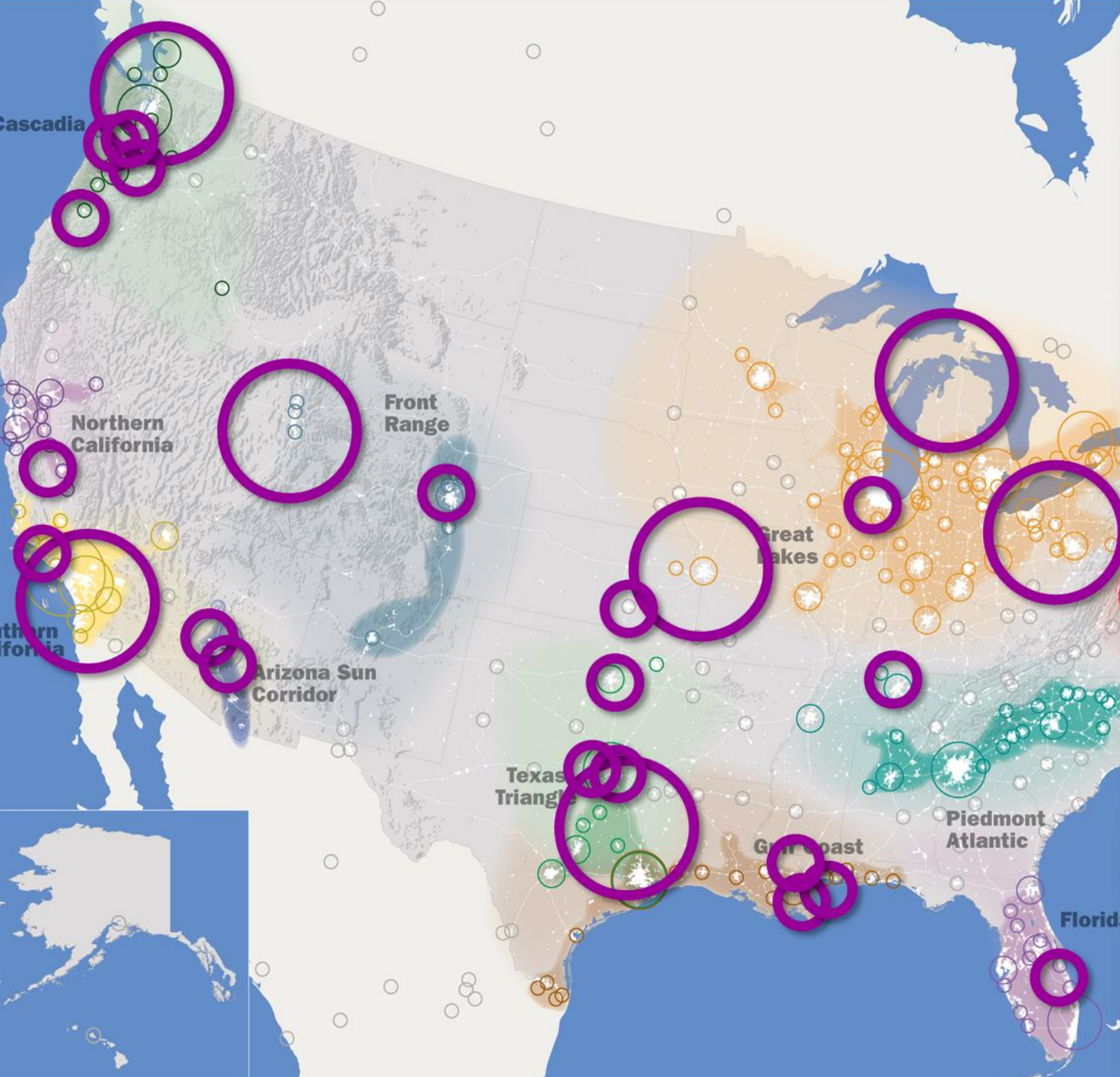


envision  
 tomorrow™

a suite of urban and regional planning tools

## Third Klimapolis Workshop

May 2019

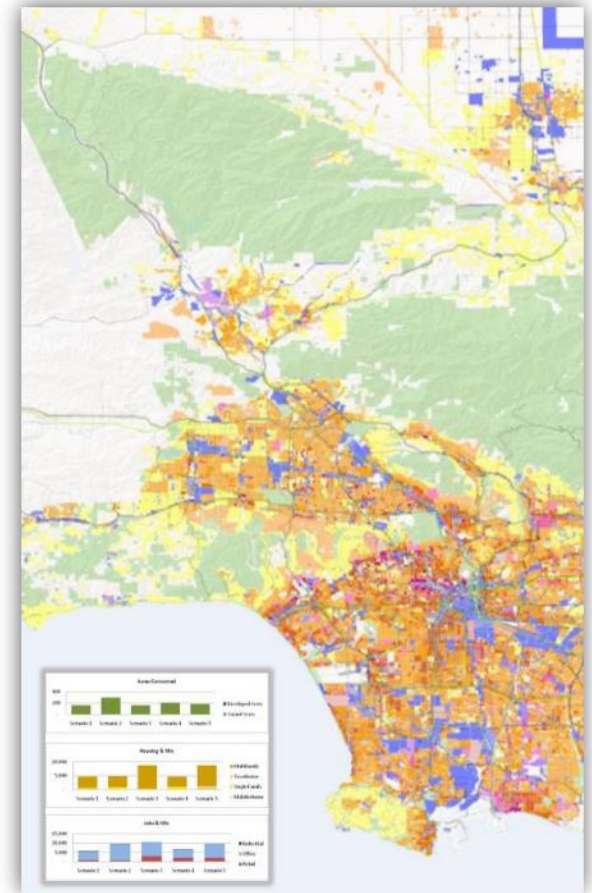


# What is Envision Tomorrow?

- Suite of open source planning tools:
  - Prototype Builder
    - Return on Investment (ROI) model
  - Scenario Builder
    - Add-in for ArcGIS
  - 20+ modules or “apps”
    - funded by national Housing and Urban Development (HUD) Sustainable Communities Grants



a suite of urban and regional planning tools



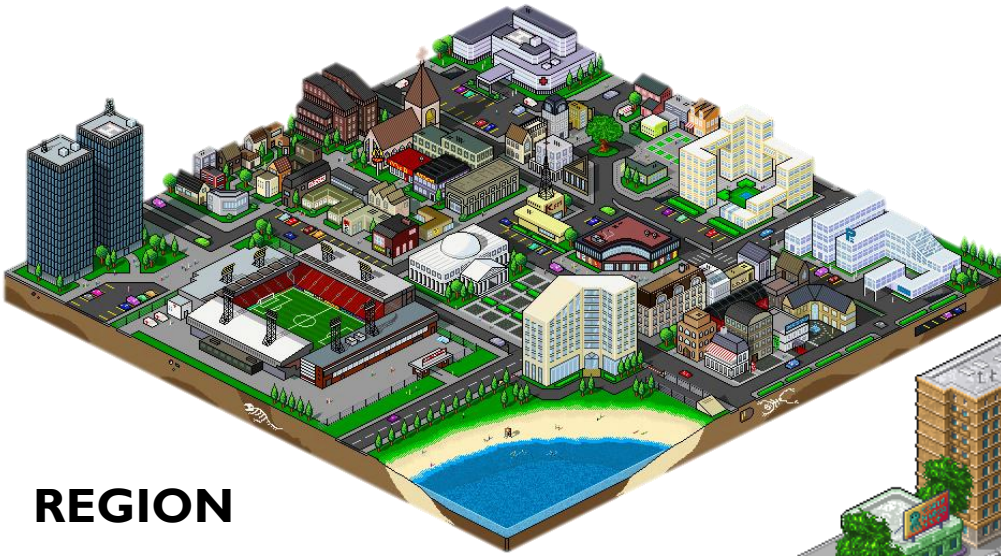
# Free and Open Source Plug-In for ArcGIS Desktop and AGOL





# Tool For All Planning Scales

**REGION**



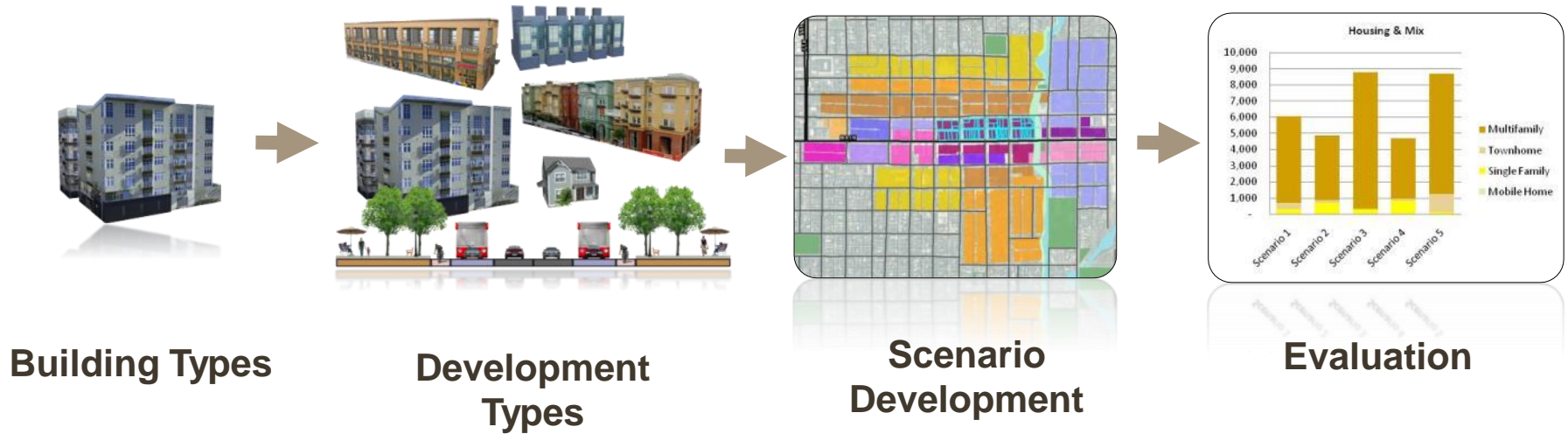
**DISTRICT**



**BUILDING**



# Scenario Building Process



Step I: Model a library of building types that are financially feasible at the local level.

# Create Prototype Buildings

## Why start with buildings?

### □ Easily modeled & lots of existing data

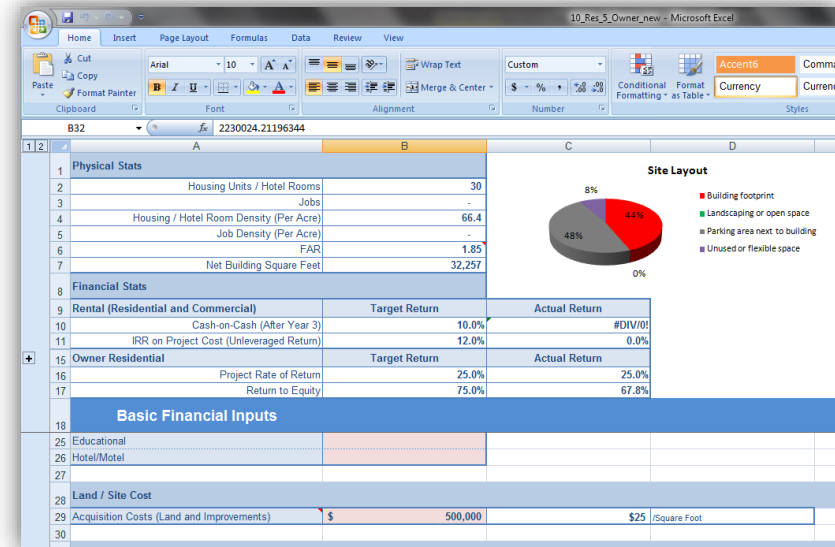
- Density and Design
- Rents and Sales Prices
- Costs and Affordability
- Energy and Water Use
- Fiscal Impacts

### □ Physical Form

- Height
- Unit sizes
- Parking configurations

### □ Financial Reality

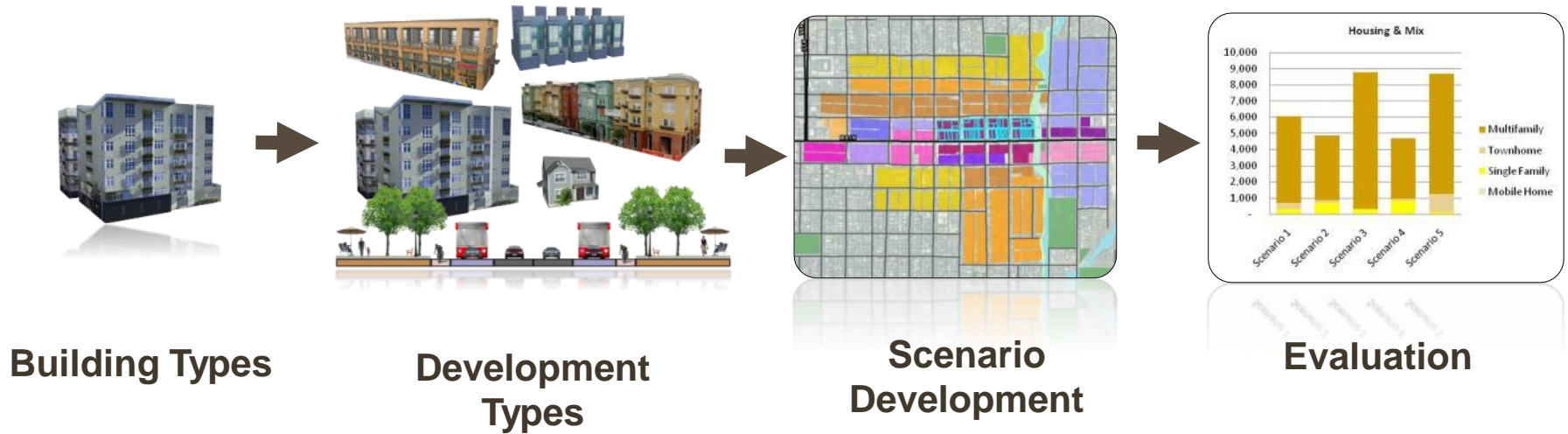
- Rents / sales prices
- Construction costs
- Land costs



**Feasible?**



# Scenario Building Process



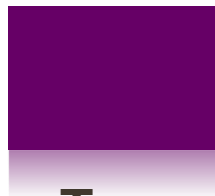
2

Step 2: Define the buildings, streets and amenities that make up all the “places” in which we live, work and play.



# Development Type Mix

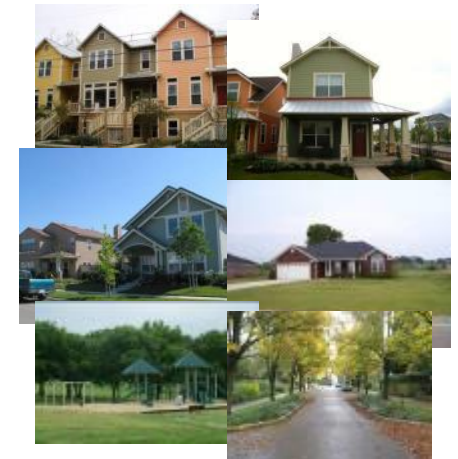
A Variety of Buildings, Streets and Amenities Create a “Place”



**Town  
Center**



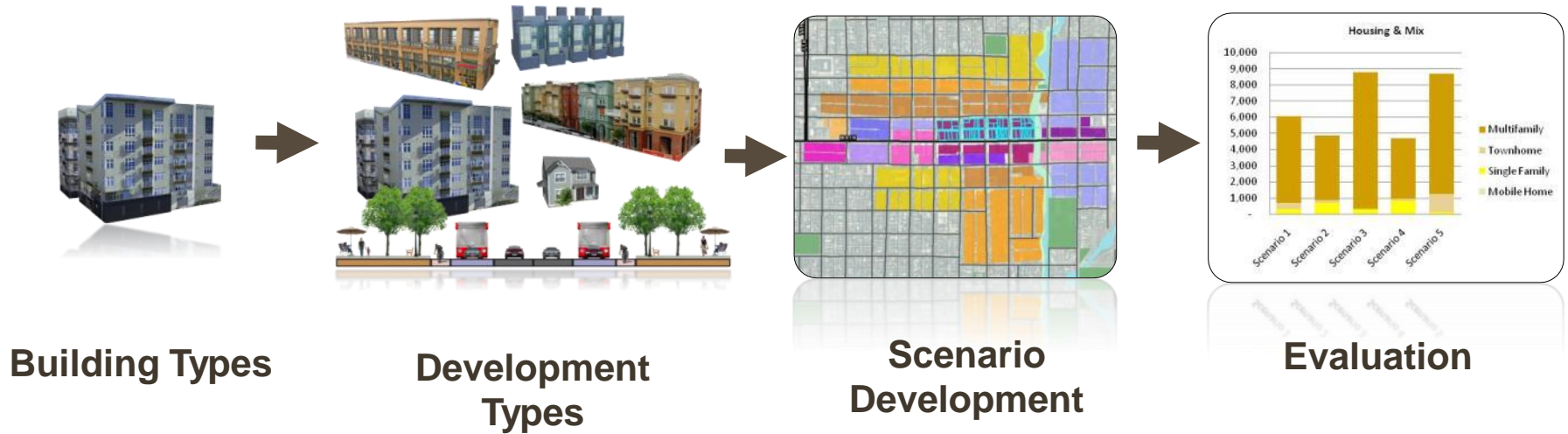
**Medium-Density  
Residential**



**Single-Family  
Residential**



# Scenario Building Process



Step 3: Painter future land use scenarios to test the implications of different decisions or policies.



# Real-time Scenario Building and Evaluation

**Select**

**Paint**

**See Changes Instantly**

File Edit Scenarios Paint Indicators Subareas

Apply Restore End Edit Save Edits

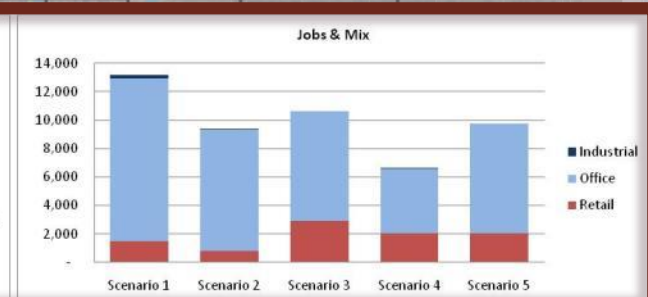
Paint Compare

Symbol Development Type

- Urban Core
- City Center
- Town Center
- Village Center
- Mixed-Use Corridor
- Main Street
- City Neighborhood
- Town Neighborhood
- Village Neighborhood
- Suburban Residential
- Rural Residential
- Office Park
- Regional Retail
- Strip Commercial
- Flex Park

Indicators: Housing Mix

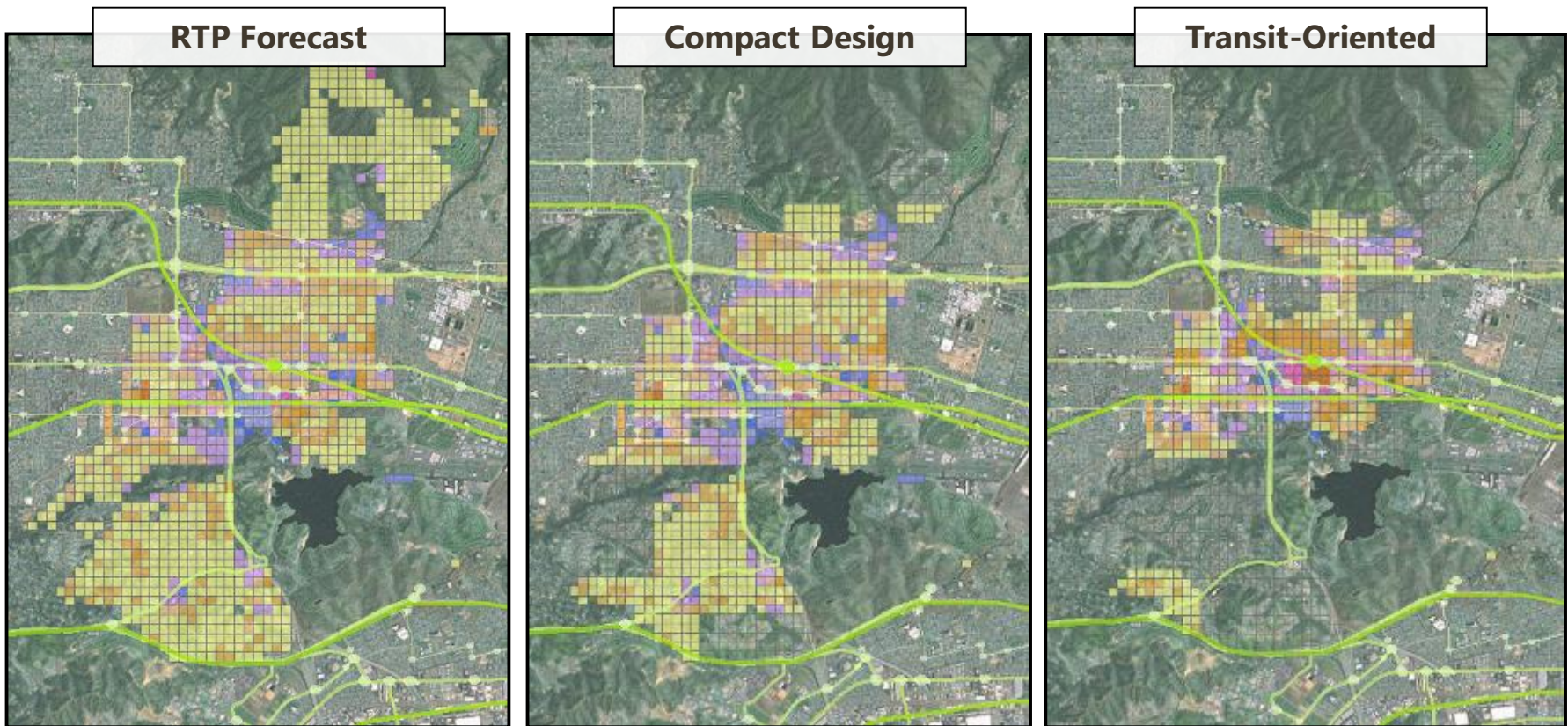
Housing Units and Mix



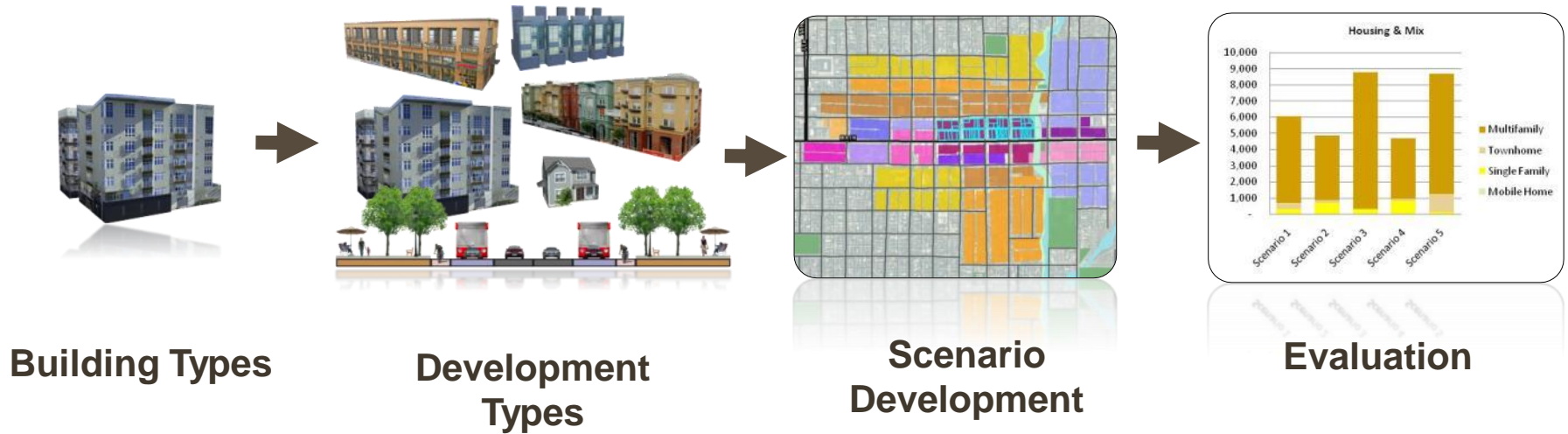


# Design and Test Multiple Scenarios

- Test land use policies
- Experiment with new development patterns



# Scenario Building Process

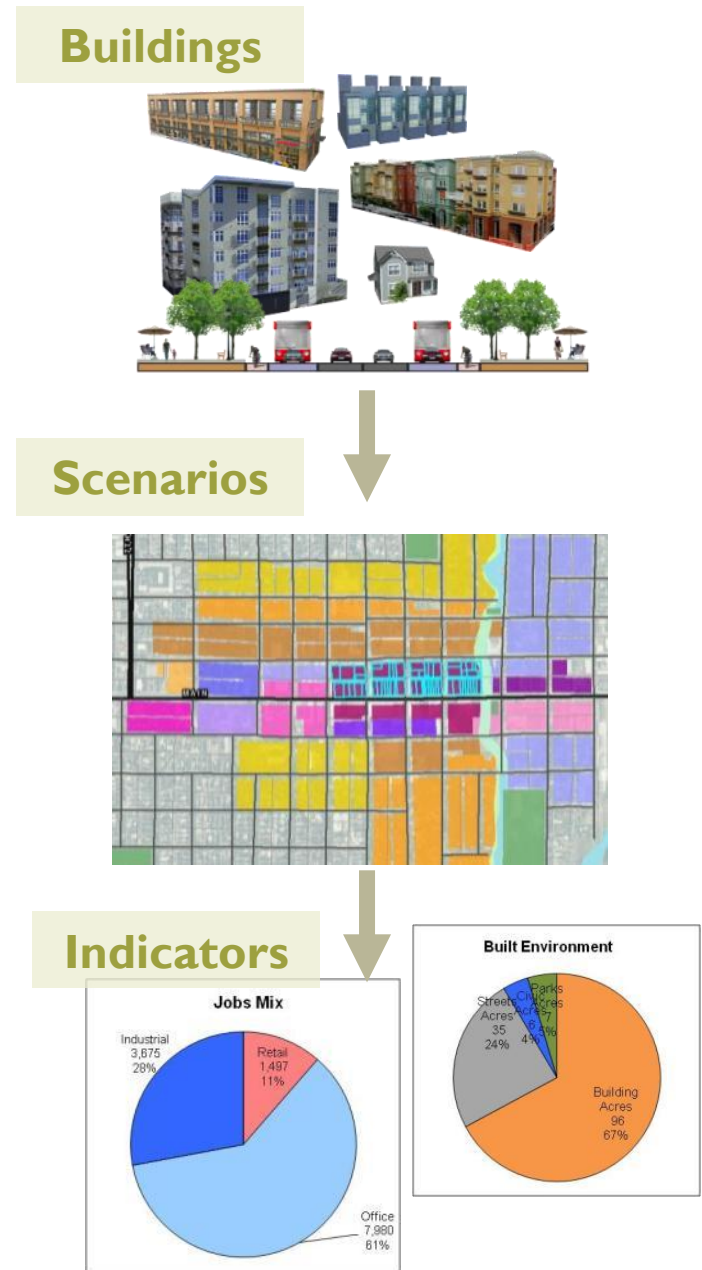


4

Step 4: Compare the scenarios and monitor the impact of land use decisions in real-time.

# Scenario Builder: *Scenario Painter for ArcGIS*

- Quickly paint scenarios using financially feasible building blocks
- Compare multiple scenarios across variety of indicators
- Track progress in real-time





# 80+ INDICATORS

Land Use  
Housing  
Employment  
Fiscal Health

Sustainability  
Public Health  
Transportation  
Parks & Recreation

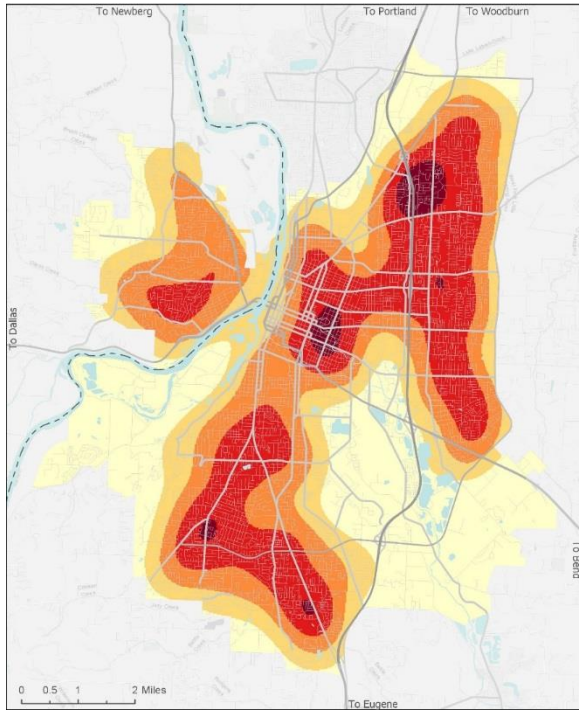


An aerial photograph of a city, likely Raleigh, North Carolina, showing a dense urban area with a river (Cape Fear River) winding through it. In the background, a prominent mountain (Mount Pisgah) is visible under a clear sky. The image is overlaid with a semi-transparent dark grey rectangle containing white text.

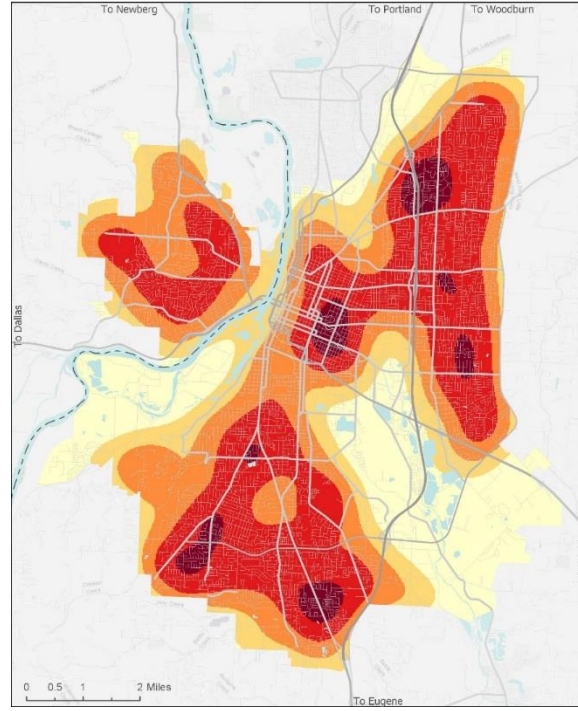
# **Our City is Growing** **How We Grow Matters**

## **Scenario Planning**

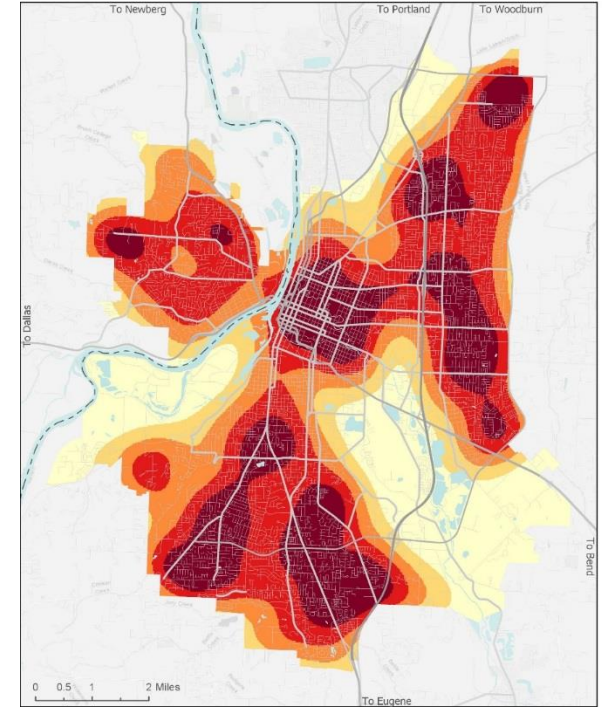
# All Households = Today + Future



Today



Scenario 1

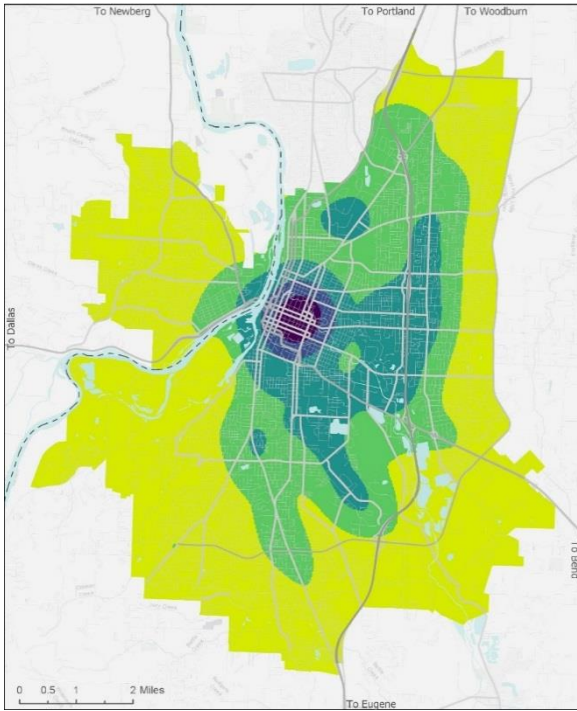


Scenario 2

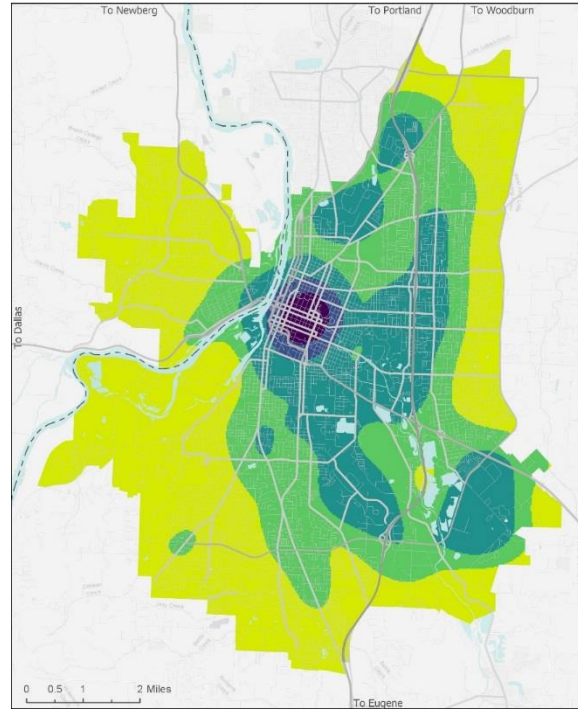




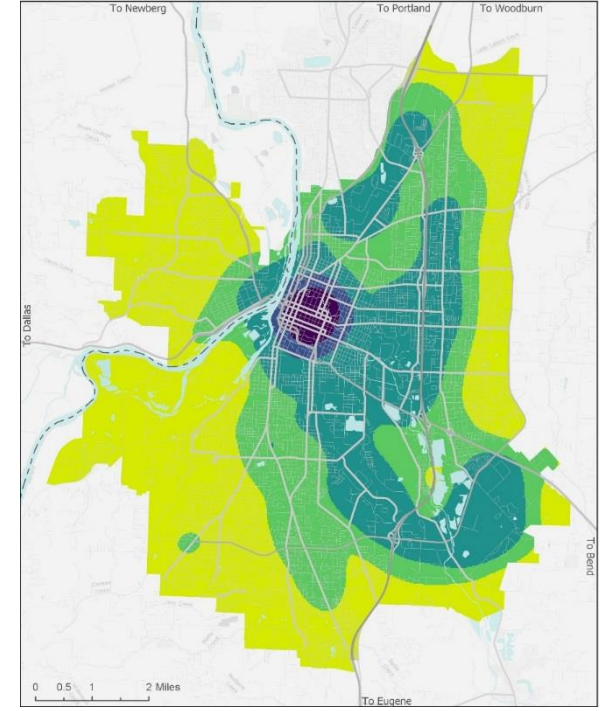
# All Jobs = Today + Future



Today



Scenario 1



Scenario 2

Least

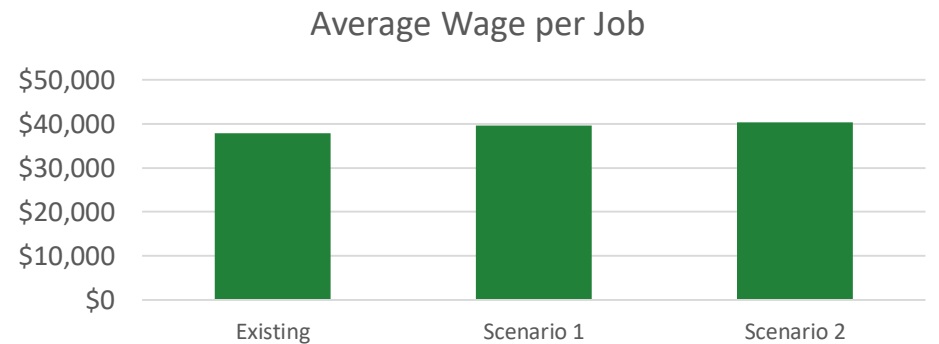
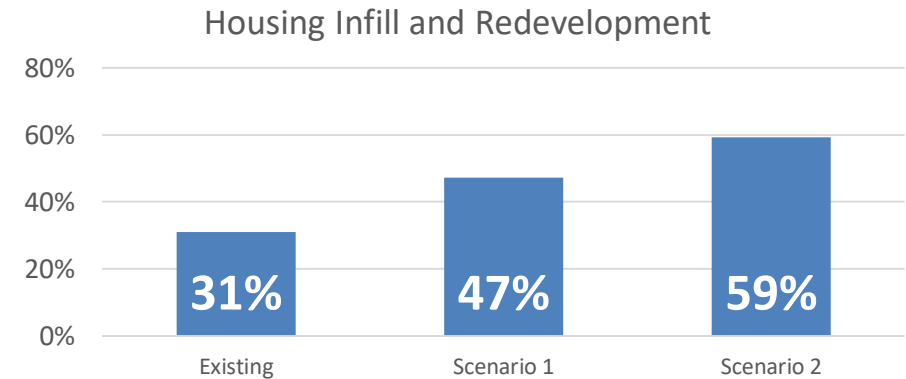


Most

# Envision Tomorrow

## Scenario Indicators

- **Land consumption & impact**
  - Vacant and redevelopment lands
  - Measure development impact to sensitive lands (user defined sensitive areas)
- **Infill and Redevelopment**
  - Percentage of growth on vacant lands or accommodated through infill
- **Housing**
  - Unit type mix, FAR, density, tenure
  - Cost and affordability (rents / sales prices)
  - Match to estimated future housing demand
- **Employment**
  - Industry mix, FAR and density
  - Employment wage
- **Jobs-Housing Balance**



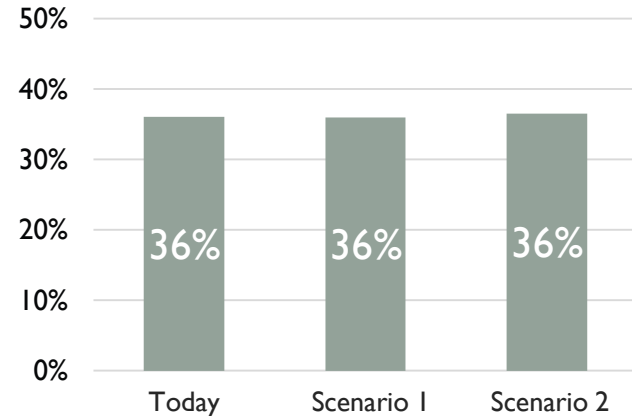


# Envision Tomorrow

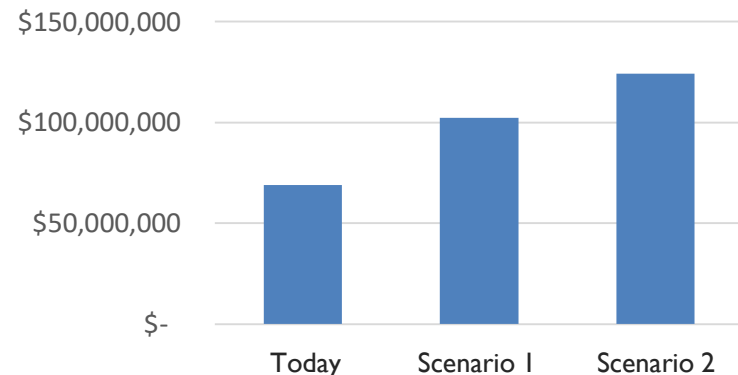
## Scenario Indicators

- **Square footage of new buildings by type**
  - Land use mix (entropy score)
- **Value of new buildings**
  - Sales and property tax revenues
  - Value of required subsidy
- **Household and Population**
  - Population and density
  - Average household size
  - Average household income
    - Based on new housing costs
- **Affordability**
  - Cost of Housing
  - Housing + Transportation + Energy Cost

HTE Cost to HH Income

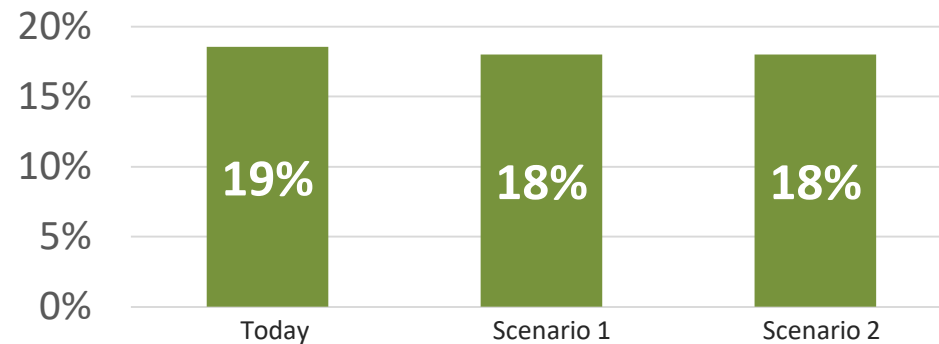
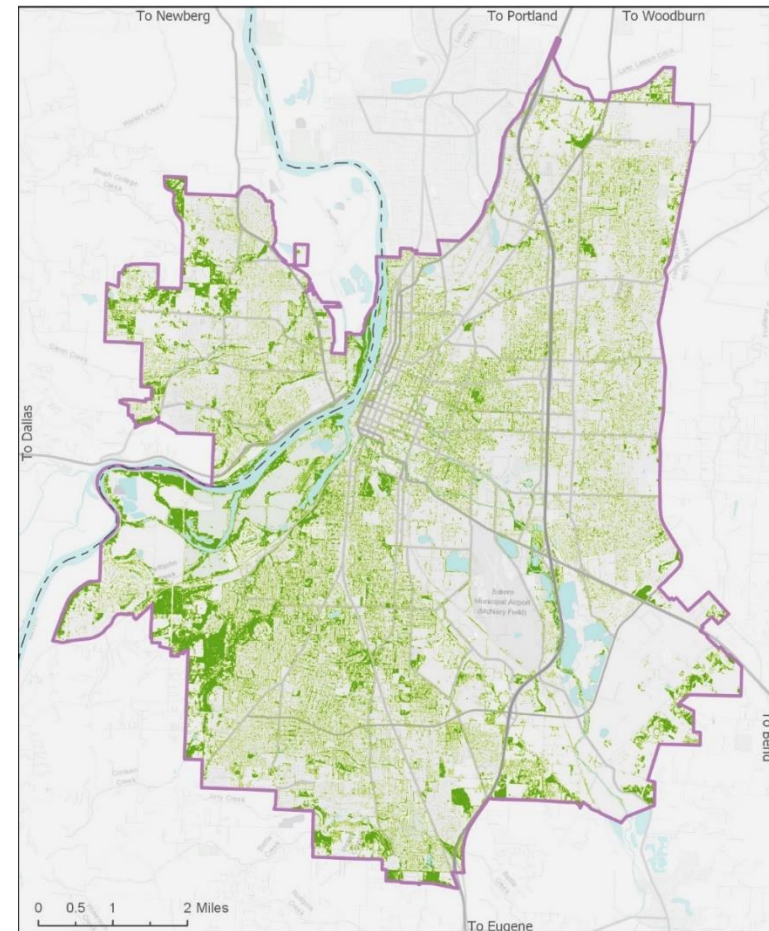


Annual Property Tax Revenue  
(Existing + Increment)



# Envision Tomorrow Scenario Indicators

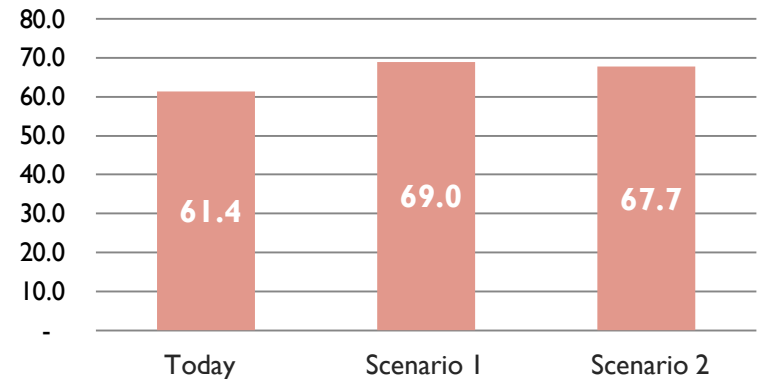
- Parking spaces, area and costs
- Lot coverage and impervious surface
- Private landscaping and open space
- Estimated new street characteristics
  - New street length
  - Network and intersection density
- Custom Indicator:
  - Tree coverage



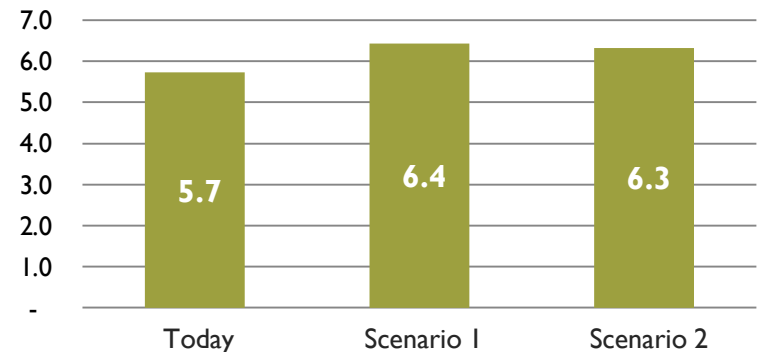
# Building-Level Sustainability Indicators

- Building energy use
- Carbon emissions from energy use
- Landscaping water consumption
- Internal building water consumption
- Solid waste generated

**Energy Use (Million BTU/Yr) per Household**

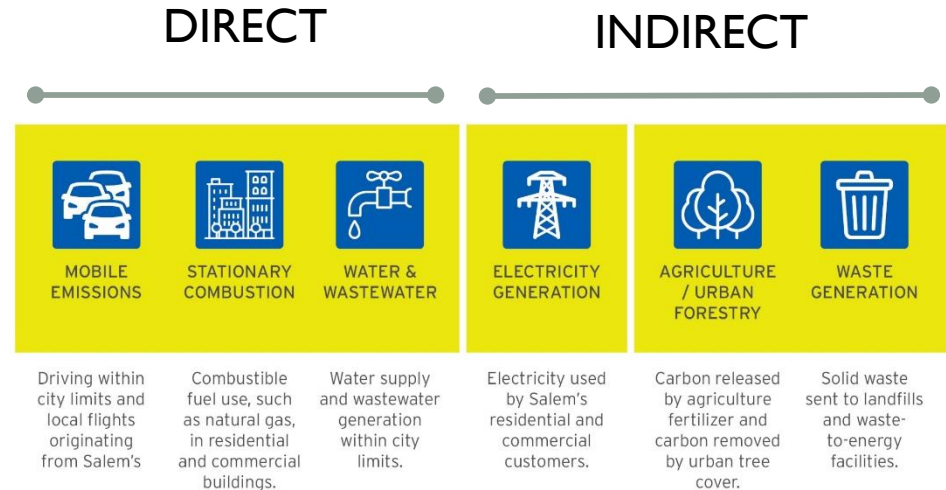


**Carbon Dioxide (CO<sub>2</sub>) Emissions (Tons/Yr) per Household**

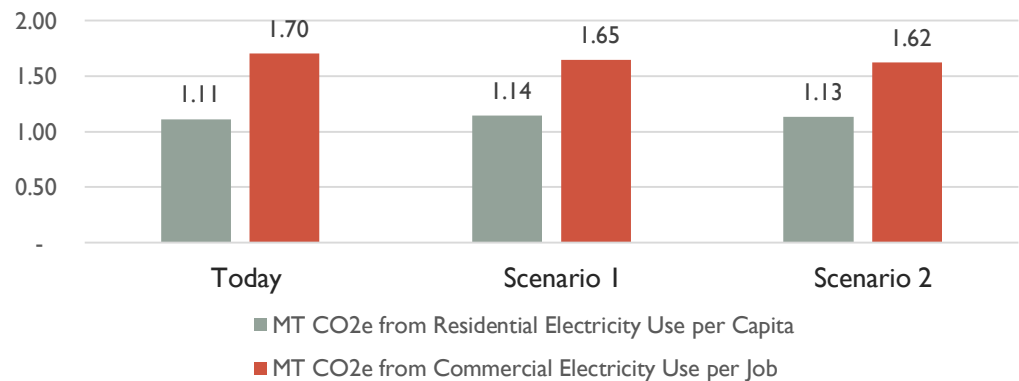


# What is a Community Greenhouse Gas (GhG) Inventory?

- Greenhouse gases absorb and emit the sun's energy.
- GhG inventories are a full accounting of these gases emitted into and removed (sequestered) from the atmosphere.
- A community GhG inventory tracks emissions and sequestration associated with activities that occur within a city, county, or region.



Annual Metric Tons (MT) CO<sub>2</sub>e Per Resident and Per Employee



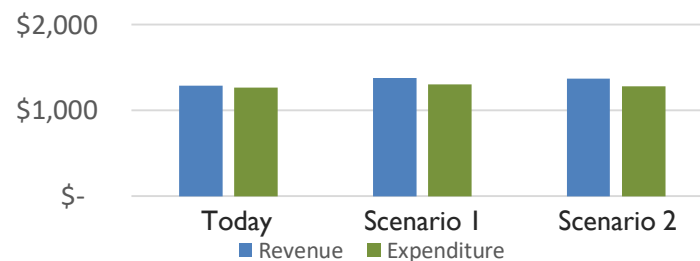


# Fiscal Impact Modeling

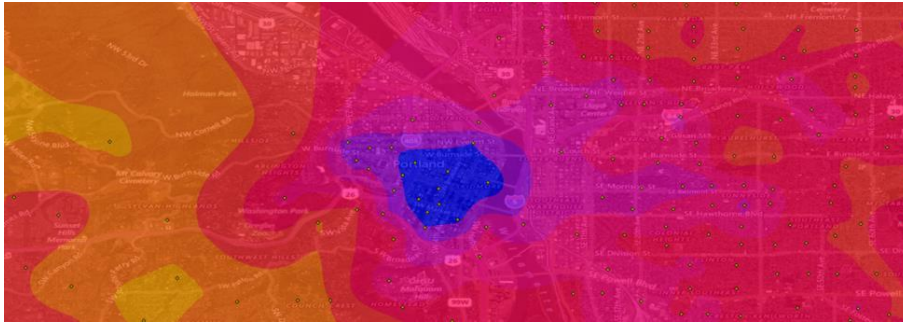
- A Modified Version of the Federal “FIT” Fiscal Impact Model
- Estimate and compare county and municipal revenues and costs from scenarios
- Uses building values and infrastructure costs from Envision Tomorrow to capture explicit differences in revenues and costs from different land use types
- Indicators:
  - Revenue Cost Ratio
  - New Revenues (Property, Income and Sales Taxes)
  - New Costs (Infrastructure, O&M and Services)

LOCAL INPUTS & ASSUMPTIONS			
County Name			
Cuyahoga County, Ohio			
		Population	Override
County Pop.	1,270,433		0
24/7 County pop.	1,151,612		0
City Pop.	186,443		170,650
Property Tax Rates (per \$100 assessment)			
	Real/Fixed		
County	\$0.26960		
City	\$0.54390		
Schools	\$0.64080		
Other1	\$0.00000		
Other2			
Total	\$1.45430		
Sales Tax Rates & Revenue			
Total	6.35%		
State	4.70%		
City	1.00%		
County	0.25%		
Annual Sales in City (\$)		Override	Taxable Sales
County	\$14,478,876,000	\$18,798,666,675	\$18,798,666,675
City	\$5,871,098,438		\$5,871,098,438
Utility Franchise Fee	0.00%		
<i>Represents a tax on both gas and electric services</i>			
Est. consumer retail sales occurring in city		Override	
		31%	31%
Percent of consumer \$s spent subject to sales tax			
30%			
Assessment ratio, Residential property		55%	
Assessment ratio, Retail property		100%	
Assessment ratio, Office property		100%	
Assessment ratio, Industrial property		100%	
Assessment ratio, Public / Civic		100%	
Assessment ratio, Educational		100%	
Assessment ratio, Hotel / Hospitality		100%	
Income tax source			
Residents + Workers			

Average Revenue and Expenditure Generated per Capita

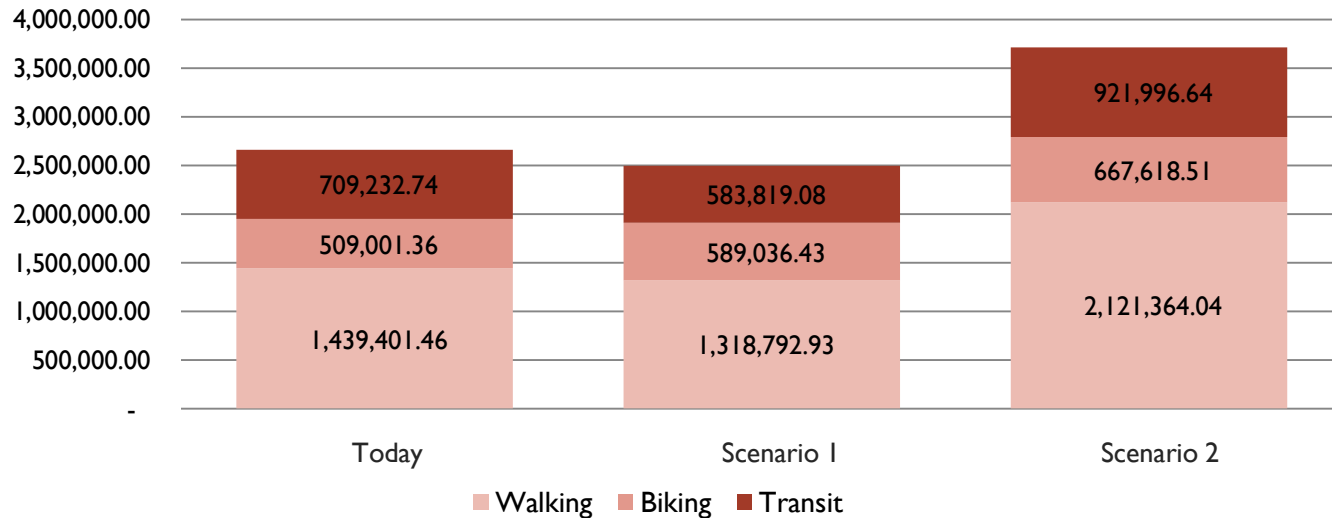


# Public Health



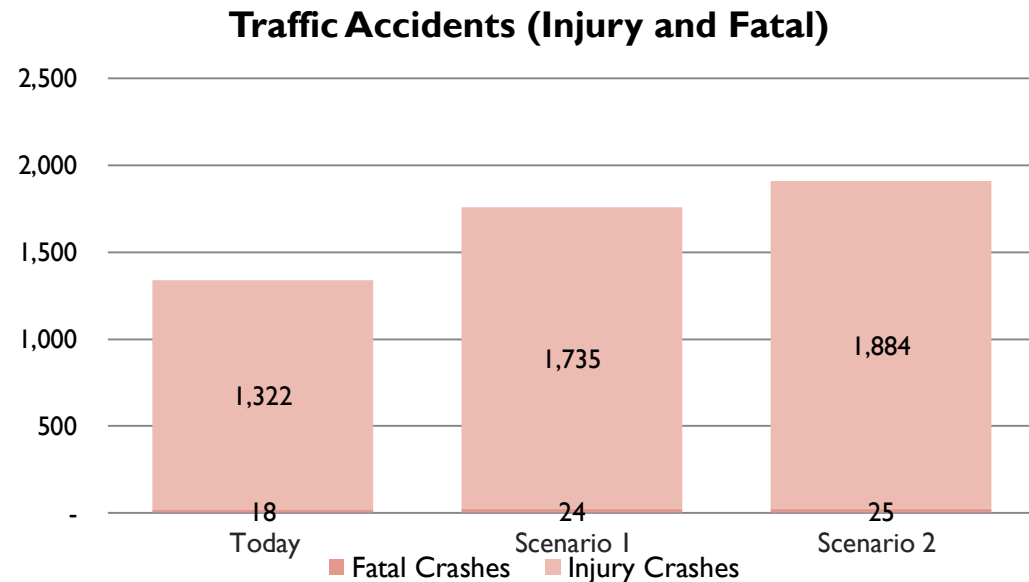
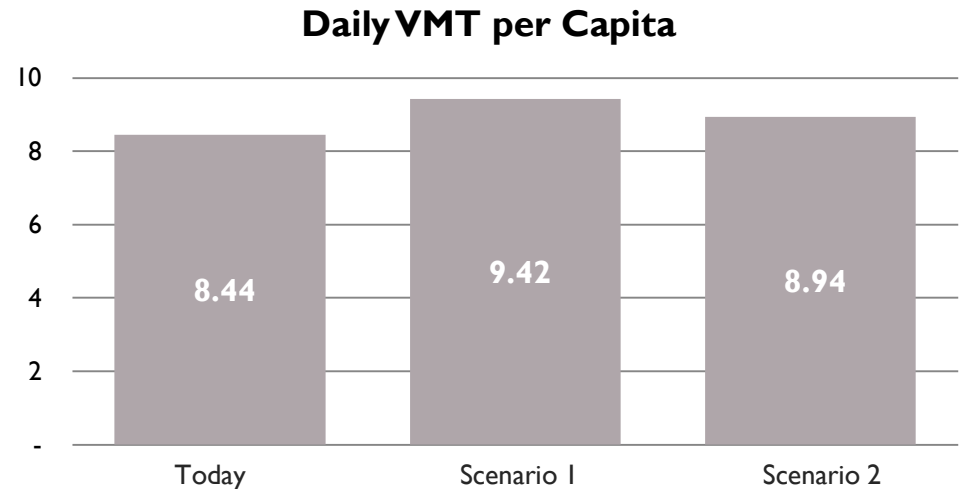
- API developed by Urban Design 4 Health (UD4H)
- Tracks walking, biking, BMI, recreation
- Metabolic equivalent of task – intensity of exercise

## Daily METs Spent in Active Transportation

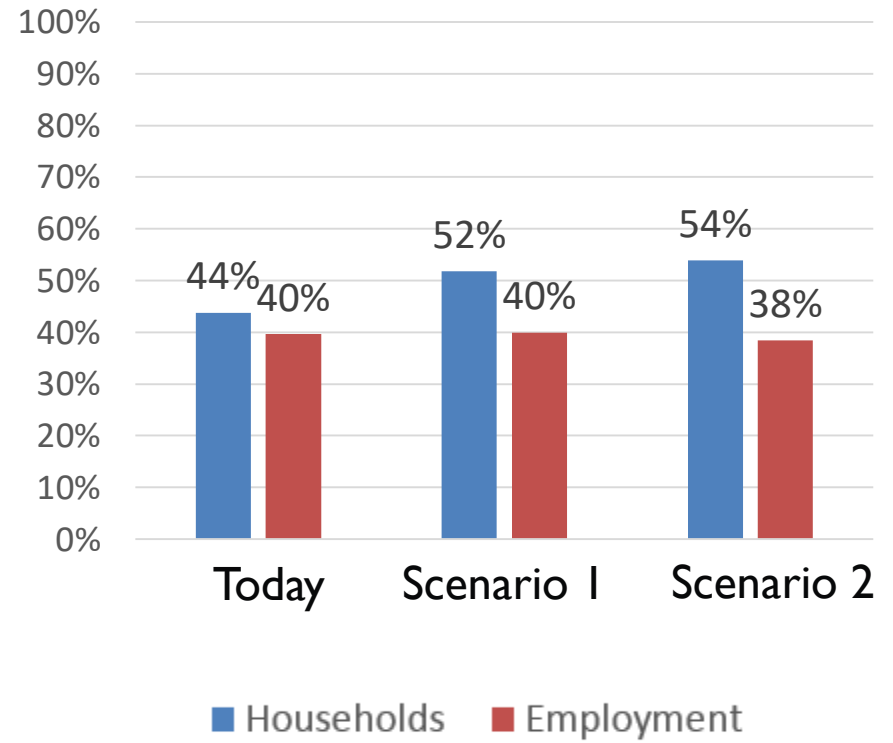
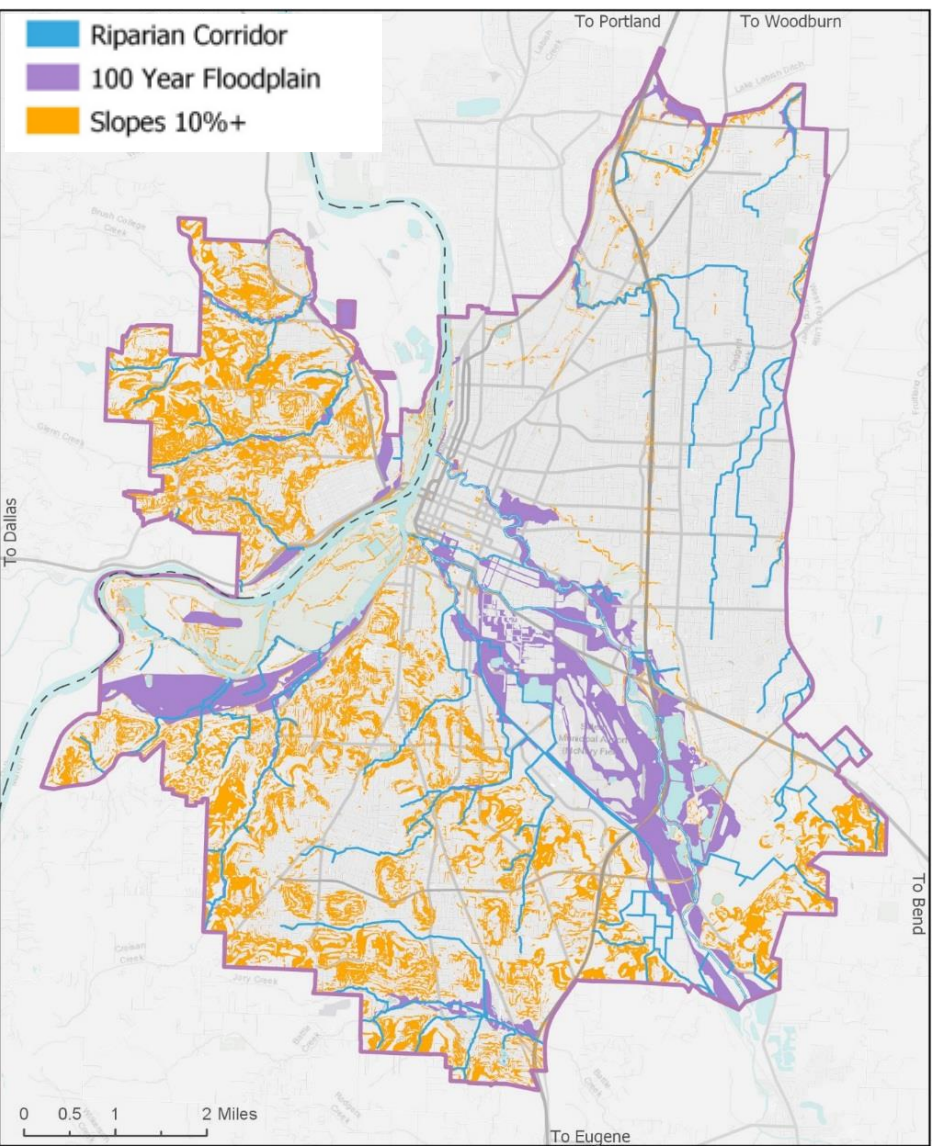


# Transportation Indicators

- Household Vehicle Miles Traveled
- Trips by Mode
  - Auto
  - Transit
  - Walk
  - Bike
- Cost of Transportation (Auto and Transit)
- Health Benefits of Increased Walking
- Changes in Transportation Air Pollutants

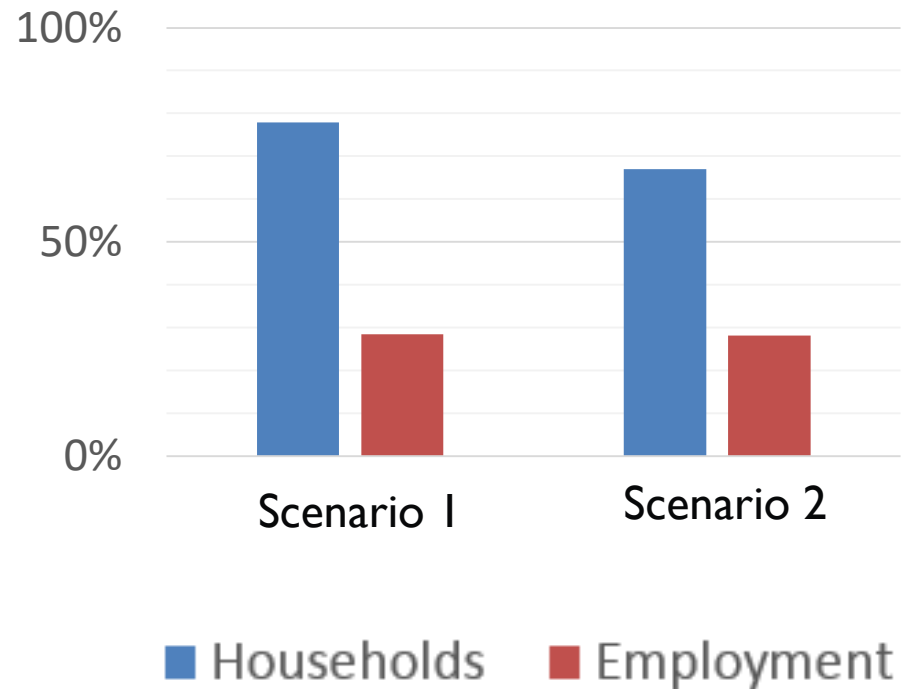
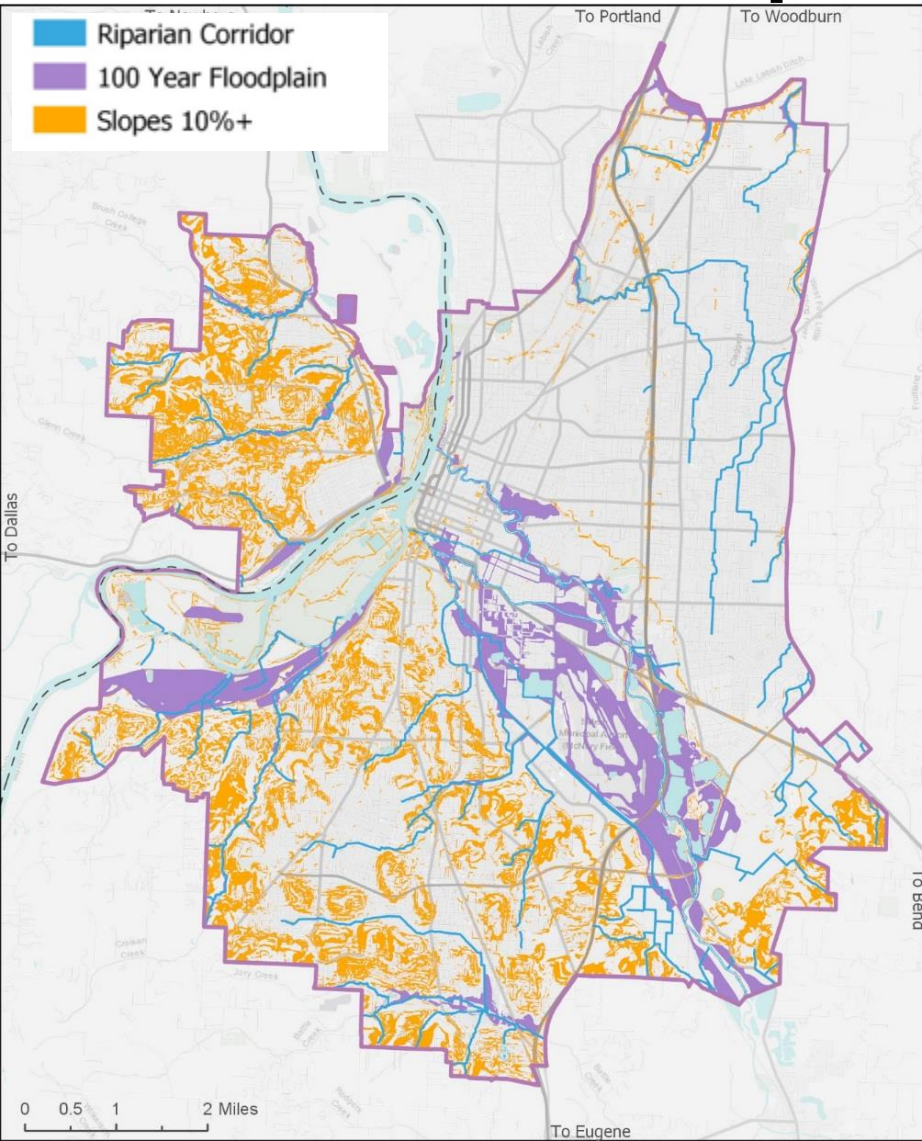


# Riparian Areas + Floodplain





# Development in areas with slopes 10% +



# Next Steps

- Environmental Resiliency
  - Flooding
    - Storms and hurricanes
    - Coastal flooding and/or rising sea water levels
  - Earthquakes/Tsunamis
  - ....

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**Contact:**

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