Place Type-Oriented Land Use Simulation for Land Use/Transportation Decision Making

30th ESRI International User Conference, 2010

Do Kim, Ph.D

Assistant Professor

Department of Urban and Regional Planning

California State Polytechnic University - Pomona

Land Use Scenario and Place Type

Scenario Planning

❖ **A process that uses scenarios to assess the future utilizes a series of scenarios to gauge possible future conditions**

❖ **Due to the strong relationship between land use patterns and travel behavior, scenario planning integrating land use and transportation has become much more wide-spread**

❖ **A survey in 2005 identified 79 land use/transportation scenario planning in US**

Land use/Transportation scenario planning projects

Source: Keith Batholomew, *Integrating Land Use Issues into Transportation Planning: Scenario Planning*, FHWA-HEP-05-032

Concept of Place Type

❖ **Place Type - a way to design and define land use patterns**

❖ **A place Type reflects pedestrian shed**

   ❖ **¼ mile diameter area (40 acres)**

   ❖ **Combination of different building/parcel types in the shed**

Model | Diagram | Description

PARKS
Block and Neighborhood Parks are located approximately every 2-3 blocks and every 1/2 Mile respectively.

LAND USE & DENSITY
3-storey garden apartments, townhouses, and single family small and large lot residential provide a diversity of housing types.

ACCESS
Local roadways with a 60' right of way provide one sided on-street parking and 10' swales to help manage stormwater runoff.

ENVIRONMENT
Stormwater detention pond/park sized to capture runoff from the Neighborhood Element

Decomposition of Urban Space

CBD

Urban Center

Decomposition

Transit Center

Urban Neighborhood

The smallest Unit

Parcel

Residential Neighborhood

Decomposition

Suburban Subdivision

Re-composition of Urban Space

Parcels

Place Types

Suburban Neighborhood · Urban Neighborhood · Town Center · CBD · ....
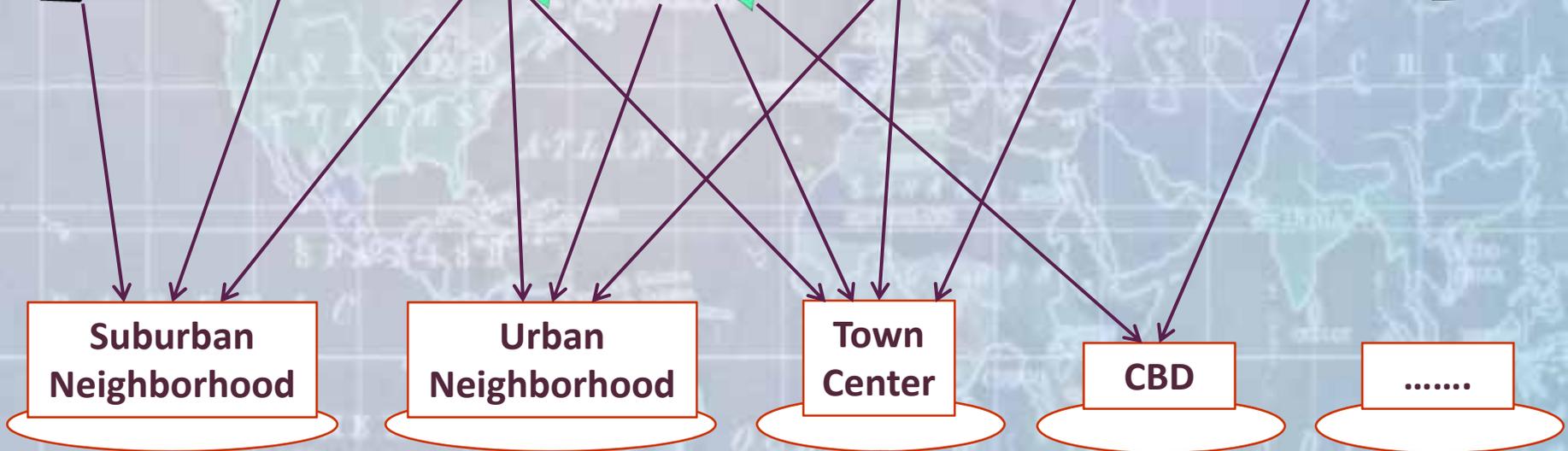
Example of Place Type
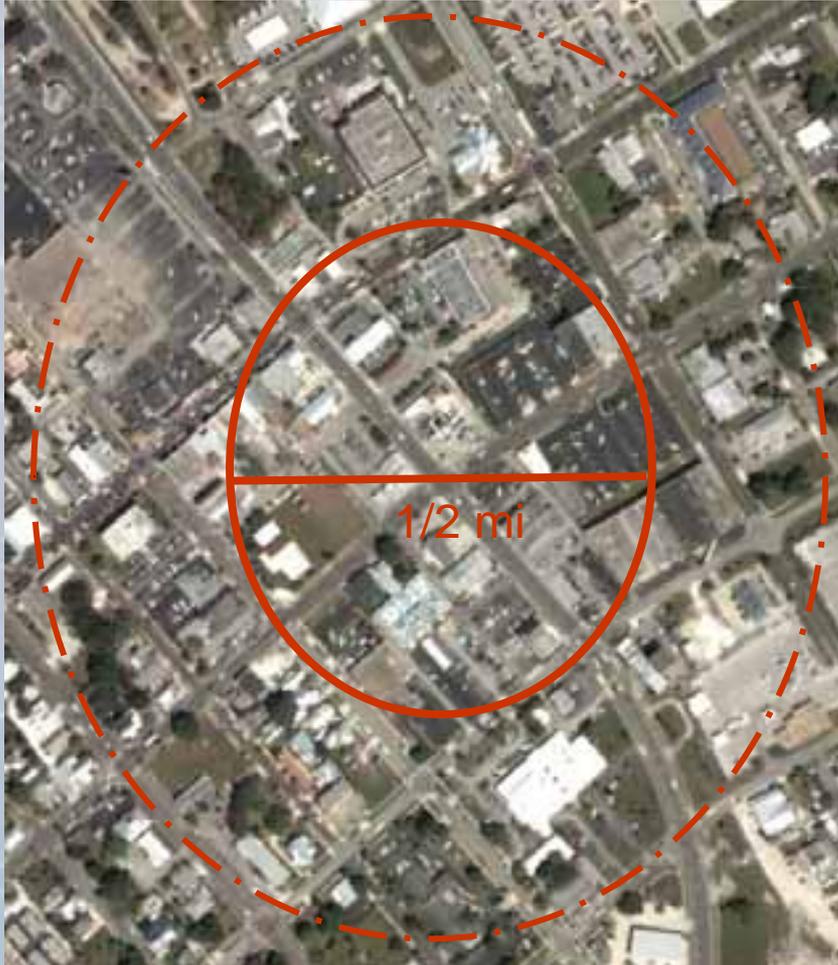
Land use detail

Dwelling Units/Acre	5
Non-Residential FAR	0.72

Non-Developable		Developable	
Park	2 %	SF House	3 %
Retention	2 %	Apartment	12 %
Road	15 %	Mixed Use	6 %
Civic	15 %	Retail	12 %
Parking	5 %	Office	28 %
Total	39 %	Total	61 %
GRAND TOTAL			100 %

CorPlan Application
- NFRPO Land Use Scenario Planning-

Project Overview

❖ **Land use scenario planning in conjunction with 2035 Long Range Transportation Plan (LRTP) of North Florida Transportation Planning Organization**

❖ **Exploring alternative land use concepts and the associated long term transportation impacts and opportunities**
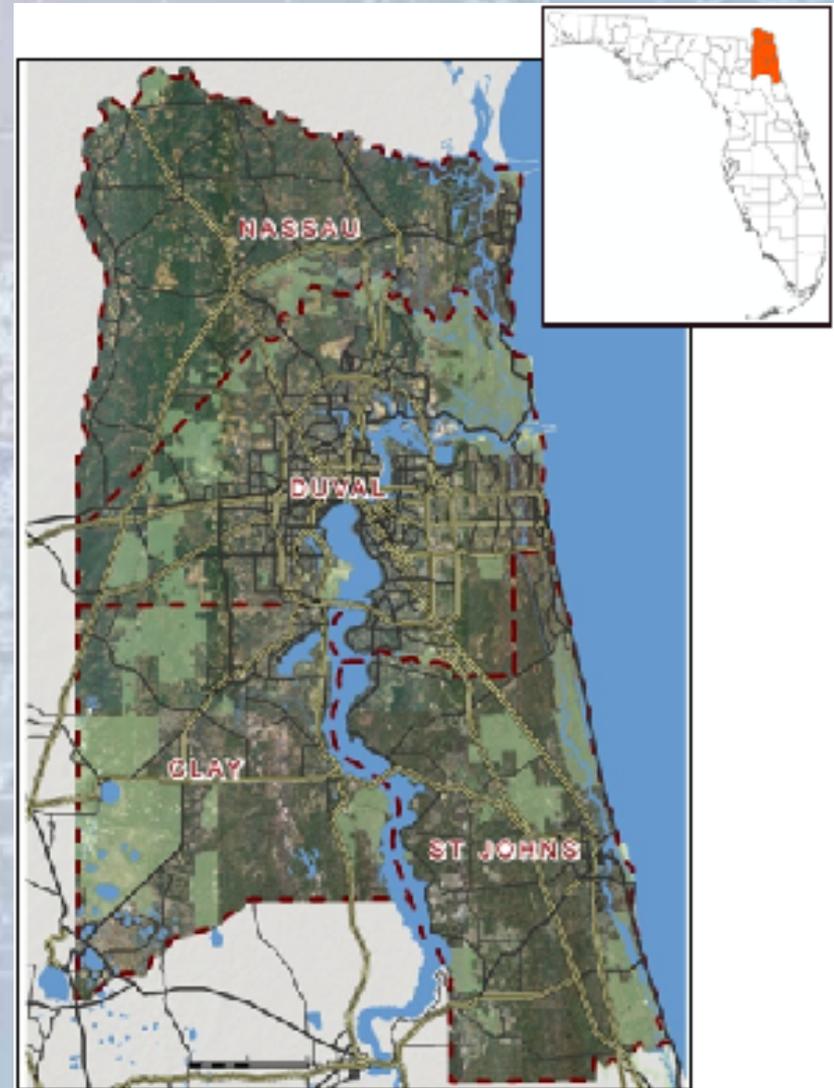
Base of Land Use Alternatives

❖ **Developing future land use alternatives in the region in order to accommodate projected population and employment growth**

County	2005		Increment 2005-2035		Annual Growth Rate	
	Population	Employment	Population	Employment	Population	Employment
Clay	184,624	47,374	132,176	25,270	1.84%	1.44%
Nassau	67,681	20,213	38,819	10,782	1.52%	1.44%
St. Johns	157,981	65,666	168,382	35,027	2.45%	1.44%
Duval	855,572	509,112	362,428	271,564	1.18%	1.44%
Total	1,262,795	642,365	701,805	342,643	Avg .1.48%	Avg. 1.44%

CorPlan

❖ **A customized GIS land use simulation tool that allows creating and allocating place types**
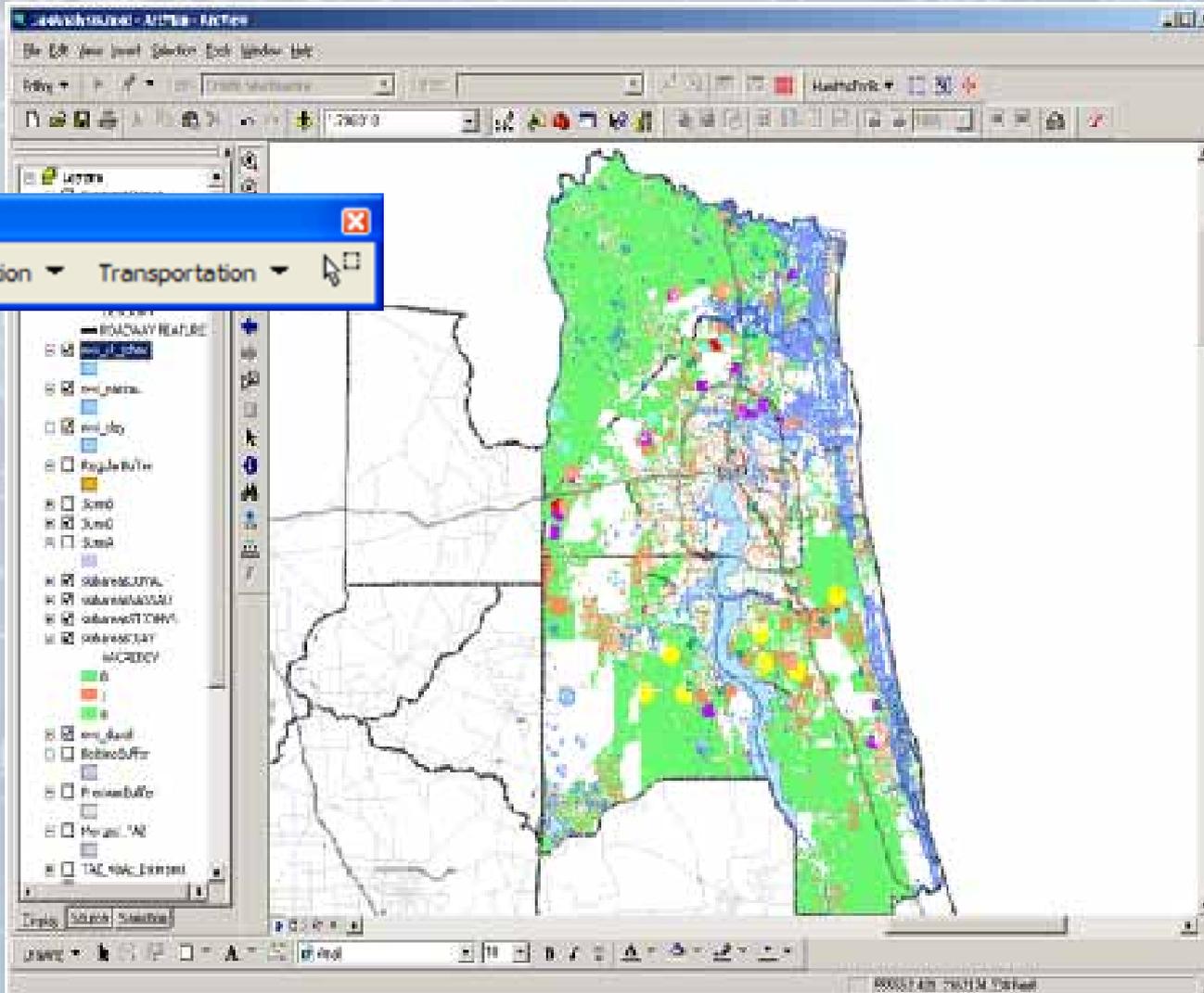
Designing Parcel with CorPlan
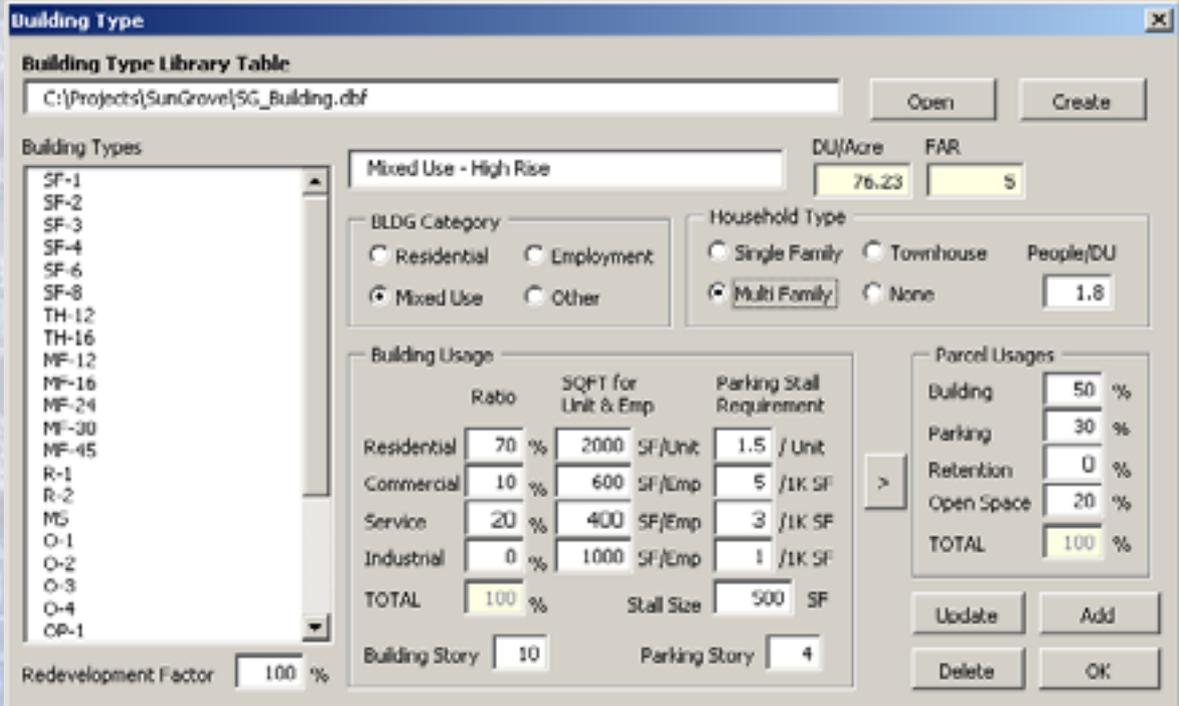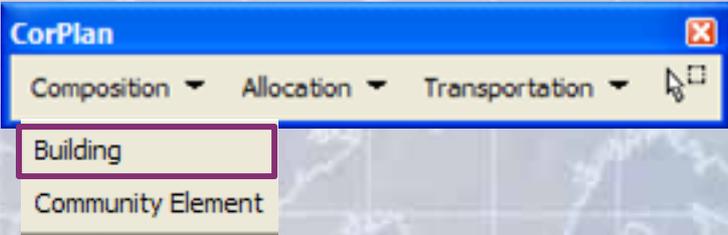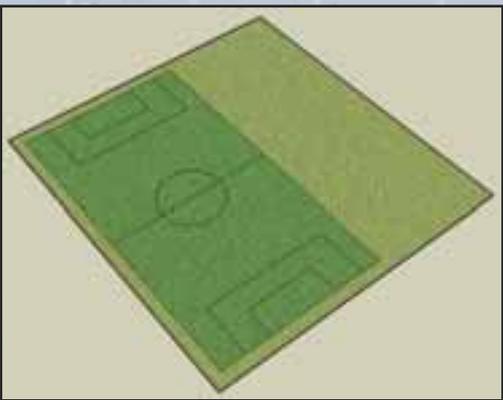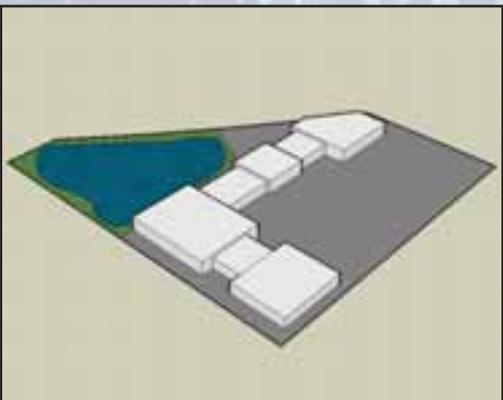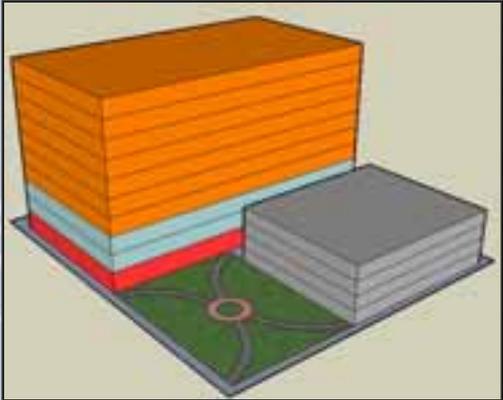
❖ **Any kind of parcels can be modeled from high-raised mixed used lot to community park.**

Creation of Place Types
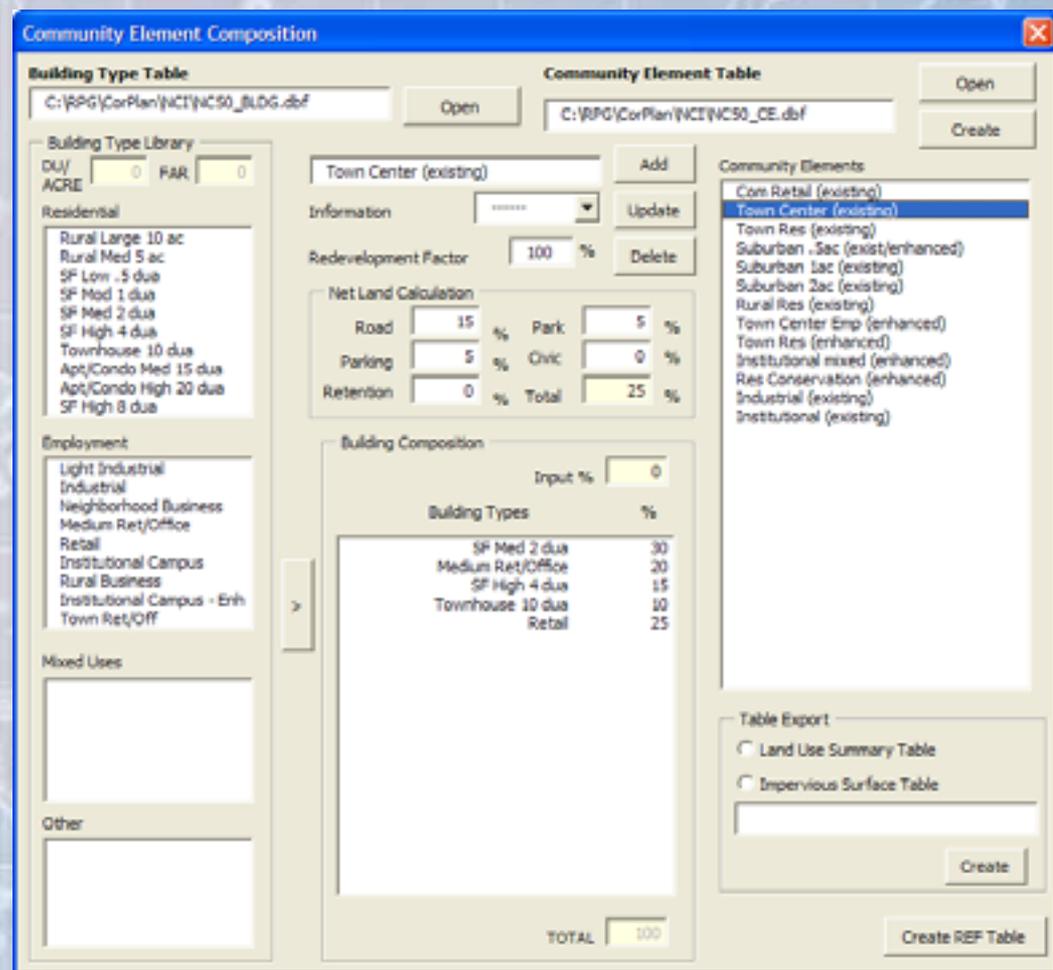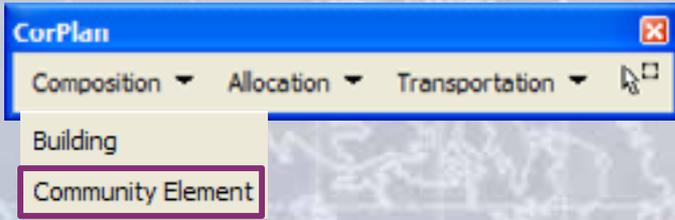
❖ **A place type is a combination of different parcel types.**

❖ **Parcels can be pulled out from the list of parcels created earlier.**

Community Element for the Project
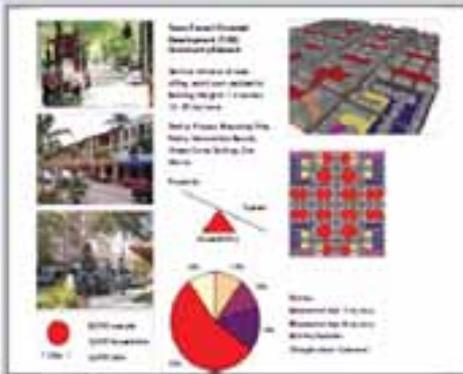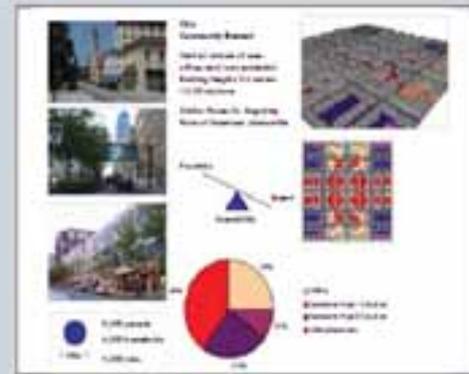
Base Polygon Preparation

❖ **Defining geographic unit of analysis**
- ❖ **Polygrids or parcel polygons**
- ❖ **Homogenous land use within polygon**

❖ **Classifying a study area into three categories**
- ❖ **Undevelopable area**
  - ❖ **environmental area, ROW, SF residential area, …**
- ❖ **Redevelopable area**
  - ❖ **built non-residential area**
- ❖ **Developable area**
  - ❖ **vacant and agricultural land**

Allocation of Place Types

Allocation Results Review

❖ **Summary Interface**
  ❖ **Providing socio-economic data based on allocation**
  ❖ **Keeping tracking allocation in overall or in particular areas**

Development of Four Scenarios
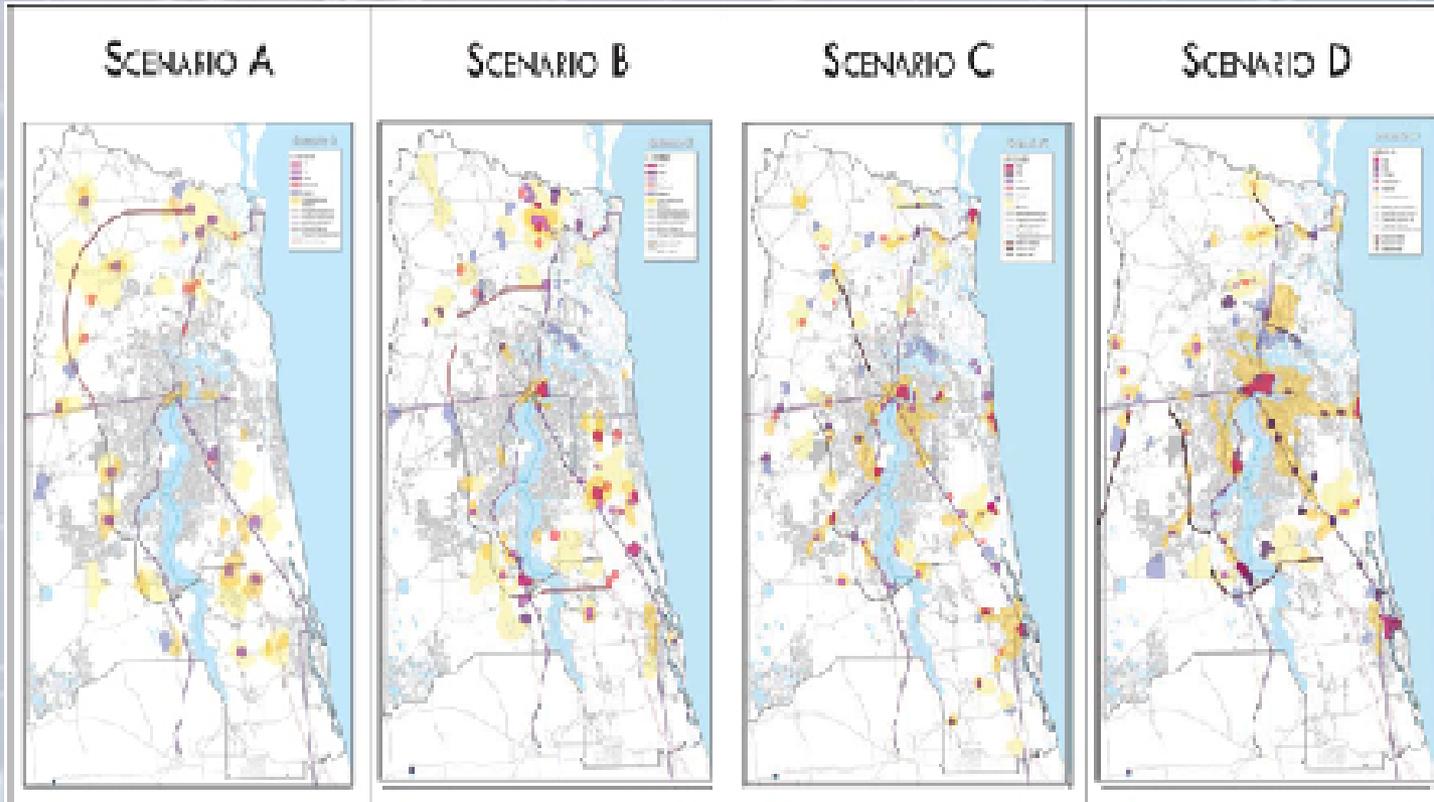

- ❖ **Scenario A – Concentric Outer Growth**
- ❖ **Scenario B – North-South Centers Growth**
- ❖ **Scenario C – Satellite Centers Growth**
- ❖ **Scenario D – Transit Centers Growth**

Allocation Results Export

❖ **Data Export Interface**

  ❖ **Summarizing allocated data by any geographical boundary (TAZ or census block) or place type**

  ❖ **Allowing exporting the summarized data in a format of DBF for further analysis**

  ❖ **Generating input data for transportation modeling**
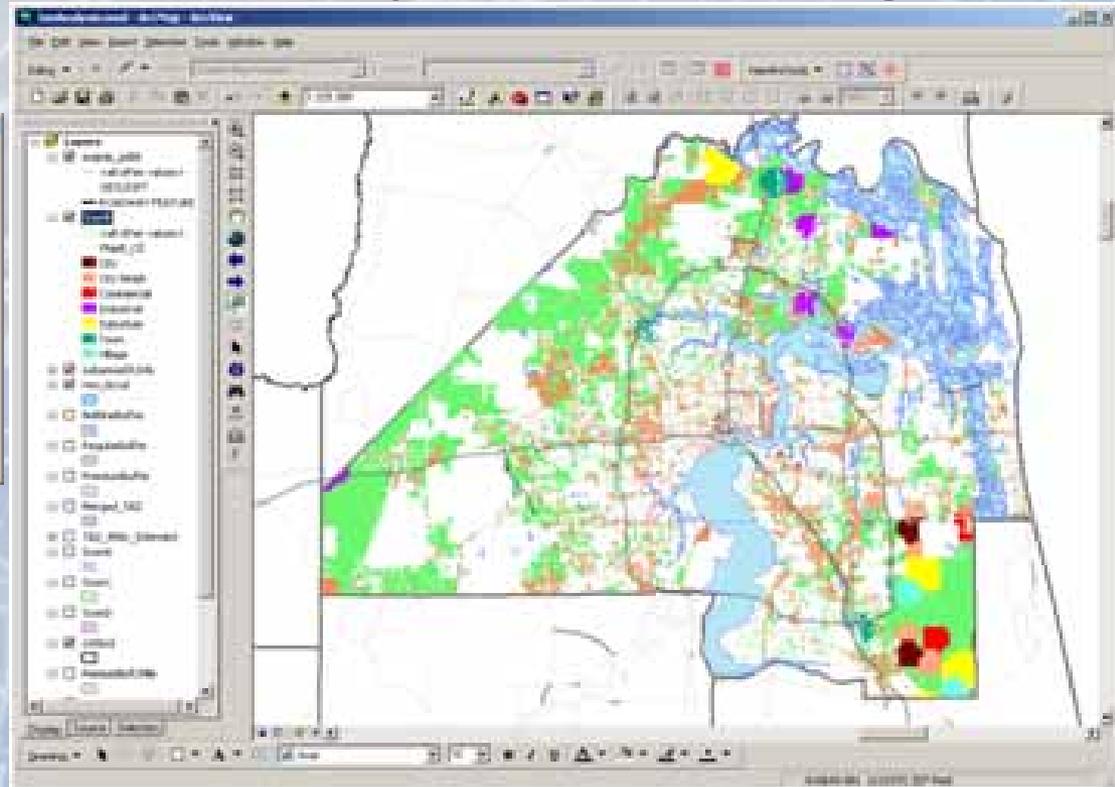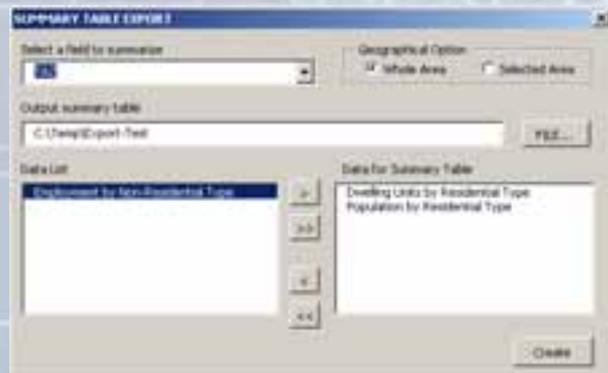
Scenario Comparison

❖ **Using the GIS layer, a variety of GIS analysis can be performed for the scenario comparison purposes.**

PERFORMANCE MEASURES	TREND SCENARIO	SCENARIO A	SCENARIO B	SCENARIO C	SCENARIO D
Total acreage of existing agricultural lands converted to urbanized lands	66,166	44,017	37,995	45,147	31,831
Persons per acre of developed lands (efficiency of urbanized land)	6.28	9.95	10.66	9.57	11.31
% of new households accomodated through redevelopment	17%	3%	2%	4%	18%
% of new jobs accomodated through redevelopment	18%	4%	2%	5%	22%

Summary

- ❖ **CorPlan, a customized ArcGIS appliction, allows creating and spatially allocating urban place types.**
- ❖ **Variety of land use scenarios can be built from the spatial allocation of place types.**
- ❖ **ArcGIS supports performing the spatial analysis of developed scenarios.**
- ❖ **CorPlan supports transportation decision making by comparing different land use development patterns.**