



Using GIS to Identify Environmental Justice Populations

Regional GIS Meeting May 11, 2011

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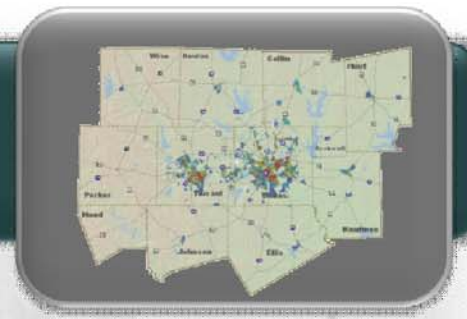
What is Environmental Justice?



- Executive Order 12898 signed in 1994
- Mandated all federal agencies *identify* and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations
- Ensure full and fair participation for all communities



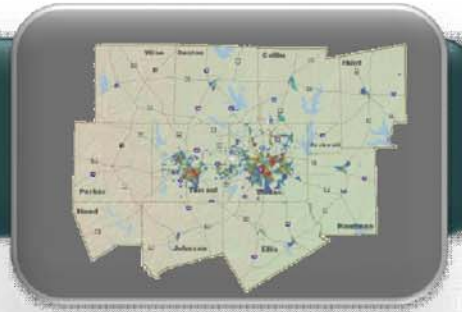
Analysis Needs



- Technical approach to analysis
- Identification technique based on academically proven methodology **not** intuition
- Use GIS to identify concentrations of EJ populations
- Results can become input in TransCAD for analysis



Populations



Basic EJ Populations

Mandated by EO 12898

Minority

- Black
- Hispanic
- Asian
- American Indian & Native Alaskan
- Native Hawaiian & Pacific Islander

Low Income

Optional Populations

Project specifications determine applicability

LEP

Persons with Disabilities

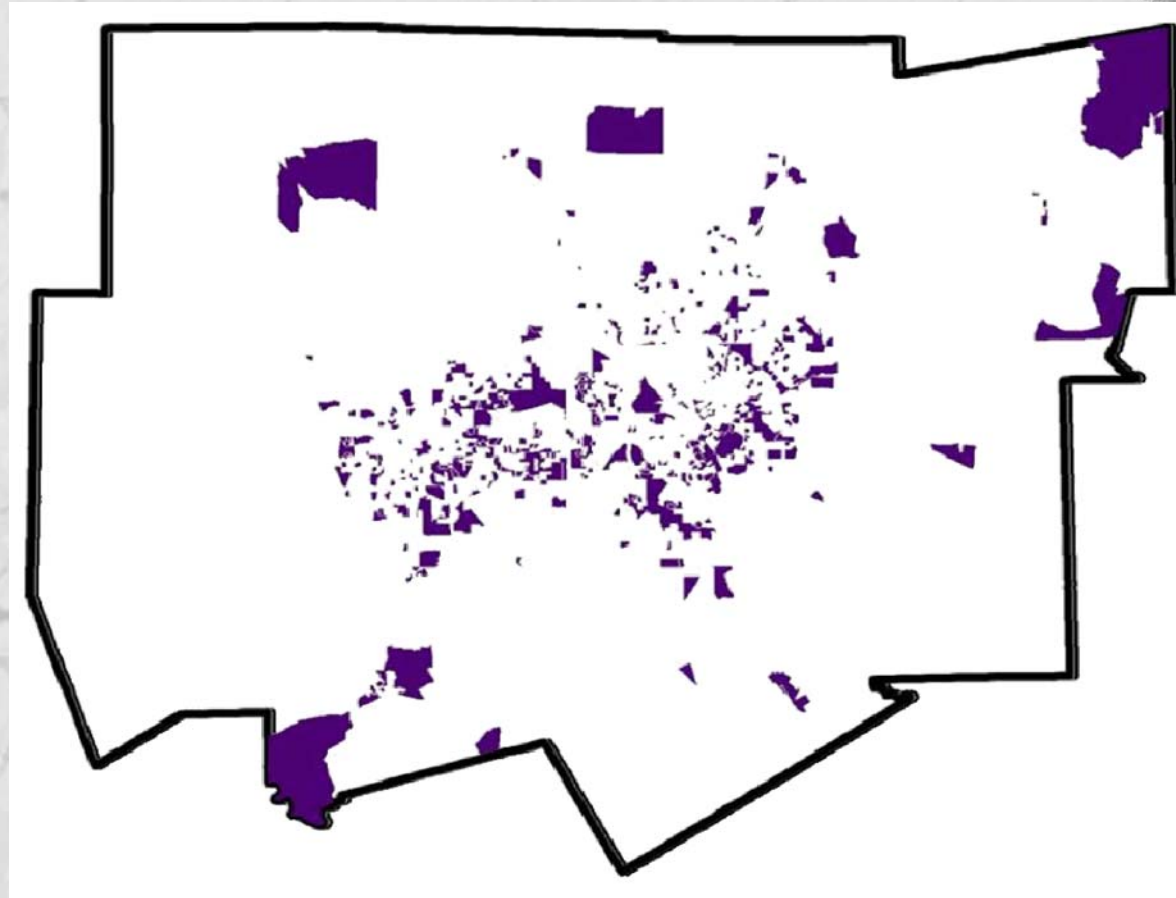
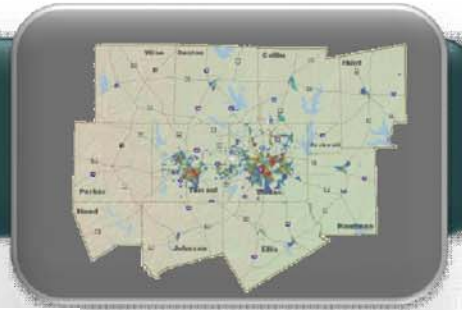
Over 65

Female Head of Household

Zero Car Household



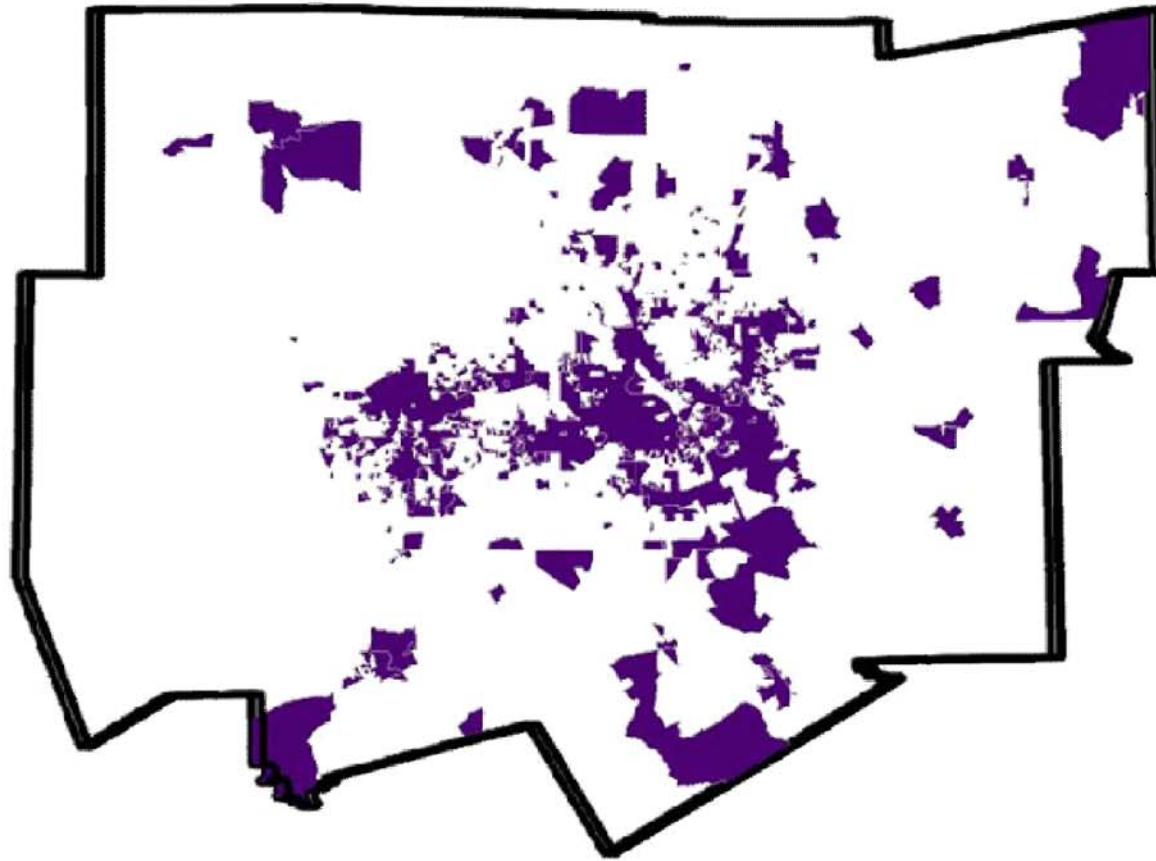
Previous Mapping Efforts



Populations mapped individually based on regional average



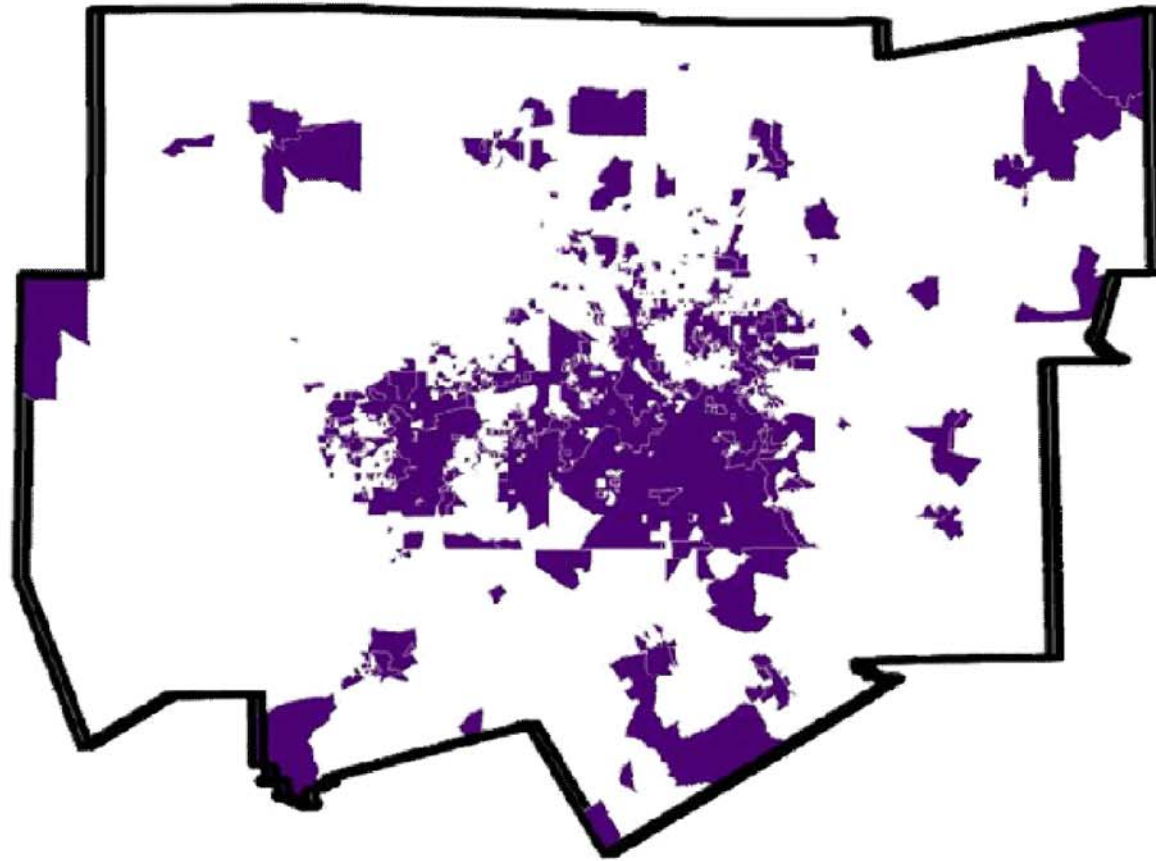
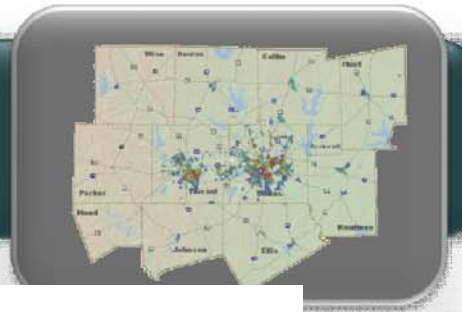
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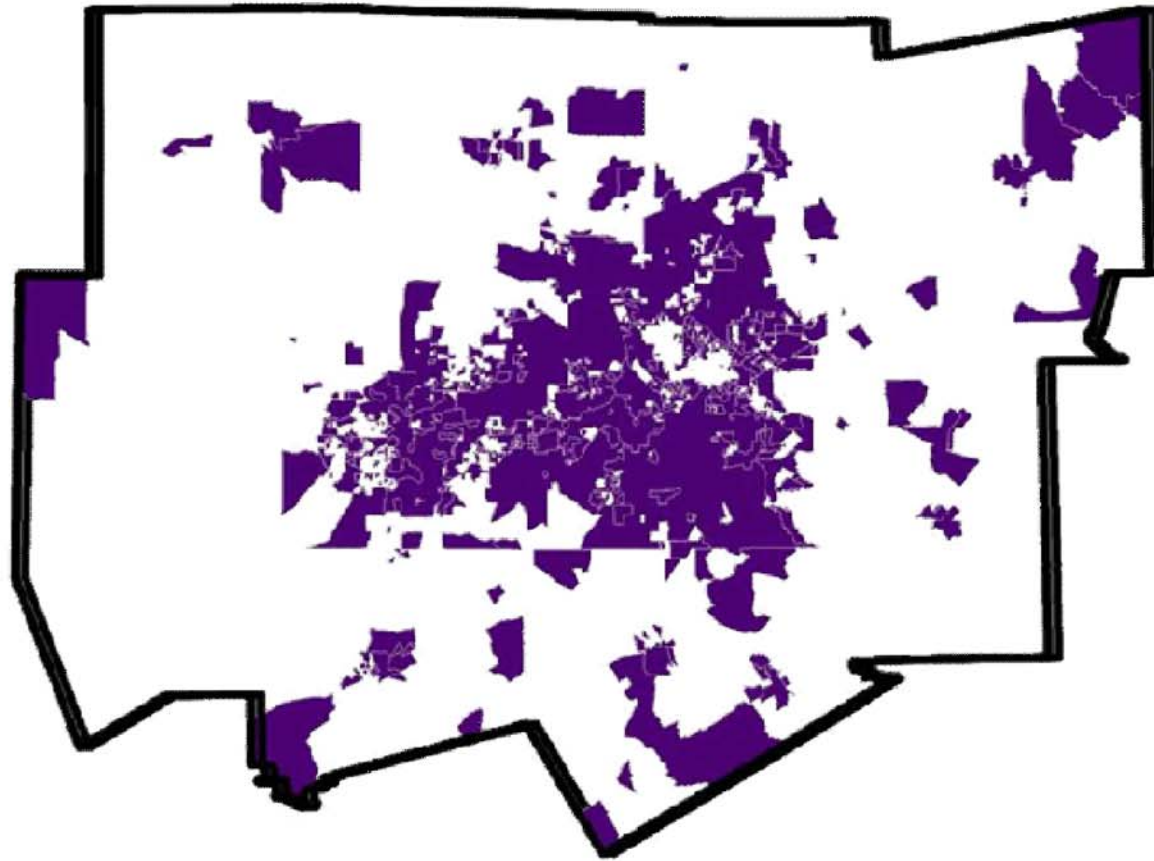
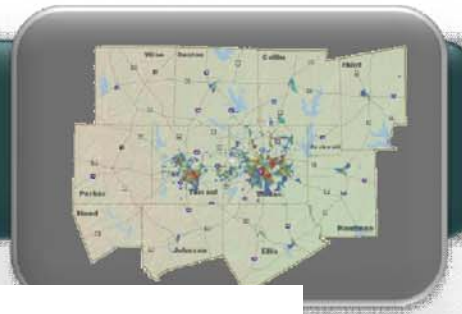
Previous Mapping Efforts



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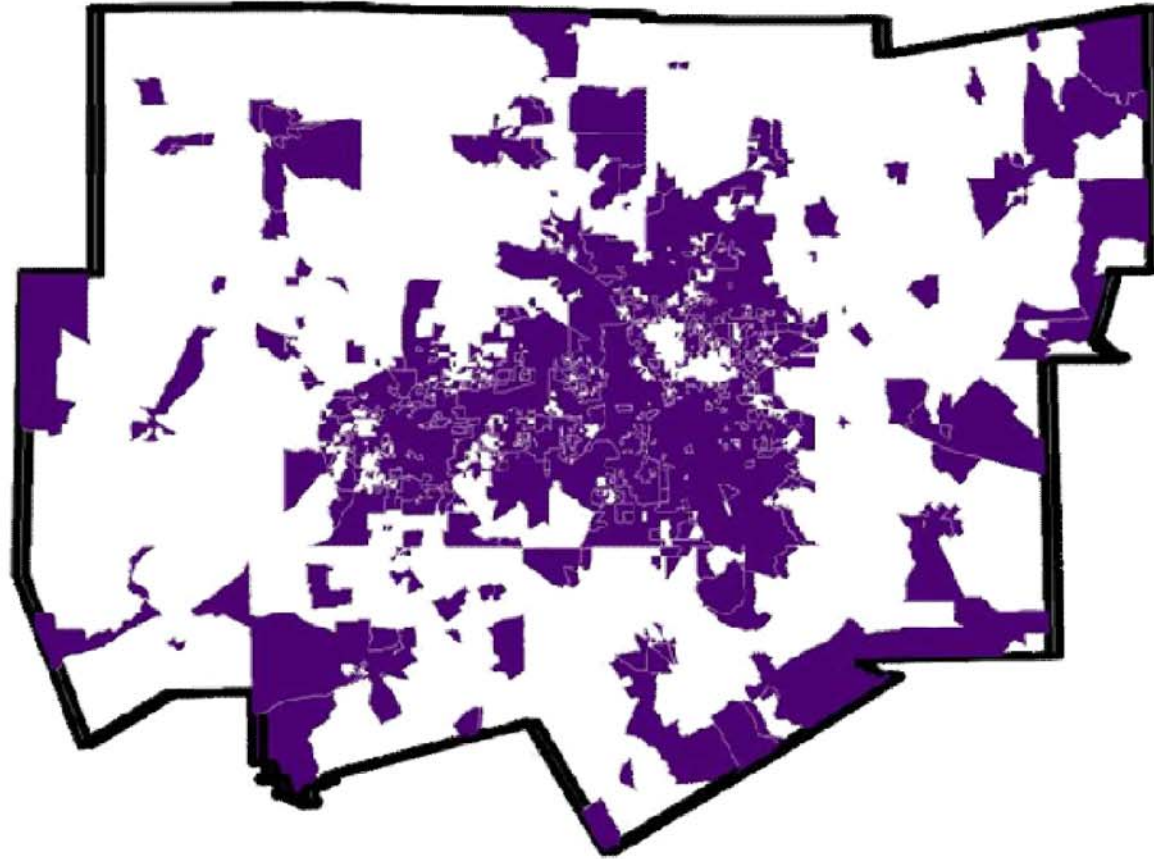
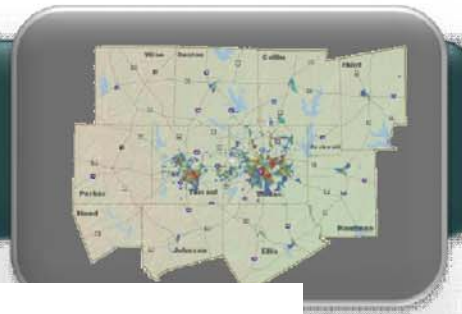
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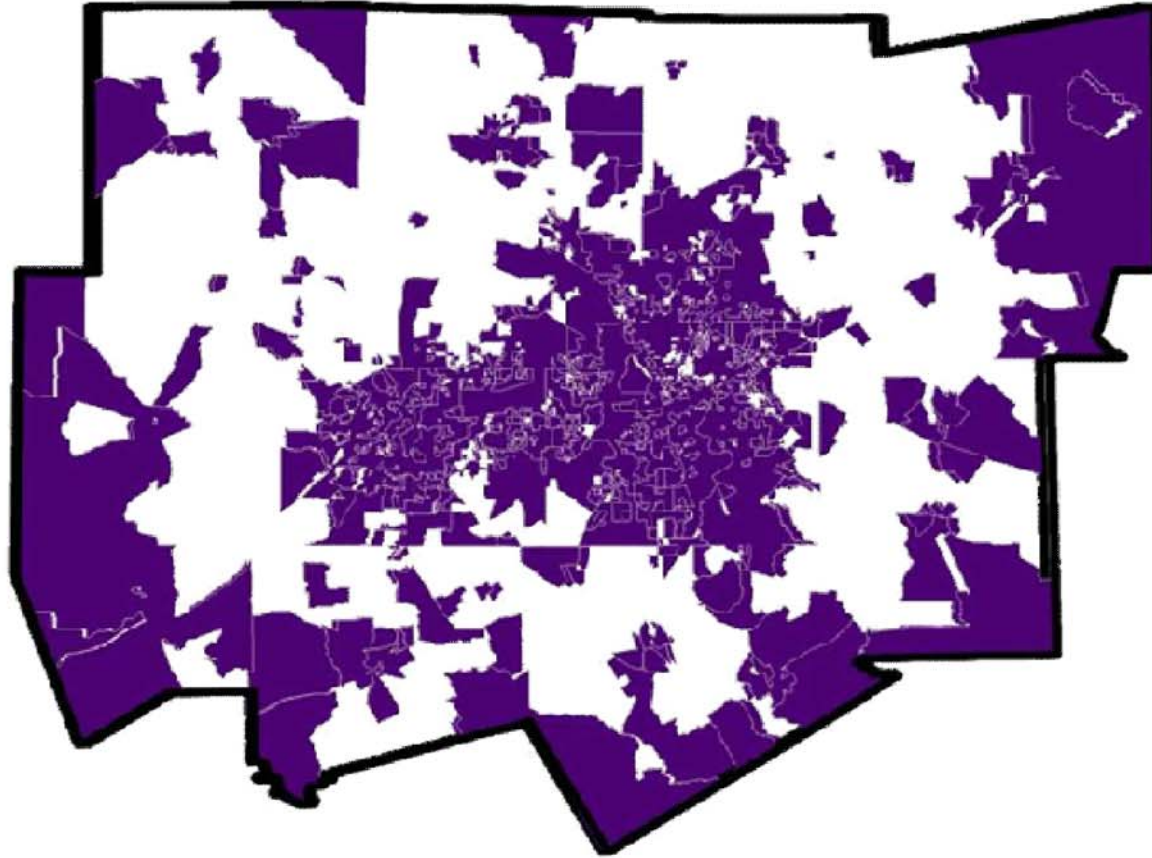
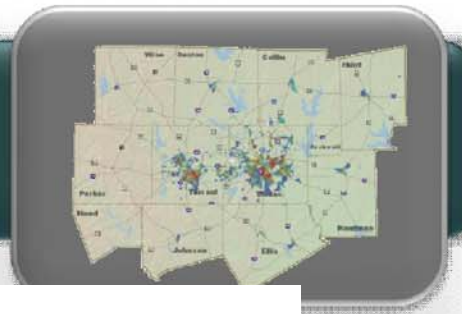
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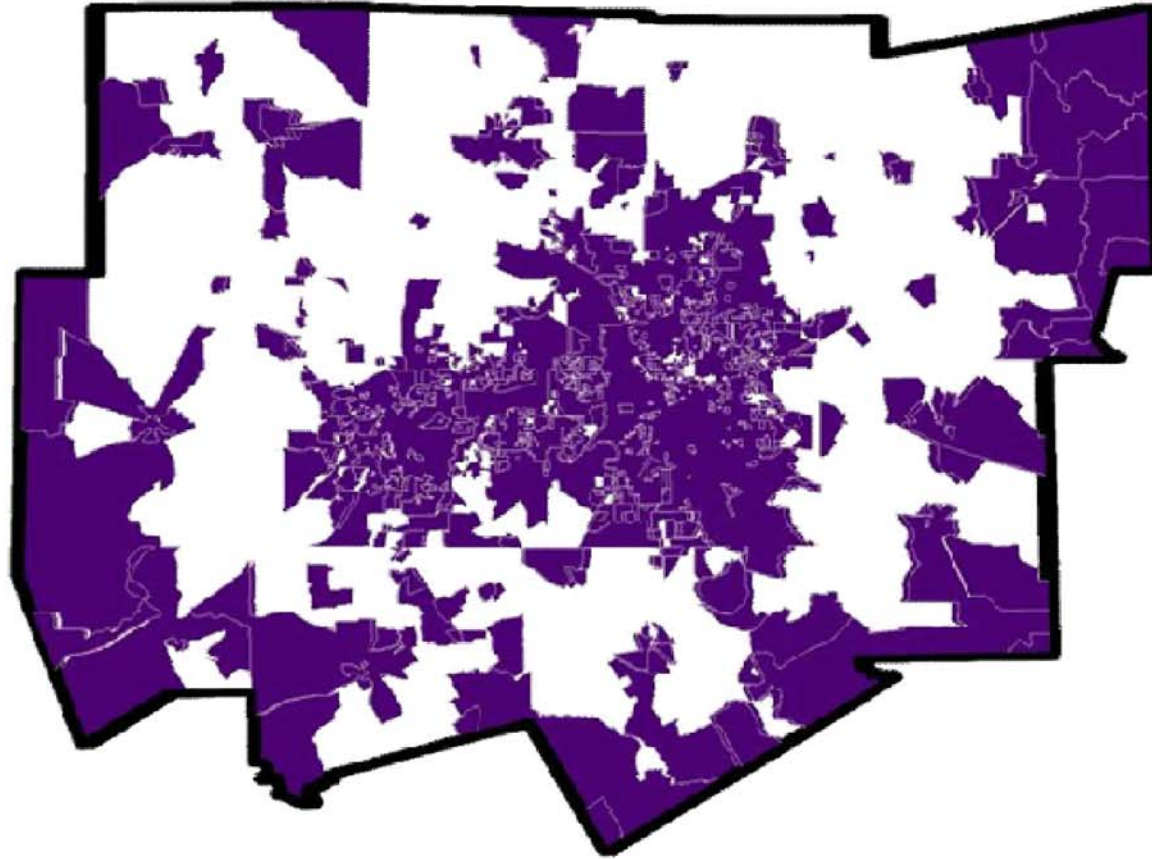
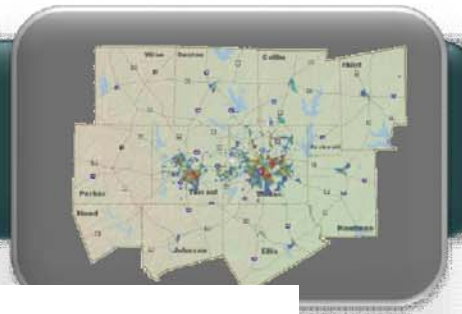
Previous Mapping Efforts



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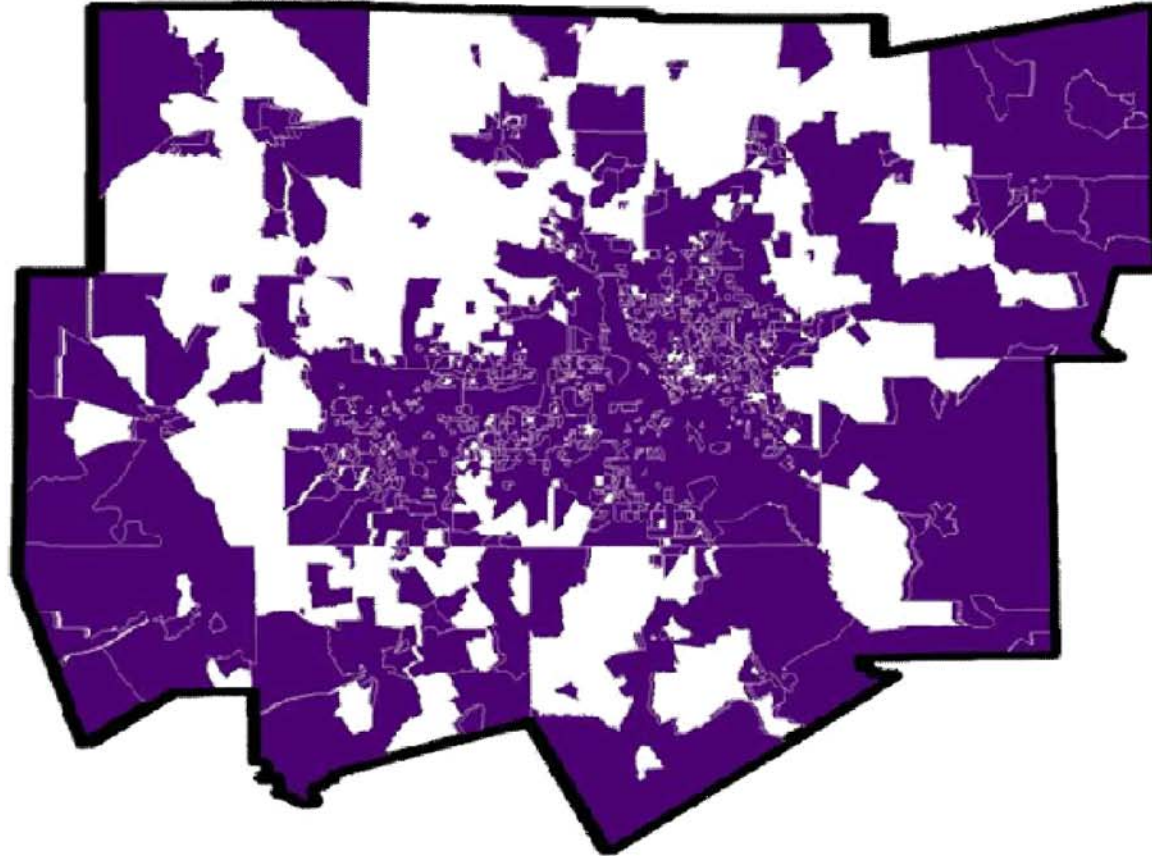
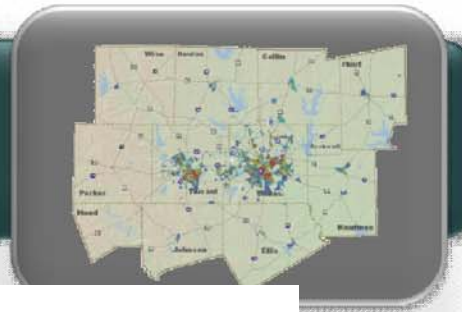
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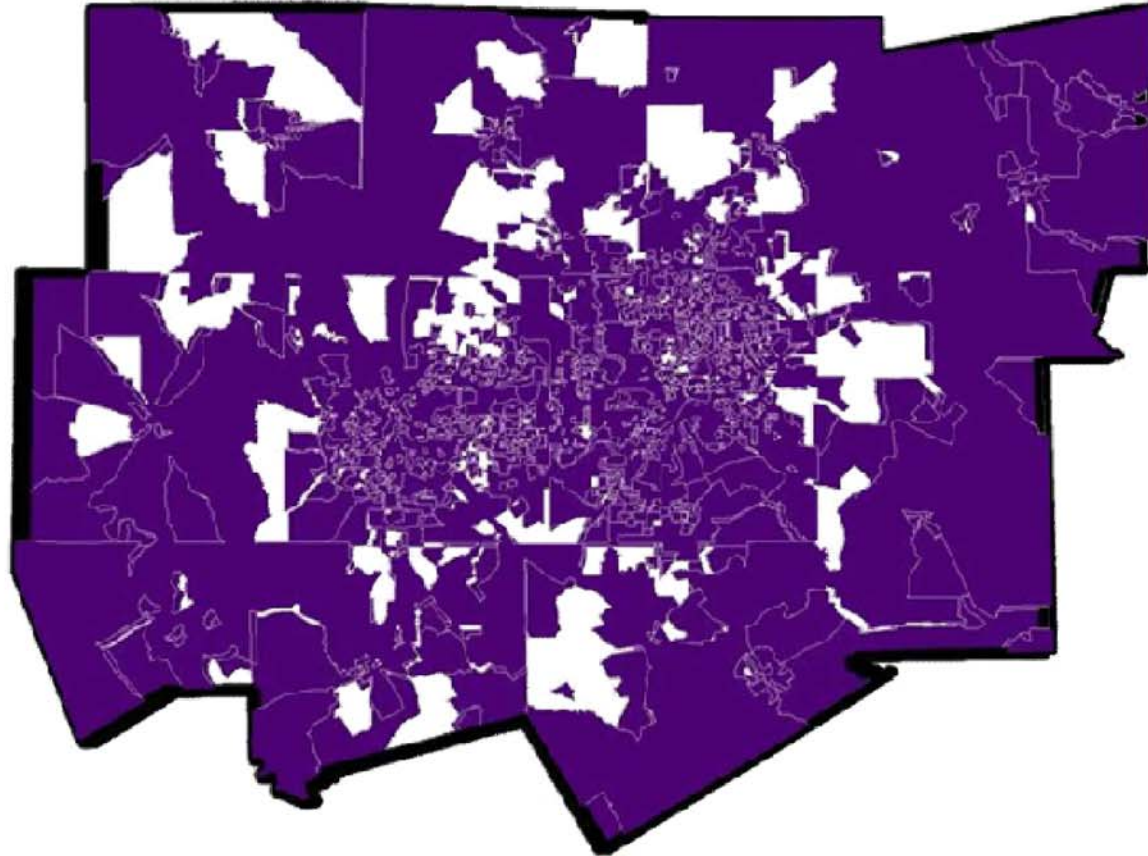
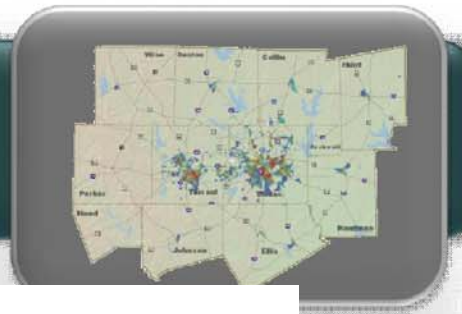
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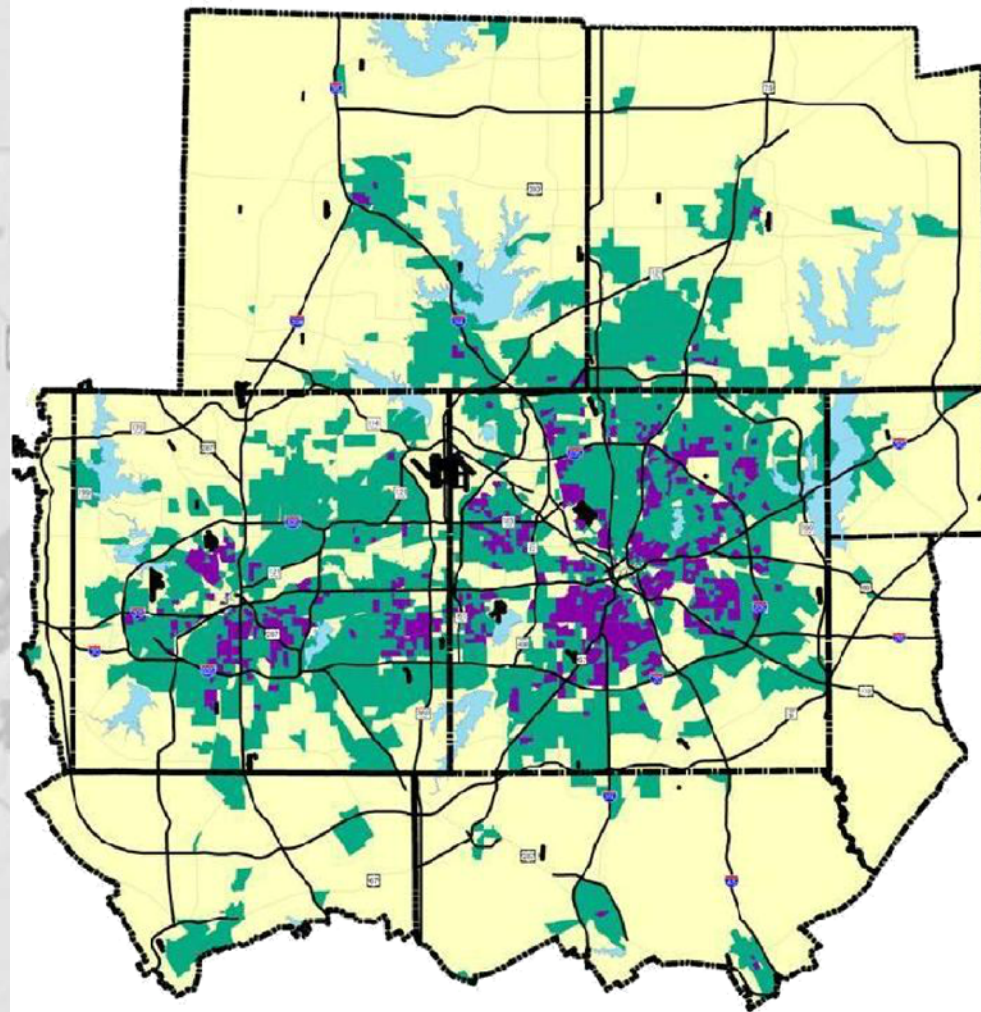
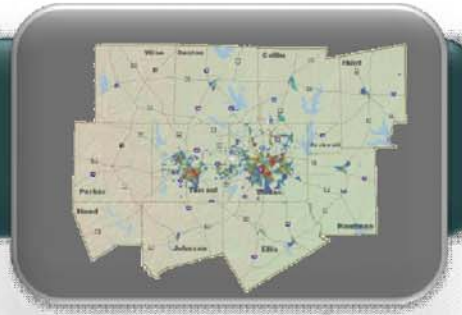
Previous Mapping Efforts



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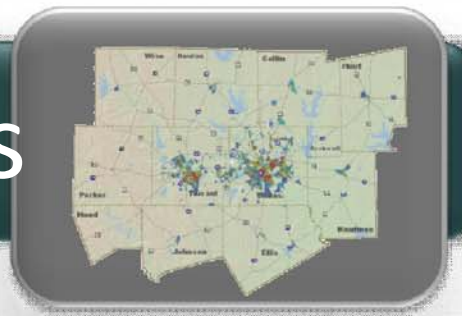
Previous Mapping Efforts



Populations aggregated and displayed by standard deviation



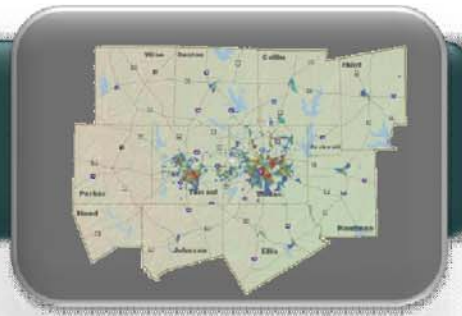
Previous Identification Challenges



- No standard methodologies across MPOs, DOTs, or Federal agencies
- Meet needs of diverse projects and programs
- Questions
 - What variables do we use?
 - How do we break them down or rank them?
 - Do we combine protected classes?
 - If so, how?



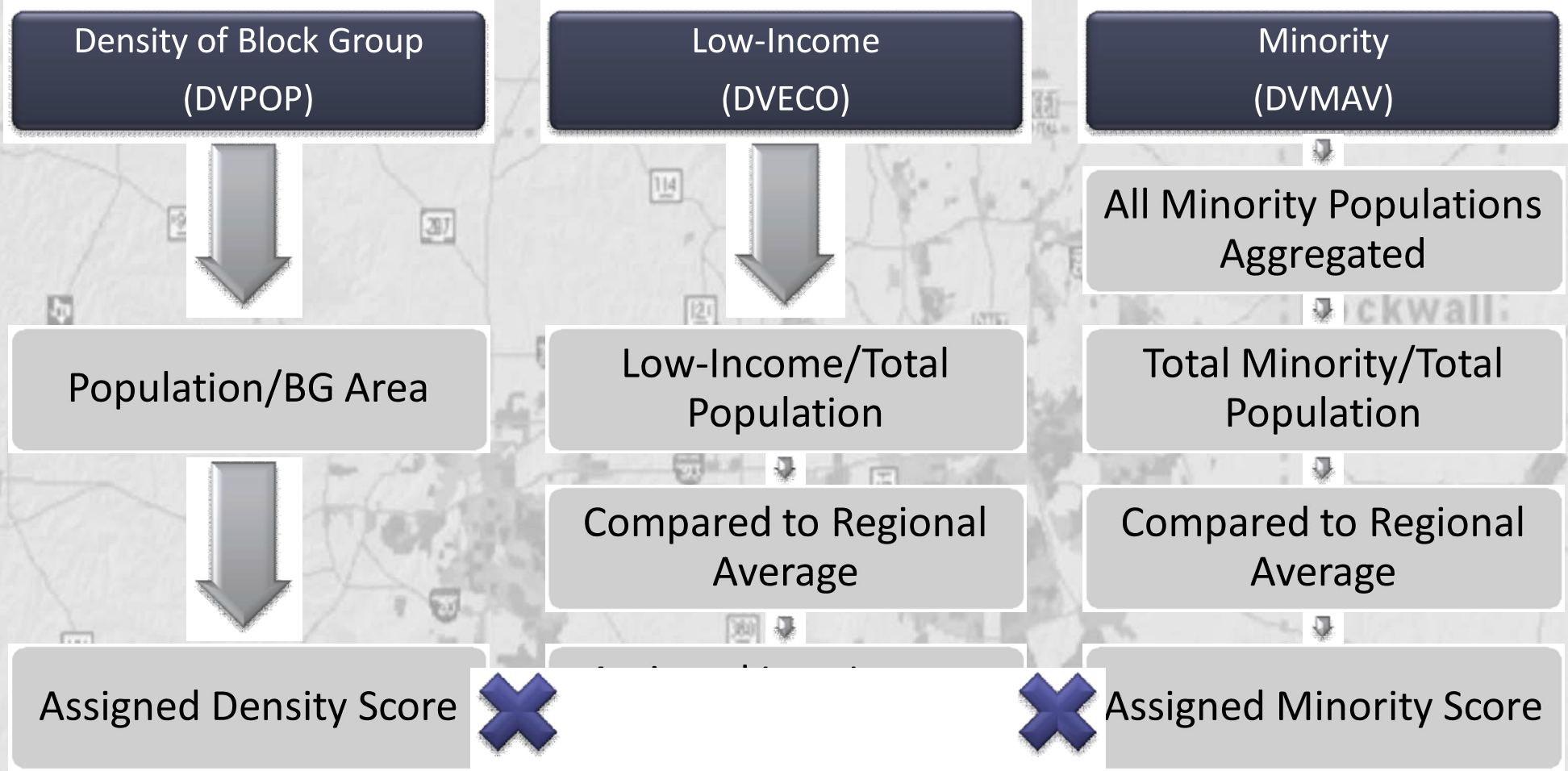
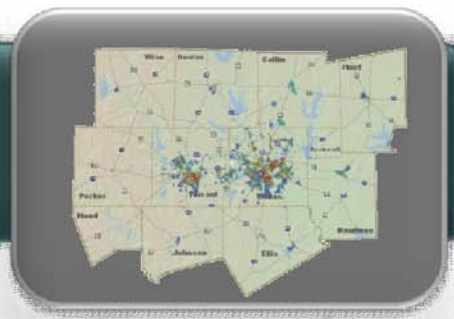
EJI Methodology



- Methodology based on TRB NCHRP Report 532 “Effective Methods for Environmental Justice”
 - Recommended this method for regional transportation analysis
- Mapped by Census block groups
- Index of three variables
 - Population Density
 - Percent Below Poverty
 - Percent Minority
- Scores are multiplied for a possible score of 1-100



Basic EJI Methodology



BASIC EJI

Scoring



Population Density (DVPOP)

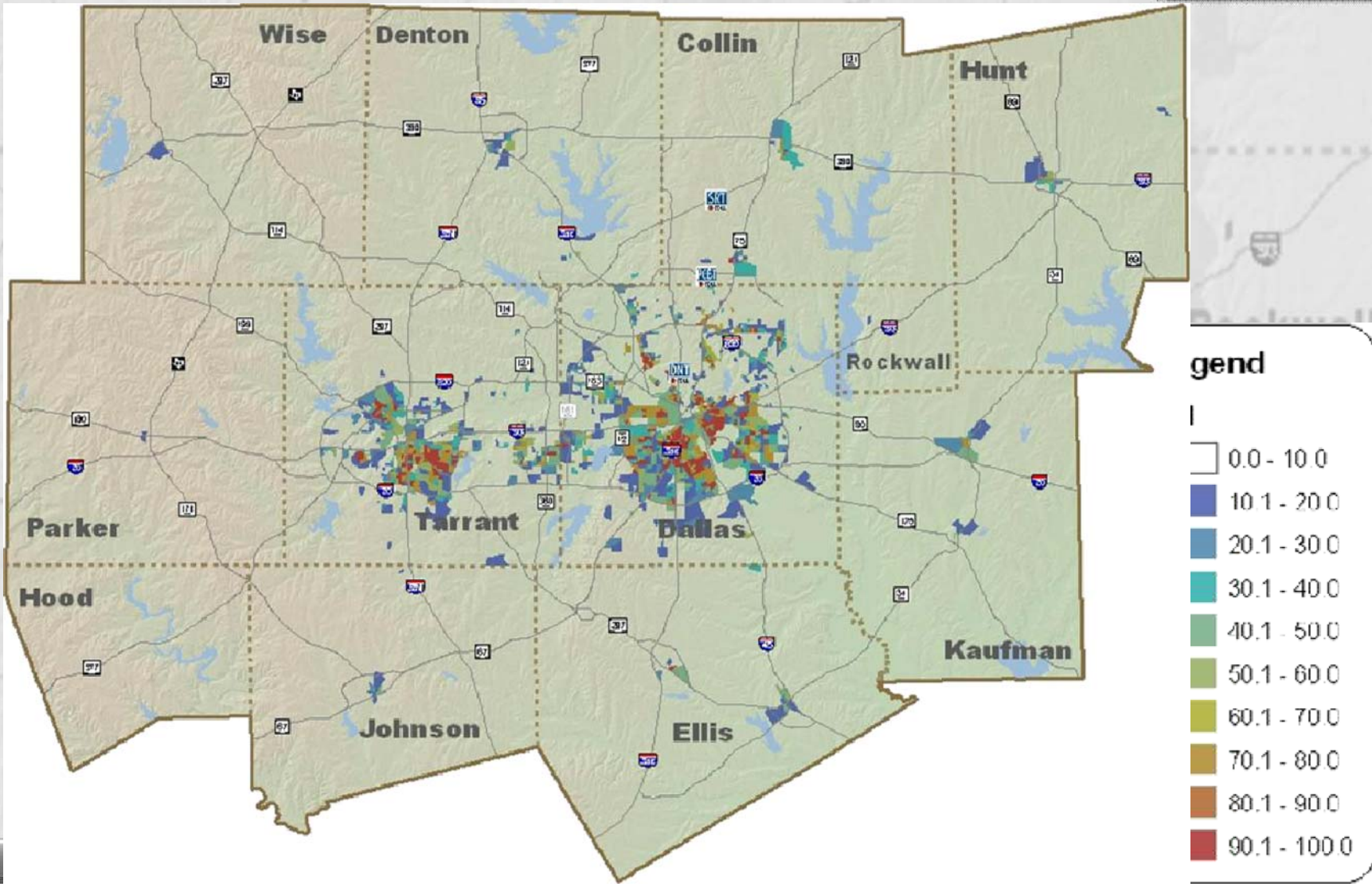
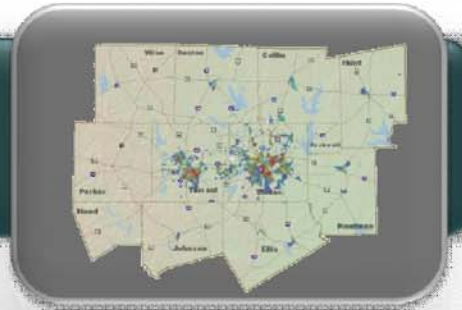
Score	Density Value	Percentile
0	≤ 126	5 th
1	> 126 and ≤ 381	10 th
2	> 381 and $\leq 1,282$	20 th
3	$> 1,282$ and $\leq 3,153$	40 th
4	$> 3,153$	60 th

Percent Below Poverty and Minority (DVECO, DVMAV)

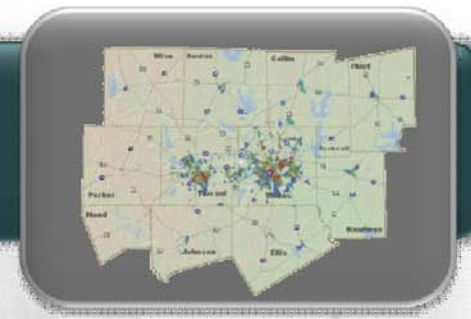
Score	Percent Minority & Low Income
1	\leq Regional Average (RA)
2	$> RA$ and $\leq 1.33 \times RA$
3	$> 1.33 \times RA$ and $\leq 1.66 \times RA$
4	$> 1.66 \times RA$ and $\leq 2.0 \times RA$
5	$> 2.0 \times RA$



Results- EJI Map



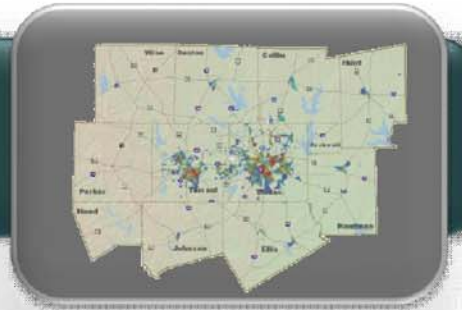
Adding Additional Populations



- Need for Analysis of Additional Populations in Specific Program Areas
- NCHRP Report Suggests that Additional Variables can be Added as Needed
 - Report gave no methodology for adding additional populations
 - Added the ability to incorporate Over 65 and Disabled in EJI
- Did not Weight the Additional Populations the Same as 3 Basic EJI Variables



Scoring Additional Variables

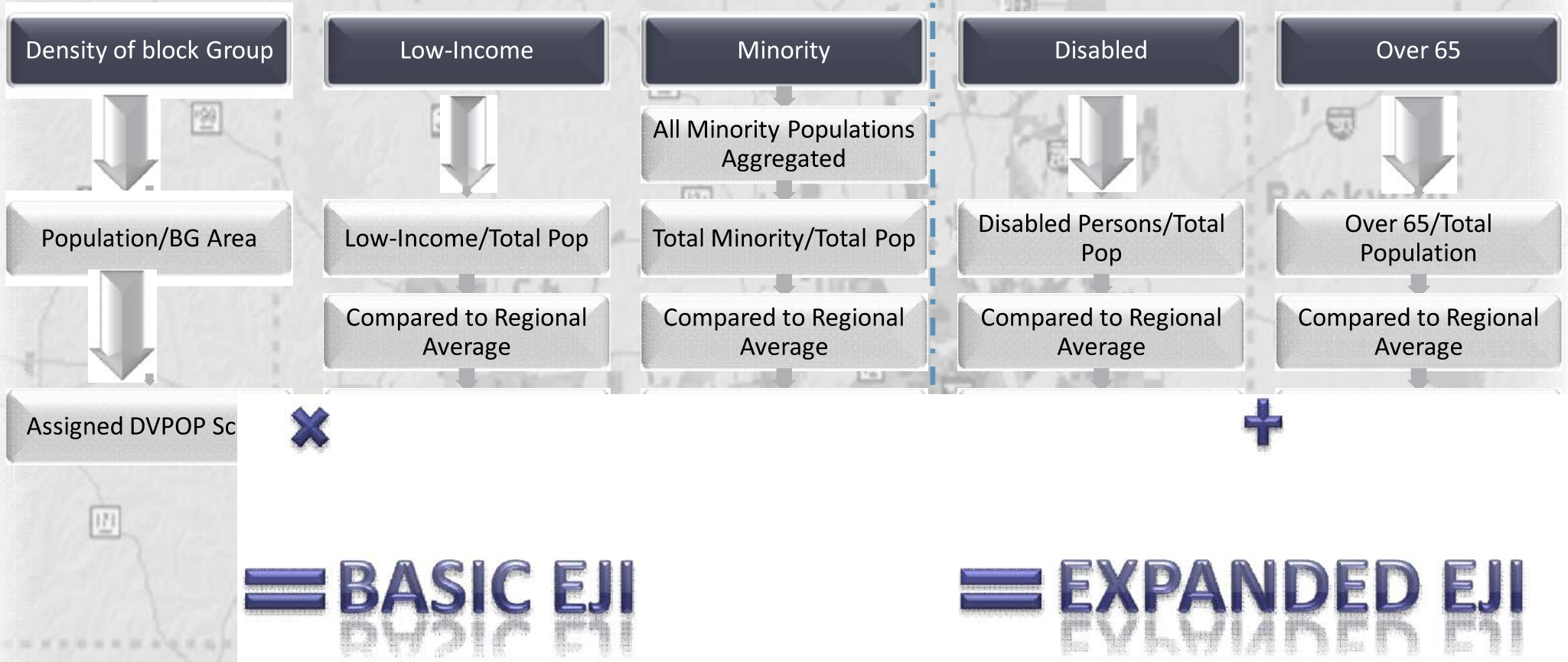
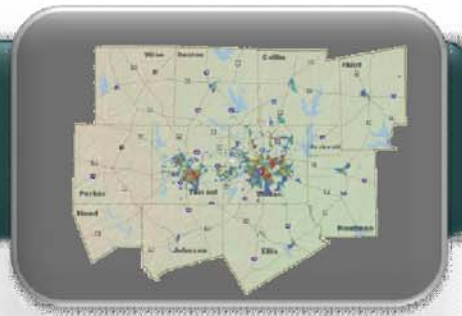


Percent Disabled or Over 65	Score
\leq Regional Average (RA)	0
$>$ RA and $\leq 1.33 \times$ RA	0
$> 1.33 \times$ RA and $\leq 1.66 \times$ RA	5
$> 1.66 \times$ RA and $\leq 2.0 \times$ RA	10
$> 2.0 \times$ RA	15

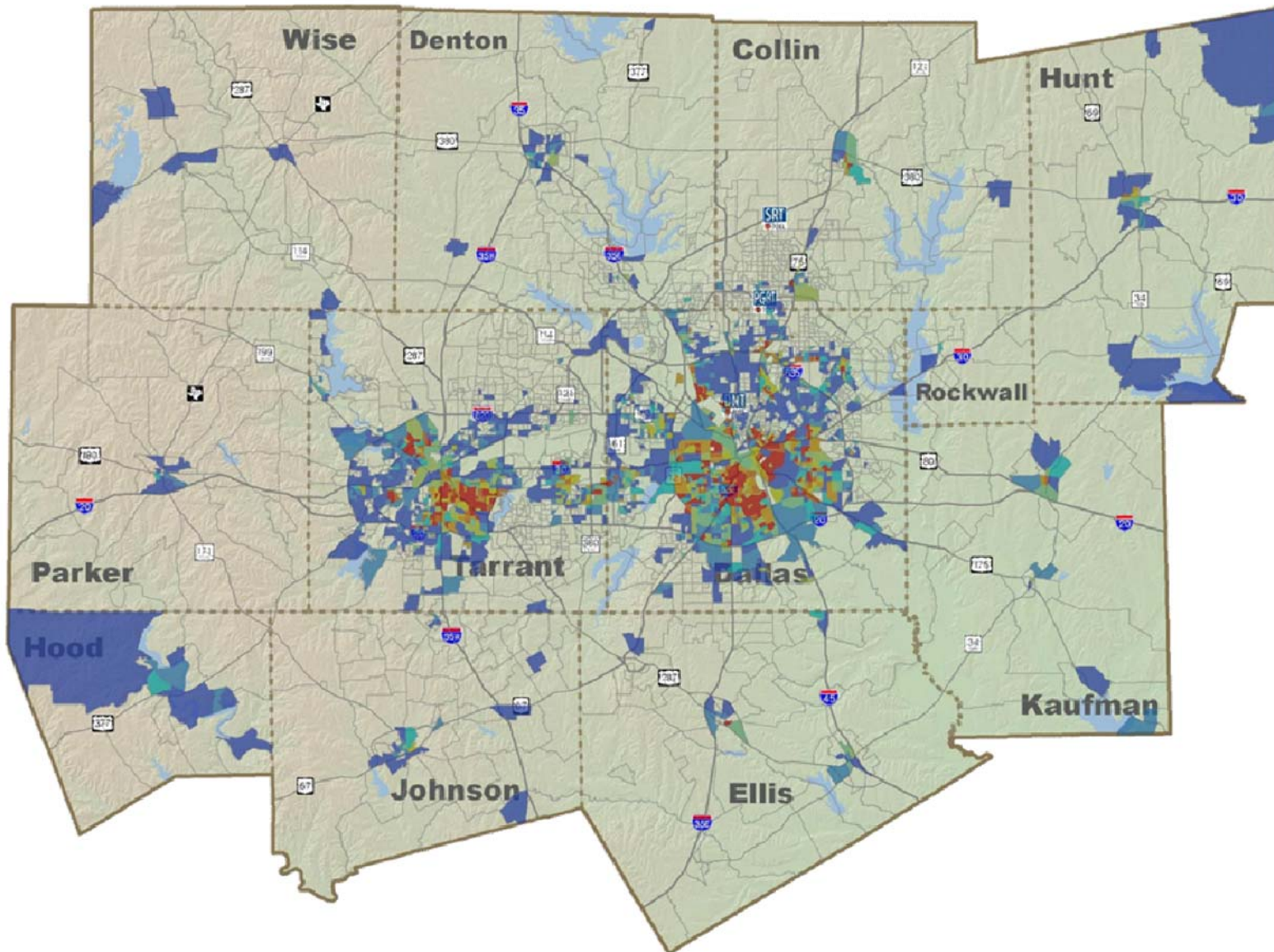
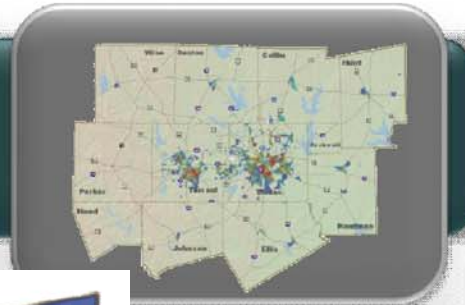
Variables	Calculation	EJI Range
Basic EJI: Density, Minority, Low-Income	DVPOP X DVMAV X DVECO	1-100
Basic EJI & Disabled	DVPOP X DVMAV X DVECO + DVDIS	1-115
Basic EJI & Over 65	DVPOP X DVMAV X DVECO + DVSixtyFive	1-115
Basic EJI, Over 65 & Disabled	DVPOP X DVMAV X DVECO + DVDIS + DVSixtyFive	1-130



Calculating Additional Variables



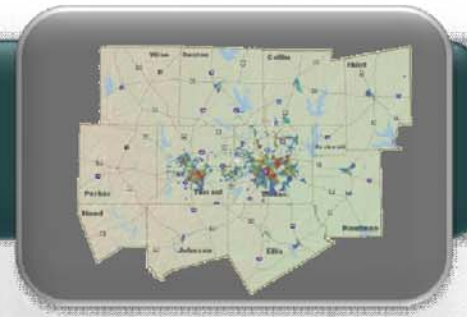
Results- EJI+ Map



end

- | 0.0 - 10.0
- | 10.1 - 20.0
- | 20.1 - 30.0
- | 30.1 - 40.0
- | 40.1 - 50.0
- | 50.1 - 60.0
- | 60.1 - 70.0
- | 70.1 - 80.0
- | 80.1 - 90.0
- | 90.1 - 125.0

Building a GIS Tool

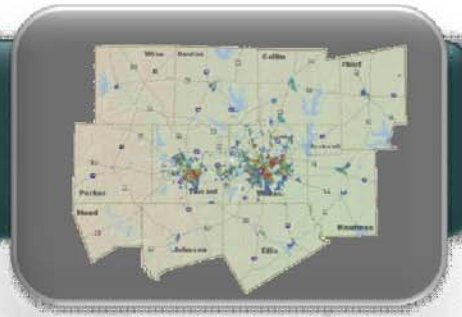


Building a tool in GIS allows information to be:

- Consistent: same methodology used every time
- Efficient: data housed in central location for quick access
- Dynamic: easily updated as new census data is available
- Comprehensive: additional layers available for further analysis



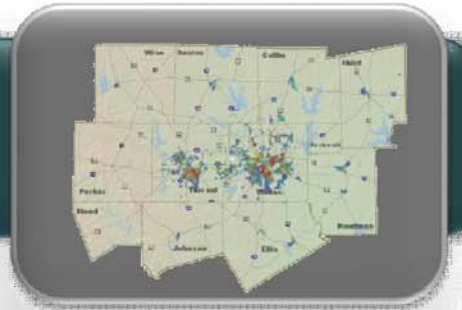
Tool Specifics



- ArcGIS Desktop Application
- Created in Visual Basic.net
- Database is housed in SQL Server
- Users select layers needed for analysis



Tool Interface



Basic EJI **must** be selected

Additional populations that can be added in EJI calculation or as overlay

LEP populations available for overlay

Individual populations displayed as above or below regional average

Load EJ Data

Select Variables

- Basic EJI Score
- Age 65 and over
- Persons with Disabilities
- Overlay Layers
- Zero Car Households
- Age 14 and under
- Limited English Proficiency (LEP)
- Total Percentage LEP
- Percent Asian
- Percent Spanish
- Percent Indo European
- Percent Others

Select Demographic Layers

- Asian Hispanic Black
- Hawaiian Pacific Islander
- American Indian Native Alaskan
- Female Head of Household
- Below Poverty Line

Load Data

BASIC EJI SCORE
AGE 65 AND OVER

Calculate Index Overlay Layers Cancel

All data is derived from SF1 census 2000 with the exception of Zero Car Households, Persons with Disability, Female Head of Households and Below Poverty line, which are from SF3 census 2000.

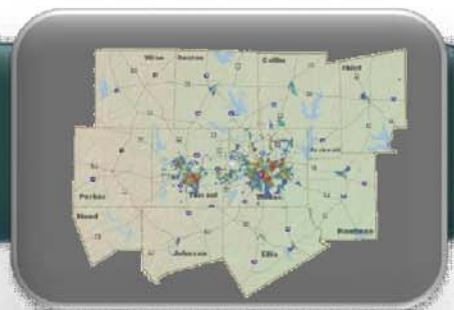
Shows all layers selected

Calculates EJI and generates layers

Description of data source



User Prompts



Load EJ Data

Select Variables

- Basic EJI Score
- Age 65 and over
- Persons with Disabilities

Overlay Layers

- Zero Car Households
- Age 14 and under

Limited English Proficiency

- Total Percentage LEP
- Percent Asian
- Percent Spanish
- Percent Indo European
- Percent Others

Select Demographic Layers

- Asian Hispanic Black
- Hawaiian Pacific Islander
- American Indian or Alaska Native
- Female Head of Household
- Below Poverty

Load Data

Index **Overlay Layers** **Cancel**

NCTCOG_Tools

Please check the Basic EJI Score

OK

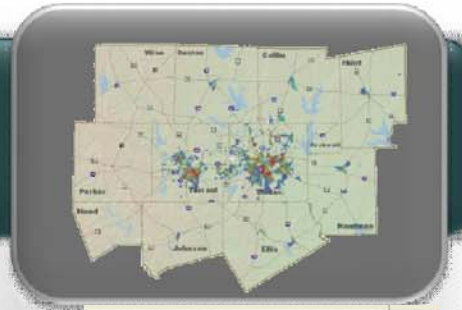
NCTCOG_Tools

The Census considers Hispanic an ethnicity, therefore choosing Hispanic and any Race simultaneously will result in double counting.

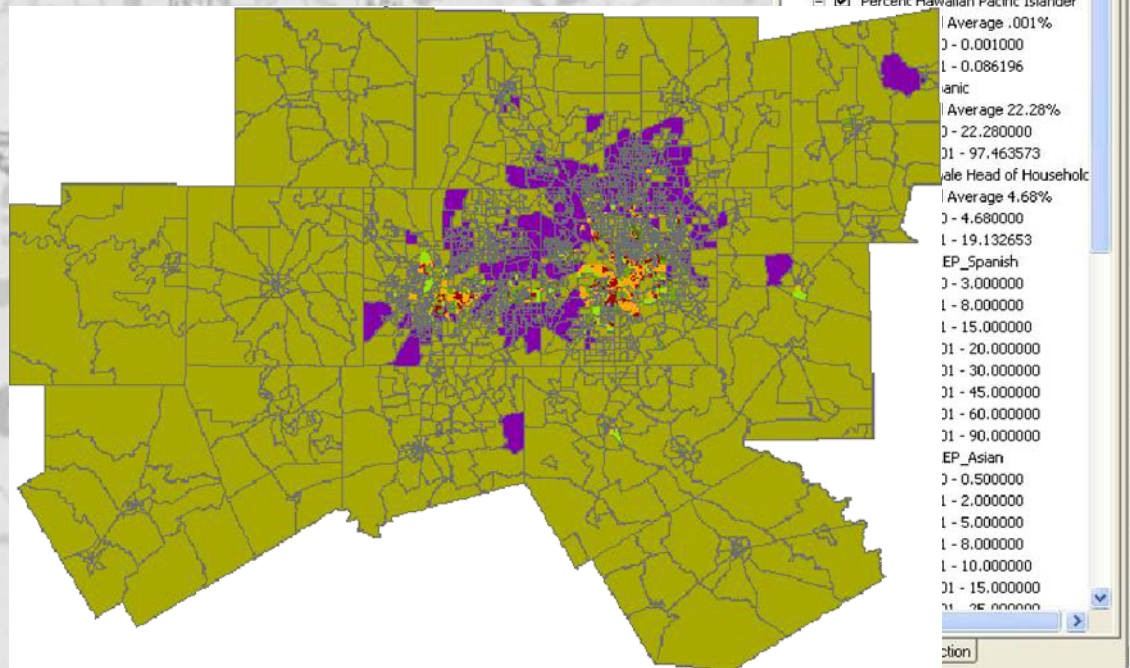
OK



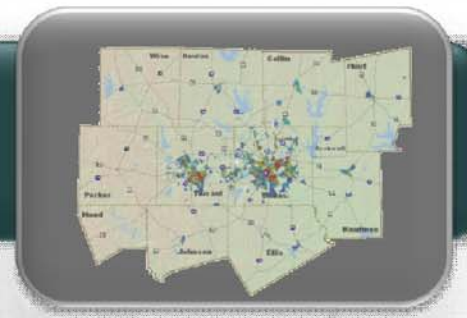
Using the Layers



- The EJI layer must be drawn every time you use the tool
- All layers can be turned on and off as needed
- Color ramps can be changed on layers as needed for aesthetics of map



Tool Applications



- Regional Transportation System Analysis
- Analysis of Funding Equity
- Call for Project Scoring
- Community Impacts of Projects
- Targeted Outreach Efforts
- Enhanced Decision Making in Project Selection



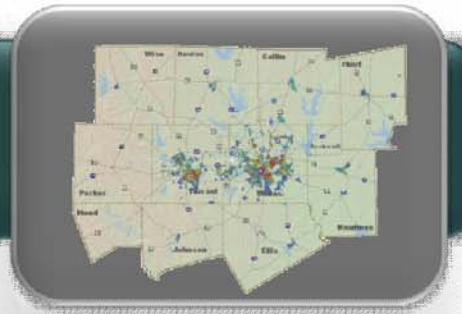
Next Steps



- Publicly accessible Website
- Reporting tool
- Integration of new Census data



Contacts



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