Carrying Capacity: A New Model For Mature Cities (UC359)

Elaine M. Dennehy, AICP – City of Arlington, TX

Carmen Oprea – City of Arlington, TX

John Huggins – HUD

Raha Pouladi – UT Arlington *(not present)*

www.arlington-tx.gov/cdp/wp-content/uploads/sites/11/2015/06/Carrying_CapacitySEQ.pdf

ARLINGTON
THE AMERICAN DREAM CITY

Project Impetus

- **Beginning of City's Comprehensive Planning Process**
  - **Previous Plan adopted 1992**
  - **City experienced significant population growth**
  - **Where should future development be targeted?**

- **City of Arlington continues to grow**
  - **Est. population at build-out (post 2023): 423K people**
  - **<10% of existing land is categorized as vacant-developable**
  - **Available land for development utilizing existing development patterns cannot support projected population**
    - **Deficit of support for 22K people**

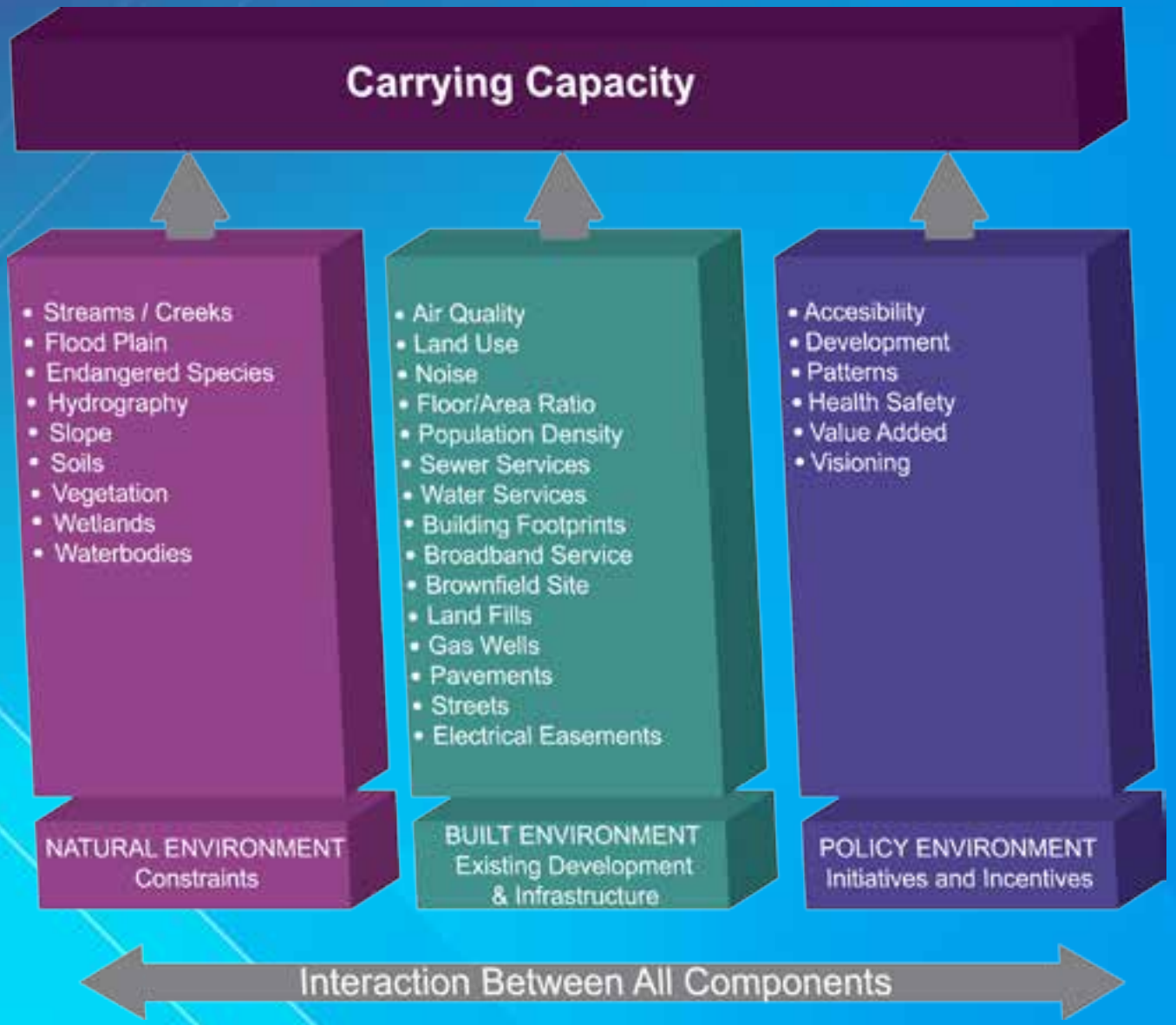
“The maximum number of people that can be supported by the environment of [an] area through optimum utilization of the available resources.”

Definition of Carrying Capacity[1]

[1]Population load is not a fixed point or measure for a mature city like Arlington

A Model Emerges: Methodology

Data Environments



Data Classification for Raster Analysis

2 Data Types

- **Prohibitive Suitability**
  - Example: wetlands, floodway areas, or endangered species habitat requiring intensive mitigation/ prohibition of development
- **Variable Suitability**
  - Example: slope, air quality, soils, or infrastructure capacity offering an array of developmental suitability

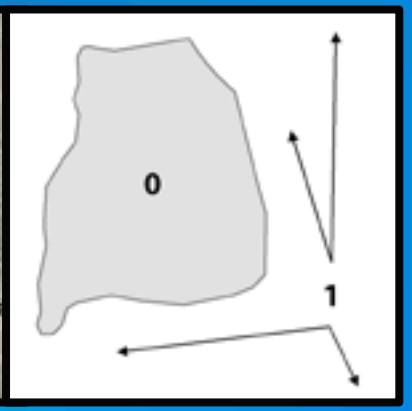
Data Modeling

Area Analysis - Prohibitive Features

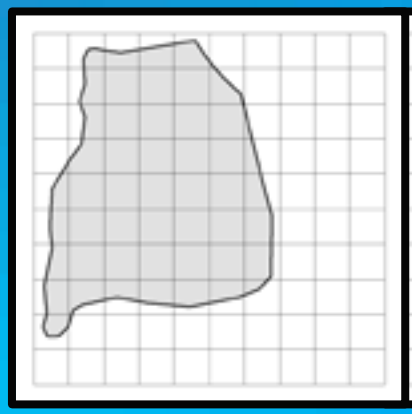
Prohibitive Features As Vector and Raster Model

Wetland feature

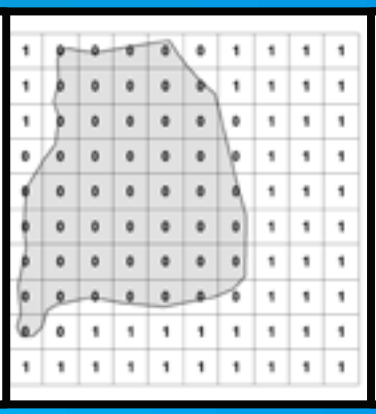
Vector model & SME classification



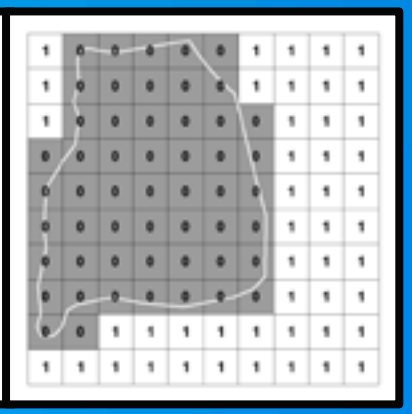
Vector model & score



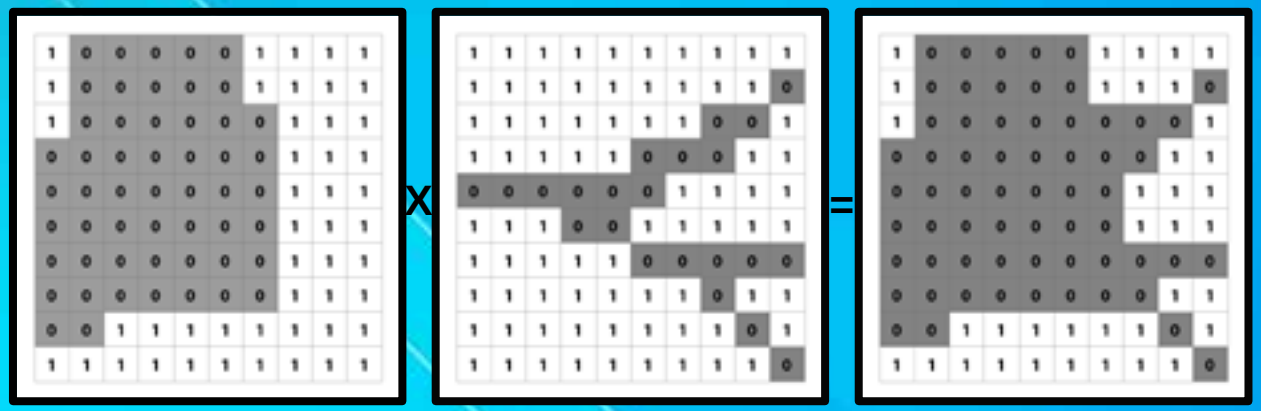
Vector overlaid with raster



Raster values relative to feature



Raster & vector representation



Different Raster Prohibitive Features Multiplied To Create Single Composite Raster

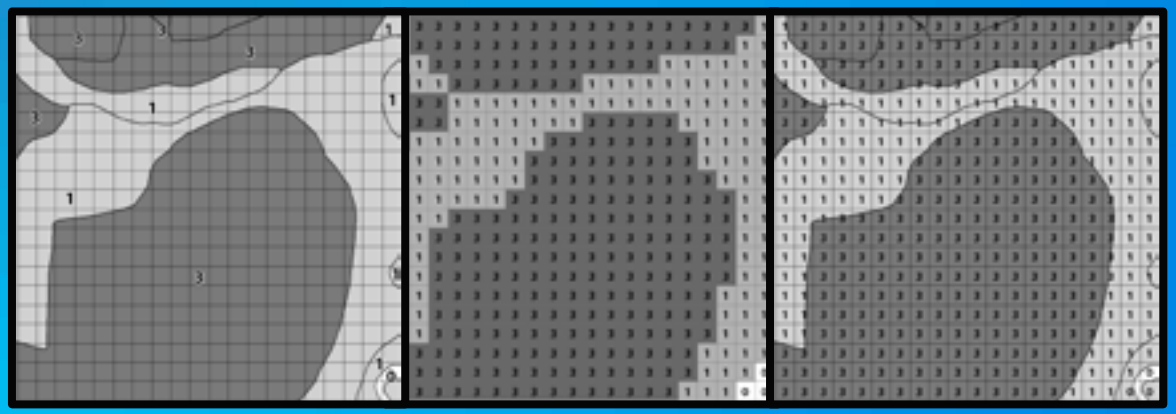
Data Modeling

Area Analysis - Variable Features

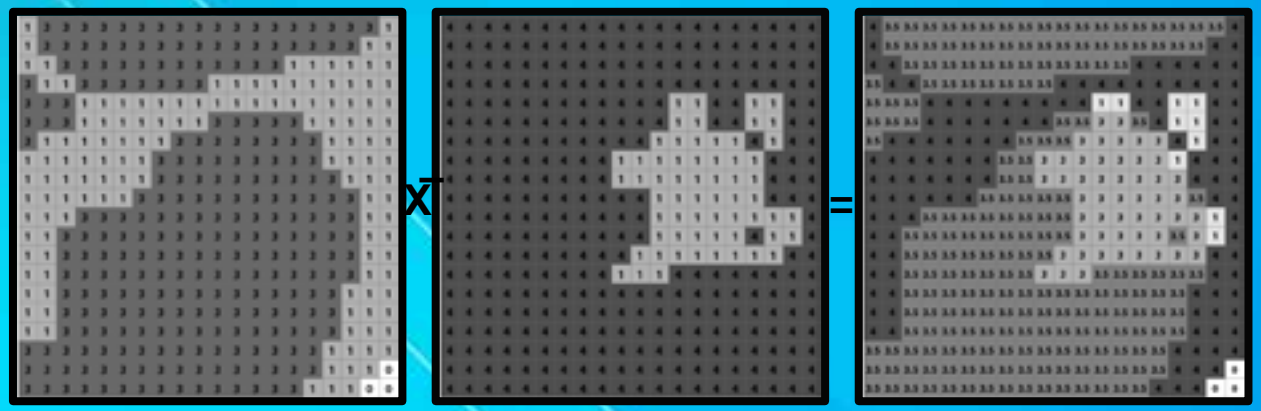
Variable Features As Vector and Raster Model

Value	SME Determination	Ordinal Score	Index Coefficient	Index Score
>8.0%	Not Suitable	0	0.25	0
6.1%-8.0%	Poor Suitability	1	0.25	.25
3.1%-6.0%	Moderate Suitability	2	0.25	.5
0.1%-3.0%	Fair Suitability	3	0.25	.75
0%	Most Suitable	4	0.25	1

Area containing variety of soil types | *Vector model & SME classification* | *Vector model & score*



Vector overlaid with raster | *Raster values relative to feature* | *Raster & vector representation*



Different Raster Variable Features Averaged To Create Single Composite Raster

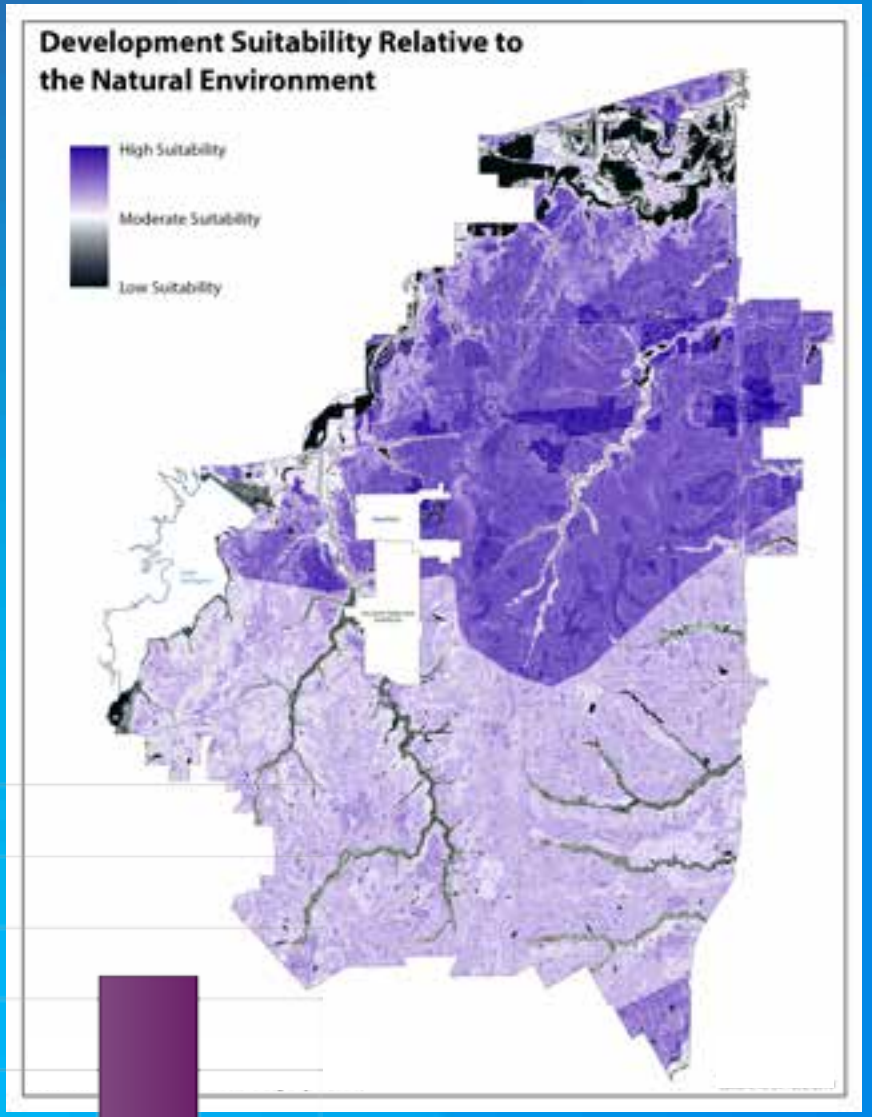
Data Modeling

Area Analysis – Final Suitability Score

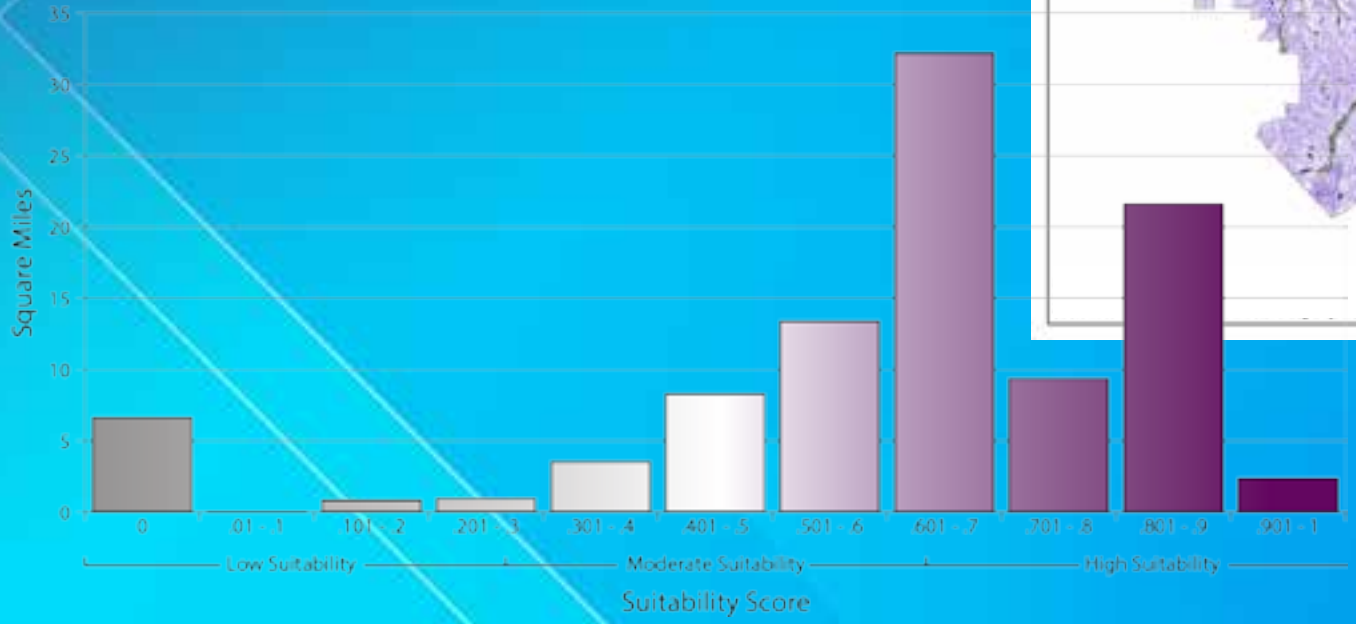
Any Given Area	Prohibitive Feature Score	X	Variable Feature Score	=	Composite Score
A	1	X	0.5	=	.5
B	0	X	0.4375	=	0
C	0	X	0.4375	=	0
D	1	X	0.3125	=	.3125

Environment Specific Analysis

Natural Environment

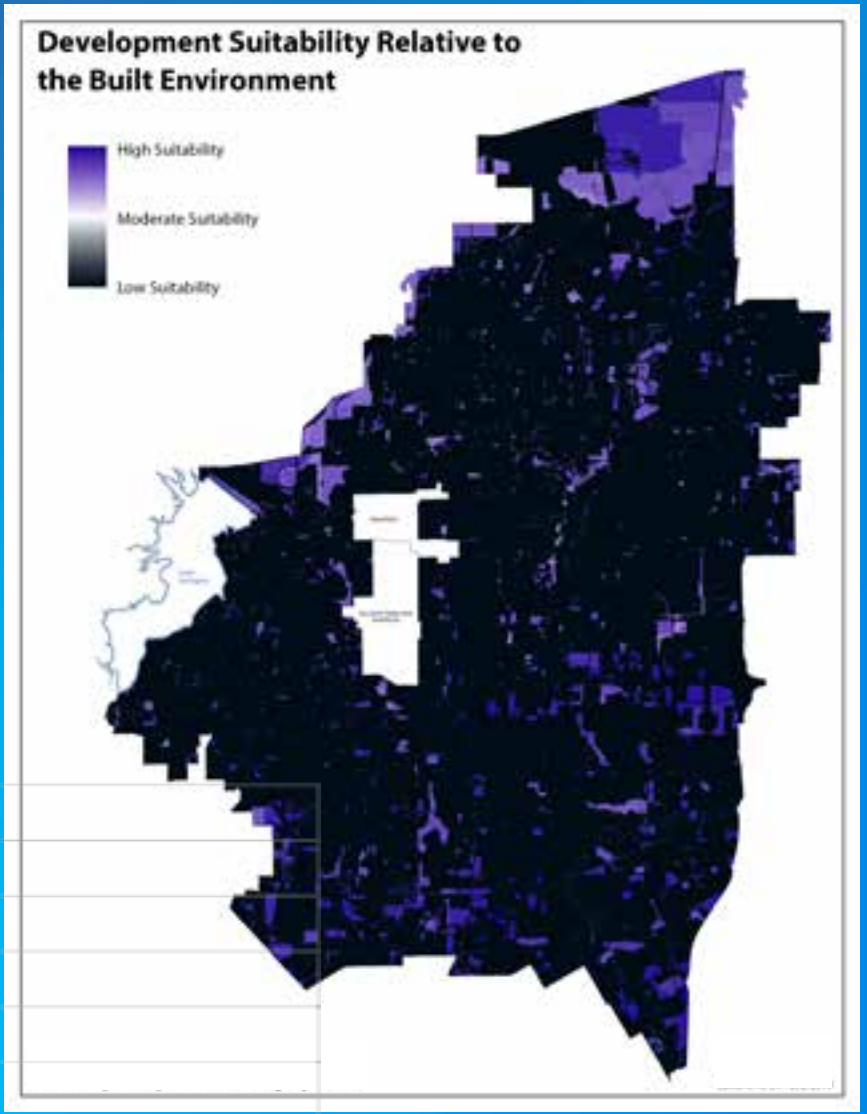


Frequency of Development Suitability Scores Relative to the City's Natural Environment



Environment Specific Analysis

Built Environment



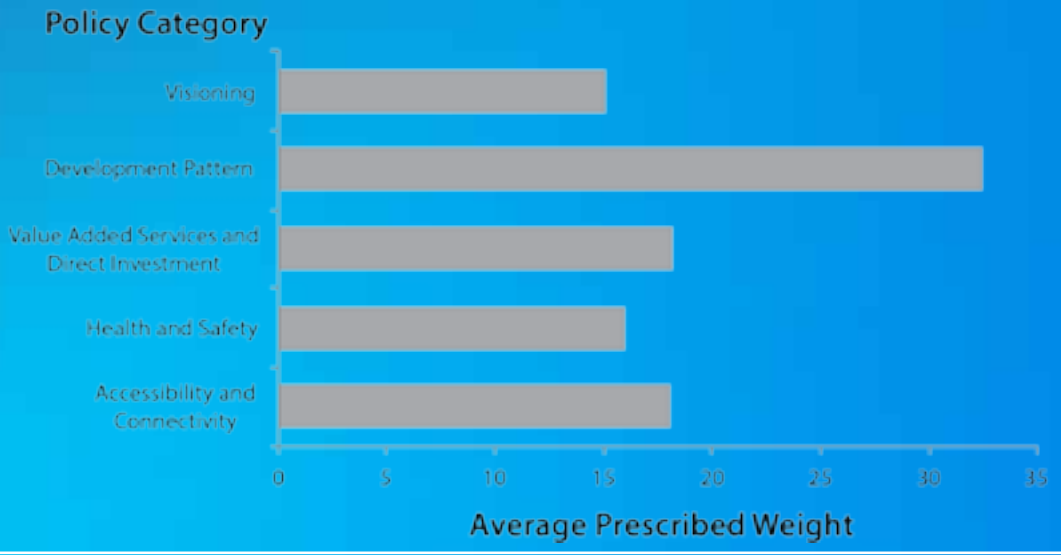
Frequency of Development Suitability Scores Relative to the City's Built Enviornment

Environment Specific Analysis

Policy Environment

Policy Groups	Associated Subject Layers
Accessibility	Thoroughfare Development Plan
Development Pattern	Zoning
Health & Safety	Building Codes
Value Added	Airport Overlay Business Park Overlay Conservation District Overlay Enterprise Zone Entertainment Overlay Hike and Bike Trails Lamar-Collins Overlay Tierra Verde Overlay TIRZ Overlay
Visioning	BBC (Housing Plan) Division ST corridor Strategy Downtown Master Plan Neighborhood Plans New York AVE Corridor Strategy Plan Sector Plans

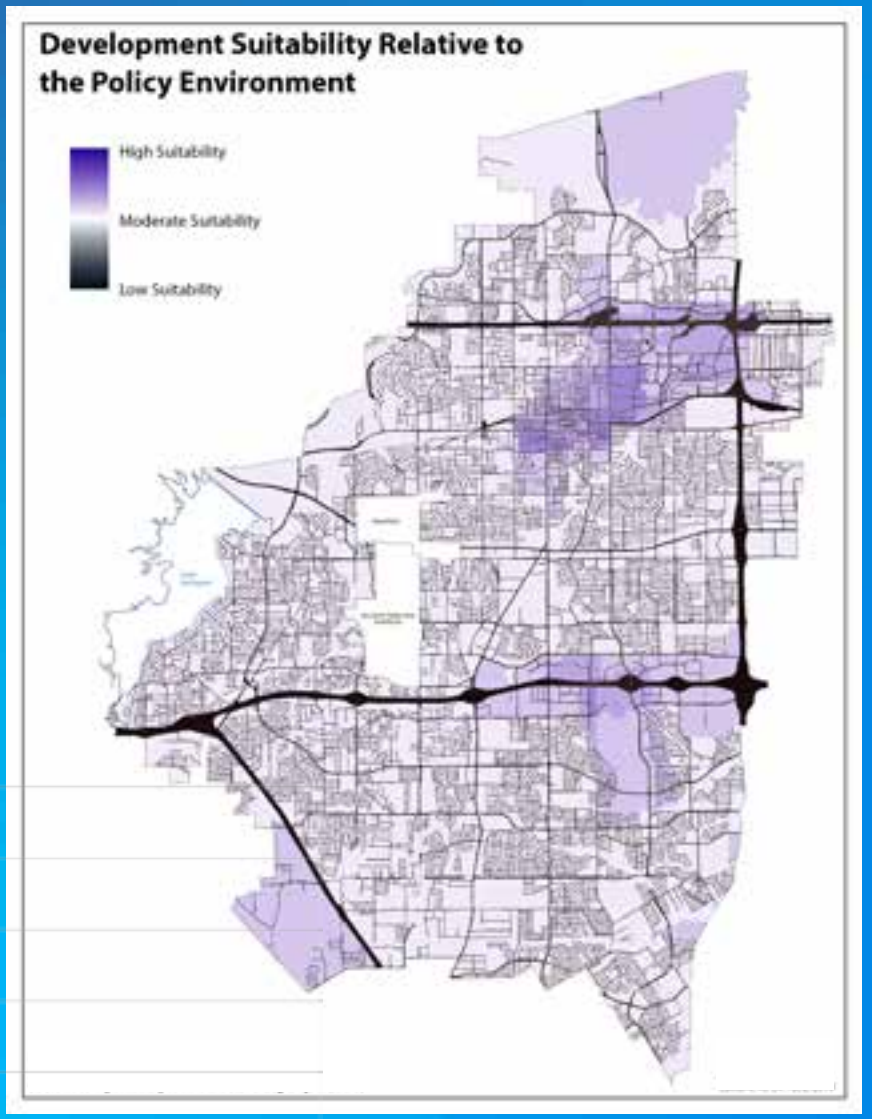
Assessed Influence of the Policy Environment on Local Development

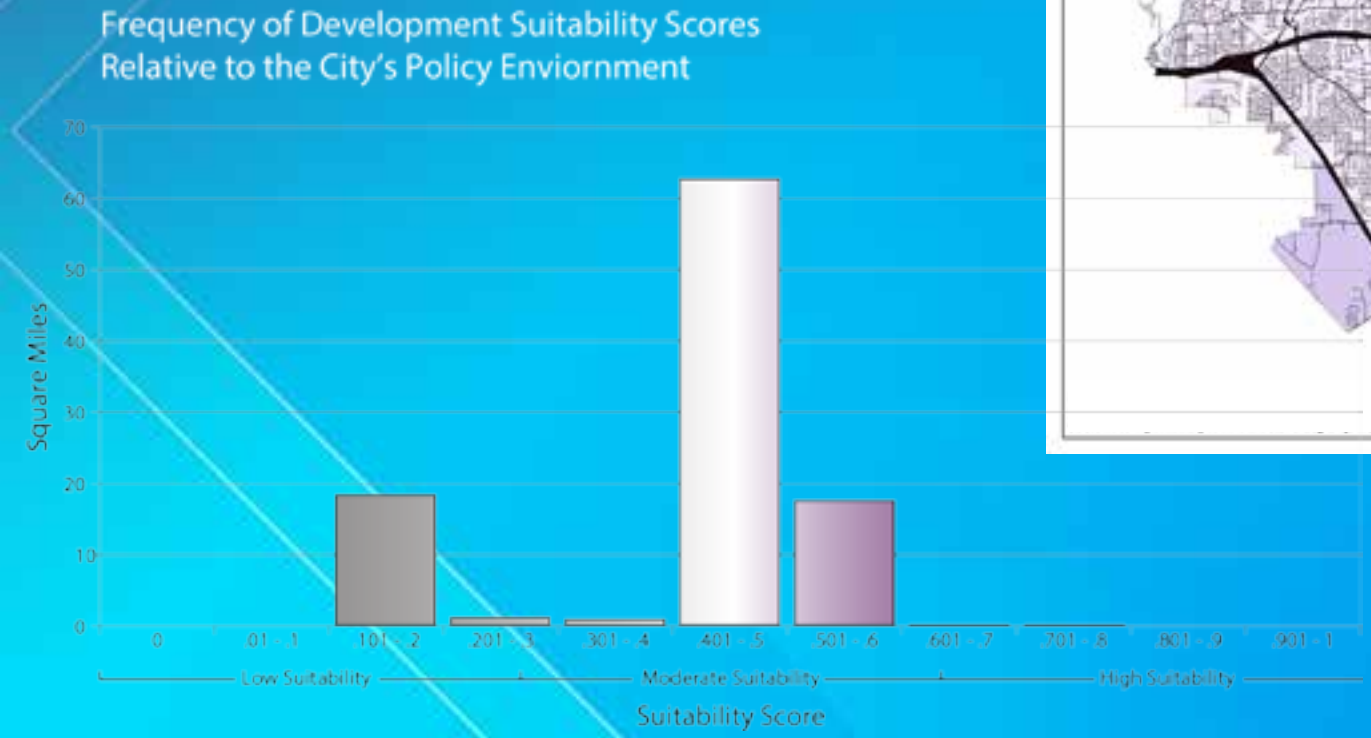


Policy Group	# of Subjects	Relative Share of Each Subject to Respective Group	Effective Weight of Group (Determined Through Interviews)	Total Policy Weight of Each Subject
Accessibility	1	1	18%	.18
Development Pattern	1	1	16%	.16
Health & Safety	10	0.1	18%	.018
Value Added	1	1	33%	.33
Visioning	6	0.166	15%	.025

Environment Specific Analysis

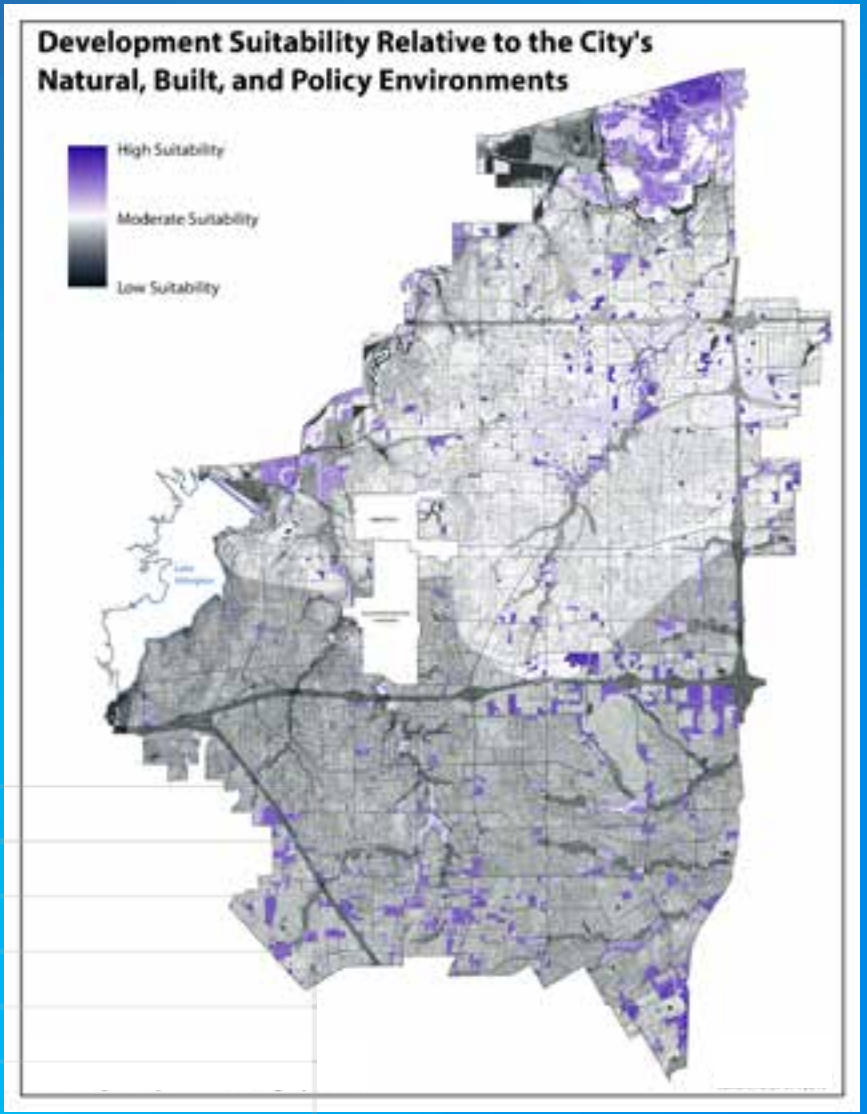
Policy Environment

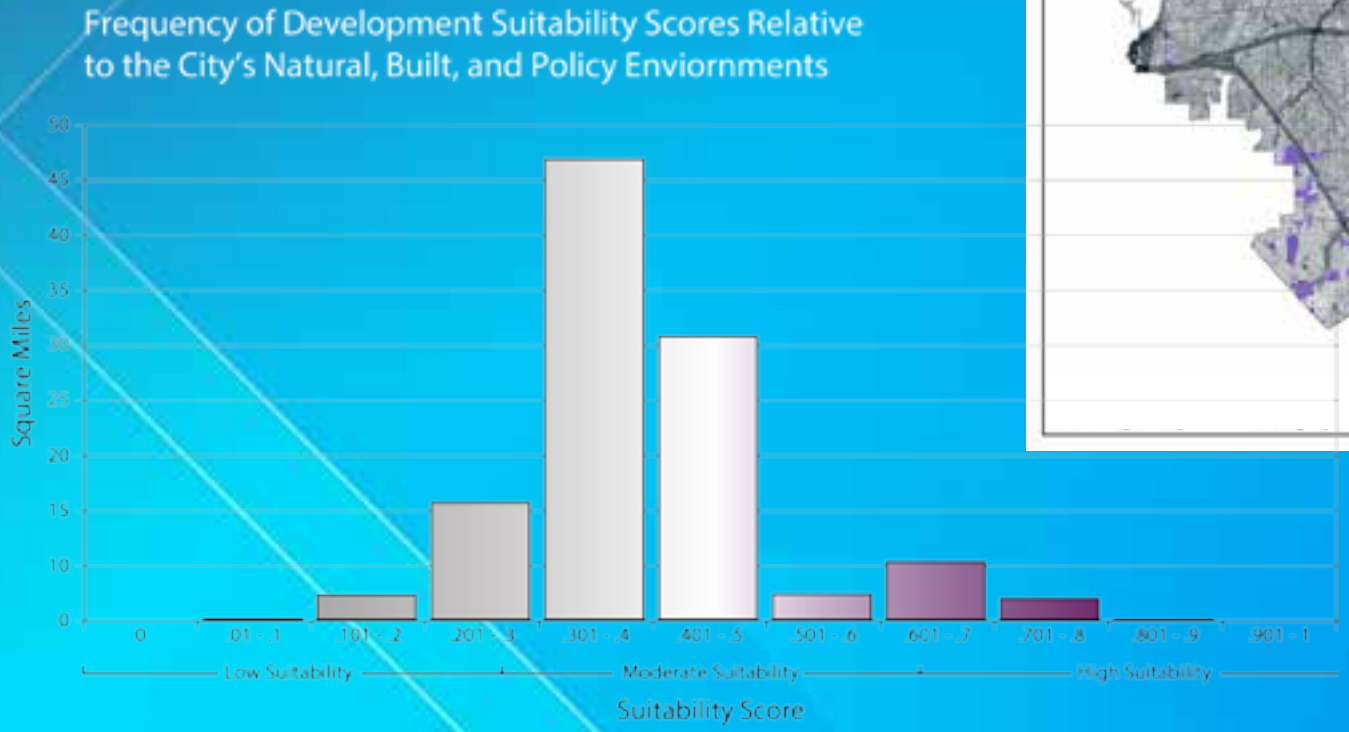




Carrying Capacity

Composite Model





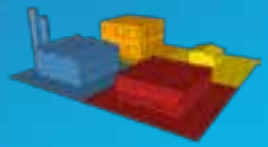
Afterword

Carrying Capacity: A New Model For Mature Cities

99 SQ Miles: A Vision for Arlington's Future

The Comprehensive Plan - http://www.arlington-tx.gov/cdp/comp-plan

- **Carrying Capacity Analysis use:**
  - **Those areas with the highest suitability scores became the basis for the City's Development Focus Areas. It is in these areas that the City will focus its future development and redevelopment energies**



Guide zoning and land use development decisions

Protect private and public property investments from incompatible land uses

Efficiently coordinate land use and infrastructure needs

Evaluate zoning and development-related ordinances

Questions?