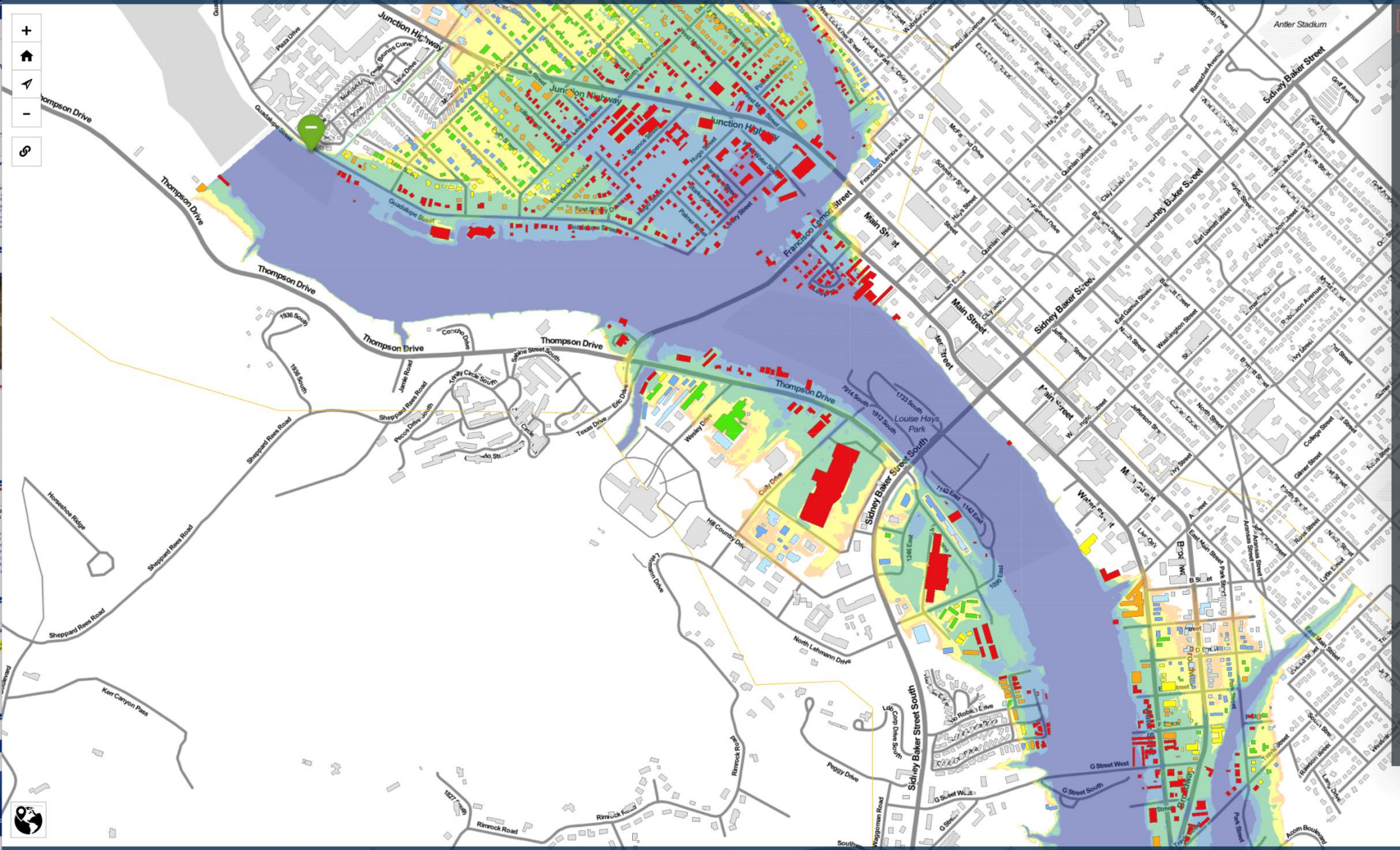



grade for commercial use
Data attribution
Latitude: 29.756357
Longitude: -95.36817
Height: 6

FUGRO
Measure
Measure Distance
Measure Area
Cancel Measureme...
Manage Measurements
202.9 m
2304.7 sq m
258.2 sq m
Collapse Zones
Safety Zones
2304.7 sq m
258.2 sq m
202.9 m


FUGRO
Measure
Collapse Zones
Safety Zones
Building Explorer
Click arrows to browse floors
Floor
16
Commerce Building
2 Houston Center
Fannin St @ Lamar St
Lamar St
N

Artificial Intelligence (AI) and Machine Learning (ML)



CLOSE

Flood Map

Current Conditions

GUADALUPE RV AT KERRVILLE, TX

River Stage 1.93 feet
60 minutes ago
2021-07-09 09:45 CDT
NOT FLOODING

Hydrograph | Historical Peaks

Flood Map Library

Simulated River Stage

40.0 feet – major flood

Opacity

Library Info | Print Map

Buildings

Select Layer

All buildings

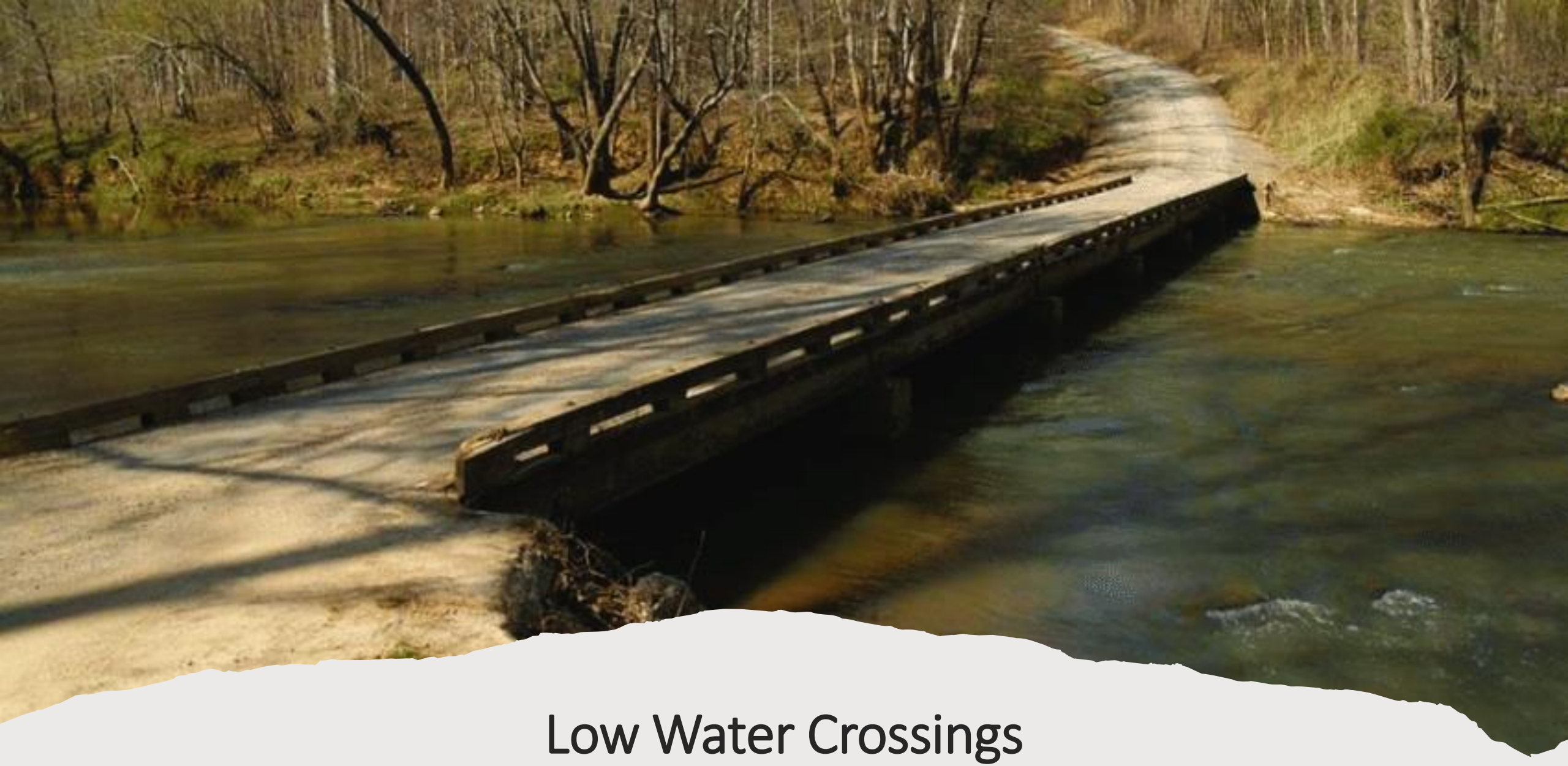
ON

DAMAGE ESTIMATES

Inundated Buildings: 1,501
Estimated Total Cost: $118,778,000

Report

Return to Home View



Low Water Crossings

Low Water Crossings

2013

Metadata | Downloads | Custom Order | Contact

DESCRIPTION

This is the start of the statewide inventory of low water crossings in Texas. Various sources of data have been compiled to create this file. The purpose of this first phase was to locate as many low water crossings as possible. Texas leads the nation in flood deaths and the majority of those deaths are in vehicles. It is thought that locating the low water crossings will better define the risks of flooding.

Highwater Marks & Low Water Crossing Interactive Map

METADATA

ONLINE MAPPING SERVICES

This dataset is available as an online mapping service. An OGC WMS service and an ArcGIS service are available. To connect to the WMS service in your software, please copy the unique url provided in the box below. To access the TNRIS ArcGIS Server, please use the following url in your ESRI software and select from the list of available services.

For questions regarding the use of one of these services in your software package, please consult the software help/support information.

https://feature.tnris.org/arcgis/services/Basemap/Low_Water_Crossing/MapServer/WMSServer

Open ArcGIS Map Preview

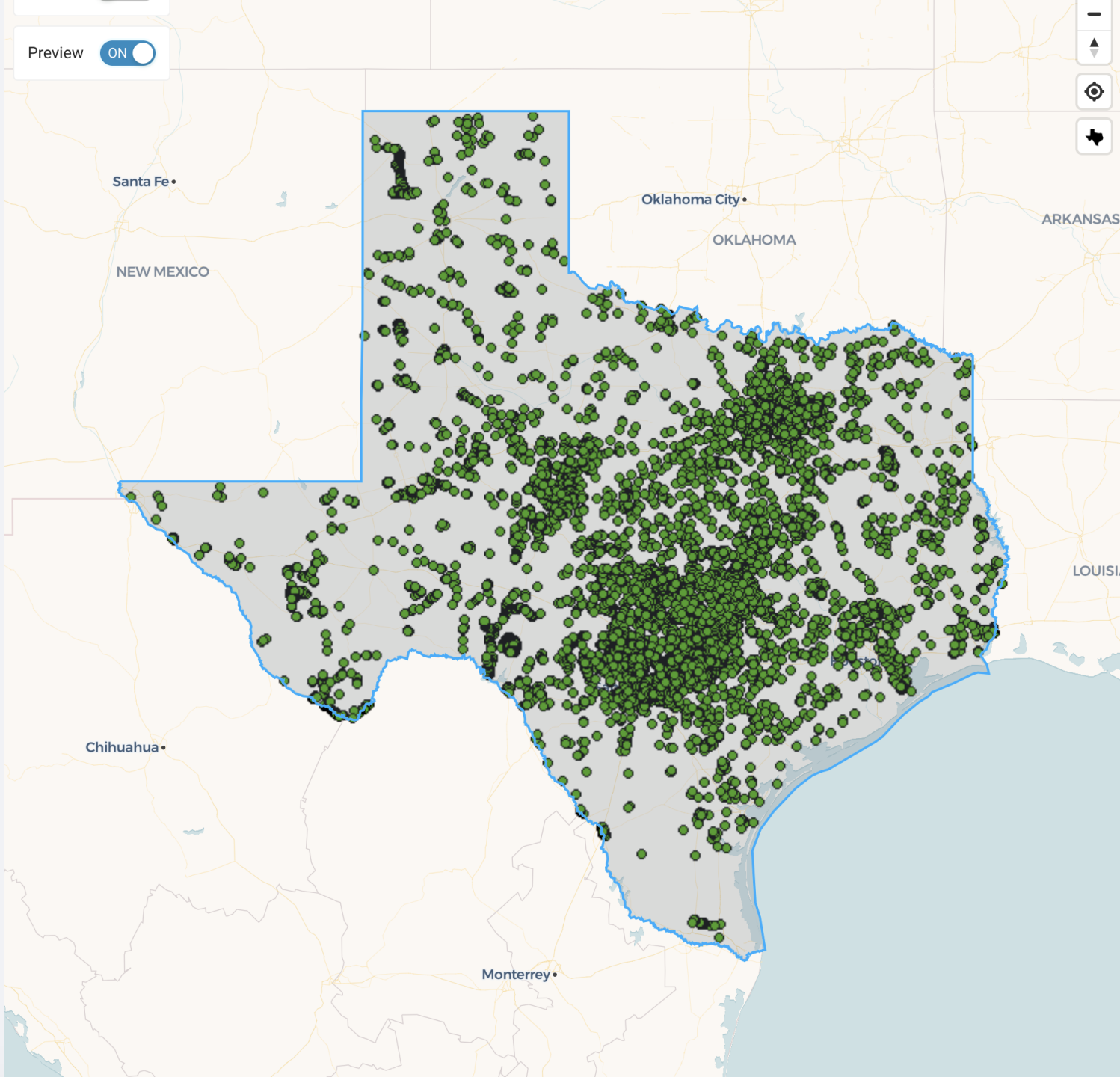
LICENSE

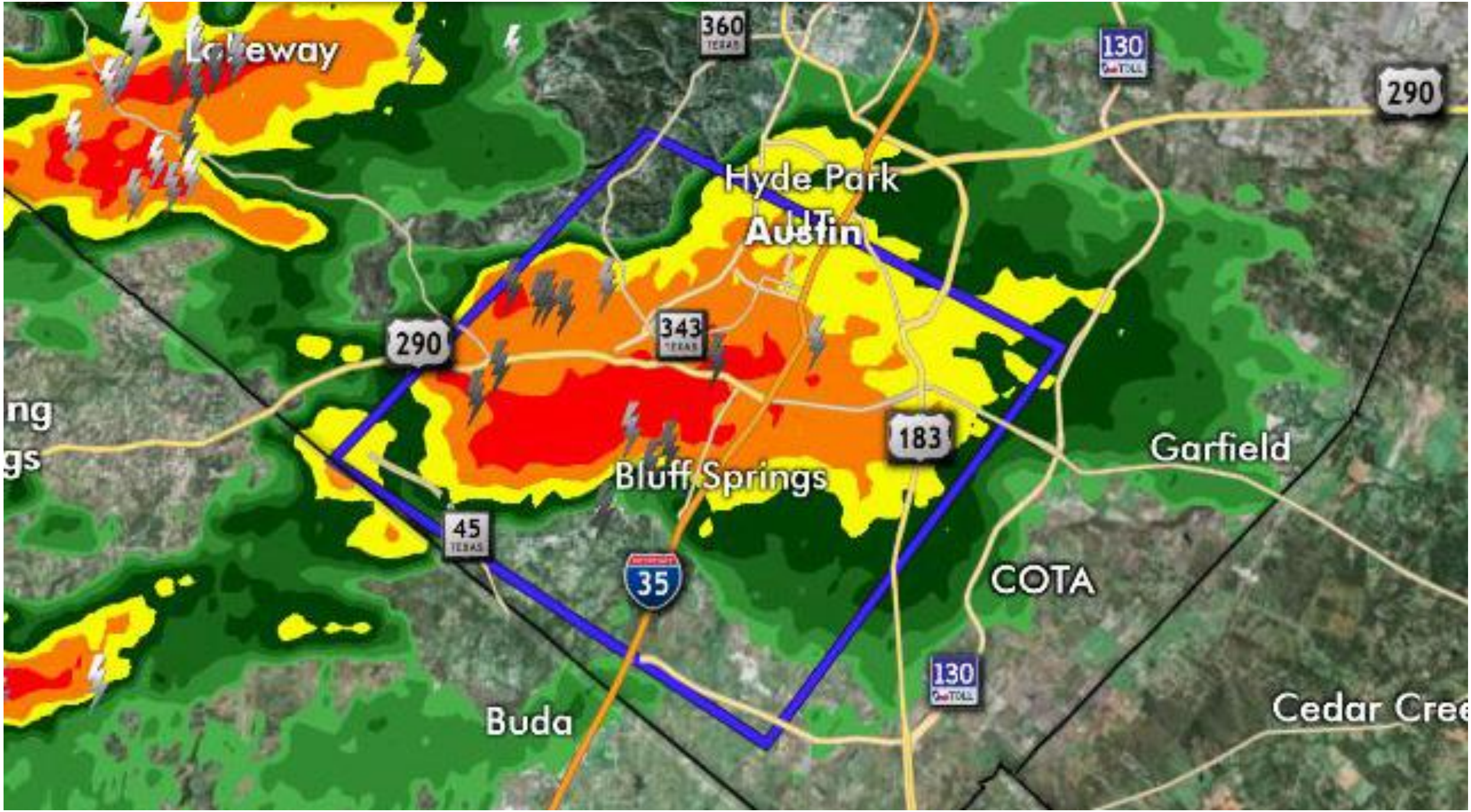
Public Domain (Creative Commons CC0)

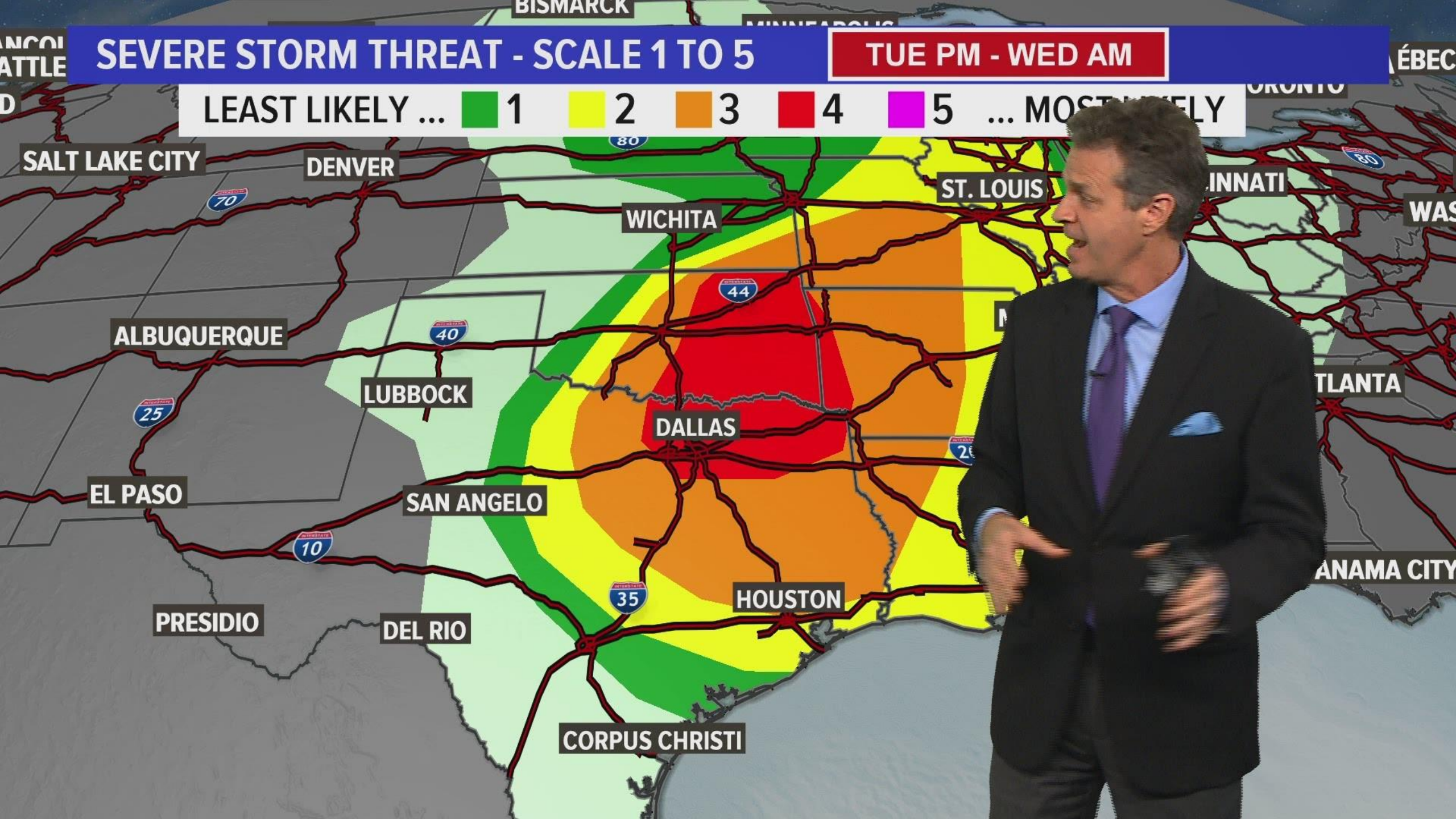
CITE THIS COLLECTION

Texas Natural Resources Information System (TNRIS). Low Water Crossings, 2013-10-23. Web. 2022-02-08.

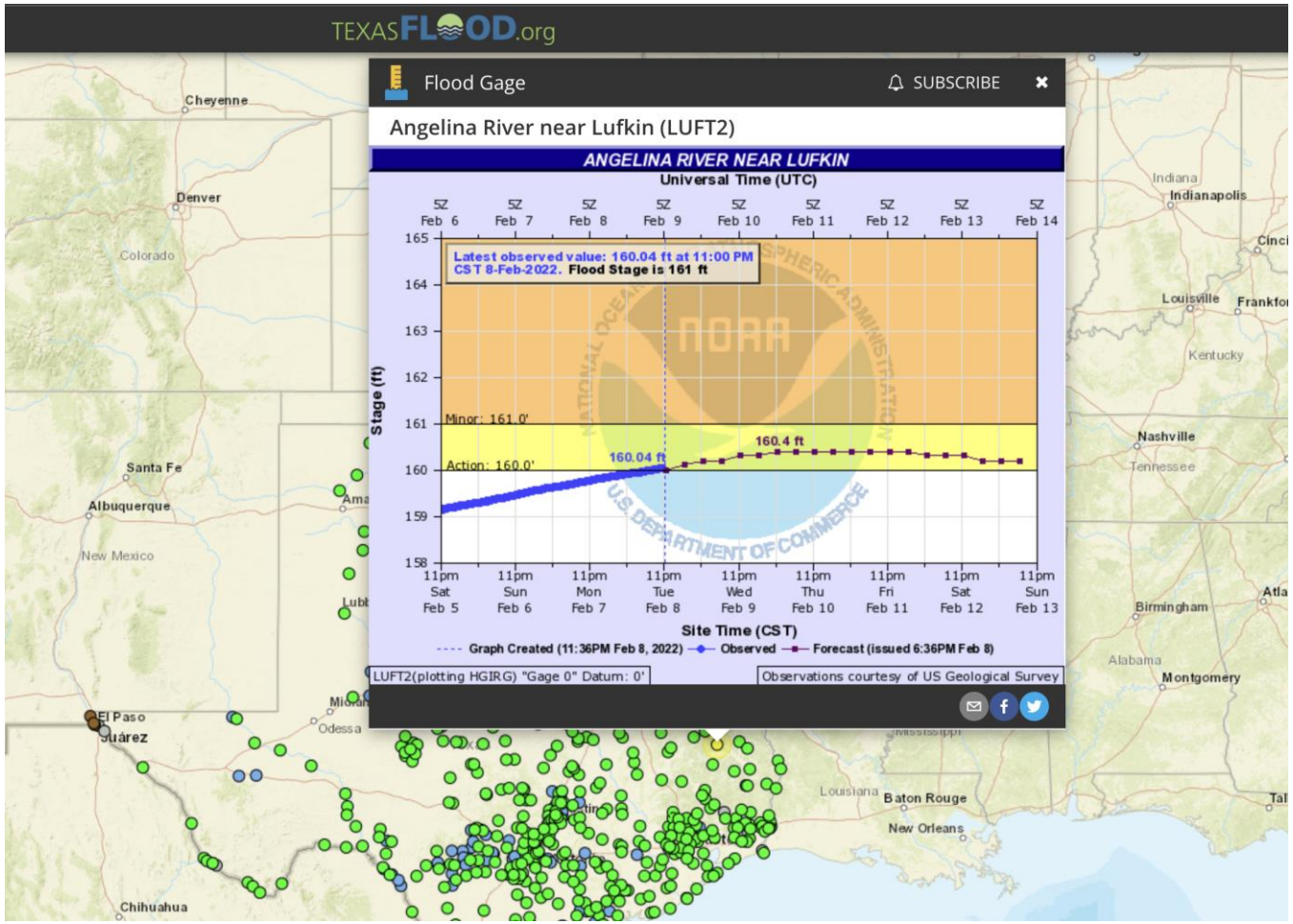
SHARE THIS COLLECTION

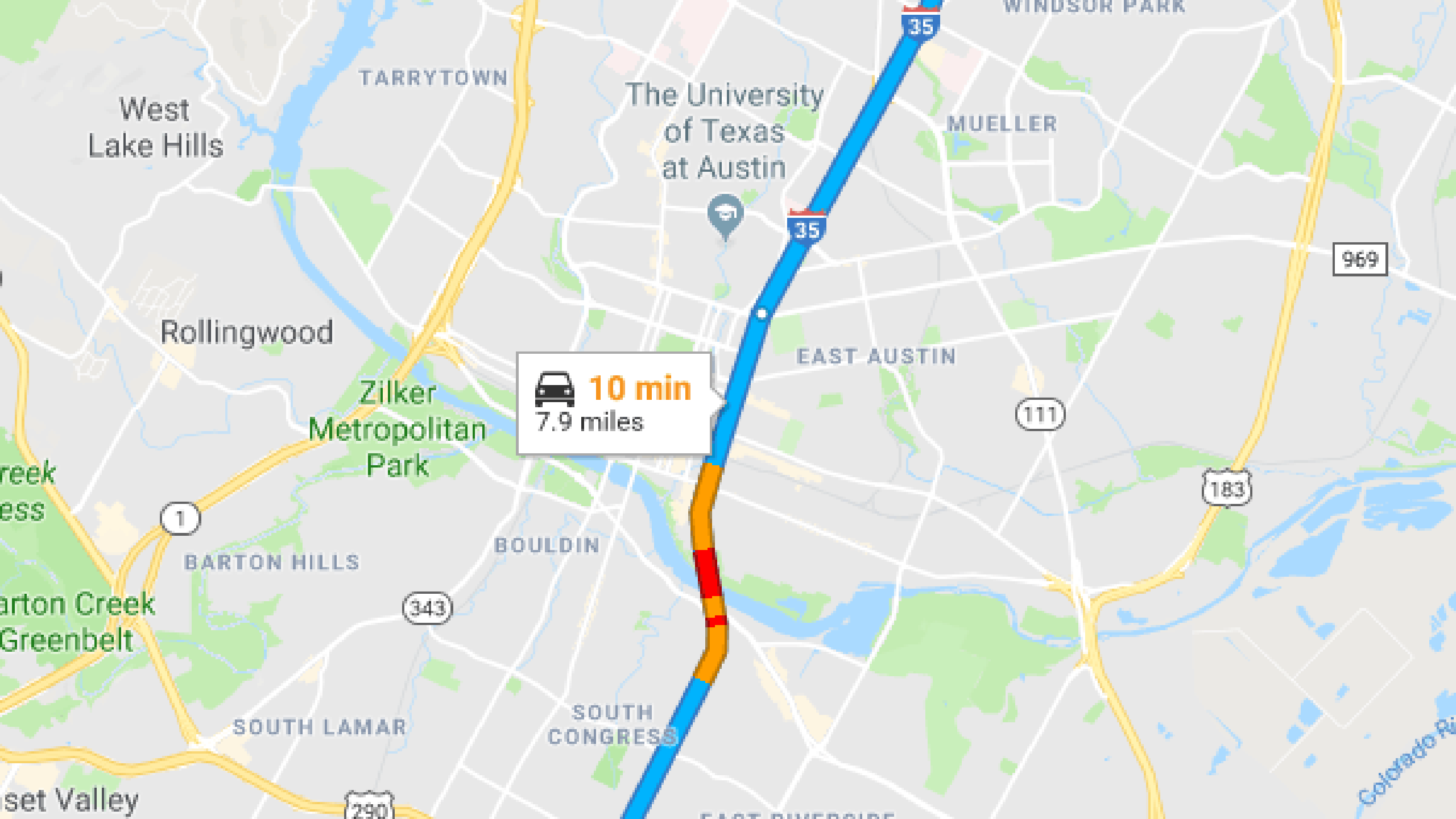


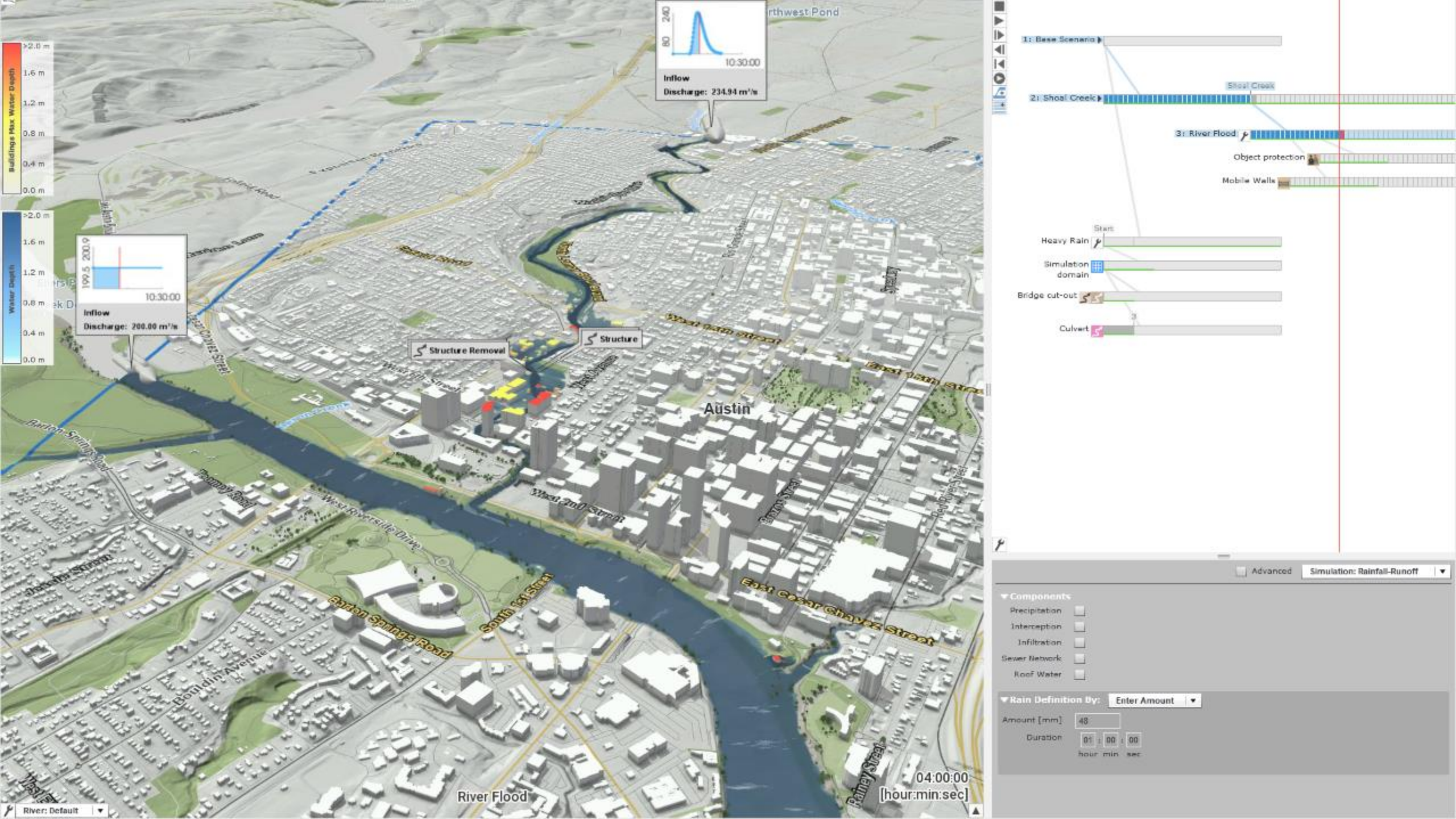

Lakeway
360
130
290
Hyde Park
Austin
343
290
183
Garfield
Bluff Springs
45
35
COTA
130
Buda
Cedar Cree

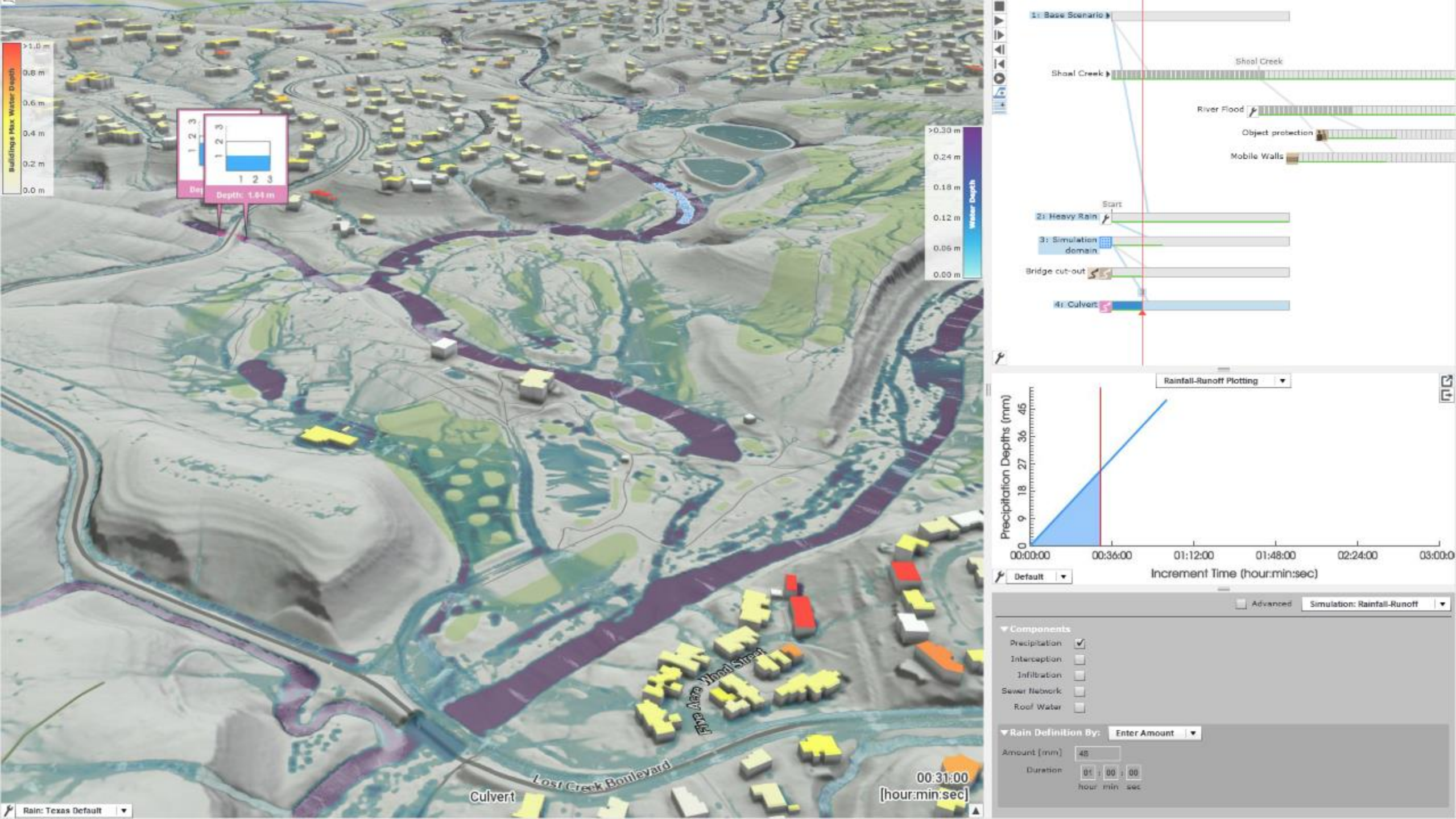

SEVERE STORM THREAT - SCALE 1 TO 5
TUE PM - WED AM
LEAST LIKELY ... 1 2 3 4 5 ... MOST LIKELY
BISMARCK
SALT LAKE CITY
DENVER
WICHITA
ST. LOUIS
ALBUQUERQUE
LUBBOCK
DALLAS
EL PASO
SAN ANGELO
HOUSTON
PRESIDIO
DEL RIO
CORPUS CHRISTI
70
80
44
40
25
10
35

FUTURETRACK RAIN TOTALS
MONDAY
3" +
7" +
12"-15" +
18" +
Hamilton
Killeen
Madisonville
College Station
Livingston
Spurger
Conroe
Austin
Brenham
Beaumont
Sealy
Katy
Houston
Winnie
New Braunfels
Columbus
Hobby
Sugar Land
Crystal Beach
Yoakum
Galveston
Floresville
Bay City
Freeport
Victoria
Palacios
Beeville
Natchez
Alexandria


TEXASFLOOD.org
Flood Gage
SUBSCRIBE
Angelina River near Lufkin (LUFT2)
ANGELINA RIVER NEAR LUFKIN
Universal Time (UTC)
Latest observed value: 160.04 ft at 11:00 PM CST 8-Feb-2022. Flood Stage is 161 ft
Minor: 161.0'
Action: 160.0'
160.04 ft
160.4 ft
Stage (ft)
Site Time (CST)
Graph Created (11:36PM Feb 8, 2022)
Observed
Forecast (issued 6:36PM Feb 8)
LUFT2(plotting HGIRG) "Gage 0" Datum: 0'
Observations courtesy of US Geological Survey
Cheyenne
Denver
Colorado
Santa Fe
Albuquerque
New Mexico
El Paso
Juárez
Chihuahua
Odessa
Indiana
Indianapolis
Louisville
Kentucky
Nashville
Tennessee
Birmingham
Alabama
Montgomery
Louisiana
Baton Rouge
New Orleans


WINDSOR PARK
35
TARRYTOWN
West
Lake Hills
The University
of Texas
at Austin
MUELLER
35
969
Rollingwood
EAST AUSTIN
Zilker
Metropolitan
Park
10 min
7.9 miles
111
183
1
BARTON HILLS
BOULDIN
343
SOUTH LAMAR
SOUTH
CONGRESS
290


Buildings Max Water Depth
>2.0 m
1.6 m
1.2 m
0.8 m
0.4 m
0.0 m
Water Depth
>2.0 m
1.6 m
1.2 m
0.8 m
0.4 m
0.0 m
240
80
10:30:00
Inflow
Discharge: 234.94 m³/s
200.9
199.5
10:30:00
Inflow
Discharge: 200.00 m³/s
Structure Removal
Structure
Austin
West 6th Street
East 6th Street
West 2nd Street
Barton Springs Road
South 1st Street
East Cesar Chavez Street
Riverside Drive
Bouldin Avenue
Pleasant Valley Road
Red River Street
Trinity Street
Navigation Blvd
Shoal Creek
1: Base Scenario
2: Shoal Creek
3: River Flood
Object protection
Mobile Walls
Start
Heavy Rain
Simulation domain
Bridge cut-out
Culvert
Advanced
Simulation: Rainfall-Runoff
Components
Precipitation
Interception
Infiltration
Sewer Network
Roof Water
Rain Definition By:
Enter Amount
Amount [mm]
48
Duration
01 : 00 : 00
hour min sec
River Flood
04:00:00
[hour:min:sec]
River: Default

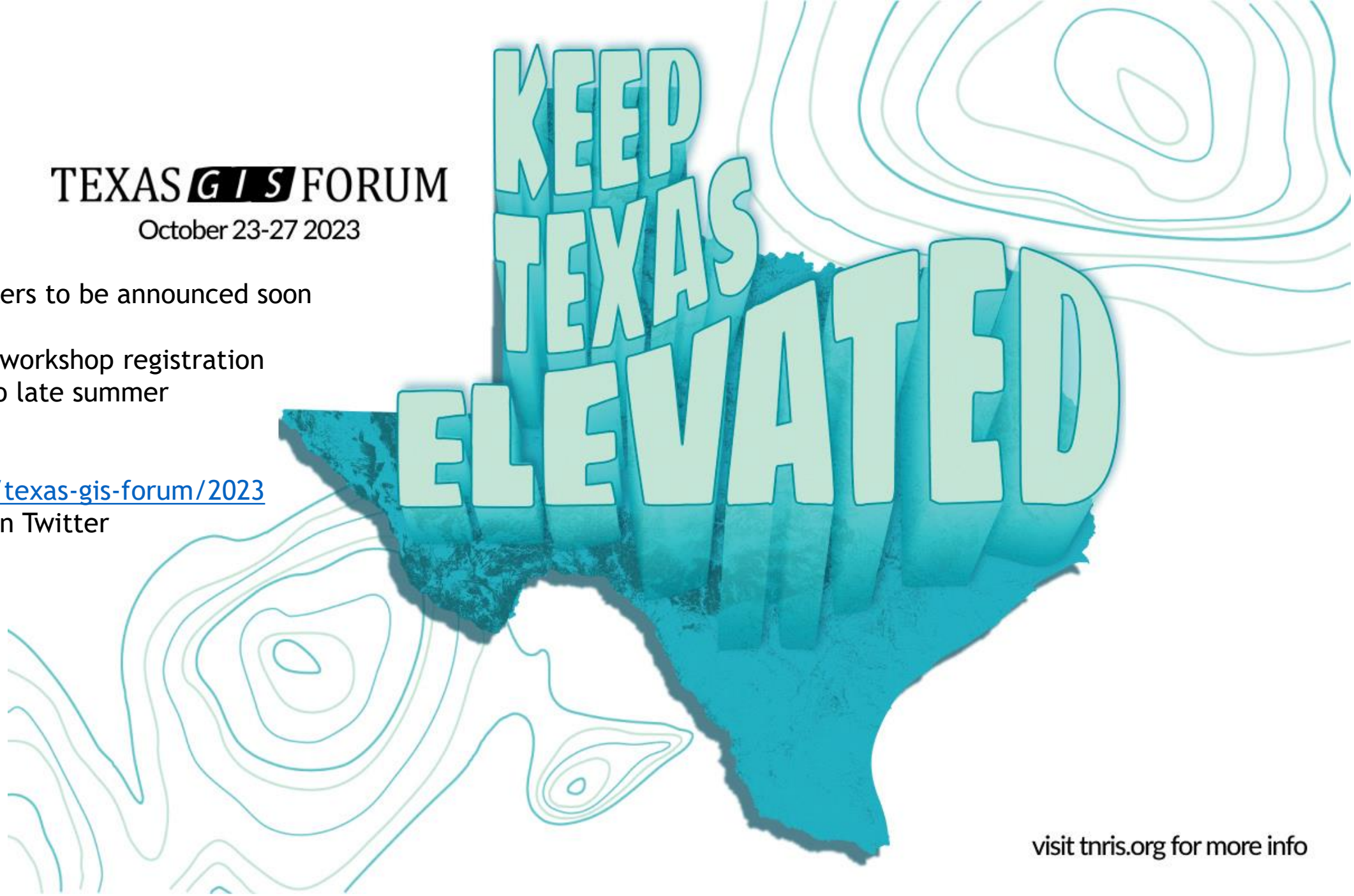

Buildings Max Water Depth
>1.0 m
0.8 m
0.6 m
0.4 m
0.2 m
0.0 m
Depth: 1.84 m
>0.30 m
0.24 m
0.18 m
0.12 m
0.06 m
0.00 m
Water Depth
Lost Creek Boulevard
Culvert
00:31:00
[hour:min:sec]
Rain: Texas Default
1: Base Scenario
Shoal Creek
River Flood
Object protection
Mobile Walls
Start
2: Heavy Rain
3: Simulation domain
Bridge cut-out
4: Culvert
Rainfall-Runoff Plotting
Precipitation Depths (mm)
0
9
18
27
36
45
00:00:00
00:36:00
01:12:00
01:48:00
02:24:00
03:00:0
Increment Time (hour:min:sec)
Default
Advanced
Simulation: Rainfall-Runoff
Components
Precipitation
Interception
Infiltration
Sewer Network
Roof Water
Rain Definition By:
Enter Amount
Amount [mm]
48
Duration
01 : 00 : 00
hour min sec

ROAD
CLOSED
HIGH
WATER

TEXAS GIS FORUM

October 23-27 2023

- Keynote speakers to be announced soon
- Conference & workshop registration opening mid to late summer
- For updates:
  - tnris.org/texas-gis-forum/2023
  - @TNRIS on Twitter



Thank you!

- Visit us at tnris.org
- Follow us @TNRIS on Twitter
- Upcoming Texas GIS Community Meetings:
  - July 19, 2023
    (ACC Highland Campus)
  - October 27, 2023
    ('State of the State' on Friday at the Texas GIS Forum)