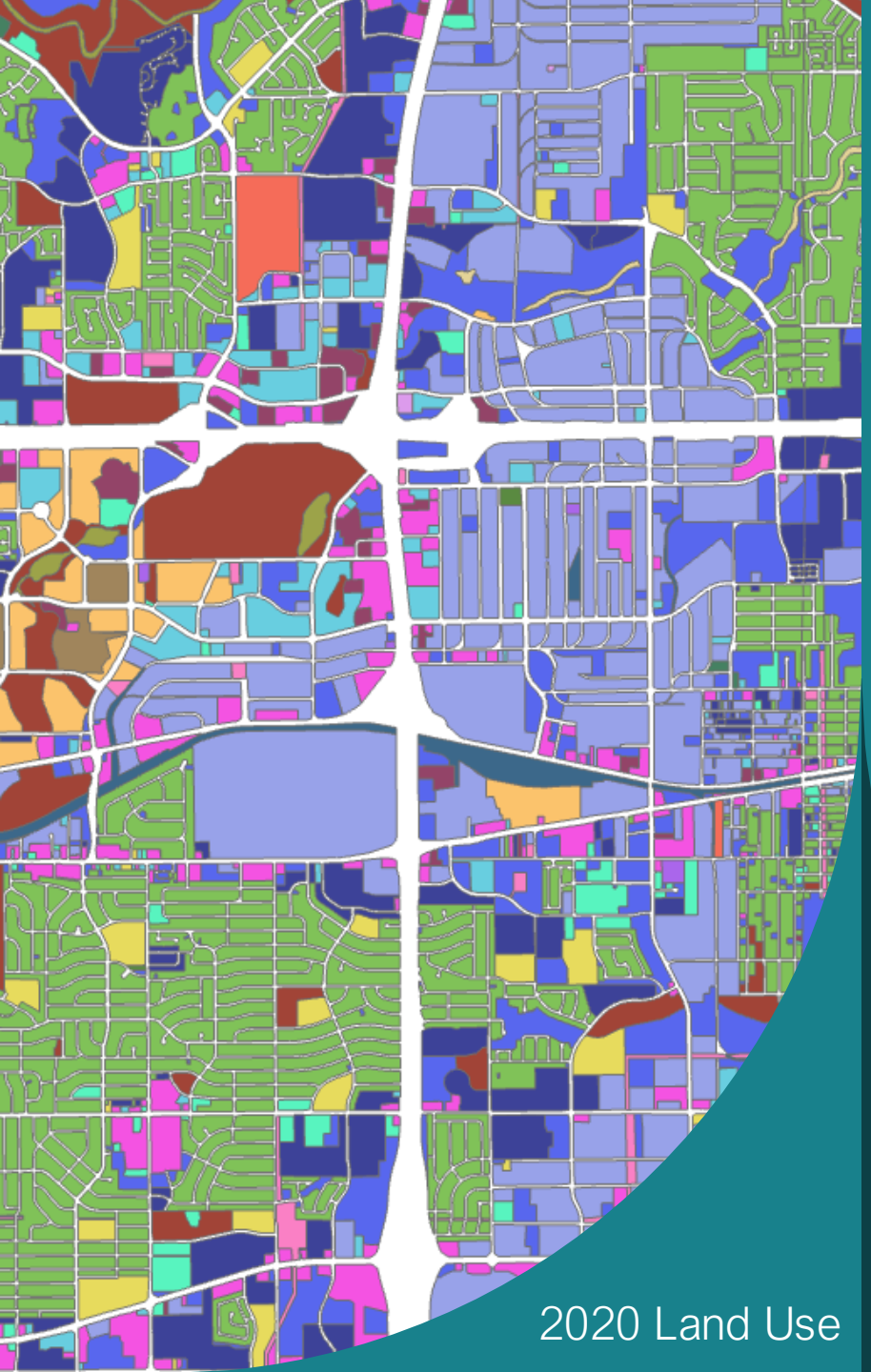


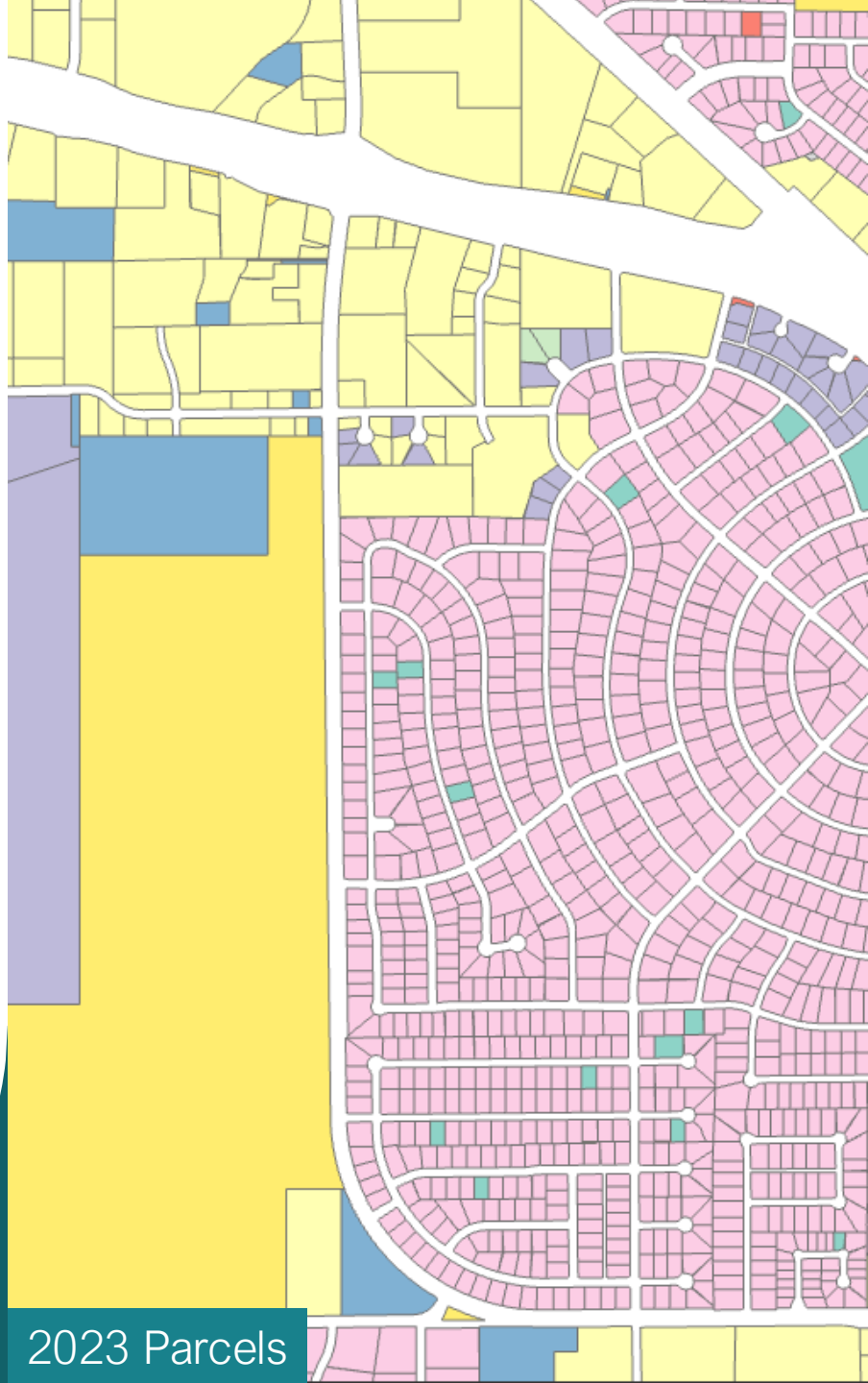
Research & Demographic Forecasting at North Central Texas Council Of Governments

Presented by:
Sarah Jackson
Geographic Information Analyst | Research & Information Services
North Central Texas Council of Governments

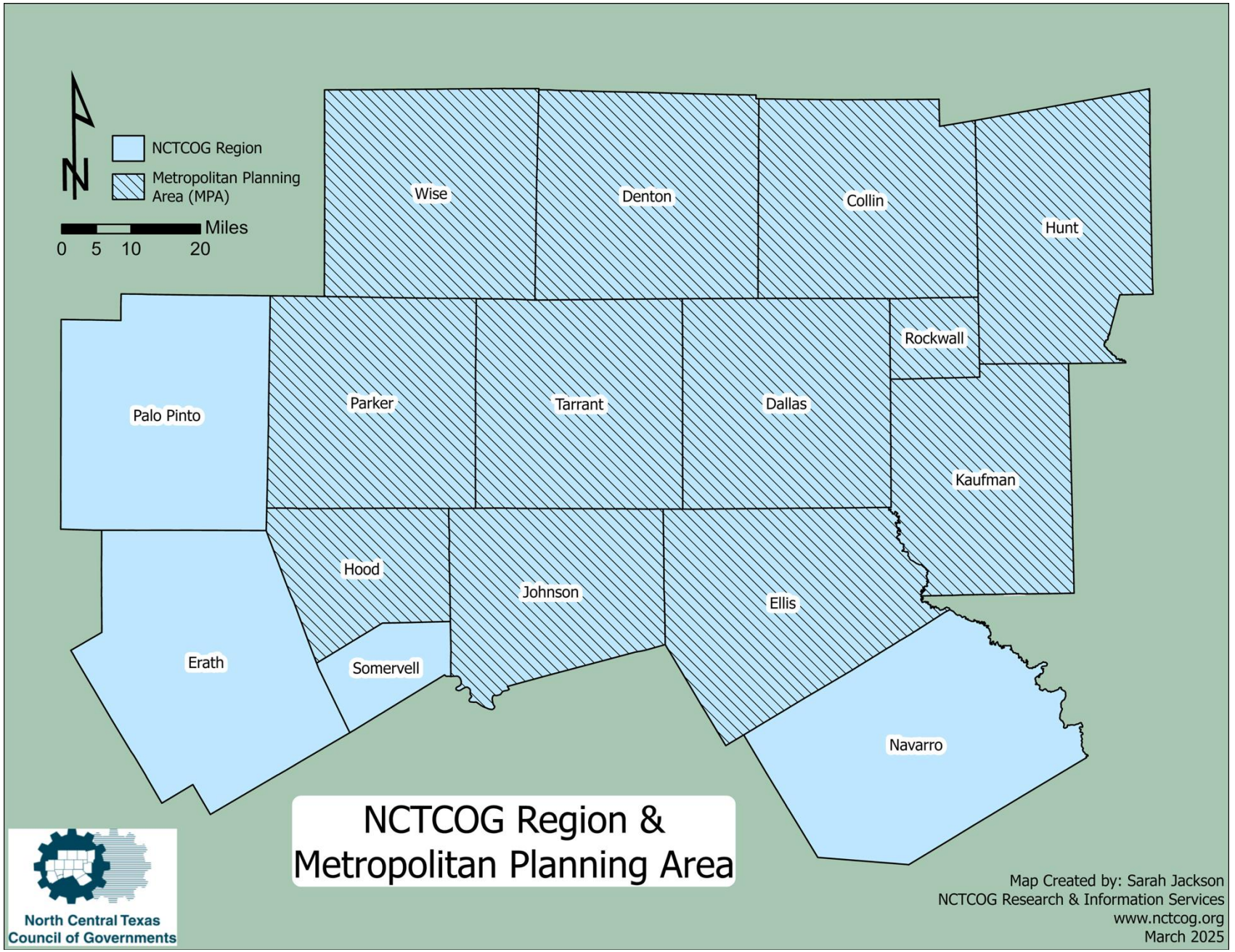
Mark Folden
Senior Predictive Analytics Specialist | Research & Information Services
North Central Texas Council of Governments

Agenda

- About Us
- Our Projects
  - Spatial Data Cooperative Program
  - GIS Projects
  - Research Projects
- External Users of Our Data
- Open Data Site
- How to Get Involved
- Questions



About us

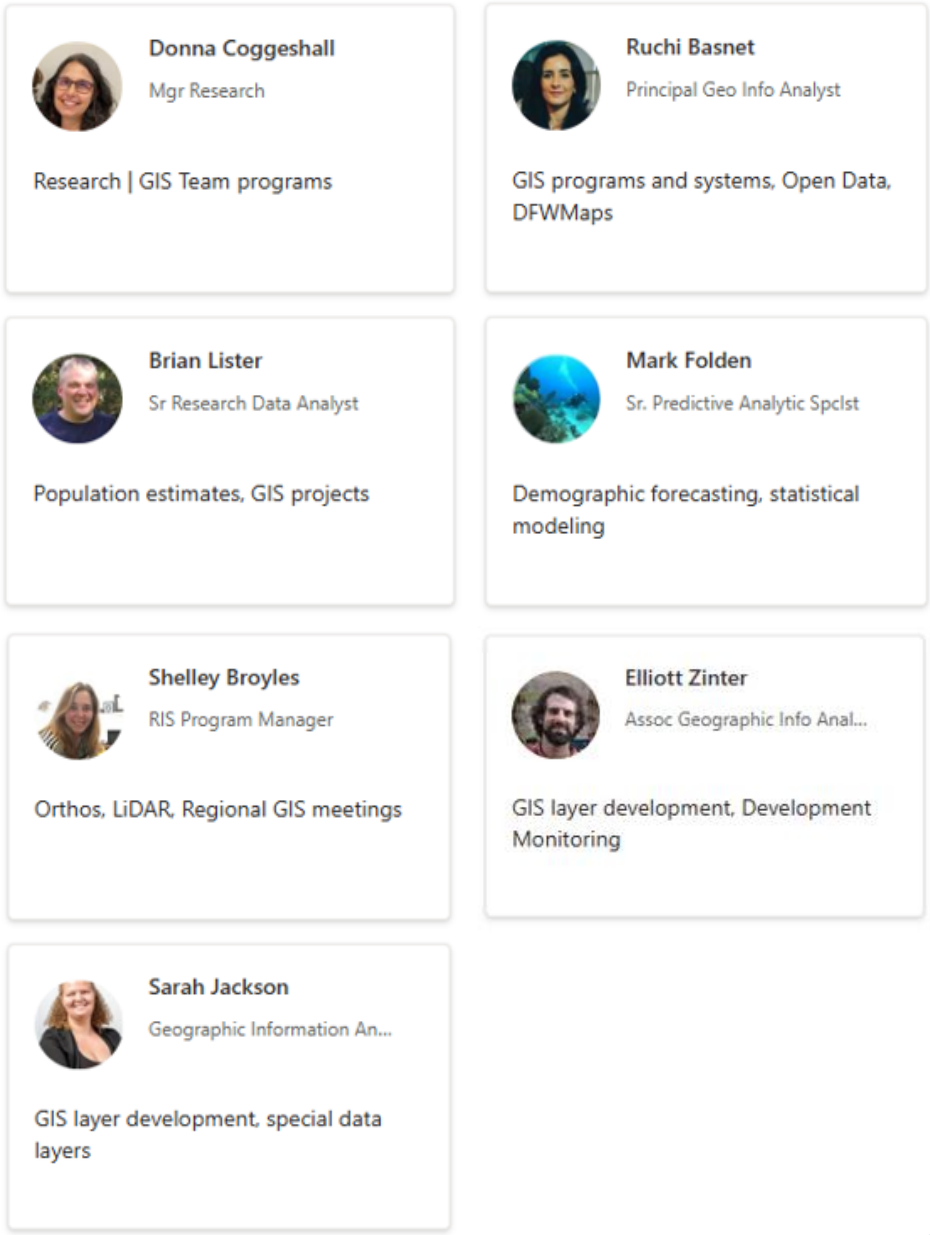

N
NCTCOG Region
Metropolitan Planning Area (MPA)
Miles
0 5 10 20
Wise
Denton
Collin
Hunt
Rockwall
Palo Pinto
Parker
Tarrant
Dallas
Kaufman
Hood
Johnson
Ellis
Erath
Somervell
Navarro
NCTCOG Region & Metropolitan Planning Area
North Central Texas Council of Governments
Map Created by: Sarah Jackson
NCTCOG Research & Information Services
www.nctcog.org
March 2025

About us

Our team is the **Research** arm of the **Research & Information Services (RIS)** department at **North Central Texas Council of Governments (NCTCOG)**

Our projects fall into 3 categories; **Spatial Data Cooperative Program, GIS Projects,** and **Research Projects**

While they fall into different categories, the projects are all interconnected and reliant on the others

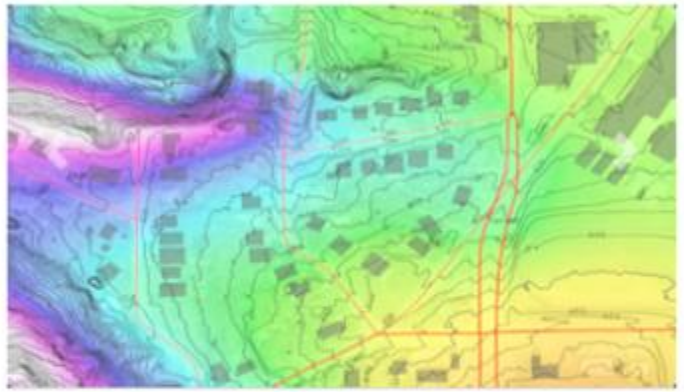


Spatial Data Cooperative Program (SDCP)

2024 Orthoimagery

SDCP Products

NCTCOG Multiyear Contours (2009-2019)



NCTCOG has developed a layer of 2' cartographic-quality digital elevation contours. It uses the the most recent lidar and digital elevation model data available for a given area.

- **Remote Sensing Data :** Orthophotography & LiDAR
- **Derivative Data**: Contours, Planimetrics, Impervious Surface, Land Use, Land Cover
- Data created in-house or by a vendor

Data Use Cases

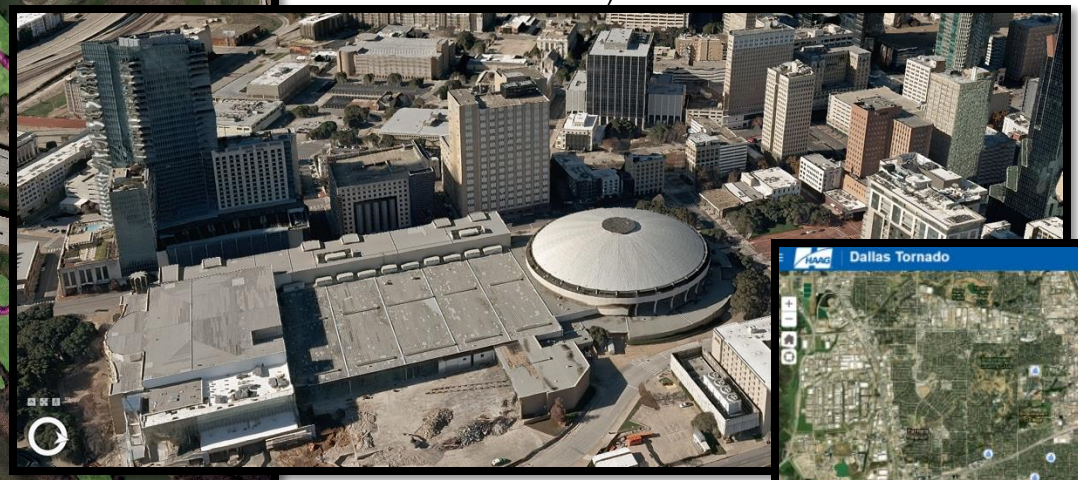
Pedestrian Studies

(uses orthophotography & planimetrics)

Pink – Sidewalks
Green - Floodplain

Digital Twin

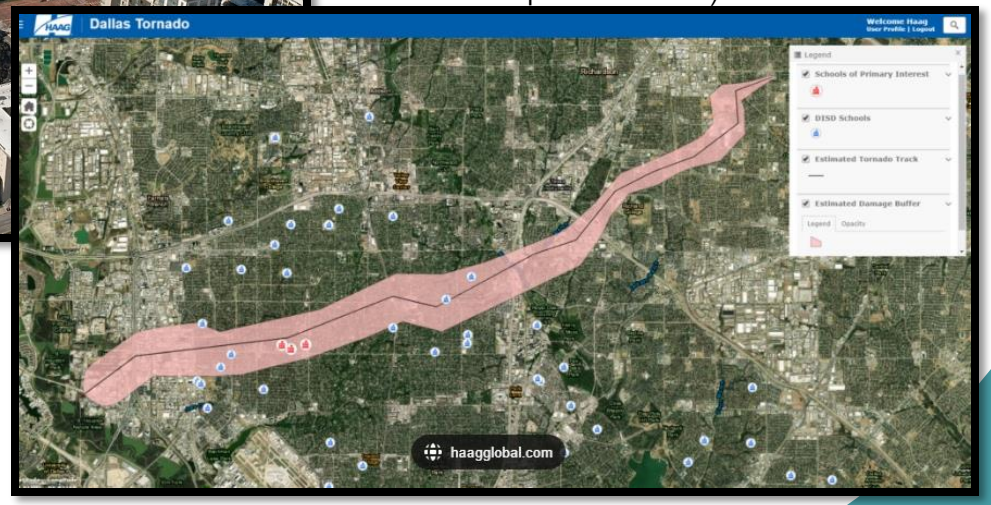
(uses true orthophotography & LiDAR)



Digital Twin of
Fort Worth
Convention Center

Disaster Modeling

(uses orthophotography & planimetrics)



Screenshot of the
Dallas Tornado Tracking Site

Why Join the Cooperative Process?

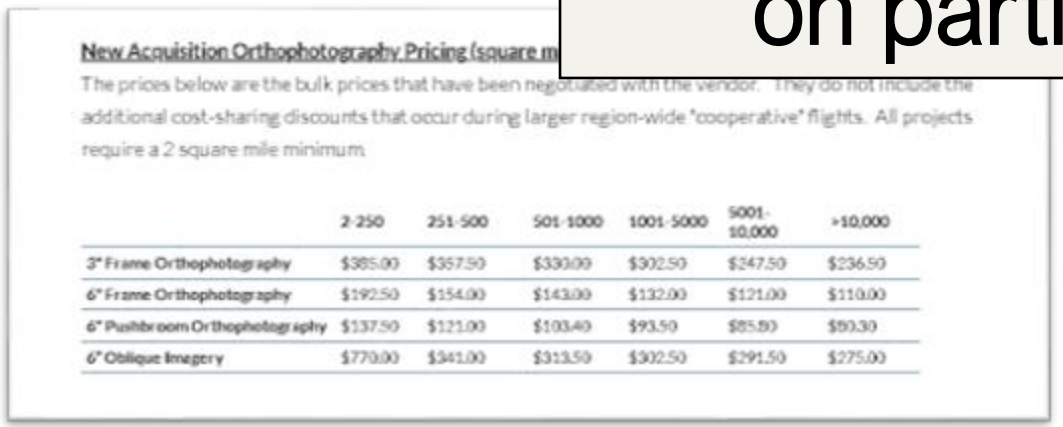
BULK DISCOUNT

- Negotiated during the Request for Proposals (RFP) Pr
- Economies of Scal area, the lower the

VOLUME DISCOUNT

- Increased number of participants pping purchase areas;
- st across all

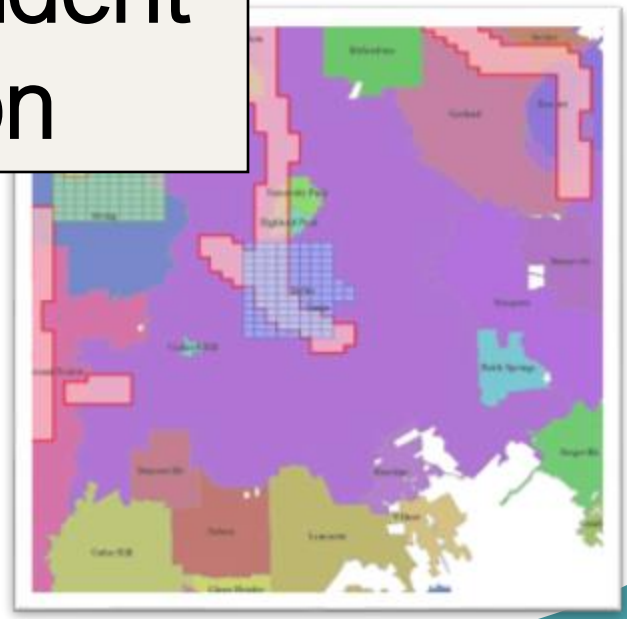
In both cases, the discounts are completely dependent on participation



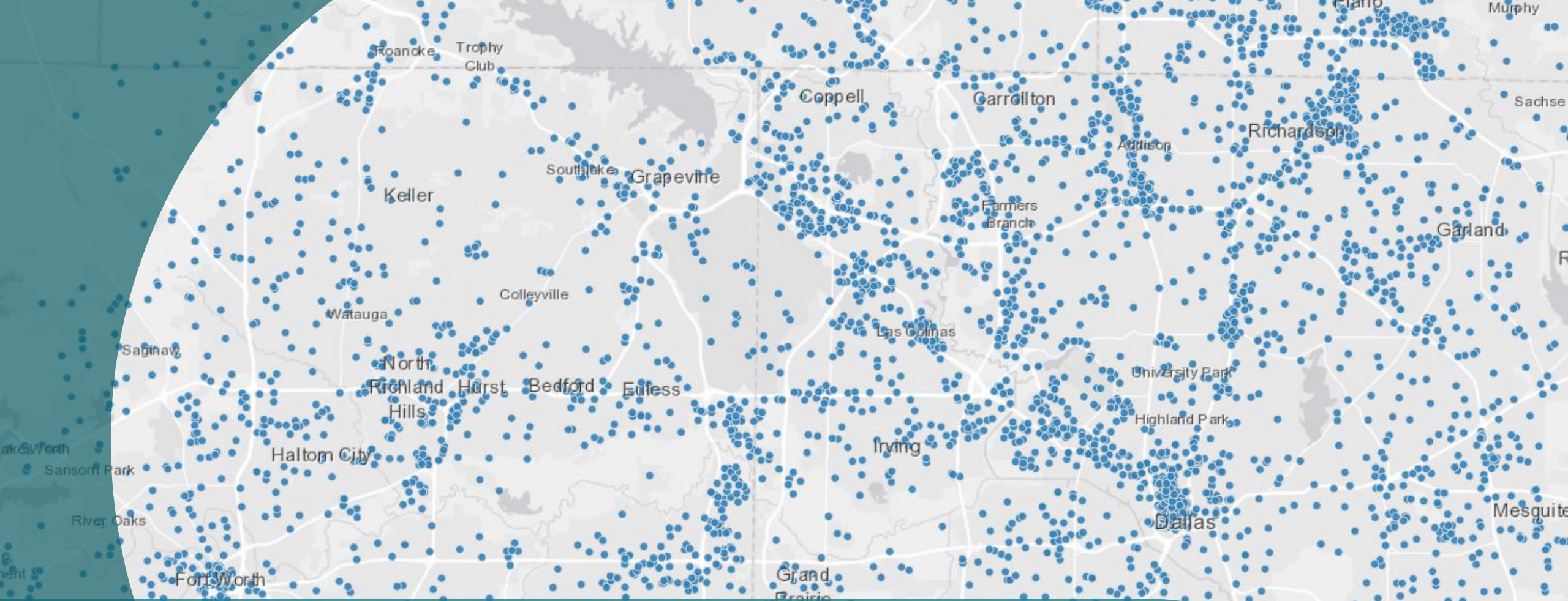
New Acquisition Orthophotography Pricing (square m

The prices below are the bulk prices that have been negotiated with the vendor. They do not include the additional cost-sharing discounts that occur during larger region-wide "cooperative" flights. All projects require a 2 square mile minimum.

	2-250	251-500	501-1000	1001-5000	5001-10,000	>10,000
3" Frame Orthophotography	$385.00	$357.50	$330.00	$302.50	$247.50	$236.50
6" Frame Orthophotography	$192.50	$154.00	$143.00	$132.00	$121.00	$110.00
6" Pushbroom Orthophotography	$137.50	$121.00	$103.40	$93.50	$85.80	$80.30
6" Oblique Imagery	$770.00	$341.00	$313.50	$302.50	$291.50	$275.00



Scan the QR code for more information on joining the 2026 program



GIS Projects

Development Monitoring & Major Employers
GIS Layer Development

Major Employers

Development Monitoring & Major Employers

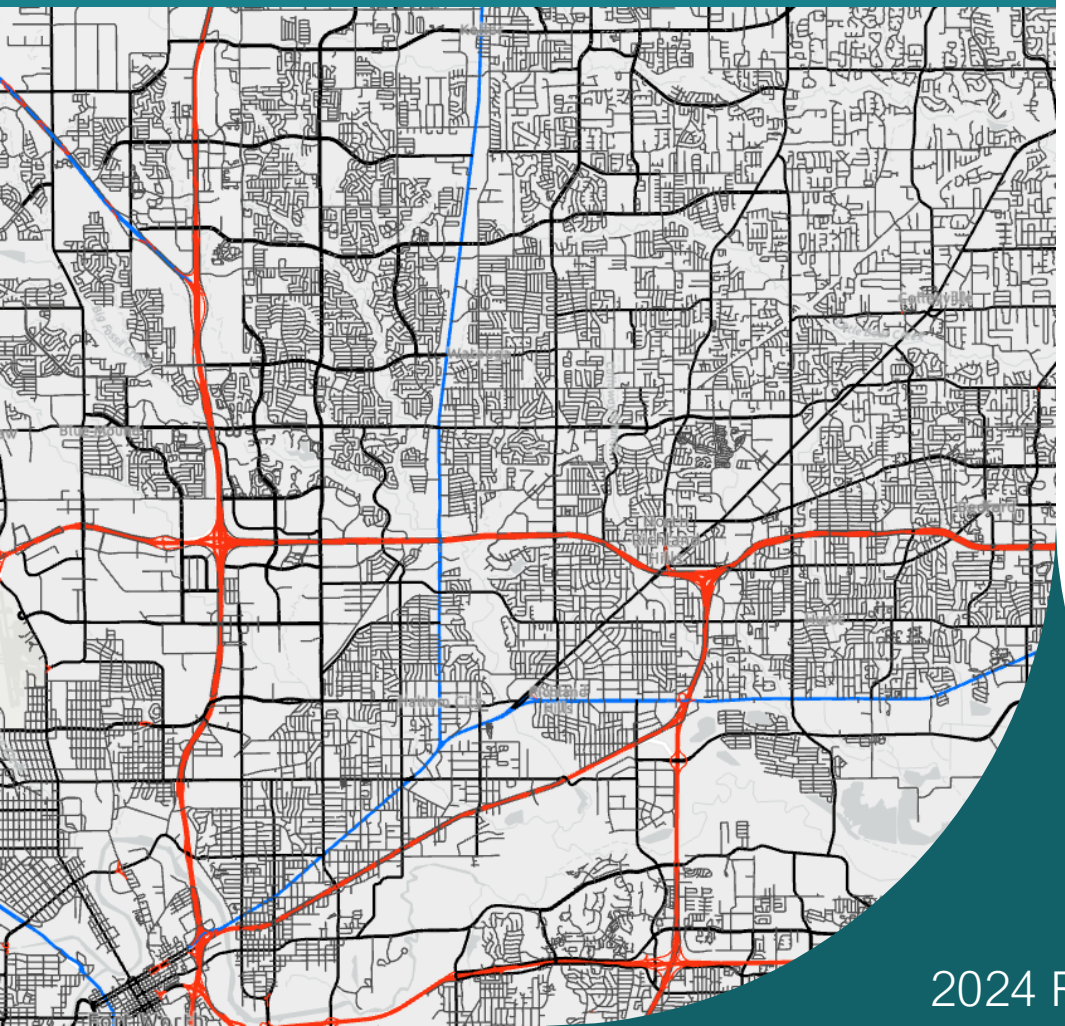
DEVELOPMENT MONITORING

- Continuously updated database of **residential, commercial,** and various other developments in the **NCTCOG region**
- Curated using **news sources**, state-wide databases, **county appraisal districts**, city council meeting minutes, and **aerial imagery**
- Point layer with over **39,000 features**

MAJOR EMPLOYERS

- Employers with at least **100 employees** at a single location
- Based on **site employment**, not company wide totals
- Classified using the **North American Industry Classification System (NAICS)**
- Point layer with over **6,700 features**

GIS Layer Development



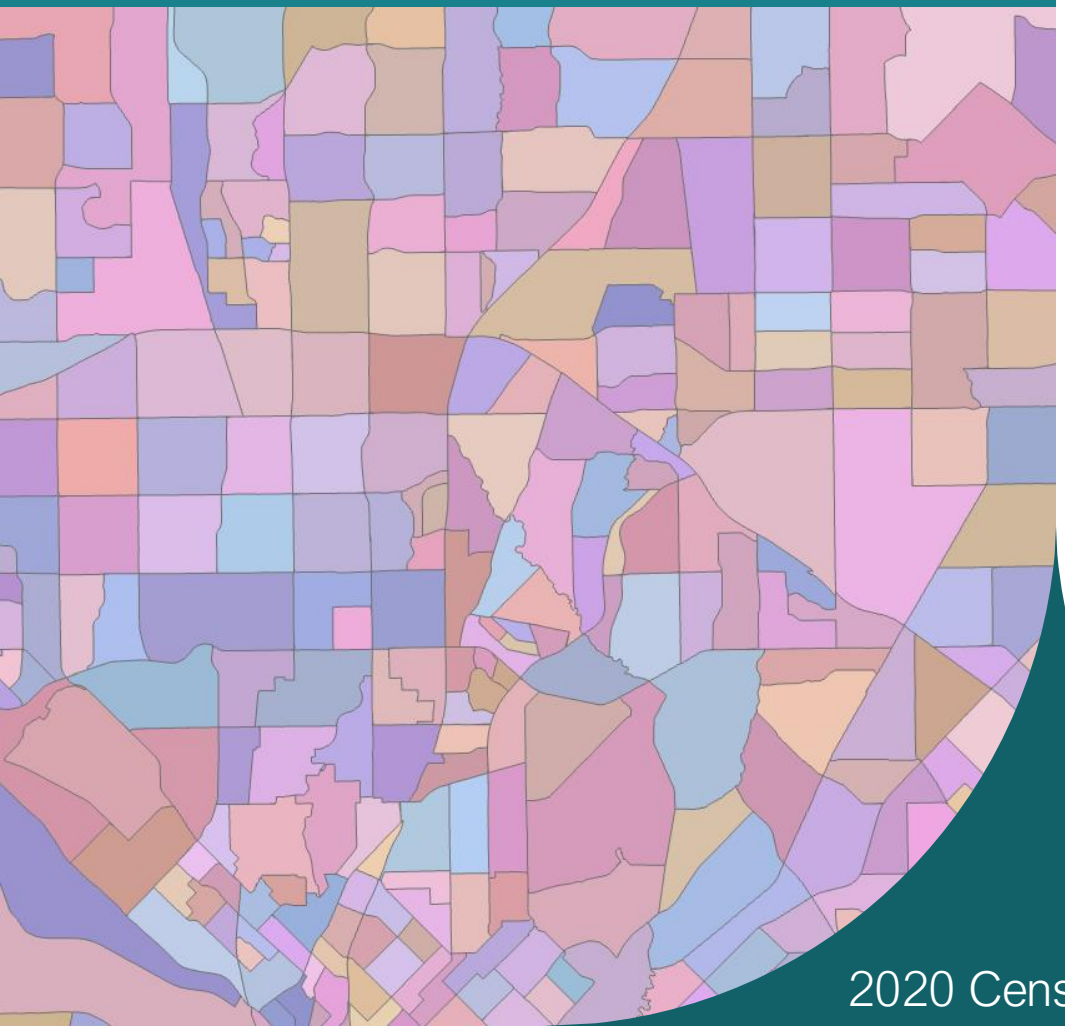
2024 Roads

- GIS projects include the development of unique layers, and the processing of layers collected from outside sources
- Developed layers are created using data sent by **Cities**, **County Appraisal Districts**, **State-wide Databases**, and the **US Census Bureau**
- Layers are updated on a rotating schedule
  - "Smaller" layers such as city limits are updated annually
  - "Larger" layers such as Land Use are updated on a 5-year cycle

Examples of Developed Layers

- City Limits
- Land Use
- Subdivisions
- Roads
- Parks

GIS Layer Processing

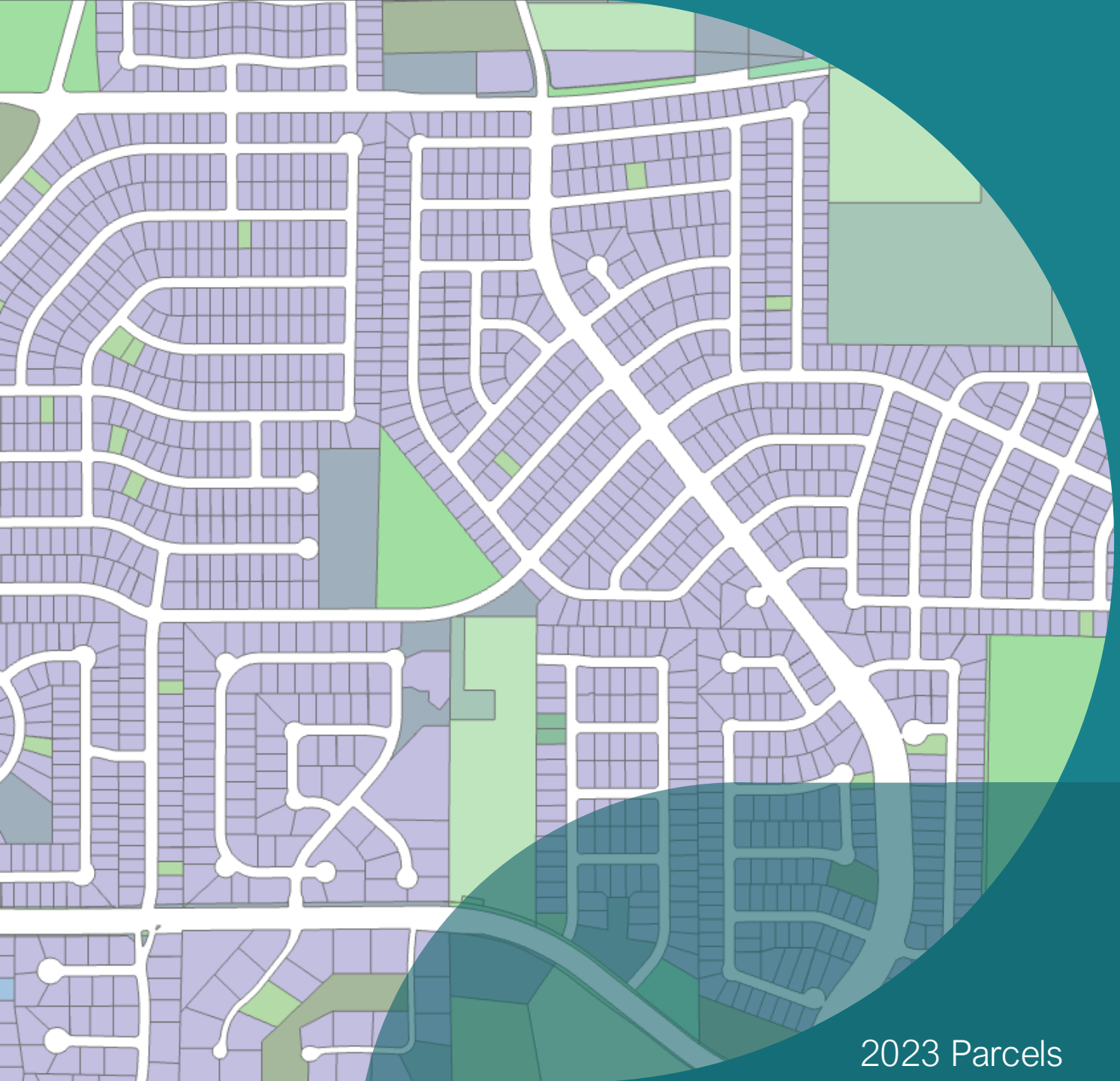


2020 Census Tracts

- Processed layers are collected from State and Federal Sources
  - Layers are available as **NCTCOG region specific** or **state-wide datasets**
  - Providing this data **improves the accessibility** for Member cities or others in the region that might not have a dedicated GIS team
- Layers are updated using a schedule that follows the election cycle or is based on updates from the original source of the data

Examples of Processed Layers

- Census Boundaries
- Texas House Districts
- Texas Senate Districts
- US Congressional Districts
- Flood Plains
- Hydrology
- Watersheds



2023 Parcels

Research Projects

POPULATION & HOUSING ESTIMATES

DEMOGRAPHIC FORECAST

Population & Housing Estimates

- Started in 1974
- **Annual publication** that provides regional population estimates
- Estimates are based on **housing stock data** provided by cities in the region and most recent **census ACS data**
  - Simplified formula on right
- Published data is broken down into housing types (**multi-family**, **single family**, and **mobile homes**) as well as by city and county

Estimated Housing Units

X

Estimated Occupancy Rate

X

Estimated Persons Per Occupied Unit

=

Estimated Household Population

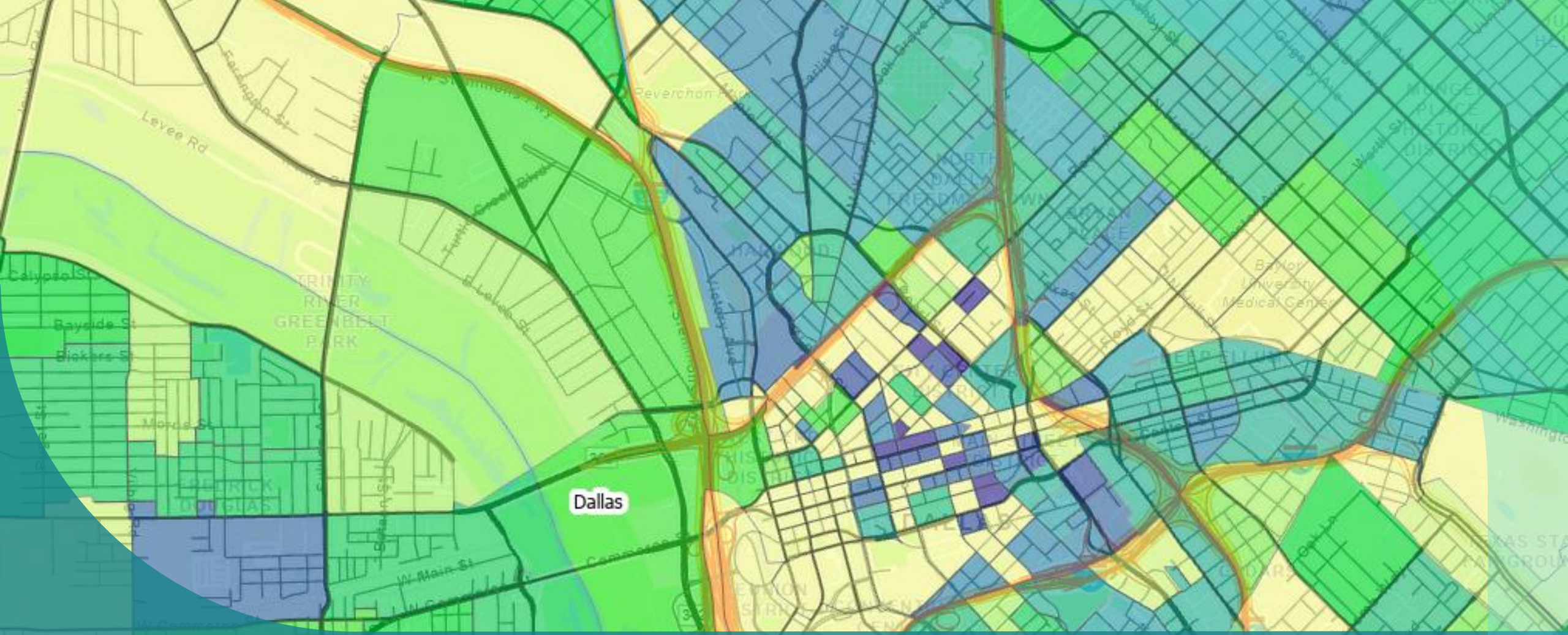
Annual Population Estimates Survey

Parameter	Single Family	Multi-Family	Other (Mobile or Manufactured Homes)	Total
1. Total number of newly constructed residential building permits issued between January 1 and December 31, 2024	250	2	10	262
2. Total number of units authorized by the above permits	200	800	10	1010
3. Total number of units listed in (2) that were ***completed*** between January 1 and December 31, 2024 Please list single family and/or multi-family completions in the table below line 14.	180	500	8	688
4. Total number of units authorized between January 1 and December 31, 2024 that were ***not completed*** in 2024 **[Line 2 - Line 3]**	20	300	2	322
5. Carryover units (units reported in previous years but not completed)	100	150	0	250
a. How many carryover units listed in (5) were completed between January 1 and December 31, 2024?	100	150	0	250
b. How many carryover units listed in (5) are still active?	0	0	0	0
6. Total number of units completed between January 1 and December 31, 2024 **[Line 3 + Line 5a]**	280	650	8	938
7. Total number of units ***annexed*** between January 1 and December 31, 2024	50	15	5	70
8. Total number of units ***demolished*** between January 1 and December 31, 2024	4	8	2	14
9. Total number of unit ***move-outs*** between January 1 and December 31, 2024 (housing units, not population)	2	2	2	6
10. Total number of unit ***move-ins*** between January 1 and December 31, 2024 (housing units, not population)	1	1	1	3
11. Other adjustments (+ or -)	0	0	0	0
12. Total units as of January 1, 2024	215	751	64	1030
13. Total housing units as of January 1, 2025 **[Line 6 + Line 7 - Line 8 - Line 9 + Line 10 + Line 11 + Line 12]**	540	1407	74	2021
14. Group quarters population ***change*** from January 1 to December 31, 2024 [Definition]				0

Sample Survey Used for Testing Purposes

Methodology

DATA	SOURCE
Total new construction, demolitions, annexations	Cities
Group Quarters	Cities
Average persons per household	Decennial Census (2020) and American Community Survey
Number of occupied single family by city	Decennial Census (2020) and American Community Survey
Number of occupied multi-family by city	Independent research firms Real Page and ALN as well as ACS



Demographic Forecast

2050 Population Density

Demographic Forecast

WHAT IS IT?

- In-house model
  - Uses developed GIS layers
  - Small Area Estimates
  - Other spatial data
  - Input data is rasterized to a 30x30m grid
- Output from one year becomes the base data for the next as the model iterates into the future

WHAT DOES IT PRODUCE?

- Predicted distribution of **households**, **household populations**, and **employment**
- Output is on a 30x30m grid to allow for tabulation to any geography
- Final published data is tabulated to **Traffic Survey Zones (TSZ)**

OCELOT

- Outlook for
- Change in the
- Economy and
- Land for
- Outcomes in
- Transportation

- Pay homage to the work at CATS
- Recognizes a native Texas species

Photo: Larry Ditto via Texas Parks & Wildlife Magazine

Why 30x30 meters?

- Try to make data and processes as independent of any geographic zone structure as we can make it
- Retains precision of several inputs
- Annualized National Land Cover Database – recently released by USGS for 1985-2023
- Enhanced Development Monitoring – discussions tend to go to the status of individual projects or properties very quickly
- Future Land Use Plans/Zoning
- Exclusions: water & floodplain, parks, O&G buffers, pipeline easements, roadways
- Easily aggregate outputs to any zone structure
- Retain computational expedience with modern equipment and efficient data structures (vectors, arrays)
- Holding capacity issues are largely taken care of for us based on inventory of available grid cells with predetermined densities

Key Concepts

Built area will expand with increased total activity

- Can see in historical orthoimagery mosaics displayed throughout the building

Built area only expands by an amount necessary to absorb growth

- The real estate market doesn't build things that won't get occupied

There should be a chance for some redevelopment

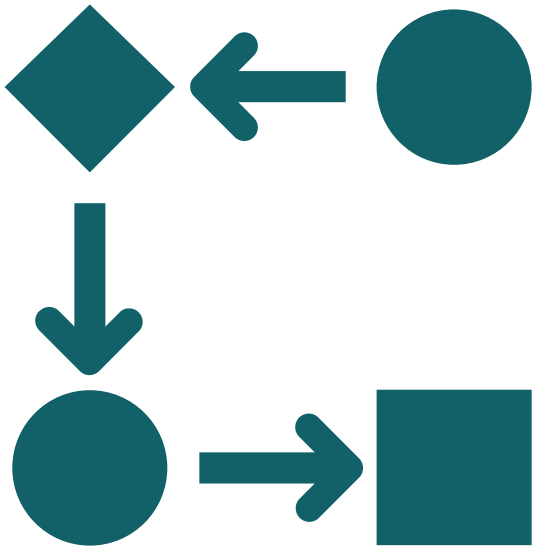
- Redevelopment is often a slow process that is difficult to predict, this is more so when the project is large and complex

Every change we are trying to predict has thousands of dollars spent on consultants before anything happens on the ground

https://i.imgur.com/H9NDbMm.jpeg

Demographic Modelling Process Overview

- Accounting system for land use and the activity it likely to contain
- Allocates future totals of activity (control totals or control targets) through a selection process of undeveloped and/or underdeveloped/underutilized grid cells
- Control totals/control targets
  - From a third party, generated internally, or a combination
  - Regional or sub regional
- Undeveloped = Vacant in NCTCOG Land Use data
  - May be currently used for agriculture or other use that doesn't involve a building or other structural element,
  - May be an isolated unit (residential or improved acreage)



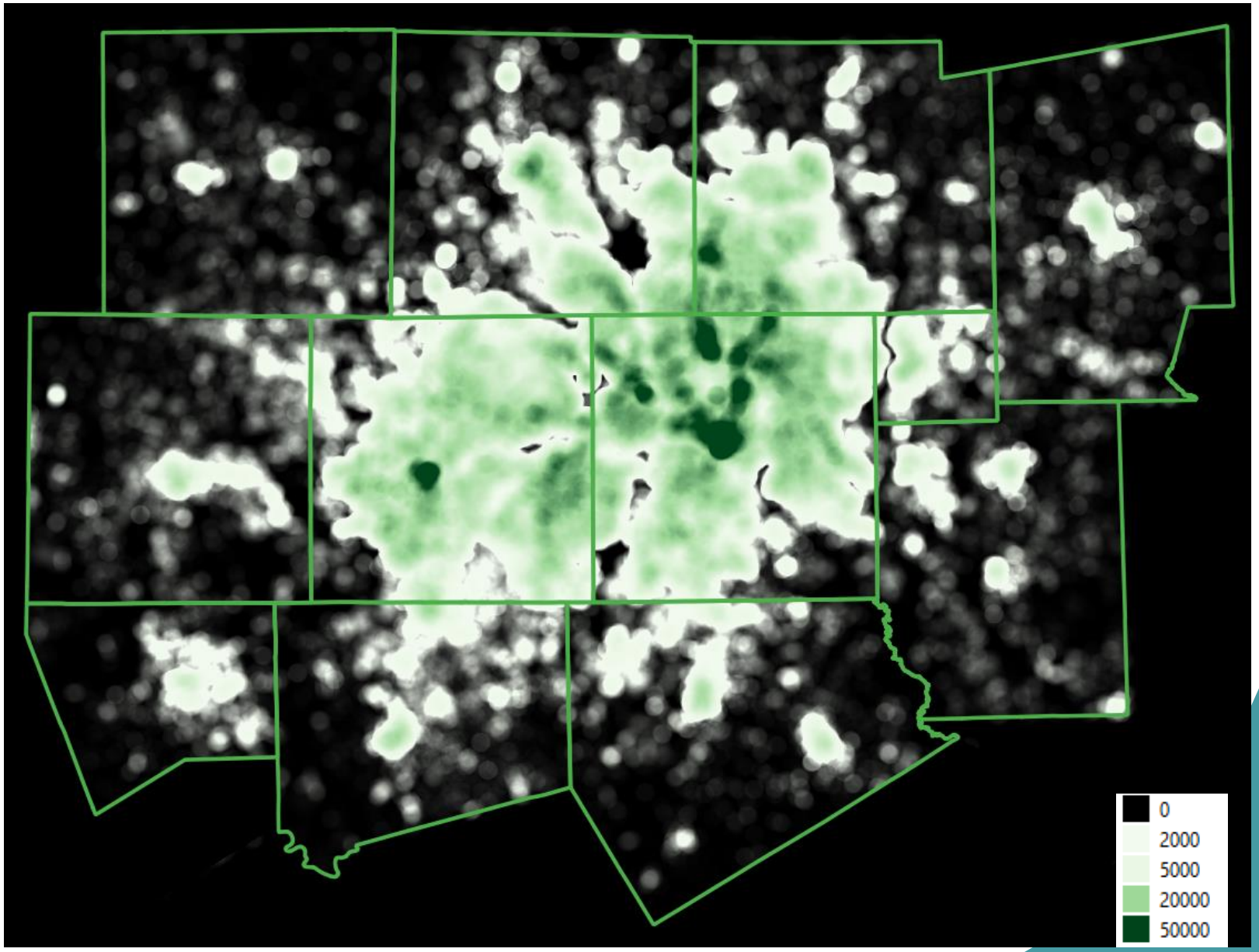
Demographic Modelling Process Overview

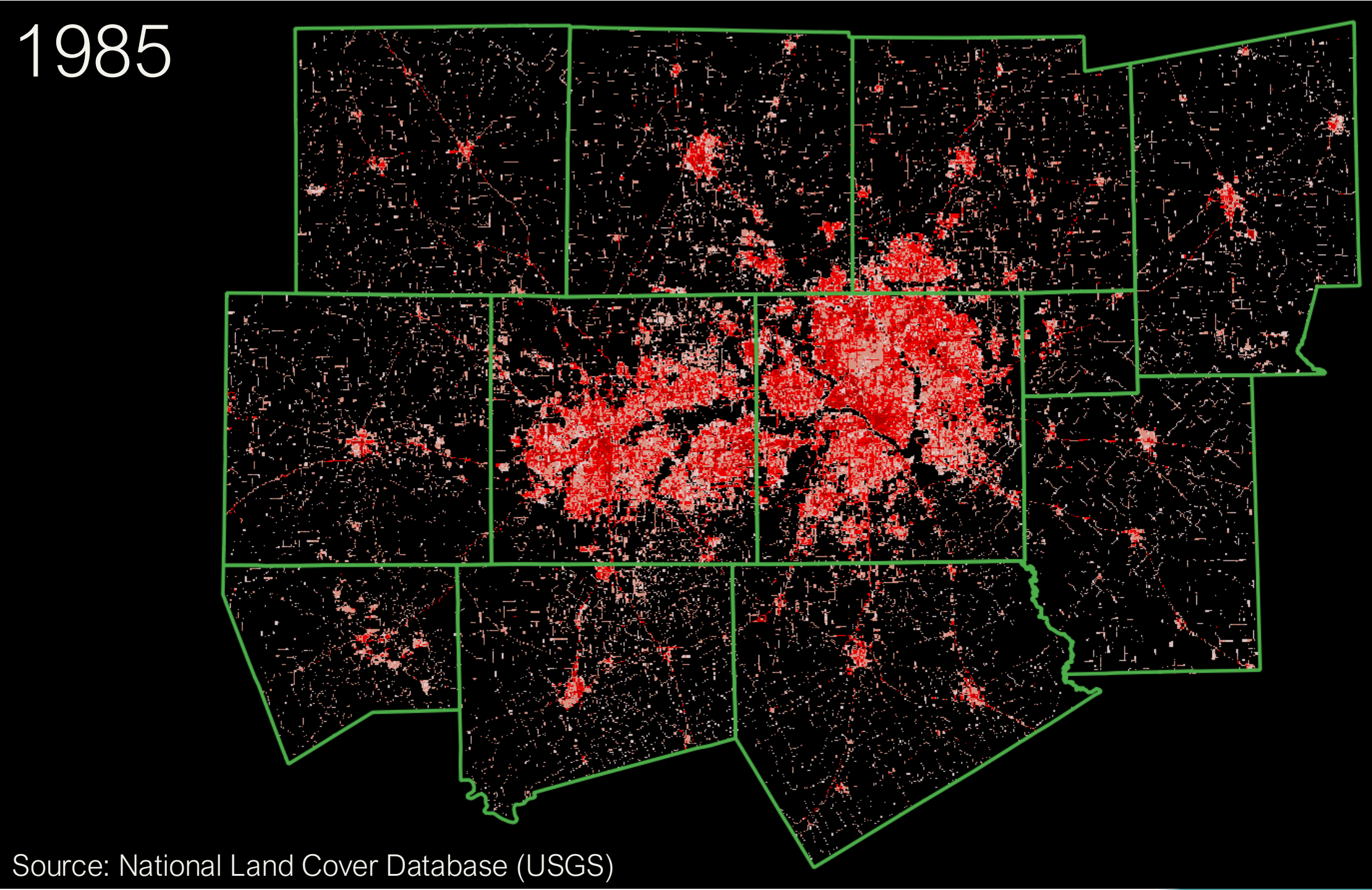
- Answer four key questions
  - Which grid cells develop?
  - How many grid cells convert and/or increase in activity?
  - What do those grid cells develop into?
  - How much activity do the newly developed grid cells contain?
- Iterates every year
- Output from one year becomes the base data for the next year

LOGISTIC REGRESSION VARIABLES

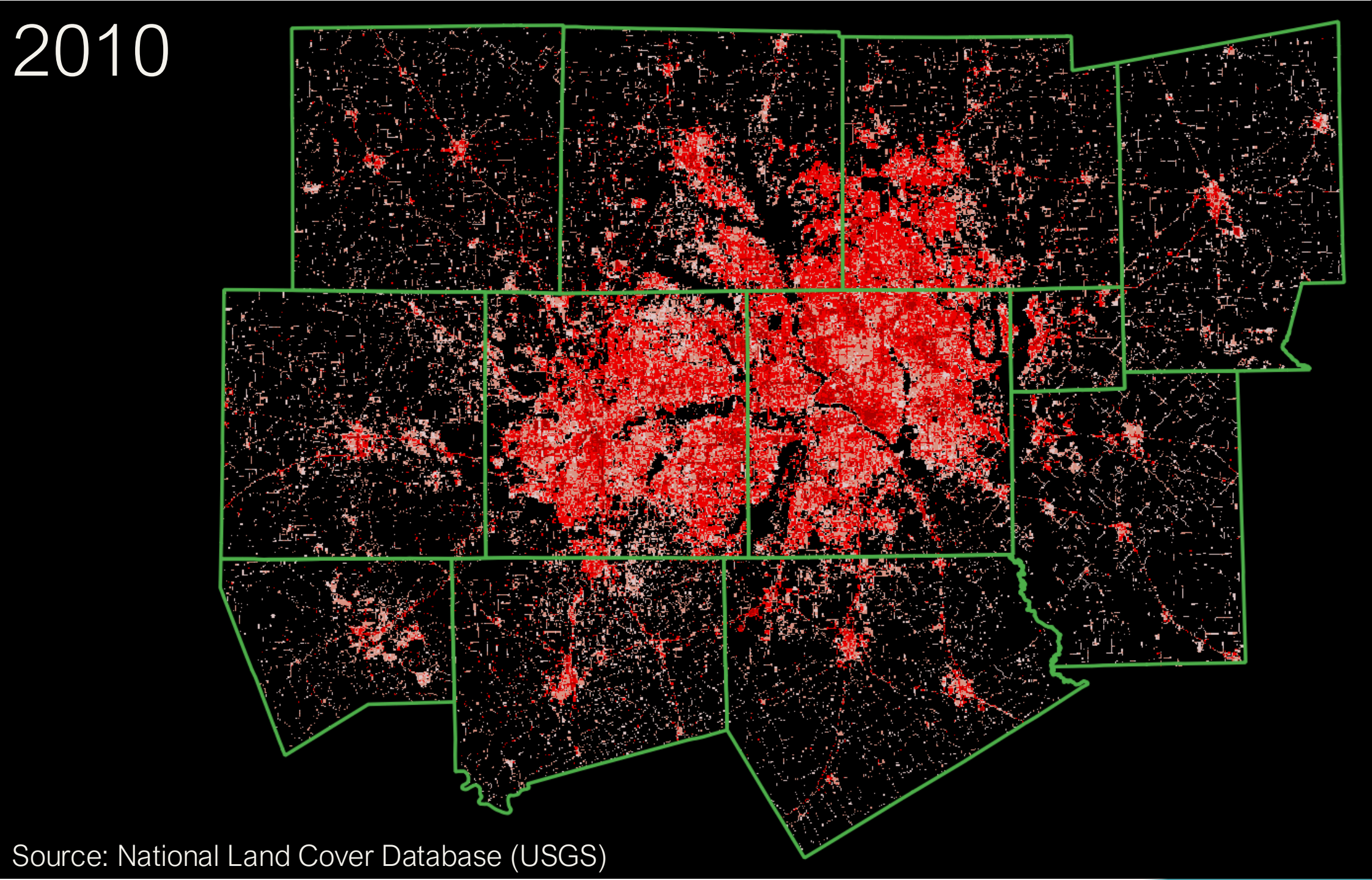
- Variables we've used in the past
  - Number of households within a radius
  - Number of built grid cells within a radius
  - Median Home Values
  - Distance to an "Employment Cluster"
- Potential New Variables
  - Distance to "Mobility" roadway facility
  - Distance to "Access" roadway facility
  - Land Cover
  - Surface Geology

Image: Total Activity within 1-mile





Source: National Land Cover Database (USGS)



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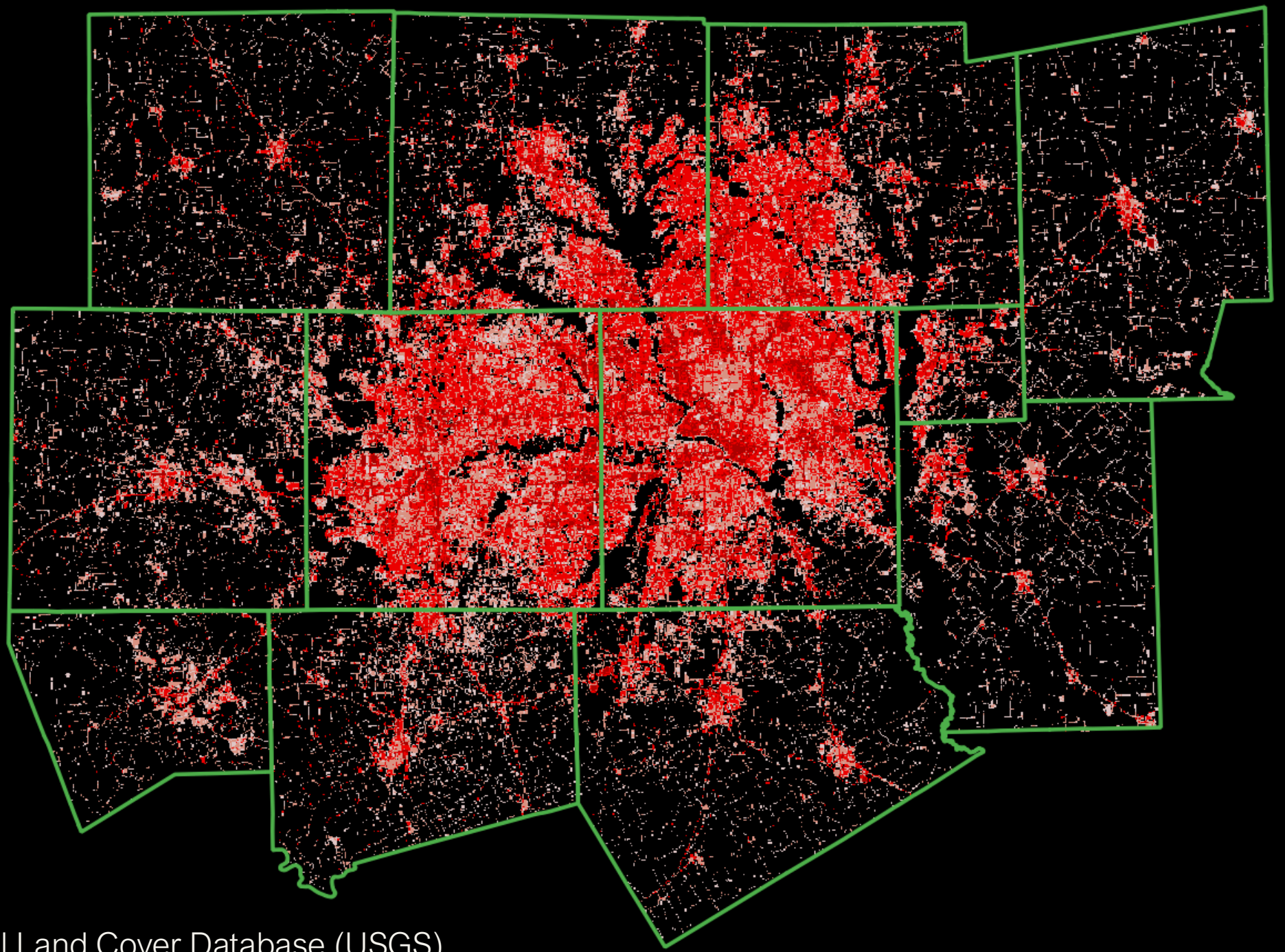

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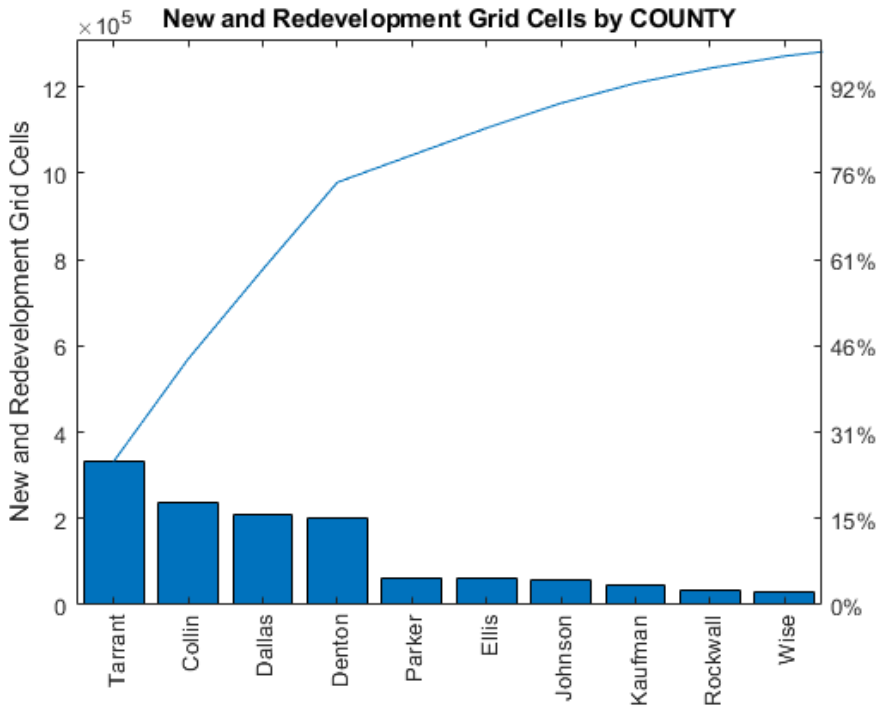
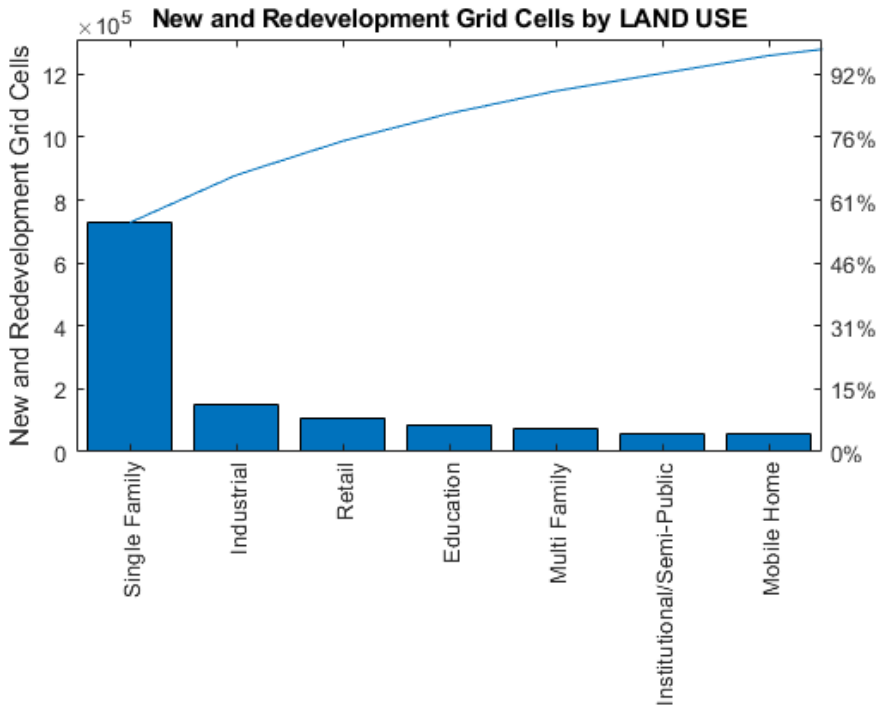
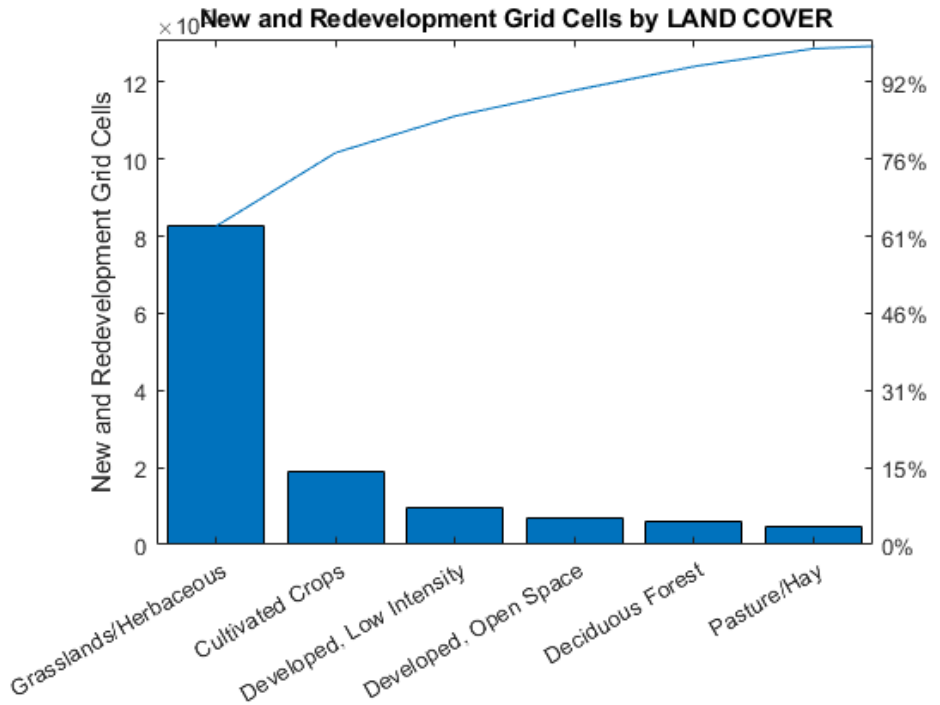
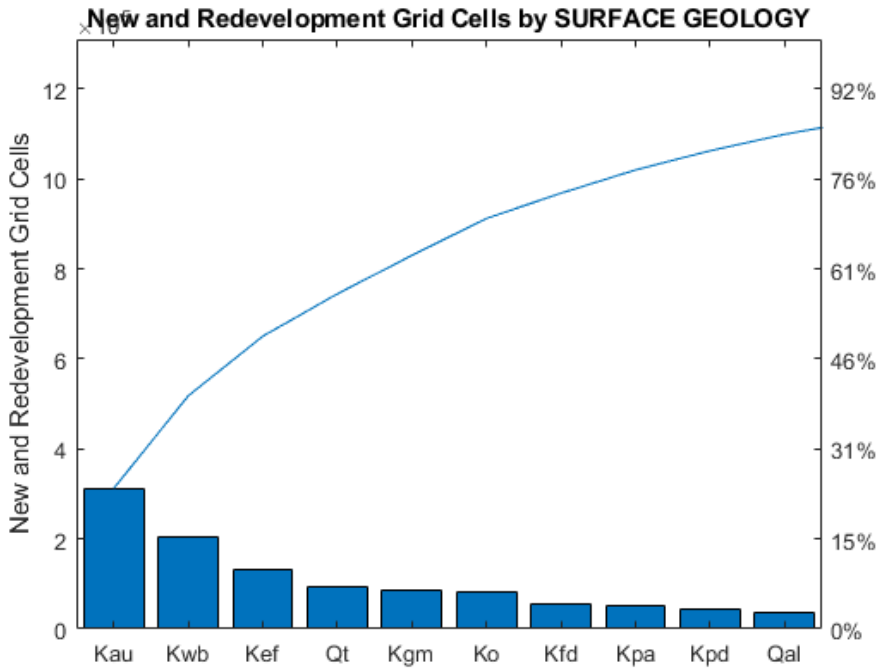




MPA SUMMARY

- 4-core counties represented the overwhelming majority of development activity
  - Dallas is third overall, fourth in new development
- Single family dominates, but all other built land uses is about 40% of the land use change we're trying to predict
- 3 other developed Land Use categories will be in the data that gets modeled, but didn't make the chart
  - Group Quarters, Hotel/Motel, Office
- We currently don't model for new Mobile Home developments or Group Quarters

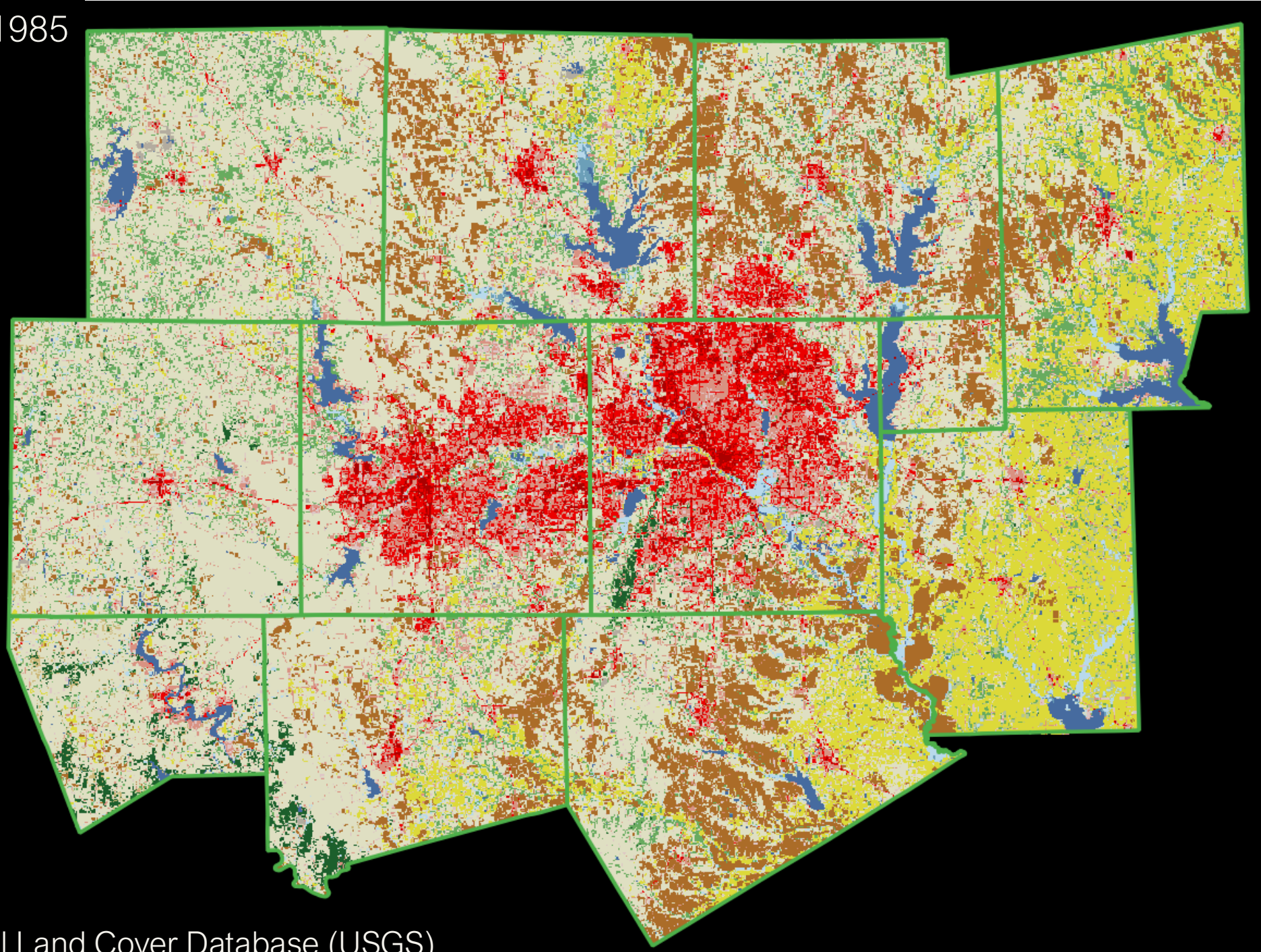




MPA SUMMARY

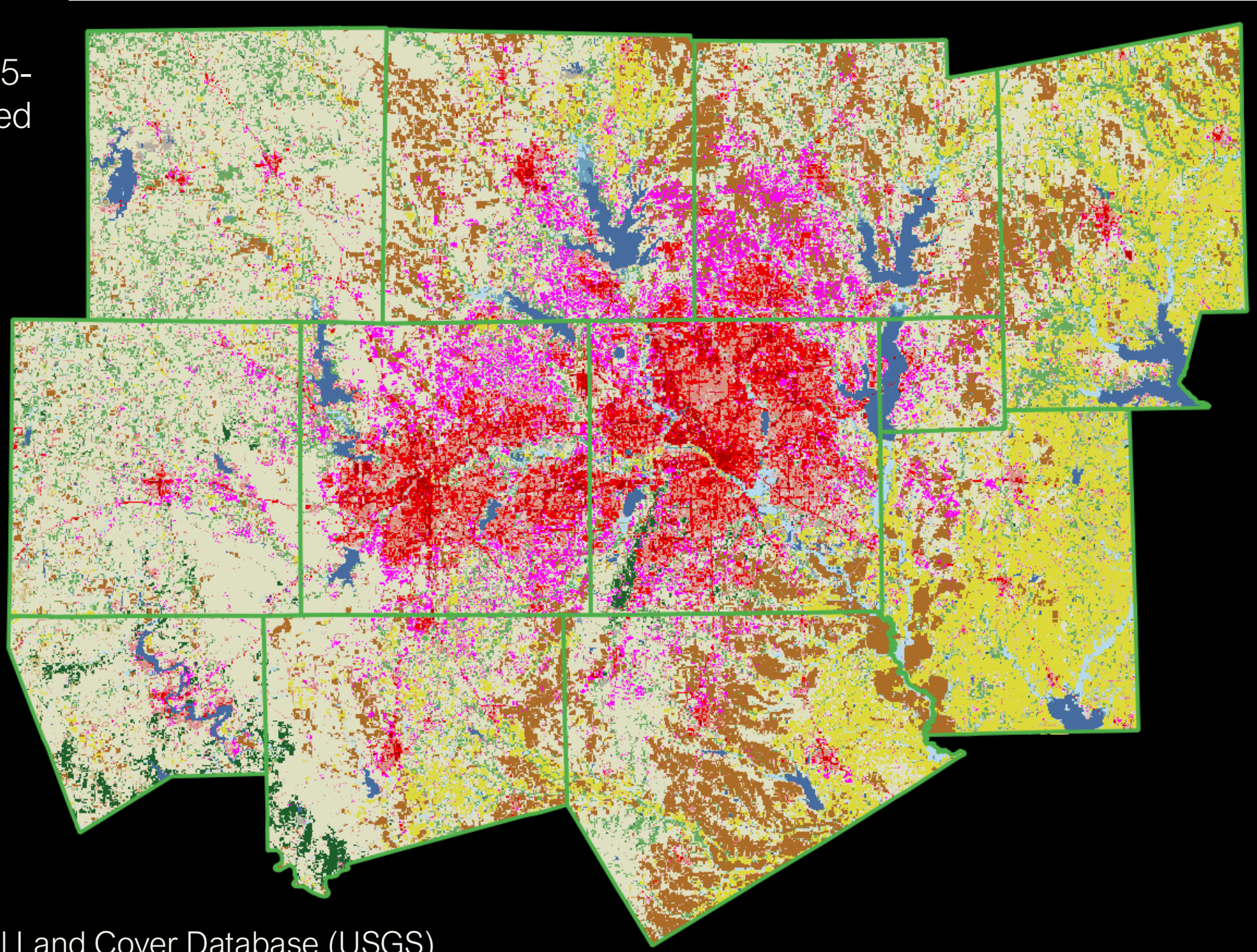
- 15 unique land cover categories
  - One of them represents >60% of all development activity
- 60 unique rock units
  - Top 10 represent > 80% of all development activity

Land Cover - 1985



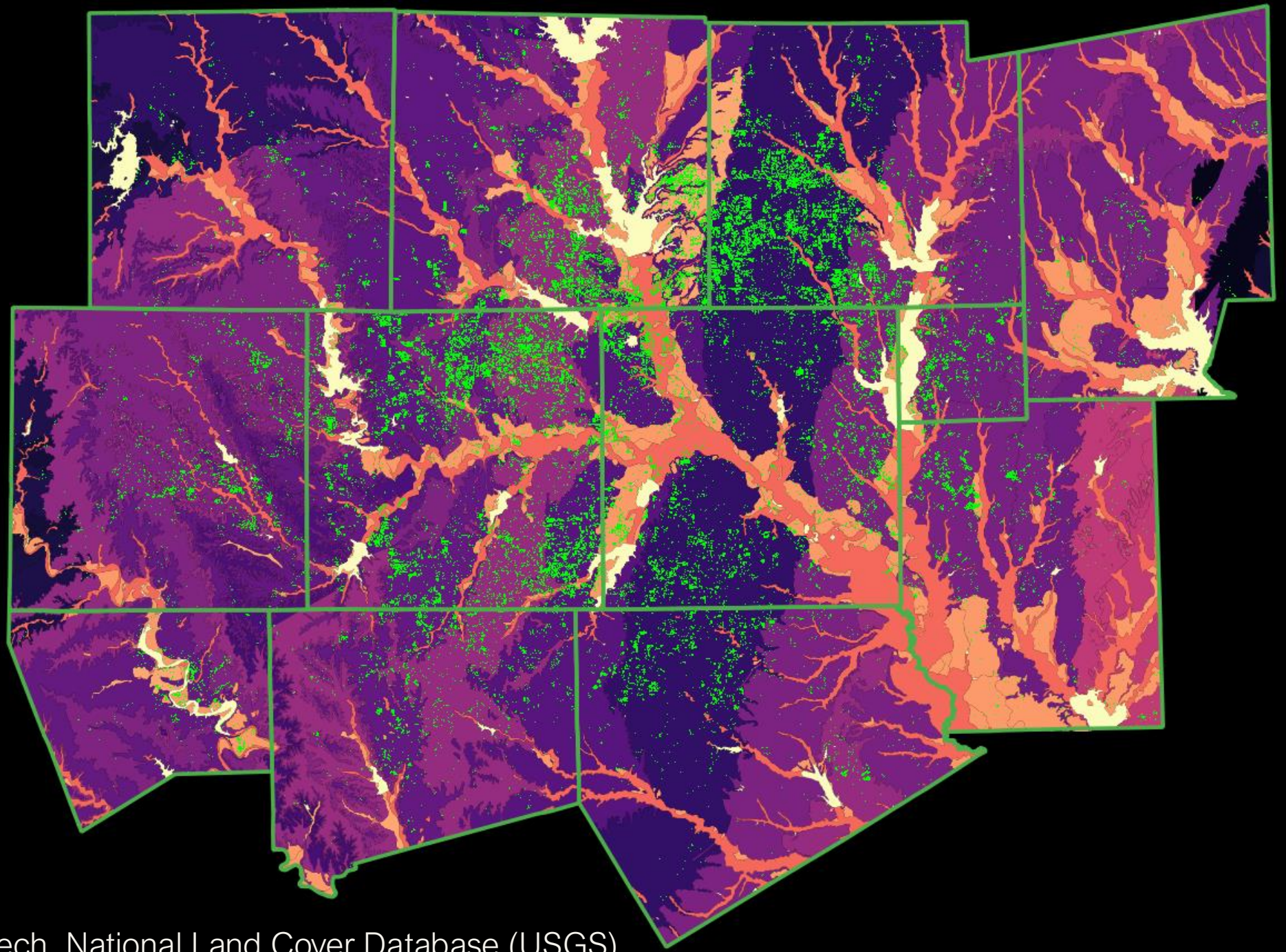
Source: National Land Cover Database (USGS)

Land Cover – 1985 with 1985-2010 Developed Change



Source: National Land Cover Database (USGS)

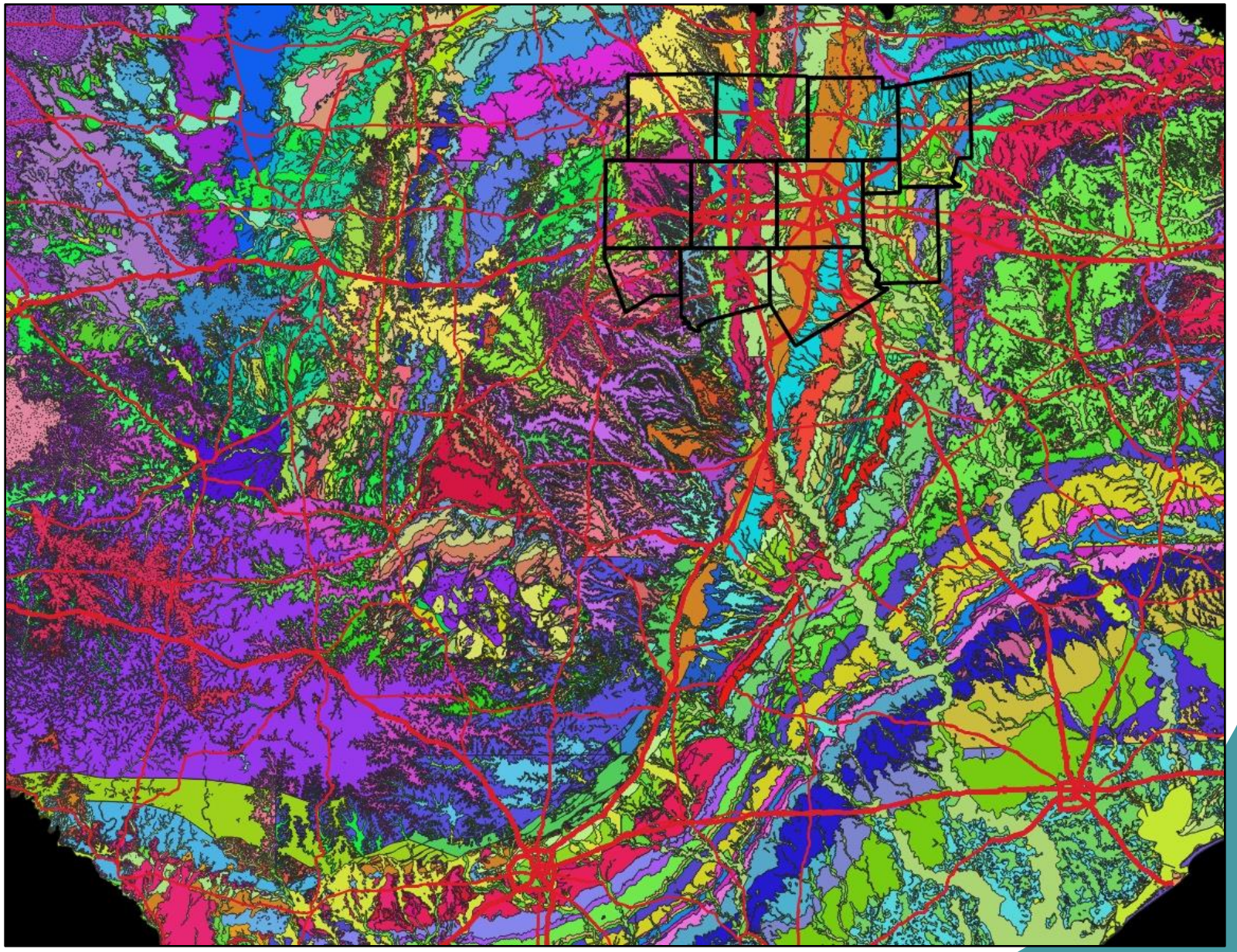
Surface Geology



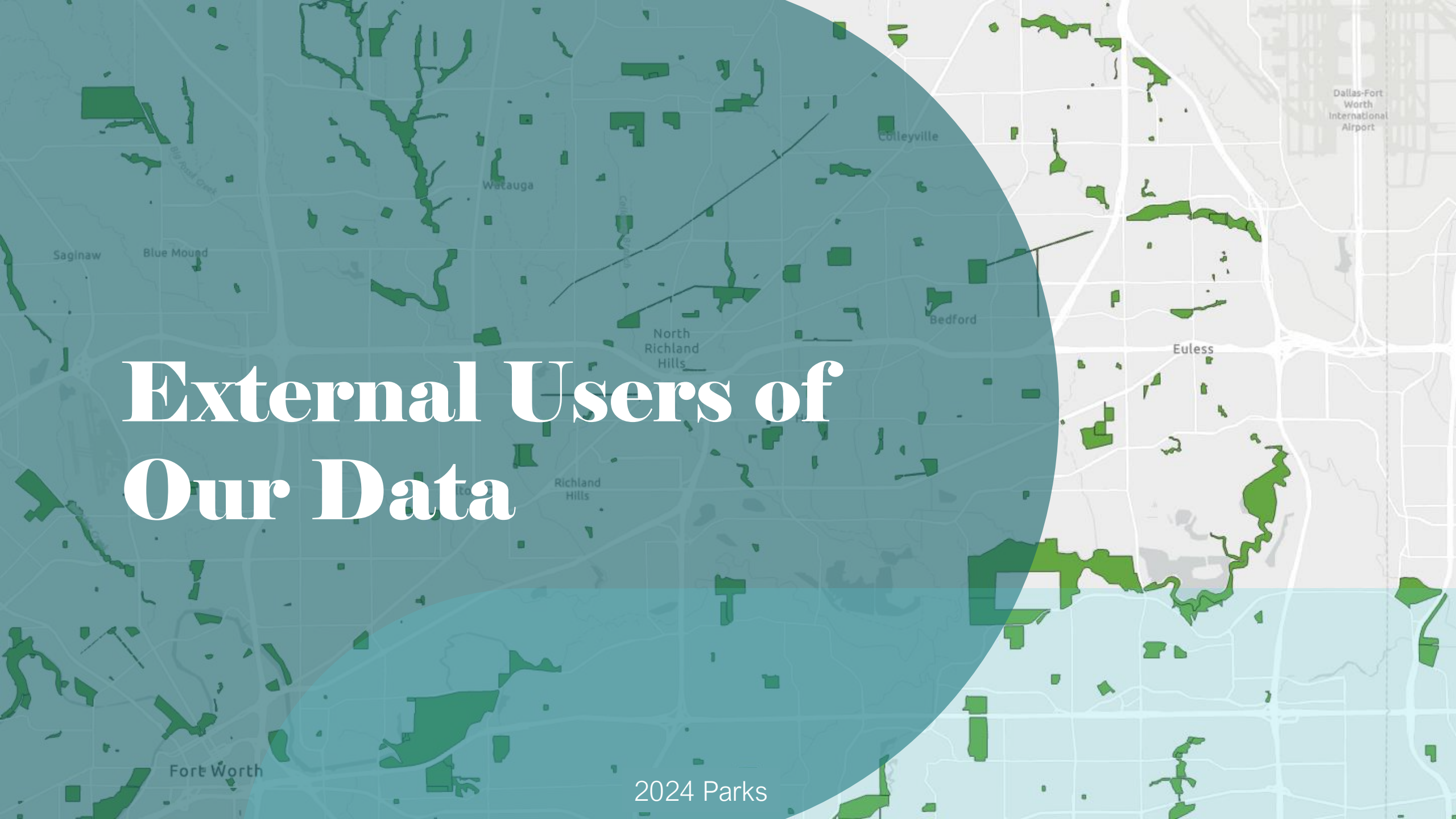
Source: Texas Tech, National Land Cover Database (USGS)

AUSTIN CHALK

- Kau
- Chalk – Soft, white, porous, sedimentary carbonate rock
- Marl – Carbonate clay or mudstone
- Deposited during ancient inland sea
- Runs from Sherman-Denison area all the way to Austin & San Antonio



External Users of Our Data



2024 Parks

Organizations That Have Accessed Our Data

7-Eleven Inc	Banks	Counties	Healthcare Providers	Other COGs	Universities
AECOM	BNSF	Developers	HERE Technologies	Realtors	US Postal Service
Apple	Chambers of Commerce	Economic Development Orgs	Home Builders	School Districts	Utilities
Appraisers	Cities	Elected Officials	Law Firms	TomTom	Walmart
Architectural & Engineering Firms	Commercial Real Estate	Emergency Response	Media	Transit and Transportation Agencies	World Bank Canada
	Consultants	Federal & State Agencies	Non-Profit Orgs	Trimble	

How to Get Involved?

2024 Lakes

How Can You Participate?

Annual Data Call

Annual Estimates Survey

GIS Newsletter

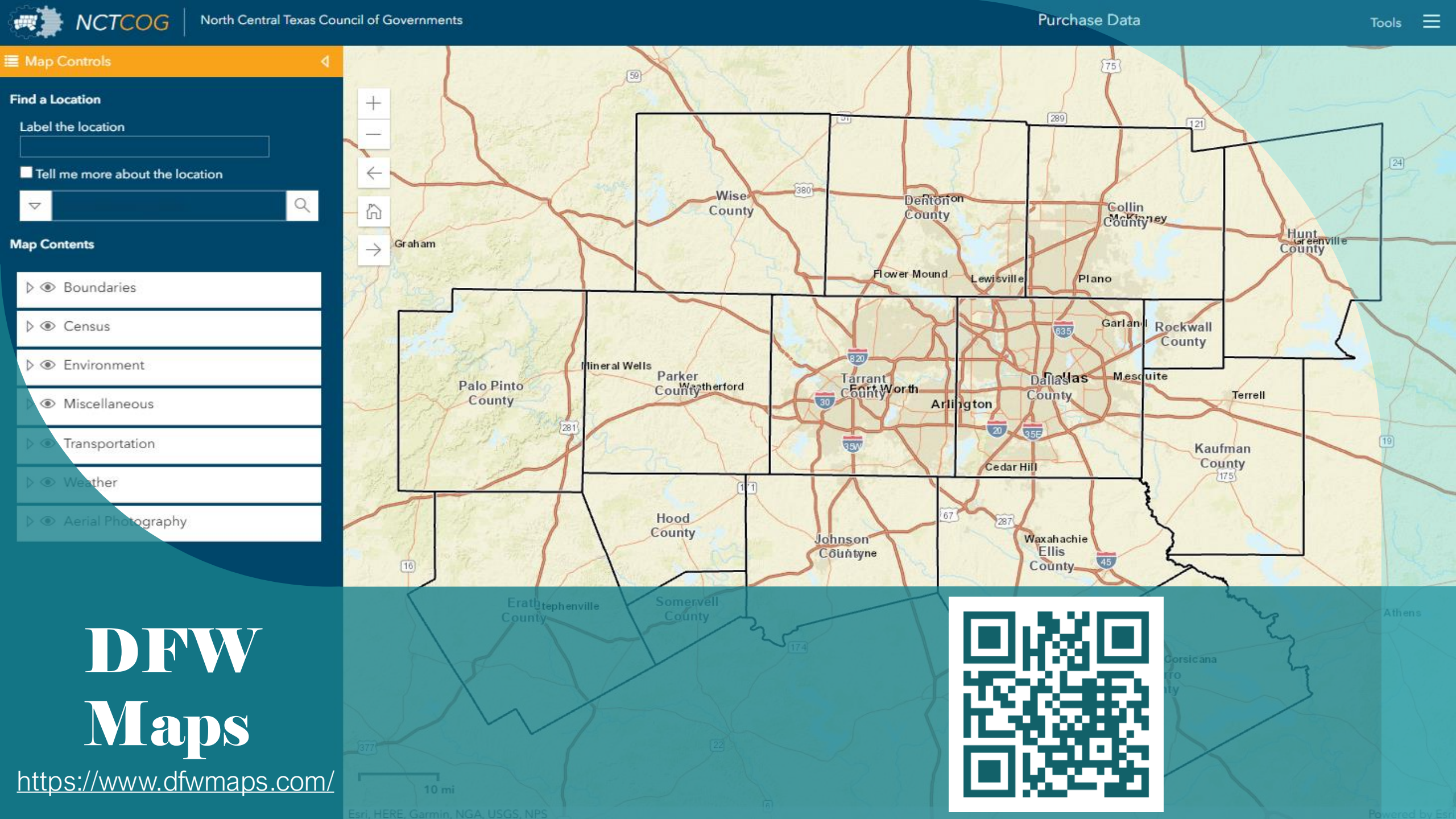
Forecast Local Review

Send us data at any time

Regional GIS Meeting

How Can You Access Our Data?

Development Monitoring



DFW Maps

https://www.dfwmaps.com/

NCTCOG Open Data Site

https://data-nctcoggis.hub.arcgis.com/

Thank you

Questions?

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SDCP

Open Data Site

DFW Maps