

A City of Tucson  
and Pima County  
Cooperative Project



# Water & Wastewater

*Infrastructure, Supply &  
Planning Study*

**Phase 2 Technical Paper: Location of  
Growth, Urban Form, and Cost of  
Infrastructure**



# Study Overview

## Phase 1 (April 2008 – May 2009)

- Gather baseline set of facts on City/County infrastructure, resources, sustainability & improved cooperation

## Phase 2 (May 2009 – December 2009)

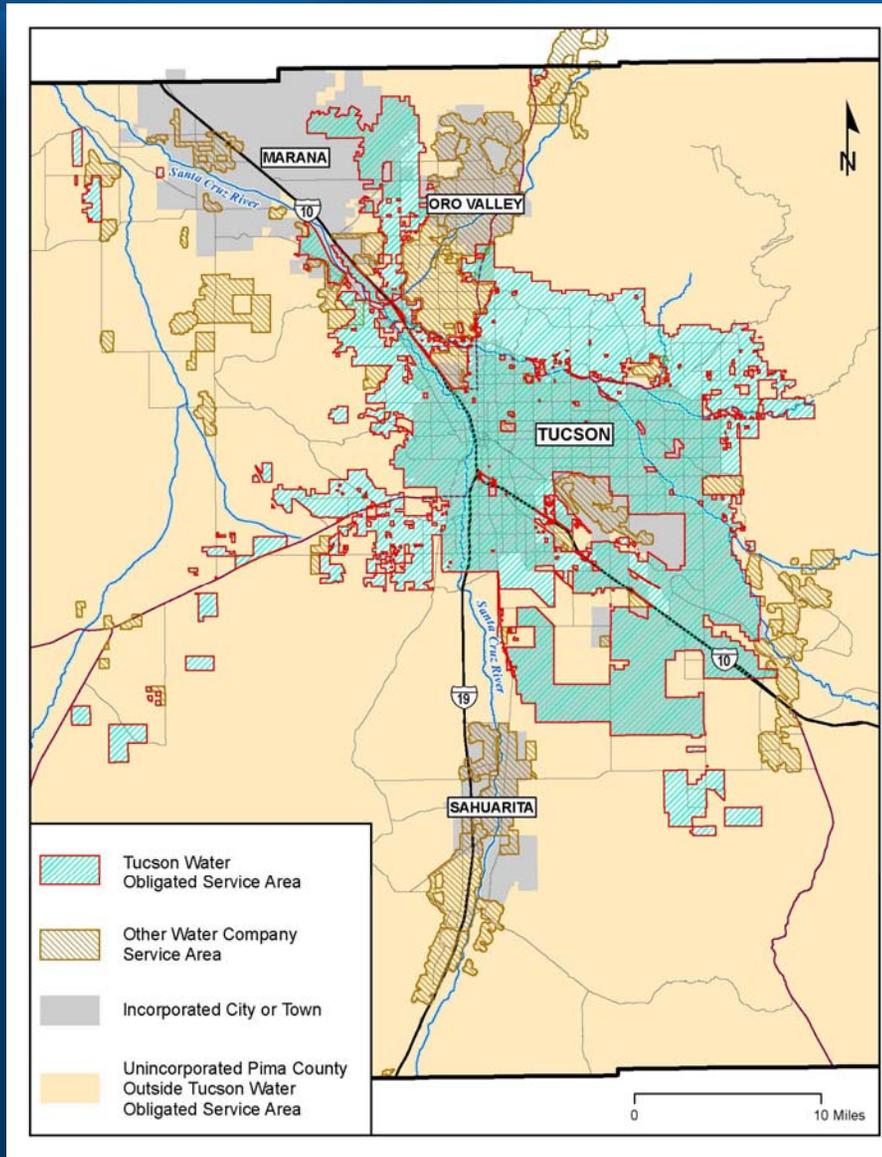
- 14 Technical papers and City/County agreement on a number of common water and planning goals

## Phase 3-5 Regional dialogue on these issues

## Study Goal:

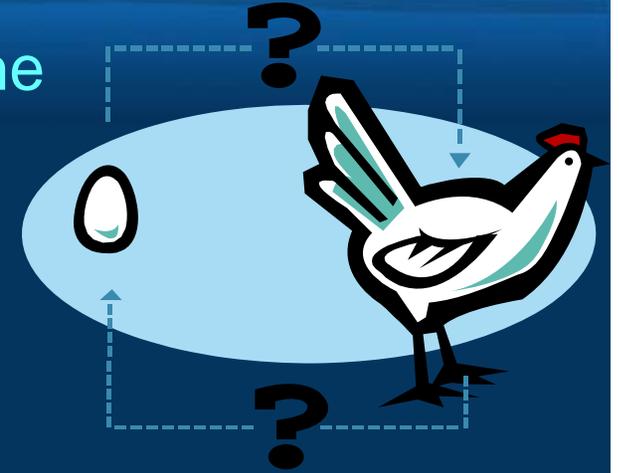
Define and develop a sustainable water future and a livable region

# Geographic Focus for this Paper: TW Obligated Service Area and Unincorporated Pima County



# What is the Connection between Water & Growth?

- Extensions of water infrastructure and the availability of water resources influence growth
- Growth influences the need for water resources and infrastructure
- Location of growth and form of growth matter and have multiple and far-reaching implications
- In the past water planning and land use planning have not been closely linked which has caused problems



# Themes from Phase 1



**Tucson Water has a reliable and renewable water supply for the near term**

**Table ES - 7 Estimated Annually Available Tucson Water Supplies**

Water Resource Type	Annual Water Supply (AF)
CAP	144,191
CAGR	12,500
Incidental Recharge	5,500
Local Groundwater	24,750
Effluent	30,500
<b>Total</b>	<b>217,441</b>

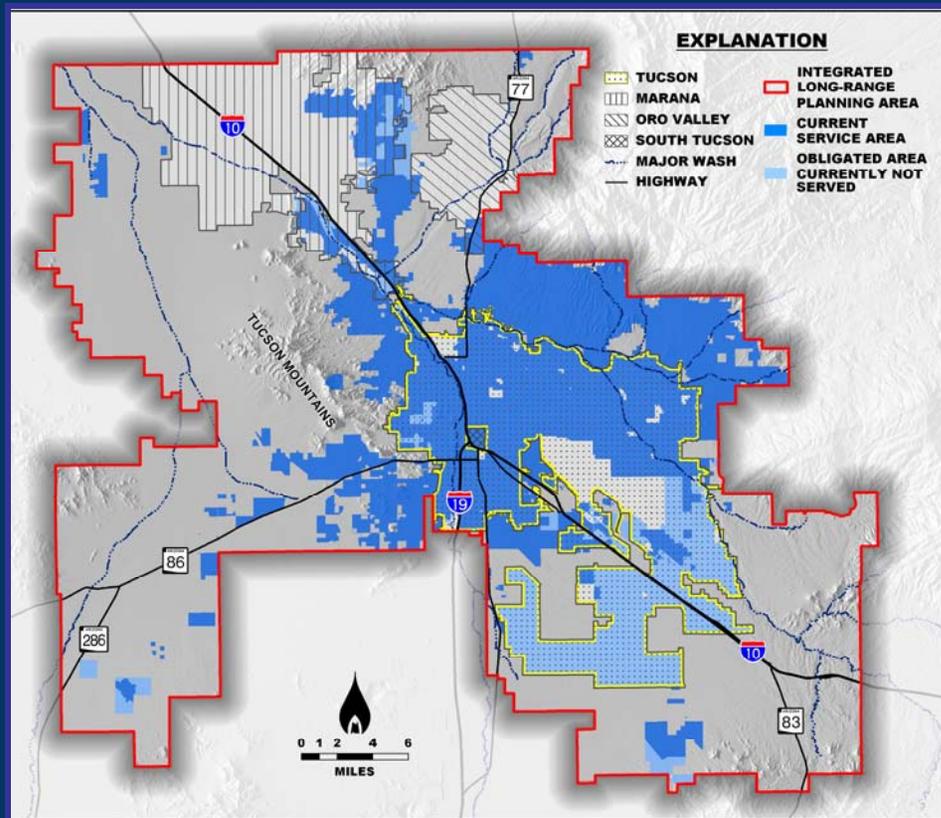
**Table ES – 8 Estimated Potential Tucson Water Service Population**

Annual water supply in AF	<b>217,441</b>
Multiply by Gallons/AF	325,851
Equals annual supply in gallons	70,853,367,291
Divide by days/year	365
Equals annual supply per day	194,118,814
Divide by GPCD	<u>177</u>
<b>Equals estimated population</b>	<b>1,096,716</b>

# Themes from Phase 1



Expanding the Tucson Water service area must be done thoughtfully and deliberately



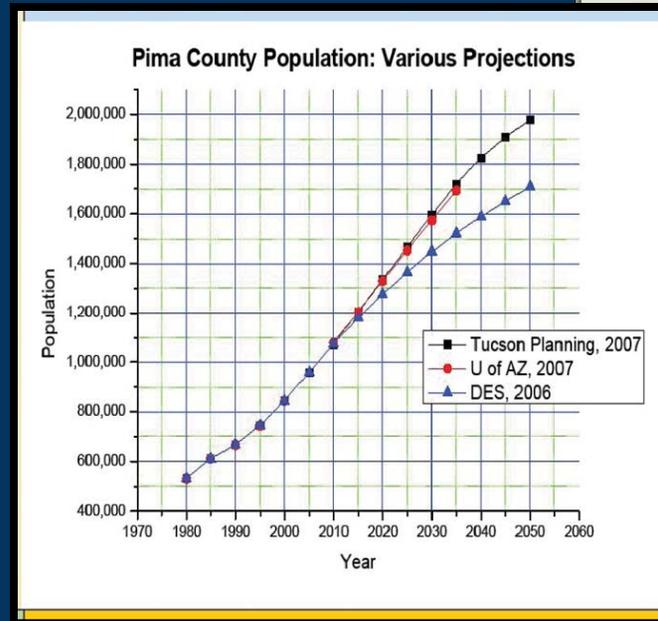
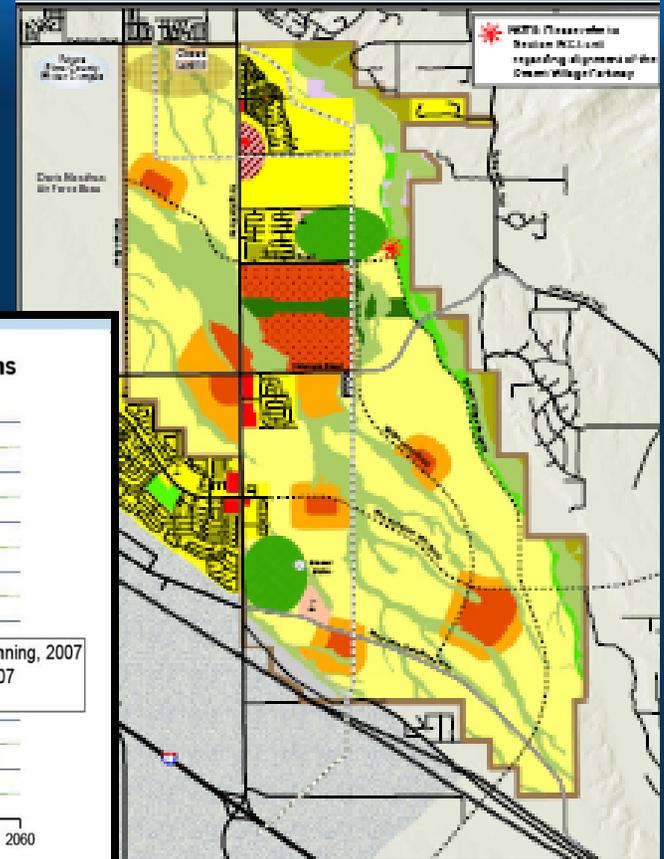
We face uncertainty on a variety of fronts and need to be prudent with our resources

# Themes from Phase 1

Planning for and managing growth is critical to creating a sustainable water future

The paradigm of water and wastewater utilities simply accommodating growth, whatever its size and location, has to be changed

Growth should pay for itself

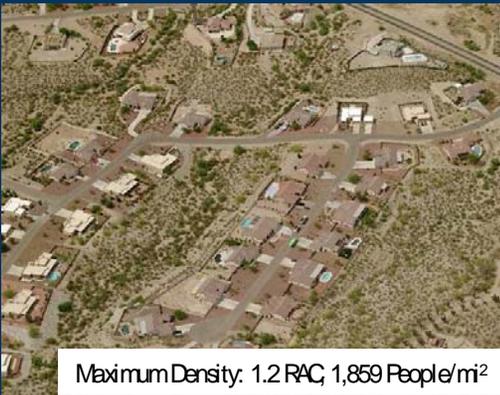




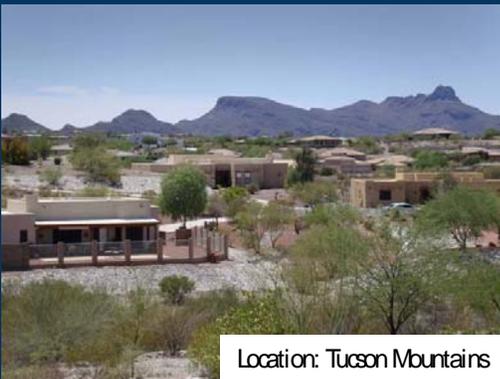
# Form of Growth



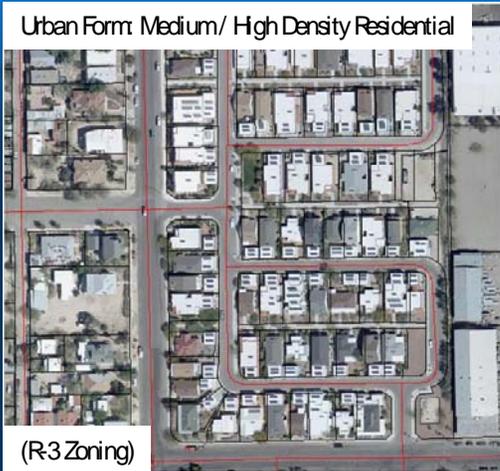
Urban Form: Single Family Residential (CR-1 Zoning)



Maximum Density: 1.2 RAC, 1,859 People/mi<sup>2</sup>

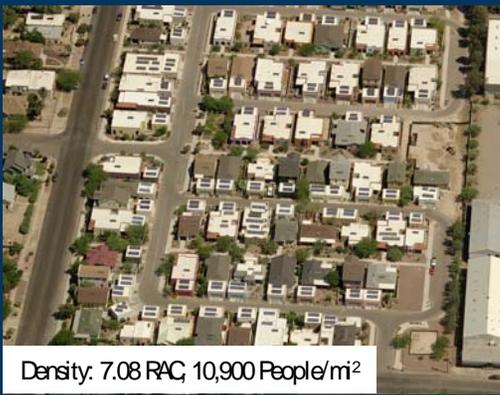


Location: Tucson Mountains



Urban Form: Medium/ High Density Residential

(R-3 Zoning)



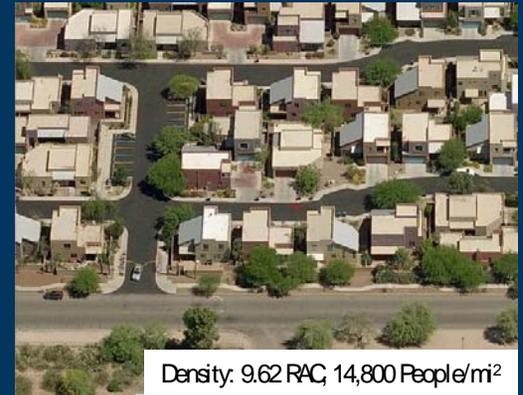
Density: 7.08 RAC, 10,900 People/mi<sup>2</sup>



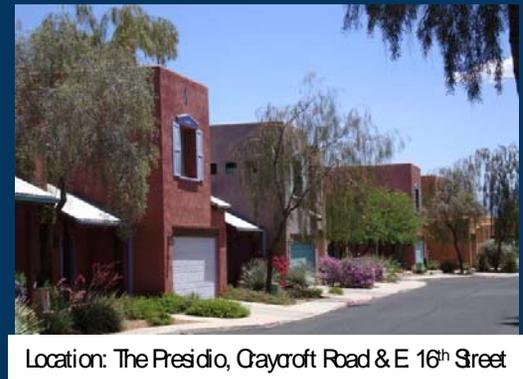
Location: Armory Park del Sol, S 3<sup>rd</sup> Ave. & E 16<sup>th</sup> S.



Urban Form: Planned Area Development (PAD-1 Zoning)



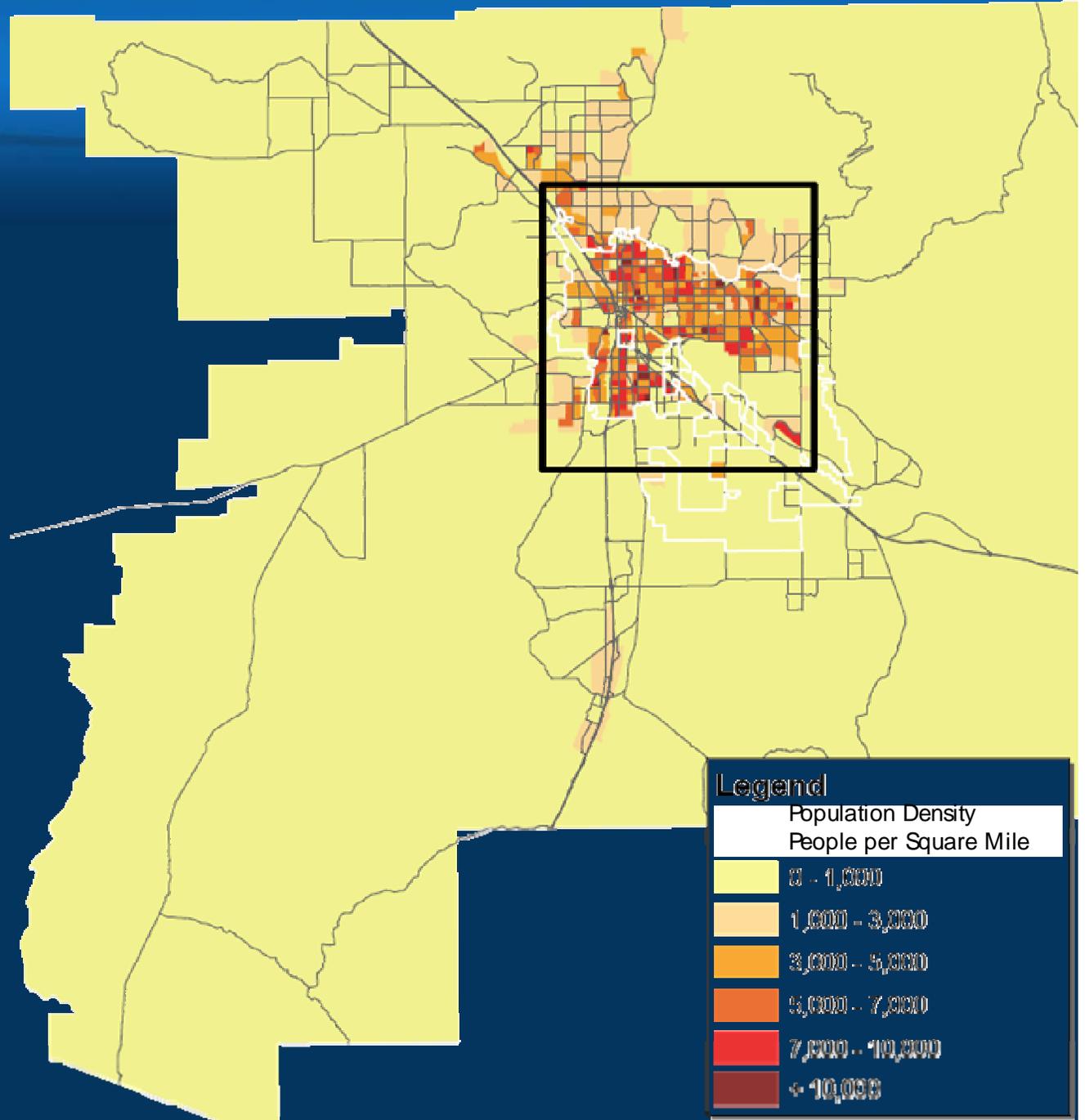
Density: 9.62 RAC, 14,800 People/mi<sup>2</sup>



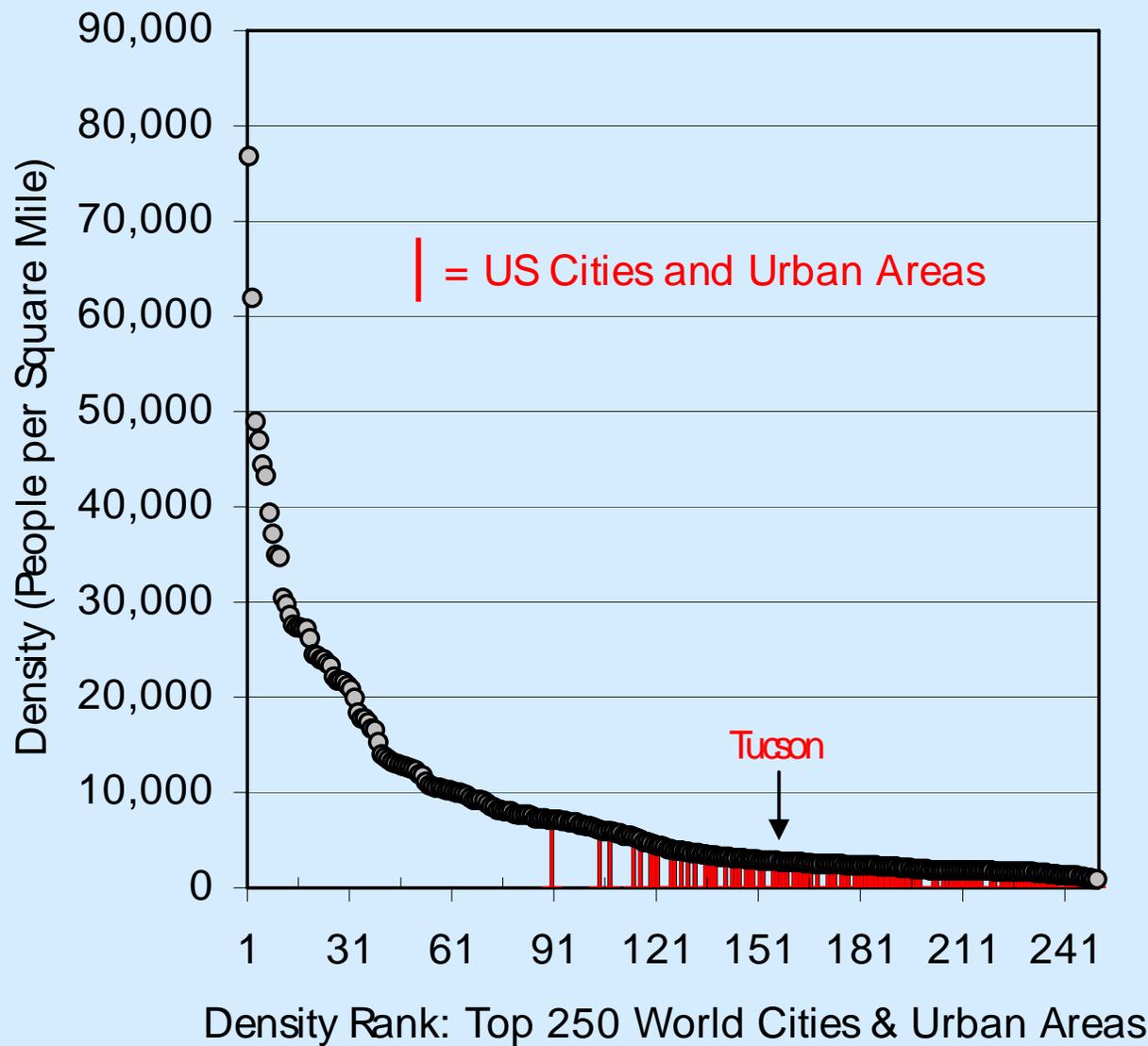
Location: The Presidio, Graycroft Road & E 16<sup>th</sup> Street

# City & County Density Pattern

Average density  
in metropolitan  
Tucson = 4  
people per acre  
or 2,560 people  
per square mile

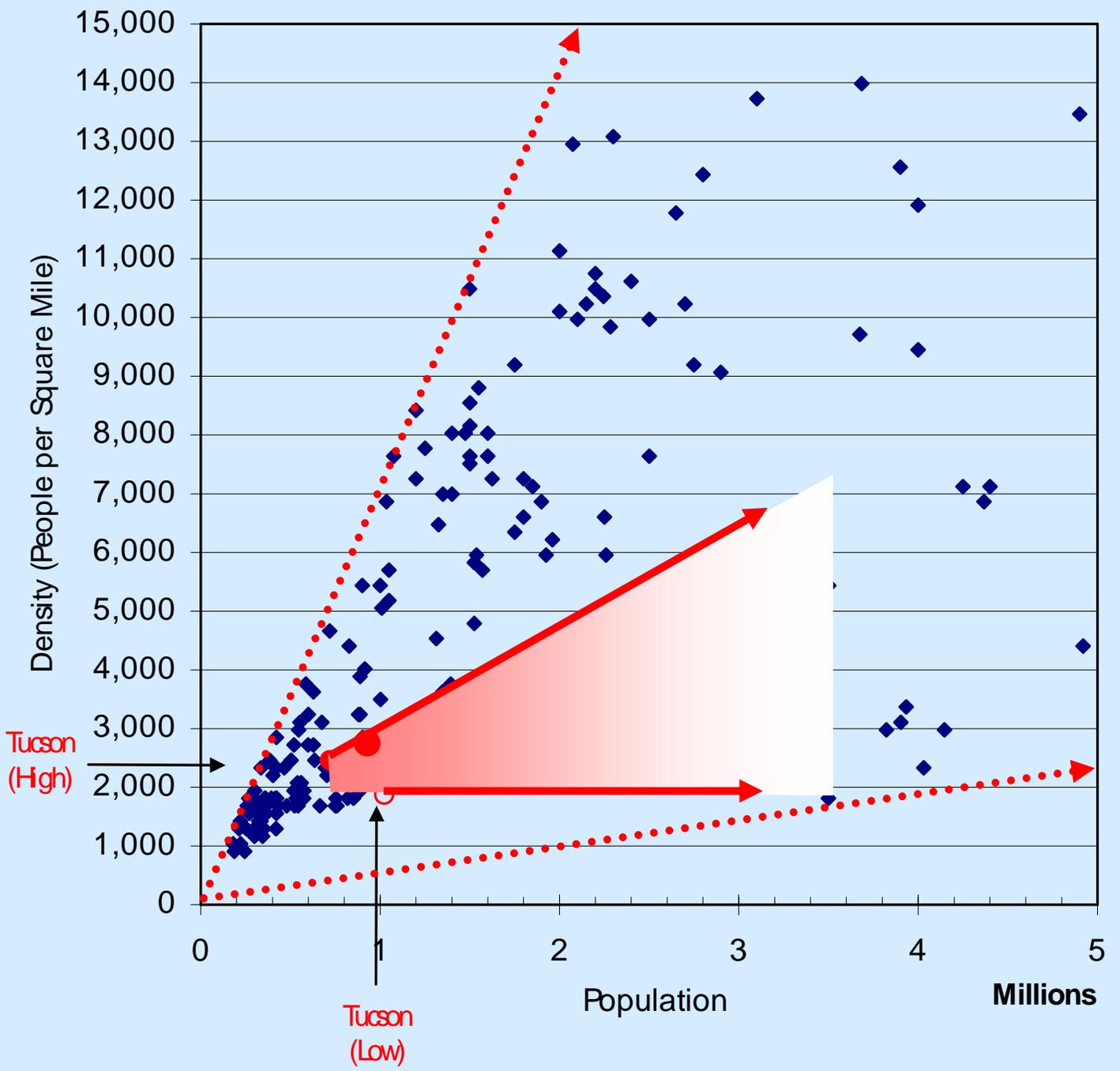


# Density Compared to Peer Cities



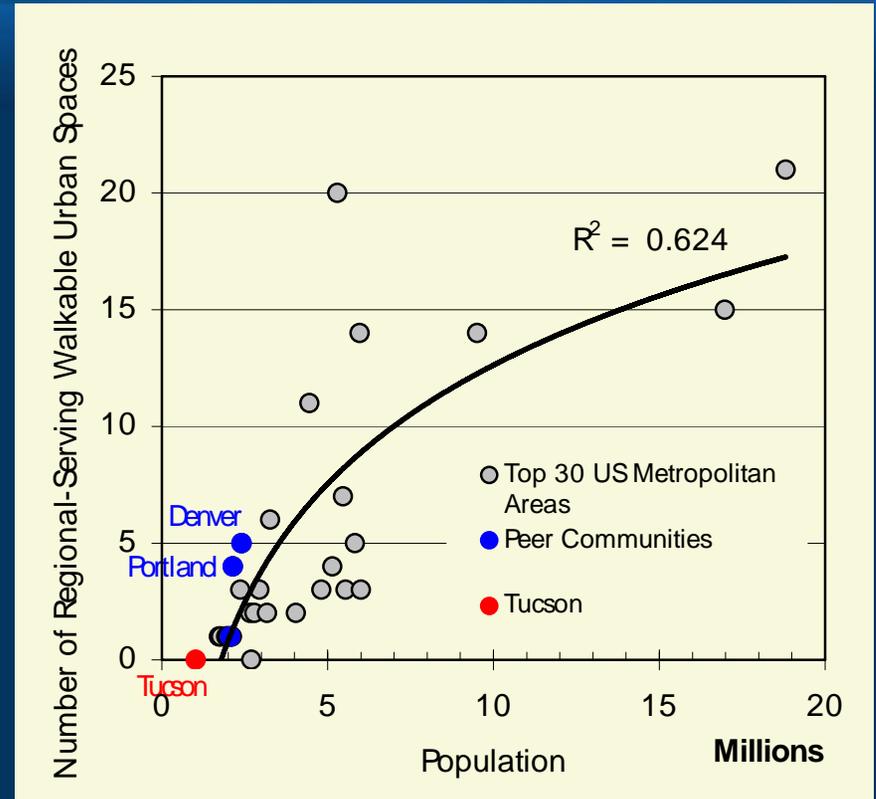
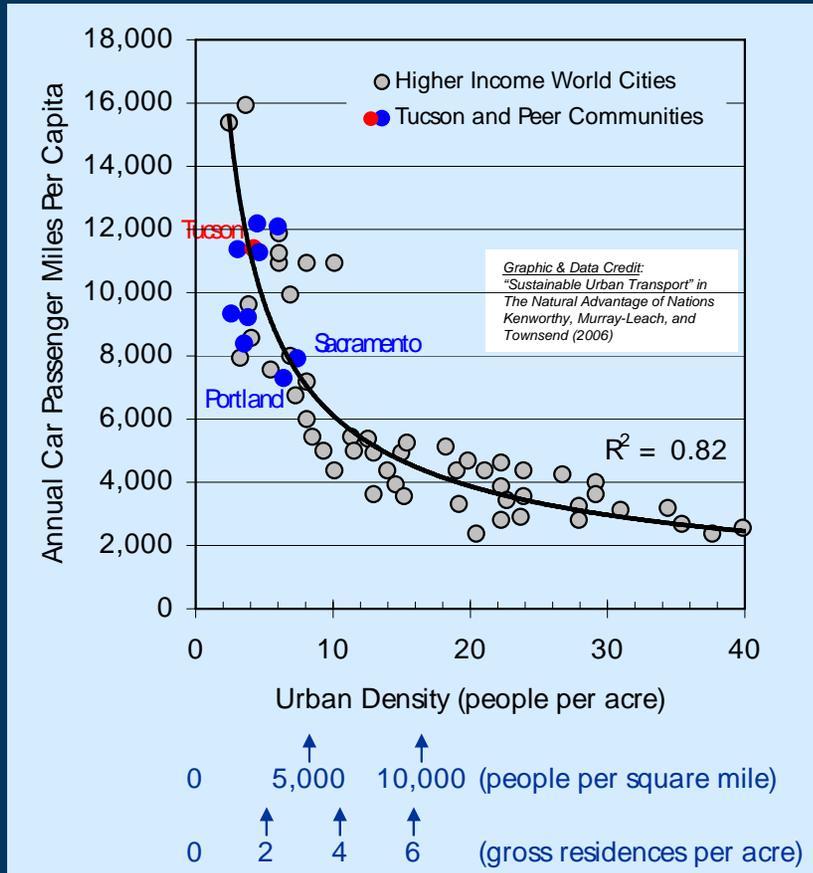
- Albuquerque
- Austin
- Calgary
- Colorado Springs
- Denver
- Edmonton
- El Paso
- Portland
- Sacramento
- Salt Lake City
- Tucson
- Vancouver

# Future Paths



# Effects of Urban Form & Density

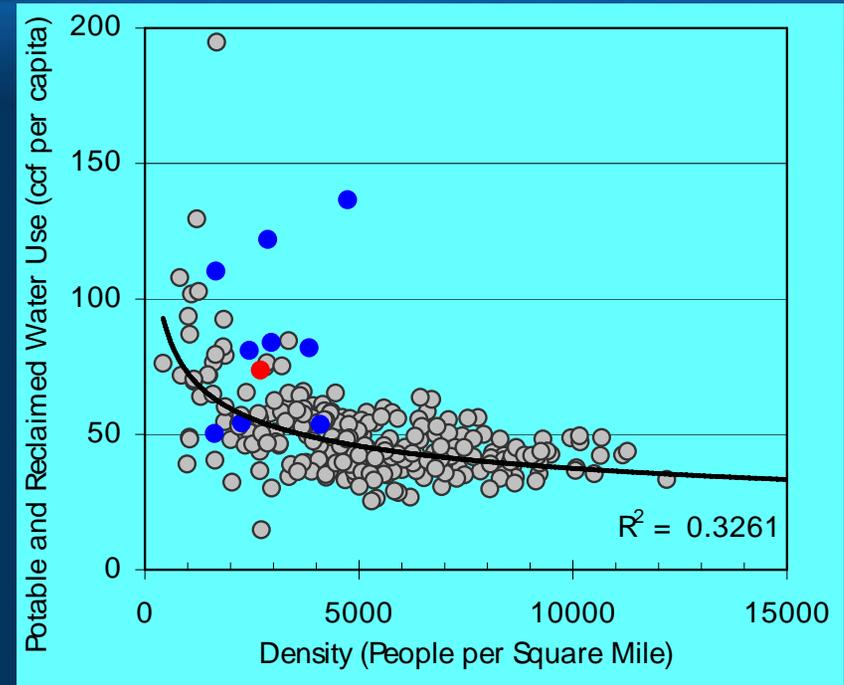
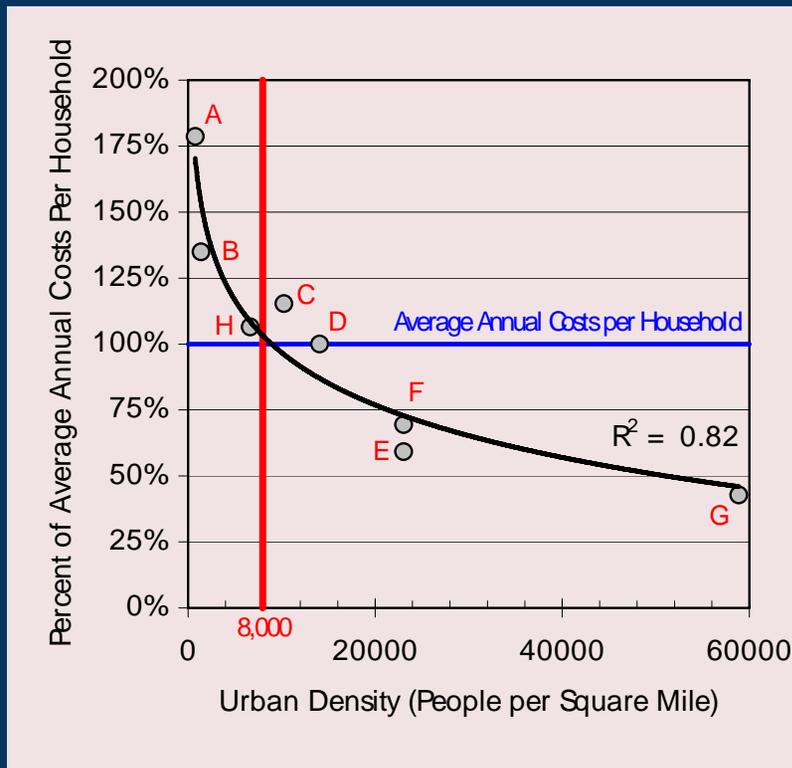
- Vehicle miles traveled



- Walkable urban spaces

# Effects of Urban Form & Density

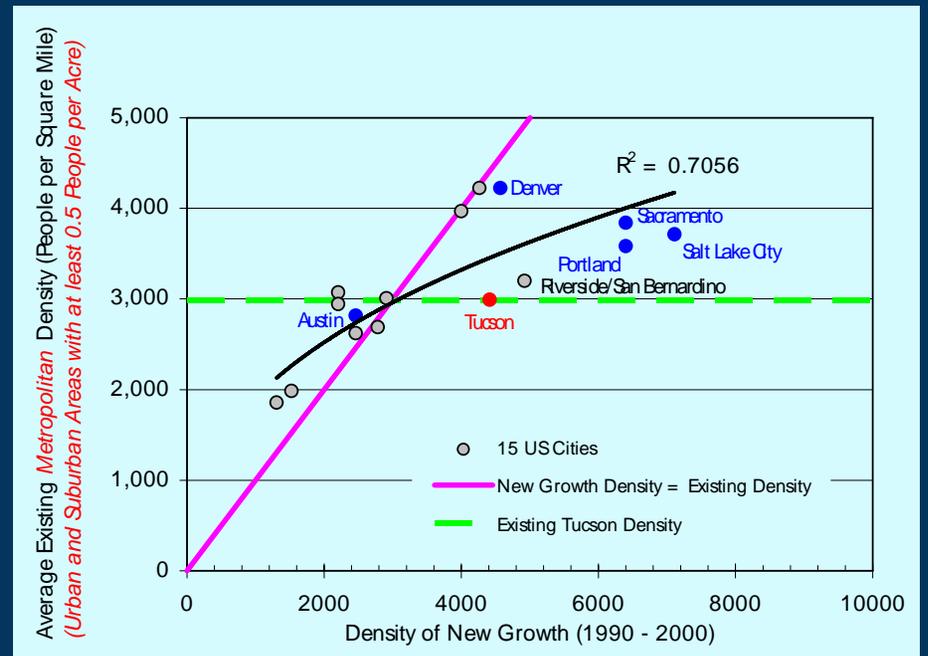
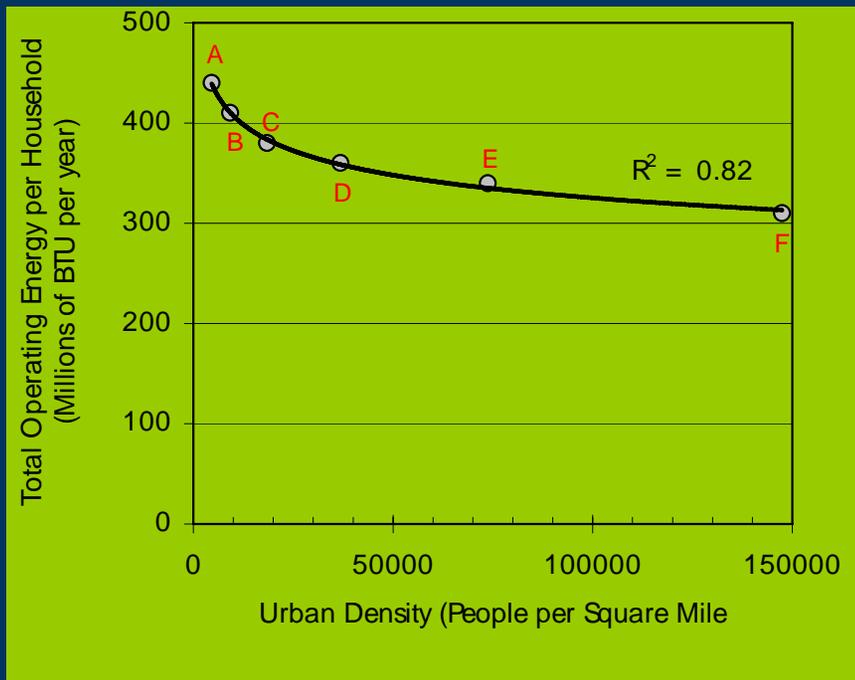
- Public service cost per household



- Water consumption

# Effects of Urban Form & Density

- Energy consumption



- Land consumption

# Modeling Location of Growth

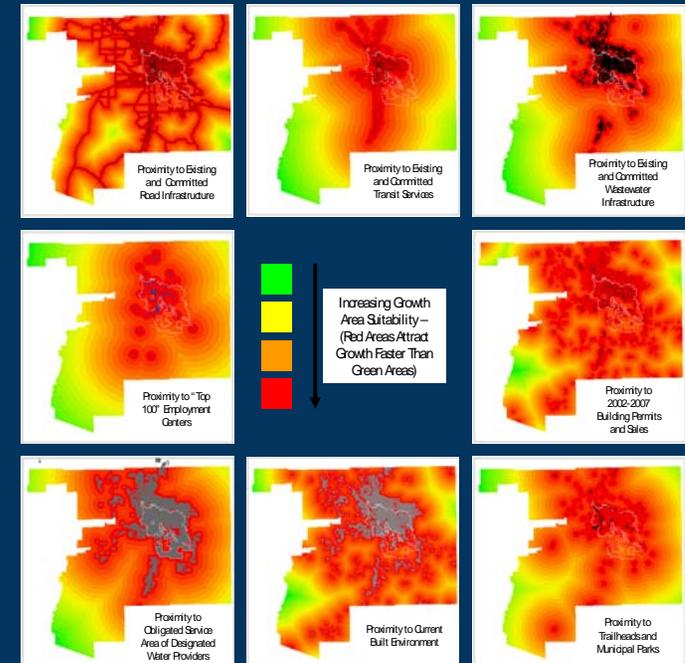
## Absolute Constraints

- Land with slope over 25%
- Natural preserves (local, state, federal)
- Federal lands (except Bureau of Land Management disposable lands outside the Conservation Lands System)
- Urban Parks, floodways, and golf courses
- Public rights-of-way and cemeteries
- Landfills, mines and quarries
- Tucson International Airport and Davis-Monthan Air Force Base approach and departure corridors
- City of Tucson lands in Avra Valley

# Modeling Location of Growth

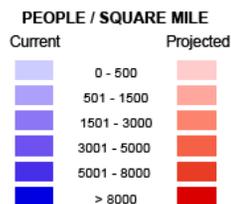
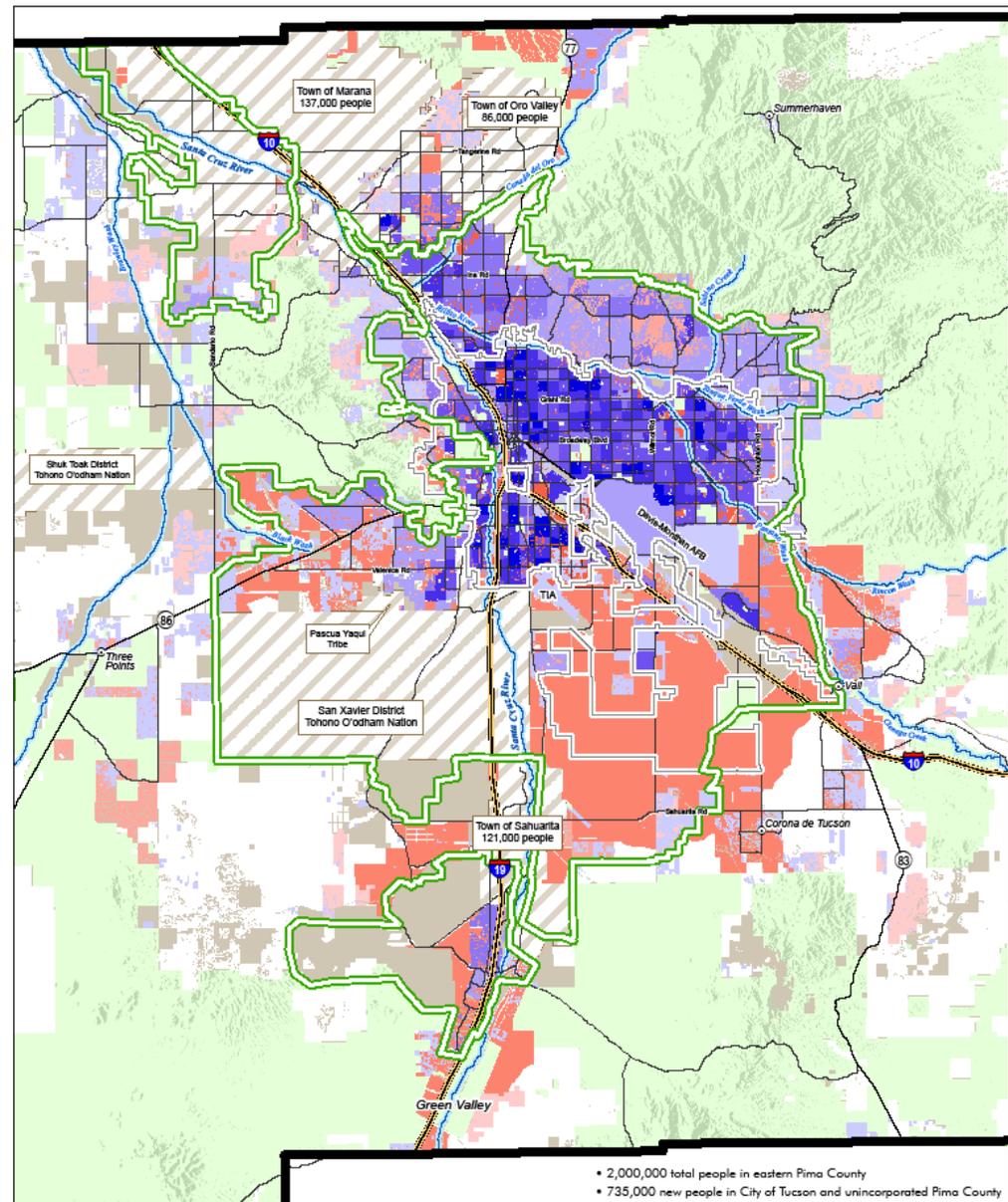
## Weighted Factors

Status Quo Scenario Growth Area Suitability Model Factors	Relative Weighting
Proximity to Existing and Committed Road Infrastructure	14.9 %
Proximity to Existing and Committed Transit Services	0.0 %
Proximity to Existing and Committed Wastewater Infrastructure	9.0 %
Proximity to Existing and Committed Water Infrastructure	13.4 %
Proximity to "Top 100" Employment Centers	2.2 %
Proximity to Locations of 2002-2007 Building Permits and Sales	19.5 %
Proximity to Current Built Environment	6.0 %
Proximity to Trailheads and Municipal Parks	0.7 %
Proximity to Obligated Service Area of Designated Water Providers	16.4 %
Quality of School District	8.2 %
Stress Index	9.7 %

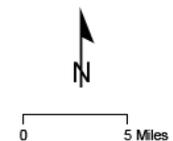


# Scenario #1: Status Quo

- Growing to Two Million People Builds Considerably in the South
- Impacts Would Be Numerous
- Sustainable?

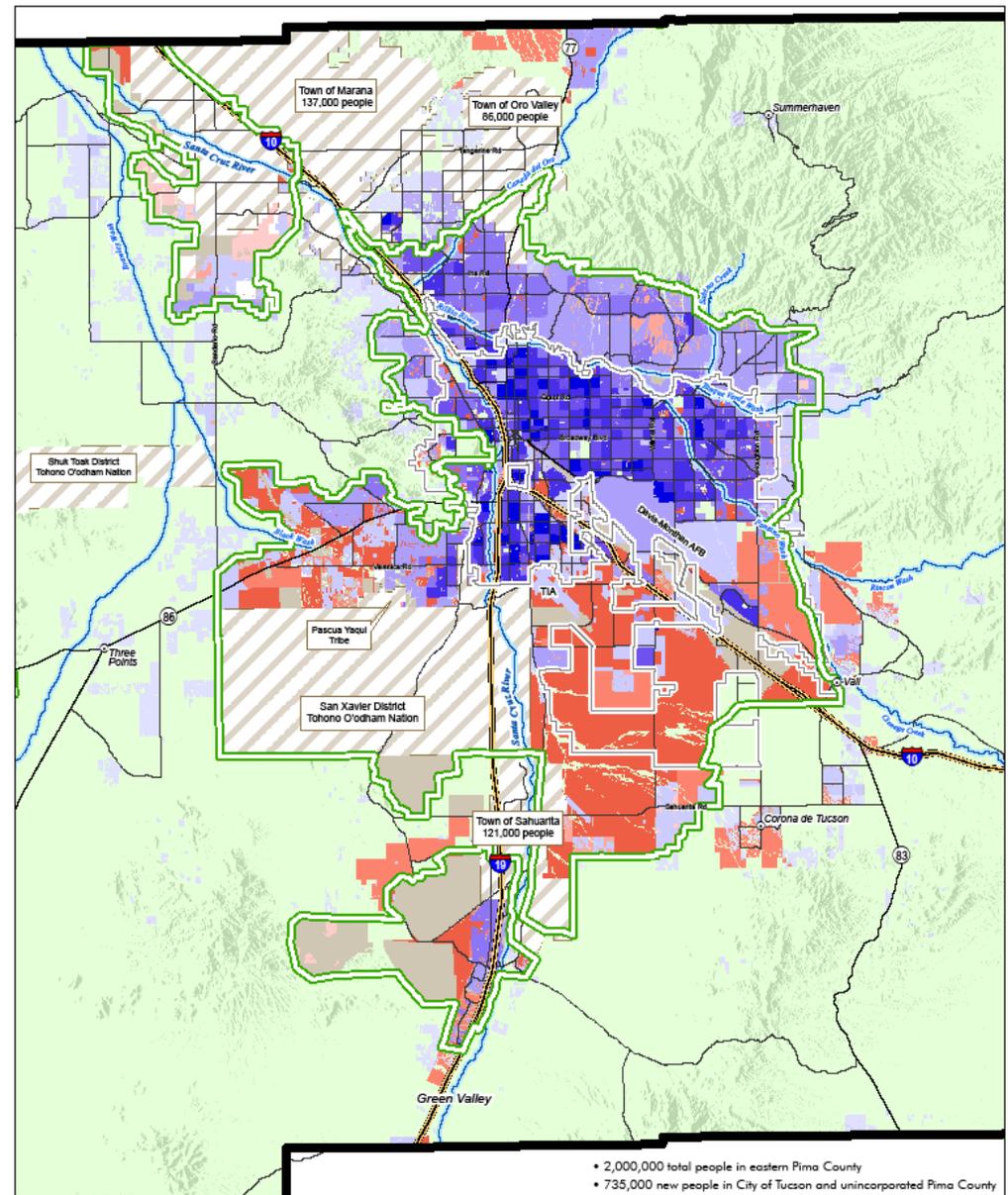


- City of Tucson Boundary
- Area Excluded from Simulation (with total population projected by AZ Dept. of Economic Security)
- Park or Natural Preserve
- Development Constraint
- Conservation Lands System Boundary (area inside green and white line is outside CLS)



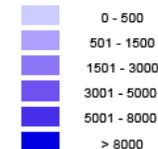
# Scenario #2: Enhanced Habitat Protection

- Land Base Exhausted (Either Protected or Built)
- New Exurb Growth is Constrained
- CLS Mechanisms?



## PEOPLE / SQUARE MILE

Current



Projected



City of Tucson Boundary

Area Excluded from Simulation  
(with total population projected by AZ Dept. of Economic Security)

Park or Natural Preserve

Development Constraint

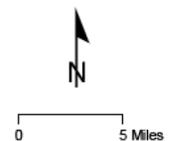
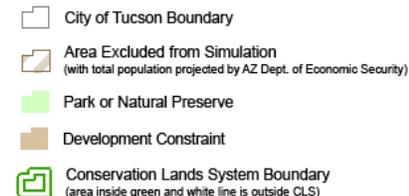
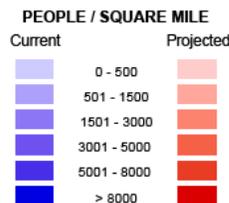
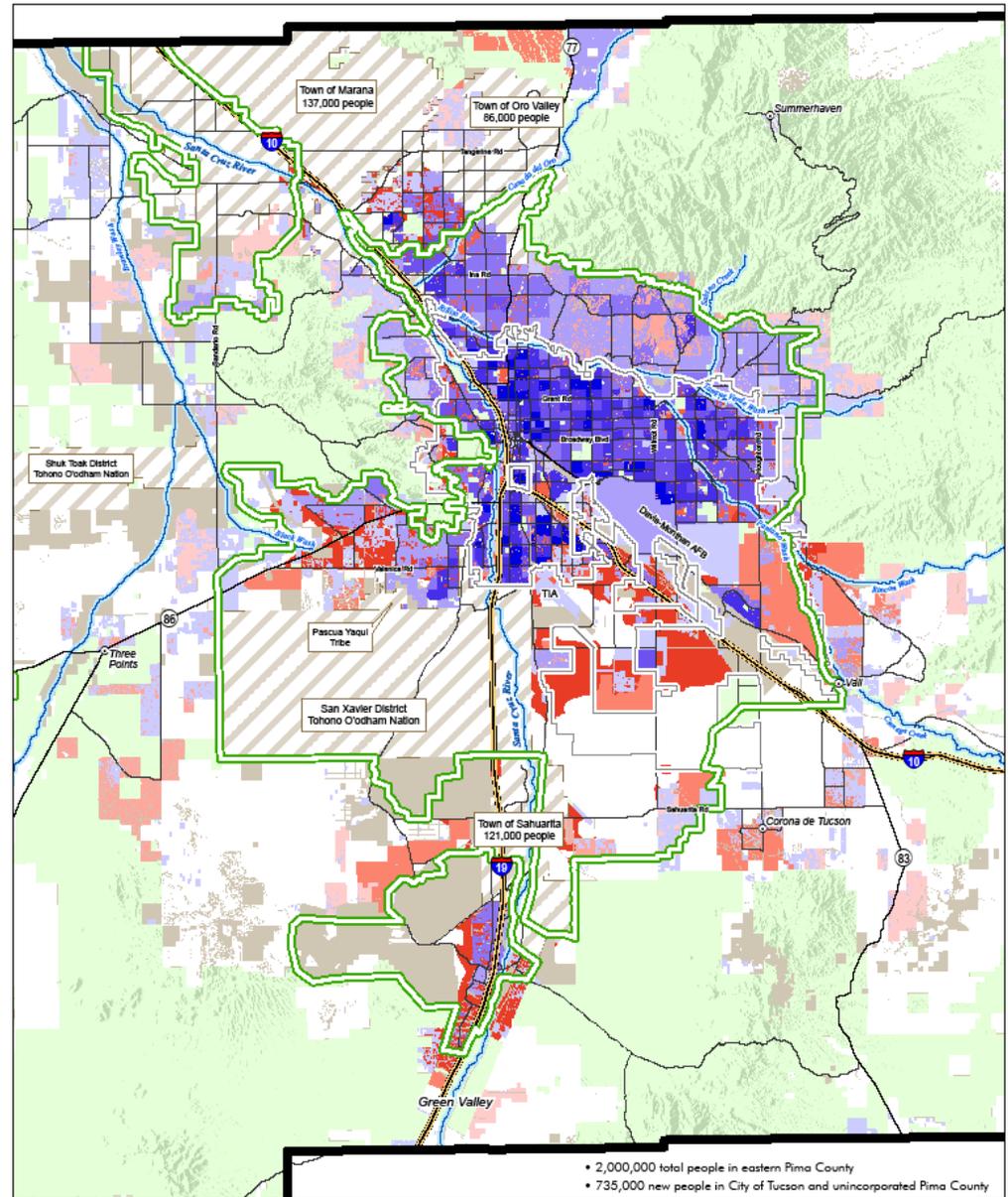
Conservation Lands System Boundary  
(area inside green and white line is outside CLS)



0 5 Miles

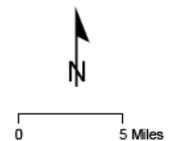
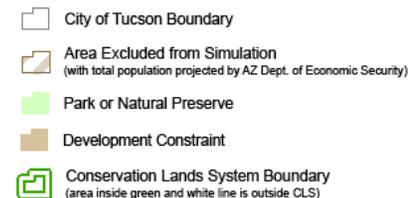
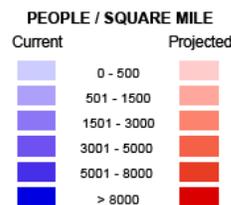
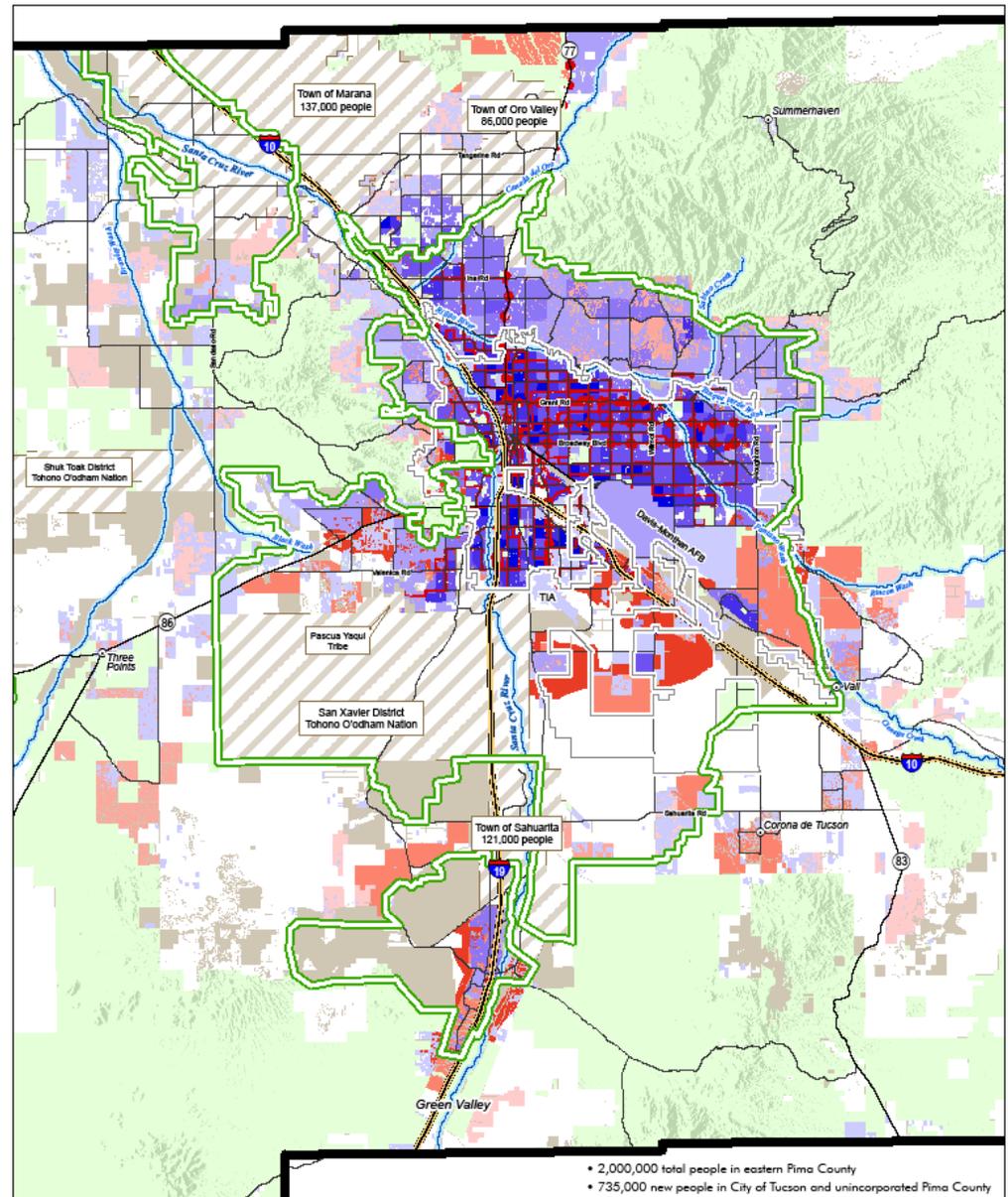
# Scenario #3: Infrastructure Efficient / Taxpayer Savings

- Land Used for Suburbs is Reduced
- Exurb Growth is not Constrained

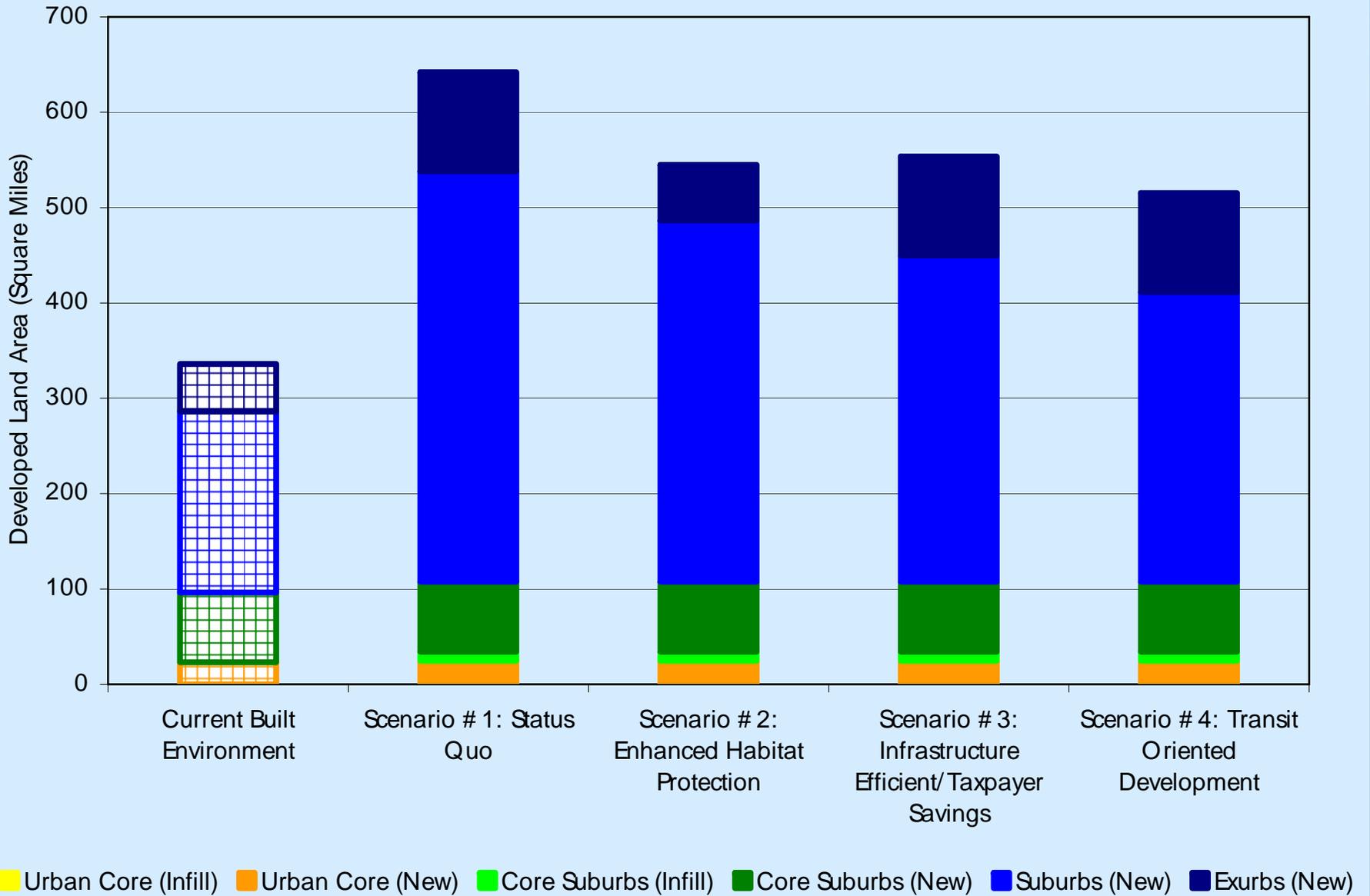


# Scenario #4: Transit Oriented Development

- Infill and Re-development
- Land is absorbed at lower rates



# Scenario Comparison

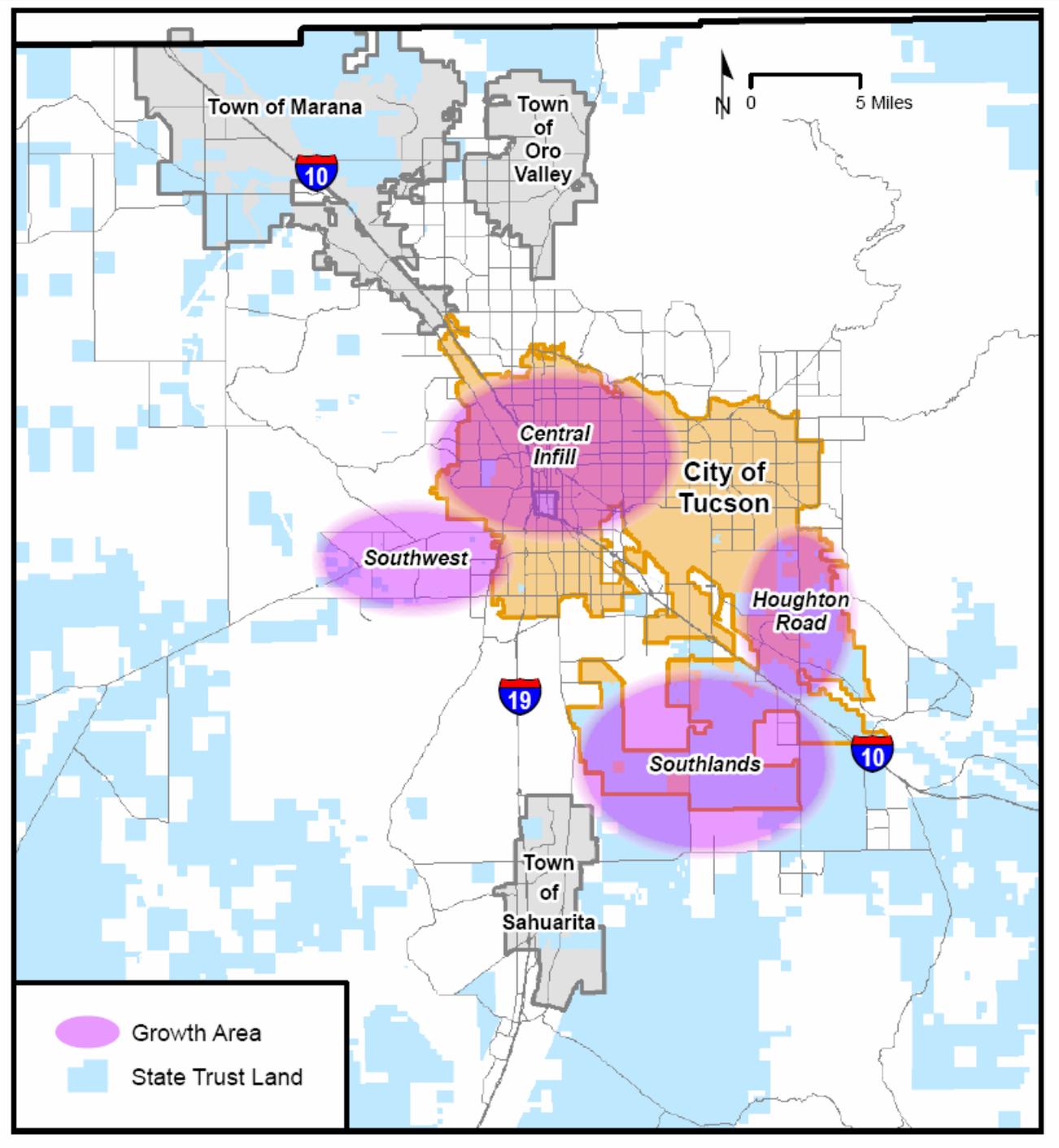


# Scenario Comparison

	Status Quo	Enhanced Habitat Protection	Infrastructure Efficient/Tax Payers Savings	Transit Orientated Development
Density within new growth areas*	2,500 pers/sq mile or 1.56 residences per acre (RAC)	3,600 pers/sq mile or 2.25 RAC	8,000 pers/sq mile or 5.0 RAC	8,000 pers/sq mile (11,000 – 23,000 pers/sq mile along urban transit lines and nodes) or 5.0 RAC (6.9-14.4 RAC)
Housing type choice	—	✓	✓✓	✓✓✓
Transportation mode choice	✓	✓	✓✓	✓✓✓
Access to jobs & services	✓	✓	✓✓	✓✓✓
Cost of services/tax levels	—	✓	✓✓	✓✓
Water, resource, energy and land consumption	—	✓	✓✓	✓✓✓
Walkable communities	—	✓	✓	✓✓

\*Outside of already planned but un-built or partially-built communities

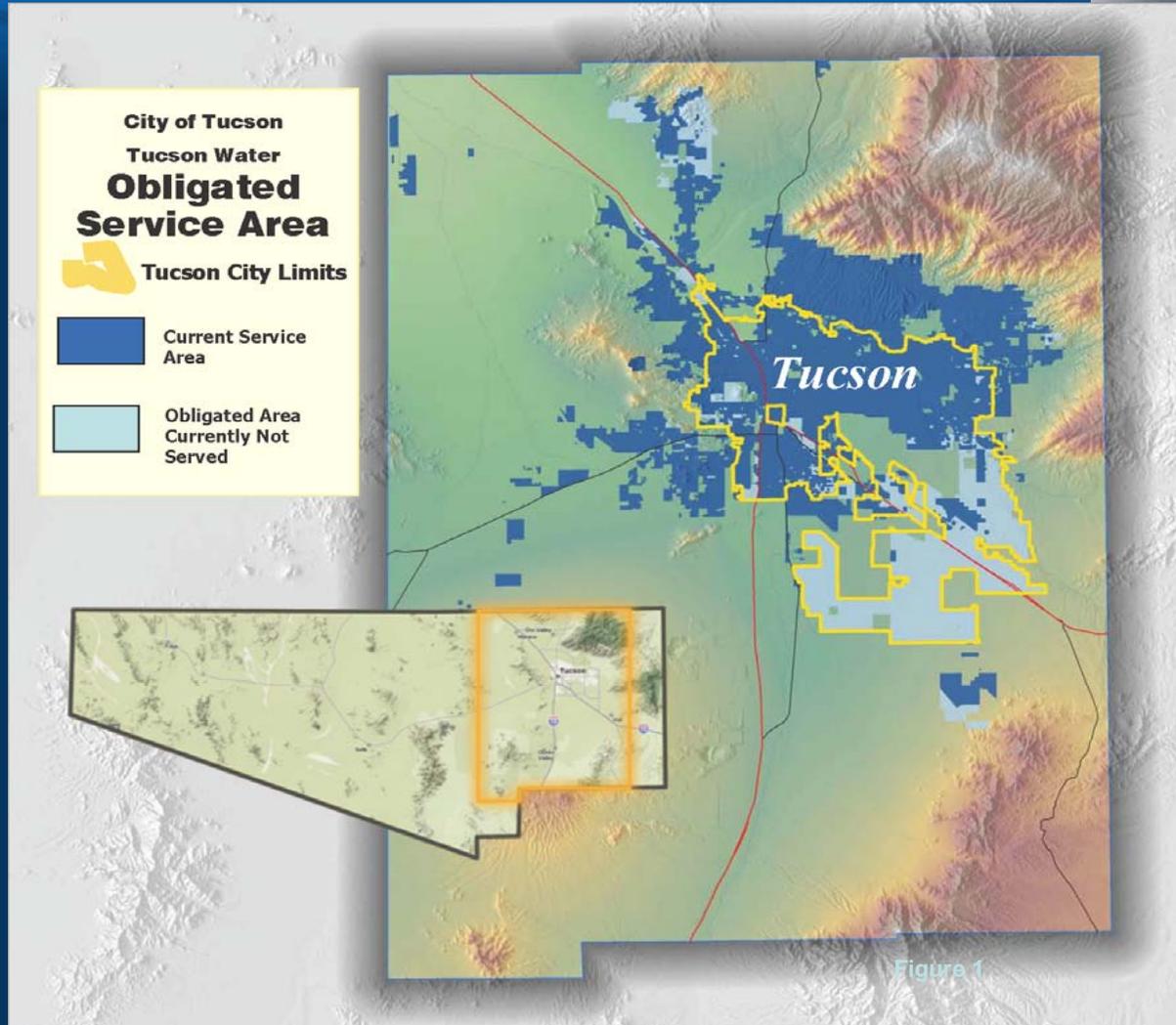
# Emergent Growth Areas



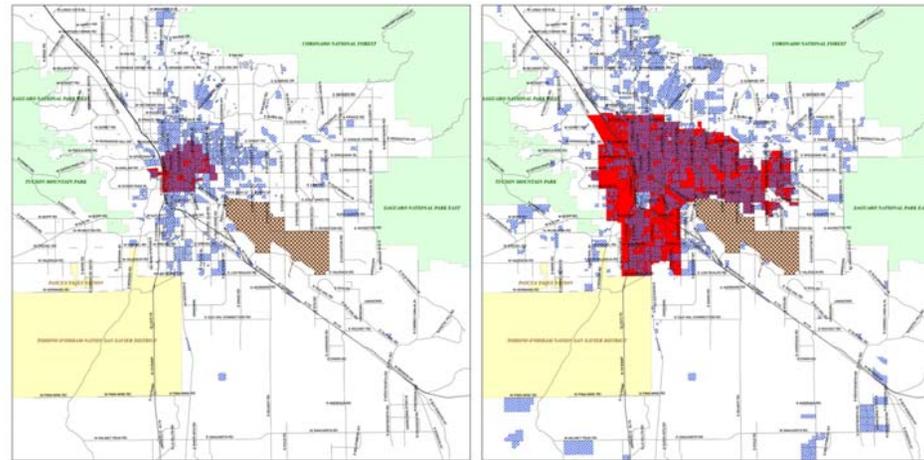
# Technical Paper Recommendations

- 1. General Plan/Comp Plan Updates & Land Use Regulations**
- 2. Capital Improvement Planning & Fiscal Sustainability**
- 3. Open Space Acquisition**

# Perspective within the Tucson Water Obligated Service Area



# Perspective within the Tucson Water Obligated Service Area



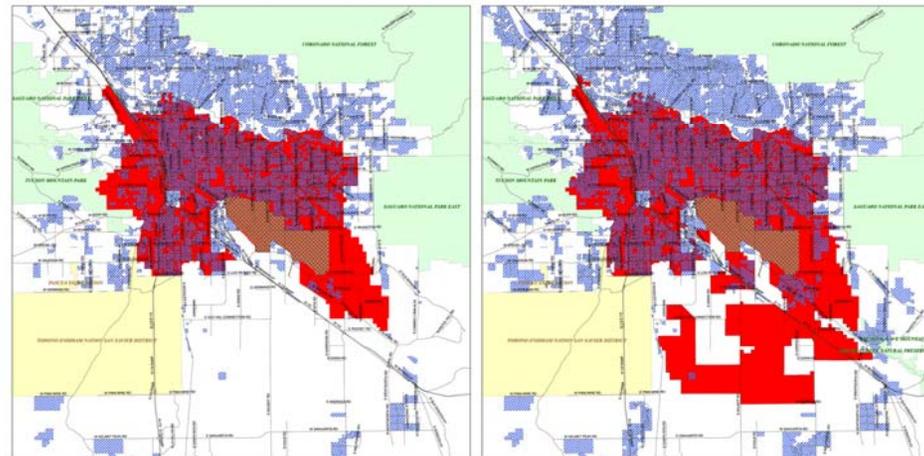
1950

1970

## Tucson Growth

1990

2005



- Platted Subdivisions
- Tucson City Limits
- Parks and National Forests
- Native American Jurisdictions
- Davis-Monthan Airbase



Department of  
**URBAN PLANNING  
& DESIGN**

Map Updated: April 6, 2005

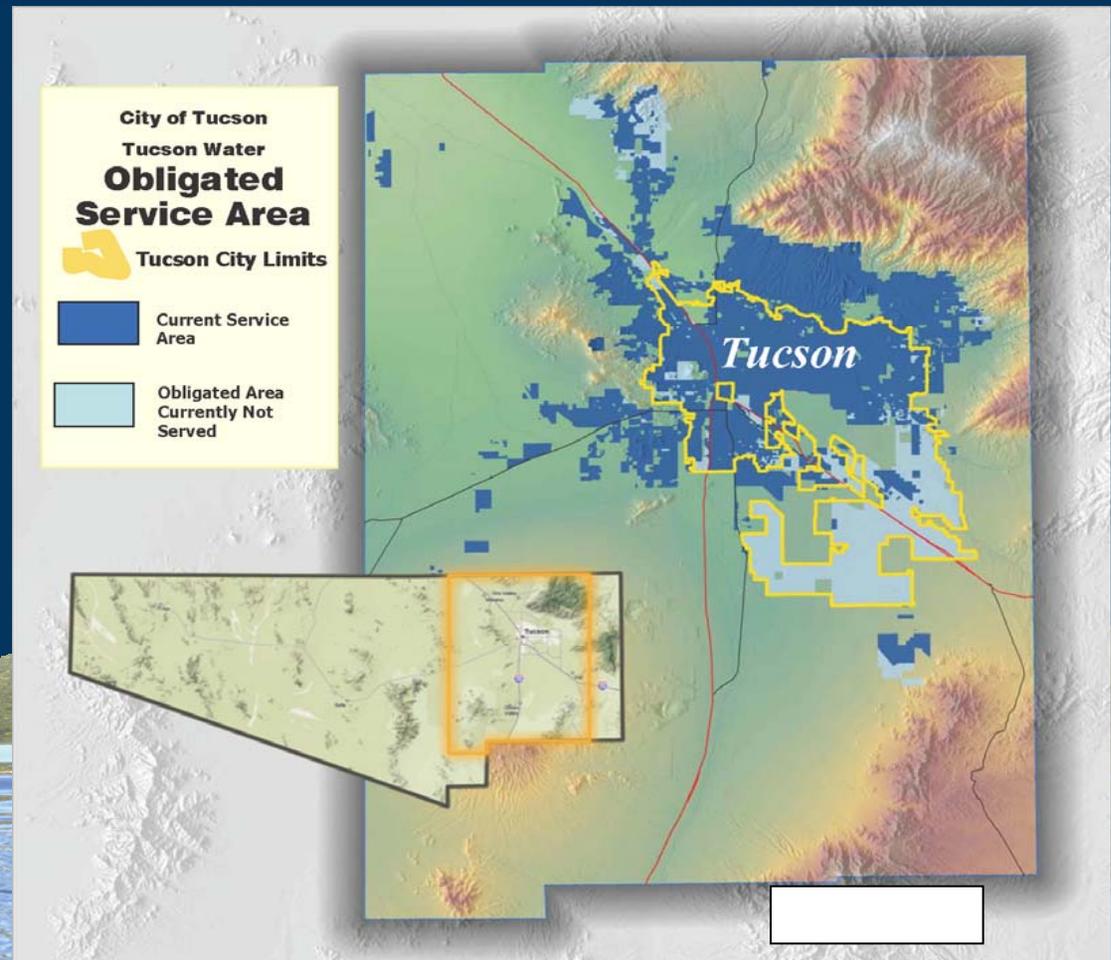
# City Efforts to Address Disconnect

1. Interim Water Service Policy
2. Water “checkbook”
3. Update to City General Plan



# Interim Water Service Policy

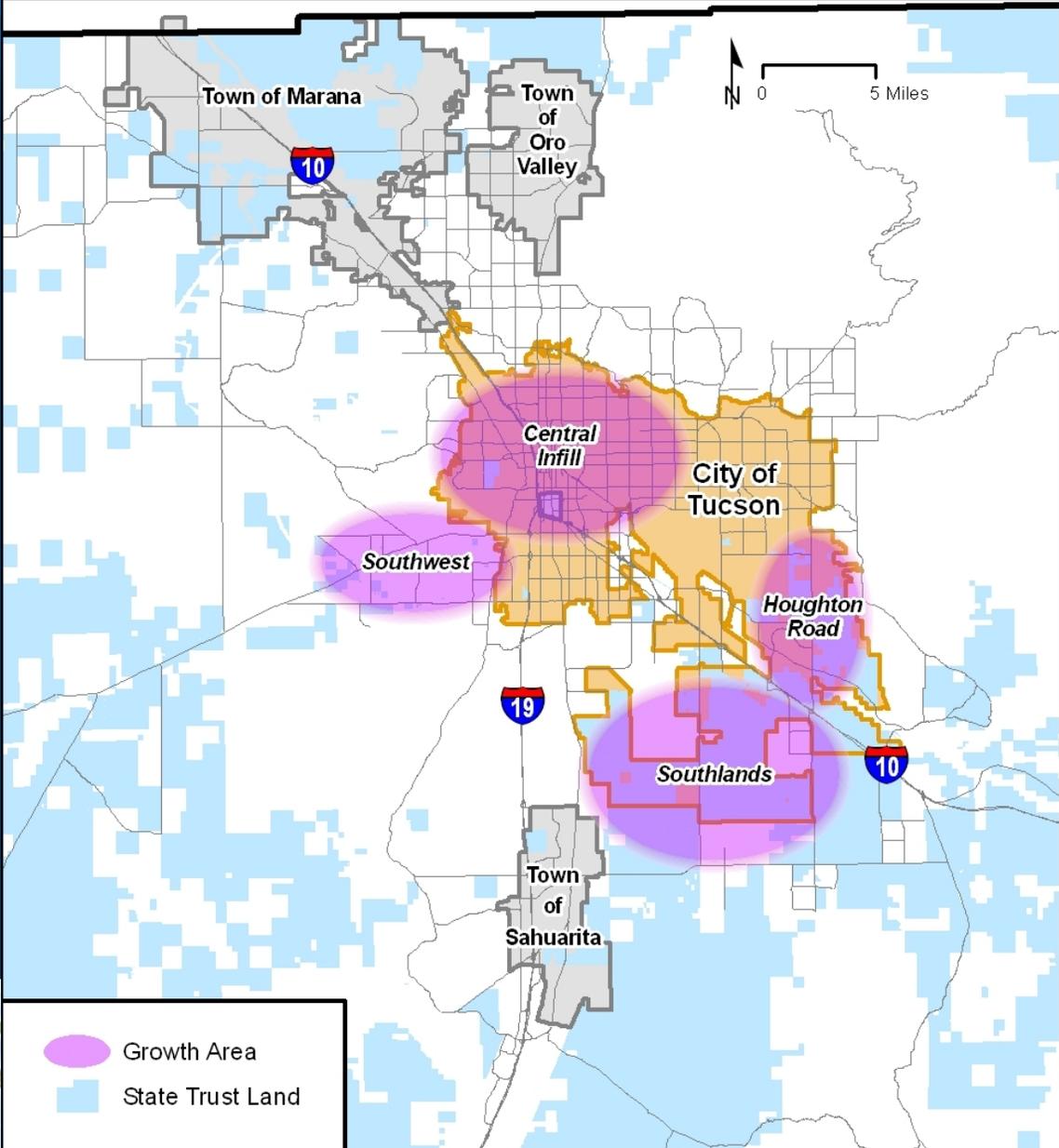
- In place since December 2007
- Policy states City will not extend water service beyond obligated area until further guidance is provided by the Study & the Mayor and Council



# Proposed Factors to Consider in Extending Service

1. In suitable growth area
2. Affect on water resources
3. Fiscal sustainability
4. Timing/location
5. Jobs and economic opportunity
6. Smart growth/sustainable urban form
7. Implications of not providing service

# 1. Suitable Growth Area?



## 2. Affect on Water Resources?

**Table ES – 8 Estimated Potential Tucson Water Service Population**

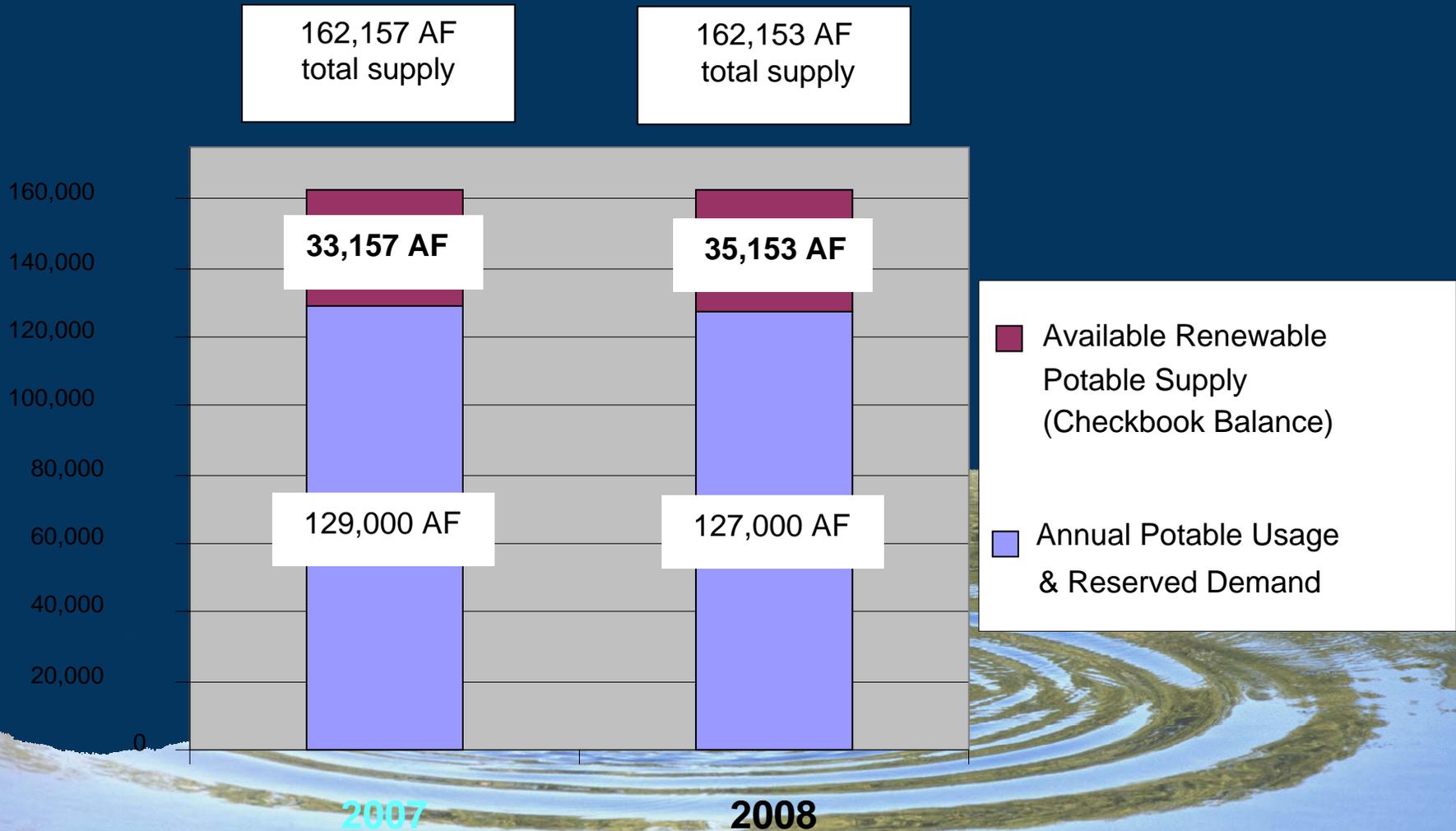
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Equals annual supply per day	194,118,814
Divide by GPCD	177
<b>Equals estimated population</b>	<b>1,096,716</b>

The Phase 1 Report calculated an estimated population that can be supported by Tucson Water's current resources

The Phase 2 technical paper on growth included a build out range for the obligated area of approximately 1 to 1.3 million people

## 2. Affect on Water Resources?

### Tucson Water “Checkbook”



### 3. Fiscal Sustainability?

#### Ongoing Revenues

- Sales tax
- Property tax
- State shared Revenue



#### Public Services

- Police/Sheriff
- Parks Maintenance
- Street Maintenance

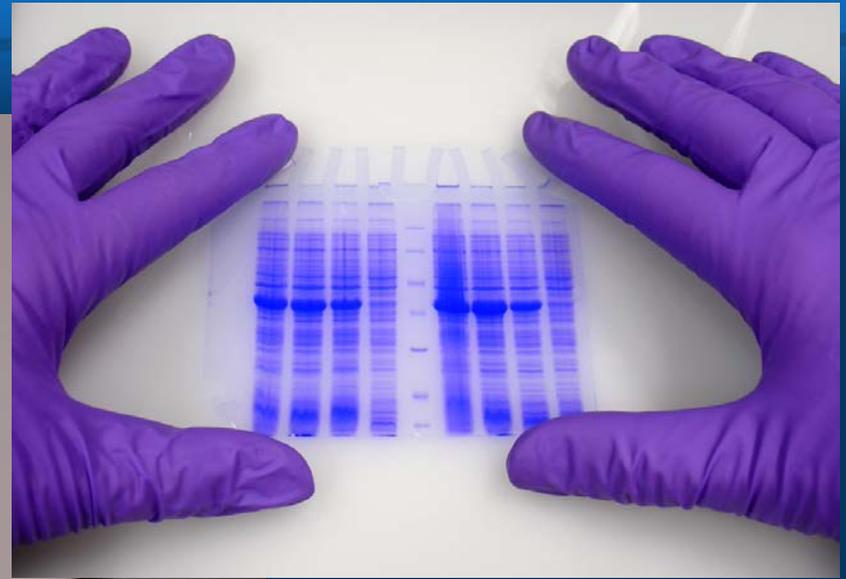


## 4. Timing/Location?

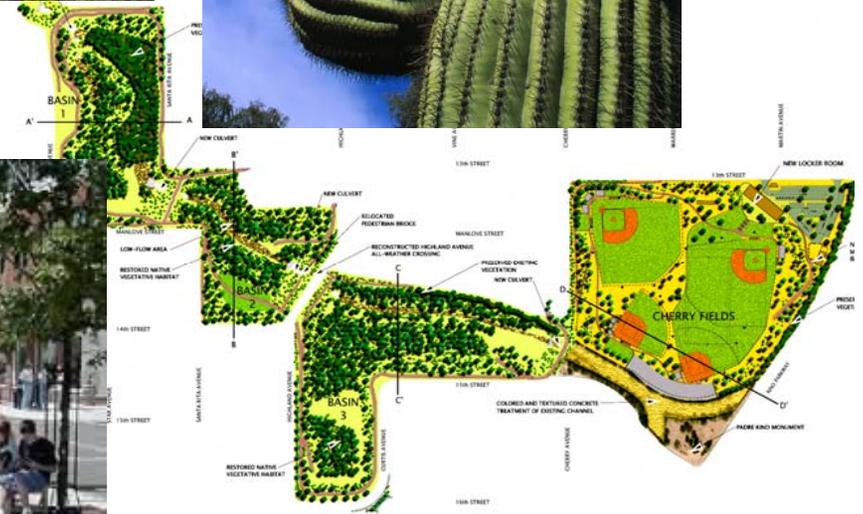


**Appropriately  
phased  
development  
closer to the  
existing built  
environment is  
more efficient to  
serve with  
infrastructure and  
public services**

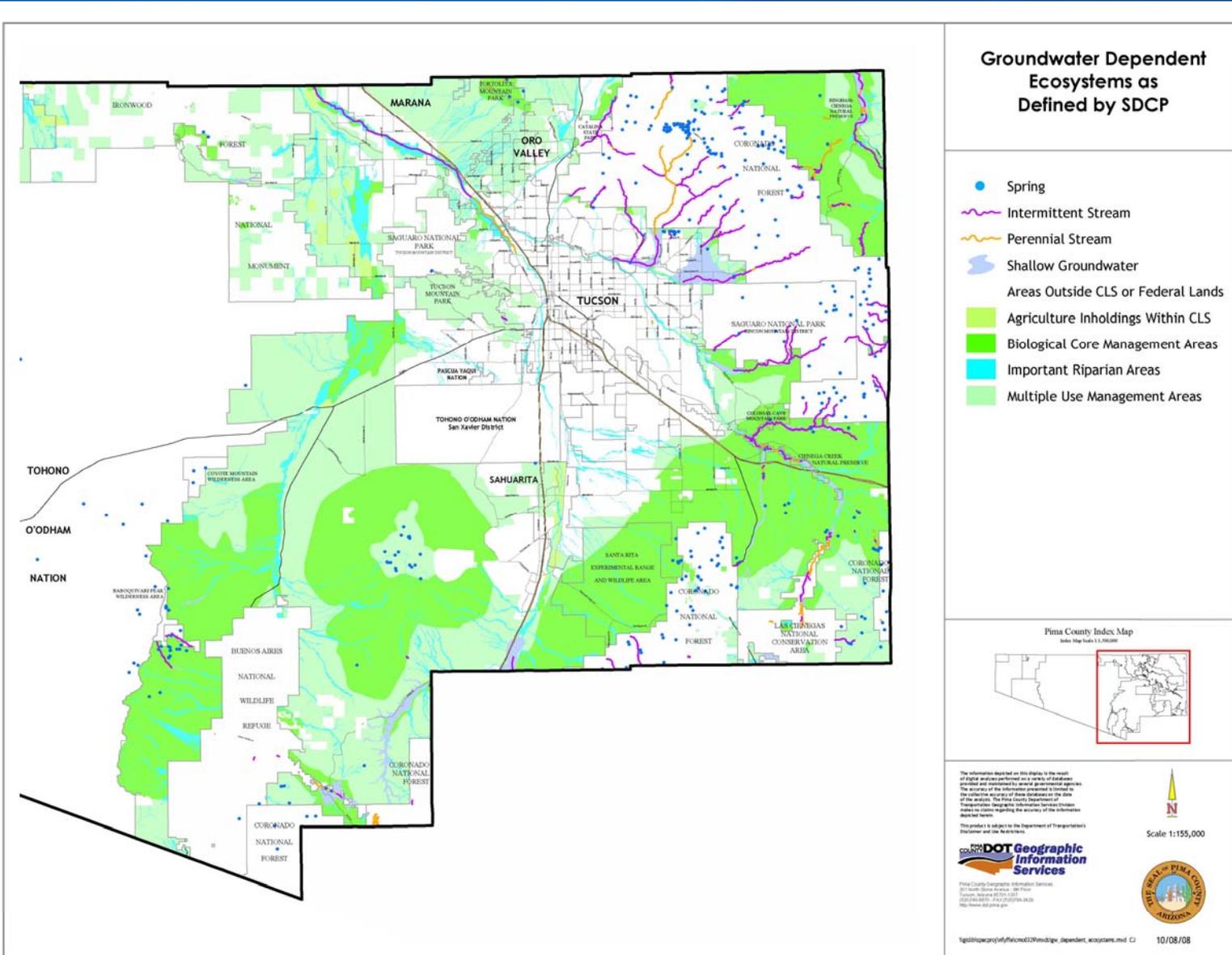
## 5. Jobs and Economic Opportunity?



# 6. Smart Growth/Sustainable Urban Form?



# 7. Implications of Not Extending Service?



# City Water Service Policy Going Forward

**We cannot continue the past demand-based approach to water service. We must consider future water service decisions from a holistic point of view, ensuring new development is truly sustainable, from all perspectives.**



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and Pima County  
Cooperative Project



# Water & Wastewater

For more information

- [www.tucsonpimawaterstudy.com](http://www.tucsonpimawaterstudy.com)
- [info@tucsonpimawaterstudy.com](mailto:info@tucsonpimawaterstudy.com)
- 884-WISP (9477)